DEPARTMENT OF THE AIR FORCE
UNITED STATES SPACE FORCE
SPACE LAUNCH DELTA 30

25 Oct 21

MEMORANDUM FOR ALL INTERESTED GOVERNMENT AGENCIES, PUBLIC OFFICIALS, ORGANIZATIONS, AND INDIVIDUAL PARTIES

FROM: 30 CES/CEI
1028 Iceland Avenue
Vandenberg SFB CA 93437-6010

SUBJECT: Final Draft Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) Pre-launch and Launch Operations of ABL Space Systems RS1 at Launch Complex 576-E, Vandenberg Space Force Base, California.

1. Attached as public and agency notification, to comply with the National Environmental Policy Act of 1969, and the President's Council on Environmental Quality's implementing regulations, is the Final Draft EA and FONSI for Pre-launch and Launch Operations of ABL Space Systems RS1 at Launch Complex 576-E, Vandenberg Space Force Base, California.

2. This Final Draft EA is available at: the Lompoc, Santa Maria, and Santa Barbara Public Libraries, and the VSFB Library. The Proposed Action is to operate the ABL Space Systems (ABL) RS1 launch vehicle at Launch Complex 576-E (LC 576-E) on Vandenberg Space Force Base, California and the associated infrastructure improvements needed to LC 576-E for the launch program. Resources analyzed in the attached Final Draft EA include air quality, sound (airborne), biological resources, water resources, cultural resources, Department of Transportation Act Section 4(f) properties, recreation, transportation, human health and safety, hazardous materials and waste management, solid waste management, and Coastal Zone management. This Final Draft EA concludes that there will be no significant environmental impacts resulting from the Proposed Action.

3. The public comment period for this Final Draft EA/FONSI will be from 27 October 2021 through 26 November 2021. Comments may be sent to Space Launch Delta 30, Installation Management Flight Environmental Assets, 1028 Iceland Avenue, Building 11146, Vandenberg Space Force Base, California 93437, attention of Ms. Samantha Kaisersatt, emailed to samantha.kaisersatt@spaceforce.mil, or faxed to (805) 606-6137. If you have any questions, please contact Ms. Samantha Kaisersatt at (805) 605-8684.

10/25/2021

X Beatrice L Kephart
Beatrice L Kephart
Signed by: KEPHART.BEATRICE.LINDA.1166122291

BEATRICE L. KEPHART
Chief, Installation Management Flight

Attachment:
Final Draft EA and FONSI for Pre-launch and Launch Operations of ABL Space Systems RS1 at Launch Complex 576-E, Vandenberg Space Force Base, California.

FINDING OF NO SIGNIFICANT IMPACT
Pre-launch and Launch Operations of ABL Space Systems RS1 at Launch Complex 576-E, Vandenberg Space Force Base, California

This Finding of No Significant Impact (FONSI) hereby incorporates by reference and attaches hereto the *Draft Environmental Assessment* (EA), *Pre-launch and Launch Operations of ABL Space Systems RS1 at Launch Complex 576-E (LC 576-E), Vandenberg Space Force Base* (VSFB)*, California*. The EA considered all potential environmental impacts of the Proposed Action (Alternative 1) and the No Action Alternative, including cumulative impacts, and identified management protective measures to avoid, prevent, or minimize environmental impacts.

PROPOSED ACTION (ALTERNATIVE 1)

The Proposed Action (Alternative 1) would improve LC 576-E infrastructure, and operate and maintain the ABL Space Systems (ABL) RS1 launch vehicle program at LC 576-E. All RS1 launch vehicle and ground support operations components are deployable. The components would be transported to LC 576-E via trailers and standard shipping containers and configured at the site before each launch. No new buildings or facilities would be constructed. ABL plans on RS1 operations of up to 12 launches and 12 static fires per year. The Proposed Action complies with the National Space Policy to provide reliable U.S. enterprise access to space through an efficient and deployable ground-based launch system with minimal infrastructure requirements. The need for the Proposed Action is to fulfill commercial and governmental requirements for the small satellite orbital and suborbital market; namely, to provide small, responsive, efficient, commercially focused, and low-cost launch vehicles.

NO ACTION ALTERNATIVE

The Council on Environmental Quality's regulation requires assessing the No Action Alternative (40 Code of Federal Regulations [C.F.R.] § 1502.14). Under the No Action Alternative, ABL would not implement the RS1 launch program at LC 576-E; therefore, it would not comply with National Space Policy to promote national economic interests by encouraging commercial investment and space use or meet mission requirements. Thus, the No Action Alternative would not meet the purpose of and need for the Proposed Action, but it is carried forward as a baseline analysis in this EA, as NEPA requires.

SUMMARY OF FINDINGS

The attached EA analyzed the potential environmental consequences of activities associated with the Proposed Action and the No Action Alternative. Based on the analysis, neither the Proposed Action nor the No-Action Alternative would result in individual or cumulatively significant impacts to any resources. However, potential adverse impacts were noted for the Proposed Action to the following resources: air quality, sound (airborne), biological resources, water resources, cultural resources, Department of Transportation Act Section 4(f) properties, recreation, transportation, human health and safety, hazardous materials and waste management, solid waste management, and Coastal Zone management. The No-Action Alternative would result in impacts less than the Proposed Action; however, it would not meet the Proposed Action's

purpose and need. Environmental protection measures that are incorporated into the Proposed Action (identified as required in the EA) would be implemented to avoid and/or minimize the potential adverse impacts. Discretionary environmental protection measures may further reduce potential impacts of the Proposed Action.

PUBLIC REVIEW AND COMMENT

The VSFB made the Draft EA available for public review and comment for 30 days following the publication of the Notice of Availability (NOA) in the *Lompoc Record* and *Santa Maria Times*. VSFB also distributed the Draft EA and FONSI per the current VSFB National Environmental Policy Act (NEPA) Distribution List, including the State Clearinghouse. Appendix N (Notice of Availability for Public Review, Proof of Delivery/Publication, Comments Received on Final Draft, and Responses) will contain a copy of the NOA, proofs of publication, proof of library deliveries, NEPA distribution list, public comments, and VSFB responses.

FINDING OF NO SIGNIFICANT IMPACT

Based on my review of the facts and analyses contained in the attached EA, conducted per the NEPA, 42 U.S. Code 4321 et seq., implementing Council on Environmental Quality Regulations, 40 C.F.R. Parts 1500–1508, and 32 C.F.R. Part 989, *Environmental Impact Analysis Process*, I conclude that implementing the Proposed Action (chosen alternative), with incorporation of required environmental protection measures, will not have a significant effect on the human environment. Therefore, further analysis with an Environmental Impact Statement is not required, and a FONSI is appropriate.

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CLIFFORD THEONY
COLONEL A.

Date

Attachment: Draft Pre-launch and Launch Operations of ABL Space Systems RS1 at Launch Complex 576-E, Vandenberg Space Force Base, California.

DRAFT

Environmental Assessment

Pre-launch and Launch Operations of ABL Space Systems RS1 at Launch Complex 576-E, Vandenberg Space Force Base, California

12 October 2021

Space Launch Delta 30, Installation Management Flight Environmental Assets
1028 Iceland Avenue, Building 11146
Vandenberg Space Force Base, California 93437

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ACRONYMS AND ABBREVIATIONS

µg/m^3	micrograms per cubic meter
2 ROPS	2nd Range Operations Squadron
ABL	ABL Space Systems
ac.	acre(s)
ADI	Area of Direct Impact
ADT	Average Daily Traffic
AADT	Annual Average Daily Traffic
ACAM	Air Conformity Applicability Model
ADI	Area of Direct Impact
AE	Applied Earthworks, Inc.
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFOSH	Air Force Occupational Safety and Health
AOC	Area of Concern
AOI	Area of Interest
APE	Area of Potential Effects
APZ	Accident Potential Zone
Base	Vandenberg Space Force Base
BCC	Federal Bird Species of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
bhp	brake horsepower
BMP	Best Management Practice
BRRC	Blue Ridge Research and Consulting
C&D	construction and demolition
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CCA	California Coastal Act
CCC	California Coastal Commission
CCMP	California Coastal Management Plan
C.C.R.	Code of California Regulations
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
CINMS	Channel Islands National Marine Sanctuary
CNEL	A-weighted Community Noise Equivalent Level
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
CRLF	California red-legged frog
CSLA	Commercial Space Launch Act
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DAF	Department of the Air Force
dB	decibel(s)
dBA	A-weighted decibel(s)
dBC	C-weighted decibel(s)
DNL	Day-Night Average Sound Level
DoD	Department of Defense
DoDI	Department of Defense Instruction
DOT	Department of Transportation
DPS	Distinct Population Segment
DTSC	California Department of Toxic Substances Control
EA	Environmental Assessment
EBS	Environmental Baseline Survey
EIS	Environmental Impact Statement
EMS	Environmental Management System
EO	Executive Order
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
EPM	Environmental Protection Measure
ERP	Environmental Restoration Program
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FE	federally endangered
FHWA	Federal Highway Administration
FR	Federal Register
ft.	foot/feet
FT	federally threatened
GHG	greenhouse gas
GIS	Geographic Information Systems
GPS	Global Positioning System
GSO	Ground Support Operations
HazMart	Hazardous Materials Pharmacy
HMERP	Hazardous Materials Emergency Response Plan
HMMP	Hazardous Materials Management Process
hp	horsepower
HWMP	Hazardous Waste Management Plan
Hwy	Highway
ICBM	Intercontinental Ballistic Missile
IRP	Installation Restoration Program

