FINDING OF NO SIGNIFICANT IMPACT

SLC-4 to SLC-6 Replacement Waterline

Vandenberg Air Force Base, California

Pursuant to provisions of the National Environmental Policy Act (NEPA), 42 U.S. Code 4321 *et seq.*, implementing Council on Environmental Quality (CEQ) Regulations, 40 Code of Federal Regulations (CFR) 1500-1508, Air Force Instruction (AFI) 32-7061, entitled *Environmental Impact Analysis Process*, as amended by the interim change dated March 12, 2003, which adopted 32 CFR Part 989, the Air Force conducted an assessment of the potential environmental consequences of constructing a waterline approximately 7 miles long to service Space Launch Complex (SLC)-4, SLC-5, and SLC-6 on Vandenberg Air Force Base (AFB), California.

Vandenberg AFB is headquarters to the 30th Space Wing, the Air Force Space Command unit that operates Vandenberg AFB and the Western Range. Vandenberg AFB operates as a missile test base and aerospace center, supporting west coast space launch activities for the Air Force, Department of Defense, National Aeronautics and Space Administration, and commercial contractors.

Vandenberg AFB is located on the south-central coast of California, approximately halfway between San Diego and San Francisco. The 99,492-acre base extends along approximately 35 miles of the Santa Barbara County coastline.

The Environmental Assessment (EA), incorporated as an attachment to this finding, considers all potential impacts of the Proposed Action and Alternative Action on the natural and human environments, both as a solitary action and also in conjunction with other similar projects. The EA summarizes the results of the evaluations of the Proposed Action and an Alternative Action, and includes defining the 1) purpose of, and need for, the Proposed Action, 2) the existing, environmental conditions, and 3) likely effects of the proposed and alternative actions on the natural and human environments.

PROPOSED ACTION

Because of the deteriorating condition and inadequate capacity of the existing, approximately 40-year old waterline servicing SLC-4, SLC-5, and SLC-6 on South Base, the 30th Space Wing Civil Engineering Squadron (CES) has identified the need to construct a new waterline to 1) meet the water supply demands at SLC-4, SLC-5, and SLC-6, and 2) support the Evolved Expendable Launch Vehicle mission at SLC-6.

The Proposed Action consists of installing a replacement, subsurface waterline that will be 18 inches in diameter and approximately 7-miles long. Construction will take place over an approximately 17-month period. The proposed route will be constructed within roads and road shoulders. The route will follow Tank Road from Tank 700 to Surf Road, where the route will then traverse to the north and to the south. The northerly route will follow Surf Road to the existing waterline at Kelp Road near SLC-4. The southerly route will follow Surf Road to Coast Road, and then south along Coast Road to the vault located at SLC-6. A connection to SLC-5 will be installed from Surf Road at Delphy Road and would follow Delphy Road to SLC-5. The waterline will be installed using open trenching technology, except in two locations wherein directional drilling will be used. In one location, it will be necessary to bore underneath railroad tracks west of the entrance to SLC-6 on Coast Road. In the second location, boring

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will be below Coast Road in the upper portions of the 70-foot deep fill layer that lies above the culvert crossing Honda Canyon and Honda Creek.

Not replacing the existing waterlines servicing SLC-4, SLC-5, and SLC-6 will interfere with the water needed to meet mission demands. As such, the No-Action Alternative is unacceptable.

Aside from the No-Action Alternative, the only other available alternative is to follow along the existing waterline. As compared to construction along existing roadways, however, construction along the existing waterline route would more likely result in adverse impacts to the environment and would be more costly. The existing waterline is located on steep terrain, so construction efforts would be more substantial to accommodate this steeper topography and could potentially result in adverse impacts on the environment. Access roads to the existing waterline are very limited in their locations, so a new road would need to be constructed and the existing roads would need maintenance and repair.

SUMMARY OF FINDINGS

a) Cultural Resources

Nineteen archaeological sites and 2 isolated artifacts were documented within the 120-meter wide Area of Potential Effects (APE). Eight of the archaeological sites in the APE do not extend into the actual area of direct impact and, thus, will not be affected by the waterline installation. Archaeological investigations were completed at the remaining 13 resources to evaluate adverse effects, per Section 106 of the National Historic Preservation Act and 36 CFR 800. Those investigations found that at one location (CA-SBA-1145H), adverse effects would occur. A Memorandum of Agreement (MOA) was executed between the Air Force and the California State Historic Preservation Officer (SHPO) on July 27, 2004. The SHPO has determined that implementation of the terms of the MOA evidences satisfactory compliance by the Air Force with Section 106 of the National Historic Preservation Act. Given the high density of archaeological sites along the length of the waterline route, the MOA also requires an archaeologist and a Native American monitor any ground disturbance associated with waterline installation.

b) Biological Resources

Native Habitats and Special Status Plant Species. The Proposed Action would directly affect Central Coastal Scrub and Central Coast Maritime Chaparral. All construction constraints and monitoring measures described in the EA (Chapter 2) will be implemented to minimize disturbances and adverse impacts to native habitats. No impacts to wetlands are anticipated. Implementation of these measures will reduce impacts to native plant communities.

No federally threatened or endangered plant species were found within the project area during the botanical surveys. Two other special status special species occur throughout the project area. Potential adverse impacts to these species include "take" from activities such as excavation, crushing, or burial. All construction constraints and monitoring measures described in the EA (Chapters 2 and 4) will be implemented to minimize and where possible eliminate these potential adverse impacts. Implementation of these measures will reduce impacts to special status plant species.

Special Status Wildlife Species. No federal threatened and endangered species were documented during the biological surveys for the Proposed Action. Two federal endangered species and one federal threatened species are known to occur near the proposed project area. However, no adverse impacts to these species are anticipated as a result of the Proposed Action (Chapter 4). Several other special status species were documented during the surveys, and are likely to occur during project implementation.

Potential adverse impacts to special status wildlife species include temporary loss of habitat, disturbance due to noise, entrapment in project area, temporary decrease of habitat quality, abandonment of breeding site, and abandonment of roosting site. All construction constraints and monitoring measures described in the EA (Chapters 2 and 4) will be implemented to minimize and where possible eliminate these potential adverse impacts. Implementation of these measures will reduce potential impacts to special status wildlife species.

c) Air Quality

An Air Conformity Analysis completed under 40 CFR 93.153(b) and (c) and also under Section 176(c)(4) of the Clean Air Act deemed the Proposed Action *de minimis* and exempt from further conformity requirements. No permits are required for implementation of the proposed project. All measures described in the EA (Chapters 2 and 4) will be implemented to further decrease emissions during construction.

d) Water Resources

Potential adverse impacts from the Proposed Action to water resources include increased sedimentation load. All measures described in the EA (Chapters 2 and 4) will be implemented to prevent this potential adverse impact. Vandenberg AFB and the contractor will adhere to all terms and conditions set forth in the National Pollutant Discharge Elimination System (NPDES) permit to ensure water discharged during construction activities meets water quality standards. A Storm Water Pollution Prevention Plan will be developed and implemented, along with associated Best Management Practices, to minimize impacts to water resources and to maintain compliance with the NPDES permit.

e) Hazardous Materials and Hazardous Waste

Per compliance with 30th CES Space Wing Plans 32-7086 and 32-7043A, *Hazardous Materials Management and Hazardous Waste Management,* respectively, proper containment, storage, and disposal of hazardous materials and hazardous wastes used and generated by construction activities associated with the Proposed Action should prevent potential adverse impacts of these substances on the environment.

f) Human Health and Safety

Potential, adverse impacts of hazardous materials and hazardous waste on human health and safety will be avoided or minimized through strict compliance with 30th CES Space Wing Plans 32-7086 and 32-7043A (see item "e" above) and with the federal Occupational Safety and Health Act and the Air Force Occupational Safety and Health regulations.

g) Pollution Prevention

Compliance with the Vandenberg AFB Pollution Prevention Management Plan and implementation of the recommended measures for air quality, hazardous waste management, and solid waste management should result in no associated, adverse impacts from implementation of the Proposed Action.

h) Noise

Because noise levels generated by construction activities associated with the Proposed Action will be temporary and short-term, no adverse impacts from noise are anticipated to occur.

i) Environmental Justice

Implementation of the Proposed Action will not result in adverse impacts to minority and low income communities.

j) Cumulative Impacts

No adverse impacts resulting from activities associated with recent projects within the Proposed Action project area were identified. In addition, given that no adverse impacts are anticipated to occur as a result of the Proposed Action, cumulative impacts are not expected to result within the project area from the two future projects identified in Chapter 4 of the EA.

FINDING OF NO SIGNIFICANT IMPACT

Based upon our review of the facts and analyses contained in the attached EA, which was conducted in accordance with the provisions of NEPA, the CEQ Regulations, AFI32-7061, as amended by the interim change dated March 12, 2003, which adopted 32 CFR Part 989, we conclude that the Proposed Action will not have a significant environmental impact, either by itself or cumulatively with other ongoing projects at Vandenberg AFB. Accordingly, an Environmental Impact Statement is not required. The signing of this Finding of No Significant Impact completes the environmental impact analysis process.

FINDING OF NO SIGNIFICANT IMPACT
CONCURRENCE PAGE

Environmental Assessment for the SLC-4 to SLC-6 Waterline Replacement
Vandenberg Air Force Base, California

I concur with the Finding of No Significant Impact (FONSI):

Environmental Protection Committee Approval:

7 Sep 04

FRANK GALLEGOS, Colonel, USAF
Commander, 30the Space Wing
Chairman, Environmental Protection Committee
Vandenberg AFB CA

Date

Judge Advocate Approval:

21 AUG 04

RAYMOND F. CHAMBERLAND, Lt Col, USAF
Staff Judge Advocate
Vandenberg AFB CA

Date

Squadron Approval:

8/19/04

BRENT L. SCHUMACHER, GM-14 (DAF)
Deputy Base Civil Engineer, 30th Civil Engineer Squadron
Vandenberg AFB CA

Date

Final
Environmental Assessment

SLC-4 to SLC-6 Replacement Waterline

Vandenberg Air Force Base
California

28 July 2004

Final
Environmental Assessment

SLC-4 to SLC-6 Replacement Waterline

Vandenberg Air Force Base
California

Submitted To:

Department of the Air Force
30th Space Wing
Environmental Flight
Vandenberg Air Force Base, California

28 July 2004

Prepared By:

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1. Introduction: Purpose of and Need for the Proposed Action

1.1. Background

The National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations require a lead agency to prepare an Environmental Assessment (EA) to evaluate the potential impacts of Federal actions on the surrounding environment. The United States Air Force (Air Force) is the lead agency for NEPA compliance on this proposed project and, as such, is the final decision-maker.

This EA evaluates the adverse environmental impacts associated with the Proposed Action and the No-Action Alternative of the Vandenberg Air Force Base (AFB) proposal to replace existing subsurface waterlines servicing Space Launch Complex (SLC)-4, SLC-5, and SLC-6 on south Vandenberg AFB (South Base) in Santa Barbara County, California over an approximately 17 month period.

This EA has been prepared in accordance with the NEPA of 1969, as amended [42 U.S. Code (USC) 4321 et seq.]; as implemented by CEQ Regulations [40 Code of Federal Regulations (CFR) Parts 1500-1508]; and Air Force Instruction (AFI) 32-7061, Environmental Impact Analysis Process, as amended by the interim change dated March 12, 2003, which adopted 32 CFR Part 989.

Vandenberg AFB is headquarters for the 30th Space Wing (30th SW). The Air Force's primary missions at Vandenberg AFB are to launch and track satellites in space, test and evaluate America's intercontinental ballistic missile systems, and support aircraft operations in the Western Range. As a non-military facet of operations, Vandenberg AFB is also committed to promoting commercial space launch ventures.

1.2. Proposed Action

Vandenberg AFB proposes to replace the over 40-year old, deteriorating, 12-inch diameter, subsurface waterlines servicing the SLC-4, SLC-5, and SLC-6 facilities on South Base (Figures 1-1 and 1-2) with approximately 7 miles of 18-inch diameter pipeline using appropriate construction materials and engineering design. Open trenching technology would primarily be used, although horizontal drilling would also be utilized in two locations to accommodate construction-engineering constraints. Construction activities would take approximately 17 months.

The proposed route would be constructed within roads and road shoulders. The proposed route would follow Tank Road from Tank 700 to Surf Road, where the route would then traverse to the north and south. The northerly route would follow Surf Road to the existing waterline system at Kelp Road near SLC-4. The southerly route would follow Surf Road to Coast Road, and then south along Coast Road to the vault located at SLC-6. A connection to SLC-5 would be installed from Surf Road at Delphy Road and would follow Delphy Road to SLC-5.

1.3. Purpose of the Proposed Action

The purpose of the Proposed Action is to meet the water supply demands at SLC-4, SLC-5, and SLC-6 and to support the Evolved Expendable Launch Vehicle mission at SLC-6 by:

- Increasing capacity and water supply
- Minimizing repair and maintenance needs of the system
- Increasing accessibility for repair and maintenance activities.

1.4. Need for the Proposed Action

Vandenberg AFB needs to replace the existing waterline servicing facilities at SLC-4, SLC-5, and SLC-6 because of the deteriorating condition and inadequate capacity. Ruptures and leaks frequently occur in the existing waterline because of pipeline age, material, size, construction engineering design, and location, as outlined below:

- The existing waterlines are over 40 years old.
- The existing waterlines are 12-inch diameter pipelines. Current and future demands on the water supply exceed the capacity of this pipeline diameter.
- Much of the cross-country alignment of the existing pipeline is located within rough terrain, making access difficult for maintenance and repair activities. These constraints increase repair and maintenance costs. Additionally, because this rough terrain is susceptible to erosion, the waterline is exposed to weather conditions; the resultant exposure hastens the aging process of the pipeline.

1.5. Scope of the Environmental Assessment

This EA describes and addresses the potential adverse environmental impacts that would result from implementing the Proposed Action to construct a waterline on South Base between SLC-4, SLC-5, and SLC-6. This EA also evaluates the potential adverse environmental impacts of the No-Action Alternative. No other Action Alternatives are considered because constructing primarily along existing roadways, as opposed to the existing waterline, would be less invasive to the environment and less costly.

Consistent with AFI 32-7061 and CEQ regulations, the scope of analysis presented in this EA is defined by the potential range of adverse, environmental impacts resulting from the implementation of the Proposed Action and the No-Action Alternative. Resources potentially impacted are considered in more detail in order to determine whether additional analysis is required pursuant to 40 CFR Part 1501.4(c). The resources analyzed in this EA include:

- Cultural resources
- Biological resources
- Air quality
- Water resources
- Hazardous materials and hazardous waste
- Human health and safety
- Pollution prevention
- Noise
- Environmental justice.

The following resource areas were considered, but not analyzed, in this EA:

- Earth Resources. The proposed construction route would be entirely within previously disturbed corridors, i.e., roads and road shoulders. As such, geologic features and soil would not be adversely impacted. Ground motion as a result of seismic activity would have limited potential impacts on the Proposed Action because 1) the waterline would not be considered a major infrastructure element (e.g., a bridge), and 2) engineering design would take seismic conditions into consideration.
- Land Use. The Proposed Action would be constructed in roads and road shoulders. Vehicular access, including emergency services, would not be impeded because roadways would remain partially open. At most, non-emergency through-traffic would be diverted and such restrictions would be posted in advance.
- Socioeconomics. The Proposed Action would be of limited duration (approximately 17 months) and would not be considered a major project. As such, socioeconomic conditions in the area would not be affected.
- Solid Waste. The amount of solid waste generated would be below levels sufficient to

result in any adverse impacts and contractors are required to appropriately dispose of all solid waste off Vandenberg AFB property. As such, solid waste would not be adversely impacted at Vandenberg AFB as a result of the Proposed Action.

- Transportation of Hazardous Materials and Hazardous Waste. Although vehicles associated with the Proposed Action may carry petroleum, oil, and lubricants (POLs) to and from the work site for routine maintenance and operation of construction equipment, the low quantities would not be sufficient to be considered being "transported" under U.S EPA and DOT regulations (49 USC). Therefore, this application of hazardous materials and hazardous waste would not apply to the Proposed Action.

1.6. Applicable Regulatory Requirements

Federal and State regulations affecting implementation of the Proposed Action and the No-Action Alternative are presented in Table1-1.

1.7. Organization of the EA

This EA is organized in the following sections and appendices:

- Chapter 1 is an introduction to the EA and includes the purpose of - and need for - the Proposed Action.
- Chapter 2 provides a description of the Proposed Action, including protection measures, and the No-Action Alternative.
- Chapter 3 and 4 present, respectively, the affected environment and the environmental consequences of implementing the Proposed Action and the No-Action Alternative. Resources areas are discussed in the order presented in Section 1.5 above, wherein those with a higher potential for being adversely impacted are presented first and those with the least potential for being adversely impacted are presented last. In addition to being discussed in Chapter 2, protection measures are discussed in Chapter 4 along with each resource area, as needed, for ease in reference when reviewing environmental consequences. To avoid unnecessary repetition, the adverse, cumulative impacts of the Proposed Action on all resource areas are discussed at the end of Chapter 4.
- Chapters 5 through 8 contain the following, respectively: list of agencies and persons consulted, bibliography, list of preparers, and acronyms and abbreviations.

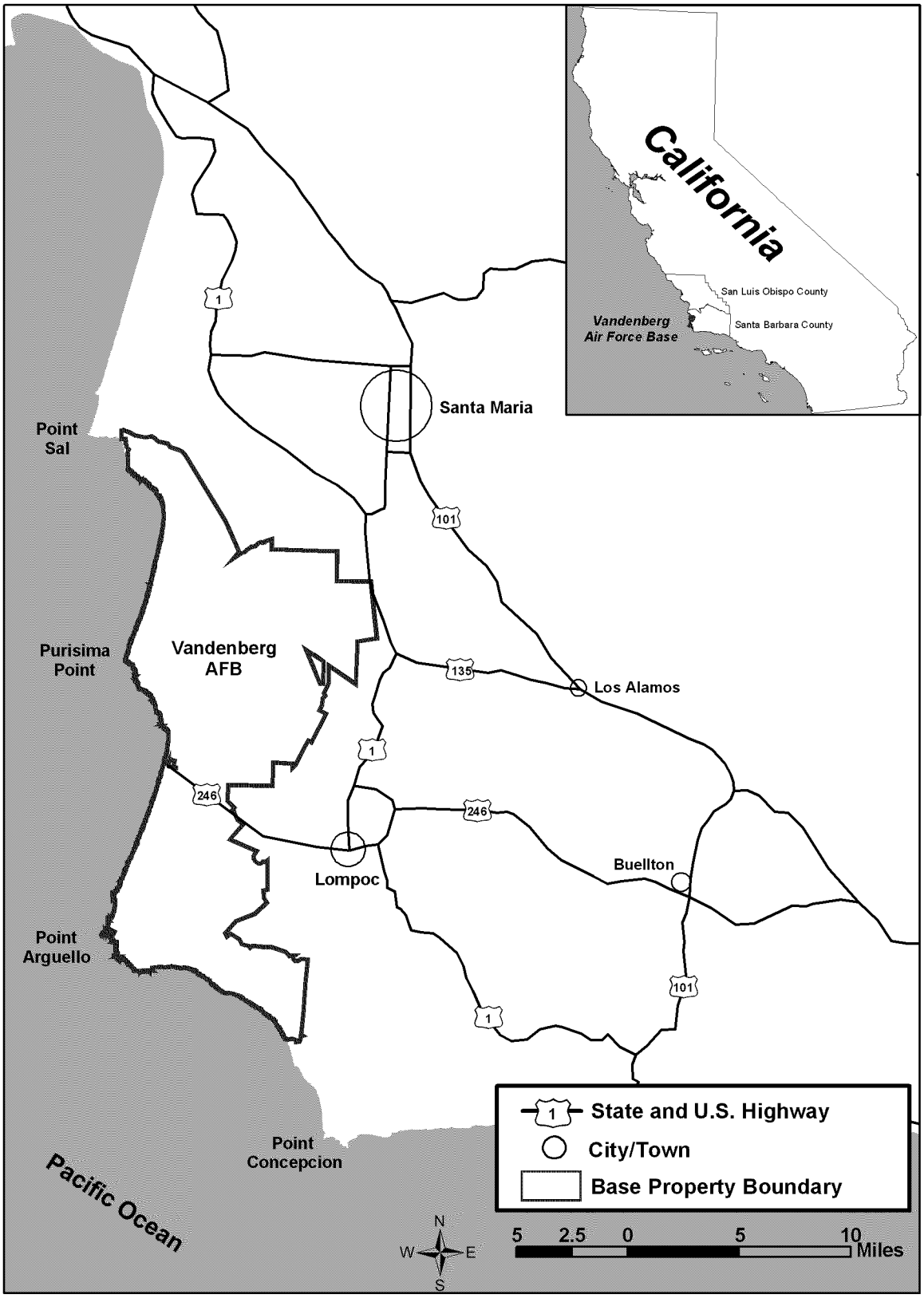

Figure 1-1. Regional Location of Vandenberg AFB.

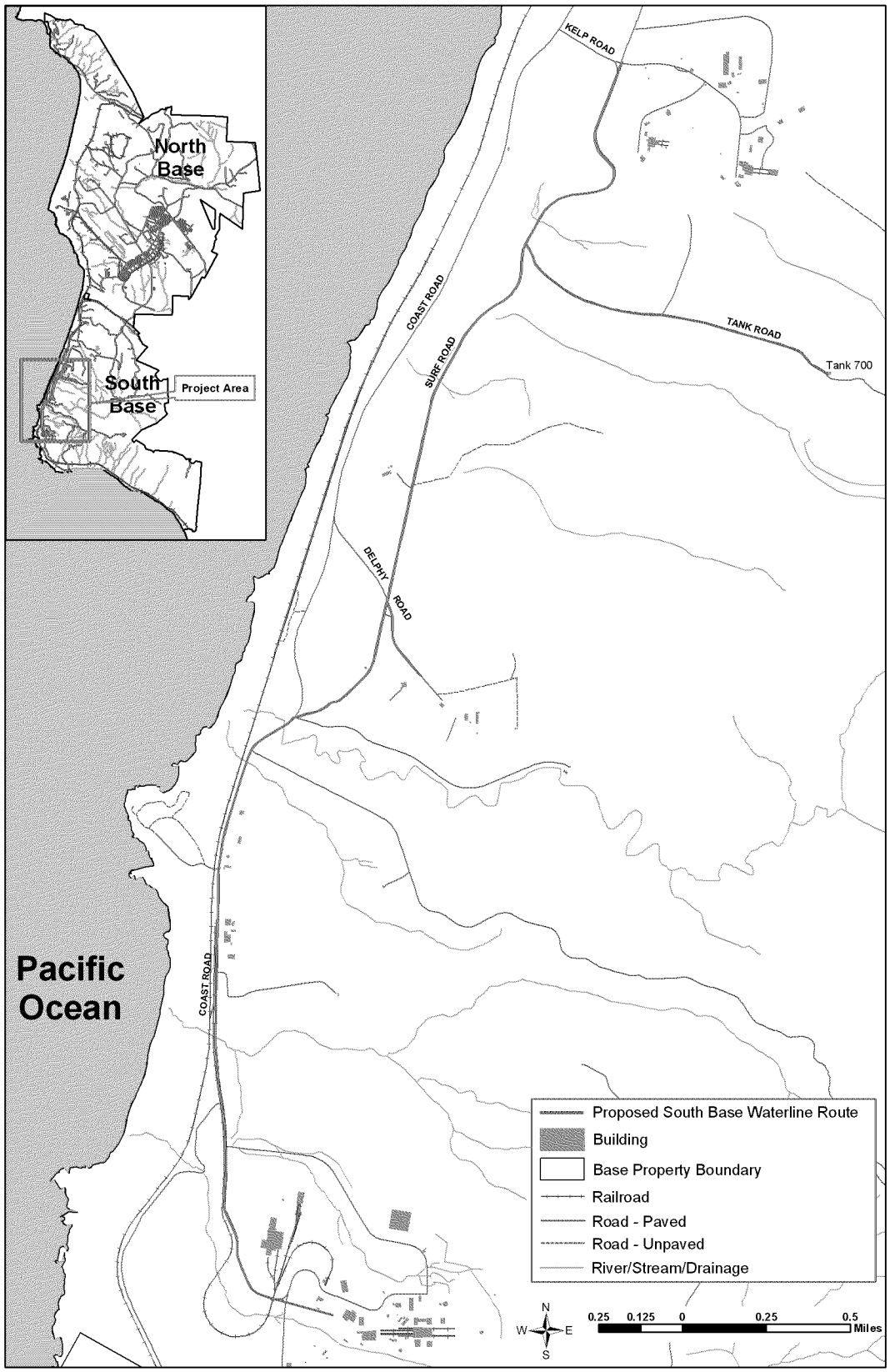

Figure 1-2. Location Map for Proposed SLC-4 to SLC-6 Replacement Waterline Route.

Table 1-1. Federal and State Regulations Applicable to the Implementation of the Proposed Action.

Federal Law	Activity or Requirement
Archaeological and Historic Preservation Act (AHPA) of 1974 (16 U.S.C. 469a et seq.)	AHPA is directed toward the preservation of historic and archaeological data that would otherwise be lost as a result of Federal construction or other Federally licensed or assisted activities. AHPA authorizes the U.S. Department of the Interior to undertake recovery, protection, and preservation of archaeological or historic data.
Archaeological Resources Protection Act (ARPA) of 1979 (16 U.S.C. 469 et seq.)	The intent of ARPA is to protect archaeological resources. As such, ARPA requires a permit for any excavation or removal of archaeological resources from public or Indian lands. ARPA also provides for confidentiality of archaeological information.
Clean Air Act (CAA) of 1970 (42 U.S.C. 7401 et seq.)	Establishes that applicable state and national ambient air quality standards must be maintained during the operation of any emission source. National Ambient Air Quality Standards include primary and secondary standards for various pollutants. The primary standards are mandated by the CAA to protect public health, while the secondary standards are intended to protect the public welfare from adverse impacts of pollution, e.g., visibility impairment.
CAA Amendments of 1990	Establishes new Federal nonattainment classifications, emissions control requirements, and compliance dates for areas in nonattainment. The requirements and compliance dates are based on the nonattainment classification.
Clean Water Act (CWA) of 1977, as amended (33 U.S.C. 1251 et. seq.)	Prohibits the discharge of pollutants from a point source into navigable waters of the United States, except in compliance with a National Pollutant Discharge Elimination System (NPDES) (40 CFR Part 122) permit. The navigable Waters of the United States are considered to encompass any body of water whose use, degradation, or destruction will affect interstate or foreign commerce. Section 401 of the CWA requires that the discharge of dredged or fill material into water of the United States does not violate State water quality standards. Generally, CWA Sec. 404 permits will not be issued until the State has been notified and the Applicant has obtained a certification of state water quality standards. Section 402 of the CWA requires that a National Pollutant Discharge Elimination System (NPDES) certification be obtained from the applicable Regional Water Quality Control Board (RWQCB) for projects that would disturb 1 or more acres of land. Section 404 of the CWA establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Activities in waters of the United States that are regulated under this program include fills for development, water resource projects (e.g., dams and levees), infrastructure development (e.g., highways and airports), and conversion of wetlands to uplands for farming and forestry.

Federal Law	Activity or Requirement
Coastal Zone Management Act (CZMA) of 1972, as amended (16 USC 1451-1464)	Based on land development controls within coastal zones, incorporates State involvement through the development of programs for comprehensive State management. Requires Federal agencies or licensees to carry out their activities in such a way that they conform to the maximum extent practicable with a state's coastal zone management program.
Endangered Species Act (ESA) of 1973 (7 U.S.C. 136, 16 U.S.C. 460 et seq.)	Declares the intention of Congress to conserve threatened and endangered species and the ecosystems on which those species depend. The ESA requires Federal agencies, in consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, use their authorities in furtherance of its purposes by carrying out programs for the conservation of endangered or threatened species.
Section 7 of the ESA (16 U.S.C. 1536)	Contains provisions that require Federal agencies to consult with the Secretary of Interior and to take necessary actions to insure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of endangered species and threatened species.
Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. 703-712)	The MBTA implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under MBTA, the taking, killing, or possessing of migratory birds is unlawful.
National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321-4347	NEPA requires Federal agencies to analyze the potential environmental impacts of major Federal actions and alternatives and to use these analyses as a decision-making tool on whether and how to proceed.
National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470 et seq.)	The key Federal law establishing the foundation and framework for historic preservation in the United States. The NHPA 1) authorizes the Secretary of the Interior to expand and maintain a National Register of Historic Places (National Register); 2) establishes an Advisory Council on Historic Preservation (Council) as an independent Federal entity; 3) requires Federal agencies to take into account the effects of their undertakings on historic properties, and to afford the Council an opportunity to comment upon any undertaking that may affect properties listed, or eligible for listing, in the National Register; and 4) makes the heads of all Federal agencies responsible for the preservation of historic properties owned or controlled by them.
Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, as amended (25 U.S.C. 3001 et seq.)	NAGPRA establishes requirements for the treatment of Native American human remains and sacred or cultural objects found on Federal land. Federal agencies and museums must compile inventories of Native American human remains and associated funerary objects in their possession, and notify the associated Indian tribes of the inventory. NAGPRA provides for repatriation of those items, and requires notification if Native American cultural items are discovered on federal lands.

Federal Law	Activity or Requirement
Subtitle C of the Resource Conservation and Recovery Act (RCRA) of 1976 (42 U.S.C. 6901 et seq.)	The basic framework for a comprehensive regulatory program for the management of hazardous waste - from its generation to its final disposal.
State Regulation	**Activity or Requirement**
CAA of 1988	Develops and implements a program to attain the California Ambient Air Quality Standards for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter less than or equal to 10 microns in diameter, lead, sulfates, hydrogen sulfide, and vinyl chloride.
CAA, 40 CFR Part 51	Gives State and local agencies the authority to establish air quality rules and regulations. Rules adopted by the Santa Barbara County Air Pollution Control District and accepted by the Air Resources Board are included in the State Implementation Plan. When approved by the U.S. EPA, these rules become Federally enforceable.
California Coastal Act (CCA) of 1976	Provides long-term protection of California's 1,100-mile coastline for the benefit of current and future generations. CCA policies constitute the standards used by the California Coastal Commission (Commission) in coastal development permit decisions and in the review of local coastal programs prepared by local governments and submitted to the Commission for approval. These policies are also used by the Commission to review federal activities that affect the coastal zone.
Porter-Cologne Water Quality Control Act	Protects all waters of the state for the use and enjoyment of the people of California and declares that the protection of water resources be administered by the regional water quality control boards.

2. Description of the Proposed Action and Alternatives

This chapter describes the Proposed Action and the No-Action Alternative for constructing a waterline to service SLC-4, SLC-5, and SLC-6 on South Base (Figures 1-1 and 1-2). Aside from the No-Action Alternative, no other alternatives were considered because the only other available alternative is to follow along the existing waterline. As compared to construction along existing roadways, construction along the existing waterline route would more likely result in adverse impacts to the environment and would be more costly. The existing waterline is located on steep terrain, so construction efforts would be more substantial to accommodate this steeper topography and could potentially result in adverse impacts on the environment. Access roads to the existing waterline are very limited in their locations, so a new road would need to be constructed and the existing roads would need maintenance and repair.

Included in this chapter are projected equipment needs, construction requirements, and operational parameters for the Proposed Action. The engineering specifications provided in this chapter are based on personal communications with Shauna Grider, P.E., Project Engineer, 30th CES/CECC on 8 August 2003 and on the Penfield and Smith document dated 25 June 2003, *South Base Waterline Replacement, Phase 1: SLC-4 to Coast Road, Phase 2: Coast Road to SLC-6, Vandenberg Air Force Base, California, 100% Submittal* (Penfield and Smith 2003).

2.1. Proposed Action

The Proposed Action consists of installing an approximately 7-mile long, subsurface waterline over an approximately 17-month period. The waterline would be located on South Base between SLC-4, SLC-5, and SLC-6. The waterline would replace an existing waterline that has deteriorated.

The waterline would be installed using primarily open trenching. However, horizontal drilling would also be used in two locations: 1) to bore under the railroad tracks near Coast Road and SLC-6, and 2) to bore through fill which lies beneath Coast Road and above the culvert at the Honda Canyon and Honda Creek crossing.

2.1.1. Project Location

The proposed route on South Base (Figure 1-2) would follow Tank Road from Tank 700 to Surf Road, where the route would tend to the eastern side of the road and would traverse to the north and to the south. The northerly route would follow Surf Road to the existing waterline system at Kelp Road near SLC-4. The southerly route would follow Surf Road to Coast Road, and then south along Coast Road to the vault located at SLC-6. The route along Coast Road would tend to the western side of the road. A lateral to SLC-5 would be provided via departure off of Surf Road onto Delphy Road, and then follow Delphy Road to SLC-5. Figure 2-1 provides a detailed route map; the "segments" identified in this figure are for biological analysis purposes and are discussed in Section 3.2.3.

2.1.2. Project Description

2.1.2.1. Construction Methods

The waterline construction process would consist of installing an 18-inch diameter, pipeline underground using primarily open trenching technology. Directional drilling would be used in areas where construction engineering specifications cannot accommodate trenching - i.e., at a railroad crossing and within road fill that isn't stable enough at the shallower trenching depths.

All construction areas would be compacted to grade and returned to their original or better condition by replacing all asphalt, landscaping, or any earthen materials.

Soil stockpiled during excavation activities would be either 1) used as backfill at the construction

site, or 2) transported to an appropriate borrow site on VAFB where it would be stockpiled for other uses.

Recontouring the surface and establishing appropriate drainage and erosion control measures would stabilize areas subject to erosion.

Trenching

Trenching would involve linearly excavating soil to an approximate width of 9 feet and, in all but one location, to an approximate depth of 5 feet within roads and road shoulders. In order to avoid a set of remediation pipelines that enter Surf Road near SLC-4, trenching would be at an approximate depth of 10 feet. This particular section would not be bored because the waterline would be encased in concrete to protect the water supply from potential leakage from the remediation pipeline. All trenching would occur in segments wherein no more than 1,000 feet of trench would be exposed at any one time during construction.

Temporarily displaced soil would be stockpiled immediately adjacent to the trench. The bottom of the trench would be backfilled with appropriate, well-graded granular material, free of organics and deleterious material. After the pipeline is placed into the trench, the remaining portion of the trench would be backfilled and compacted with either the stockpiled soil or imported material, such as sand cement slurry. During the backfill process, a warning tape would be placed 12 inches below grade.

Directional Drilling

Directional drilling would be accomplished using jack and bore operations. The process would involve drilling a borehole into the ground, continuing the borehole underground until it reaches the designated end point, wherein the borehole would terminate at the ground surface. The Proposed Action would use directional drilling to bore 1) under the railroad tracks near Coast Road and the entrance to SLC-6 on Coast Road, and 2) through fill above the culvert that lies beneath Coast Road at the Honda Canyon and Honda Creek crossing.

A surface-operated drilling device is angled into the ground from the surface at the pilot hole and directed to its destination using a radio-controlled mole that contains a cutter head. Personnel directing the mole control its depth and direction of excavation. The borehole would extend to a maximum depth of approximately 25 feet below grade. A truck-mounted generator would be used to power the equipment at the drill site.

During the typical boring process, bentonite slurry is pumped through the borehole to lubricate the drill bit, carry drill cuttings to the surface, and prevent the bore tunnel from collapsing. Material safety data information on bentonite is provided in Appendix A. The slurry is typically stored in tanks at the drill site when not in use. After the bore is completed, any excess slurry remaining is removed from the site and either reused by the drilling contractor or disposed of at an appropriate facility.

Although it is highly unlikely, drilling slurry can escape the borehole through fissures or cracks in the soil and then reach the ground surface. Containment measures included in the SWPPP would be implemented, as needed.

2.1.2.2. Cathodic Protection System

To help protect the waterline from corrosion, a cathodic protection system would be installed. A cathodic protection system generates a "shield" of electrons around metallic surfaces and prevents the corrosion process from commencing.