ISWMP	Integrated Solid Waste Management Plan
km	kilometer(s)
km^2	square kilometer(s)
LC 576-E	Launch Complex 576-E
LCZ	Lateral Clear Zone
L_{eq}	single equivalent sound level
L_{eq1H}	the continuous sound level that would contain the same acoustical energy for 1 hour as the fluctuating sound levels during the same period
LETE	California least tern
LOA	Letter of Authorization
LOS	Level of Service
m	meter(s)
MAMU	Marbled Murrelet
MBTA	Migratory Bird Treaty Act
mi.	mile(s)
MMPA	Marine Mammal Protection Act
MMRP	Military Munitions Response Program
MSRS	ManTech SRS Technologies, Inc.
NAAQS	National Ambient Air Quality Standards
Navy	U.S. Department of the Navy
NCI	Northern Channel Islands
ND	Negative Determination
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NO_x	nitrogen oxide
NMFS	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NOTAM	Notice to Airmen
NOTMAR	Local Notice to Mariners
NRHP	National Register of Historic Places
O_3	ozone
OEL	Occupational Exposure Limit
OEEL	Occupational and Environmental Exposure Limit
OSHA	Occupational Safety and Health Administration
PBO	Programmatic Biological Opinion
$PM_{2.5}$	particulate matter less than 2.5 microns
PM_{10}	particulate matter less than 10 microns
POLs	petroleum, oil, and lubricants
ppb	part(s) per billion
ppm	part(s) per million
psf	pound(s) per square foot
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
ROI	region of influence
RP-1	rocket propellant
RWQCB	Regional Water Quality Control Board
SAR	stock assessment report
SBCAPCD	Santa Barbara County Air Pollution Control District
SCC	State Candidate Species
SCE	State Candidate Endangered
SE	State Endangered Species
SHPO	State Historic Preservation Officer
SLC	Space Launch Complex
SLD 30	Space Launch Delta 30
SLD 30/CEI	Space Launch Delta 30, Installation Management Flight
SLD 30/CEIEC	Space Launch Delta 30, Installation Management Flight, Environmental Quality
SLD 30/SEL	Space Launch Delta 30, Launch Safety
SLD 30/SEW	Space Launch Delta 30, Weapons Safety Office
SMI	San Miguel Island
SNPL	western snowy plover
SO_2	sulfur dioxide
SO_x	sulfur oxides
SPL	Sound Pressure Level
SR	State Route
SSC	State Species of Special Concern
SSPP	Strategic Sustainability and Performance Plan
SWI	Space Wing Instruction
SWRCB	State Water Resources Control Board
SYBCI	Santa Ynez Band of Chumash Indians
TCE	trichloroethylene
TCH	toxic hazard corridors
TI	Traffic Index
U.S.	United States
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance
VSFB	Vandenberg Space Force Base
V/C	volume-to-capacity
VOC	volatile organic compounds
VSMR	Vandenberg State Marine Reserve

1.0 Introduction

Space Launch Delta 30 (SLD 30), Vandenberg Space Force Base (VSFB or Base), California, prepared this Environmental Assessment (EA). This EA evaluates the potential environmental impacts associated with operating ABL Space Systems (ABL) RS1 launch vehicle at Launch Complex 576-E (LC 576-E) on VSFB, and LC 576-E associated infrastructure improvements needed. Congress, under the U.S. Commercial Space Launch Act (CSLA), 51 United States Code (U.S.C.) Subtitle V, Chapter 509, Sections 50901-50923, provided the Department of Transportation (DOT) statutory direction to, in part, "protect the public health and safety, safety of property, and national security and foreign policy interests of the United States" while "strengthening and [expanding] that United States space transportation infrastructure, including the enhancement of United States launch sites and launch-site support facilities, and development of reentry sites, with Government, State, and private sector involvement, to support the full range of United States space-related activities." Within the DOT, the Secretary of Transportation's authority under the CSLA has been delegated to the Federal Aviation Administration (FAA) Office of Commercial Space Transportation. Per agreements between the Department of the Air Force (DAF) and the FAA, the DAF will act as the lead agency for preparing and coordinating the National Environmental Policy Act (NEPA) documentation for the Proposed Action and the FAA will act as a cooperating agency to review the EA preparation.

This EA was prepared to enable the DAF, FAA, and the public to understand the potential environmental impacts of the proposed ABL RS1 launch program. Because FAA regulations (14 Code of Federal Regulations [C.F.R.] parts 400–460) require an applicant to provide enough information for the FAA to analyze the potential environmental impacts associated with proposed launch activities, this EA has been prepared to comply with the requirements of the NEPA as amended (42 U.S.C. 4321 et seq.); the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 C.F.R. parts 1500–1508); the DAF's Environmental Impact Analysis Process (32 C.F.R. 989), and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.

1.1. Background

The DAF supports the U.S. Government and commercial entities for low-cost and reliable access to space, to make continued space exploration, development and use more affordable. The *2020 National Space Policy* guidelines (in part) are reflected in Table 1.1-1.

Table 1.1-1: National Space Policy Guidelines

National Space Policy Guidelines
✓ Encourage an innovative and entrepreneurial commercial space sector. ✓ Enhance operational efficiency, increase capacity, and reduce launch costs by investing in the modernization for space launch infrastructure. ✓ Develop launch systems and technologies necessary to assure and sustain future reliable and efficient access to space, in cooperation with U.S. industry, when sufficient U.S. commercial capabilities and services do not exist. ✓ Purchase and use commercial space capabilities and services to the maximum practical extent when such capabilities and services are available in the marketplace and meet U.S. Government requirements.

Source: U.S. Government (2020)

1.2. Purpose and Need

The purpose of the Proposed Action, which supports National Space Policy compliance, is to provide reliable U.S. enterprise access to space through an efficient and deployable ground-based launch system with minimal infrastructure requirements. The need for ABL's proposal is to fulfill the requirements of commercial and governmental entities in the small satellite orbital and suborbital market; namely, to provide small, responsive, efficient, commercially focused, and low-cost launch vehicles. The Proposed Action would also fulfill the U.S. expectation of reducing space transportation costs and ensuring continued affordable space exploration, development, and use. The RS1 vehicle and Ground Support Operations (GSOO) design minimizes the need for ground infrastructure and would enable ABL to efficiently conduct lower cost VSFB launch missions to support commercial and government clients.

1.3. Project Location

VSFB occupies approximately 99,100 acres (ac.) (400 square kilometers [km^2]) of central Santa Barbara County, California (Figure 1.3-1). The Santa Ynez River and State Highway 246 divide it into the north Base and south Base. LC 576-E is located on north Base (Figure 1.3-2).

Figure 1.3-1: Regional Location of Proposed Action Area

Figure 1.3-2: Proposed Action Area and Vicinity

1.4. Scope of the Environmental Assessment

This EA identifies, describes, and evaluates the potential environmental impacts that could result from the Proposed Action, reasonable alternatives to the Proposed Action, and the No Action Alternative.

The EA identifies environmental permits relevant to the Proposed Action and describes, in terms of a regional overview or a site-specific description, the affected environment and potential environmental consequences of the action. The EA also identifies management measures to avoid, prevent, or minimize environmental impacts. The resources analyzed can be found in Table 1.4-1.

Table 1.4-1: Environmental Resources Analyzed

Environmental Resources Analyzed	
✓ Air Quality	✓ Sound (Airborne)
✓ Terrestrial Biological Resources	✓ Marine Biological Resources
✓ Water Resources	✓ Cultural Resources
✓ Department of Transportation Act Section 4(f) Properties	✓ Recreation
✓ Transportation	✓ Human Health and Safety
✓ Hazardous Materials and Waste Management	✓ Solid Waste Management
✓ Coastal Zone Management	✓ Utilities
✓ Airspace	

1.5. Interagency Coordination and Consultation

Through the Interagency and Intergovernmental Coordination for Environmental Planning process, SLD 30 notified relevant federal, state, and local agencies, and the surrounding communities of the Proposed Action, and provided them sufficient time to make known their environmental concerns specific to the action.

SLD 30 initiated formal Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) to address potential adverse impacts on federally protected species, associated with routine mission operations and maintenance, including space launch operations that would include the Proposed Action. The USFWS issued the completed consultation as a Programmatic Biological Opinion (PBO) (8-8-13-F-49R [Appendix A]). In addition, to provide coverage for potential impacts on the federally threatened marbled murrelet (*Brachyramphus marmoratus*), which was not included in the PBO, SLD 30 initiated informal consultation with the USFWS and was issued concurrence with our determination that the proposed activities may affect, but are not likely to adversely affect, marbled murrelets on the basis of discountable effects on 27 April 2021 (08EVEN00-2021-I-0293, Appendix A). There are no Endangered Species Act (ESA) protected species under the jurisdiction of National Oceanic and Atmospheric Administration (NOAA) or National Marine Fisheries Service (NMFS) found on VSFB. However, SLD 30 initiated informal consultation with NMFS for potential impacts on the federally endangered Guadalupe fur seal

(*Arctocephalus townsendi*) that is on the Northern Channel Islands (NCI) and NMFS issued SLD 30 concurrence with our determination that the proposed activities may affect but are not likely to adversely affect the Guadalupe fur seal on 20 April 2021 (WCRO-2021-00737, Appendix B).

Under the Marine Mammal Protection Act (MMPA) of 1972, NMFS issued the SLD 30 VSFB regulations (a "Final Rule") for taking marine mammals incidental to U.S. Air Force at VSFB, including launches (NMFS 2019a), and a Letter of Authorization (LOA) (NMFS 2019b; Appendix B). The LOA allows specified VSFB launch programs to unintentionally take small numbers of marine mammals during launches and first stage recovery activities. SLD 30 is required to comply with the conditions listed in the LOA and address NMFS concerns regarding marine mammals at VSFB and the NCI.

The Proposed Action is a federal undertaking subject to compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966 as amended (16 U.S.C. 470 et seq.). VSFB initiated consultation with the State Historic Preservation Officer (SHPO) under 36 C.F.R. Part 800. SLD 30 determined that there would be no historic properties affected by the Proposed Action. The SHPO concurred on 28 July 2021 with SLD 30's determination of no adverse effect to historic properties (Appendix C). Native American traditional cultural properties are also protected by the NHPA of 1966, as amended (16 U.S.C. 470). Per NHPA implementing regulations at 36 C.F.R. Part 800, consultation with, consultation with the Santa Ynez Band of the Chumash Indians is discussed below in Section 1.6 (Intergovernmental Coordination and Consultation).

SLD 30 determined that the Proposed Action would not adversely affect coastal zone resources, and the California Coastal Commission (CCC) concurred with a Negative Determination (ND) on 8 September 2021 for infrastructure improvements at LC 576-E and the operation of the RS1 launch program (ND-0020-21; Appendix D).

The FAA is a cooperating agency because of its role in licensing commercial space launch operations and approving airspace closures for launch operations. The FAA expects to receive a launch license application from ABL for RS1 operations at LC 576-E. If, after reviewing the launch license application and this EA, the FAA determines that ABL's proposed operations fall within the scope of this EA and that the FAA's action of issuing a launch license to ABL for operations at LC 576-E would not result in significant impacts on the human environment, the FAA would adopt this EA and issue its own Finding of No Significant Impact to support issuing a launch license to ABL. The FAA will draw its own conclusions from the analysis presented in this EA and assume responsibility for its environmental decisions and any related mitigation measures. For the FAA to use this analysis to support its determination, the EA must meet the requirements of FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, which contains the FAA's policies and procedures for compliance with NEPA.

1.6. Intergovernmental Coordination and Consultation

The SLD 30 Commander appointed Christopher Ryan (Space Launch Delta 30, Installation Management Flight, Environmental Conservation [SLD 30/CEIEC]) as the Installation Tribal Liaison Officer. Roscoe Loetzerich, Base Archeologist was designated by Mr. Ryan to represent the Space Force in this tribal consultation. Mr. Loetzerich carried out American Indian consultation via

email with Sam Cohen, the Santa Ynez Band of Chumash Indians' (SYBCI) tribal chairman's appointee to SLD 30 for Section 106 consultations. As the SYBCI is a federally recognized tribe, VSFB consulted with it on a government to government basis. On 27 April 2021, SLD 30 notified the SYBCI of the Proposed Action and requested tribal comments on the Proposed Action to initiate government-to-government consultation (Appendix C). The SYBCI responded on 7 October 2021, requesting a map showing the new locations for the four sites that were previously incorrectly mapped and indicating that there were no further concerns with the Proposed Action (Appendix C).

2.0 Description of the Proposed Action and Alternatives

This chapter describes the Proposed Action (Alternative 1) and the No Action Alternative in details, describes selection criteria used to identify and select alternatives, and summarizes alternatives that were considered but eliminated from further analysis. It also details the proposed space launch activities of the RS1 vehicle at LC 576-E at VSFB to support commercial and government customers.

2.1. Selection Criteria

SLD 30 identified a range of reasonable alternatives at VSFB by evaluating the ability of each alternative to meet the purpose and need of the Proposed Action and their ability to meet selection criteria. The proposed satellite launch activities require a land-based site that can accommodate the low-profile mission control and support systems. The criteria for site selection alternatives are summarized in Table 2.1-1.

Table 2.1-1: Criteria for Site Selection Alternatives

Criterion	Description
1	An existing flat area with minimal site improvement requirements.
2	A secure site area that is capable of handling RS1 and sufficient for supporting prelaunch and launch operations.
3	A long-term dedicated site for the ABL RS1 launch program to avoid competing launch schedules and conflicts.

2.2. Alternatives Considered and Eliminated from Further Analysis

In accordance with CEQ Regulations, reasonable alternatives were originally considered for the ABL RS1 launch program, but dismissed from detailed analysis as they did not meet the requirements of the program. Space Launch Complex (SLC)-8 at VSFB and SLC-46 at Cape Canaveral Space Force Station were considered. Both sites provided secure flat areas to support the low-profile RS1 mission control and supporting equipment (Selection Criteria 1 and 2). However, these pads were both common use pads, owned by other entities, and ABL would be required to return them to original condition and relinquish them for use by other programs between launches. For both sites, this would cause delays to the RS1 launch schedule and significantly diminish the ability to meet customer requirements and maintain the proposed launch tempo (12 launches annually). Additionally, the use of SLC-8 would require removing the existing launch ring and redesigning the stool in order for the RS1 to successfully mate to the existing structures, which would require further delays in relinquishing the site between launch events. Therefore, ABL determined that using SLC-8 and SLC-46 under the shared use requirements would not allow them to meet Selection Criterion 3 (Table 2.1-1). These alternatives were eliminated from further consideration, and only the Proposed Action and No

Action Alternative have been carried forward for further evaluation.

2.3. Alternative 1 (Proposed Action)

Alternative 1 includes: infrastructure improvements at LC 576-E and operating the RS1 launch program at LC 576-E. Alternative 1 meets all of the selection criteria as noted in Table 2.3-1.

Table 2.3-1: Alternative 1 Selection Criteria

Proposed Action – LC 576-E	Criterion Met*
LC 576-E is a deactivated launch site with an existing pad that requires little infrastructure improvements for use in the RS1 launch program.	1
LC 576-E is a secure site on VAFB where access to Base is controlled and existing infrastructure and support systems are in place to support multiple ongoing and new space launch programs.	2
LC 576-E can be dedicated by VAFB to the ABL RS1 launch program, therefore eliminating schedule conflicts for use of the site.	3

*See Table 2.1-1 for Criteria for Site Selection Alternatives

2.3.1. Launch Complex 576-E Site Plan and Facility Operation

All RS1 launch vehicle and the Ground Support Operations (GSO) Support System components are deployable and would be transported to LC 576-E via trailers and standard shipping containers and configured at the site prior to each launch (Figures 2.3-1 and 2.3-2). No new buildings or facilities would be constructed.

Figure 2.3-1: GSO Support System Components

ABL would run above-ground fiber optics communications lines and electrical lines from the demarcation points immediately outside the fences to the avionics racks (Figure 2.3-2). Tactical fiber optic lines will connect GSO equipment and RSI to network demarcations, while the electrical lines will supply the primary form of launch pad power. If prime power is lost, a remote-controlled portable 80 horsepower (hp) diesel generator would provide standby power.

28 days prior to launch, staff and equipment would begin arriving on the site. Each launch would be manned by up to 30 staff on site. Staff would utilize Spur Rd. for transporting commodities and equipment as well as parking.