The cathodic protection system would be installed in the same trench as, and concurrently with, the waterline. A cathodic protection system would not be installed where the waterline is bored, as there would be no physical access for placement of the features. The cathodic protection system features would primarily consist of 19 anode test stations, which would be placed along the length of the waterline at the mile marker locations indicated below (Penfield and Smith 2003):

Surf Road		Coast Road	Delphy Road	Tank Road
12+00.00	70+93.75	1+00.00	1+00.00	29+99.22
26+50	91+94.01	14+49.90	12+99.22	
31+95.13	114+94.01	25+49.89		
37+94.61	134+40.00	33+49.89		
46+96.71	144+93.42	151+93.38		
52+94.84				

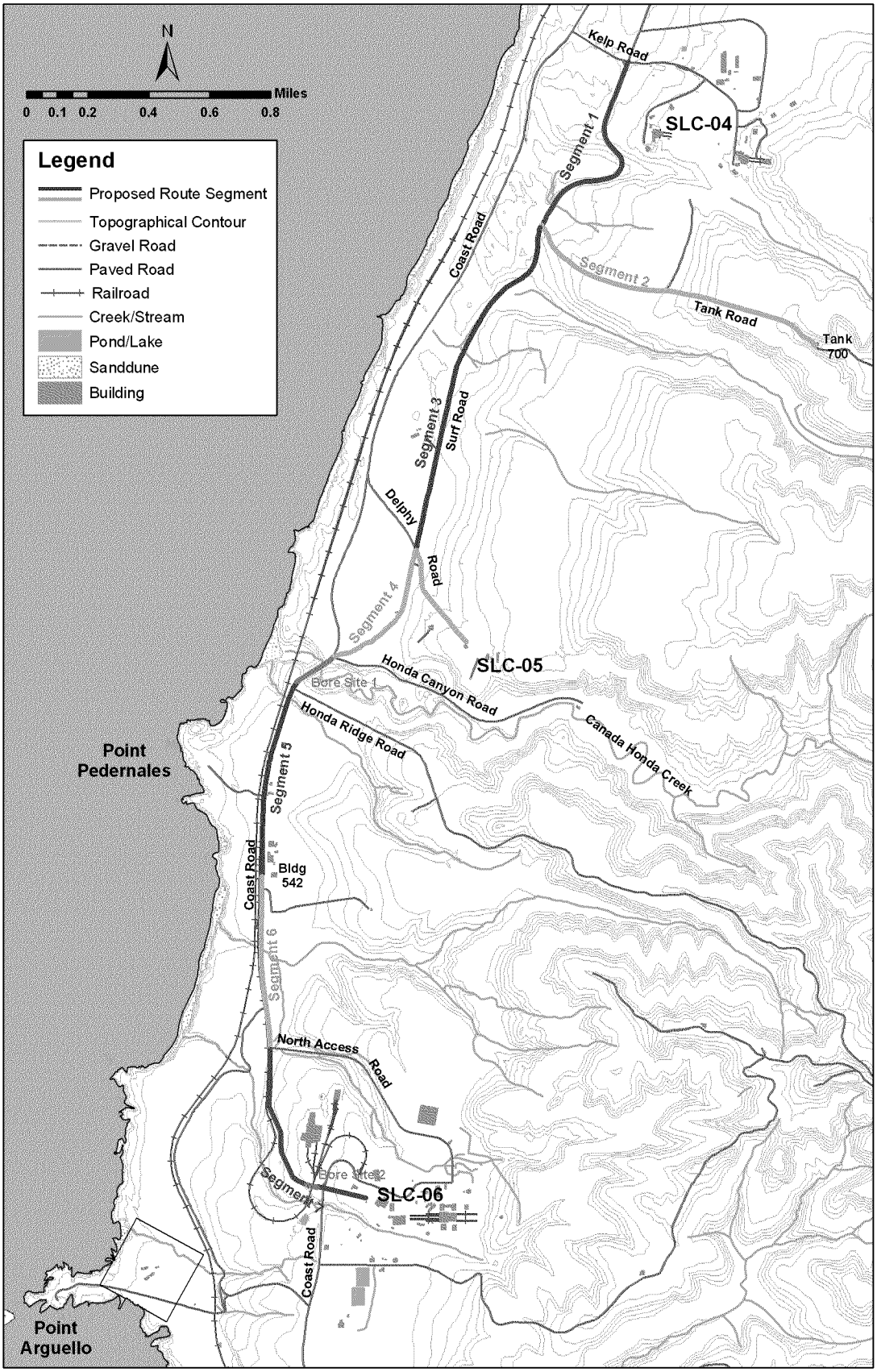

Figure 2-1. Detailed Map of the Proposed SLC-4 to SLC-6 Replacement Waterline Route.

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Each anode test station would consist of anode beds, electrical wires, and a terminal board. Anode beds would be arranged horizontally and parallel to the waterline within a radius of 5 to 10 feet from the bottom half of the exterior wall of the waterline pipe (Figure 2-2).

The alignment of the anode beds relative to the waterline would be anywhere between the point directly below the bottom of the waterline and directly parallel to the horizontal mid-line of the waterline. As such, the approximate depth of trenches where anode test stations would be located would be between 5 and 15 feet and the approximate width of trenches would be between 9 and 19 feet.

Within the anode test stations, each anode would have wires routed above ground to the anode test station's terminal board. The aboveground terminal boards would measure approximately 4 feet high by 6 feet long by 6 inches wide. In addition to the anode test stations, the cathodic protection system includes three insulating joint test stations, four casing test stations, and three corrosion test stations would also be installed. These aboveground test stations measure would approximately 4 feet high by 6 feet long by 3 inches wide and would be connected to the subsurface features of the waterline pipe.

2.1.2.3. Staging Areas

Staging areas for construction equipment and supplies would be located on existing paved areas and at other, previously disturbed areas, e.g., open fields along the route.

2.1.2.4. Construction Equipment

The equipment that would be used during the Proposed Action is listed below. The exact type of equipment that would be used during the proposed retrofit may vary slightly from the projections below, depending on the contractor's capability. However, these estimates provide a sound basis for analyzing related issues, such as air quality, noise, and traffic. A list of construction equipment that would be used is included in Table 2-1.

2.1.2.5. Construction Personnel and Schedule

Construction is expected to last 17 months (i.e., 340 construction days). An average of approximately 20 workers would be at the work site each day. A 40-hour workweek is expected.

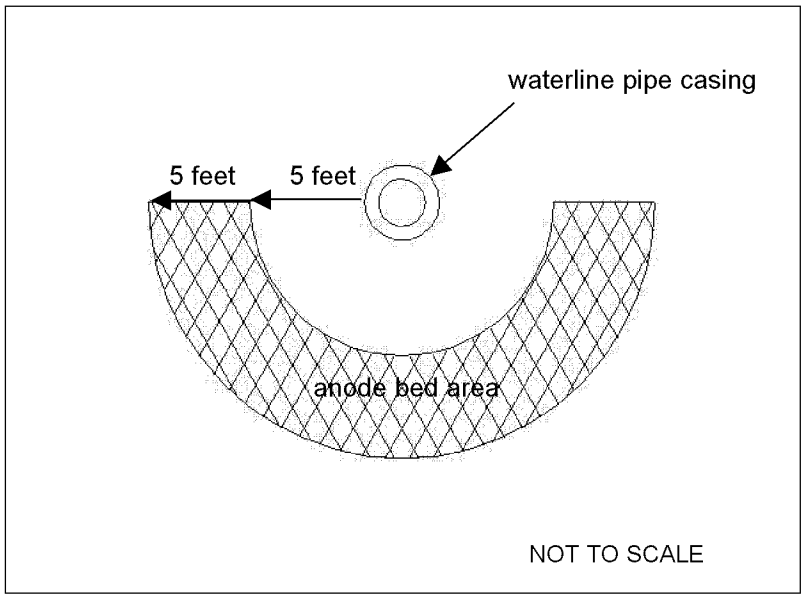

Figure 2-2. Cross-section of Possible Anode Bed Area Relative to Waterline Piping

Table 2-1. Construction Equipment to be used for Installation of the Proposed Waterline.

Backhoe/skip loader	Generator, 48kW
Jack and bore unit	Motor grader
Bulldozer	Wheeled loader
Compactor truck	Pressure grouting equipment
30 ton crane	Dewatering pump
End dump truck	Street sweeper
Excavator	Dewatering pump
AWD forklift, 10klbs	Miscellaneous delivery trucks

2.1.2.6. Operations Personnel

The number of personnel currently involved in the operation and maintenance of existing waterline would be sufficient for the operation of the proposed project. No additional personnel would be needed after the proposed waterline is installed.

2.1.3. Protection Measures

In order to avoid or minimize potential adverse impacts to resources during construction activities associated with the Proposed Action, and in addition to strict compliance with all applicable laws and regulations, the protection measures would be implemented, as outlined below. For resource areas not listed, protection measures would not be needed.

2.1.3.1. Cultural Resources

A qualified archaeologist and Native American will monitor all ground disturbing activities associated with the installation of the proposed waterline. Monitors will ensure that ground disturbance remains within the consulted upon area of direct impact as outlined in the attached Memorandum of Agreement (MOA) signed between Vandenberg AFB and the State Historic Preservation Officer (SHPO) (Appendix B).

2.1.3.2. Biological Resources

1. A qualified biologist would conduct pre-construction surveys up to two weeks before the start of any construction at all proposed waterline sites to delineate work area boundaries and identify special status plant species needing protective measures.
   a. Work area boundaries would be delineated and marked with flags or stakes prior to construction. These boundaries would be maintained throughout the construction period.
   b. Special status plants present within the work areas would be isolated and protected from construction.
   c. Federal threatened and endangered plant species identified during these surveys would be flagged and protected from adverse effects during construction activities.
   d. If avoidance is not possible for federal species of concern, plants would be transplanted to adjacent suitable habitat outside the construction area.
   e. If available at the time of the surveys, seed would be collected from federal special status species, to be sown in the area after completion of construction activities, or in an adjacent area with suitable habitat.
   f. All activities involving transplanting plants or collecting and sowing seeds would be coordinated with the Base Botanist.
2. Throughout the length of the project, a qualified biologist would conduct daily pre-construction surveys immediately preceding the commencement of construction activities to identify special status plant and wildlife within the boundaries of the work areas.
   a. Special status plants present within the work areas would be isolated and protected from construction as described in item 1 above.
   b. Trenches left open overnight would be inspected before the start of construction and any trapped wildlife would be moved to suitable habitat outside of the construction area.

c. Equipment left at the site overnight would be inspected before the start of construction to ensure no wildlife species are trapped underneath. Any species found underneath the equipment would be moved to suitable habitat outside of the construction area.

d. Where needed, raking surveys for silvery legless lizards and California horned lizards would be conducted immediately prior to initiating construction activities. Individuals found during these surveys would be moved to suitable habitat outside of the construction area. In suitable habitat, raking surveys would continue throughout the construction period.

3. A qualified biologist would conduct pre-construction surveys up to two weeks before the start of any construction from March through August to determine if nesting native birds are present. Nesting bird surveys would continue throughout the nesting season for the duration of construction to identify any new nests initiated in the path of construction.

   a. If territorial or nesting native birds are found within 50 feet of the construction limit line, disturbance would be minimized (see below) and they would be monitored to determine construction related impacts. If eggs or unfledged young are found, they would be monitored and disturbance minimized to prevent abandonment.

   b. If nesting native birds are found with eggs or unfledged chicks within the construction limit line, they would be monitored and disturbance would be minimized until after the young have fledged to prevent abandonment. Depending on the nest location, this may necessitate working around the area until the chicks have fledged.

4. A qualified biologist would be present during the initial clearing of vegetation. Any wildlife uncovered during these activities would be moved to suitable habitat outside of the construction area.

5. Removal of native vegetation and plant communities would be minimized to the greatest extent possible.

6. Where possible, native vegetation would not be excavated because leaving root systems intact would allow native vegetation to resprout.

7. To minimize the potential for wildlife entrapment, trenches and holes would not be left open overnight, whenever possible.

8. Trenches or segments of trenches and holes that must be left open at the end of the workday would have a silt fence installed several inches below ground to exclude wildlife.

9. If trenches cannot be refilled prior to the end of the workday, the ends of the trenches would be ramped at a 45-degree angle or less to minimize the potential for entrapment of wildlife.

10. All soil excavated in areas adjacent to roads would be placed as close to the roads as possible.

11. All soil excavated in areas within native habitats would be temporarily placed within the work boundary limits.

12. In the vicinity of Honda Creek, silt fencing would be utilized to prevent sediment and construction related debris from entering the creek or affecting the adjacent riparian community. Preventing impacts to the creek and riparian community would prevent impacts to the special status species (i.e., unarmored threespine stickleback, tidewater goby and California red-legged frog) associated with this wetland.

13. Upon completion of the project, a qualified botanist would conduct a post-construction assessment to assess the need for revegetation at any or all of the sites. A report generated from this assessment would include a proposal for revegetation at all sites where native vegetation is irreversibly disturbed and would be submitted to 30 CES/CEV for approval prior to implementation. To prevent reinvasion by exotic species, this report would also include a proposal for revegetation with

native plant species within the area of sites where non-native vegetation was removed for construction.

The construction contractor would provide biological monitors 48-hours advance notice of their planned construction activities.

2.1.3.3. Air Quality

Dust control measures would be required to decrease fugitive dust emissions from ground disturbing activities, as outlined below:

- Applying water to dirt roads, graded areas, and dirt stockpiles to prevent excessive dust at the staging areas. Chlorinated water would not be allowed to run into any waterway.
- Minimizing vehicle speeds on exposed earth.
- After completion of construction activities, treating disturbed soil by watering, revegetating, or spreading soil binders to prevent wind erosion of the soil.
- Limiting ground disturbance to the smallest, practical area and to the least amount of time.
- Designating personnel to monitor construction to ensure that excessive dust is not generated at construction sites.
- Complying with the 1) SWPPP, including Best Management Practices (BMPs), to reduce dust emissions, and 2) contractor Environmental Protection Plan, which includes dust control compliance measures.

2.1.3.4. Water Resources

Following a SWPPP and implementing BMPs would avoid adverse impacts to water resources. Honda Creek would be protected from construction activity discharges by implementing the measures described in Section 4.4.1.

2.1.3.5. Hazardous Materials and Hazardous Waste

Strict compliance with all applicable regulations, including 30th CES Plan 32-7086, *Hazardous Materials Management,* would avert the potential for adverse impacts to the environment as a result of the presence and use of hazardous materials at the Proposed Action.

Strict compliance with all applicable regulations, including 30th CES Plan 32-7043A, *Hazardous Waste Management,* would avert the potential for adverse impacts to the environment as a result of the potential generation of hazardous waste during the Proposed Action.

2.1.3.6. Human Health and Safety

To provide for the health and safety of workers, subcontractors, and visitors who may be exposed to the operations of the Proposed Action, the construction contractor would comply with AFOSH and Federal-OSHA over the entire project and with Cal-OSHA south of Honda Ridge Road.

Measures would be taken to avoid contact with the existing, remediation pipelines associated with Installation Restoration Program (IRP) Site 9 by 1) demarcating the location wherein those pipelines would intersect the proposed waterline route on Surf Road, and 2) trenching underneath those pipelines.

2.1.3.7. Pollution Prevention

Compliance with the Vandenberg AFB Pollution Prevention Management Plan and implementation of the recommended measures for air quality and hazardous waste management would enhance pollution prevention efforts. In addition, the construction contractor should use environmentally preferred materials and processes when feasible.

2.2. Alternatives to the Proposed Action

Only a No-Action Alternative is considered because the only other available alternative would be to follow along the existing waterline. Constructing along the existing waterline route would be less environmentally benign and more costly than the Proposed Action, which would primarily follow existing roadways.

The No-Action Alternative would consist of solely using the existing waterline to service SLC-4, SLC-5, and SLC-6. Adverse, environmental impacts would potentially occur because of the increased maintenance and repair activities associated with the deteriorating condition of the existing waterline.

2.3. Comparison of Alternatives

2.3.1. Proposed Action

A waterline along the proposed route would serve critical water demands on South Base between the facilities located on SLC-4, SLC-5, and SLC-6. The proposed waterline would be buried in roadways and road shoulders and would take approximately 17 months to complete.

Impacts to cultural resources, including any unanticipated discoveries during the proposed project, would be avoided or mitigated through implementation of measures described in Sections 2.1.3.1 and 4.1.3, and the attached MOA (Appendix B).

Impacts to biological resources would be avoided by restricting construction activities to selected locations and through the use of protection measures designed to reduce potential impacts to biological resources, as described in Sections 2.1.3.2 and 4.2.1. Therefore, significant impacts, whether direct or indirect, to federal special status wildlife species would not be expected.

All other resources analyzed in this EA would be protected, if need be, from potential, adverse impacts through construction design specifications and implementation of relatively routine, resource-specific, protection measures outlined in the remainder of Section 2.1.3 and in Chapter 4, Environmental Consequences.

2.3.2. No-Action Alternative

The No-Action Alternative would consist of no new construction and the continued use of the existing waterline to service SLC-4, SLC-5, and SLC-6. As such, there would be no adverse environmental impacts related to the new construction.

However, because of the existing waterline's location on steep terrain and its deteriorating condition, maintenance and repair activities could be substantial and could potentially result in adverse impacts on the environment.

The access roads to the existing waterline are very limited in their locations. If a break were to occur where there wasn't a road, a new road would need to be graded. In addition, the existing access roads have not been maintained over the years. Therefore, new access roads would need to be constructed and the existing roads would need maintenance and repair.

Because of the existing waterline's deteriorating condition and limited capacity (Penfield and Smith 2003), the water supply to SLC-4, SLC-5, and SLC-6 is at risk. Not improving the water supply to these facilities would adversely impact mission goals.

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3. Affected Environment

This chapter presents the existing environmental conditions for the relevant resource areas at Vandenberg AFB that are likely to be affected by the Proposed Action and the No-Action Alternative. For the reasons outlined in Section 1.5, the following resource areas were not analyzed:

- Earth resources
- Land use
- Socioeconomics
- Solid waste.

Vandenberg AFB is located in northern Santa Barbara County, where, outside of the Air Force, agriculture is the main economic and land use influencer. The base encompasses 99,492 acres. Much of Vandenberg AFB is open space that is set aside as security or safety buffer zones for space launch activities. Approximately 25,000 acres of rangeland on the base are leased for cattle grazing. Resource-specific conditions are described below.

3.1. Cultural Resources

3.1.1. Cultural Setting

The following summary of prehistory and ethnohistory is modified from Lebow and Moratto (1999). The historical overview derives primarily from Palmer (1999).

3.1.1.1. Prehistory

The prehistory of California's central coast spans the entire Holocene and may extend back to late Pleistocene times. In the Santa Barbara Channel region, a fluted Clovis point found on the surface of a coastal site suggests use of the area possibly as early as 11,000–12,000 years ago (Erlandson et al. 1987), while a site on San Miguel Island has yielded a radiocarbon date of 10,300 B.P. (Erlandson 1991). Recent calibrations suggest that terminal Pleistocene radiocarbon dates are about 2,000 years too recent (Fiedel 1999:95) and thus these early sites may be even older. In San Luis Obispo County, excavations at CA-SLO-2 in Diablo Canyon revealed an occupation older than 9,000 years (Greenwood 1972; Moratto 1984) and investigations at CA-SLO-1797 indicate initial occupations as early as 10,300 B.P. (Fitzgerald 1998). Occupations on Vandenberg AFB occurred by at least 9,000 years ago, based on radiocarbon dates from CA-SBA-931 at the mouth of the Santa Ynez River (Glassow 1990, 1996).

Moratto (1984) refers to these early occupations as Paleocoastal. Population densities were probably low, judging from the limited number of sites dated to this period. Diagnostic tools associated with this time period have not been identified, although similarities with the San Dieguito Complex in southern California (Wallace 1978; Warren 1967) have been suggested (Erlandson 1994). Cultural assemblages have few of the grinding implements common to subsequent periods. These sites are characterized by a strong maritime orientation and an apparent reliance on shellfish. Occupants are thought to have lived in small groups that had a relatively egalitarian social organization and a forager-type land-use strategy (Erlandson 1994; Glassow 1996; Greenwood 1972; Moratto 1984).

Site densities throughout the central coast are higher during the subsequent periods, suggesting increased population size and possibly better site preservation. Sites dating between about 8,000 and 6,500 years ago often have relatively high densities of manos and milling slabs that are typically associated with processing seeds. These milling stones are diagnostic of this period. Shellfish appear to have continued as a dietary staple throughout the central coast (Erlandson 1994; Glassow and Wilcoxon 1988), including Vandenberg AFB (Glassow 1996; Woodman, Cagle *et al.* 1995). However, terrestrial mammals composed a larger portion of the diet on Vandenberg AFB during this period than during any other time (Glassow 1996; Rudolph 1991). Fish were a larger part of the diet than shellfish at

Morro Bay in San Luis Obispo County, although shellfish were better represented during this period than during subsequent periods (Jones *et al.* 1994).

Early scholars associated sites of this age with inland knolls and terraces (e.g., Rogers 1929), but subsequent investigations revealed that coastal environments were also used (e.g., Glassow *et al.* 1988). Well-developed middens at many sites suggest a more sedentary and stable settlement system (Breschini *et al.* 1983). Glassow (1990, 1996) infers that occupants of Vandenberg AFB during this time were sedentary and had begun using a collector-type (i.e., logistically mobile) land-use strategy. Burial practices suggest that society was primarily egalitarian (Glassow 1996).

Population densities appear to have decreased substantially between 6500 and 5000 B.P. throughout the region, and little is known about this period. It is possible that arid conditions associated with the Altithermal degraded the environment to the point that only low population densities were possible (Glassow 1996; Glassow and Wilcoxon 1988).

After 5000 B.P., population densities increased to pre-6500 B.P. levels as conditions became cooler and moister. Between 5000 and 3000 B.P., mortars and pestles became increasingly common throughout the region, suggesting intensified use of acorns (Basgall 1987), although these implements may have been associated with processing pulpy roots or tubers (Glassow 1997). Along the Santa Barbara Channel coastline, use of shellfish declined as other animal foods became more important. Use of more diverse environmental settings is suggested (Erlandson 1997). On Vandenberg AFB, fish and sea mammals composed a larger part of the diet during this period. Large side-notched and stemmed projectile points became more prevalent in the archaeological record, presumably reflecting increased hunting, although Glassow (1996) suggests that proportions of terrestrial mammals do not surpass the pre-6500 B.P. levels. However, higher proportions of terrestrial mammals in archaeological assemblages are associated with this period in San Luis Obispo County. Increased logistical organization is suggested in this area (Jones *et al.* 1994; Jones and Waugh 1995). Proportions of obsidian (indicating exchange with other regions) increased after about 5000 B.P., particularly in San Luis Obispo County (Jones *et al.* 1994; Jones and Waugh 1995).

Cultural complexity appears to have increased around 3,000–2,500 B.P. Based on mortuary data from the Santa Barbara area, King (1981, 1990) suggests a substantial change in social organization and political complexity about 3,000 years ago. According to King, high-status positions became hereditary and individuals began to accumulate wealth and control exchange systems. Arnold (1991, 1992) proposes that this evolutionary step in socioeconomic complexity occurred around 700–800 years ago.

The period between 2,500 and 800 years ago is marked by increased cultural complexity and technological innovation. Fishing and sea mammal hunting became increasingly important, corresponding to development of the *tomol* (a plank canoe), single-piece shell fishhooks, and harpoons (Glassow 1996; King 1990). The bow and arrow also was introduced during this period (Glenn 1990, 1991). Sites in San Luis Obispo County suggest that use of terrestrial mammals remained high. Proportions of imported obsidian continued to increase during this period (Jones *et al.* 1994).

Arnold (1992) proposes that the complex Chumash sociopolitical system known at historic contact evolved substantially during a brief period between A.D. 1150 and 1300, which she terms the Middle/Late Transitional Period. Arnold infers that decreased marine productivity caused by elevated sea-surface temperatures resulted in subsistence stress that allowed an elite population to control critical resources, labor, and key technologies, resulting in hierarchical social organization and a monetary system. Although the issue of elevated sea-surface temperatures has been questioned (e.g., Kennett 1998) and the inference of marine degradation and subsistence stress has been challenged (e.g., Raab *et al.* 1995; Raab and Larson 1997), the full emergence of Chumash cultural complexity around this time is generally accepted.

On Vandenberg AFB and in the Santa Barbara Channel region, population densities reached peak levels between 700 years ago and historic contact (Glassow 1990, 1996). Higher numbers of

Olivella shell beads reflect increased exchange between the Channel Islands, the Santa Barbara mainland, and Vandenberg AFB. Increased subsistence diversity is apparent. Although shellfish continued to be a dietary staple in the Vandenberg area, the use of fish and birds increased, proportions of secondary species in shellfish assemblages increased (Glassow 1990), and dietary expansion is evident (Lebow and Harro 1998). Correspondingly, the range and diversity of site types increased as a greater range of habitats and resources was used (Glassow 1990; Lebow and Harro 1998; Woodman *et al.* 1991). In San Luis Obispo County, the settlement system appears to have changed substantially after 700 B.P. as residential bases along the coast were abandoned in favor of habitation sites farther inland. Coastal sites were used to obtain resources during short-term occupations (Breschini and Haversat 1988; Greenwood 1972; Jones *et al.* 1994; Jones and Waugh 1995). In addition, proportions of imported obsidian decreased substantially during this period (Jones *et al.* 1994).

3.1.1.2. Ethnohistory

People living in the Vandenberg AFB area prior to historic contact are grouped with the Purisimeño Chumash (Greenwood 1978; King 1984; Landberg 1965), one of several linguistically related members of the Chumash culture. Blackburn (1975), Grant (1978a, 1978b, 1978c, 1978d), Greenwood (1978), Hudson *et al.* (1977), Hudson and Blackburn (1982, 1985, 1986), Hudson and Underhay (1978), Johnson (1988), and Landberg (1965) describe their social organization, traditions, cosmology, and material culture.

Accounts of early explorers in the Santa Barbara Channel area indicate that the Chumash people lived in large, densely populated villages with well-built structures (e.g., Bolton 1926, 1931; Engelhardt 1933; Fages 1937; Moriarity and Keistman 1968; Simpson 1939; Teggart 1911; Wagner 1929). With a total Chumash-speaking population estimated at 18,500 (Cook 1976) and employing a maritime economy, the Chumash had a culture that "was as elaborate as that of any hunter-gatherer society on earth" (Moratto 1984:118). Leadership was hereditary and chiefs exercised control over more than one village, reflecting a simple chiefdom social organization. The Chumash engaged in craft specialization and maintained exchange systems (Arnold 1992; Johnson 1988).

Relatively little is known about the Chumash in the Vandenberg region. Explorers noted that villages were smaller and lacked the formal structure found in the channel area (Greenwood 1978:520). The Purisimeño Chumash at historic contact used approximately 22 villages, with populations between 30 and 200 per village (Glassow 1996:13–14). King (1984:Figure 1) identifies about five ethnohistoric villages on Vandenberg AFB, along with another five villages in the general vicinity.

Unfortunately, early explorers paid scant attention to Chumash subsistence and settlements systems. Using ethnohistoric, ethnographic, and archaeological data, Landberg (1965) attempted to reconstruct those facets of Chumash lifeways. Chumash subsistence relied primarily on fishing, hunting, and gathering plants (primarily acorns). In the spring, groups left their winter villages for temporary camps where they gathered grasses, roots, tubers, and bulbs. Hunting marine mammals became important during times when seals and sea lions congregated at their rookeries. Bulbs, roots, and tubers also were gathered during the summer months as well, and seeds became important during this season, especially to the people north of Point Concepción. Interior groups moved to the coast during the spring and summer to collect shellfish. Coastal groups returned to their villages in late summer and early fall to harvest large schooling fish such as tuna. Pine nuts were collected in the mountains during the fall months; acorns also were gathered in the late fall. Both of these resources, as well as berries collected during the late summer and early fall, were stored for use during the winter. Hunting also was important during the fall. Winter months were spent in villages, where residents relied primarily on stored foodstuffs as well as occasional fresh fish (Landberg 1965:102–104). Regional variation in subsistence strategies is evident in the ethnohistoric record (Landberg 1965:104–118); in the interior and along the northern coast of Chumash territory, marine resources were less important than acorns, seeds, and game (particularly deer).

Contact with early Euroamerican explorers, beginning with the maritime voyages of Cabrillo in A.D. 1542–1543, undoubtedly had an effect on the Chumash culture. The effect may have been profound. Erlandson and Bartoy (1995, 1996) and Preston (1996) convincingly argue that Old World diseases substantially impacted Chumash populations more than 200 years before Spanish occupation began in the 1770s.

Unquestionably, drastic changes to Chumash lifeways resulted from the Spanish occupation that began with the Portolá expedition in A.D. 1769. The first mission in Chumash territory was established in San Luis Obispo in 1772, followed in short order by San Buenaventura (1782), Santa Barbara (1786), and La Purísima Concepción, established in 1787 in the present location of Lompoc. The Santa Ynez Mission was established in 1804. Eventually, nearly the entire Chumash population was under the mission system (Grant 1978a). During the 1830s, the missions were secularized in an attempt to turn the mission centers into pueblos and make the Indians into Mexican citizens.

3.1.1.3. History

Vandenberg AFB history is divided into the Mission, Rancho, Anglo-Mexican, Americanization, Regional Culture, and Suburban periods (Palmer 1999). The Mission Period began with the early Spanish explorers and continued until 1820. Poor sailing conditions along California's coastline prompted the Spanish to find overland routes for colonization. In August and September of 1769, Captain Gaspar de Portola led an expedition that crossed through the Vandenberg AFB area on its way to establish a mission at Monterey. Fray Juan Crespi kept a diary of the expedition. Reconstruction of the expedition route suggests that they camped at several locations in the Vandenberg region, including Jalama Beach, the ethnohistoric Chumash village of *Nocto* near Point Pedernales, the mouth of the Santa Ynez River, and a temporary Chumash encampment adjacent to a large pond just north of San Antonio Creek (Bradley 1994:16; Roberts 1984:11-2--11-3).

In 1776, Juan Bautista de Anza led an expedition of settlers to establish San Francisco, following the route used by Portola through the Vandenberg AFB region. Fray Pedro Font kept a detailed diary of the journey (Bolton 1930), indicating that the expedition camped near Jalama Beach on February 27, and near the mouth of the Santa Ynez River the next day. On February 29, they crossed the river and traveled northeast for four leagues (approximately 10 miles), camping at the same pond where Portola camped (Bradley 1994:17; Roberts 1984:11-5).

The Mission Period continued until 1820. Established in 1787, Mission La Purísima encompassed the area between Gaviota and Guadalupe. Farming and ranching were the primary economic activities at the Mission, which was responsible for supplying the Santa Barbara Presidio with food supplies. The Mission had 4,000 head of sheep by 1800; by 1812 they numbered 12,000. The number of cattle peaked at 23,456 in 1821. Missionaries had the Chumash weave wool blankets for the Santa Barbara Presidio. Approximately 14,000 head of livestock remained when the Mission closed in 1835. In addition to livestock, crops such as wheat, barley, corn, peas, and beans were grown at Mission La Purísima. Agricultural activities primarily occurred along the major streams such as San Antonio Creek and the Santa Ynez River (Palmer 1999:1–7).

The Rancho Period of Vandenberg AFB history began in 1820 and continued until 1845 (Palmer 1999:7). Following secularization in 1834, the Alta California government granted former mission lands to Mexican citizens as ranchos. A portion of the SLC-4, SCL5, and SLC-6 proposed waterline route lies entirely within Rancho La Espada, which was purchased by Gaspar Oreña in 1837. Oreña was a successful businessman who also owned Ranchos Cuyama and Zaca as well as the Orena store in Santa Barbara. He was an absentee landowner of Rancho La Espada and placed in his charge a mayordomos to manage the property, a typical practice among wealthy rancho landowners (Palmer 1999:9). Oreña's financial standing was not typical among the rancho owners in the region. Most rancho owners were not wealthy and, as a consequence, were required to maintain their properties themselves along with family members.

The Bear Flag Revolt and the Mexican War marked the beginning of the Anglo-Mexican Period (1845–1880). Cattle ranching continued to flourish during the early part of this period, with as many as 500,000 cattle in Santa Barbara County during the 1850s. However, severe droughts during the 1860s decimated cattle herds and less than 5,000 cattle remained in the entire county. The combination of drought and change in government from Mexican to the United States caused substantial changes in land ownership. By 1851, approximately 42 percent of the land grants were owned by non-Mexicans; by 1864, after a few years of drought, 90 percent of the southern California ranchos were mortgaged. Sheep ranching and grain farming replaced the old rancho system during this period. Dairy farming became an important economic activity, particularly as Swiss-Italians immigrated into the area. Early roads were established during the 1860s and 1870s to obtain supplies that were surfed in at Point Sal. Although the amount of farming increased substantially, it still remained a limited activity due in large part to the difficulty of shipping to markets, but also due to climatic fluctuations and lack of water.

The northwestern portion of the Rancho Lompoc land grant – extending from the Santa Ynez River south to the Point Arguello area - was sold to the Lompoc Valley Land Company, which formed the Lompoc Temperance Colony in 1874 (Palmer 1999:18). Farming tracts were sold in the Santa Ynez River valley, and the town of Lompoc was established. The land company dissolved in 1879, but the pattern of land ownership had been established. Prime farmland in the Santa Ynez River valley sold quickly, followed by small farming tracts on the Lompoc Terrace. Andrew Huyck, one of the founders of the land company, developed a community known as Huyckville. This townsite was located at the southern edge of the Santa Ynez River valley, not far from the current entrance to South Base (Palmer 1999).

Population growth during this period created a demand for a more extensive road system. As summarized by Palmer *et al.* (2000), the Lompoc colonists used an established route along the south bank of the Santa Ynez River (Ocean Avenue) to reach the beach. The road, which traversed the bluff south of the Santa Ynez River lagoon and Huyckville, is still evident today. The Army constructed a tank road across the Santa Ynez River, which later became the 35th Street Bridge (CA-SBA-3546H). The Air Force abandoned the bridge and road after the 1969 flood damaged the structure beyond repair.

The Lompoc colonists also established a road on the South Base of the study area in the 1870s. Sebren Steele constructed the original Surf Road from Lompoc's Ocean Avenue to Honda in 1876. The road was extended east to the Sudden Ranch in the 1880s; this route had a plank road surface during the 1920s. Santa Barbara County paved the road for the Coast Guard Lifeboat Rescue Station in 1940. Portions of the old road lay east of the current road (Glassow 1990:A1-9) [Palmer *et al.* 2000].

Wharves were constructed during this period as a means of avoiding long overland routes to export and import supplies. In 1875, members of the Lompoc Temperance Colony began construction of Lompoc Landing north of the mouth of the Santa Ynez River. Construction was completed in 1879, and included a hotel, restaurant, warehouses, a machine shop, and residences. Stagecoach service was provided between Lompoc and the wharf. Recreation at the Santa Ynez River, Surf, and Lompoc Landing became popular in the 1870s. Palmer (1999:40) includes a piece from the April 17, 1879 issue of the *Lompoc Record* noting that more than 100 residents visited the beach at the mouth of the Santa Ynez River on the previous Sunday.

Increased population densities characterize the Americanization Period (1880–1915). Transportation was still a problem early during this period. In 1885, Mark and Michael Meherin began construction of the Meherin Wharf at the north side of the mouth of the Santa Ynez River in an attempt to undercut the monopolistic Lompoc Landing. By 1890, the wharf included a two-story house, a boarding house, a warehouse, and a bar. However, the railroad reached the area in the late 1890s, providing a more efficient means of shipping and receiving goods and supplies, which in turn increased economic activity. The wharf system was largely abandoned by 1901 as the railroad was completed between San Francisco and Los Angeles. Construction of the railroad

bridge over the Santa Ynez River began in 1896, and a construction camp known as Bridgeport was created just east of Surf. The camp hosted several hundred residence, and included saloons, a dance hall, brothels, and markets. A station was built at Surf, and in 1899, a branch line connected Lompoc with Surf. A post office was built at Surf in 1897, which continued to operate until 1957. Surf included several residences, a hotel, and a general store. Presidents McKinley and Roosevelt both made whistlestop speeches at Surf. The area continued to be popular for recreation by Lompoc Valley residents. Ocean County Park opened at Surf in 1913, and a racetrack, complete with a 400-seat grandstand, was built between the ocean and the railroad tracks (Palmer 1999).

Ranching continued and agriculture increased during the Americanization Period, particularly with development of steam-powered threshers. Row crops became increasingly common; sugar beets were one of the most economically important crops. Dairy farming also increased, particularly in the general area of Honda Canyon, and the population of the Italian-Swiss ethnic community continued to grow. The land was further subdivided for ranches, dairies, and farms in the Bear Creek, Surf, and La Salle Canyon areas. Families in these areas established the Lynden School near Surf in 1883; it was moved to the current location of the Vandenberg AFB South Gate in 1909, where it served area children until 1942. In 1888, a school was built near the mouth of La Salle Canyon, which drew students from Huyckville and homesteads in La Salle Canyon (Palmer 1999).

Agriculture continued to dominate the economy during the Period of Regional Culture (1915–1945). As many as 150 dairies operated in the area during this period, although the number of dairies decreased as farmland became more profitable for row crops and the dairy industry switched from an emphasis on butter and cream to milk. Many small, independent dairies, such as those in Honda Canyon, were unable to survive. Peas and beans were important crops in the area, with a bean warehouse located at La Salle Canyon. Migrant workers were attracted to the area and a camp was established in the Bear Creek area. The Huyckville farming community was unable to survive and the Huyck tract was sold in 1924, with some of the land along Ocean Avenue and Surf Road becoming the Aloha Beach development. Surf's popularity as a recreation destination continued to increase; in 1933, nearly 12,600 people visited Ocean Park. Crude homes were constructed at the park and many Lompoc residences would summer at Surf. During World War II, the Salvation Army opened a USO club at Surf, which entertained approximately 30,000 troops per month.

All ranching, farming, and dairy farming in the Vandenberg AFB area was substantially reduced when Camp Cooke was established in 1941. This Army training facility was built on approximately 90,000 acres along the coast. Camp Cooke was deactivated at the end of World War II (Palmer 1999:85–117).

The Suburban Period (1945–1965) began with the end of World War II. After Camp Cooke was deactivated, the Army continued the historic tradition and leased much of the area for ranching and farming. Camp Cooke was reactivated in 1950 for training during the Korean War. It was put into caretaker status from 1953 to 1956. The Cantonment area became so overgrown that sheep were used to manage the vegetation and reduce the fire hazard. In November of 1956, the Army transferred 64,000 acres of North Camp Cooke to the Air Force, and it was renamed the Cooke Air Force Base (Palmer 1999a). In 1958 the base had its first missile launch, the Thor, and was renamed Vandenberg AFB. The southern section of the current base was transferred to the Air Force from Army and Navy control in 1964 (Vandenberg AFB 1992). Post-transfer use of both North and South Base has related primarily to the construction and operation of missile launch and support facilities. Specific activities include management of ballistic missile and space system launch, test, and evaluation activities for the Department of Defense (DOD) and also operation of the Western Range (Science Applications International Corporation [SAIC] 1995; Vandenberg AFB 1992).