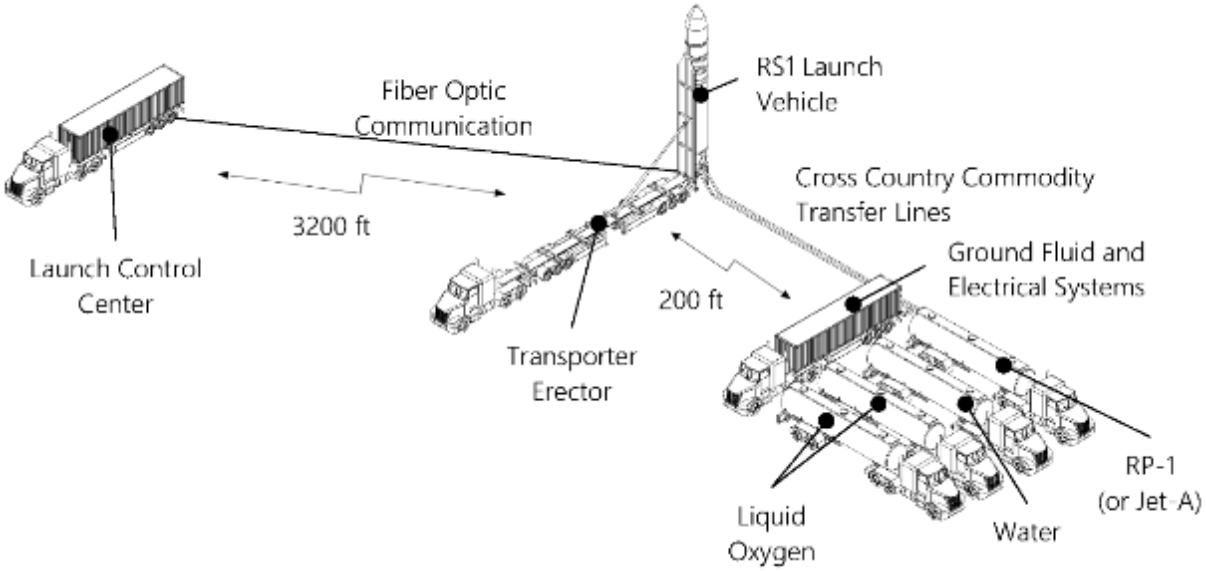

Figure 2.3-2: Example RS1 Launch Site Configuration

2.3.2. Launch Complex 576-E Infrastructure Improvements

To improve the existing infrastructure and meet ABL's requirements, ABL would install new utility lines within the fence line down to 12 inches deep (Figure 2.3-3). ABL would also install up to 10 light poles with a maximum height of 40 feet (ft.) (12 meters [m]) within the fence line in holes dug down to 20 ft. (6.0 m) deep, establish a 40–50-ft. (12 to 15-m) wide firebreak around LC 576-E (Figure 2.3-4), and mow the vegetation between the firebreak and the facility to 6 inches. Light poles would be designed such that they do not illuminate the California least tern (LETE; *Sterna antillarum browni*) nesting area and that they cannot be used as perch or nest sites for avian predators.

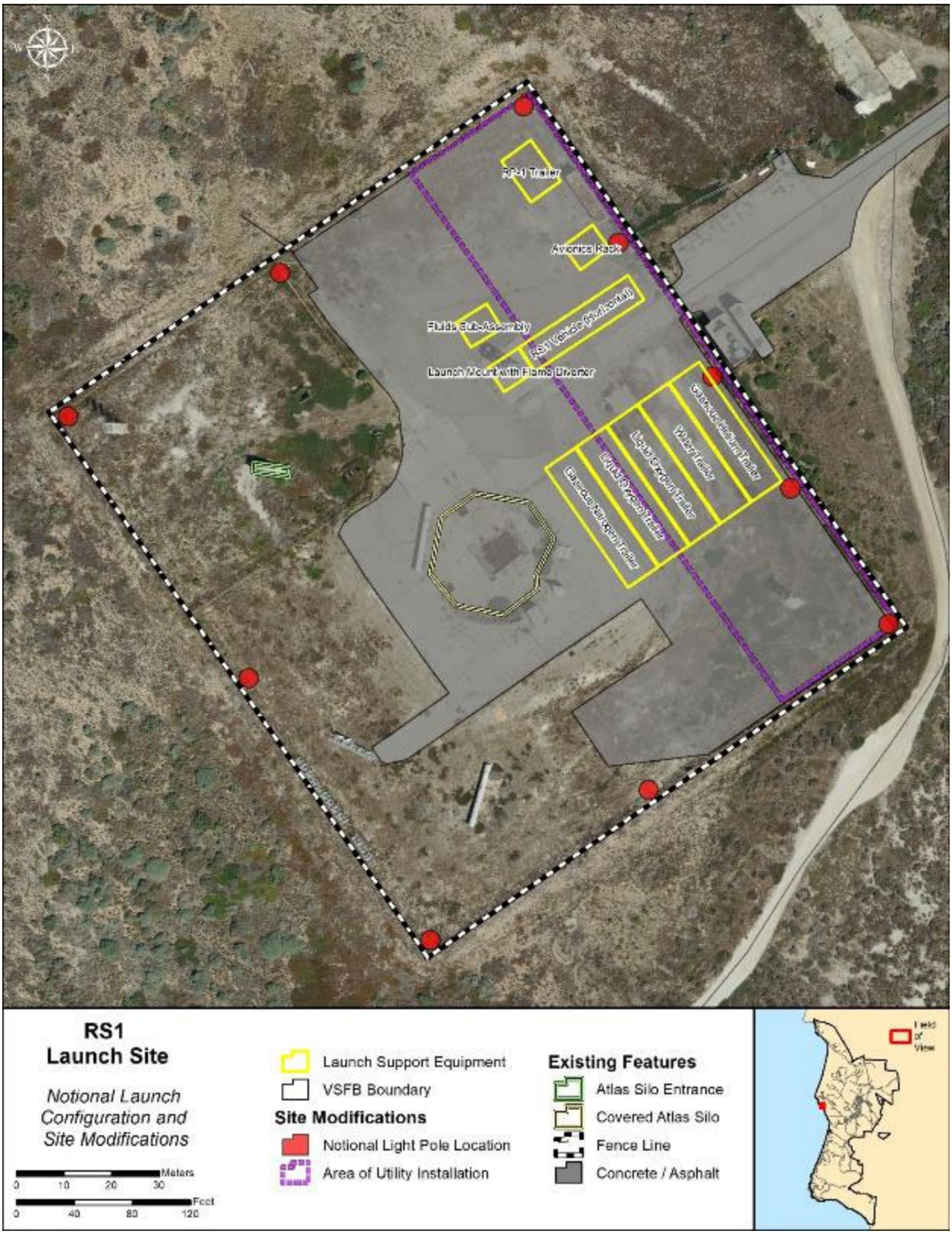

Figure 2.3-3: Notional Launch Configuration and Site Plan at LC 576-E

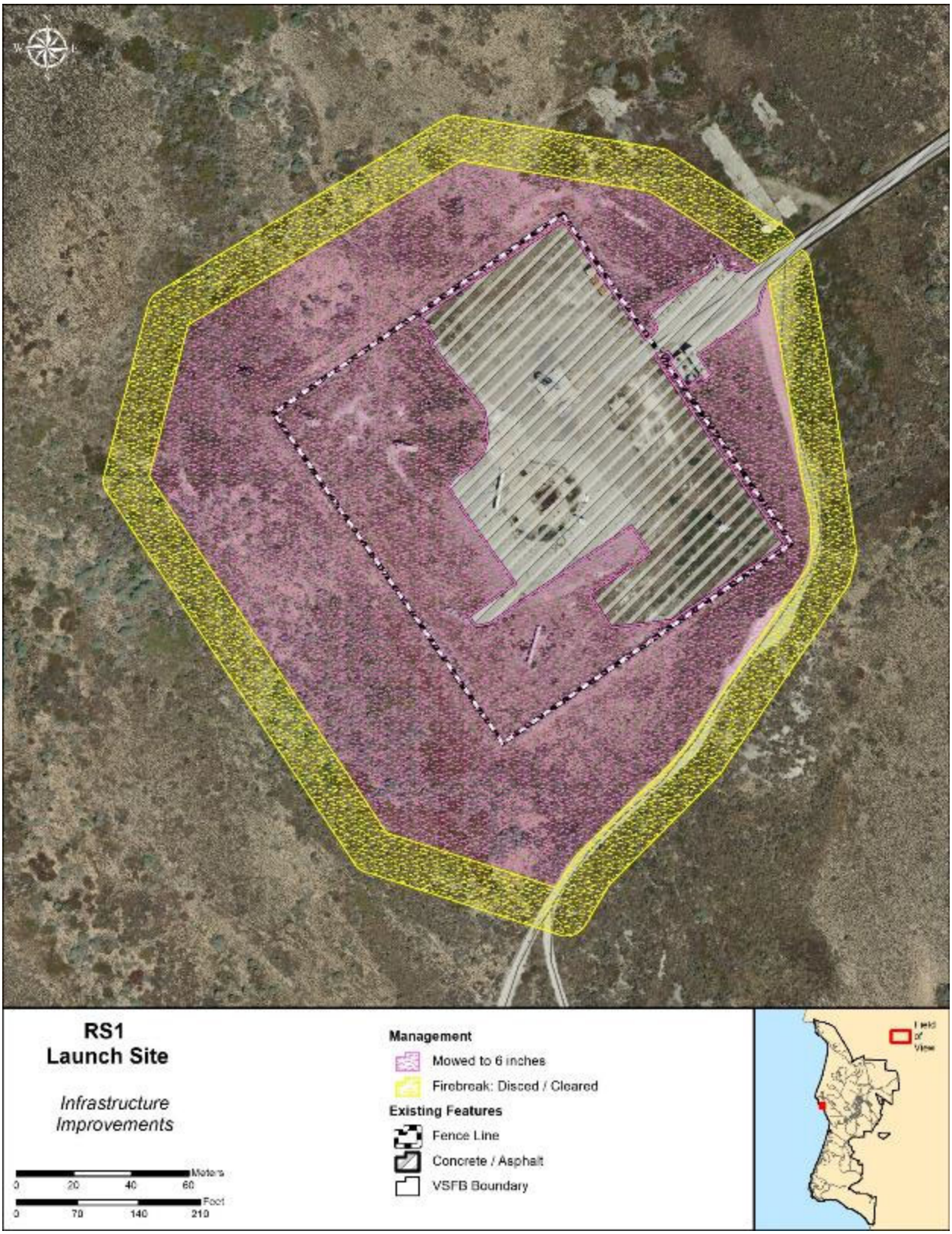

Figure 2.3-4: Infrastructure Improvements

2.3.2.1. Estimated Equipment Needs

Construction is anticipated to require 45 to 60 days. Table 2.3-2 lists the equipment that would be used for the project's construction, and Table 2.3-3 lists the equipment that would be used during launch operations. Generators would be registered under California's Portable Equipment Registration Program.

Table 2.3-2: Estimated Equipment Usage during Construction

Expected Equipment	Brake Horsepower	Estimated Duration (Total Project Hours)
Front-end Loader	50	80
Four (4) concrete mixer trucks (Class IIX)	≥300	24
All-terrain forklift	120	32
Flatbed truck (Class VI)	≤300	24
Two (2) Pickup trucks – crew transport & tool storage (Class II)	350	360
40 kw generator (portable)	80	360

Table 2.3-3: Estimated Equipment Usage during Launch Operations

Expected Equipment	Brake Horsepower	Estimated Duration (Total Project Hours)
36K all-terrain forklift	>300	16
Two (2) All-terrain Reach Forklift	>300	16
Back-up Generators on ATS (Outages only)	80	360
Flatbed truck (Class VI)	≤300	24
Tanker trucks (Commodity delivery)	≤300	8
Cherry Picker/Scissor Lift	>100	8

2.3.3. RS1 Launch Program Operations

The RS1 launch vehicle and typical mission profile are described in detail in Appendix E. ABL proposes to conduct up to 12 launches, during both day and night, and 12 static fire operations of the RS1 launch vehicle at LC 576-E per year. Launch trajectories departing from VSFB will be unique to the vehicle configuration, mission, and environmental conditions but within a range of potential launch azimuths between 180° and 210°. During ascent, a sonic boom (overpressure of high energy impulsive sound) would be generated while the first-stage booster is supersonic. Blue Ridge Research and Consulting (BRRC) used PCBOOM, an FAA-approved model, to predict the location and magnitude of the sonic boom (Blue Ridge Research and Consulting 2020). The modeling predicts a sonic boom, up to 5.4 pounds per square foot (psf), would be primarily directed at the Pacific Ocean south of Point Conception, potentially reaching up to 2.0 psf on the NCI (Figure 2.3-5).

BRRC also modeled engine noise for RS1 launches and static fire engine tests (Blue Ridge Research and Consulting 2020). BRRC used the Launch Vehicle Acoustic Simulation Model (RUMBLE), a fully featured time-simulation model developed by BRRC, to predict the location and magnitude of engine noise. The FAA's Office of Environment and Energy approved using RUMBLE for this project. Engine noise produced during the launch and static fire events would impact the area between San Antonio Creek and the Santa Ynez River mouth, including Purisima Point (Figures 2.3-6 and 2.3-7). Static fire engine tests would be conducted 2–4 weeks prior to each launch. During static fire, when the vehicle is in a horizontal position on the pad, engine noise would be focused primarily along the coastline between Purisima Point and the Santa Ynez River mouth (Figure 2.3-6). The sonic boom and engine noise are an expected part of the Proposed Action and help define the region of influence for the affected environment. As such, they are described here, and the effects of the expected sonic boom and landing noise are described in Chapter 4 (Environmental Consequences). No expected sonic boom impact is expected on VSFB or elsewhere on the mainland. The only land that would potentially be impacted by sonic boom would be on the NCI.

The A-weighted Community Noise Equivalent Level (CNEL) [1] contours from 60 to 85 A-weighted decibels (dBA) are presented in Figure 2.3-8 (Blue Ridge Research and Consulting 2020). CNEL is a cumulative metric that accounts for all noise events in a 24-hour period. To account for increased sensitivity to noise at night, CNEL applies an additional 10 decibel (dB) adjustment to events during the acoustical nighttime period, defined as 10:00 PM to 7:00 AM, and a 4.8 dB adjustment to events during the acoustical evening period (7:00 PM to 10:00 PM) to account for decreased community noise during this period. The CNEL 65 and 60 dBA contours over land extend approximately 0.36 and 0.62 miles (mi.) (0.58 and 1.0 kilometers [km]) from the LC 576-E, respectively (Figure 2.3-8).

Post-launch activities would include depressurizing and emptying ground support systems of any commodities, packing up all GSO components, and leaving the site. If an additional launch is

[1] CNEL may be used in lieu of Day-Night Average Sound Level (DNL) for FAA actions needing approval in California.

planned, the propellants would be purged and ABL would perform a series of inspections and checkouts to begin preparations for the next launch.

All launch operations would comply with the necessary notification requirements, including issuance of Notices to Airmen (NOTAMs) and Local Notices to Mariners (NOTMARs), consistent with current procedures. A NOTAM provides notice of unanticipated or temporary changes to components of, or hazards in, the National Airspace System (FAA Order JO 7930.2S, *Notices to Airmen*). A NOTMAR provides notice of temporary changes in conditions or hazards in navigable waterways. Western Range operations (which include the proposed launches from LC 576-E) currently follow the procedures stated in a Letter of Agreement (dated 10 April 2019) between the SLD 30 and FAA. The Letter of Agreement establishes responsibilities and describes procedures for the SLD 30, Western Range Operations, within airspace common to the Oakland Air Route Traffic Control Center, Los Angeles Air Route Traffic Control Center, Santa Barbara Terminal Radar Approach Control Facility, Fleet Area Control and Surveillance Facility, Air Traffic Control System Command Center, Pacific Military Altitude Reservation Function, and Central Altitude Reservation Function areas of jurisdiction. The Letter of Agreement also defines responsibilities and procedures applicable to operations, which require the use of Restricted Areas, Warning Areas, Air Traffic Controlled Assigned Airspace, and/or altitude reservations within Western Range airspace.

The Proposed Action does not include altering the dimensions (shape and altitude) of the airspace. However, temporary closures of existing airspace issued by the FAA's Air Traffic Organization are Federal actions connected to the Proposed Action and thus analyzed in this EA. Advance notice of these closures via NOTAMs would assist pilots in scheduling around any temporary disruption of flight activities in the area of operation. Launches would be of short duration and scheduled in advance to minimize interruption to airspace.