3.1.2. Existing Resources

For purposes of cultural resources, the area of potential effects (APE) is defined as a corridor 60 meters on either side of the centerline of the

proposed waterline route. Ground disturbance will be limited to the consulted upon area of direct impact which is 50 meters wide (25 meters on either side of the centerline) and includes the installation of the waterline and cathodic protection system by way of trenching.. An archaeological site record and literature search was completed at the 30th CES/CEVPC, Vandenberg AFB, and at the Central Coast Information Center, University of California Santa Barbara (UCSB). Background research included a review of archaeological literature, archaeological base maps, and cultural resource records. Previous archaeological studies within 1.0 mile of the APE (see Table B-1 in Appendix B) and archaeological resources within 0.25 mile of the APE (see Table B-2 in Appendix B) were identified during the record search. More extensive information was collected for sites and isolated artifacts within the APE (See Tables B-3 and B-4 in Appendix B). Maps examined at 30 CES/CEVPC included the Vandenberg AFB C-1 series (46 map set), the Base Comprehensive Plan GIS, and USGS topographic maps.

3.1.2.1. Cultural Resources in the Project Vicinity

Many of the archaeological sites in the project vicinity were identified during Larry Spanne's 3-year survey of Vandenberg AFB (Benson 1969; Spanne 1970, 1974). Working under a National Park Service contract funded by the Air Force, Spanne employed a "mixed strategy" survey encompassing about 68,500 acres (Spanne 1974:2). Approximately 421 sites were recorded.

The most extensive archaeological investigations completed within the immediate project area are associated with Space Shuttle Program, formally known as the Space Transportation System (STS). Cultural resource studies for proposed STS facilities were started in a corridor 21 miles long and 3,000 feet wide (i.e., encompassing approximately 13 square miles) between the Santa Ynez River and a location south of Point Arguello. Working under a National Park Service contract, UCSB surveyed the project area for cultural resources in 1974 and identified 80 archaeological sites, including 40 previously unknown sites. Thirty-one of the 80 sites most likely to be affected by STS facilities were tested to evaluate eligibility for the National Register of Historic Places (NRHP) (Glassow *et al.* 1976; Spanne and Glassow 1974). Additional planning for the STS narrowed the APE to the point that only three of the sites considered eligible for the NRHP would be impacted. Still under a National Park Service contract, data recovery excavations began at CA-SBA-539, -670, and -931 in November 1978; the results of both testing and data recovery excavations are reported in detail by Glassow (1990) and subsequently summarized in a published case study (Glassow 1996).

Archaeological studies were also completed for ancillary projects related to the STS. The route for a 69-kV transmission line supplying power from the Santa Ynez Valley to STS facilities was surveyed; limited testing was completed at five locations (Spanne 1980b).

Beginning in the mid-1980s, a series of archaeological investigations was associated with development, maintenance, and repairs at SLC-4, SLC-5, and SLC-6 on South Base (Environmental Solutions 1990a, 1990c, 1990d; Ferraro *et al.* 1988; Moore *et al.* 1988). Altogether, these investigations generated substantial archaeological data. Fourteen prehistoric archaeological sites in and adjacent to Spring Canyon were tested and their National Register of Historic Places (NRHP) eligibility evaluated after a Titan 34D space launch vehicle exploded at SLC-4 in 1986 (Moore *et al.* 1988). Ferraro *et al.* (1988) report archaeological studies associated with a natural gas pipeline connecting the City of Lompoc with SLC-5, which is located on the north edge of Honda Canyon. Most of the project crossed the Lompoc Mesa, encompassing Bear Creek and Spring Canyons, in addition to Honda Canyon. Fourteen prehistoric archaeological sites were tested by Ferraro *et al.* (1988) to evaluate NRHP eligibility. Work in the Lompoc Mesa continued with excavations at seven sites where significant archaeological deposits would be affected by installation of the gas pipeline (Environmental Solutions, Inc. 1990a). Additional investigations were subsequently completed at five sites in conjunction with a power system upgrade for SLC-4 (Environmental Solutions, Inc. 1990d).

Lastly, beginning in the mid-1990s, Vandenberg AFB began to proactively manage cultural resources following requirements of Section 110 of the National Historic Preservation Act of 1966, which makes federal agencies responsible for preservation of historic properties under their jurisdiction. As part of that program, archaeological investigations have been completed at three sites within the study area. These include testing to evaluate NRHP eligibility at CA-SBA-530 (Woodman *et al.* 1995) and excavations to recover data that would otherwise be lost to erosion at CA-SBA-671 and -677 (Lebow *et al.* 1998). Excavations also took place at CA-SBA-530 to recover data being lost to erosion (Lebow *et al.* 2002). In the fall of 2002, Applied Earthworks conducted a combination of testing and data recovery at CA-SBA-1119 near the mouth of Honda Creek. Materials recovered during the project are currently being analyzed and the final report is expected later this year.

3.1.2.2. Cultural Resources within the APE

Background research identified 19 previously recorded archaeological sites and two previously recorded isolated artifacts within 60 meters of either side of the SLC-4, SLC-5, and SLC-6 proposed waterline route. Previously recorded sites are described in Table B-3 of Appendix B, and previously recorded isolated artifacts are described in Table B-4 of that same Appendix.

In addition to the archaeological sites and isolated artifacts described in these tables, the Juan Bautista de Anza National Historic Trail crosses through the project area. As discussed above in Section 3-3.3, in 1776 Juan Bautista de Anza led an expedition of settlers to colonize San Francisco, which led to the founding of the San Francisco Presidio and the Mission San Francisco de Asis. The route followed by Anza began in Culican, Mexico, entered the United States at Nogales, Arizona, followed the Santa Cruz River to the Gila River and then to the Yuma crossing of the Colorado River. The route crossed the Baja and Borrego deserts to San Gabriel, and then followed established Native American trails to Monterey. In 1990, Congress designated the expedition route as a National Historic Trail, given its importance to the colonization of the western United States (Bradley 1994). The National Park Service administers the historic trail. Designation as a National Historic Trail is unrelated to the NRHP (Bradley 1994:3).

The Anza expedition - and, thus, the Juan Bautista de Anza National Historic Trail - crossed through what is now Vandenberg AFB, following the trail used by Portola in 1769. Dames & Moore reported a study of the trail on the base in draft form in 1994 (Bradley 1994), and work is currently underway to finalize the study. Among other sources, the study examined the various journals kept by members of the Portola and Anza expeditions, including maps of the expeditions. Journals provided detailed descriptions of landmarks along the route, including Chumash villages, rivers, canyons, and dunes. Distances and directions traveled on a daily basis were also recorded. Bradley (1994) used these types of information to reconstruct the trail route across the region now encompassed by Vandenberg AFB. In many parts of the base, the route can be reconstructed with fairly high resolution. In 1769, Portola camped at Jalama Beach and the ethnohistoric Chumash village of Nocto near Rocky Point before entering the general area of the proposed SLC-4, SLC-5, and SLC-6 proposed waterline project. As described by Bradley, on August 29, Portola's expedition left Chumash village of *Nocto* and "proceeded north/northwest on high land along the shore (by Rocky Point and Point Arguello), over sand dunes, to Canada Seca. Given the description of this area (pasture, less than a league from the river), this was most likely Bear Creek. That night they camped at the Santa Ynez River" (Bradley 1994:16). The de Anza expedition traveled slightly faster in 1776. His group camped near Jalama Beach on February 27, and near the mouth of the Santa Ynez River the next day (Bradley 1994:17). Based on this reconstruction, the Juan Bautista de Anza National Historic Trail parallels the coastline on South Base, and thus roughly corresponds to the proposed SLC-4, SLC-5, and SLC-6 waterline route south of the Santa Ynez River.

3.2. Biological Resources

Vandenberg AFB is in a transitional, ecological region that includes the northern and southern distributional limits for many species and, as such, supports a high diversity of biological resources, including many state and federal special status species.

The proposed project area traverses two major landforms: the Lompoc Terrace and the western Santa Ynez Mountains. Lompoc Terrace extends from the southern edge of the Santa Ynez River floodplain south and east to the foothills of the Santa Ynez Mountains (Evenson and Miller 1963). It is a gently rounded, north trending, low ridge extending from an elevation of approximately 450 feet down to the Santa Ynez River floodplain. Terrace deposits flank the south and southwest margins of the mesa, where the Proposed Action would occur. Most of the length of the western margin is mantled by sand dunes.

The western Santa Ynez Mountains are south of Lompoc Terrace and comprise the farthest northwest extent of the Transverse Ranges. Ridges that exceed 2,000 feet in elevation characterize the portion of these mountains that lies within Vandenberg AFB boundaries. A strong east-west trending stream canyon, Cañada Honda, which extends approximately 7.5 miles inland, cuts the western end of the range, where the Proposed Action would occur. The Santa Ynez Mountains also contain rocky headlands and points consisting of Rocky Point, Point Arguello, and Point Pedernales.

Geologic controls, such as the age of particular deposits, and whether the underlying bedrock has been exposed by wind or water erosion, determine the type and development of vegetation within the project area. Wildlife resources in the project area are, in turn, a function of these geological and vegetative characteristics.

3.2.1. Methodology

A literature search, general biological survey, and special-status species survey were used to characterize the biological resources within the proposed project area. Examining a corridor extending 50 feet on either side of the proposed waterline route identified botanical resources. Wildlife surveys consisted of direct identification of species (i.e., visual and acoustical) and indirect identification (e.g., track identification), and were conducted along a 50-foot wide corridor on either side of the proposed waterline route. Because avian species are highly mobile, avian species that were either seen or heard from the edge of these corridors were also recorded.

For purposes of the biological surveys, the proposed route was divided into segments that are based on manmade features, including road intersections. Figure 2-1 shows a detailed map of these segments. Detailed descriptions of each segment are included in Section 3.2.3, and a complete list of plant and wildlife species documented within the project area can be found in Appendix C.

3.2.2. Plant Communities

The botanical survey identified four distinct plant communities within the survey corridor, Central Coastal Scrub, Central Coast Maritime Chaparral (Burton Mesa Chaparral), Non-native Grassland, and Ruderal, which are outlined below. Monterey cypress (*Cupressus macrocarpa*), eucalyptus (*Eucalyptus* spp.), and mimosa (*Albizia lophantha*) groves are also present within the 50-foot corridor surveyed.

Central Coastal Scrub.

Coastal scrub is a diverse community that occupies a narrow corridor extending along almost the entire coast of California. Shallow-rooted, mesophyllic plant species that are often drought-deciduous and summer-dormant characterize this community. It is present on approximately 25,000 acres, roughly 25 percent of Vandenberg AFB, from the dry slopes and soils near the coast to the interior foothills (USAF 2003). In disturbed or more mesic areas, the dominant species tends to be coyote brush (*Baccharis pilularis*). Common associates of this vegetation type include coastal buckwheat (*Eriogonum parvifolium*), California sagebrush (*Artemisia californica*), black sage (*Salvia melifera*), silver lupine (*Lupinus chamissonis*), deerweed (*Lotus* spp.), and poison oak (*Toxicodendron diversilobum*). Many

perennial and annual herbs are also found in this community.

Central Coast Maritime Chaparral.

Chaparral is a dense, evergreen, rigid, fire-adapted form of shrubby vegetation native to California's coastal areas. Central Coast Maritime Chaparral, which includes Burton Mesa Chaparral, is restricted mostly to Vandenberg AFB and its vicinity (Odion 1992) where it occurs on mesas and higher ridges. Central Coast Maritime Chaparral covers approximately 13,061 acres (approximately 13 percent) of Vandenberg AFB (USAF 2003) and is dominated by manzanitas, California lilacs (*Ceanothus sp.*), and chamise (*Adenostoma fasiculatum).* Burton Mesa Chaparral is characterized by the presence of a group of endemic, codominant species, such as sand mesa or shagbark manzanita (*Arctostaphylos rudis*), La Purisima manzanita (*Arctostaphylos purissima*), buck brush (*Ceanothus cuneatus*), and Santa Barbara ceanothus (*Ceanothus impressus*).

Non-native Grassland.

These grasslands are characterized by a dense to sparse cover of annual grasses with flowering cultms up to two feet high, which are often associated with numerous species of native wildflowers. Non-native Grassland, which now cover approximately 19,324 acres of Vandenberg AFB (approximately 19 percent), have replaced perennial, native bunchgrasses and areas historically dominated by native herbs (USAF 2003). Dominant plant species include bromes (*Bromus* spp.), wild oats (*Avena* spp.), foxtail barley (*Hordeum murinum* spp. *leporinum),* ryegrass (*Lolium* spp.), fescues (*Vulpia* spp.), redtop grass (*Agrostis stolonifera*), veldt grass (*Ehrharta calycina*), filarees (*Erodium* spp.), mustards (*Brassica* spp.), California burclover (*Medicago polymorpha*), California plantain (*Plantago erecta*), California croton (*Croton californicus*), and iceplant (*Carpobrotus* spp.).

Ruderal.

Ruderal plant communities typically occur at roadsides, waste areas, and other sites continuously disturbed by activities such as traffic, road construction and road maintenance. Ruderal communities are dominated by annual and usually non-native forbs and grasses that can rapidly invade disturbed areas. Plant species commonly found at these sites include wild oat, soft chess brome (*Bromus hordaceus*), foxtail, ryegrass, black mustard (*Brassica nigra*), wild radish (*Raphanus sativus*), and Russian thistle (*Salsola* spp.).

3.2.3. Segment Descriptions

Segment 1.

This segment starts at the intersection of Kelp and Surf Roads and extends 0.7 miles south along Surf Road to the intersection of Surf and Tank Roads (Figure 2-1). Ruderal and Central Coast Scrub plant communities comprise Segment 1.

The Ruderal community immediately adjacent to the road shoulder is locally dominated by bromes, cut leaf plantain (*Plantago coronopus*) and filaree The remainder of this Ruderal community, which extends approximately 10 feet from the road shoulder, is locally dominated by ripgut grass (*Bromus diandrus*), foxtail chess (*Bromus madritensis*), and sea fig (*Carpobrotus chilensis*). Slender leaf ice plant *(Conicosia pugioniformis*), fiddle neck (*Amsinkia* spp.), locoweed (*Astragalus* spp.), and jubata grass (*Cortaderia jubata*) occur locally as subdominants.

The Central Coastal Scrub community is dominated by mock heather (*Ericameria ericoides*), and silver lupine on the western side of Surf Road and coyote brush and California sagebrush on the eastern side. Poison oak, and California coffeeberry (*Rhamnus crocea*) occur as subdominants.

Approximately 700 feet South of the Surf and Kelp Roads intersection, black-flowered figwort (*Scrophularia atrata*) grows ten feet off the road, as an understory component of the Central Coastal Scrub, where it intersects the roadside Ruderal community.

Approximately 1,000 feet south of the Surf and Kelp Roads intersection, steep hillsides arise on both sides of Surf Road. Veldt grass and sea fig (*Carpobrotus chilensis*) dominated the Non-native Grassland covering these hillsides.

Further south, approximately 2,000 feet south of the Surf and Kelp Roads intersection, Surf Road descends and turns westward. Here, there is a grove of blue gum eucalyptus trees (*Eucalyptus* globulus). Poison oak and wild blackberry (*Rubus ursinus*) dominate the under story. This site is known as Lower Spring Canyon and serves as a permanent monarch butterfly (*Danaus plexippus*) aggregation site (Meade 1999).

South of Lower Spring Canyon, a steep hillside rises on the eastern side of Surf Road. Introduced grasses dominate the Ruderal community, which extends approximately 5 feet from the roadside. A mix of herbaceous and woody plants dominate the slope, including bracken (*Pteridium aquilinum*), hedge nettle (*Stachys bullata*), poison oak, California sagebrush, and sticky monkey flower (*Mimulus aurantiacus*). Black-flowered figwort grows along the shrub line at this location. A small grove of Monterey cypress trees is present on the west side of Surf Road. Patches of Central Coastal Scrub, dominated by mock heather, California sagebrush, and coyote brush; with coastal buckwheat and giant coreopsis (*Coreopsis gigantea*) occurring as subdominants, are also present on the west side of Surf Road.

Approximately 800 feet south of Lower Spring Canyon, Surf Road straightens and a mix of introduced grass species, ripgut grass, foxtail chess, soft chess brome, and veldt grass locally dominate the ruderal community, with sea fig also being locally dominant. Central Coastal Scrub, dominated by California sagebrush, coyote brush and mock heather, is present 10 feet off the road shoulder. Both Kellogg's horkelia (*Horkelia californica* ssp. *sericea*) and black-flowered figwort are under story components of the community at this location.

Two special status plant species, Kellogg's horkelia and black-flowered figwort, are present in Segment 1.

The plant communities in Segment 1 provide foraging and breeding habitat for wildlife species including the western fence lizard (*Sceloporus occidentalis*), southern alligator lizard (*Elgaria multicarinata*) mule deer (*Odocoieius hemionus*), California quail (*Callipepla californica*), bushtit (*Psaltriparus minimus*), western scrub jay (*Aphelocoma californica*), wrentit (*Chamaea fasciata)*, northern flicker (*Colaptes auratus*), mourning dove (*Zenaida macroura*), Anna's hummingbird (*Calypte anna*), western meadowlark (*Sturnella neglecta*), yellow-rumped warbler (*Dendroica coronata*), white-crowned sparrow (*Zonotrichia leucophrys*), red-tailed hawk (*Buteo jamaicensis*), turkey vulture (*Cathartes aura*), Botta's pocket gopher (*Thomomys bottae*), and coyote (*Canis latrans*).

Suitable habitat is also present in this segment for special status wildlife species such as California horned lizard (*Phrynosoma coronatum frontale*), silvery legless lizard (*Anniella pulchra pulchra*), white-tailed kite (*Elanus leucurus*), ferruginous hawk (*Buteo regalis*), western burrowing owl (*Athene cunicularia hypugaea*), loggerhead shrike (*Lanius ludovicianus*), and California thrasher (*Toxostoma redivivum*).

Lower Spring Canyon is a permanent monarch butterfly aggregation site with many thousands of the butterflies forming large clusters in trees within 40 feet of Surf Road between September and February. Santa Barbara County designates winter roosts for the monarch butterfly as Environmentally Sensitive Habitats. These habitats are protected under the local county coastal plan. Overwintering monarch butterflies are considered a "special animal" by the California Department of Fish and Game (CDFG 2003).

Segment 2.

Segment 2 begins at Tank 700 at the east end of Tank Road and continues west for approximately 1.0 mile along Tank Road to the intersection of Tank and Surf Roads (Figure 2-1). The segment is comprised of Ruderal, Central Coast Maritime Chaparral, Non-native Grassland and Central Coastal Scrub.

Along the length of Tank Road, the road margin consists of rocky culverts, which are overgrown by varying degrees of vegetation. The Ruderal community is dominated by bromes and cut leaf plantain. Bushes from the adjacent communities regularly intrude into the culvert.

Central Coast Maritime Chaparral is present along Tank Road, west of Tank 700. This community grades into Central Coastal Scrub approximately 1,500 feet west of Tank 700. The Central Coast

Maritime Chaparral is dominated by ceanothus (*Ceanothus impressus* and *Ceanothus thrysiflorus*), chamise and La Purisima manzanita. Subdominants in the chaparral community are saw-toothed golden bush (*Hazardia squarrosa*) and poison oak.

Westbound along Tank Road, about 2,800 feet west of Tank 700 there is a small, Non-native Grassland dominated by ripgut grass, filaree, and Bermuda buttercups (*Oxalis pes-caprae*). Black sage dominates the adjacent Central Coastal Scrub community, with some roadside areas dominated by coyote brush and sticky monkey flower. Subdominants include California sagebrush, bracken, wild blackberry, and mock heather.

Approximately 1,300 feet east of the Tank and Surf Roads intersection, California sagebrush and mock heather dominate the Central Coastal Scrub community. Veldt grass, sea fig, and jubata grass locally dominate the ruderal community. Sparsely vegetated Non-native Grassland, dominated by veldt grass and sea fig, is present just east of the intersection of Tank and Surf Roads.

Kellogg's horkelia, is the only special status plant species found in Segment 2. It is a common component of the Central Coastal Scrub in this segment.

The plant communities in this segment provide foraging and breeding habitat for wildlife species including western fence lizard, wrentit, bushtit, song sparrow (*Melospiza melodia*), Anna's hummingbird, spotted towhee (*Pipilo maculates*), Botta's pocket gopher, mule deer, and coyote.

Suitable habitat is also present in this segment for special status wildlife species such as California horned lizard, silvery legless lizard, ferruginous hawk, loggerhead shrike, Bell's sage sparrow (*Amphispiza belli belli*), and California thrasher.

Segment 3.

Segment 3 begins at the intersection of Tank and Surf Roads and extends south along Surf Road to the intersection with Delphy Road (SLC-5 Road, Figure 2-1). This segment is approximately 1.2 miles long and is comprised of Ruderal, Non-Native Grassland, and Central Coastal Scrub plant.

Introduced grasses, wild oats, bromes, and veldt grass dominate the Ruderal community, which extends approximately 7 to 10 feet from the road shoulders. A large Indian-fig (*Opuntia ficus-indica*) is present on the road shoulder at the intersection of Tank and Surf Roads. Coyote brush, black sage, and California sagebrush dominate the Central Coastal Scrub immediately south of the intersection of Surf and Tank Roads.

Along Surf Road, approximately 1,200 feet south of the intersection with Tank Road, the Central Coastal Scrub community grades into a woodland dominated by exotic trees, eucalyptus on the west side and mimosa on the east side. Milk thistle (*Silybum marianum*), stinging nettle (*Urtica dioica*), poison hemlock (*Conium maculatum*), poison oak and introduced grasses dominate the understory. This site is known as Dry Creek Canyon and is a recognized autumnal monarch butterfly aggregation site (Meade 1999).

South of Dry Creek Canyon, the hillsides are covered by Non-native Grassland, which is dominated by a mix of sea fig and veldt grass. Scattered Central Coastal Scrub species (California sagebrush and mock heather) and areas of bare sand occur along this hillside, as well. Further south, along Surf Road, the Central Coastal Scrub increases in density.

Black-flowered figwort is common along the border of the Ruderal and Central Coastal Scrub communities and is the only special status plant species found in this segment.

The plant communities in Segment 3 provide important foraging and breeding habitat for many wildlife species including western fence lizard, southern alligator lizard, western skink, common garter snake (*Thamnophis sirtalis*), northern flicker, northern harrier (*Circus cyaneus*), spotted towhee, California quail, song sparrow, wrentit, Botta's pocket gopher, and coyote. Monarch butterflies are present in association with the eucalyptus trees.

Suitable habitat is also present in this segment for special status wildlife species such as the California horned lizard, silvery legless lizard, white-tailed kite, ferruginous hawk, loggerhead shrike, and California thrasher.

Segment 4.

Segment 4 extends from the intersection of Surf and Delphy Roads, southeast on Delphy Road to SLC-5, and south along Surf Road to the intersection with Coast Road (Figure 2-1). This segment is approximately 0.8 mile long and is comprised of Central Coastal Scrub, Non-native Grassland and Ruderal communities.

Dense Central Coastal Scrub is present along the northern side of Delphy Road. On the south side of Delphy Road, the scrub gives way to mowed fields.

Monterey cypress and sea fig locally dominate the Central Coastal Scrub along Surf Road south of the intersection with Delphy Road. California burclover and sea fig locally dominate the Ruderal community, which extends 5 to 10 feet from the shoulders of Surf Road.

Along Surf Road, between Building 595 and the intersection with Coast Road, sea fig becomes increasingly dominant and Central Coastal Scrub vegetation becomes more fragmented. European beach grass (*Ammophila arenaria*), and Sydney golden wattle (*Acacia longifolia*) are locally dominant along this portion of Surf Road; areas of bare sand are also present.

Black-flowered figwort, a special status plant species, is a component of Central Coastal Scrub along Delphy Road.

The plant communities in this segment provide foraging and breeding habitat for many wildlife species including western toad (*Bufo boreas*), house finch (*Carpodacus mexicanus*), cliff swallow (*Petrochelidon pyrrhonota*), California thrasher (*Toxostoma redivivum*), northern harrier, California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher, coyote, and brush rabbit (*Sylvilagus bachmani*).

The only special status wildlife species observed in this segment was California thrasher. However, suitable habitat is also present in this segment for special wildlife status species such as California horned lizard, silvery legless lizard, white-tailed kite, ferruginous hawk, and loggerhead shrike.

Segment 5.

Segment 5 extends south along Coast Road, from the intersection at Surf Road to Building 542 on the east side of Coast Road (Figure 2-1). This segment is approximately 0.8 miles long and is comprised of Central Coastal Scrub, and Ruderal plant communities.

Introduced grasses (i.e., bromes, wild oats, and veldt grass), Bermuda buttercups, and mustard (*Brassica* spp.) dominate the Ruderal community, which extends 5 to 10 feet from the road shoulders. California sagebrush and coyote brush dominate the Central Coastal Scrub on the east side of Coast Road. Saw-toothed goldenbush is a subdominant plant in this community. On the western side of Coast Road, the Central Coastal Scrub is more fragmented due to the presence of railroad tracks. Giant coreopsis is a subdominant plant on the western side of Coast Road.

Black-flowered figwort, the only special status species found in this segment, is abundant and grows as an under story plant where coyote brush and California sagebrush are present.

The plant communities in this segment provide foraging and breeding habitat for wildlife species such as western fence lizard, wrentit, house finch, Botta's pocket gopher, and coyote.

Suitable habitat is also present in this segment for special status wildlife species such as California horned lizard, silvery legless lizard, ferruginous hawk, western burrowing owl, loggerhead shrike, and California thrasher.

Honda Creek flows through this segment. This creek contains suitable habitat for three special status aquatic species, unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*), tidewater goby (*Eucyclogobius newberryi*), and California red-legged frog (*Rana aurora draytonii*). All three species are known to occur in Honda Creek.

Segment 6.

Segment 6 extends south along Coast Road from Building 542 to the intersection at North Access Road (Figure 2-1). This segment is approximately 0.6 mile long and is comprised of Central Coastal Scrub, and Ruderal communities.

Introduced grasses – i.e., bromes and veldt grass – locally dominate the Ruderal community, which extends about 7 feet from the road shoulder. A mix of deerweed, California sagebrush, coyote brush, and coastal buckwheat locally dominates the Central Coastal Scrub, which is present beyond the Ruderal community. Sea fig and common hottentot fig (*Carpobrotus edulis*) are also locally dominant in both the Central Coastal Scrub and Ruderal communities.

The area around building 542 is disturbed and sparsely vegetated. The west side of Coast Road, which is paralleled by railroad tracks, is also disturbed. Various introduced grasses dominate both areas.

Black-flowered figwort, the only special status plant species found in this segment, is present and common along the shrub line, which occurs along the border of the Coastal Scrub and Ruderal communities

The plant communities in this segment provide foraging and breeding habitat for wildlife species including western fence lizard, wrentit, house finch, Botta's pocket gopher, and coyote.

Suitable habitat is also present in this segment for special status wildlife species such as California horned lizard, silvery legless lizard, ferruginous hawk, western burrowing owl, loggerhead shrike, and California thrasher.

Segment 7.

Segment 7 extends south along Coast Road from the intersection at North Access Road to SLC-6 (Figure 2-1). This segment is approximately 0.7 mile long and is comprised of Central Coastal Scrub, and Ruderal plant communities.

Mowed California sagebrush, coyote brush, and a variety of herbaceous species, locally dominate the Ruderal community, which extends approximately 5 feet from the eastern shoulder of Coast Road. The Ruderal community, which extends 5 to 10 feet from the western shoulder of Coast Road, is locally dominated by bromes and yellow sweet clover (*Melilotus indica*). The Central Coastal Scrub, which occurs beyond the Ruderal community, is locally dominated by California sagebrush and coyote brush. Sticky monkey flower, saw-toothed goldenbush, and coastal buckwheat occur as subdominants. Sea fig and common hottentot fig are also locally dominant in the communities within this segment.

The plant communities in this segment provide foraging and breeding habitat for wildlife species including western fence lizard, wrentit, house finch, Botta's pocket gopher, and coyote.

Black-flowered figwort, the only special status plant species found in this segment, is present and common along the shrub line that occurs along the border of the Central Coastal Scrub and Ruderal communities

Suitable habitat is also present in this segment for special status wildlife species such as California horned lizard, silvery legless lizard, ferruginous hawk, western burrowing owl, loggerhead shrike, California thrasher, and Bell's sage sparrow. In addition, California red-legged frogs have been documented in the wastewater ponds located south of Coast Road at the entrance to SLC-6.

3.2.4. Sensitive Plant Communities and Special Status Species

3.2.4.1. Sensitive Communities and Plant Species

Central Coast Maritime (Burton Mesa) Chaparral, a sensitive plant community recorded in the CNDDB (CDFG 1999, 2001) for the Surf and Tranquillion Mountain 7.5 minute USGS quadrangles, occurs within the proposed waterline route. This sensitive community occurs off of Tank Road in Segment 2.

Two federal plant species of concern, Kellogg's horkelia and black-flowered figwort, were documented within the proposed fiber optic cable route during the course of the biological surveys (Table 3-1). Three other special status plant species, beach layia (*Layia carnosa*), Gaviota tarplant (*Hemizonia increscens* ssp. *villosa*) and Blochman's leafy daisy (*Erigeron blochmaniae*) were identified as having the potential to occur within the proposed project area (Table 3-1) based on previous botanical surveys conducted for other projects (SRS Technologies 2001a), the

Table 3-1. Federal Special Status Plant Species Occurring or With Potential to Occur Within the Work Area of the Proposed Waterline Route.

Scientific Name Common Name	Status[1]	Occurrence[2]		Habitat	Blooming Period
		O	P		
Layia carnosa Beach layia	FE/SE/ CNPS		1	Coastal Dune Scrub	May-Jul
Hemizonia increscens ssp. *villosa* Gaviota tarplant	FE/SE/ CNPS		7	Coastal Bluff, Coastal Scrub	
Erigeron blochmaniae Blochman's leafy daisy	FSC/ CNPS		1, 3, 4, 5, 6, 7	Coastal Dune Scrub, Mid-dunes	May-Nov
Horkelia cuneata ssp. *sericea* Kellogg's horkelia	FSC/ CNPS	1, 2	3, 4, 5, 6, 7	Coastal Dune Scrub, Central Coastal Scrub, Central Maritime Chaparral, Coastal Live Oak Woodland	Apr-Sep
Scrophularia atrata Black-flowered figwort	FSC/ CNPS	1, 3, 5, 6, 7	2, 4	Coastal Dune Scrub, Central Coastal Scrub, Central Maritime Chaparral, Coast Live Oak Woodland	Apr-Jun

1 FE – Federally Endangered FSC – Federal Species of Concern SE – California State Endangered CNPS – California Native Plant Society 1B

2 O = observed during field surveys P = potential to occur

Vandenberg AFB Integrated Natural Resources Management Plan (USAF 2003), and the CNDDB (CDFG 2001, 2003b).

Beach layia (*Layia carnosa*) [FE/CE/CNPS 1B]

Beach layia formerly occurred along the California coast from Humboldt County to near Point Conception in Santa Barbara County. Only two populations are known in Santa Barbara County, both on Vandenberg AFB in the coastal dune scrub vegetation. One population is approximately 0.2 miles north of Kelp Road and west of Surf Road and the railroad tracks, at the edge of the bluff overlooking the ocean. The second population is located in the ruderal zone west of Coast Road, approximately 0.2 miles north of Kelp Road. These populations would not be affected by this project. However, this plant could potentially occur within Segment 1.

Gaviota tarplant (*Hemizonia increscens* ssp. *villosa*) [FE/CE/CNPS 1B]

There are many known locations of this species on Vandenberg AFB: While most locations are coastal, some extend inland. This plant is most often associated with grasses, and on occasion, with coastal shrubs such as *Baccharis* and *Isocoma*. This species has been observed in several locations near SLC-6 and could potentially occur within Segments 6 and 7.

The U.S. Fish and Wildlife Service published the Proposed Designation of Critical Habitat for Gaviota tarplant on November 15, 2001 (66 FR 57560). The Air Force has proposed the designation of Sensitive Resource Protection Areas (SRPA) for Gaviota tarplant. Designation of SRPA will initially include all units designated by the USFWS in their proposed critical habitat designation for this species.

Blochman's leafy daisy (*Erigeron blochmaniae*) [FSC/CNPS 1B]

In Santa Barbara County, this herb is endemic to the dunes from Vandenberg AFB north of Honda Creek, to the Santa Maria River where it occurs on coastal dunes, coastal strand, and sandstone hills. In the past it has been documented along Surf Road and near the intersection of Surf and Coast Roads (Segments 3, 4, and 5), as a member of the Central Coastal Scrub (Keil 1998).

Kellogg's horkelia (*Horkelia cuneata* ssp. *sericea*)
[FSC/CNPS 1B]

This matting, herbaceous perennial is widely distributed throughout Vandenberg AFB in Central Coastal Scrub in sandy soils, on old dunes, and on coastal sand hills. *H. cuneata* ssp. *sericea* closely resembles *H. c.* ssp. *cuneata* and is highly variable in this area, which encompasses the southern part of its range. Due to the difficulty of distinguishing between the two subspecies, all *cuneata* found during the field surveys were treated as subspecies *sericea* (C. Gillespie, pers. comm.). This plant was observed in Segments 1 and 2 during the botanical surveys for the proposed project, was observed on previous surveys in the vicinity of Segments 3, 4, and 5, (SRS Technologies 2001a) and could potentially occur in Segments 6 and 7.

Black-flowered figwort (*Scrophularia atrata*)
[FSC/CNPS 1B]

Black-flowered figwort is a perennial herb found from southern San Luis Obispo County to northern Santa Barbara County, in coastal dunes, coastal scrub, chaparral and woodlands in calcareous or diatomaceous soils, at elevations less than 500 meters. This species is a common component of Central Coastal Scrub, riparian and oak woodlands, and chaparral on Vandenberg AFB. This species was observed in Segments 1, 3, 5, 6, and 7 during field surveys for this project. This species could potentially occur in Segment 2 and has been observed during previous surveys near Segment 4 (SRS Technologies 2001a).

3.2.4.2. Special Status Wildlife Species

Table 3-2 lists federal special status wildlife species and other wildlife species of concern known to occur or that potentially occur within the proposed project area. Potential occurrence was determined based on field surveys conducted for this project, on past documentation of special status species within the vicinity of the project area, and on the suitability of habitat and occurrence within the region of a particular species.

Unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*)
[FE/SE]

This small fish is native to San Antonio Creek on North Vandenberg AFB. A population of the species has been transplanted and established successfully in Canada Honda Creek (South Vandenberg AFB). This fish requires slow water flow with low turbidity and aquatic vegetation for cover and nest material. It is sensitive to excessive sedimentation and the loss of habitat through changes in water flow, water level, and the growth of emergent plants. On Vandenberg AFB, they are found in San Antonio Creek and Honda Creek in Segment 5.

Tidewater goby (*Eucyclogobius newberryi*)
[FE/CSC]

This small fish in the goby family (Gobidae) is a bottom dweller found in brackish waters of California's coastal estuaries, wetlands and lagoons, and lower reaches of coastal streams and rivers. This species is the only found within the genus and is endemic to California. On Vandenberg AFB, they are found in the San Antonio Creek lagoon and Santa Ynez River lagoon, and the lower reaches of these two waterways, as well as in the lagoon at the mouth of Honda Creek (CDFG 2001a), in Segment 5.

Critical habitat for the tidewater goby was designated on November 20, 2000. Streams and drainages within Vandenberg AFB were not included in this designation.

California red-legged frog (*Rana aurora draytonii*)
[FT/CSC]

This highly aquatic amphibian inhabits quiet pools of streams, marshes, and occasionally ponds, where it prefers shorelines with extensive vegetation. It is active year-round in coastal areas, and can be found in upland areas during the winter and early spring. Red-legged frogs breed from January to July (peak in February). On Vandenberg AFB, they occur in nearly all permanent streams and ponds (Christopher 1996). California red-legged frogs have been documented in the wastewater ponds in Honda Creek (Segment 5), and in the water detention ponds on the west

side of Coast Road just outside of SLC-6 (Segment 7) (Christopher 1996).

Critical habitat for the California red-legged frog was designated on March 13, 2001. However, Vandenberg AFB was excluded from final designation of critical habitat for the California red-legged frog because its Integrated Natural Resource Management Plan contains habitat protection measures for this species.

California Horned Lizard (*Phrynosoma coronatum frontale*) [FSC/CSC]

Horned lizards are found in areas with abundant open vegetation, such as coastal scrub and annual grasslands with loose sandy soils. These terrestrial lizards are active above ground from April through October and can often be found in the early morning basking on the ground or on elevated objects. They avoid predators and extreme heat by burrowing into loose soil. These lizards pass periods of inactivity and winter hibernation under surface objects such as rocks or logs, or in crevices or mammal burrows. The breeding season varies depending on locality, but has been reported to exist mostly from May to June. This species is known on Vandenberg AFB from a few records in dune scrub and chaparral communities within the San Antonio Terrace, Burton Mesa, and Lompoc Terrace (Christopher 1996). Suitable habitat for this species occurs in all segments of the proposed route.

Table 3-2. Federal Special Status Wildlife Species and Other Species of Concern that Occur or With Potential to Occur Within the Proposed Project Area.

Common Name *Scientific Name*	Status[1]	Occurrence[2]		Breeding Season
		O	P	
Unarmored threespine stickleback *Gasterosteus aculeatus williamsoni*	FE/SE	5		Year-round Peak in March
Tidewater goby *Eucyclogobius newberryi*	FE/CSC	5		April – May
California red-legged frog *Rana aurora draytonii*	FT/CSC	5,7		Feb – mid Apr
California horned lizard *Phrynosoma coronatum frontale*	FSC/CSC	5,6,7	1,2,3,4	Apr – Aug
Silvery legless lizard *Anniella pulchra pulchra*	FSC/CSC	3,4,5	1,2,6,7	Mate May-Jun Birth Sep - Oct
White-tailed kite *Elanus leucurus*	FSC (nesting)	7	1,3,4	Mar – Jul
Ferruginous hawk *Buteo regalis*	FSC/CSC (wintering)		1,2,3,4,5,6,7	
Golden eagle *Aquila chrysaetos*	FP/CSC		3,4,5	Jan – Aug Mar – Jul peak
American peregrine falcon *Falco peregrinus anatum*	FD/SE (nesting)	5,7	6	mid Feb – Jul
Western burrowing owl *Athene cunicularia hypugaea*	FSC/CSC (burrow sites)	1,5,7	6	Apr – Jun
Loggerhead shrike *Lanius ludovicianus*	FSC/CSC (nesting)	1,3,4,5,6,7	2	Mar – Aug
California thrasher *Toxostoma redivivum*	FSC	3,4,5,6,7	1,2	Jan – Jun
Bell's sage sparrow *Amphispiza belli belli*	FSC/CSC	2,7		Mar – Jul

1. FE – Federally Endangered FT – Federally Threatened
   FP – Federally Protected (Bald and Golden Eagle Protection Act) FSC – Federal Species of Concern
   FD – Federally Delisted SE – California State Endangered CSC – California Species of Concern
2. O = segments where observed during present and past field surveys P = segments with potential to occur

Silvery Legless Lizard (*Anniella pulchra pulchra*)
[FSC/CSC]

This fossorial lizard is found in habitats with sandy or loose organic soils where there is plenty of leaf litter, such as in coastal scrub and chaparral habitat. Legless lizards often seek cover under surface objects and are often encountered buried in leaf litter or burrowing near the surface through loose sandy soil. Mating occurs in late spring or early summer, with live young born from September through November. On Vandenberg AFB, this lizard is found associated with stabilized dunes on San Antonio, Burton Mesa and Lompoc Terraces.

This species has been documented near Coast and Honda Canyon Roads (Segments 4 and 5) in the past (Christopher 1996). Suitable habitat for this species occurs in all segments.

White-tailed kite (*Elanus leucurus*)
[FSC (nesting)]

This resident species is fairly common in grassland and open scrublands where it hunts small animals. White-tailed kites were previously documented in the vicinity of Segment 7 (Holmgren and Collins 1999). The breeding season extends from March to July. White-tailed kites nest in wooded areas; suitable nesting habitat exists in Segments 1, 3, and 4.

Ferruginous hawk (*Buteo regalis*)
[FSC/CSC (wintering]

This uncommon fall transient and winter visitor to Santa Barbara County is typically observed in coastal and interior grasslands, riparian woodlands, and agricultural fields. Ferruginous hawks have been previously documented in Segment 2 (Holmgren and Collins 1999). Ferruginous hawks have the potential to occur in all segments.

Golden eagle (*Aquila chrysaetos*)
[FP/CSC]

Typical habitats of golden eagles are rolling foothills, mountain areas, sage-juniper flats, and desert and require open terrain for hunting, and secluded cliffs with overhanging ledges or large trees for cover. Golden eagles typically nest on cliffs and in large trees in open areas. Rugged, open habitats with canyons and escarpments are used most frequently for nesting, which occurs from late January through August, with a peak in March through July. Golden eagles are occasionally seen throughout Vandenberg AFB and are thought to nest in the local mountains (Lehman 1994). Golden eagles have also been sighted flying over Coast Road (Segment 5, 6 and 7) (SRS Technologies 2001a).

American peregrine falcon (*Falco peregrinus anatum*)
[FD/CES]

Peregrine falcons are residents of open country, such as grasslands and coastal shores. This falcon breeds mainly in woodland, forest, and coastal habitats. Breeding sites are usually located near a wetland, lake, river, or other body of water, or on high cliffs or banks, with the breeding season lasting from early March through late August. Two pairs of Peregrine falcons are known to nest along the southern coast of Vandenberg AFB. These pairs are likely to occasionally occur near Coast Road (Segments 5, 6, and 7).

Western burrowing owl (*Athene cunicularia hypugaea*)
[FSC/CSC]

Burrowing owls are year-round residents of open, dry grassland, desert habitats, and open scrub communities. This small owl can be active during the day and night. They usually nest in abandoned ground squirrel (or other small mammal) burrows, although they may dig their own burrows in soft soil. No nesting records have been documented on Vandenberg AFB in the last decade. Burrowing owls have been sighted in coastal dune scrub habitat along Surf Road on South Vandenberg AFB (Segments 1, 5, and 7) (Holmgren and Collins 1999) where they are suspected of wintering.

Loggerhead Shrike (*Lanius ludovicianus*)
[FSC/CSC nesting]

This common resident and winter visitor in lowlands and foothills throughout California prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches.

Shrikes build nests on stable branches of densely foliaged shrubs or trees. The breeding period extends from March through August. Shrikes are likely to occur and potentially breed in all segments.

California thrasher (*Toxostoma redivivum*) [FSC]

The California thrasher is endemic to coastal and foothill areas of California. Core habitat, in both coastal ranges and interior foothills, is chaparral. Within chaparral-dominated landscapes, California thrashers inhabit riparian and oak woodlands, especially where understory shrubs are dense. This species has an extended breeding season (January through July), with territorial activity intensifying with the start of the winter rains, usually in November. Most pairs raise two broods between February and June.

This thrasher is fairly numerous in dense riparian areas and coastal sage scrub of Santa Barbara County. This species was observed during field surveys for this project in Segment 4. In previous surveys, it has been observed in the vicinity of Segments 3, 5, 6, and 7 (SRS Technologies 2001a). California thrashers are likely to occur and potentially breed in all segments.

Bell's sage sparrow (*Amphispiza belli belli*) [FSC/CSC]

This subspecies of sage sparrow occurs in scrub habitats, especially chaparral and coastal sage scrub. It particularly favors dense chaparral for breeding. Its breeding period extends from late March to late July. Vandenberg AFB supports a relatively large population of Bell's sage sparrow, and its distribution is associated with Central Maritime Chaparral (Holmgren and Collins 1999). This species is a documented resident and breeder in the Burton Mesa chaparral south of Tank Road (Segment 2).

3.2.5. Waters of the United States and Wetlands

The proposed waterline would cross Honda Creek at its intersection with Coast Road (Segment 5). Honda Creek has approximately 100 ft of adjacent wetlands on either side of the creek dominated by Central Coast Arroyo Willow Riparian Woodland. The proposed project crosses Honda Creek and associated wetlands at the Coast Road overpass. The road here is built up on fill high above a culvert that drains Honda Creek to the Pacific Ocean. The road is approximately 70 feet above Honda Creek. Boring would occur 25 feet below the roadway, avoiding any adverse effects on the wetland and riparian community associated with Honda Creek.

Freshwater marshes dominated by California bulrush occur on the southwest of Coast Road near the entrance to SLC-6. However, this wetland habitat is outside the project area and would not be affected by the proposed project.

3.3. Air Quality

Air quality is described by the concentration of pollutants in the atmosphere. These concentrations are expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). Air quality is determined by the type and amount of pollutants emitted into the atmosphere together with the size and topography of the air basin and the prevailing meteorological conditions. Comparing the concentration to state and federal ambient air quality standards determines the significance of any particular pollutant concentration. These standards represent the maximum allowable atmospheric concentrations that may occur while still providing protection for public health and safety with a reasonable margin of safety.

The CAA required the U.S. EPA to establish ambient ceilings for certain criteria pollutants. Subsequently, the U.S. EPA promulgated regulations that set the National Ambient Air Quality Standards (NAAQS). NAAQS have been established for carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter 10 microns or less in diameter (PM_{10}), particulate matter 2.5 microns or less in diameter ($PM_{2.5}$), and sulfur dioxide (SO_2). Of these criteria pollutants, only O_3 is a secondary pollutant – i.e., it is not directly emitted, but is formed from the reaction of nitrogen oxides (NO_Xs) and reactive

organic compounds (ROCs). The NAAQS are presented in Table 3-3.

Under the California CAA, California established air quality standards for the state, known as the California Ambient Air Quality Standards (CAAQS). CAAQS are generally more stringent than the NAAQS and there are additional CAAQS for sulfates (SO_4), hydrogen sulfide (H_2S), vinyl chloride, and visibility-reducing particulate matter. The CAAQS are also presented in Table 3-3.

The area affected by the emissions from the Proposed Action includes Vandenberg AFB and the surrounding portions of northern Santa Barbara County. For CO, NO_2, PM_{10}, and SO_2, the affected area is generally limited to a few miles downwind of the emission source, while for 0_3 it can extend many miles downwind. Because the reaction between ROCs and NO_Xs usually occurs several hours after they are emitted, the maximum O_3 level can be many miles from the source; therefore, the area affected by Vandenberg AFB-produced O_3 and its precursors could include most of northern Santa Barbara County. In addition, O_3 and its precursors transported from other regions can combine with local emissions to produce high, local O_3 concentrations.

3.3.1. Regional Climate and Meteorology

The climate at Vandenberg AFB can be characterized as cool and wet from November through April and warm and dry from May through October. The average annual rainfall is approximately 14.6 inches, most of which falls between November and May. Winds are usually light during the nighttime hours, reaching moderate speeds of approximately 12 miles per hour by the afternoon. Winds are most often northwesterly on North Base and north to northeasterly on South Base. The strongest winds are associated with rainy season storms.

Vandenberg AFB is subject to early morning and afternoon temperature inversions about 96 and 87 percent of the time, respectively. In an inversion, air temperature rises with increasing altitude, which confines the surface air and prevents it from rising (USAF 1996). This restricts the vertical dispersion of pollutants and, therefore, increases local pollutant concentrations. Pollutants are "trapped" under an inversion layer until either solar radiation produces enough heat to lift the layer or strong surface winds disperse the pollutants. In general, these conditions occur most frequently during the nighttime and early morning hours.

3.3.2. Existing Air Quality

The U.S. EPA classifies air quality within each air quality control region with regard to its attainment of NAAQS. The California Air Resources Board does the same for CAAQS. An area with air quality better than state or federal ambient air quality standards for a specific pollutant is designated as attainment for that pollutant. Any area not meeting those standards is classified as non-attainment. Santa Barbara County is in attainment or unclassified for all the ambient air quality standards except for the state standard for PM_{10} and the state O_3 standards. Currently, Santa Barbara County's air quality is classified as maintenance attainment for the federal 1-hour O_3 standard (U.S. EPA 2003).

3.4. Water Resources

Vandenberg AFB encompasses portions of two major drainage basins, San Antonio Creek and the Santa Ynez River. Five other minor drainage basins, associated with smaller creeks, and several ponds, also occur within base boundaries.

San Antonio Creek, located on North Base, drains an area of approximately 135 square miles, and discharges into the Pacific Ocean. The Santa Ynez River, located approximately 3.5 miles to the north of the proposed waterline route, drains approximately 900 square miles, and flows westward to discharge into the Pacific Ocean.

Surface drainage within the proposed area for the waterline route generally flows to the west. The two primary drainage basins on South Base include Bear Creek and Honda Creek. Bear Creek is approximately 1.0 mile to the north of the proposed waterline route. Honda Creek is within the proposed waterline route. This is the only

Table 3-3. Ambient Air Quality Standards.

Pollutant	Averaging Time	CAAQS[1,3]	NAAQS[2,3]	
			Primary[4]	Secondary[5]
Ozone	8-hour	--	0.08 ppm [6] (157 µg/m^3)	same as primary
	1-hour	0.09 ppm (180 µg/m^3)	0.12 ppm [6] (235 µg/m^3)	
Carbon Monoxide	8-hour	9 ppm (10,000 µg/m^3)	9 ppm (10,000 µg/m^3)	--
	1-hour	20 ppm (23,000 µg/m^3)	35 ppm (40,000 µg/m^3)	--
Nitrogen Dioxide	annual average	--	0.053 ppm (100 µg/m^3) (geo)	same as primary (geo mean)
	1-hour	0.25 ppm (470 µg/m^3)	--	--
Sulfur Dioxide	annual average	--	0.03 ppm (80 µg/m^3)	--
	24-hour	0.04 ppm (105 µg/m^3)	0.14 ppm (365 µg/m^3)	--
	3-hour	--	--	0.5 ppm (1300 µg/m^3)
	1-hour	0.25 ppm (655 µg/m^3)	--	--
PM_{10}	annual mean (arith or geo)	20 µg/m^3 (geo)	50 µg/m^3 (arith)	same as primary (arith mean)
	24-hour	50 µg/m^3	150 µg/m^3	same as primary
$PM_{2.5}$	annual arith mean	12 µg/m^3	15 µg/m^3	same as primary
	24-hour	--	65 µg/m^3	same as primary
Sulfates	24-hour	25 µg/m^3	--	--
Lead	30-day average	1.5 µg/m^3	--	--
	quarterly	--	1.5 µg/m^3	same as primary
Hydrogen Sulfide	1-hour	0.03 ppm (42 µg/m^3)	--	--
Vinyl Chloride	24-hour	0.010 ppm (26 µg/m^3)	--	--
Visibility Reducing Particles	1 8-hour observation from 8 AM to 6 PM PST	sufficient amount to produce extinction coefficient of 0.07 per kilometers due to particles when relative humidity less than 70 percent	--	--

1. California Standards for ozone, carbon monoxide, sulfur dioxide (1- & 24-hour), nitrogen dioxide, PM_{10}, $PM_{2.5}$ and visibility reducing particles are not to be exceeded. Sulfate, lead, hydrogen sulfide & vinyl chloride standards are not to be equaled or exceeded.
2. National Standards, (other than ozone, particulate matter, and those based upon annual averages or average arithmetic means) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight-hour concentration in a year, averaged over three-years, is equal to or less than the standard. For PM_{10}, the 24-hours standard is attained when 99% of the daily concentrations, averaged over three years, are equal to or less than the standard. For $PM_{2.5}$, the 24-hours standard is attained when 98% of the daily concentrations, averaged over three years, are equal to or less than the standard.
3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature and pressure of 25 ^{O} C and 760-mm Hg, respectively. Most measurements of air quality are to be corrected the reference temperature of 25 ^{O} C and reference pressure of 760-mm Hg; ppm in this table refers to ppm by volume or micromoles of pollutant per mole of gas.
4. National Primary Standards: The level of air quality necessary, with an adequate margin of safety to protect the public health.
5. National Secondary Standards: The level of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
6. U.S. EPA promulgated new Federal 8-hour Ozone and PM2.5 standard on July 18, 1997

waterway within the area of influence of water discharges from the Proposed Action.

The Honda Creek watershed encompasses approximately 12 square miles. This creek originates on South Base approximately 7.5 miles east of its discharge into the Pacific Ocean. The proposed waterline route would traverse Honda Creek where Coast Road crosses this water resource 70 feet above a culvert. Directional boring would be required in this location, as trenching activities have the potential to impact the structural integrity of the road fill, as described in Section 2.1. In addition, trenching would also have the potential to adversely impact Honda Creek and associated wetlands.

3.4.1. Floodplain

The 100-year floodplain for Honda Creek has not been described. However, construction activities associated with the Proposed Action near Honda Creek would not be expected to affect floodplains given that the boring activities would occur in road fill which extends 70 feet above the creek. As such, this element is not addressed further in this EA.

3.4.2. Groundwater

Groundwater on Vandenberg AFB occurs mainly in unconsolidated alluvial deposits beneath river and stream channels in valleys and canyons. Only the deeper portions of San Antonio Creek and the Santa Ynez River have aquifers capable of yielding large quantities of water usable for water supply (USAF 1998). South Base obtains drinking water through a connection with North Base.

The depth of the water table in South Base varies between 70 and 131 feet below the ground surface (Vandenberg AFB 1994). Excavations for the proposed waterline route would extend approximately 5 feet below grade and directional boring would extend to a maximum depth of 25 feet below grade.

3.4.3. Surface Water

The 30th Weather Squadron estimates that Vandenberg AFB receives an average annual precipitation of approximately 14.6 inches per year. Primarily San Antonio Creek and the Santa Ynez River collect runoff on Vandenberg AFB. On South Base, several small seasonal creeks, including Honda Creek, collect runoff. High discharge occurs in November through May, while little to no discharge occurs during the summer. Permanent fresh water is limited to a few small ponds, and wetlands.

3.4.4. Water Quality

Water quality can be affected by construction activities either directly, through runoff from erosion and hazardous waste spillage or leaks, or indirectly, through storm water runoff containing these substances. Honda Creek is the only waterway with potential to be affected by construction activities. No documentation exists regarding measurements of water quality in Honda Creek. Occasional measurements of pH and dissolved oxygen are performed as part of the monitoring requirements for space vehicle launches from SLC-4.

3.5. Hazardous Materials and Hazardous Waste

Hazardous materials and hazardous waste include substances that, because of their quantity, concentration, physical, chemical, or infectious characteristics, can present substantial danger to public health and welfare or to the environment when released into the environment. These substances are defined as hazardous and toxic by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (42 USC 9601-9675), the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act (RCRA) (42 USC 6901-6992), and Title 22 of the California Code of Regulations (CCR). Executive Order 12088, under the authority of U.S. Environmental Protection Agency (EPA), ensures necessary actions are taken for the prevention, management, and abatement of environmental pollution from hazardous materials, hazardous waste, and toxic substances caused by federal facility activities. No

toxic substances (i.e., lead based paint and asbestos) would be encountered during the proposed construction activities since construction would not be interfacing with any exiting buildings. Therefore, toxic substances are not addressed further in this document.

An inherent component of working responsibly in an environment with hazardous materials and hazardous waste is ensuring human health and safety. This element is addressed below in Section 3.6, Human Health and Safety.

3.5.1. Hazardous Materials

Vandenberg AFB uses hazardous materials for its missions and mission support activities. In addition to complying with federal and state regulations, all operators on Vandenberg AFB must comply with 30th SW Plan 32-7086 *Hazardous Materials Management*. These regulations and plans include measures for spill prevention. All hazardous materials brought onto Vandenberg AFB must be approved and coordinated through the Base Hazardous Materials Pharmacy (Hazmart). Hazardous materials management also requires compliance with California Business Plan regulations (California Health and Safety Code 6.95). Inspections by base and Santa Barbara County officials verify compliance with hazardous materials requirements. Hazardous materials, primarily in the form of POLs, would be used for operating the construction equipment for the Proposed Action.

3.5.2. Hazardous Waste

Vandenberg AFB generated approximately 656 tons of hazardous waste in the year 2000 (Vandenberg AFB 2001). An example of inadvertent generation of hazardous waste would be spilling a significant quantity of hazardous material. An example of advertent generation of hazardous waste would be a known and useless byproduct of a process. Currently, Vandenberg AFB operates "satellite" and less than 90-day accumulation points. Hazardous waste is manifested and shipped off-site for final disposal by a Defense Logistic Agency approved contractor.

Vandenberg AFB must comply with 30th SW Plan 32-7043A, *Hazardous Waste Management*, February 2001. A component of this plan is the Hazardous Waste Management Plan (HWMP), which outlines the procedures to be followed for hazardous waste management and disposal.

The potential exists for unexpected releases of POLs that would be used for the equipment in the Proposed Action; as such, hazardous waste could be generated.

3.6. Human Health and Safety

3.6.1. Background

In addition to the regulations and plans described in Section 3.5 above, all construction activities and facility operations on Vandenberg AFB are subject to the requirements of the federal Occupational Health and Safety Act (OSHA) and Air Force Occupational Safety and Health (AFOSH) regulations to protect human health and safety.

Relevant health and safety requirements include industrial hygiene and ground safety. Industrial hygiene is the joint responsibility of Bioenvironmental Engineering, 30th SW Safety and contractor safety departments. Responsibilities include monitoring of exposure to workplace chemicals and physical hazards, hearing and respiratory protection, medical monitoring of workers subject to chemical exposures, and oversight of all hazardous or potentially hazardous operations. Ground safety is the responsibility of 30th SW Safety and includes protection from hazardous situations and hazardous materials.

Many areas on Vandenberg AFB were used as ordnance training ranges in the past. As a result, there are remnants of unexploded ordnance (UXO) in recognized areas of the base. Only a slight movement may detonate UXO from these areas, resulting in an explosion, burning, or release of smoke. Special precautions need to be taken in known areas of Vandenberg AFB that were used as practice ranges for artillery firing, referred to as Explosive Ordnance Disposal Zones. None of these sites are within the proposed project area.

3.6.2. Hazardous Materials and Hazardous Waste

As is standard operating procedures for construction activities, POLs would be used in small quantities. The potential exists for unexpected releases of these POLs; as such, hazardous waste could be generated.

3.6.3. IRP Sites

The Installation Restoration Program (IRP) was implemented at Department of Defense (DOD) facilities to identify, characterize, and restore hazardous substance release sites. IRP sites are remediated through the Federal Facilities Site Remediation Agreement, a working agreement between the Air Force; the California Regional Water Quality Control Board, Central Region; and the California Department of Toxic Substances Control.

In addition to IRP sites, there are identified Areas of Concern (AOC), where potential hazardous material releases are suspected; and Areas of Interest (AOI), defined as areas with the potential for use and/or presence of a hazardous material or hazardous waste.

The 30th Civil Engineer Squadron, Environmental Flight, IRP Section (30 CES/CEVR) manages the IRP, AOC, and AOI sites on Vandenberg AFB. One IRP site, IRP-9, has been identified by 30 CES/CEVR within an approximately ½-mile radius of the Proposed Action. No AOC or AOI sites have been identified.

The contamination at IRP-9 is limited to groundwater (Vandenberg AFB 2002); the primary contaminant is trichloroethylene. Groundwater in this area is, at a minimum, approximately 70 feet below ground surface. A groundwater remediation system is present in this area at a depth of 4 feet below grade, and includes subsurface pipelines for extracted vapor and for extracted and treated groundwater. As shown in Figure 3-1, the remediation pipelines enter the eastern side of Surf Road from a SLC-4 dirt access road midway between Kelp and Tank Roads, traverse Surf Road to the western side, follow Surf Road to the north, and then continue on past the Kelp Road end point for the proposed waterline.

Although the proposed waterline would follow the Surf Road route on the eastern side, and waterline construction activities would not extend beyond approximately 10 feet below grade in this area, construction could potentially intercept the IRP-9 groundwater remediation system where the remediation pipelines intercept Surf Road from SLC-4.

3.6.4. Other Potential Hazards

In addition to these more obvious risks to human health and safety, the following, more mundane, physical features also have the potential to be present in the vicinity of the Proposed Action and, therefore, also have the potential to adversely impact the health and safety of the construction site workers:

- Physical hazards – traffic in the roads, holes and ditches, uneven terrain, sharp or protruding objects, slippery soils or mud, quicksand, steep grades, and unstable ground.
- Biological hazards – vegetation (e.g., poison oak and stinging nettle), animals (e.g., insects, spiders, and snakes), and disease vectors (e.g., ticks and rodents).

3.7. Pollution Prevention

The Pollution Prevention Act (PPA) was enacted in 1990 to refocus the national approach on environmental protection. The PPA has turned the focus of environmental protection toward pollution prevention (P2), which emphasizes source reduction and recycling to reduce impacts to all media.

The Air Force has developed a P2 Program to implement the requirements of the Resource Conservation and Recovery Act (RCRA), Hazardous and Solid Waste Amendments (HSWA), and the PPA of 1990. This program requires each installation to develop a Pollution Prevention Management Plan (PPMP) outlining an overall program strategy. The PPMP along with the Hazardous Waste Management Plan, the Wastewater Management Plan, Hazardous Materials Emergency Response Plan, Solid Waste

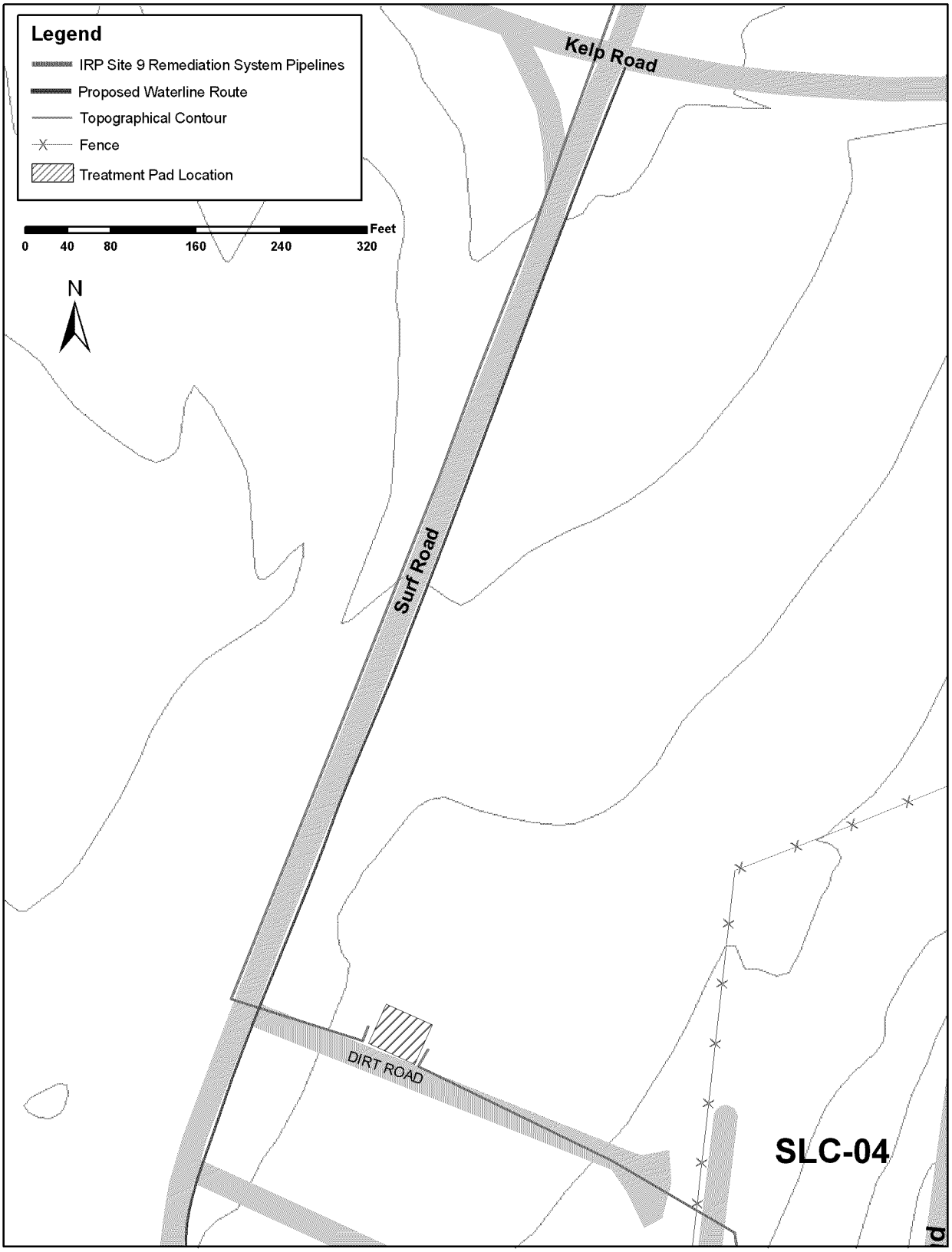

Figure 3-1. IRP Site 9 Remediation System Pipelines in Relation to Proposed Waterline.

Management Plan, and other associated waste minimization directives and plans, forms the basis for reducing pollution at Vandenberg AFB. The PPMP is applicable to all entities, including military units, DOD and non-DOD agencies, government and non-government contractors, and commercial operators conducting activities on Vandenberg AFB and its remote sites that generate air emissions, hazardous and solid waste, and wastewater.

The Air Force has established specific minimization and reduction goals for selected P2 Program components. These components include:

- Ozone depleting chemicals
- Environmental Protection Agency 17 (EPA-17) industrial toxic project chemicals
- Hazardous waste
- Municipal solid waste
- Environmentally preferred products
- Energy conservation
- Water conservation
- Emergency Planning and Community Right-to-Know Act/Toxic Release Inventory chemical releases
- Pesticide management.

The P2 Program addresses waste generation, material acquisition, proper use of materials, production and operational activities, process management, waste management, and waste disposal. It is a cradle-to-grave approach, wherein there is an accounting of what enters, what is used, and what leaves Vandenberg AFB.

The Proposed Action would have the potential to 1) generate hazardous waste, and 2) select environmentally preferred products. As such, the Proposed Action has the potential to affect the effectiveness of the P2 Program.

3.8. Noise

3.8.1. Introduction

The purpose of the Noise Control Act (42 U.S.C. 4901 et seq.) is to limit the exposure and disturbance that individuals and communities suffer from noise. It focuses on surface transportation and construction sources, particularly near airport environments. The legislation specifies that performance standards for transportation equipment be established with the assistance of the U.S. Department of Transportation. Section 7 gave the Federal Aviation Administration regulatory authority after consultation with the U. S. EPA. In addition, the 1987 Quiet Community amendment gave state and local authorities greater involvement in controlling noise.

Noise is often defined as unwanted sound that can interfere with normal activities or otherwise diminish the quality of the environment. Depending on the level, noise has the potential to disrupt sleep, interfere with speech communication, or cause temporary or permanent changes in hearing sensitivity in humans and wildlife. Noise sources can be continuous (e.g., constant noise from traffic or air conditioning units) or transient (e.g., a jet overflight or an explosion). Noise sources also have a broad range of frequency content (i.e., pitch) and can be nondescript, such as noise from traffic or be specific and readily definable such as a whistle or a horn. The way the acoustic environment is perceived by a receptor (i.e., an animal or a person) is dependent on the receptor's hearing capabilities at the frequency of the noise and their perception of the noise. (URS 1986).

The amplitude of sound is described in a unit called the decibel (dB). Decibels are measured on a quasi-logarithmic scale because the range of sound pressures encountered by human ears covers a very broad range – i.e., from the approximate human threshold of hearing at 0.00002 Pascals to the approximate human threshold of pain at 200 Pa (a 10 million fold range). The dB scale simplifies this range of sound pressures to a scale of 0 to 140 dB and allows the measurement of sound to be more easily understood. Although not exactly analogous, the decibel scale is similar to the commonly used earthquake Richter scale. As such, a 120 dB sound is not twice the amplitude of a 60 dB sound, but a 1000-fold increase. In most cases, adding 2 identical sound sources will increase the decibel level by 3 dB (i.e., 100 dB plus 100 dB equals 103 dB).

Noise sources can be continuous (e.g., constant noise from traffic or refrigeration units) or transient (e.g., passing noise from a jet overflight or an explosion). Noise sources can also have a broad range of frequency content (i.e., pitch) and can be rather nondescript (e.g., noise from traffic) or be very specific and readily identifiable (e.g., a whistle or a car alarm).

According to OSHA regulations, employees should not be subjected to sound exceeding an L_{eq} of 90 dB for an 8-hour period. This sound level increases by 5 dB with each halving of time (e.g., a 4-hour period at 95 dB). Exposure up to an L_{eq} of 115 dB is permitted for a maximum of only 15 minutes during an 8-hour work day and no exposure above 115 dB is permitted (OSHA 1996). For this analysis, OSHA standards are used as the "not to exceed" criteria as they are the most appropriate standards available, however for this document "employees" would refer instead to personnel working on or visiting Vandenberg AFB that are not associated with construction activities of the Proposed Action.

There are many methods for quantifying noise, depending on the potential impacts in question and on the type of noise. One useful noise measurement in determining the effects of noise is the one-hour average sound level, abbreviated L_{eq1H}. The L_{eq1H} can be thought of in terms of *equivalent* sound – i.e., a L_{eq1H} is 45.3 dB is what would be measured if a sound measurement device were placed in a sound field of 45.3 dB for one hour. However, this is not what happens during real sound measurements. When a L_{eq1H} level of 45.3 dB is measured, the sound level has fluctuated above and below 45.3 dB, but the *average* during that hour is 45.3 dB. The L_{eq1H} is usually A-weighted, unless specified otherwise. A-weighting is a standard filter used in acoustics that approximates human hearing and in some cases is the most appropriate weighting filter when investigating the impacts of noise on wildlife and humans. L_{eq} measurements can also be specified for other time periods, e.g., 8- or 24-hour periods. Examples of A-weighted noise levels for various common noise sources are shown in Table 3-4.

3.8.2. Local Noise Setting

Existing noise levels on Vandenberg AFB are generally quite low due to the large areas of undeveloped landscape and relatively sparse noise sources. Background noise levels are primarily driven by wind noise; however, louder noise levels can be found near industrial facilities and near transportation routes. Louder intermittent noise levels are created by rocket launches and aircraft overflights. On Vandenberg AFB, ambient L_{eq1H} measurements have been determined to range from approximately 35 to 60 dB (SRS Technologies, 2001b). Typical sources of noise include automobiles, trucks, and trains, with the higher noise levels occurring near transportation routes and industrial facilities.

3.9. Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, was issued on February 11, 1994. A Presidential Transmittal Memorandum accompanying this Order states that "Each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions including effects on minority communities and low-income communities, when such analysis is required by the NEPA 42 USC Section 4321, et seq." Under 32 CFR Part 989.33, environmental justice analyses, as specified in the Executive Order, are to be included in U.S. Air Force NEPA documents.

A significant impact to environmental justice would occur if any of the following conditions resulted from the Proposed Action:

- A significant adverse impact to the natural or physical environment or to human health that affected a minority or low-income population or children.
- A significant adverse environmental impact on minority or low-income populations or children that appreciably exceeded those on the general population or other comparison group.

Table 3-4. Comparative A-Weighted Sound Levels.

Noise Level (dBA)	Common Noise Levels	
	Indoor	Outdoor
100 - 110	Rock band inside New York subway	Jet flyover at 304 meters
90 - 100	Food blender at one meter	Gas lawnmower at one meter
80 - 90	Garbage disposal at one meter	Diesel truck at 15 meters Noisy urban daytime
70 - 80	Shouting at one meter Vacuum cleaner at three meters	Gas lawnmower at 30 meters
60 - 70	Normal speech at one meter	Commercial area heavy traffic at 100 meters
50 - 60	Large business office Dishwasher next room	
40 - 50	Small theater (background) Large conference room (background)	Quiet urban nighttime
30 - 40	Library (background)	Quiet suburban nighttime
20 - 30	Bedroom at night	Quiet rural nighttime
10 - 20	Broadcast and recording studio (background)	
0 – 10	Threshold of hearing	

(modified from U.S. Department of Transportation 1980)

- The risk or rate of environmental hazard exposure by a minority or low-income population was significant and exceeded those on the general population or other comparison group.
- A health or environmental effect occurred in a minority or low-income population affected by cumulative or multiple adverse exposures from environmental hazards.

The 2000 Census of Population and Housing reports numbers of both minority and property residents. Minority populations included in the census are identified as Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, Hispanic or Latino, and Other. Poverty status is reported as the number of families with income below the federal poverty level. The federal poverty level in 1999 for a family of four in the lower 48-states was $16,700.

The potential economic and environmental impacts resulting from the Proposed Action at Vandenberg AFB would occur primarily within Santa Barbara County. Based upon the 2000 Census of Population and Housing, Santa Barbara County had a population of 399,347 persons. Of this total, 108,929 persons (27.3 percent) were minority and 55,086 persons (14.3 percent) were low-income. The city of Lompoc had a population of 41,103 persons. Of this total, 14,053 persons (34.2 percent) were minority and 16,148 persons (39.3 percent) were low-income.

4. Environmental Consequences

This chapter presents the results of the analysis of potential adverse environmental impacts on the relevant resource areas that are likely to be affected by the Proposed Action and the No-Action Alternative. For the reasons outlined in Section 1.5, the following resource areas were not considered relevant and, therefore, were not analyzed:

- Earth resources
- Land use
- Socioeconomics
- Solid waste.

In addition to the protection measures described in the sections below, the following features would also be implemented to minimize impacts of the Proposed Action on resources:

- Contractor Environmental Protection Plans would be implemented.
- The construction contractor would be required to participate in a training session to address Vandenberg AFB compliance requirements relevant to the resource areas addressed in this EA.

4.1. Cultural Resources

4.1.1. Proposed Action

Cultural resources would be adversely affected if the Proposed Action would 1) cause loss of the value or characteristics that qualify the resource for listing on the NRHP, or 2) substantially alter the natural environment or access to it in such a way that traditional cultural or religious activities are restricted. The criteria used to evaluate the significance of cultural resources and to assess potential adverse project effects are set forth in the NHPA of 1966 (as amended). Associated implementing regulations include 36 CFR 60 and 800.