Figure 2.3-5: Predicted Sonic Boom Footprint

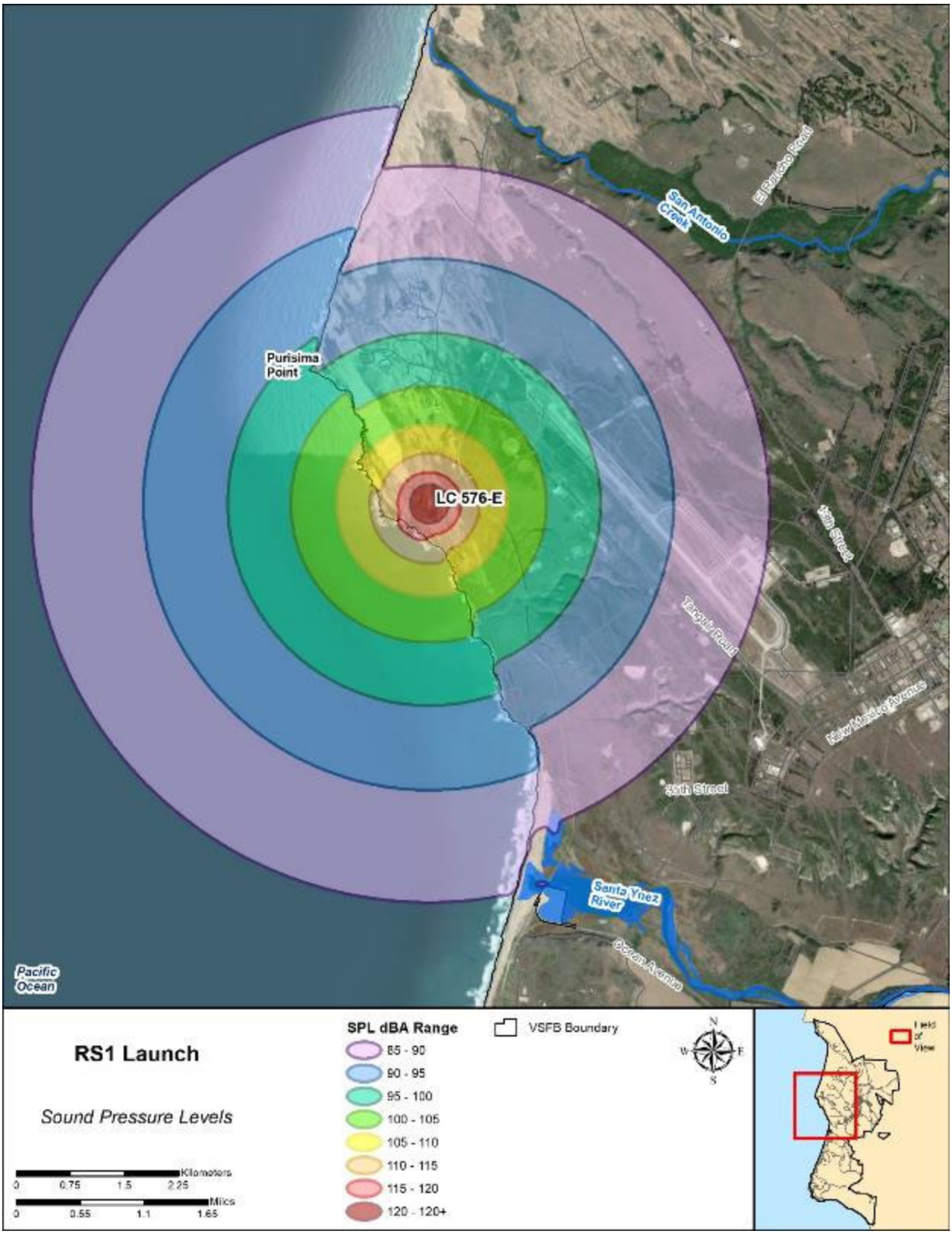

Figure 2.3-6: Maximum A-Weighted Engine Noise Distribution During Launch

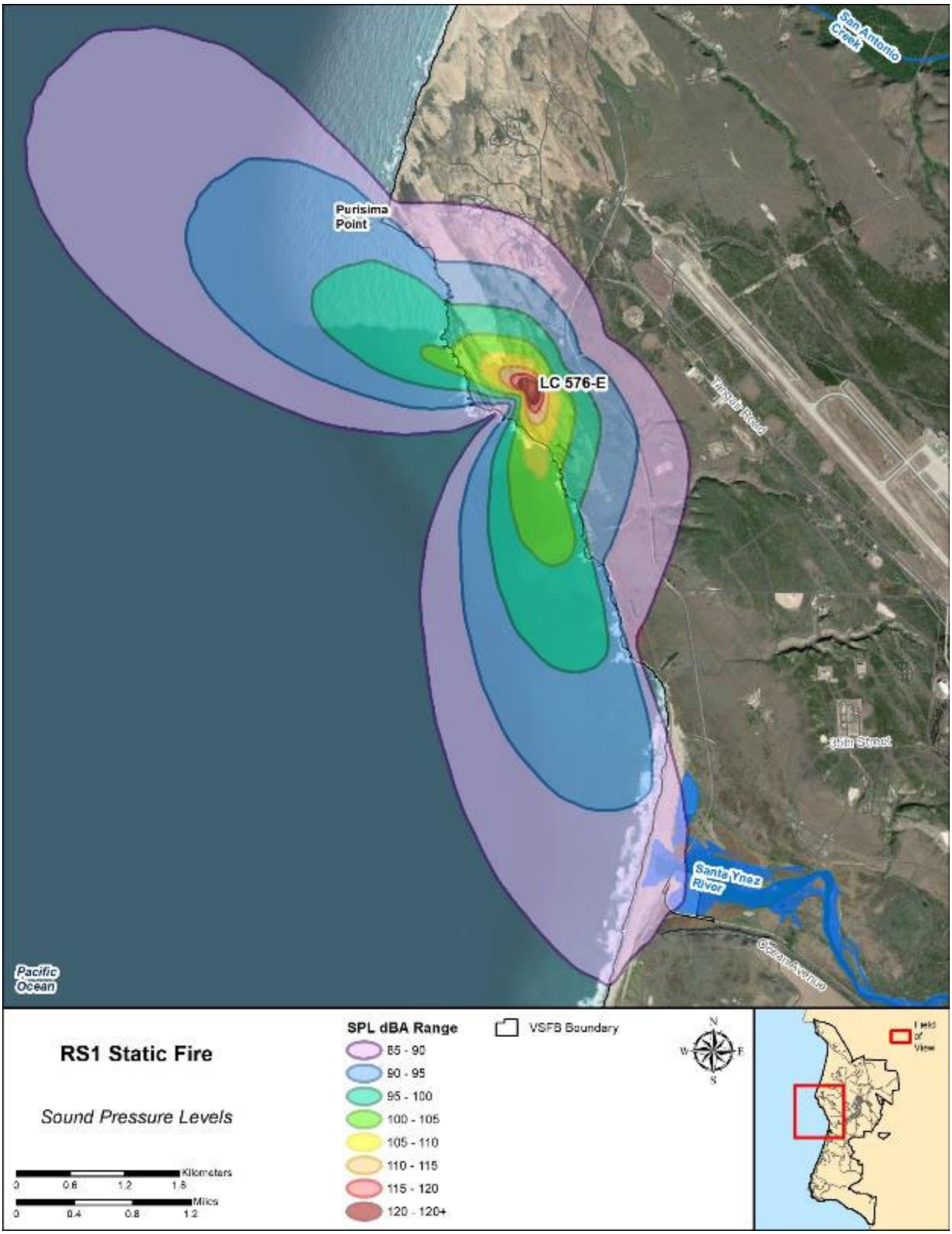

Figure 2.3-7: Maximum A-Weighted Engine Noise Distribution During Static Fire

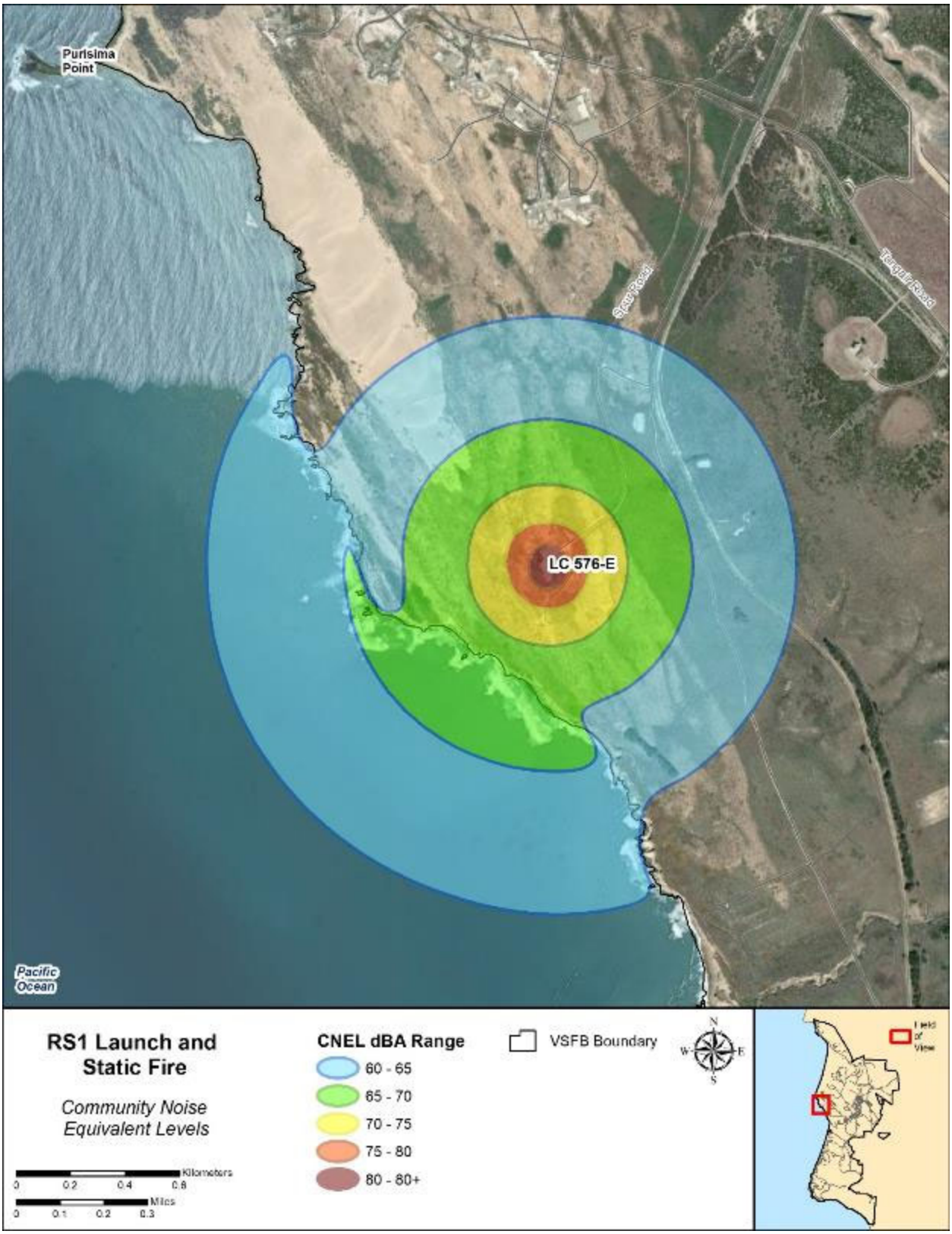

Figure 2.3-8: CNEL Contours for RS1 Launch and Static Operations from VSFB LC 576-E