The Proposed Action complies with Section 106 of the NHPA and with AFI 32-7065. In the event that previously undocumented cultural resources are discovered during construction activities, procedures established in 36 CFR 800.13 would be followed.

As discussed in Section 3.1.2.2 and detailed in Appendix B, 19 previously recorded archaeological sites and 2 previously-recorded isolated artifacts have been recorded within the 120-meter-wide APE. Each of these resources is discussed below, relative to the Proposed Action.

Eight of the 21 known cultural resources within the APE do not extend into the area of direct impact. Archaeological investigations to comply with Section 106 of the NHPA and 36 CFR 800 have been completed at the remaining 13 resources, including, from north to south: CA-SBA-1125/H, VAFB-ISO-692, -CA-SBA-676/H, CA-SBA-2230, CA-SBA-670, CA-SBA-539, CA-SBA-212/H, CA-SBA-1145H, CA-SBA-654, VAFB-ISO-264, CA-SBA-551, and CA-SBA-1678.

CA-SBA-537

CA-SBA-537 is a prehistoric archaeological site that has been determined eligible for the NRHP. Surf Road bisects the western half of the site. Within the site boundary, the proposed waterline route would extend along the shoulder on the east side of Surf Road. Surf Road and adjacent utility lines have heavily disturbed the northern portion CA-SBA-537, and Surf Road cuts deeply through the middle and southern portions of the site. No archaeological studies were necessary within the heavily disturbed northern site area, nor along the road-cut portion of the site, since the road lies well below the elevation of the site. In addition to the waterline itself, an anode test station would be installed within the site. The proposed location is within the deep road cut and well below the depth of the cultural deposit. Thus, installation of the

anode test station and the waterline would not affect CA-SBA-537.

CA-SBA-1125/H

CA-SBA-1125/H contains both historic and prehistoric archaeological components that have been determined eligible for the NRHP. The historic component consists of the MacReynolds homestead remnants. The prehistoric component consists of flaked stone, shell, and vertebrate faunal remains. Surf Road bisects the site, as do several utility lines. Within the site boundary, the proposed waterline route would run along the shoulder on the east side of Surf Road. Except at the northern and southern ends of the site, Surf Road cuts fairly deeply and, thus, the proposed waterline would be below the archaeological deposit. In addition to the waterline itself, two anode test stations are within or adjacent to CA-SBA-1125/H. Archaeological excavations were completed to more precisely define site boundaries and to assess potential adverse effects at the northern and southern ends of the site (i.e., outside of the Surf Road cut), per Section 106 of the NHPA and 36 CFR 800. That effort, which included 10 shovel test pits and two test excavation units, yielded very few cultural remains within the area of direct impact and, as a consequence, the site's significant qualities would not be adversely affected by installation of the waterline (Lebow *et al.* 2003).

VAFB-ISO-692

VAFB-ISO-692 is an isolated prehistoric artifact on the north side of Tank Road. Excavation of four shovel test pits in the immediate vicinity of the isolated artifact found no evidence of an isolated artifact or of an archaeological site (Lebow *et al.* 2003). Lacking evidence of an archaeological deposit, VAFB-ISO-692 would not be adversely affected by installation of the waterline.

CA-SBA-2231/H

CA-SBA-2231 is a prehistoric and historic archaeological site that has been recommended as ineligible for the NRHP, but no official determination has yet been made. Surf Road cuts deeply through the site, and the road lies well below the elevation of the archaeological deposit. The proposed waterline would be installed along the east side of Surf Road within the site boundaries. As a result, the proposed waterline would be below the depth of the archaeological deposit and the site would not be affected by the proposed waterline installation.

An anode test station is within or adjacent to CA-SBA-2231. This utility would be installed 5 to 10 feet directly below the waterline and thus even deeper below the cultural deposit. As such, installation of the anode test station would not affect the site.

CA-SBA-1126

CA-SBA-1126 is a prehistoric archaeological site that has been determined eligible for the NRHP. The site is west of Surf Road. The road is built on substantial fill in the site area. Previous testing indicates that the site does not extend to the road (Lebow 2001). Consequently, installation of the proposed waterline would not affect the site.

CA-SBA-676/H

CA-SBA-676/H contains historic and prehistoric archaeological components that have been determined eligible for the NRHP. The proposed waterline would be constructed along the east shoulder of Surf Road within the site boundaries. Archaeological testing was completed within the proposed waterline route as it passes through the site to define boundaries and to assess adverse effects, per Section 106 of the NHPA and 36 CFR 800. That effort included six shovel test pits, two test excavation units, and a backhoe trench. Although low densities of historic and prehistoric cultural remains were found, they were associated with road fill and not in their original contexts. Therefore, the site's significant qualities are not present within the area of direct impact and installation of the waterline would not adversely affect the site (Lebow *et al.* 2003).

CA-SBA-1124

CA-SBA-1124 is a prehistoric archaeological site that has been recommended as ineligible for the NRHP, but no official designation has yet been determined. The proposed waterline would be constructed along the east side of Surf Road in the site vicinity. Previous testing indicates that the

site does not extend to Surf Road (Lebow 2001). Consequently, installation of the proposed waterline would not affect the site.

CA-SBA-1122

CA-SBA-1122 is a prehistoric archaeological site that has been recommended as ineligible for the NRHP, but no official evaluation has yet been completed. The proposed waterline would be constructed along the east side of Surf Road in the site vicinity. Testing by Applied Earthworks confirmed that the site does not extend to the road (Lebow 2001). Consequently, installation of the proposed waterline would not affect the site.

CA-SBA-1120

CA-SBA-1120 is a prehistoric archaeological site that has been recommended as ineligible for the NRHP, but no official evaluation has yet been completed. The site is west of Surf Road. The proposed waterline would be constructed along the east side of Surf Road in the site vicinity. Testing by Applied Earthworks confirmed that the site does not extend to Surf Road (Lebow 2001). Consequently, installation of the proposed waterline would not affect the site.

CA-SBA-2230

CA-SBA-2230 is a prehistoric archaeological site that has been recommended as ineligible for the NRHP, but no official evaluation has yet been completed. The site lies east of Surf Road and the proposed waterline would be constructed along the east side of Surf Road in the site vicinity. Excavation of 10 shovel test pits within the waterline route as it would pass near the site did not recover any evidence of an archaeological deposit, indicating that the site does not extend to the waterline route (Lebow *et al.* (2003). As a consequence, it would not be affected by installation of the waterline.

CA-SBA-670

CA-SBA-670 is an extensive prehistoric archaeological site that has been determined eligible for the NRHP. Surf Road and small portions of Honda Canyon Road and Coast Road bisect the site. The proposed waterline would be constructed along the east side of Surf Road within the site's eastern boundary. A borehole would be excavated within the site to bore under the road as it crosses Honda Canyon. An anode test station also would be within the site. Archaeological studies were completed along the waterline route, within the borehole, and in the vicinity of the anode test station to assess adverse effects, per Section 106 of the NHPA and 36CFR 800. That effort included 31 shovel test pits, four test excavation units, and a backhoe trench. Archaeological materials were recovered, but only in disturbed contexts. Therefore, the qualities that make CA-SBA-670 significant are not present within the area of direct impact and installation of the waterline would not adversely affect the site (Lebow *et al.* 2003).

CA-SBA-1144H

CA-SBA-1144H is recorded as the remains of an historic ranch house southeast of Surf Road and within the boundaries of CA-SBA-670. Archaeological testing within the waterline route for CA-SBA-670 found no evidence of CA-SBA-1144H, indicating that the site does not extend to the area of direct impact. As a consequence, installation of the waterline would not affect CA-SBA-1144H.

CA-SBA-1119

CA-SBA-1119 is a prehistoric archaeological site in Honda Canyon. Coast Road crosses Honda Canyon on deep fill, and the proposed waterline would be placed in this fill. Consequently, CA-SBA-1119 would not be affected by the proposed waterline installation.

CA-SBA-539

CA-SBA-539 is a prehistoric archaeological site that has been determined eligible for the NRHP. The site has been extensively disturbed by construction of Coast Road and Honda Ridge Road. The proposed waterline is to exit a borehole in Coast Road at the southern end of the fill across Honda Creek and within the northern boundary of CA-SBA-539. From that location, the proposed waterline would cross to the west side of Coast Road and then run along the western edge of the road. The proposed waterline would be rerouted into the road through the site to minimize impacts.

An anode test station would be within the site. Archaeological studies were completed to assess adverse effects from the borehole excavation, installation of the proposed waterline, and installation of the anode test station, per Section 106 of the NHPA and 36 CFR 800. That effort included excavation of seven shovel test pits within the waterline route. Although cultural materials were recovered, none derived from intact sediments. As a consequence, the qualities that make CA-SBA-539 eligible for the NRHP are absent from the area of direct impact and, thus, installation of the waterline would not adversely affect the site (Lebow *et al.* 2003).

CA-SBA-212/H

CA-SBA-212/H contains an historic component and a prehistoric component on the west side of Coast Road that have been determined eligible for the NRHP. The prehistoric component is outside the proposed project APE, but the railroad grade from the historic component extends in the APE. However, since the existing active Union Pacific railroad (constructed in the late 1890s) lies between the waterline route and the site's historic component, the abandoned railroad grade would have stopped at the Union Pacific railroad and thus would not extend into the actual area of direct impact for the waterline. Archaeological studies associated with CA-SBA-1145H found no evidence of CA-SBA-212/H within the waterline corridor (Lebow *et al.* 2003). Thus, installation of the waterline would not affect CA-SBA-212/H.

CA-SBA-1145/H

CA-SBA-1145/H contains an historic component and a sparse prehistoric component, which have been determined eligible for the NRHP. Archaeological materials have been identified on both sides of Coast Road within the site boundaries. The proposed waterline would be installed along the west side of Coast Road through the site. In addition, an anode test station would be within the site. Archaeological studies were completed to assess adverse affects from the proposed waterline and anode test station installation, per Section 106 of the NHPA and 36 CFR 800. That effort included a backhoe trench excavated in the location of the proposed waterline trench to determine if intact historical features were present. Three small, intact historical refuse features were identified. All three were excavated using archaeological techniques and their data potentials have been realized and documented. No other historical features or archaeological deposits were identified. In consultation with the SHPO, it was determined that installation of the waterline had the potential to cause an adverse effect to this site; therefore a MOA will be implemented to mitigate the adverse effect through a data recovery and monitoring program (Appendix B).

CA-SBA-662

CA-SBA-662 is a prehistoric archaeological site that has been determined eligible for the NRHP. Although within the APE, the site is on top of a knoll east of Coast Road, which cuts deeply in the site area. The proposed waterline, which would be installed along the west side of Coast Road, would be well below the elevation of the site. In addition, an anode test station would be within the site, but it also would be well below the elevation of the cultural deposit. Therefore, installation of the proposed waterline and anode test station would not affect the site.

CA-SBA-654

CA-SBA-654 is a prehistoric archaeological site that has been determined eligible for the NRHP. The proposed waterline would be installed along the west edge of Coast Road. Coast Road and the SPRR tracks cut the northern half of the site; these transportation features lie below the elevation of the site. Environmental Solutions, Inc. (1990b) tested within the southern half of the site between 5 to 10 meters west of Coast Road. Their testing revealed an intact archaeological deposit. As a result, archaeological studies were completed to assess adverse effects from proposed waterline installation in the southern half of the site, per Section 106 of the NHPA and 36 CFR 800. That effort included excavation of 12 shovel test pits and three test excavation units within the waterline route. Most of the recovered materials derived from disturbed contexts, although one of the test excavation units may have sampled an area with an intact archaeological deposit. However, even the integrity of that deposit is questionable and the questionable relationship limits the utility of any data that may be obtained from this area. As a

consequence, the site's significant qualities are not present within the area of direct impact, and installation of the waterline would not adversely affect CA-SBA-654 (Lebow *et al.* 2003).

VAFB-ISO-264

VAFB-ISO-264 was recorded as one or more possible flakes just south of CA-SBA-654 and west of Coast Road. L. Spanne originally recorded it in 1974. Archaeological testing has since extended the boundary of CA-SBA-654 to incorporate VAFB-ISO-264. Thus, testing completed at CA-SBA-654 also pertained to VAFB-ISO-264 (Lebow *et al.* 2003).

CA-SBA-551

CA-SBA-551 is a prehistoric archaeological site that has been determined eligible for the NRHP. Lunar Road bisects the site. The proposed waterline would be constructed along the west side of Lunar Road through the site. Archaeological studies were completed to assess adverse effects from the proposed waterline installation, per Section 106 of the NHPA and 36 CFR 800. That effort included excavation of 17 shovel test pits and two test excavation units within the waterline route. Only a small amount of cultural materials were recovered, and none derived from intact sediments, indicating that the site's significant qualities are not present within the area of direct impact (Lebow *et al.* 2003). Consequently, installation of the waterline would not adversely affect CA-SBA-551.

CA-SBA-1678

CA-SBA-1678 is a prehistoric archaeological site that had not previously been evaluated for NRHP eligibility. It was originally recorded on the east side of Lunar Road; the west side of Lunar Road is built on fill for most of the length of the site. The proposed waterline would be routed to the west side of the road prior to reaching the northern boundary of CA-SBA-1678 so that the line is placed in fill. Archaeological testing was completed along the western edge of the road before it is built on fill to ensure that the site did not extend to this area. That effort found that the site did, in fact, extend across Lunar Road and into the area of direct impact. Consequently, archaeological testing was completed to evaluate the site's NRHP eligibility and to assess potential adverse effects. Altogether, 47 shovel test pits and four 1-by-1 meter units were excavated. Based on that effort, CA-SBA-1678 was found to be eligible for the NRHP. However, testing within the area of direct impact found few cultural materials, indicating that the site's significant qualities are not present within the waterline route (Lebow *et al.* 2003). As a consequence, installation of the waterline would not adversely affect CA-SBA-1678.

Anza Trail

The Juan Bautista de Anza National Historic Trail crosses through the project area (Bradley 1994). Unlike an archaeological site, a trail does not necessarily have any associated physical manifestations. For most of its length, the de Anza trail is a linear landscape feature, and the concern for environmental impacts is the viewshed associated with the trail. However, because the waterline will be buried, it will not alter the viewshed and thus the Juan Bautista de Anza National Historic Trail will not be adversely affected.

4.1.2. No Action Alternative

Under the No-Action Alternative, there would be no construction associated with a new waterline between SLC-4, -5, and -6 on South Base. Therefore, no adverse impacts would occur as a result of new construction. Maintenance and repair activities associated with the existing waterline would continue, though. Being that the existing waterline is in deteriorating condition, it can be expected that substantial repairs would be required. However, these activities would be occurring in previously disturbed areas and, as such, no adverse impacts to cultural resources would result.

4.1.3. Impact Avoidance, Mitigation, and Monitoring Measures

Of the 21 known cultural resources within the 120-meter-wide APE, eight (i.e., CA-SBA-537, CA-

SBA-2231/H, CA-SBA-1126, CA-SBA-1124, CA-SBA-1122, CA-SBA-1120, CA-SBA-1119, and CA-SBA-654) are not within the waterline corridor itself and thus would not be affected by installation of the waterline, as discussed above. No site-specific mitigation measures would be necessary to avoid adverse effects at these eight sites.

The remaining 13 resources (i.e., CA-SBA-1125/H, VAFB-ISO-692, -CA-SBA-676/H, CA-SBA-2230, CA-SBA-670, CA-SBA-539, CA-SBA-212/H, CA-SBA-1145/H, CA-SBA-654, VAFB-ISO-264, CA-SBA-551, and CA-SBA-1678) were investigated under Section 106 of the NHPA and 36 CFR 800 (Lebow *et al.* 2003). As discussed for each site above, that effort found that 12 resources would not be adversely affected by installation of the waterline. However, at CA-SBA-1145/H, a data recovery and monitoring program will be implemented in order to mitigate the potential adverse effect to this site.

Based on the results of the archaeological studies, Vandenberg AFB submitted an Adverse Effect determination to the California SHPO, which resulted in a MOA requiring a data recovery program at site CA-SBA-1145/H. The MOA also requires archaeological and Native American monitors ensure that all ground disturbance associated with the proposed project remain within the area of direct impact. In the event that unanticipated cultural resources are encountered during construction, stipulations outlined in the MOA will be followed.

4.2. Biological Resources

Federal agencies are required by Section 7 of the Endangered Species Act of 1973, as amended (16 USC 1531 *et seq.*), to assess the effect of any project on federally listed threatened or endangered species. Under Section 7, consultation with the USFWS and NOAA Fisheries is required for federal projects if such actions could directly or indirectly affect listed species or destroy or adversely modify critical habitat. It is also Air Force policy to consider listed and special status species recognized by state agencies when evaluating impacts of a project. Adverse impacts to biological resources can be short- or long-term impacts, for example, short-term or temporary impacts from noise and dust during construction, and long-term impacts from the loss of vegetation and, consequently, loss of the capacity of habitats to support wildlife populations. Adverse impacts are considered significant if the project would result in permanent adverse effects, either directly or indirectly, to special status species (endangered, threatened, rare, or candidate) or their habitats, as designated by federal and state agencies.

Impacts to jurisdictional waters of the United States and wetlands are considered significant if the project would result in net loss of wetland area or habitat value, either through direct or indirect impacts to wetland vegetation, loss of habitat for wildlife, degradation of water quality, or alterations in hydrological function.

No adverse impacts to the coastal zone, as defined by the Coastal Zone Management Act (CZMA) are anticipated as a result of construction activities associated with the Proposed Action.

4.2.1. Proposed Action

The proposed action would potentially result in disturbance to a 50-foot wide corridor on either side of the 7-mile long waterline route. Installation of the proposed waterline would be accomplished over a 17-month period.

The proposed waterline route would be located in previously disturbed corridors – i.e., in the existing fill from roads and road shoulders (including mowed fields). Disturbance to adjacent vegetation and habitats by the proposed construction activities would be minimized by this alignment. The waterline would be installed by trenching along this corridor with the exception of two locations – where directional boring would be required. In one location, it would be necessary to cross a set of railroad tracks; as such, this could only be reasonably achieved by boring underneath the tracks. The second area that would require directional boring would be along the Coast Road crossing over Honda Creek. The road here is built up on fill high above a culvert that drains Honda Creek to the Pacific Ocean. The road is approximately 70 feet above Honda Creek.

Boring would occur 25 feet below grade, avoiding any adverse effects on the wetland and riparian community associated with Honda Creek. The potential exists for an accidental release of drilling fluids (i.e., bentonite) into the environment. However, given the distance above Honda Creek where the boring would occur, if any drilling fluids were accidentally released they would become entrapped in the soils above the creek and would not affect this waterway. In addition, the implementation of spill protection measures as described in Sections 2.1.3.4 above and 4.4.1 below would contain drilling fluids accidentally released on the surface, thereby preventing spillage into the creek.

4.2.1.1. Native Plant Communities and Species

Potential impacts to native plant communities and plant species associated with the implementation of the proposed project include:

- Short-term (temporary) and long-term (permanent) loss of habitat from construction related activities such as access, and excavation;
- Loss of individuals within the work area due to excavation, crushing or burial;
- Loss of individuals in habitats adjacent to work areas due to soil erosion; and
- Soil erosion in wetlands or open water adjacent to the project site.

Construction of the proposed waterline will necessitate the clearing of vegetation to accommodate construction activities and installation of the waterline and test stations. Where possible vegetation will be leveled rather than excavated. This would allow native shrubs to resprout from existing root systems upon project completion. Native plant communities that would be affected by the proposed project include Central Coastal Scrub and Central Coast Maritime Chaparral. Table 4-1 lists the potential project related impacts to native plant communities along the proposed route. All disturbance estimates assume a construction requirement of a 50-foot wide corridor.

Upon completion of the project, a qualified botanist would conduct a post-construction assessment to assess the need for revegetation at any or all of the sites. A report generated from this assessment would include a proposal for revegetation at all sites where native vegetation is irreversibly disturbed and would be submitted to 30 CES/CEV for approval prior to implementation. This report would also include a proposal for revegetation with native plant species present within the area of sites where non-native vegetation was removed for construction, to prevent reinvasion by exotic species. Implementation of construction constraints and monitoring measures described in Section 2.1.3.2 would ensure that impacts to native vegetation are minimized.

4.2.1.2. Special Status Plant Species

Construction activities have the potential to result in the take of some special status plant species from activities such as excavation, crushing, or

Table 4-1. Potential Project Related Impacts to Native Plant Communities by Segment.

Native Plant Community Affected	Segment(s) where Impacted	Potential Adverse Impact (acres)
Central Coastal Scrub	1	3.2
	2	4.1
	3	5.5
	4	2.3
	5	2.1
	6	0.9
	7	0.7
Central Coast Maritime Chaparral	2	0.6

burial. No federally threatened or endangered plant species were observed during the biological surveys. A review of documents providing historical biological data for the area where the proposed project would occur reveal evidence of past occurrence of two federally endangered species, which could potentially occur within the project area. Potential project related impacts to special status plant species are listed in Table 4-2.

Black-flowered figwort was observed during botanical surveys, as a ubiquitous member of Central Coastal Scrub in Segments 1, 3, 5, 6, and 7. Any clearing of Central Coastal Scrub in these segments would result in the loss of some black-flowered figwort individuals. Previous surveys have documented it as occurring in Segment 4 and it could potentially occur in Segment 2 as well.

Kellogg's horkelia was observed during botanical surveys as a common component of the Central Coastal Scrub in Segments 1, and 2. Clearing of Central Coastal Scrub vegetation in these segments would likely result in the loss of some plants. Previous surveys have also documented this plant as occurring in Segments 3, 4, and 5, and it could potentially occur in Segments 6 and 7 as well.

Beach layia occurs along the west side of Surf Road north of Kelp Road. Although this species was not observed during the biological surveys, it occurs close enough to Segment 1 to be considered a potential occurrence. Surveys immediately preceding construction would document its presence within the project area so measures could be implemented to minimize or avoid impacts.

Gaviota tarplant has been observed in several locations near SLC-6. Although this species was not observed during the biological surveys, it has the potential to occur within Segment 7. Surveys immediately preceding construction would document its presence within the project area so measures could be implemented to avoid impacts.

Blochman's leafy daisy has been documented in the past along Surf Road in Segments 3, 4, and 5. Although this species was not documented during the biological surveys, it could occur given its past presence. Surveys immediately preceding construction in Segments 3, 4, and 5, would document its presence within the project area so measures could be implemented to minimize or avoid impacts.

Adherence to the protective measures outlined in the construction constraints and monitoring measures (Section 2.1.3.2) would ensure that impacts to these two special status plants are avoided or minimized. Given that botanical surveys were completed several months prior to scheduled implementation of the Proposed Action, pre-construction surveys immediately preceding construction would be completed to identify, document and protect any special status plant species occurring within the proposed waterline corridor. Special status plants occurring within the

Table 4-2. Potential Impacts to Federal Special Status Plant Species Occurring or Potentially Occurring Within the Proposed Project Area.

Common Name *Scientific Name*	**Status**[1]	**Occurrence**[2]		**Impacts**
		O	**P**	
Beach layia *Layia carnosa*	FE/SE/CNPS		1	Loss of individuals
Hemizonia increscens ssp. *villosa* Gaviota tarplant	FE/SE/CNPS		7	Loss of individuals
Blochman's leafy daisy *Erigeron blochmaniae*	FSC/CNPS		1, 3, 4, 5, 6, 7	Loss of individuals
Kellogg's horkelia *Horkelia cuneata* ssp. *sericea*	FSC/CNPS	1, 2	3, 4, 5, 6, 7	Loss of individuals
Black-flowered figwort *Scrophularia atrata*	FSC/CNPS	1, 3, 5, 6, 7	2, 4	Loss of individuals

1 FE – Federally Endangered FSC – Federal Species of Concern SE – California State Endangered CNPS – California Native Plant Society 1B (Rare or Endangered in California and elsewhere)

2 O = segment(s) where observed during field surveys P = segment with potential to occur

construction area would be marked and protected from construction activities with flagging. Any federal threatened or endangered species documented within the construction area would be avoided to prevent adverse impacts. For other special status plant species – i.e., federal species of concern – if avoidance is not possible, plants would be transplanted to adjacent suitable habitat outside the construction area, or seed would be collected if available to be sown in the area after completion of construction activities, or in an adjacent area with suitable habitat. All activities involving the removal of or seed collection from special status plants would be coordinated with the Base Biologist.

4.2.1.3. *Wildlife Species*

Construction Disturbances

Construction activities associated with the proposed replacement of the waterline would occur over 17 months, which would include the breeding season for many wildlife species, including birds. The Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. 703-712), provides federal protection to all native avian species, their nests, eggs, and unfledged young.

The Proposed Action minimizes potential adverse impacts to wildlife species by siting the waterline route primarily on the periphery of habitats, along existing roads where some level of traffic noise already occurs. Potential impacts to wildlife species associated with the construction activities of the proposed project include:

- Short-term (temporary) and long-term (permanent) loss of habitat from construction related activities such as access, and excavation;
- Loss of individuals within the work area due to excavation, crushing or burial;
- Loss of individuals in habitats adjacent to work areas due to soil erosion;
- Abandonment of breeding and/or roosting sites due to project related noise and associated disturbance;
- Disruption of foraging or roosting activities due to project related noise and associated disturbance; and
- Soil erosion into wetlands or open water adjacent to the project site.

Construction Noise

Wildlife, including mammals, amphibians, reptiles, fish, and birds, present in the area could be affected by construction noise. One of the most useful measurements to assess the effects of noise is the one-hour average sound level, abbreviated L_{eq1H}. The L_{eq1H} can be thought of in terms of *equivalent* sound. For example a L_{eq1H} of 45.3 decibels (dB) is what would be measured if a sound measurement device were placed in a sound field of 45.3 dB for one hour. However, this is not what happens during real sound measurements. When a L_{eq1H} level of 45.3 dB is measured, the sound level has fluctuated above and below 45.3dB, but the *average* during that hour is 45.3 dB. The L_{eq1H} is usually A-weighted unless specified otherwise. A-weighting is a standard filter used in acoustics that approximates human hearing and in many cases is the most appropriate weighting filter when investigating sound effects on wildlife as well as humans. L_{eq} measurements can also be specified for other time periods such as eight or 24-hour periods.

Predictions of noise levels for different construction activities for a stationary observer were developed for distances of 50, 100 and 300 feet (Table 4-3). The equipment and machinery selected for each activity is typical for the installation of a 24- to 60-inch diameter pipeline. A smaller-diameter pipeline, i.e., 18 inches, would be installed for the Proposed Action and, as such, the calculations in Table 4-3 are conservative for these purposes.

Table 4-3. Noise Levels as a Result of Construction Activities.

Distance from Construction Area (feet)	Leq (dB)
50	91.1
100	86.6
300	79.4

On Vandenberg AFB, L_{eq1H} measurements have been found to range from 35 to 60 dB, with the higher-level representative of areas with higher traffic (SRS Technologies 2001b). To place noise levels in perspective, a food blender at a distance of three feet generates 90 dBA (A-weighted decibels). Riding an automobile at 40 miles per hour produces approximately 75 dBA. Normal speech is approximately 60 dBA. Consequently, short-term disturbance of noise-sensitive wildlife species near the construction site would potentially occur. The project area for the proposed action is characterized by open space with roadways connecting space launch and mission related facilities. Traffic in this area is cyclic, associated with work hours and facilities throughout south Vandenberg AFB. Thus, during weekdays noise as a result of commuter traffic and mission related transportation would be higher between 0700 and 1700 hours, and on weekends and after hours noise associated with traffic would be greatly reduced.

Wildlife response to noise can be physiological or behavioral. Physiological responses can range from mild, such as an increase in heart rate, to more damaging effects on metabolism and hormone balance. Behavioral responses to man-made noise include attraction, tolerance, and aversion. Each has the potential for negative and positive effects, which vary among species and among individuals of a particular species due to temperament, sex, age, and prior experience with noise. Responses to noise are species-specific; therefore, it is not possible to make exact predictions about hearing thresholds of a particular species based on data from another species, even those with similar hearing patterns.

Fish

Various fish species react differently to sound. It is unlikely that the noise generated by construction would cause a change in ambient conditions in Honda Creek given that activities would occur along the road overpass approximately 70 feet above the creek.

Herpetofauna

Reptile and amphibian hearing is poorly studied. However, reptiles and amphibians are sensitive to vibrations, which provide information about approaching predators and prey. Vibration and noise associated with construction activities would potentially cause short-term disturbance to amphibians (e.g., California red-legged frog, California horned lizard). These impacts would be considered short-term and temporary and would not be considered of a magnitude to result in adverse impacts to populations within the vicinity of the project area. Monitoring during construction activities would identify any potential disturbances so measures could be implemented to avoid adverse effects.

Birds

Potential adverse impacts to birds resulting from construction and human generated noise, include disruption in foraging, roosting, and courtship activities. Birds would be expected to move away from the area of disturbance during construction activities. However, once activity ceases, birds would be likely to return to the area.

The Migratory Bird Treaty Act provides federal protection to all native avian species, their nests, eggs, and unfledged young. Construction activities associated with the proposed project would result in short-term noise disturbances, which may temporarily disrupt foraging and roosting activities of individual birds. In addition, if the construction occurs during the breeding season for avian species, it has the potential to disrupt breeding activities including courtship, incubation and brooding. These impacts would be considered short-term and temporary and would not be considered of a magnitude to result in adverse impacts to populations within the vicinity of the project area. Avian surveys immediately preceding the initiation of construction activities would identify the presence of any nests. Monitoring during construction would identify any potential disturbance so measures could be implemented to avoid adverse effects.

Mammals

Potential noise related impacts to mammalian species during construction activities would include disruption of normal activities due to noise and ground disturbances. These impacts would be considered short-term and temporary and would

not be considered of a magnitude to result in adverse impacts to populations within the vicinity of the project area. Monitoring during construction activities would identify any potential disturbances so measures could be implemented to avoid adverse effects.

4.2.1.1. Special Status Wildlife Species

The unarmored threespine stickleback, a federally endangered species and California endangered species, the tidewater goby, a federally endangered species, and the California red-legged frog, a federally threatened species, occur within the proposed project area in Honda Creek. The Proposed Action incorporates the use of directional boring on Coast Road, where it crosses Honda Canyon, approximately 70 feet above the creek, so direct effects within the creek and to these federally listed species would be avoided. Erosion control measures would be implemented to prevent sediment from falling into the creek, and avoid increased turbidity.

Several other federal special status wildlife species occur within or near the proposed project area. Potential project related impacts to these species are listed in Table 4-4. Construction activities have the potential to result in the take of some special status wildlife species from activities such as disturbance, excavation, crushing or burial. Project specific measures to reduce adverse impacts to special status bird and mammal species are presented in the construction constraints and monitoring measures section (Section 2.1.3.2).

Herpetofauna

Construction activities have potential to result in incidental take of some individuals of California horned lizard, and silvery legless lizard, from disturbance and possible mortality during project activities, and during capture and relocation efforts prior to and during construction.

Construction associated activities could result in the short-term temporary disturbance of California red-legged frogs within Honda Creek and in the wastewater ponds south of Coast Road near SLC-6. However, because none of the construction activities would occur within the creek or the pond areas, direct impacts to this species would be avoided. In addition, given the distance between potential breeding areas and project activities, and the short-temporary noise disturbance that would result, no adverse effects to the reproductive success of this species are expected to occur from implementation of the proposed action. To further decrease any disturbances to California red-legged frogs, construction activities near Honda Creek or the wasterwater ponds near SLC-6 would occur during the dry season (May through November), when this species is less active and less likely to be disturbed. As an additional measure, a qualified biologist would monitor construction activities in the vicinity of these two known California red-legged frog areas.

California legless lizards and coast horned lizards would be vulnerable to mortality during implementation of the Proposed Action as a result of injuries sustained during activities such as vegetation clearing. Individuals have the potential to become trapped in open trenches where they would be vulnerable to inclement climate and predation. Individuals also have the potential to be crushed by vehicles. Implementation of the construction constraints and monitoring measures described in Section 2.1.3.2 would minimize adverse effects to these species by decreasing the chance for injury and mortality.

The removal of vegetation on either side of the proposed waterline route would result in some loss of habitat for these species. However, since abundant habitat is available adjacent to but outside of the project area, vegetation removal would not result in a significant loss of habitat.

Birds

Disturbances associated with construction activities for the proposed waterline installation have the potential to result in short-term disturbances to special-status bird species. Foraging, roosting and breeding habitat would also have the potential to be affected by construction activities, either through direct loss or degradation as a result of digging and trenching, or indirectly from disturbances associated with construction activities. Implementation of the construction constraints and monitoring measures outlined in Section 2.1.3.2 should minimize or avoid any

Table 4-4. Potential Impacts to Federal Special Status Wildlife Species Documented or Potentially Occurring Within the Proposed Project Area.

Common Name *Scientific Name*	Status[1]	Occurrence[2]		Potential Impacts
		O	P	
Unarmored threespine stickleback *Gasterosteus aculeatus williamsoni*	FE/SE	5		No adverse impacts anticipated
Tidewater goby *Eucyclogobius newberryi*	FE/CSC	5		No adverse impacts anticipated
California red-legged frog *Rana aurora draytonii*	FT/CSC	5, 7		Temporary disturbance due to noise
California horned lizard *Phrynosoma coronatum frontale*	FSC/CSC	5, 6, 7	1, 2, 3, 4	Loss of individuals; disruption due to noise
Silvery legless lizard *Anniella pulchra pulchra*	FSC/CSC	3, 4, 5	1, 2, 6, 7	Loss of individuals; disruption due to noise
White-tailed kite *Elanus leucurus*	FSC (nesting)	7	1, 3, 4	Abandonment of breeding site and disruption due to noise
Golden eagle *Aquila chrysaetos*	FP/CSC		1, 2, 3, 4, 5, 6, 7	Temporary disturbance to noise
Ferruginous hawk *Buteo regalis*	FSC/CSC		3, 4, 5	Temporary disturbance to noise
American peregrine falcon *Falco peregrinus anatum*	FD/SE	5, 7	6	Temporary disturbance to noise
Western burrowing owl *Athene cunicularia hypugaea*	FSC/CSC	1, 5, 7	6	Temporary disturbance to noise
Loggerhead shrike *Lanius ludovicianus*	FSC/CSC (nesting)	1, 3, 4, 5, 6, 7	2	Abandonment of breeding site and disruption due to noise
California thrasher *Toxostoma redivivum*	FSC	3, 4, 5, 6, 7	1, 2	Abandonment of breeding site and disruption due to noise
Bell's sage sparrow *Amphispiza belli belli*	FSC/CSC (nesting)	2, 7		Abandonment of breeding site and disruption due to noise

1. FT – Federal Threatened Species FP – Federally Protected (Bald and Golden Eagle Protection Act)
FSC – Federal Species of Concern FPD – Federally Proposed for Delisting FD – Federally Delisted
SE – California State Endangered CSC – California Species of Concern
2. O = segments where documented during present and past field surveys P = segments with potential for species to occur

adverse effects on special status bird species and their habitats.

Potential adverse impacts from disturbance on breeding birds include abandonment of breeding sites, egg breakage by "panicked" adults, physical damage to the eggs due to noise, heating and cooling from exposure during periods of nest abandonment, and increased vulnerability to predation. Increased levels of human activity and associated noise generated during the construction could potentially displace special status species from nesting habitat. The severity of the impact would depend in a large part on the timing of the activity relative to the stage of the breeding cycle. If disturbance occurs after nesting has already been initiated, construction-related noise could adversely impact reproductive success. However, if disturbance is initiated before nesting begins, the birds may move to other suitable habitat further away from the project site. Avian surveys immediately preceding the initiation of construction activities would identify the presence of any nests and provide an opportunity for implementing measures to minimize or avoid adverse impacts. In addition, monitoring during construction would identify any unforeseen potential disturbance so additional measures could be implemented to avoid adverse effects.

The removal of vegetation on either side of the proposed waterline route would result in some loss of foraging, roosting, and/or nesting habitat for special status avian species. However, since abundant habitat is available adjacent to but outside of the project area, vegetation removal would not result in a significant loss of habitat.

Mammals

Construction activities associated with the installation of the proposed waterline and removal of vegetation on either side of the proposed route have the potential to result in short-term disturbance to this species and a loss of some habitat. However, because the disturbances would be short-term, and abundant suitable habitat is available adjacent to but outside the proposed project area, these impacts would not be significant.

4.2.2. No Action Alternative

Under the No-Action alternative, no construction would occur and, therefore, no impacts to biological resources would occur as a result of new construction. However, the existing waterline is in deteriorating condition and, as such, an increase in maintenance activities would occur. Various potential impacts to biological resources would result from activities such as the potential need to establish new access roads, the reestablishment of existing access roads that have not been maintained, and the waterline maintenance activities and equipment themselves. All of these activities would have potential to adversely impact biological resources directly through removal of vegetation to establish access roads and expose underground pipes, digging and trenching for maintenance activities, or indirectly through disturbances associated with the maintenance activities. Because these maintenance activities would increase as the existing waterline deteriorates, these adverse effects would be recurring and potentially incremental.

4.3. Air Quality

The criteria for determining the significance of air quality impacts are based upon federal, state, and Santa Barbara County standards and regulations. Impacts would be considered to be significant if project emissions increase ambient pollutant concentrations from below the NAAQS or CAAQS to above these standards, or if they contribute measurably to an existing or projected ambient air quality standard violation.

4.3.1. Proposed Action

Construction activities for the Proposed Action would last approximately 17 months. Fugitive dust emissions generated from equipment on exposed ground and combustive emissions from the construction equipment would cause adverse air quality impacts. The largest adverse impacts would occur during the trench excavating and filling activities; smaller impacts would occur during the pipeline installation activities.

The U.S. Air Force is required to make a formal conformity analysis to determine whether the Proposed Action complies with the conformity rule found in the CAA; as such, an Air Quality Analysis (Appendix D) was completed for the Proposed Action. The results of this analysis deemed the Proposed Action *de minimis* and not regionally significant and, therefore, would be exempt from further conformity requirements. This determination is in accordance with conformity requirements set forth in 40 CFR 93.153 (b) and (c), *Determining Conformity of Federal Actions to State or Federal Implementation Plans, Applicability*, and section 176(c)(4) of the CAA.

Estimates for construction equipment specifications are presented in Appendix D, Table D-1, while the factors used to estimate emissions are found in Table D-2. For purposes of this analysis, it is estimated that an average of 0.28 acres per day would be disturbed from the trenching and boring activities and other equipment operating on exposed ground. It is further estimated that in a reasonable worst-case day - wherein more equipment than expected would be in operation - 2.77 acres would be

disturbed from the trenching and other equipment operating on exposed ground. With construction lasting 8-hours per day, the reasonable worst-case day for fugitive dust emissions during the Proposed Action would be 242 pounds of PM_{10} per day. These emissions would not be expected to exceed any ambient air quality standard and, therefore, no adverse impacts from PM_{10} would occur.

The methodology and assumptions used to calculate emissions from the Proposed Action are presented in Appendix D. The daily and total emission from construction activities can be found in Tables D-3 and D-4, respectively.

The daily emissions from the Proposed Action are estimated to be as follows:

- 30 pounds of CO
- 74 pounds of NO_x
- 247 pounds of PM_{10}
- 7.1 pounds of ROC
- 1.4 pounds of SO_x.

The total project emissions from the Proposed Action are estimated to be as follows:

- 4.3 tons of CO
- 8.0 tons of NO_x
- 4.7 tons of PM_{10}
- 1.0 tons of ROC
- 0.2 tons SO_x.

Based on the distribution of emissions throughout the proposed construction schedule, emissions from this short-term construction project would not be expected to exceed the SBCAPCD significant threshold levels of 25 tons per year. Since no ambient air quality standards would be exceeded, the impacts from the Proposed Action would not be considered to be significant to the region's air quality.

4.3.2. No-Action Alternative

Under the No-Action Alternative, there would be no construction associated with a new waterline between SLC-4, -5, and -6 on South Base. Therefore, no adverse impacts would occur as a result of new construction.

Maintenance and repair activities associated with the existing waterline would continue, though, with the No Action Alternative. Being that the existing waterline is in deteriorating condition, it can be expected that substantial repairs would be required. As with the Proposed Action described above, these activities would likely produce adverse impacts to air quality, albeit minimal and not significant, as a result of combustive emissions. Fugitive dust emissions would be minimized with implementation of the above-referenced SBCAPCD dust control measures.

4.3.3. Minimization Measures

The following SBCAPCD dust control measures would be required to further decrease fugitive dust emissions from ground disturbing activities:

- Apply water - preferably reclaimed - at least twice daily to dirt roads, graded areas, and dirt stockpiles to prevent excessive dust at the staging areas. Chlorinated water would not be allowed to run into any waterway.
- Minimize vehicle speeds on exposed earth.
- After completion of construction activities, treat disturbed soil by watering, revegetating, or spreading soil binders to prevent wind erosion of the soil.
- Limit ground disturbance to the smallest, practical area and to the least amount of time.
- Designate personnel to monitor construction to ensure that excessive dust is not generated at construction sites.
- Comply with the SWPPP, including BMPs to reduce dust emissions, and the contractor's Environmental Protection Plan, which includes dust control compliance measures.

4.4. Water Resources

4.4.1. Proposed Action

Adverse impacts to water resources would occur if the Proposed Action 1) caused substantial flooding or erosion, 2) adversely affected surface water, or 3) adversely affected ground water quantity or quality. The Proposed Action has the potential to adversely affect surface water – i.e., Honda Creek.

The Proposed Action would disturb a land area greater than 5 acres. Thus, a National Pollutant Discharge Elimination System (NPDES) General Permit is required to protect water resources. The NPDES General Permit requires a SWPPP that identifies sources of sediment and other pollutants in order to 1) reduce or eliminate storm water and non-storm water discharges associated with construction activities, and 2) minimize impacts to water resources by ensuring water discharged from the construction site meets water quality standards at the point of discharge. All NPDES permit requirements would be implemented to reduce water quality impacts to the Honda Creek drainage basin.

Construction activities would include the use of hazardous materials that could result in an adverse impact to water resources if not properly controlled and managed. Proper storage, secondary containment, and spill prevention measures would be implemented for the duration of construction activities to prevent the accidental introduction of any hazardous waste into the environment. The contractor's Environmental Protection Plan would address these environmental compliance issues, along with pollution prevention practices, to help provide the necessary protection measures to reduce impacts and ensure compliance with the NPDES General Permit.

The contractor's Environmental Protection Plan would be approved by 30 CES prior to initiation of the Proposed Action.

Erosion control measures would be implemented at the boring site in the vicinity of Honda Creek to avoid potential erosion and sediment discharge into this waterway. Specifically, and in addition to any measures mandated by the NPDES General Permit, the following construction methods would be implemented to prevent sediment runoff from the Proposed Action:

- Soil stabilization measures before the beginning of the rainy season.
- Minimization of the amount of ground disturbance.
- After completion of construction activities, disturbed soil would be treated by watering, revegetating, covering, or spreading soil binders to 1) prevent wind erosion of the soil, 2) promote soil stabilization, and 3) promote regrowth of vegetation. These elements would, in turn, reduce sedimentation runoff.

In addition, spill protection measures, including placement of temporary berms and silt fencing would be implemented to prevent contamination and to contain bentonite in the event of an accidental release into the environment.

4.4.2. No-Action Alternative

Under the No-Action Alternative, there would be no construction associated with a new waterline between SLC-4, -5, and -6 on South Base. Therefore, no adverse impacts should occur as a result of new construction.

Maintenance and repair activities associated with the existing waterline would continue, though, with the No Action Alternative. Being that the existing waterline is in deteriorating condition, it can be expected that substantial repairs would be required. As with the Proposed Action described above, these activities would have the potential to result in adverse impacts to water resources. However, compliance with NPDES permit conditions would alleviate the potential for these adverse impacts.

4.5. Hazardous Materials and Hazardous Waste

4.5.1. Proposed Action

The potential for adverse impacts to the natural environment exists for the reasons outlined below. Besides the adverse effect that hazardous materials and hazardous wastes have on the natural environment, human health and safety is also potentially at risk. This issue is addressed in Section 4.6, Human Health and Safety.

4.5.1.2. Hazardous Materials

Hazardous materials, primarily in the form of POLs, would be used for operating the construction equipment for the Proposed Action. Strict compliance, however, with all applicable regulations, including 30th CES Plan 32-7086, *Hazardous Materials Management,* would avert the potential for adverse impacts to the environment as a result of the presence and use of hazardous materials at the Proposed Action.

4.5.1.3. Hazardous Waste

The potential exists for unexpected releases of POLs that would be used for the equipment in the Proposed Action; as such, hazardous waste would be generated. Strict compliance, however, with all applicable regulations, including 30th CES Plan 32-7043A, *Hazardous Waste Management,* would avert the potential for adverse impacts to the environment as a result of the generation and presence of hazardous waste at the Proposed Action.

4.5.2. No Action Alternative

Under the No Action Alternative, no construction would occur for a new waterline. However, because of the deteriorating condition of the existing waterline, maintenance and repair activities would potentially use hazardous materials, generate hazardous waste, and require transportation of these substances. The level of effort for maintenance and repairs would be considered of lesser magnitude than the Proposed Action, but, in any case, as with the Proposed Action, strict compliance with all applicable regulations should avert the potential for adverse impacts as a result of these substances with the No Action Alternative.

4.6. Human Health and Safety

4.6.1. Proposed Action

Construction sites, in general, can be dangerous to workers and the public. To provide for the health and safety of workers, subcontractors, and visitors who may be exposed to the operations of the Proposed Action, the construction contractor would comply with AFOSH and Federal-OSHA over the entire project and with Cal-OSHA south of Honda Ridge Road. As such, human health and safety would not be adversely impacted by general construction hazards.

Potential adverse impacts to human health and safety from the site-specific elements of the Proposed Action are described below. Since the proposed construction would not involve connections to buildings, asbestos as a toxic substance is not considered in this analysis.

As described below, adverse impacts to human health and safety as related to hazardous materials and hazardous waste should be avoided or minimized, assuming standard construction safety measures and all applicable regulations are implemented.

4.6.1.1. Hazardous Materials

Hazardous materials, primarily in the form of POLs, would be used for operating the construction equipment for the Proposed Action. Strict compliance, however, with OSHA and AFOSH regulations should avert the potential for adverse impacts on human health and safety as a result of the presence and use of hazardous materials at the Proposed Action.

4.6.1.2. Hazardous Waste

The potential exists for unexpected releases of POLs that would be used for the equipment in the Proposed Action; as such, hazardous waste would be generated. Strict compliance with OSHA and AFOSH regulations would avert the potential for adverse impacts on human health and safety as a result of the generation of hazardous waste. A specific component of hazardous waste is IRP sites; this element is addressed below in Section 4.6.1.3.

4.6.1.3. IRP Sites

IRP 9 has been identified by 30th CEV/CEVR within an approximately ½-mile radius of the Proposed Action. IRP-9 is located in the area of Surf Road between Tank and Kelp Roads. No AOC or AOI sites have been identified

As described in Section 3.6.2.1, contamination is limited to groundwater; wherein the primary contaminant is trichloroethylene (Vandenberg AFB 2002). The only potential contact with the contaminated groundwater would be through the remediation system pipelines. However, because the route for the proposed waterline along Surf Road would be on the eastern side of the road, while the remediation pipelines are along the western side of Surf Road, the only potential interception could occur at the point where the remediation pipelines enter Surf Road from SLC-4, as shown in Figure 3-2.

As stated in Section 2.1.2.1, the proposed waterline at this specific site would be encased in concrete to protect against potential leakage from remediation pipelines. Furthermore, because the remediation pipelines are approximately 4 feet below grade (Amena Atta, 30th CES/CEVR, pers. comm., 21 October 2003) and the proposed waterline would be approximately 9 feet below grade, trenching underneath the remediation pipelines would be used to install the waterline. Contact with contaminated groundwater should be avoided by the trenching. Potential for worker exposure should also be minimized through coordination with 30 CES/CEVR, the use of appropriate worker personal protection equipment, and adherence to OSHA and AFOSH regulations.

4.6.1.4. Other Potential Hazards

Potential biological hazards (e.g., snakes and poison oak) and physical hazards (e.g., rocky and slippery surfaces) could possibly adversely impact the health and safety of construction personnel. Awareness training would reduce the likelihood that these hazards would interfere with construction personnel.

4.6.2. No Action Alternative

Under the No Action Alternative, no construction would occur for a new waterline. However, because of the deteriorating condition of the existing waterline, maintenance and repair activities would potentially use hazardous materials, generate hazardous waste, and require transportation of these substances. The level of effort for maintenance and repairs would be considered of lesser magnitude than the Proposed Action, but, in any case, as with the Proposed Action, strict compliance with all applicable regulations would avert the potential for adverse impacts to human health and safety.

4.7. Pollution Prevention

4.7.1. Proposed Action

The construction operations of the Proposed Action would create pollution in the air and water and could generate hazardous waste. Compliance with the Vandenberg AFB Pollution Prevention Management Plan and implementation of the recommended measures for air quality and hazardous waste management (Sections 4.3 and 4.5, respectively) would enhance pollution prevention efforts. In addition, the construction contractor should use environmentally preferred materials and processes when feasible.

4.7.2. No-Action Alternative

Under the No-Action Alternative, construction would not occur. The use or purchase of

environmentally preferred construction materials would not be necessary. Therefore, there would be no adverse impacts to pollution prevention efforts under the No-Action Alternative.

4.8. Noise

The Proposed Action would temporarily increase the ambient noise levels in the project area. The proposed route follows roads that are adjacent to buildings and, as such, there would likely be sensitive receptors in the vicinity of the construction.

Table 4-5 shows the predictions of noise levels for different construction activities a stationary observer encounters at distances of 50, 100, and 300 feet. The equipment and machinery selected for each activity is typical for the installation of a 24- to 60-inch diameter pipeline. A smaller-diameter pipeline (i.e., 18-inch) would be installed for the Proposed Action and, as such, the calculations in Table 4-5 are conservative for these purposes.

Table 4-5. L_{eq1h} Noise Levels as a Result of Construction Activities.

Distance from Construction Area (feet)	L_{eq}(dB)
50	91.1
100	86.6
300	79.4

Although construction could potentially proceed for more than 8 hours per day, the duration of exposure to increased noise levels by an observer would likely be less, as the noise sources would be moving along the construction route throughout the day. As a sound source gets further away, the sound level decreases. This is called the attenuation rate. The rate used in these estimates was a decrease in level of 4.5 dB per doubling of distance. This average rate has been shown to be an accurate estimate from field data on grassy surfaces (Harris 1998). To place noise levels in perspective, a food blender at a distance of 3 three feet generates 90 dBA (decibels on the A-weighted scale). Riding in an automobile at 40 miles per hour produces approximately 75 dBA. Normal speech is approximately 60 dBA. Disturbances from elevated L_{eq1h} noise levels near the proposed project area would be temporarily elevated during equipment operation.

Based on the size of the construction activities, the anticipated exposure time to the construction noise, and the effect of attenuation rate, no adverse noise impacts should occur to construction personnel or others in the vicinity.

4.8.1. Proposed Action

Although construction could potentially proceed for more than 8 hours per day, the duration of exposure to increased noise levels by an observer would likely be less, as the noise sources would be moving along the construction route throughout the day.

Based on the size of the construction activities, the anticipated exposure time to the construction noise, and the effect of attenuation rate, no impacts would occur to construction personnel or others in the vicinity of the Proposed Action.

4.8.2. No-Action Alternative

Construction would not occur with the No Action Alternative; thus, noise would not be generated from new construction activities. Although maintenance and repair activities associated with the existing waterline could be substantial, due to the deteriorating condition of the system, the noise levels associated with these activities are not expected to exceed those for the Proposed Action. Therefore, there would be no adverse noise impacts associated with the No Action Alternative.

4.9. Environmental Justice

Implementation of the Proposed Action would adversely affect environmental justice if any of the following conditions would occurred:

- There was an adverse impact to the natural or physical environment or to health that affected a minority or low-income population or children.
- There was an adverse environmental impact on minority or low-income populations or children that appreciably exceeded those on the general population or other comparison group.
- The risk or rate of environmental hazard exposure by a minority or low-income population was significant and exceeded those on the general population or other comparison group.
- An adverse health or environmental effect occurred in a minority or low-income population affected by cumulative or multiple exposures from environmental hazards.

4.9.1. Proposed Action

The project area of the Proposed Action is located along roads in South Base. The Proposed Action would not affect environmental justice because the proposed area is void of the subject population and community.

4.9.2. No-Action Alternative

The No Action Alternative would not affect environmental justice because the proposed area is void of the subject population and community.

4.10. Cumulative Impacts

Adverse, cumulative impacts (hereinafter referred to as "cumulative impacts") result from the incremental effect of an action when added to other past, present, and reasonably foreseeable future actions in the local vicinity, regardless of what agency undertakes such other actions. Cumulative impacts can result from actions whose adverse impacts are individually minor or negligible, yet, over a period of time, are collectively significant.

The construction period for the Proposed Action is anticipated to last approximately 17 months. Projects completed in the vicinity of the Proposed Action in the past 24 months include a power line modification and a subsurface, fiber optic conduit and cable installation. Projects proposed for completion in the vicinity of the Proposed Action within the next five years include removing the tops of power poles along Coast Road and adding electrical line to power poles along Surf Road, between SLC-4 and Honda Canyon (Vandenberg AFB 2003).

While it is too early to assess the full impact of these future projects, the potential exists for adverse impacts on the resources evaluated in this EA, when considered cumulatively with the two, recently completed projects and the Proposed Action. The potential differs per the resource areas analyzed in this EA, as outlined below.

4.10.1. Cultural Resources

Cultural resource surveys indicate that no adverse impact occurred to cultural resources within the area of the Proposed Action as a result of the two completed projects. Measures to be implemented for the Proposed Action would also avoid adverse impacts to these resources. Adverse impacts are possible for the future projects if the tops of power poles are removed within archaeological sites or if utility lines are added to existing poles within archaeological sites. In these cases, impacts would occur if poles fall onto, and are yarded across significant archaeological deposits, or if vehicles are driven across sensitive archaeological deposits. At the time of implementation of these future projects, measures would be implemented to minimize or avoid these impacts.

Given that no past and present adverse impacts to cultural resources are expected to occur, cumulative adverse impacts to cultural resources within the Proposed Action APE would not result when considering these future projects.

4.10.2. Biological Resources

Biological surveys indicate that no adverse impacts to special status plants and wildlife

species resulted from the implementation of the two past projects within the area for the Proposed Action. Adverse impacts from the Proposed Action to these resources are not expected with the implementation of the construction constraints and monitoring measures recommended in this EA. The potential exists for adverse impacts to sensitive plant communities and special status plant and wildlife species as a result of the future projects within the area of the Proposed Action. However, construction constraints and monitoring measures would be developed to avoid or lessen adverse impacts to the resources. As such, no adverse cumulative impacts to special status biological resources are expected as a result of all of these projects within the area of the Proposed Action.

4.10.3. Other Resources

At the present time, the scope of these other, smaller-scale projects is not expected to be of a magnitude that would result in adverse impacts to the other resource areas analyzed in this EA, i.e., air quality, environmental justice, hazardous materials and hazardous waste, human health and safety, noise, pollution prevention, and water resources, assuming compliance with all applicable environmental laws and regulations. As such, these other projects, in conjunction with the Proposed Action, would not have cumulative impact effect on these resources in the vicinity of the Proposed Action.

5. Persons and Agencies Consulted

Amena Atta, Environmental Engineer, 30th CES/CEVR, Vandenberg AFB

Shannon Davis, Student Conservation Associate, 30 CES/CEVPC, Vandenberg AFB

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8. Acronyms and Abbreviations

30th CES/CECB	30th Civil Engineering Squadron, Base Planning
30th CES/CECC	30th Civil Engineering Squadron, Engineering Contracts
30th CES/CEV	30th Civil Engineering Squadron, Environmental Flight
30th SW	30th Space Wing
AASHTO	American Association of State Highway and Transportation Officials
ACOE	U.S. Army Corps of Engineers
AFI	Air Force Instruction
AFOSH	Air Force Occupational Safety and Health
AOC	Area of Concern
AOI	Area of Interest
Caltrans	California Department of Transportation
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CISS	Cast-in-steel-shell
CMP	Corrugated metal pipe
CNDDB	California Natural Diversity Data Base
CNPS	California Native Plant Society
CWA	Clean Water Act
dB	Decibels
dBA	Decibels on the A-weighted scale
DGPS	Differential Global Positioning System
DOD	Department of Defense
DOT	Department of Transportation
EA	Environmental Assessment
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
EPA-17	Environmental Protection Agency 17
EPCRA	Emergency Planning and Community Right-to-Know Act
gpm	gallons per minute
Hazmart	Hazardous Materials Pharmacy
HDPE	High density polyethylene
HSWA	Hazardous and Solid Waste Amendments
IRP	Installation Restoration Program
L_{eq1H}	One-hour average sound level
M	Magnitude on the Richter scale
NEPA	National Environmental Policy Act of 1969
NWI	National Wetlands Inventory
ODC	Ozone depleting chemicals
OHW	Ordinary High Water
P2	Pollution Prevention
PPA	Pollution Prevention Act
PPMP	Pollution Prevention Management Plan

RCRA	Resource Conservation and Recovery Act
SMBSLR	Santa Maria Basin-San Luis Range
SPT	Standard penetration test
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USC	U.S. Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UXO	Unexploded ordnance
Vandenberg AFB	Vandenberg Air Force Base

Note: Not all acronyms listed are necessarily included in the document.

APPENDIX A

BENTONITE
MATERIAL SAFETY DATA INFORMATION

FISHER SCIENTIFIC, CHEMICAL DI -- BENTONITE
==========
MSDS Safety Information
==========
FSC: 6850
NIIN: 00-263-8640
MSDS Date: 11/06/1991
MSDS Num: BMWRL
Product ID: BENTONITE
MFN: 01
Responsible Party
Cage: 1B464
Name: FISHER SCIENTIFIC, CHEMICAL DIV.
Address: 1 REAGENT LANE
City: FAIR LAWN NJ 07410
Info Phone Number: 201-796-7100
Emergency Phone Number: 201-796-7100 OR 201-796-7523
Review Ind: Y
Published: Y
==========
Contractor Summary
==========
Cage: 1B464
Name: FISHER SCIENTIFIC CO. CHEMICAL MFG DIV
Address: 1 REAGENT LANE
City: FAIRLAWN NJ 07410-2802
Phone: 201-796-7100
==========
Item Description Information
==========
Item Manager: S9G
Item Name: DESICCANT,ACTIVATED
Specification Number: MIL-D-3464E
Type/Grade/Class: TYPE I
Unit of Issue: CN
Quantitative Expression: 00000000005GL
UI Container Qty: 1
Type of Container: CAN/PAIL
==========
Ingredients
==========
Cas: 1302-78-9
RTECS #: CT9450000
Name: BENTONITE (AS NUISANCE DUST OR PARTICULATES NOT OTHERWISE REGULATED)
% Wt: 100
OSHA PEL: 15 MG/M3 TOTAL DUST
ACGIH TLV: 10 MG/M3 TDUST;8990
==========
Health Hazards Data
==========
LD50 LC50 Mixture: LD50 (INTRAVENOUS, AT) 35 MG/KG
Route Of Entry Inds - Inhalation: YES
Skin: YES
Ingestion: NO
Carcinogenicity Inds - NTP: NO
IARC: NO
OSHA: NO

```
Effects of Exposure: ACUTE-INHALE:HIGH CONCENTRATIONS OF DUST MAY CAUSE
  IRRITATION.SKIN:NO ADVERSE EFFECTS.EYE:PARTICLES IN THE EYE MAY CAUSE
  IRRITATION.ORAL:INGESTION OF LARGE AMOUNTS MAY CAUSE INTESTINAL
  OBSTRUCTION.CHR ONIC-MAY CAUSE PNEUMOCONIOSIS,CHEST
  PAIN,COUGH,DYSPNEA,CYANOSIS,FATIGUE & BRONCHITIS.
Signs And Symptions Of Overexposure: HIGH CONCENTRATIONS OF DUST MAY CAUSE
  IRRITATION BY INHALATION. PARTICLES IN THE EYE MAY CAUSE IRRITATION.
  INGESTION OF LARGE AMOUNTS MAY CAUSE INTESTINAL OBSTRUCTION.
Medical Cond Aggravated By Exposure: PERSONS WITH PRE-EXISTING RESPIRATORY
  DISORDERS BE MORE SUSCEPTIBLE TO THE EFFECTS OF THE SUBSTANCE.
First Aid: GET MEDICAL ATTENTION IF SYMPTOMS PERSIST.SKIN:WASH WITH SOAP &
  WATER.EYE:FLUSH WITH WATER FOR 15 MINUTES,HOLDING EYELIDS OPEN.INHALED:REMOVE
  TO FRESH AIR & PROVIDE OXYGEN/CPR IF NEEDED.ORAL:DO NOT IN DUCE
  VOMITING.IF VOMITING OCCURS,KEEP HEAD BELOW HIPS DUE TO ASPIRATION
  HAZARD.TREAT SYMPTOMATICALLY AND SUPPORTIVELY.CALL PHYSICIAN.
==========
Handling and Disposal
==========
Spill Release Procedures: USE NIOSH APPROVED DUST MASK/RESPIRATOR &
  PROTECTIVE GLOVES. SWEEP UP OR VACUUM AND TRANSFER INTO A CONTAINER FOR LATER
  DISPOSAL OR RECOVERY.
Waste Disposal Methods: KEEP IN COVERED DRUMS, PENDING DISPOSAL. HANDLE &
  DISPOSE IN FULL COMPLIANCE WITH ALL APPLICABLE FEDERAL, STATE & LOCAL
  REGULATIONS.
Handling And Storage Precautions: STORAGE-STORE IN COOL,DRY,VENTILATED AREA
  AWAY FROM MOISTURE. KEEP CONTAINERS TIGHTLY CLOSED.
Other Precautions: AVOID CREATING DUST. PROVIDE ADEQUATE VENTILATION. DO NOT
  INHALE DUST. USE APPROVED DUST MASK/RESPIRATOR WHEN HANDLING MATERIAL ON
  LARGE SCALE.
==========
Fire and Explosion Hazard Information
==========
Flash Point Text: NONE
Extinguishing Media: WATER SPRAY, CO2, FOAM/DRY CHEMICAL. WATER SPRAY MAY BE
  USED TO KEEP FIRE EXPOSED CONTAINERS COOL & FLUSH SPILLS AWAY.
Fire Fighting Procedures: WEAR FULL PROTECTIVE CLOTHING AND NIOSH-APPROVED
  SELF-CONTAINED BREATHING APPARATUS. MOVE CONTAINER FROM FIRE AREA IF
  POSSIBLE. AVOID BREATHING VAPOR OR DUST.
Unusual Fire/Explosion Hazard: NEGLIGIBLE FIRE HAZARD
==========
Control Measures
==========
Respiratory Protection: USE NIOSH APPROVED DUST MASK/RESPIRATOR OR
  SELF-CONTAINED BREATHING APPARATUS.
Ventilation: GOOD GENERAL VENTILATION IS SUFFICIENT FOR MOST CONDITIONS (10
  ROOM VOLUMES PER HOUR).
Protective Gloves: AS REQUIRED
Eye Protection: DUST-RESISTANT SAFETY GOGGLES
Other Protective Equipment: EYE WASH STATION, QUICK DRENCH SHOWER AND
  IMPERVIOUS CLOTHING
Work Hygienic Practices: OBSERVE GOOD PERSONAL HYGIENE PRACTICES AND
  RECOMMENDED PROCEDURES. DO NOT WEAR CONTAMINATED CLOTHING OR FOOTWEAR.
==========
Physical/Chemical Properties
==========
HCC: N1
M.P/F.P Text: UNKNOWN
```

```
Decomp Text: UNKNOWN
Spec Gravity: UNKNOWN
Solubility in Water: INSOLUBLE
Appearance and Odor: VERY FINE, ODORLESS, HYGROSCOPIC, PALE BUFF OR
  CREAM-COLORED TO GRAYISH POWDER
Corrosion Rate: UNKNOWN
==========================================================
Reactivity Data
==========================================================
Stability Indicator: YES
Stability Condition To Avoid: MOISTURE. SWELLS TO APPROXIMATELY TWELVE TIMES
  ITS VOLUME WHEN ADDED TO WATER.
Materials To Avoid: LITHIUM: MOLTEN LITHIUM ATTACKS SILICATES.
Hazardous Decomposition Products: THERMAL DECOMPOSITION MAY RELEASE ACRID SMOKE
  AND IRRITATING FUMES.
Hazardous Polymerization Indicator: NO
==========================================================
Toxicological Information
==========================================================
==========================================================
Ecological Information
==========================================================
==========================================================
MSDS Transport Information
==========================================================
==========================================================
Regulatory Information
==========================================================
==========================================================
Other Information
==========================================================
==========================================================
Transportation Information
==========================================================
Responsible Party Cage: 1B464
Trans ID NO: 62923
Product ID: BENTONITE
MSDS Prepared Date: 11/06/1991
Review Date: 06/02/1992
MFN: 1
Multiple KIT Number: 0
Review IND: Y
Unit Of Issue: CN
Container QTY: 1
Type Of Container: CAN/PAIL
==========================================================
Detail DOT Information
==========================================================
DOT PSN Code: ZZZ
DOT Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
==========================================================
Detail IMO Information
==========================================================
IMO PSN Code: ZZZ
IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION
==========================================================
Detail IATA Information
```

```
==========================================================
IATA PSN Code: ZZZ
IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
==========================================================
Detail AFI Information
==========================================================
AFI PSN Code: ZZZ
AFI Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
==========================================================
HAZCOM Label
==========================================================
Product ID: BENTONITE
Cage: 1B464
Company Name: FISHER SCIENTIFIC CO.  CHEMICAL MFG DIV
Street: 1 REAGENT LANE
City: FAIRLAWN NJ
Zipcode: 07410-2802
Health Emergency Phone: 201-796-7100 OR 201-796-7523
Label Required IND: Y
Date Of Label Review: 06/02/1992
Status Code: C
MFG Label NO: UNKNOWN
Label Date: 06/02/1992
Origination Code: F
Eye Protection IND: YES
Signal Word: CAUTION
Health Hazard: Slight
Contact Hazard: Slight
Fire Hazard: None
Reactivity Hazard: None
Hazard And Precautions: ACUTE-INHALE:HIGH CONCENTRATIONS OF DUST MAY CAUSE
  IRRITATION.SKIN:NO ADVERSE EFFECTS.EYE:PARTICLES IN THE EYE MAY CAUSE
  IRRITATION.ORAL:INGESTION OF LARGE AMOUNTS MAY CAUSE INTESTINAL
  OBSTRUCTION.CHR ONIC-MAY CAUSE PNEUMOCONIOSIS,CHEST
  PAIN,COUGH,DYSPNEA,CYANOSIS,FATIGUE & BRONCHITIS.STORAGE-STORE IN
  COOL,DRY AREA.KEEP CONTAINERS TIGHTLY CLOSED.FIRST AID-GET MEDICAL ATTENTION
  IF SYMPTOMS PERSIST.S KIN:WASH WITH SOAP & WATER.EYE:FLUSH WITH WATER FOR
  15 MINUTES,HOLDING EYELIDS OPEN.INHALED:REMOVE TO FRESH AIR & PROVIDE
  OXYGEN/CPR IF NEEDED.ORAL:DO NOT INDUCE VOMITING.IF VOMITING OCCURS,KEEP HEAD
   BELOW HIPS.TREAT SYMPTOMATICALLY.CALL PHYSICIAN.
==========================================================
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  particular situation regardless of similarity to a corresponding Department
  of Defense or other government situation.
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International Chemical Safety Cards

BENTONITE

ICSC: 0384

BENTONITE Wilkinite CAS # 1302-78-9 RTECS # CT9450000 ICSC # 0384

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
• **INHALATION**		Avoid inhalation of fine dust and mist.	
• **SKIN**		Protective gloves.	
• **EYES**		Safety spectacles.	
• **INGESTION**			

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting (extra personal protection: P1 filter respirator for inert particles).		
SEE IMPORTANT INFORMATION ON BACK		

ICSC: 0384	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** ODOURLESS GRANULES OR POWDER IN VARIABLE COLOUR. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance is a weak base in suspension in water. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of dust. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the lungs , resulting in silicosis due to the presence of crystalline silica (see ICSC # 0808).
PHYSICAL PROPERTIES	Relative density (water = 1): 2.5	Solubility in water: none
ENVIRONMENTAL DATA		

NOTES

Bentonites are aluminate silicate and can contain crystalline silica. The content varies widely from less than 1% to about 24%.

ADDITIONAL INFORMATION

ICSC: 0384 **BENTONITE**

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

APPENDIX A

BENTONITE
MATERIAL SAFETY DATA INFORMATION

FISHER SCIENTIFIC, CHEMICAL DI -- BENTONITE
==========
MSDS Safety Information
==========
FSC: 6850
NIIN: 00-263-8640
MSDS Date: 11/06/1991
MSDS Num: BMWRL
Product ID: BENTONITE
MFN: 01
Responsible Party
Cage: 1B464
Name: FISHER SCIENTIFIC, CHEMICAL DIV.
Address: 1 REAGENT LANE
City: FAIR LAWN NJ 07410
Info Phone Number: 201-796-7100
Emergency Phone Number: 201-796-7100 OR 201-796-7523
Review Ind: Y
Published: Y
==========
Contractor Summary
==========
Cage: 1B464
Name: FISHER SCIENTIFIC CO. CHEMICAL MFG DIV
Address: 1 REAGENT LANE
City: FAIRLAWN NJ 07410-2802
Phone: 201-796-7100
==========
Item Description Information
==========
Item Manager: S9G
Item Name: DESICCANT,ACTIVATED
Specification Number: MIL-D-3464E
Type/Grade/Class: TYPE I
Unit of Issue: CN
Quantitative Expression: 00000000005GL
UI Container Qty: 1
Type of Container: CAN/PAIL
==========
Ingredients
==========
Cas: 1302-78-9
RTECS #: CT9450000
Name: BENTONITE (AS NUISANCE DUST OR PARTICULATES NOT OTHERWISE REGULATED)
% Wt: 100
OSHA PEL: 15 MG/M3 TOTAL DUST
ACGIH TLV: 10 MG/M3 TDUST;8990
==========
Health Hazards Data
==========
LD50 LC50 Mixture: LD50 (INTRAVENOUS, AT) 35 MG/KG
Route Of Entry Inds - Inhalation: YES
Skin: YES
Ingestion: NO
Carcinogenicity Inds - NTP: NO
IARC: NO
OSHA: NO

```
Effects of Exposure: ACUTE-INHALE:HIGH CONCENTRATIONS OF DUST MAY CAUSE
  IRRITATION.SKIN:NO ADVERSE EFFECTS.EYE:PARTICLES IN THE EYE MAY CAUSE
  IRRITATION.ORAL:INGESTION OF LARGE AMOUNTS MAY CAUSE INTESTINAL
  OBSTRUCTION.CHR ONIC-MAY CAUSE PNEUMOCONIOSIS,CHEST
  PAIN,COUGH,DYSPNEA,CYANOSIS,FATIGUE & BRONCHITIS.
Signs And Symptions Of Overexposure: HIGH CONCENTRATIONS OF DUST MAY CAUSE
  IRRITATION BY INHALATION. PARTICLES IN THE EYE MAY CAUSE IRRITATION.
  INGESTION OF LARGE AMOUNTS MAY CAUSE INTESTINAL OBSTRUCTION.
Medical Cond Aggravated By Exposure: PERSONS WITH PRE-EXISTING RESPIRATORY
  DISORDERS BE MORE SUSCEPTIBLE TO THE EFFECTS OF THE SUBSTANCE.
First Aid: GET MEDICAL ATTENTION IF SYMPTOMS PERSIST.SKIN:WASH WITH SOAP &
  WATER.EYE:FLUSH WITH WATER FOR 15 MINUTES,HOLDING EYELIDS OPEN.INHALED:REMOVE
  TO FRESH AIR & PROVIDE OXYGEN/CPR IF NEEDED.ORAL:DO NOT IN DUCE
  VOMITING.IF VOMITING OCCURS,KEEP HEAD BELOW HIPS DUE TO ASPIRATION
  HAZARD.TREAT SYMPTOMATICALLY AND SUPPORTIVELY.CALL PHYSICIAN.
==========
Handling and Disposal
==========
Spill Release Procedures: USE NIOSH APPROVED DUST MASK/RESPIRATOR &
  PROTECTIVE GLOVES. SWEEP UP OR VACUUM AND TRANSFER INTO A CONTAINER FOR LATER
  DISPOSAL OR RECOVERY.
Waste Disposal Methods: KEEP IN COVERED DRUMS, PENDING DISPOSAL. HANDLE &
  DISPOSE IN FULL COMPLIANCE WITH ALL APPLICABLE FEDERAL, STATE & LOCAL
  REGULATIONS.
Handling And Storage Precautions: STORAGE-STORE IN COOL,DRY,VENTILATED AREA
  AWAY FROM MOISTURE. KEEP CONTAINERS TIGHTLY CLOSED.
Other Precautions: AVOID CREATING DUST. PROVIDE ADEQUATE VENTILATION. DO NOT
  INHALE DUST. USE APPROVED DUST MASK/RESPIRATOR WHEN HANDLING MATERIAL ON
  LARGE SCALE.
==========
Fire and Explosion Hazard Information
==========
Flash Point Text: NONE
Extinguishing Media: WATER SPRAY, CO2, FOAM/DRY CHEMICAL. WATER SPRAY MAY BE
  USED TO KEEP FIRE EXPOSED CONTAINERS COOL & FLUSH SPILLS AWAY.
Fire Fighting Procedures: WEAR FULL PROTECTIVE CLOTHING AND NIOSH-APPROVED
  SELF-CONTAINED BREATHING APPARATUS. MOVE CONTAINER FROM FIRE AREA IF
  POSSIBLE. AVOID BREATHING VAPOR OR DUST.
Unusual Fire/Explosion Hazard: NEGLIGIBLE FIRE HAZARD
==========
Control Measures
==========
Respiratory Protection: USE NIOSH APPROVED DUST MASK/RESPIRATOR OR
  SELF-CONTAINED BREATHING APPARATUS.
Ventilation: GOOD GENERAL VENTILATION IS SUFFICIENT FOR MOST CONDITIONS (10
  ROOM VOLUMES PER HOUR).
Protective Gloves: AS REQUIRED
Eye Protection: DUST-RESISTANT SAFETY GOGGLES
Other Protective Equipment: EYE WASH STATION, QUICK DRENCH SHOWER AND
  IMPERVIOUS CLOTHING
Work Hygienic Practices: OBSERVE GOOD PERSONAL HYGIENE PRACTICES AND
  RECOMMENDED PROCEDURES. DO NOT WEAR CONTAMINATED CLOTHING OR FOOTWEAR.
==========
Physical/Chemical Properties
==========
HCC: N1
M.P/F.P Text: UNKNOWN
```

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Decomp Text: UNKNOWN
Spec Gravity: UNKNOWN
Solubility in Water: INSOLUBLE
Appearance and Odor: VERY FINE, ODORLESS, HYGROSCOPIC, PALE BUFF OR
  CREAM-COLORED TO GRAYISH POWDER
Corrosion Rate: UNKNOWN
==========================================================
Reactivity Data
==========================================================
Stability Indicator: YES
Stability Condition To Avoid: MOISTURE. SWELLS TO APPROXIMATELY TWELVE TIMES
  ITS VOLUME WHEN ADDED TO WATER.
Materials To Avoid: LITHIUM: MOLTEN LITHIUM ATTACKS SILICATES.
Hazardous Decomposition Products: THERMAL DECOMPOSITION MAY RELEASE ACRID SMOKE
  AND IRRITATING FUMES.
Hazardous Polymerization Indicator: NO
==========================================================
Toxicological Information
==========================================================
==========================================================
Ecological Information
==========================================================
==========================================================
MSDS Transport Information
==========================================================
==========================================================
Regulatory Information
==========================================================
==========================================================
Other Information
==========================================================
==========================================================
Transportation Information
==========================================================
Responsible Party Cage: 1B464
Trans ID NO: 62923
Product ID: BENTONITE
MSDS Prepared Date: 11/06/1991
Review Date: 06/02/1992
MFN: 1
Multiple KIT Number: 0
Review IND: Y
Unit Of Issue: CN
Container QTY: 1
Type Of Container: CAN/PAIL
==========================================================
Detail DOT Information
==========================================================
DOT PSN Code: ZZZ
DOT Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
==========================================================
Detail IMO Information
==========================================================
IMO PSN Code: ZZZ
IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION
==========================================================
Detail IATA Information
```

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==========================================================
IATA PSN Code: ZZZ
IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
==========================================================
Detail AFI Information
==========================================================
AFI PSN Code: ZZZ
AFI Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
==========================================================
HAZCOM Label
==========================================================
Product ID: BENTONITE
Cage: 1B464
Company Name: FISHER SCIENTIFIC CO.  CHEMICAL MFG DIV
Street: 1 REAGENT LANE
City: FAIRLAWN NJ
Zipcode: 07410-2802
Health Emergency Phone: 201-796-7100 OR 201-796-7523
Label Required IND: Y
Date Of Label Review: 06/02/1992
Status Code: C
MFG Label NO: UNKNOWN
Label Date: 06/02/1992
Origination Code: F
Eye Protection IND: YES
Signal Word: CAUTION
Health Hazard: Slight
Contact Hazard: Slight
Fire Hazard: None
Reactivity Hazard: None
Hazard And Precautions: ACUTE-INHALE:HIGH CONCENTRATIONS OF DUST MAY CAUSE
  IRRITATION.SKIN:NO ADVERSE EFFECTS.EYE:PARTICLES IN THE EYE MAY CAUSE
  IRRITATION.ORAL:INGESTION OF LARGE AMOUNTS MAY CAUSE INTESTINAL
  OBSTRUCTION.CHR ONIC-MAY CAUSE PNEUMOCONIOSIS,CHEST
  PAIN,COUGH,DYSPNEA,CYANOSIS,FATIGUE & BRONCHITIS.STORAGE-STORE IN
  COOL,DRY AREA.KEEP CONTAINERS TIGHTLY CLOSED.FIRST AID-GET MEDICAL ATTENTION
  IF SYMPTOMS PERSIST.S KIN:WASH WITH SOAP & WATER.EYE:FLUSH WITH WATER FOR
  15 MINUTES,HOLDING EYELIDS OPEN.INHALED:REMOVE TO FRESH AIR & PROVIDE
  OXYGEN/CPR IF NEEDED.ORAL:DO NOT INDUCE VOMITING.IF VOMITING OCCURS,KEEP HEAD
   BELOW HIPS.TREAT SYMPTOMATICALLY.CALL PHYSICIAN.
==========================================================
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  of Defense or other government situation.
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International Chemical Safety Cards

BENTONITE

ICSC: 0384

BENTONITE Wilkinite CAS # 1302-78-9 RTECS # CT9450000 ICSC # 0384

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
• **INHALATION**		Avoid inhalation of fine dust and mist.	
• **SKIN**		Protective gloves.	
• **EYES**		Safety spectacles.	
• **INGESTION**			

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting (extra personal protection: P1 filter respirator for inert particles).		
SEE IMPORTANT INFORMATION ON BACK		

ICSC: 0384	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** ODOURLESS GRANULES OR POWDER IN VARIABLE COLOUR. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance is a weak base in suspension in water. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of dust. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The substance may have effects on the lungs , resulting in silicosis due to the presence of crystalline silica (see ICSC # 0808).
PHYSICAL PROPERTIES	Relative density (water = 1): 2.5	Solubility in water: none
ENVIRONMENTAL DATA		

NOTES

Bentonites are aluminate silicate and can contain crystalline silica. The content varies widely from less than 1% to about 24%.