2.3.4. Environmental Protection Measures

Implementing the environmental protection measures (EPMs) outlined in Tables 2.3-4 and 2.3-5 would avoid or minimize potential adverse effects to various environmental resources during executing the Preferred Alternative. Qualified ABL personnel or contractor staff would oversee fulfilling EPMs.

2.3.4.1. Air Quality

The Santa Barbara County Air Pollution Control District (SBCAPCD) and California Air Resources Board (CARB) requires the dust control measures described in Table 2.3-4 to decrease fugitive dust emissions from ground disturbing activities, as applicable to the Proposed Action.

Table 2.3-4: Dust Control Measures

Air Quality – Dust Control Measures	
Measure	**Description/Purpose**
Water—preferably reclaimed—shall be applied at least twice daily to dirt roads, graded areas, and dirt stockpiles created during construction and demolition activities.	Prevents excessive dust at the staging areas. Watering frequency would be increased whenever wind speed exceeds 15 miles per hour.
After completing construction/demolition activities, disturbed soil shall be treated by watering, revegetating, or spreading soil binders.	Prevents wind erosion of the soil.
All fine material transported off-site shall be either sufficiently watered or securely covered	Prevents excessive dust.
All haul trucks, if needed and if driving off of paved surfaces, would be required to exit the site.	Must exit via an access point where a gravel pad or grizzly has been installed.
Stockpiles of soil or other fine loose material shall be stabilized by watering or another appropriate method.	Prevents wind-blown fugitive dust.
On-site vehicle speeds shall be limited.	Speed limit of 15 miles per hour.
Ground disturbance shall be limited.	Limited to the smallest practical area and to the least amount of time.
Designated personnel shall monitor project activities.	Meant to ensure that excessive dust is not generated at demolition sites.
The Proposed Action shall comply with storm water management plans, including Best Management Practices (BMPs).	To reduce dust emissions.
Any portable equipment powered by an internal combustion engine with a rated horsepower of 50 brake horsepower (bhp) or greater used for this project shall be registered in the California State-wide Portable	Examples of such equipment are portable generators, compressors, and light-carts. Copies of each registration or permit along with fuel usage and hours of operation must be submitted to SLD 30/CEIEC Air

Air Quality – Dust Control Measures	
Measure	**Description/Purpose**
Equipment Registration Program or have a valid SBCAPCD Permit to Operate.	Quality section at the end of the project or by 15 January, whichever occurs first.
Earth moving shall comply with SBCAPCD Rule 345, Control of Fugitive Dust from Construction and Demolition Activities.	Under Rule 345, construction, demolition, or earthmoving activities are prohibited from causing discharge of visible dust outside the property line and must utilize standard BMPs to minimize dust from truck hauling, track-out/carry-out from active construction sites, and demolition activities.
Off-road construction equipment shall comply with all Federal, State, and local regulations.	A description of each piece of equipment, including make, model, serial number and rated bhp, along with fuel usage and hours of operation, must be provided to the SLD 30/CEIEC Air Quality section at the end of the project or by 15 January, whichever occurs first.

The following control measures listed in Table 2.3-5 may be implemented to decrease diesel emissions, as applicable.

Table 2.3-5: Control Measures to Decrease Diesel Emissions

Diesel Emissions Control Measures
✓ When feasible, the contractor may use equipment powered with Federally mandated “clean” diesel engines.
✓ The size of the engine in equipment and number of pieces of equipment operating simultaneously for the project should be minimized.
✓ Engines should be maintained in tune per manufacturer or operator’s specification.
✓ Ultra-low sulfur diesel fuel (15 parts per million by volume) may be used for all diesel equipment.
✓ U.S. Environmental Protection Agency or CARB-certified diesel catalytic converters, diesel oxidation catalysts, and diesel particulate filters may be installed on all diesel equipment.
✓ CARB-developed idling regulations may be followed for trucks during loading and unloading.
✓ When practicable, diesel equipment should be replaced with electrical equipment.
✓ The construction period should be lengthened during smog season (May through October), to minimize the number of vehicles and equipment operating at the same time.
✓ Alternatively, fueled construction equipment, such as compressed natural gas, liquefied natural gas, or electric, should be used if feasible.

2.3.4.2. Terrestrial Biological Resources

All applicable minimization, monitoring, and avoidance measures in VSFB's PBO (8-8-13-F-49R; Appendix A), which are included below, would be implemented during site preparation, construction, and operation of the RS1 launch program at LC 576-E.

2.3.4.2.1. *General Measures*

The measures described in Table 2.3-6 would be implemented to minimize the potential impacts on terrestrial biological resources.

Table 2.3-6: General Measures

Terrestrial Biological General Measures
✓ Disturbances shall be kept to the minimum extent necessary to accomplish project objectives.
✓ All excess materials excavated shall be removed and transported to a designated waste or fill site.
✓ All erosion control materials used would be from weed-free sources and, if left in place following project completion, constructed from 100% biodegradable erosion control materials (e.g., erosion blankets, wattles).
✓ All human-generated trash at the project site shall be disposed of in proper containers and removed from the work site and disposed of properly at the end of each workday. Large dumpsters can be maintained at staging areas for this purpose. All construction debris and trash shall be removed from the work areas upon completion of the project.
✓ If fueling of equipment must occur onsite, it will be conducted over the asphalt or pavement at LC 576-E, and spill containment materials shall be readily available on site at all times.
✓ Qualified biological monitors shall oversee and monitor activities as necessary during construction, demolition, and initial vegetation clearing activities. The biological monitors shall be responsible for delineating areas where special status species are located or concentrated, relocating special status species during construction activities if necessary, and inspecting equipment and equipment staging areas for cleanliness and gas and oil leaks.
✓ The qualified biological monitor(s) shall brief all project personnel prior to participating in construction activities. At a minimum, the training would include a description of sensitive biological resources occurring in the area, the general and specific measures and restrictions to protect these resources during project implementation, the provisions of the ESA and the necessity of adhering to the provisions of the ESA, and the penalties associated with violations of the ESA.
✓ No holes or trenches would be left open overnight. Plywood sheets or steel plates may be used to cover holes or trenches. A biological monitor would inspect these locations before resuming work.
✓ Heavy equipment (e.g., dozers, mowers) shall be cleaned of weed seeds prior to use in the project area to prevent the introduction of weeds. Prior to transport of equipment to the site, any skid plates shall be removed and cleaned. Once on site, vehicles will be inspected by biological monitor to verify that they are free of potential weed seeds. The equipment should be cleaned of weed seeds daily, especially wheels, undercarriages, and bumpers. Prior to

Terrestrial Biological General Measures	
	leaving the project area, vehicles with caked-on soil or mud shall be cleaned with hand tools such as bristle brushes and brooms at a designated exit area; vehicles may subsequently be washed at an approved wash area. Vehicles with dry dusted soil (not caked-on soil or mud), prior to leaving a site at a designated exit area, shall be thoroughly brushed; vehicles may alternatively be air blasted on site.
✓	If it is not practical to stage or operate project vehicles or equipment on paved or existing roadways and trails, the DAF will stage and operate vehicles and equipment on nonnative vegetation to the maximum extent practicable.
✓	During construction, open holes and trenches would be covered overnight, or if not possible to cover, LC 576-E would be surrounded by a minimum 3 feet high exclusion fence to prevent animals from entering the construction areas.
✓	Vegetation clearing would occur during daylight hours during periods where there is no rainfall.

2.3.4.2.2. *Migratory & Special Status Birds*

The measures described in Table 2.3-7 would be implemented to minimize the potential impacts on migratory birds and special status bird species.