ADDITIONAL INFORMATION

ICSC: 0384 **BENTONITE**

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APPENDIX B

CULTURAL RESOURCES

Table B-1. Archaeological Studies within 1.0 Mile of the Proposed SLC-4 to SLC-6 Replacement Waterline Route APE.

Reference (in chronological order)	VAFB Reference Number	UCSB Reference Number
Benson 1969	1969-01	V-247
Spanne and Glassow 1974	1974-01	V-77
Spanne 1974	1974-02	V-115
Glassow and Spanne 1976	1976-01	V-58
Spanne 1980a	1980-06	V-74
Spanne 1980b	1980-07	V-207
Stone and Glassow 1980	1980-11	V-78
Spanne 1980c	1980-14	-
Stone and Haley 1981	1981-06	V-15
Kahn 1981	1981-07	-
Glassow et al. 1981	1981-10	V-57
Spanne 1981	1981-15	-
Serena et al. 1981	1981-16	-
Neff 1982	1982-05	V-9
Gibson 1982	1982-07	V-86
Gibson 1983	1983-04	-
Airforce Flight Test Center 1983	1983-11	-
Spanne 1983	1983-15	V-26
Westec Services 1984	1984-02	V-20
Greenwood and Foster 1984	1984-07	-
Spanne 1984	1984-20	-
Westec Services 1985	1985-03	V-27
URS-Berger	1985-04	V-199
Gibson 1985a	1985-07	V-205, E-993
Martin Marietta Corp.	1985-09	-
Gibson and Jackson 1985	1985-21	-
Gibson 1985b	1985-22	-
Jackson 1985	1985-26	V-85
Gibson 1986a	1986-07	-
Gibson 1986b	1986-15	v-206
Harmsworth Associates 1987a	1987-06	-
Weaver 1987	1987-11	V-252
Harmsworth Associates 1987b	1987-14	-
Bergin 1988a	1988-01	V-251
Bergin 1988b	1988-03	-
Bergin 1988c	1988-04	-
Moore et al. 1988	1988-05	E-950
Environmental Solutions, Inc. 1988	1988-06	-
Marmor 1988	1988-07	V-249
Rudolph 1988	1988-08	V-201
Ferraro et al. 1988	1988-12	V-227
Dames and Moore 1988	1988-13	V-204
Bergin 1988d	1988-18	V-233
Berry 1989a	1989-02	V-241
Peter 1989	1989-04	E-1124
Lassen 1989	1989-06	-

Reference (in chronological order)	VAFB Reference Number	UCSB Reference Number
Environmental Solutions, Inc. 1989	1989-07	V-188
Berry 1989b	1989-09	V-185
King 1989	1989-11	-
Bergin 1989a	1989-12	V-115
Bergin 1989b	1989-13	-
Bergin 1990a	1990-01	-
Bergin 1990b	1990-02	-
Environmental Solutions, Inc. 1990a	1990-06	-
Wells and Farrell 1990	1990-08	-
Tetra Tech, Inc.	1990-09	-
Gard et al. 1990	1990-10	-
Environmental Solutions, Inc. 1990b	1990-15	V-126
Environmental Solutions, Inc. 1990c	1990-17	-
Schmidt and Bergin 1990	1990-18	-
Glassow et al. 1990	1990-21	E-1137
Environmental Solutions Inc 1990d	1990-22	-
SAIC 1991	1991-01	-
Snethkamp and Munns 1991a	1991-09	V-138
Maschner et al. 1991	1991-10	V-118
Snethkamp and Munns 1991b	1991-11	V-117
York, 1992	1992-04	V-137
Thorne 1993	1993-02	E-1583
Kirkish 1993	1993-11	V-189
Gerber 1994	1994-02	-
SAIC 1994	1994-06	V-209
Gerber and Eisentaut 1994	1994-32	-
Cagle and McDowell 1995	1995-06	V-155
Eisentraut 1995	1995-11	V-153
SAIC, Chambers Group 1995	1995-12	-
Harro et al. 1996	-	V-161
Lebow 1997a	1997-12	V-162
Lebow and McKim 1997	1997-13	-
Gibson et al. 1997	1997-23	-
Anderson et al. 1997	1997-25	-
Lebow 1997b	1997-27	-
Lebow et al. 1998	1998-02	V-216
Carbone and Mason 1998	1998-03	-
Denardo and Gerber 1998	1998-04	-
Lebow and McKim 1998	1998-09	-
Harro and Gerber 1999	1999-03	V-257
Applied EarthWorks, Inc. 1999	1999-06	V-264
Palmer 1999	1999-09	V-287
Ryan and Lebow 1999	1999-10	-
Harro et al. 1999	1999-12	V-225
Lebow 2000a	2000-05	-
Lebow 2000b	2000-12	-
Applied EarthWorks, Inc. 2000	2000-15	-
Applied EarthWorks, Inc. 2000	2000-16	-

Reference (in chronological order)	VAFB Reference Number	UCSB Reference Number
Lebow 2001a	-	-
Lebow 2001b	2001-01	V-279
Lebow 2002a	2002-02	V-292
Lebow 2002b	-	-

Table B-2. Archaeological Resources within 0.25 Mile of the Proposed SLC-4 to SLC-6 Replacement Waterline Route APE.

CA-SBA-212/H	CA-SBA-675	CA-SBA-1145H	VAFB-ISO-259
CA-SBA-530	CA-SBA-676	CA-SBA-1148	VAFB-ISO-261
CA-SBA-537	CA-SBA-677	CA-SBA-1678	VAFB-ISO-262
CA-SBA-538	CA-SBA-678	CA-SBA-1679	VAFB-ISO-263
CA-SBA-539	CA-SBA-1105	CA-SBA-1680	VAFB-ISO-264
CA-SBA-551	CA-SBA-1106	CA-SBA-1815	VAFB-ISO-265
CA-SBA-651	CA-SBA-1107	CA-SBA-1816	VAFB-ISO-272
CA-SBA-653	CA-SBA-1108	CA-SBA-1908	VAFB-ISO-278
CA-SBA-654	CA-SBA-1109	CA-SBA-1908	VAFB-ISO-279
CA-SBA-660	CA-SBA-1110	CA-SBA-2148	VAFB-ISO-290
CA-SBA-661	CA-SBA-1119	CA-SBA-2215	VAFB-ISO-291
CA-SBA-662	CA-SBA-1120	CA-SBA-2219	VAFB-ISO-311
CA-SBA-666	CA-SBA-1121	CA-SBA-2229	VAFB-ISO-312
CA-SBA-668	CA-SBA-1122	CA-SBA-2230	VAFB-ISO-313
CA-SBA-669	CA-SBA-1123	CA-SBA-2231	VAFB-ISO-314
CA-SBA-670	CA-SBA-1124	CA-SBA-2917	VAFB-ISO-334
CA-SBA-671	CA-SBA-1125/H	CA-SBA-2918H	VAFB-ISO-442
CA-SBA-672	CA-SBA-1126	CA-SBA-2920H	VAFB-ISO-688
CA-SBA-673	CA-SBA-1127	CA-SBA-2934	VAFB-ISO-692
CA-SBA-674	CA-SBA-1144H	VAFB-ISO-258	

Table B-3. Summary of Archaeological Sites Within the Proposed SLC-4 to SLC-6 Replacement Waterline Route APE.

Site (CA-SBA)	NRHP Status*	Description
212/H	DE	CA-SBA-212 has both prehistoric and historic components. The dense prehistoric component is primarily along the shoreline at Point Pedernales and is well outside the APE, as demonstrated by recent subsurface probing completed by Æ (a report of those investigations is underway). Historically, the site was first used in 1769 when Portolá's soldiers collected flint to use in their firearms (Palmer 2000:29). Southern Pacific Railroad (SPRR) crews subsequently used part of the site to quarry rock for the railroad; that quarry is along the rocky shoreline several hundred meters outside the APE. Most of the historic features at CA-SBA-212 are associated with the SPRR, including an old railroad grade, trash scatters, industrial building and structure foundations, and haul roads (Palmer 1999). The only part of the site that extends into the APE is the old railroad grade.
537	DE	The western portion of CA-SBA-537 intersects Surf Road; much of the site is within SLC-4. The site covers 81,015 square meters and consists of prehistoric archaeological materials including ground stone, flaked stone, and marine shell. Originally recorded in the 1950s, it was rerecorded in 1970 by Spanne. CA-SBA-537 has subsequently been tested several times for projects associated with SLC-4, including repairs and restoration following a failed Titan 34D launch (Bergin 1988-01; Moore et al. 1988), installation of a security fence and natural gas pipeline (Environmental Solutions 1990a), and a power system upgrade (Environmental Solutions 1990d). Investigations identified four artifact concentrations: Loci A, B, C, and D. Two radiocarbon samples using shell fragments from Locus A dated to 500±90 and 570±80 years B.P. (uncorrected) (Moore et al. 1988:11-13). Investigations in the late 1980s included archaeological excavation of 56.7 cubic meters of site deposits, yielding cores, bifaces, projectile points, flake tools, ground stone, limited amounts of marine shell, and limited vertebrate faunal remains. A 1990 site record prepared by Bergin and Locke indicates that the site's condition is poor, with approximately 50 percent of the site's surface mechanically disturbed to depths of 20–60 centimeters. Activities causing disturbance include grading, installation of communication and power lines, installation of a security fence, construction of access roads and Surf Road, and construction of fire breaks.
539	DE	CA-SBA-539 is bisected by Coast Road and consequently has been the subject of several archaeological investigations. Encompassing approximately 42,000 square meters, the site was initially recorded in the 1950s and was rerecorded during a survey in the early 1970s (Spanne 1974). It was tested in 1974 in conjunction with the STS project and found to contain midden with marine shell, bone, lithic debitage, and flaked stone tools. A cemetery was identified in part of the site (Glassow et al. 1976:62–63). Subsequent data recovery excavations during 1978 and 1979 (Glassow 1981, 1990, 1996) brought the total excavated volume to 12.8 cubic meters. Three radiocarbon age determinations indicate that the site was occupied between about 2305 and 1915 cal B.P., corresponding to the middle of the Middle Period (Glassow 1990, 1996). A subsequent testing effort focused on the proposed route of a gas pipeline along the eastern edge of Coast Road, and included three 1-by-1 meter test excavation units as well as 13 auger borings. Cultural materials found along the road edge were considered redeposited (Moore et al. 1988:7-6). These results were sufficient to satisfy the requirements of a second gas pipeline project along Coast Road (Ferraro et al. 1988), and no subsequent excavations have been completed at the site.

Site (CA-SBA)	NRHP Status*	Description
551	DE	The eastern third of CA-SBA-551 extends across the APE along Coast Road. Construction of Coast Road and the SPRR affected an estimated 20 percent of the site (Environmental Solutions 1990c:4-6). CA-SBA-551 encompasses approximately 77,150 square meters and includes a dense shell midden. When the site was tested in 1974, a burial and a dense deposit of marine shell, flaked stone, and fish and sea mammal bones were discovered. Diagnostic beads and radiocarbon samples place the age of the site in the late Middle-Late period (Glassow et al. 1976:63). At least three shovel test pits encountered the massive sands of the Orcutt surface at depths of 5–30 centimeters. Subsequent testing occurred for the Backbone Fiber Optic Cable project (Environmental Solutions 1990c). Three shovel test pits were placed along the project corridor. Impenetrable sand was encountered in each shovel test pit at about 30 centimeters below the surface. Altogether, three chert flakes were recovered. In 1997, Æ conducted a site condition assessment at CA-SBA-551 and determined that although the site has been disturbed in several places, most of the large site remains intact. Construction of Coast Road involved cutting and filling within site boundaries. Construction of Lunar Road had an impact on the eastern edge of the site, and a transmission pole and overhead utility line cross the site (Lebow 1997).
654	DE	CA-SBA-654 was originally recorded by Spanne in 1970 and was tested in 1974 for the STS project (Glassow et al. 1976). As recorded, the site encompasses 75,195 square meters and contains a moderately-dense concentration of flakes; bifaces, and biface fragments in various stages of production; faunal bone; and a low-density scatter of shell. Environmental Solutions (1990c) tested the site with ten shovel test pits and two 1-by-1-meter test excavation units. The test excavation units revealed an apparently intact cultural deposit between 80 to 100 centimeters below surface. Materials recovered from this deposit include possible flake tools, two cores, one hammerstone, one *Olivella* bead, and 88 pieces of debitage. The cultural deposit is capped by road fill. In 1997, Æ assessed the site's condition and observed that the eastern boundary had been severely impaired by the construction of Old Coast Road, the modern Coast Road, and the SPRR (McKim 1997). Artifacts, however, are still visible on the surface on both sides of the modern Coast Road. Additionally, a series of aboveground utility poles, two barbed-wire fences, and underground utility lines have affected the site's condition on the eastern side of the site.
662	DE	CA-SBA-662, on the top and sides of a knoll, is a large, moderate to dense shell midden containing bone, fire-altered rocks, and flaked stone debris. The site is estimated to be approximately 69,946 square meters in size. Spanne and Glassow (1974) tested the site and encountered a possible house floor, a rock concentration, and, in two different areas of the site, human burials. One radiocarbon date of 2720±200 (uncorrected) from a *Haliotis* shell as well as other chronological indicators place occupation at CA-SBA-662 in the Middle Period (Glassow 1990). No other excavations have been completed at the site. The construction of Coast Road cut through the westernmost boundary of the site, but artifact density was low in this area.

Site (CA-SBA)	NRHP Status*	Description
670	DE	Encompassing approximately 82,300 square meters, CA-SBA-670 is bisected by Coast, Surf, and Honda Canyon Roads. It was recorded during an early basewide survey and classified as a seasonal village or intermittently occupied habitation site (Spanne 1974). The site was tested in 1974 in conjunction with the STS project (Glassow et al. 1976). That work found dense concentrations of marine shell, vertebrate faunal remains, lithic debitage, flaked stone tools, and fire-altered rock. Extensive data recovery excavations were completed for the STS project during 1978–1980 (Glassow 1981, 1990, 1996); the total excavated volume, including testing, was 52.73 cubic meters (Glassow 1990:Table 10.1). Two midden strata were identified. The lower midden was radiocarbon dated between 3175 and 4585 years B.P., corresponding to the end of the Early Period, while the upper midden deposit dated between 335 and 490 years B.P., corresponding to the Late Period. In May 1980, Spanne examined a trench that had been inadvertently excavated within CA-SBA-670 south of Honda Canyon Road (Spanne 1980a). Complex cultural stratigraphy was revealed, with 5–10 cultural strata apparent. Glassow and his UCSB students subsequently examined backhoe trenches excavated in the site for a telephone cable (Stone and Glassow 1980). Two midden deposits were identified in a trench south of Honda Canyon Road were determined to be redeposited materials. Schilz (1985) reports that excavation of 15 shovel test pits along Old Surf Road in conjunction with an STS gas pipeline revealed buried midden (marine shell and flaked stone). Additional testing was subsequently completed along Coast, Old Surf, and Honda Canyon roads for two gas pipelines associated with the STS (Ferraro et al. 1988; Moore et al. 1988). This work included excavation of eight 1-by-1-meter test excavation units and 19 auger borings. Intact portions of the site's lower midden were sampled, revealing a moderately dense deposit of lithic debitage, biface fragments, utilized flake tools, and other lithic artifacts. A stone-lined hearth also was discovered (Moore et al. 1988:7-8–7-9). Analyses indicated that the site was occupied during at least three chronological periods (Ferraro et al. 1988:5-78). In 1988, seven auger borings, four 1-by-1-meter test excavation units, and four 9-by-0.5-meter trenches were excavated to recover data from the pipeline right of ways, primarily along the eastern side of Coast Road (Environmental Solutions 1990a). Five additional 1-by-1-meter test excavation units were excavated to recover data from the stone-lined hearth identified during the testing phase. These excavations were focused on the initial site occupation, dating about 6500–6000 B.P. In 2001, Æ tested the eastern edge of the site as part of the Encapsulated Payload Transfer Route project, revealing a low-density deposit of flakes without marine shell, flaked or ground stone tools, or faunal remains (Lebow 2001).
676/H	DE	Located along Surf Road, CA-SBA-676/H was originally recorded in 1970 as a twentieth-century farmstead and is known as the Hansen homestead. The site encompasses approximately 9,162 square meters and includes foundation remains, an artifact scatter, and a refuse disposal site. Three 1-by-1-meter test excavation units were excavated at the site in conjunction with installation of a natural gas pipeline (Moore et al. 1988:7-9–7-10); each excavation revealed both historic and prehistoric artifacts. Æ tested the site in 2001 as part of the Encapsulated Payload Transfer route project, with one shovel test pit and one 1-by-1-meter test excavation unit on the west side of Surf Road. Prehistoric and historic materials were found in both test excavation units and the site boundary was extended to the west side of Surf Road.
1119	NE	Located in the bottom of Honda Canyon, CA-SBA-1119 was recorded in 1974 during the initial basewide survey (Spanne 1974). A single test excavation unit excavated during the 1974 testing for the STS project revealed that the site contains a low-density deposit of marine shell and lithic debitage (Glassow et al. 1976). In 2002, Æ tested the site as part of Vandenberg AFB's compliance with Section 110 of the NHPA. Excavations took place on alluvial terraces both north and south of Honda Creek; a total of three 1-by-1-meter test excavation units and 38 shovel test pits were excavated. The report of Æ's methods and findings is pending.

Site (CA-SBA)	NRHP Status*	Description
1120	NE	Encompassing approximately 3,880 square meters, CA-SBA-1120 was recorded in 1974 as a low-density scatter of marine shell and asphaltum among the sand dunes west of Surf Road. In 2001, Æ excavated five shovel test pits between the site and Surf Road to determine whether the site extended into the APE for the Encapsulated Payload Transfer route project. All five shovel test pits were negative, indicating that the site does not extend to Surf Road (Lebow 2001).
1122/H	RI	CA-SBA-1122 was recorded in 1974 as a low-density scatter of marine shell and a fire-altered rock. The site lies just west of Surf Road. It was tested in conjunction with a natural gas pipeline (Moore et al. 1988:7-10–7-11), an effort that included four 1-by-1-meter test excavation units and three auger borings. Only two flake tools, two flakes, and marine shell were recovered. Historic materials also were noted. The site encompasses approximately 5,500 square meters. Æ tested near the site in 2001 as part of the Encapsulated Payload Transfer route project by excavating two shovel test pits along the west edge of Surf Road. Both shovel test pits were negative, indicating that the site does not extend to Surf Road (Lebow 2001).
1124H	RI	Located along Surf Road and recorded in 1974, CA-SBA-1124 is a scatter of marine shell and historic artifacts not far from the Hansen homestead (CA-SBA-676/H). The site is relatively small, encompassing only 1,287 square meters. Two 1-by-1-meter test excavation units excavated in conjunction with installation of a natural gas pipeline found glass, metal fragments, nails, and other historic debris. No prehistoric artifacts were found (Moore et al. 1988:7-11). Æ tested near the site in 2001 as part of the Encapsulated Payload Transfer route project by excavating two shovel test pits between the site and Surf Road. Both shovel test pits were negative, indicating that the site does not extend to Surf Road (Lebow 2001).
1125H	DE	Originally recorded in 1974 as a low-density scatter of abalone shell and historic artifacts, CA-SBA-1125/H was reexamined in 1985 and found to be much larger and to include "discolored soil from trash burning, melted glass, nails, wood fragments, bottles, porcelain, rusted cans, and metals fragments" (Schilz 1985). The site is bisected north/south by Surf Road and east/west by Tank Road. Investigations for a natural gas pipeline concluded that the historic site was the remains of the MacReynolds homestead. A prehistoric component was identified during those investigations. Together, the two components encompass approximately 30,780 square meters. Thirteen 1-by-1-meter test excavation units and seven shovel test pits were excavated in the prehistoric component. These test excavation units recovered small quantities of lithic debitage, historic deer bone, and weathered mussel shell (Moore et al. 1988:7-11–7-12). Two prehistoric cultural strata were identified. The upper component was dated to 530 ±130 B.P. (uncorrected) and the lower component to 1430±250 B.P. (uncorrected) (Moore et al. 1988:11-3). The site was subsequently sampled again prior to construction of an overhead transmission line. That effort included three shovel test pits and one 1-by-2-meter test excavation unit. No cultural materials were recovered (Environmental Solutions 1990d). In 2001, Æ tested the site for the Encapsulated Payload Transfer Route project. Six 1-by-1-meter test excavation units and three shovel test pits were excavated along the west side of Surf Road at the locations proposed for power poles. The highest density of historic artifacts appeared in test excavation units placed near the center of the site, just west of the intersection of Surf and Tank Roads. Prehistoric materials including shell fragments and lithic debitage were recovered from test excavation units in the central and northern areas of the site. Materials were found between 50 and 100 centimeters below the surface. A sample of marine shell was radiocarbon dated to A.D. 1450–1650 (Lebow 2001:6.16).

Site (CA-SBA)	NRHP Status*	Description
1126	DE	CA-SBA-1126 was recorded in 1974 as a low-density scatter of lithic debitage in a 2-by-2-meter area west of Surf Road. The site was tested with five 1-by-1-meter test excavation units in conjunction with a natural gas pipeline and was found to cover an area of approximately 4,050 square meters. test excavation units revealed a maximum site depth of 40 centimeters. Cultural materials were found in relatively low densities and consisted of lithic debitage and marine shell (Moore et al. 1988:7-12–7-13). Æ tested near the site in 2001 as part of the Encapsulated Payload Transfer route project by excavating four shovel test pits between the site and Surf Road. All four shovel test pits were negative, indicating that CA-SBA-1126 does not extend to Surf Road (Lebow 2001).
1144H	NE	CA-SBA-1144H was recorded in 1974 as the remains of a ranch house east of Surf Road. Spanne examined a cable trench that had been excavated inadvertently within CA-SBA-1144H and found no historic artifacts. He noted, however, that the site contains tin cans, auto parts, and non-native trees (Spanne 1980a:4). Although various undertakings have passed near the site, no archaeological investigations have been completed specifically for CA-SBA-1144H.
1145H	DE	CA-SBA-1145/H was first recorded in 1974 and has been investigated many times. The site consists of historic trash scatters and the red brick and concrete remains of the SPRR Honda section house. The historic remains date from ca. the 1890s to 1930 and are associated primarily with the SPRR railroad. The section house was constructed between 1898 and 1900 and is associated with two important events: the train crash of 1907 at Honda siding and the Navy destroyers crash of 1923. Injured survivors of both events were treated at the section house. CA-SBA-1145/H encompasses roughly 71,000 square meters and extends north-south along Coast Road and the SPRR. The site was determined eligible for the NRHP in 1979. While monitoring at the site, Gibson (1983) identified three "trash dump" loci of historic materials about 30 centimeters below the surface. Historic materials at these loci date between 1890 and 1930 and include domestic ceramics and glass fragments, butchered animal bones, and metal cans. Westec Services (Schilz 1985) identified the red brick and concrete foundation of the section house during a survey for a buried gas line. The foundation most likely represents the remains of the section house. Ferraro et al. (1988) tested the northern portion of the site and determined that historic materials were very sparse and disturbance had occurred in this area. Gibson (1985) tested along the west side of the site for the STS Project. Historic materials were discovered, but not in primary context. Some undisturbed prehistoric materials also were encountered, but in low densities. Gibson reported that the southern portion of the site has experienced heavy disturbance from railroad and Coast Road construction. In 1991 Maschner et al. tested the southern end of the site with two shovel test pits and four 1-by-1-meter test excavation units. Their testing revealed a very low-density deposit of prehistoric artifacts and highly disturbed historic materials. In sum, much of the historic deposit at CA-SBA-1145/H has been badly damaged if not destroyed by the SPRR railroad and construction of Coast Road. Also, a low-density prehistoric component is present at the site.
1678	NE	CA-SBA-1678 is a low-density scatter of prehistoric flakes and marine shell adjacent to the western portion of SLC-6. The site covered an area of at least 25,000 square meters before it was mostly destroyed by the construction of a parking lot, roads, buildings, railroad tracks, and a power line (per Spanne's 1981 site record). During monitoring for installation of two power poles, Berry (1989) identified cultural materials including a mano northwest of the guard shack between a fence line and a power pole line. Crisologo (1981) observed that photographs and maps revealed the area was graded between 1966 and 1967, which removed several meters of natural surface within the site boundary. They excavated 12 shovel test pits and discovered that archaeological materials were present at a depth of at least 60 centimeters. These test excavation units yielded debitage and shell fragments. Unfortunately, shovel test pit locations are not identified in the report. While monitoring the construction of SLC-6, two stemmed dart points, a bifacial mano, a hammerstone, and other cultural remains were recovered from a disturbed portion of the site (Crisologo 1981).

Site (CA-SBA)	NRHP Status*	Description
2230	RI	Located east of Surf Road, CA-SBA-2230 was recorded in 1988 as a low-density scatter of ground and flaked stone during a survey for a power system upgrade for SLC-4. It was tested for the same project and found to encompass approximately 30,150 square meters. Seventy-two flakes, three flaked stone tools, 19.6 grams of marine shell, and 80 bones (weighing 1.47 grams) were recovered from eight 1-by-1-meter test excavation units and 33 shovel test pits. Most of the bone was determined to be noncultural. Two artifact concentrations were identified (Environmental Solutions 1990d). Æ excavated two shovel test pits between the site and Surf Road as part of the Encapsulated Payload Transfer route project. Both test excavation units were negative, indicating that the site did not extend to Surf Road (Lebow 2001).
2231H	RI	CA-SBA-2231H was recorded in 1988 during a survey for a power system upgrade for SLC-4. It was considered a low-density scatter of ground and flaked stone in two sandy blowouts east of Surf Road. A buried fence and part of an old wagon also were identified. Two features were noted, including an area of burned soil and a possible wagon trail. Eight 1-by-1-meter test excavation units and 43 shovel test pits excavated in conjunction with the power system upgrade revealed two flaked stone tools, 27 pieces of lithic debitage, 1.38 grams of marine shell, and 1.29 grams of bone. Most of the bone is noncultural (Environmental Solutions 1990d).

* DE = Determined eligible for the NRHP in consultation with the SHPO.
DI = Determined ineligible for the NRHP in consultation with the SHPO.
NE = Not evaluated (i.e., NRHP status is unknown).
RE = Recommended eligible for the NRHP by a consultant, but not officially determined eligible in consultation with SHPO.
RI = Recommended ineligible for the NRHP by a consultant, but not officially determined ineligible in consultation w/SHPO.

Table B-4. Summary of Isolated Artifacts Within the Proposed SLC-4 to SLC-6 Replacement Waterline Route APE.

Isolate (VAFB-ISO-)	Description
264	ISO-264 was recorded as one or more possible flakes just south of CA-SBA-654 and just west of Coast Road. It was originally recorded in 1974 by L. Spanne.
692	ISO-692 was recorded as a single piece of flaked stone debitage. It is located on the north side of Tank Road.

STATE OF CALIFORNIA – THE RESOURCES AGENCY
ARNOLD SCHWARZENEGGER, Governor

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July 27, 3002

Re: USAF031014A

Thomas M. Churan, GS-14
Chief, Environmental Flight
Department of the Air Force
30th Space Wing (AFSPC)
30 CES/CEV
806 13th Street, Ste 116
Vandenberg AFB CA 93437-5242

Re: Section 106 Memorandum of Agreement for Space Launch Complex (SLC)-4 to SLC—6 Waterline Replacement Project, Vandenberg AFB, CA

Dear Mr. Churan:

I have executed the subject Memorandum of Agreement (MOA) and am returning it to you as an enclosure to this letter. The MOA is now in effect.

Execution of this MOA by Vandenberg and the California State Historic Preservation Officer, and implementation of its terms, evidences satisfactory compliance by Vandenberg with section 106 of the National Historic Preservation Act for this undertaking.

Thank you for your cooperation in bringing this consultation to a successful conclusion. If you have any questions, please contact John Sharp, Staff Archaeologist, at (916) 653-2716 or at jshar@ohp.parks.ca.gov.

Sincerely,

Milford Wayne Donaldson, FAIA
State Historic Preservation Officer

Enclosure

MEMORANDUM OF AGREEMENT
BETWEEN
VANDENBERG AIR FORCE BASE, CALIFORNIA
AND THE
CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING THE SPACE LAUNCH COMPLEX-4 TO SPACE LAUNCH COMPLEX-6
WATERLINE REPLACEMENT PROJECT

WHEREAS, Vandenberg Air Force Base (VAFB), California, proposes to accommodate components of the Space Launch Complex (SLC)-4 to SLC-6 Waterline Replacement Project (Undertaking); and

WHEREAS, VAFB has determined that the Undertaking will have an adverse effect on archaeological site CA-SBA-1145/H, a property determined eligible for inclusion in the National Register of Historic Places (NRHP)(historic property); and

WHEREAS, VAFB has consulted with the California State Historic Preservation Officer (SHPO) regarding the Undertaking, notified the Advisory Council on Historic Preservation (ACHP) of the adverse effect finding in accordance with 36 CFR Part 800 regulations effective January 11, 2001 implementing Section 106 of the National Historic Preservation Act (NHPA), as amended (16 U.S.C. 470f), and proposes to resolve the adverse effect of the Undertaking on historic properties by executing and implementing this Memorandum of Agreement (MOA); and

WHEREAS, VAFB has consulted with the Santa Ynez Band of Mission Indians (Tribe) regarding the proposed Undertaking and its effect on historic properties, will continue to consult with the Tribe, and will afford the Tribe with the opportunity to participate in the implementation of this MOA;

NOW, THEREFORE, VAFB and the SHPO agree that the Undertaking shall be implemented in accordance with the following stipulations in order to take into account the effects of the Undertaking on historic properties, and that these stipulations shall govern the Undertaking and all of its parts until this MOA expires or is terminated.

Stipulations

VAFB will ensure that the following measures are carried out:

I. AREA OF POTENTIAL EFFECTS

The Area of Potential Effects (APE) for the Undertaking will be 120-meters wide with a 50-meter wide Area of Direct Impact (ADI). In the vicinity of CA-SBA-1145/H, the width of the ADI will narrow to 16 meters and this encompasses the entire area between Coast Rd and the Union Pacific right-of-way boundary as defined in *SLC-4 to SLC-6 Waterline Replacement Project: CA-SBA-1145/H Treatment Plan, Vandenberg Air Force Base, Santa Barbara County, California*, May 2004 (TP), that is Attachment 1 to this MOA.

II. RESOLUTION OF ADVERSE EFFECTS ON HISTORIC PROPERTIES

VAFB shall resolve the known and any potentially adverse effects of the Undertaking on historic properties by:

A. Implementing and completing the Treatment Plan.

B. Construction Monitoring

1. Monitoring, in accordance with VAFB policy as set forth in the VAFB Integrated Cultural Resource Management Plan (ICRMP), of all ground disturbing activities adjacent to archaeologically sensitive areas, and of all ground disturbing activities associated with the Undertaking, will be carried out to ensure that disturbance is limited to the ADI. Monitoring will be conducted by archaeologists and Native Americans.

2. Archaeological and Native American monitors have the authority to temporarily halt or redirect construction activities to a less sensitive area and examine potentially significant archaeological or historical materials that would be adversely affected if construction continued. If an archaeological monitor or a Native American monitor observes cultural or historic material (artifacts or features) within CA-SBA-1145/H, the monitor shall halt or redirect construction activities to a less sensitive area and contact the project manager, who in turn shall contact the Base Historic Preservation Officer (BHPO). The BHPO will decide the treatment of the artifacts/features relative to the Undertaking in consultation with the SHPO and in accordance with stipulation III.

C. Resolution of Adverse Effects: Reporting

1. Within 18 months after VAFB has determined that all fieldwork required by sections A. and B. of this stipulation has been completed, VAFB will prepare and concurrently distribute to the SHPO and to the Tribe, should the Tribe so request, a written draft technical report that documents the results of implementing the requirements of sections A. and B. of this stipulation. The reviewing parties will be afforded 45 days following receipt of the draft technical report to submit any written comments to VAFB. Failure of these parties to respond within this time frame shall not preclude VAFB from either finalizing the draft technical report without revisions or revising the draft technical report as VAFB may deem appropriate. VAFB will provide the reviewing parties with written documentation indicating whether and how the draft technical report will be modified in accordance with any timely reviewing party comments. Unless the reviewing parties object of this documentation in writing to VAFB within 30 days following receipt, VAFB may issue the draft technical report in final form without revisions or issue the draft technical report in final form following any revisions that VAFB may deem appropriate. Thereafter, VAFB will distribute the final technical report in accordance with section C.2. of this stipulation.

2. Copies of the final technical report documenting the results of implementing the requirements of sections A. and B. of this stipulation will be distributed by VAFB to the SHPO, to the Tribe should the Tribe so request, and to the appropriate California Historical Resources Information Survey (CHRIS) Regional Information Center, subject to the terms of stipulation IV.C.

III. DISCOVERIES AND UNANTICIPATED EFFECTS

If VAFB determines after construction has commenced, that the Undertaking will affect a previously unidentified property that may be eligible for inclusion in the NRHP, or affect CA-SBA-1145/H in an unanticipated manner, VAFB will address the discovery or unanticipated effect in accordance with 36 CFR § 800.13 (b)(3). VAFB may assume the discovered property to be eligible for the NRHP, in accordance with 36 CFR § 800.13 (c). VAFB shall include the results of any actions taken pursuant to this stipulation in the report prescribed in stipulation II.C.

IV. ADMINISTRATIVE PROVISIONS

A. Qualifications. VAFB shall ensure that all activities prescribed by stipulations II. and III. of this MOA are conducted by or are carried under the direct supervision of a person or persons meeting, at a minimum, the Secretary of Interior's Professional Qualifications Standards (PQS) in the discipline of archaeology (48 FR 44738-44739).

B. Standards

1. **Documentation.** VAFB shall ensure that documentation prepared in fulfillment of stipulations II. and III. of this MOA is reasonably consistent with the *Secretary of the Interior's Standards for Archaeological Documentation* and the *Secretary of the Interior's Guidelines for Archaeological Documentation* (48 FR 44734-44737).

2. **Curation.** VAFB shall ensure that, to the extent permitted by applicable federal law and regulation, materials and records resulting from activities carried out pursuant to stipulations II. and III. of this MOA are curated in accordance with 36 CFR Part 79.

C. Confidentiality

1. VAFB shall ensure that all sensitive information, as defined in Section 9 of the Archaeological Resources Protection Act (ARPA), Section 304 of the NHPA, and the Native American Graves Protection and Repatriation Act (NAGPRA), is managed in such a way that historic properties, traditional cultural values, sacred objects, and human remains are not compromised, to the fullest extent available under law.

2. The signatories to this MOA shall safeguard information about the nature and location of archeological, historic, and traditional cultural properties, and not reveal that information to any additional parties, pursuant to Section 304 of the NHPA and Section 9 of the ARPA, without the express written permission of VAFB.

D. Resolving Objections

1. Should the SHPO or the Tribe object to the manner in which the terms of this MOA are implemented, to any action carried out or proposed with respect to implementation of the MOA (other than the Undertaking itself), or to any documentation prepared in accordance with and subject to the terms of this MOA, VAFB shall immediately consult with the objecting party for no more than 14 days to resolve the objection. VAFB shall reasonably determine when this consultation will commence. If the objection is resolved through such consultation, the disputed action may proceed according to the terms of that resolution. If, after initiating consultation, VAFB determines that the objection cannot be resolved through consultation, then VAFB shall forward all documentation relevant to the objection to the ACHP, including VAFB's proposed response to the objection, with the expectation that the ACHP will within thirty (30) days after receipt of such documentation:

    a. advise VAFB that the ACHP concurs in VAFB's proposed response to the objection, whereupon VAFB will respond to the objection accordingly; or

    b. provide VAFB with recommendations, which VAFB will take into account in reaching a final decision regarding its response to the objection; or

    c. notify VAFB that the objection will be referred for comment pursuant to 36 CFR 800.7 (a)(4), and proceed to refer the objection and comment. VAFB shall take the resulting comments into account in accordance with 36 CFR 800.7 (c)(4) and Section 110 (l) of the NHPA.

2. Should the ACHP not exercise one of the foregoing options within 30 days after receipt of all pertinent documentation, VAFB may assume the ACHP's concurrence in its proposed response to the objection.

3. VAFB shall take into account any ACHP recommendation or comment provided in accordance with this stipulation with reference only to the subject of the objection. VAFB's responsibility to carry out all actions under this MOA that are not the subjects of the objection will remain unchanged.

4. At any time during implementation of the measures stipulated in this MOA should an objection pertaining to such implementation be raised by a member of the public, VAFB shall notify the SHPO and the Tribe in writing of the objection, and take the objection into consideration. VAFB shall consult with the objecting party, and if the objecting party so requests, with the SHPO and/or the Tribe, for no more than 15 days. Within 10 days following closure of the consultation period, VAFB will render a decision regarding the objection and notify the consulting parties of this decision in writing. In reaching its decision, VAFB will take any comments from the consulting parties, including the objecting party, into account. VAFB's decision regarding resolution of the objection will be final.

5. VAFB shall provide the SHPO, the Tribe, the ACHP when the ACHP has issued comments hereunder, and any parties that have objected pursuant to item 4. of section D. of the stipulation, with a copy of its final written decision regarding any objection addressed pursuant to section D. of this stipulation.

6. VAFB may authorize any action subject to objection under section D. of this stipulation to proceed after the objection has been resolved in accordance with the terms of section D. of this stipulation.

E. Amendments

1. VAFB, the SHPO, or the Tribe may propose that this MOA be amended, whereupon these parties will consult for no more than 30 days to consider such amendment. The amendment process shall comply with 36 CFR § 800.6 (c)(1) and § 800.6 (c)(7). This MOA may be amended only upon the written agreement of VAFB and the SHPO. If it is not amended, this MOA may be terminated by either signatory party in accordance with section F. of this stipulation.

2. Attachment 1 (TP) to this MOA may be amended through consultation among VAFB, the SHPO and the Tribe without amending the MOA proper.

F. Termination

1. If this MOA is not amended as provided for in section E. of this stipulation, or if either signatory party proposes termination of this MOA for other reasons, the signatory party proposing termination shall, in writing, notify the other signatory party and the Tribe, explain the reasons for proposing termination, and consult with that signatory party and the Tribe for at least 30 days to seek alternatives to termination. Such consultation shall not be required if VAFB proposes termination because the Undertaking no longer meets the definition set forth in 36 CFR § 800.16 (y).

2. Should such consultation result in an agreement on an alternative to termination, then the parties shall proceed in accordance with the terms of that agreement.

3. Should such consultation fail, the signatory party proposing termination may terminate this MOA by promptly notifying the other signatory party and the Tribe in writing. Termination hereunder shall render this MOA without further force or effect.

4. If this MOA is terminated hereunder, and if VAFB determines that the Undertaking will nonetheless proceed, then VAFB shall either consult in accordance with 36 CFR § 800.6 to develop a new MOA or request the comments of the ACHP pursuant to 36 CFR Part 800.

G. Duration of the MOA

1. Unless terminated pursuant to section F. of this stipulation, or unless it is superseded by an amended MOA, this MOA will be in effect following execution by VAFB and the SHPO until VAFB, in consultation with the SHPO, determines that all of its stipulations have been satisfactorily fulfilled. This MOA will terminate and have no further force or effect on the day that VAFB notifies the SHPO in writing of its determination that all stipulations of this MOA have been satisfactorily fulfilled.

2. The terms of this MOA shall be satisfactorily fulfilled within 5 years following the date of execution by VAFB and the SHPO. If VAFB determines that this requirement cannot be met, VAFB and the SHPO will consult to reconsider its terms. Reconsideration may include continuation of the MOA as originally executed, amendment, or termination. In the event of termination, VAFB will comply with section F. 4. of this stipulation if it determines that the Undertaking will proceed notwithstanding termination of this MOA.

3. If the Undertaking has not been implemented within 5 years following execution of this MOA by VAFB and the SHPO, this MOA shall automatically terminate and have no

further force or effect. In such event, VAFB shall notify the SHPO in writing and, if VAFB chooses to continue with the Undertaking, it shall reinitiate review of the Undertaking in accordance with 36 CFR Part 800.

V. EFFECTIVE DATE

This MOA will take effect immediately upon execution by VAFB and the SHPO.

EXECUTION of this MOA by VAFB and the SHPO, its transmittal by VAFB to the ACHP in accordance with 36 CFR § 800.6(b)(1)(iv), and subsequent implementation of its terms, shall evidence, pursuant to 36 CFR § 800.6(c), that this MOA is an agreement with the ACHP for purposes of Section 110(l) of the NHPA, that VAFB has afforded the ACHP an opportunity to comment on the Undertaking and its effects on historic properties, and that VAFB has taken into account the effects of the Undertaking on historic properties.

SIGNATORY PARTIES:

VANDENBERG AIR FORCE BASE

By: Thomas M. Churan Date: June 21, 2004

Name: THOMAS M. CHURAN, GS-14
Title: Chief, Environmental Flight

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

By: [signature] Date: 27 JUL 2004

Name: MILFORD WAYNE DONALDSON, FAIA
Title: State Historic Preservation Officer

APPENDIX C

BIOLOGICAL RESOURCES

Table C-1. Plant species observed throughout the botanical survey corridor.

Scientific Name	Common Name	Segment[1]						
		1	2	3	4	5	6	7
Achille millefolium	Common yarrow		*					
Acacia longifolia	Sydney golden wattle				*			
Adenostoma fasiculatum	Chemise		*					
Albizia lophantha.	Mimosa			*				
Ammophila arenaria	European beach grass				*			
Amsinkia spp.	Fiddleneck	*						
Anagallis arvensis	Scarlet pimpernel							*
Arctostaphylos purissima[4]	La Purisima manzanita		*					
Artemisia californica	California Sagebrush	*		*	*		*	*
Astragalus spp.	Locoweed	*		*				*
Avena spp.	Wild oat			*		*		
Baccharis pilularis	Coyote brush	*	*	*			*	*
Brassica spp.	Mustard							*
Bromus diandrus	Ripgut Grass	*	*	*		*	*	*
Bromus hordaceus	Soft chess brome	*	*	*		*	*	*
Bromus madritensis	Foxtail chess	*	*	*		*	*	
Calystegia macrostegia	Morning glory	*						
Carpobrotus chiliensis	Sea fig (ice plant)	*	*	*	*		*	*
Carpobrotus edulis	Common hottentot fig (ice plant)						*	*
Ceanothus cuneatus	Buckbrush							
Ceanothus thrysiflorus	Ceanothus		*					
Ceanothus impressus	Santa Barbara ceanothus		*					
Cirsium occidentale	Cobwebby thistle							*
Conicosa pugioniformis	Slender leaved iceplant	*		*				
Conium maculatum	Poison hemlock			*				
Coreopsis gigantean	Giant coreopsis	*				*		
Cortaderia jubata	Jubata grass	*	*					
Croton californicus	Croton							*
Cupressus macrocarpa	Monterey cypress	*			*			
Cynodon spp.	Bermuda grass		*					
Dichelostemma capitatum	Blue dick	*						
Duleya spp.	Dudleya	*						
Ehrharta calycina	Veldt grass	*	*	*	*	*	*	
Eschscholtzia californica	California poppy	*		*				*
Ericameria ericoides	Mock heather	*	*	*	*			
Eriogonum parvifolium	Coastal buckwheat	*					*	*
Eriophyllum confertiflorum	Golden yarrow	*						
Erodium spp.	Filaree	*	*	*				*
Erysimum capitatum capitatum	Western wallflower	*						
Eucalyptus globulus	Blue gum eucalyptus	*		*				
Eucalyptus spp.	Eucalyptus			*				
Gnaphalium ramosissimum	Everlasting	*						*
Hazardia squarosa	Saw-toothed goldenbush		*					*
Heteromeles arbutifolia	Toyon	*						
Horkelia cuneata ssp. *sericea*[2,3,4]	Kellogg's horkelia	*	*					

1 * = Segment where species occurs.
2 Due to the difficulty of distinguishing between the two subspecies, all *Horkeila californica* found during the field surveys was treated as subspecies *sericea* (C. Gillespie, pers. comm.).
3 Federal Species of Concern.
4 California Native Plant Society 1B – Rare or endangered in California and elsewhere.

Scientific Name	Common Name	Segment[1]						
		1	2	3	4	5	6	7
Lobularia maritime	Sweet alyssum	*						
Lotus spp.	Deer weed	*	*				*	
Lupinus chamissonas	Silver lupine	*						
Marrubium vulgare	Horehound	*						
Medicago polymorpha	California burclover				*			
Melotis indica	Yellow sweet clover	*		*	*			*
Mimulus aurantiacus	Sticky monkey flower	*	*					*
Opuntia ficus-indica	India-fig			*				
Oxalis pes-caprae	Bermuda buttercup		*	*				
Plantago coronopus	Cut leaf plantain	*	*					
Pteridium aquilinum	Bracken	*	*					
Rhamnus crocea	California coffeeberry	*						
Rubus ursinus	Wild blackberry	*	*					
Salvia mellifera	Black sage		*	*				
Salvia spathacea	Hummingbird sage	*						
Sambucchus mexicana	Mexican elderberry			*	*			
Scrophularia atrata[2,3,4]	Black flowered figwort	*		*		*	*	*
Silybum marianum	Milk thistle	*		*				*
Solanum douglasii	Black nightshade	*						*
Solanum xanti	Purple nightshade	*						
Stachys bullata	Hedge nettle	*						
Toxicodendron diversilobum	Poison oak	*	*	*				
Urtica dioica	Stinging nettle			*				
Verbena californica	California vervain	*						

1 * = Segment where species occurs.
2 Due to the difficulty of distinguishing between the two subspecies, all *Horkeila californica* found during the field surveys was treated as subspecies *sericea* (C. Gillespie, pers. comm.).
3 Federal Species of Concern.
4 California Native Plant Society 1B – Rare or endangered in California and elsewhere.

Table C-2. Wildlife species observed throughout the biological survey corridor or documented on previous surveys within specific portions of the route

Common Name *Scientific Name*	Segment[1]						
	1	2	3	4	5	6	7
Monarch butterfly *Danaus plexippus*	*		*		H	H	H
Tidewater goby *Eucyclogobius newberryi*[2,8]					G		
Ensatina *Ensatina eschscholzii*	C		C	C			
Arboreal salamander *Aneides lugubris*	C		C	C			
Western toad *Bufo boreas*				*	A		
California red-legged frog *Rana aurora draytonii*[3,8]					A		B
Pacific treefrog *Pseudacris regilla*	C		C,H	C,H	A,H	H	H
California horned lizard *Phrynosoma coronatum frontale*[4,8]					H	H	H
Western fence lizard *Sceloporus occidentalis*	*	*	*	C,H	A,H	H	*
Western skink *Eumeces skiltonianus*	C		*	C			
Southern alligator lizard *Elgaria multicarinata*	*		*	C,H	H	H	A,H
Silvery legless lizard *Anniella pulchra pulchra*[4,8]			H	H	H		
California whipsnake *Masticophis lateralis lateralis*					H	H	H
Gopher snake *Pituophis melanoleucus*	C		C	C			
Western terrestrial garter snake *Thamnophis elegans*	C		C	C			
Two-striped garter snake *Thamnophis hammondii*[8]					A		
Common garter snake *Thamnophis sirtalis*	C		*	C			
Western rattlesnake *Crotalus viridis*			H	H	H	H	H
Pied-billed grebe *Apodilymbus podiceps*			H	H	H		
Great blue heron *Aredea herodias*			H	H	H		
Great egret *Ardea alba*			H	H	H		

1 * = Species observed during biological surveys for Proposed Action A = Christopher 1996 B = Christopher 2002
C = Coulombe & Mahrdt 1976 D = Davis 2001 E = Holmgren & Collins 1999 F = Meade 1999 G = Swift 1997 H = SRS 2001
2 Federal Endangered Species
3 Federal Threatened Species
4 Federally Protected (Bald and Golden Eagle Protection Act)
5 Federal Species of Concern
6 Federal Delisted Species
7 State Endangered Species
8 California Species of Concern

Common Name *Scientific Name*	Segment[1]						
	1	2	3	4	5	6	7
Turkey vulture *Canthartes aura*	*		H	H	H	H	H
Hooded merganser *Lophodytes cucullatus*					H	H	H
Ruddy duck *Oxyura jamaicensis*				H	H	H	H
White-tailed kite *Elanus leucurus*[4]							E
Northern harrier *Circus cyaneus*[8]			*	*	H		E
Sharp-shinned hawk *Accipiter striatus*[8]					E		
Cooper's hawk *Accipiter cooperii*[8]					E		
Red-shouldered hawk *Buteo lineatus*			H	H	H		
Red-tailed hawk *Buteo janaicensis*	*		H	H	H	H	H
American kestrel *Falco sparverius*			H	D,H	H	H	H
American peregrine falcon *Falco peregrinus anatum*[6,7]					E		E
California quail *Callipepla californica*	*		*	H	H	H	H
Sora *Porzana carolina*					H	H	H
American coot *Fulica americana*			H	H	H	H	H
Killdeer *Charadrius vociferous*			H	H	H	H	H
Western gull *Larus occidentalis*			H	H	H		
Mourning dove *Zenaida macroura*	*		H	H	H	H	H
Great horned owl *Bubo virginianus*			H	H	H		
Western burrowing owl *Athene cunicularia hypugaea*[4,8]	E				E		E
White-throated swift *Aeronautes saxitalis*					H	H	H
Anna's hummingbird *Calypte anna*	*		H	H	H		
Nuttall's woodpecker *Picoides nutallii*			H	H	H	H	H
Northern flicker *Colaptes auratus*	*		*	H	H	H	H

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Common Name *Scientific Name*	Segment[1]						
	1	2	3	4	5	6	7
Black phoebe *Sayornis nigricans*			H	H	H	H	H
Loggerhead shrike *Lanius ludovicianus*[4,8]	E		H	H	H	H	E,H
Hutton's vireo *Vireo huttoni*			H	H	H		
Western scrub jay *Aphelocoma californica*	*		H	H	H	H	H
American crow *Corvus brachyrhynchos*			H	H	H		
Tree swallow *Tachycineta bicolor*					H	H	H
Northern rough-winged swallow *Stelgidopteryx serripennis*					E		
Cliff swallow *Petrochelidon pyrrhonota*				*	H	H	H
Barn swallow *Hirundo rustica*					H	H	H
Chestnut-backed chickadee *Poecile rufescens*			H	H	H	H	H
Bushtit *Psaltriparus minimus*		*	H	H	E,H	H	H
Canyon wren *Catherpes mexicanus*					H	H	H
Bewick's wren *Thrymanes bewickii*					H	H	H
House wren *Troglodytes aedon*			H	H	H	H	H
Marsh wren *Cistothorus palustris*					H	H	H
Ruby-crowned kinglet *Regulus calendula*			H	H	H		
Wrentit *Chamaea fasciata*		*	*	H	H	H	*
Northern mockingbird *Mimus polyglottos*					H		
California thrasher *Toxostoma redivivum*[4]			H	*	H	H	H
European starling *Sturnus vulgaris*					H	H	H
Orange-crowned warbler *Vermivora celata*			H	H	H		
Yellow-rumped warbler *Dendroica coronata*	*						
Wilson's warbler *Wilsonia pusilla*			H	H	E,H		

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Common Name *Scientific Name*	Segment[1] 1	2	3	4	5	6	7
Yellow-breasted chat *Icteria virens*					E		
Spotted towhee *Pipilo maculates*			*	H	H	H	H
California towhee *Pipilo crissalis*				H	H	H	H
California rufous-crowned sparrow *Aimophila ruficeps ruficeps*[8]							E
Bell's sage sparrow *Amphispiza belli belli*[4,8]		E					E
Song sparrow *Melospiza melodia*		*	*	H	E,H	H	H
White-crowned sparrow *Zonotrichia leucophrys*	*			H	E,H	H	H
Dark-eyed junco *Junco hymenalis*			H	H	H		
Black-headed grosbeak *Pheucticus melanocephalus*			H	H	H		
Western meadowlark *Sturnella neglecta*	*						
Brewer's blackbird *Euphages cyanocephalus*			H	H	H		
House finch *Carpodactus mexicanus*			H	*	H	H	*
Lesser goldfinch *Carduelis psaltria*			H	H	E		
American goldfinch *Carduelis tristis*			H	H	H	H	H
Ornate shrew *Sorex ornatus*	C		C	C			
Trowbridge's shrew *Sorex trowbridgii*	C		C	C			
Broad-footed mole *Scapanus latimanus*	C		C	C			
Audubon's (desert) cottontail *Sylvilagus audubonii*			H	H	H		
Brush rabbit *Sylvilagus blochmani*				*	H	H	H
California ground squirrel *Spermophilus beecheyi*				*			
Botta's pocket gopher *Thomomys bottae*	*	*	*	*	*	*	*
California pocket mouse *Chaetodipus californicus*	C		C	C			
Pacific kangaroo rat *Dipodomys agilis*	C		C	C			

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Common Name *Scientific Name*	Segment[1] 1	2	3	4	5	6	7
Heerman's kangaroo rat *Dipodomys heermanni*	C,D		C	C			
Western harvest mouse *Rheithrodontomys megalotis*	C		C	C			
California mouse *Peromyscus californicus*	C,D		C,D	D			
Deer mouse *Peromyscus maniculatus*	C,D		C,D	C			
Pinyon mouse *Peromyscus truei*			D,H	H	H		
Dusky-footed woodrat *Neotoma fuscipes*	C		C,D,H	C,D,H	H	H	H
San Diego desert woodrat *Neotoma lepida intermedia*[8]	C		C	C			
California vole *Microtus californicus*	C		C	C			
Coyote *Canis latrans*	*	*	*	*	*	*	*
Gray fox *Urocyon cinereoargenteus*			H	D,H	H		
Raccoon *Procyon lotor*	D				H	H	H
American badger *Taxidea taxus*					H	H	H
Striped skunk *Mephitis mephitis*					H	H	H
Mountain lion *Felis concolor*			H	H	H		
Bobcat *Felis rufus*			H	H	C,H	H	H
Black-tailed (mule) deer *Odocoieius hemionus*	*	*	H	H	H		

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APPENDIX D

AIR QUALITY ANALYSIS

Air Quality Analysis

Technical Assumptions and Emission Calculation

Data was obtained from Shauna Grider, P.E., Project Engineer, 30th Civil Engineer Squadron (CES), who is responsible for preparing the engineering analysis for the Proposed Action. The proposed waterline – which would be installed using primarily open trenching technology, but would also directional drilling at two bore sites - would replace an existing system that is in deteriorating condition and is lacking capacity. Detailed analysis of the construction equipment for the Proposed Action is presented in Table D-1. Detailed analysis of the factors used to estimate the emissions are presented in Table D-2. Numerous assumptions that are based on normal construction practices were used to augment the CES data to estimate the emissions for the Proposed Action.

Table D-1. Equipment Usage.

Emission Source	Fuel	Horse Power Rating (HP)	Load Factor	Number of Units	Daily Duration (hours)	Project Duration (days)	Project Usage (hours total)
Backhoe/Skip loader, Cat 410D	diesel	97	0.465	1	2	340	680
Boring Jack Unit, DD-1, American Augers	diesel	20	0.75	1	6	30	180
Bulldozer, Track, John Deere 450H	diesel	74	0.59	1	3	30	90
Compactor Ingersol Rand, SD-40	diesel	80	0.66	1	6	300	1,800
Crane - 30 Ton, Grove	diesel	175	0.43	1	1	30	30
Dump Truck, End	diesel	250	0.47	1	3	30	90
Excavator, Track Hitachi EX370	diesel	184	0.58	1	6	300	1,800
Forklift, AWD, 10klbs, 534D, Gradall	diesel	116	0.30	1	2	300	600
Generator, 48kW	diesel	64	0.68	1	3	300	900
Loader, Wheeled, Komatsu WA450	diesel	260	0.465	1	3	300	900
Motor Grader Cat 140H	diesel	138	0.575	1	1	8	8
Pressure Grouting Equipment	gasoline	50	0.48	1	0.5	15	8
Pump, Dewatering	gasoline	15	0.74	1	0.5	15	8
Street Sweeper, Sweepmaster25, Waldon	diesel	80	0.68	1	0.5	300	150
Water Truck Ford L-800	diesel	210	0.47	1	2	300	600
Miscellaneous Delivery Trucks [(a)]	n/a	30	n/a	6	n/a	200	72,000
Worker Commuting [(a)]	n/a	15	n/a	15	n/a	340	153,000
Fugitive Dust [(b)] - Peak Day	n/a	2.77	n/a	n/a	n/a	1	n/a
Fugitive Dust [(b)] - Average Day	n/a	0.28	n/a	n/a	n/a	340	n/a

(a) Power Rating is the number of miles traveled in a one-way trip. Number of Units is the number of one-way trips. Project Usage is for total mileage.
(b) Horse Power Rating is acres disturbed per day and is used to calculate fugitive emissions

Table D-2. Emission Factors Used to Estimate Emissions.

Emission Source	Emission Factors (gm/hr-hr)					Vehicle Category[a]
	CO	NO_x	PM_{10}	ROC	SO_x	
Backhoe/Skip loader, Cat 410D	2.71	8.80	0.76	1.12	0.19	Wheeled Loader
Boring Jack Unit, DD-1, American Augers	3.03	8.40	0.95	0.97	0.19	Miscellaneous
Bulldozer, Track, John Deere 450H	2.15	8.80	0.66	0.88	0.19	Track-type Tractor
Compactor Ingersol Rand, SD-40	4.60	8.80	0.86	1.16	0.21	Miscellaneous
Crane, 30 Ton, Grove	4.60	8.80	0.86	1.16	0.21	Miscellaneous
Dump Truck, End	4.70	22.80	1.00	1.20	0.40	Off-Highway Truck
Excavator, Track Hitachi EX370	2.15	8.80	0.66	0.88	0.19	Track-type Tractor
Forklift, AWD, 10klbs, 534D, Gradall	4.28	8.80	0.86	1.16	0.21	Miscellaneous
Generator, 50 kW	3.03	11.20	0.95	1.27	0.21	Industrial
Loader, Wheeled, Komatsu WA450	2.71	8.80	0.76	1.12	0.19	Wheeled Loader
Motor Grader Cat 140H	1.54	8.80	0.59	0.46	0.20	Motor Grader
Pressure Grouting Equipment	3.03	11.20	0.95	1.27	0.21	Industrial
Pump, Dewatering	198.00	4.79	0.30	6.13	0.26	Gasoline Misc.
Street Sweeper, Sweepmaster25, Waldon	4.28	8.80	0.86	1.16	0.21	Miscellaneous
Water Truck Ford L-800	4.70	22.80	1.00	1.20	0.40	Off-Highway Truck
Miscellaneous Delivery Trucks[b]	0.025508	0.031208	0.001003	0.003362	0.000241	EMFAC2002
Worker Commuting[b]	0.01815	0.002014	0.000112	0.001935	0.00001	EMFAC2002
Fugitive Dust[c]	0.00	0.00	10.91	0.00	0.00	SBCAPCD

(a) Emission factors from SBCAPCD Form 24, controlled emissions.
(b) Emission factor from SCAQMD CEQA On-Road Vehicles 2003 are in lbs/mile.
(c) Emission factor is uncontrolled is in units of lbs/acre-hr.

Proposed Action

The proposed waterline project is scheduled to last for 17 months. It is assumed the average workday would be eight hours. The estimated crew size would be 20 workers. One-half of the workers would carpool from a local company to the Vandenberg AFB job site for the length of the project. For employee commuting, the average, one-way commute is assumed to 15 miles. For work trucks, the average, one-way commute would be 30 miles. All delivery supply trucks are assumed to travel 15 miles one-way, while concrete trucks are assumed to travel 12.5 miles one-way.

Maps were used to estimate the area disturbed by the construction equipment. It was assumed that for a reasonable, worst-case day, one-fifth of the area would be disturbed; for the average day, one-tenth of the area would be disturbed.

The emissions from the various sources were estimated on daily and project basis. The daily emissions were calculated by multiplying the emission factor by the appropriate equipment usage rate. Except for the PM_{10} emissions, the project emissions were estimated by multiplying the daily emissions for each source by the duration of the project. For the PM_{10} emissions, the project emissions were obtained by multiplying the average area disturbed by the length of the day and the duration of the project. Daily and total emissions for the construction project are presented in Tables D-3 and D-4, respectively.

Table D-3. Proposed Action SLC-4 to SLC-6 Replacement Waterline Daily Emissions.

Emission Source	Daily Emissions (Lbs)				
	CO	NO_x	PM_{10}	ROC	SO_x
Backhoe/Skiploader, Cat 410D	0.5	1.8	0.2	0.2	0.0
Boring Jack Unit, DD-1, American Augers	0.6	1.7	0.2	0.2	0.0
Bulldozer, Track, John Deere 450H	0.6	2.5	0.2	0.3	0.1
Compactor Ingersol Rand, SD-40	3.2	6.1	0.6	0.8	0.1
Crane, 30 Ton R	0.8	1.5	0.1	0.2	0.0
Dump Truck, End	3.7	17.7	0.8	0.9	0.3
Excavator, Track Hitachi EX370	3.0	12.4	0.9	1.2	0.3
Forklift, AWD, 10klbs, 534D, Gradall	0.7	1.4	0.1	0.2	0.0
Generator, 50 kW	0.9	3.2	0.3	0.4	0.1
Loader, Wheeled, Komatsu WA450	2.2	7.0	0.6	0.9	0.2
Motor Grader Cat 140H	0.3	1.5	0.1	0.1	0.0
Pressure Grouting Equipment	5.2	0.1	0.0	0.2	0.0
Pump, Dewatering	2.4	0.1	0.0	0.1	0.0
Street Sweeper, Sweepmaster25, Waldon	0.3	0.5	0.1	0.1	0.0
Water Truck Ford L-800	2.0	9.9	0.4	0.5	0.2
Miscellaneous Delivery Trucks	4.6	5.6	0.2	0.6	0.0
Worker Commuting	4.1	0.5	0.0	0.4	0.0
Fugitive Dust	0.0	0.0	241.6	0.0	0.0
Total	**29.9**	**73.7**	**246.5**	**7.1**	**1.4**

Table D-4. Proposed Action SLC-4 to SLC-6 Replacement Waterline Total Emissions.

Emission Source	Project Emissions (Lbs)				
	CO	NO_x	PM_{10}	ROC	SO_x
Backhoe/Skiploader, Cat 410D	183.2	595.0	51.4	75.7	12.8
Boring Jack Unit, DD-1, American Augers	18.0	50.0	5.7	5.8	1.1
Bulldozer, Track, John Deere 450H	18.6	76.2	5.7	7.6	1.6
Compactor Ingersol Rand, SD-40	963.8	1,843.8	180.2	243.0	44.0
Crane, 30 Ton R	22.9	43.8	4.3	5.8	1.0
Dump Truck, End	109.6	531.5	23.3	28.0	9.3
Excavator, Track Hitachi EX370	910.5	3,726.7	279.5	372.7	80.5
Forklift, AWD, 10klbs, 534D, Gradall	197.0	405.1	39.6	53.4	9.7
Generator, 50 kW	261.6	967.1	82.0	109.7	18.1
Loader, Wheeled, Komatsu WA450	650.1	2,111.0	182.3	268.7	45.6
Motor Grader Cat 140H	2.2	12.3	0.8	0.6	0.3
Pressure Grouting Equipment	78.6	1.9	0.1	2.4	0.1
Pump, Dewatering	36.3	0.9	0.1	1.1	0.0
Street Sweeper, Sweepmaster25, Waldon	77.0	158.3	15.5	20.9	3.8
Water Truck Ford L-800	261.1	65.3	0.0	0.0	0.0
Miscellaneous Delivery Trucks	1,836.6	2,247.0	72.2	242.1	17.4
Worker Commuting	2,777.0	308.1	17.1	296.1	1.5
Fugitive Dust	0.0	0.0	8,215.9	0.0	0.0
Total (Lbs)	**8,679.2**	**16,058.0**	**9,306.5**	**1,888.3**	**299.1**
Total (Tons)	**4.34**	**8.03**	**4.65**	**0.94**	**0.15**

Conformity Determination

The U.S. Air Force is required to make a formal conformity analysis to determine whether the Proposed Action at Vandenberg AFB complies with the air conformity rule found in the CAA. This determination is in accordance with conformity requirements set for the in 40 CFR 93.153 (b) and (c), *Determining Conformity of Federal Actions to State or Federal Implementation Plans, Applicability,* and section 176(c)(4) of the CAA.

Background

The U.S. EPA Final Conformity Rule requires federal agencies to ensure that all agency activity conforms to state- or federally-approved implementation plans. Conformity means ensuring the federal activity will not:

1. Cause a new violation of the National Ambient Air Quality Standards (NAAQS).
2. Contribute to an increase in the frequency or severity of violations of existing NAAQS.
3. Delay the timely attainment of any NAAQS, interim milestones, or other milestones to achieve attainment.

The general conformity rule applies to federal actions that are not covered by the transportation conformity rule. Other than the listed exemptions and presumptions of conformity, the general conformity rule applies to actions in which projected emissions exceed applicable conformity *de minimis* thresholds. If project emissions are less than *de minimis* thresholds and are 10 percent or more of a nonattainment or maintenance area's total emissions of any criteria pollutant, then the action is considered "regionally significant" and the requirements of conformity determination apply. If the Proposed Action's direct and indirect emissions are less than the established *de minimis* thresholds, and are not considered regionally significant, the project is then assumed to be in conformity, and formal reporting of the conformity determination is not required.

Emission Thresholds and Quantification

The emission threshold for determining conformity is based on the NAAQS attainment standard for Santa Barbara County. Santa Barbara County is in attainment or unclassifiable for the NAAQS for carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter 10 microns or less diameter (PM_{10}), sulfur dioxide (SO_2), and ozone (O_3). The US EPA Region 9 has declared that the county is in attainment of the federal 1-hour ozone standard (USEPA Region 9 2003). U.S. EPA threshold limits used to determine general conformity are listed in Table D-5.

Emission quantification is defined as the sum of all direct and indirect criteria pollutants and precursor emissions, including stationary and mobile emission sources. Timing and location rather than the type of emission source distinguishes direct and indirect emissions. Direct emissions occur at the same time and place as the federal action. Indirect emissions include those that may occur later or at a distance from the federal action. General conformity limits the scope of indirect emissions to those that can be quantified and are reasonably foreseeable by the federal agency at the time of analysis, and those for which the federal agency can practicably control and will maintain control through its continuing program management responsibilities.

Table D-5. U.S. EPA Threshold Limits Used to Determine General Conformity

Criteria Pollutant Maintenance Status	Threshold Level (Tons/Year)
Ozone (NO, NO_2 or SO) All Maintenance Areas	100
Ozone [Volatile Organic Compound's (VOC's)]	
Maintenance areas inside an ozone transportation region	50
Maintenance areas outside an ozone transportation region	100
CO – All Maintenance Areas	100
PM_{10} - All Maintenance Areas	100
Pb - All Maintenance Areas	25

Source: 40 CFR 93.153(b).

Emissions Summary

As part of this conformity determination, the project emissions were compared with the Santa Barbara County's emissions. The latest, approved emission inventory is the 1999 Annual Emission Inventory, as found in the 2001 Clean Air Plan. Because Outer Continental Shelf sources are now part of Santa Barbara County Air Pollution Control District (SBCAPCD) jurisdiction and contribute to air quality impacts in Santa Barbara County, Outer Continental Shelf emission sources are included in the total emissions. Both inventories and the emission amounts that qualify as regional significant are presented in Table D-6. In Santa Barbara County, the term Reactive Organic Compounds (ROC) is used to describe that portion of Volatile Organic Compounds (VOC) that readily react in the atmosphere and produce ozone. The definition of ROC found in SBCAPCD Rule 102, *Definitions*, is identical to the U.S. EPA definition of VOC. They are used synonymously in this analysis.

Table D-6. 1999 Santa Barbara County (SBC) Annual Emission Inventory

Source	Annual Emissions (Tons/Year)	
	NO_x	ROC
Santa Barbara County		
Stationary Sources	2,001.46	3,051.82
Area-Wide Sources	551.05	3,270.75
Mobile Sources	15,316.54	9,351.65
Outer Continental Shelf		
Stationary Sources	254.99	377.24
Mobile Sources	10,356.26	651.23
Total SBC	***28,480.30***	***16,702.69***
Regional Significant Emissions	***2,848.03***	***1,670.27***

Source: 2001 Santa Barbara County APCD Clean Air Plan

Proposed Action Emissions and Conformity Determination

Due to the maintenance status of ozone for Santa Barbara County, the corresponding threshold of 100 tons per year for O_3 is used to determine general conformity. Table D-7 shows a comparison of the estimated annual project emissions with threshold levels and with regional significant emission levels.

Table D-7. Proposed Action Emissions at Vandenberg AFB

Source	Annual Emissions (Tons/Year)	
	NO_x	ROC
Project Emissions[(a)]	8.03	0.94
De minimis Thresholds	100.00	100.00
Regional Significant Emission Levels	2,848.03	1,670.27

Note: (a) These are project totals for 17 months, which are greater than yearly totals.

The total direct and indirect emissions from the SLC-4 to SLC-6 Replacement Waterline project would not exceed Federal *de minimis* conformity threshold values for O_3 precursors (NO_x and VOCs). In addition, total emissions of NO_x and VOCs from the Proposed Action would be less than 10 percent of the latest approved Annual Emission Inventory for Santa Barbara County (2001 SBCAPCD Clean Air Plan). The Proposed Action is therefore deemed *de minimis* and not regionally significant and is exempt from further conformity requirements.