Table 2.3-7: Migratory and Special Status Birds Measures

Migratory Birds	
General Measures	
If vegetation clearing occurs during the nesting period for non-raptor species (15 February through 15 August) a qualified biologist would survey the area for nesting birds and delineate buffers around any nests that are found that are of sufficient size to prevent disturbance.	
Species-Specific Measures	
California Least Tern (*Sterna antillarum browni*)[1]	Monitoring will consist of two pre-launch and two post-launch population surveys in least tern habitat closest to the launch facility. Nesting least terns will be video recorded during diurnal launches to document their reaction to launches. The biologists will select a representative area that minimizes additional disturbances to nesting least terns. Depending on results, video recordings will be conducted until the DAF and USFWS reach a mutual agreement regarding the impacts on this species.
Western Snowy Plover (*Charadrius nivosus*)[2]	The DAF will monitor the first two launches of the RS1 at LC 576-E that occur in western snowy plover (*Charadrius* nivosus; SNPL) nesting season (1 March and 30 September). Monitoring will consist of two pre-launch and two postlaunch population surveys in the snowy plover habitat area nearest to LF 576-E. For daytime launches, if launch safety restrictions allow it and a snowy plover nest is present within the habitat area being surveyed, the USFWS-approved biologist will monitor the nest during the

Migratory Birds	
	launch to record any abnormal behavior by incubating adults. If safety dictates that a USFWS-approved biologist cannot be within a reasonable distance to observe the plover's reaction, the biologists will use video recording equipment to record the reaction of the plovers.

[1] Per requirements of the PBO (Appendix A), USFWS-approved biologists will monitor nesting LETE at the Purisima Point colony when LETEs are present (typically 15 April to 15 August), to assess potential adverse effects on reproductive success from the RS1 launch programs at LC 576-E.

[2] Per requirements of the PBO (Appendix A), between 1 March and 30 September, USFWS-approved biologists will monitor SNPL to assess potential adverse effects on reproductive success from rocket launches.

Additionally, if the VSFB launch frequency increases to more than 12 combined rocket launches from SLC-2, SLC-4, LC 576-E, and TP-01 between March 1 and September 30, all subsequent launches will be monitored to determine adverse effects to the SNPL plover at Minuteman, Wall, and Surf Beaches.

2.3.4.3. Marine Biological Resources

All applicable minimization, monitoring, and avoidance measures in VSFB's LOA (Appendix B), listed in Table 2.3-8, would be implemented during site preparation, construction, and operation of the RS1 launch program at LC 576-E.

Table 2.3-8: Minimization, Monitoring, and Avoidance Measures

Minimization, Monitoring, and Avoidance Measures
✓ Sonic boom modeling would be completed prior to each launch to estimate the overpressure levels and footprint and determine if monitoring on the Northern Channel Islands (NCI) is required (see following).
✓ Monitoring of pinnipeds during launches on the NCI is required if sonic boom modelling predicts a sonic boom greater than 2 psf would impact the NCI between 1 March and 31 July; if a sonic boom greater than 3 psf is predicted between 1 August and 30 September; or if a sonic boom greater than 4 psf is predicted between 1 October and 28 February. Acoustic monitoring on the NCI would be performed to record the sonic boom level. Monitoring would commence at least 72 hours prior to a launch event and continue until at least 48 hours after each event.
✓ Between 1 January and 30 June, harbor seal monitoring at South Spur would commence at least 72 hours prior to a launch event and continue until at least 48 hours after each event. Monitoring data collected would include multiple surveys each day that record the species, number of animals hauled out, general behavior, presence of pups (although harbor seals have not been successful breeding at Purisima Point over the past several years [R. Evans, pers. comm.]), age class, and gender. Environmental conditions such as tide, wind speed, air temperature, and swell would also be recorded.

2.3.4.4. Water Resources

The following measures, as described in Table 2.3-9, would be implemented to minimize impacts on water resources and stormwater:

Table 2.3-9: Water Resources and Stormwater Measures

Water Resources and Stormwater Measures	
Measure	**Additional Information**
The site will be secured from potential erosion resulting from rain and wind events. Existing vegetation will be preserved to the extent feasible.	Mowing to 6 inches inside the fence should accomplish this.
BMPs to prevent discharge of waste (construction materials, contaminants, washings, fuels, and oils).	BMPs shall include the following, as applicable: • Ensure all equipment is properly maintained and free of leaks during operation, and all necessary repairs carried out with proper spill containment. • Fueling equipment only in pre-designated areas with spill containment materials placed around the equipment before refueling. Outfit stationary equipment with drip pans and hydrocarbon absorbent pads. • Maintain adequate spill response supplies at the construction staging area for immediate response and clean up of any fuel spills. • Store hazardous materials in proper containers, to include secondary containment. • Wash vehicles and equipment only within staging areas. High-pressure washing of undercarriages and wheel wells shall be prohibited at the project site. • Cover trash disposal containers at all times. Pick up any trash that escapes from containers at the end of each day. • Portable toilets must be properly secured to prevent tipping in windy conditions.

2.3.4.5. Cultural Resources

The following measures, described in Table 2.3-10, would be implemented to minimize impacts on sensitive archaeological resources:

Table 2.3-10: Cultural Resources Measures

Cultural Resources Measures
✓ VSFB requires archaeological and Native American monitoring during construction through or adjacent to any known archaeological site, regardless of a site's National Register of Historic Places eligibility. Archaeological and Native American monitors will therefore be present during establishment of the firebreak and ground disturbing construction at LC 576-E.
✓ If previously undocumented cultural resources are discovered during maintenance activities, work would stop, and the procedures established in 36 Code of Federal Regulations 800.13 and the VSFB Integrated Cultural Resources Management Plan shall be followed.

2.3.4.6. Transportation

The following measures, described in Table 2.3-11, would be implemented to minimize the potential for adverse impacts on transportation resources:

Table 2.3-11: Transportation Measures

Transportation Measures
✓ Employees may be encouraged to carpool and eat lunch on site.
✓ Truck trips should be scheduled during non-peak traffic hours to the greatest extent practicable.

2.3.4.7. Human Health and Safety

The following measures, described in Table 2.3-12, would be implemented to minimize the potential for adverse impacts on human health and safety:

Table 2.3-12: Human Health and Safety Measures

Human Health and Safety Measures
✓ The construction contractor and ABL would comply with Occupational Safety and Health Administration (OSHA), Air Force Occupational Safety and Health (AFOSH), California Division of Occupational Safety and Health regulations, and other recognized standards and applicable Department of the Air Force regulations or instructions.
✓ Restricted general access to the proposed construction site would be provided through use of signs and fencing if feasible.
✓ The contractor and ABL must also provide for the health and safety of workers and all subcontractors who may be exposed to their operations or services. The contractor and ABL must submit a health and safety plan to VSFB and appoint a formally trained individual to act

Human Health and Safety Measures
as safety officer. The appointed individual would be the point of contact on all problems involving job site safety.
✓ The safety program would include coordination with the Air Force Civil Engineer Center Environmental Operations Division Mitigation, Monitoring, and Reporting Program manager and contact with the weapons safety specialist for information on VSFB policies on unexploded ordnance (UXO) safety for construction work at VSFB. Since LC 576-E is located within MU809, anomaly avoidance and UXO monitors would be required for all trenching, digging, and heavy equipment operations.
✓ During work performance, the contractor and ABL must comply with all provisions and procedures prescribed for the control and safety of personnel and visitors to the job site.

2.3.4.8. Hazardous Materials and Waste Management

The following measures, described in Table 2.3-13, would be implemented to minimize impacts on hazardous materials and waste management:

Table 2.3-13: Hazardous Materials and Waste Management Measures

Hazardous Materials and Waste Management Measures
✓ Proper disposal of hazardous waste would be accomplished through identification, characterization, sampling (if necessary), and analysis of wastes generated.
✓ All hazardous materials would be properly identified and used in accordance with manufacturer's specifications to avoid accidental exposure to or release of hazardous materials required to operate and maintain construction equipment.
✓ Hazardous materials would be procured through or approved by the Vandenberg Hazardous Materials Pharmacy (HazMart). Monthly usage of hazardous materials would be reported to the HazMart to meet legal reporting requirements.
✓ All equipment would be properly maintained and free of leaks during construction and maintenance activities. All necessary equipment maintenance and repairs would be performed in pre-designated controlled, paved areas to minimize risks from accidental spillage or release. Prior to construction, a Spill Prevention Plan would be submitted to SLD 30 Environmental Compliance Section for approval.

2.3.4.9. Solid Waste Management

Solid waste would be minimized by strict compliance with VSFB's Integrated Solid Waste Management Plan. Implementing the measures described in Table 2.3-14 would further minimize the potential for adverse impacts associated with solid waste:

Table 2.3-14: Solid Waste Management Measures

Solid Waste Management Measure
✓ All materials that are disposed of off base would be reported to the Space Launch Delta 30, Installation Management Flight (SLD 30/CEI) Solid Waste Manager.

2.4. No Action Alternative

The CEQ regulations require the inclusion of a No Action Alternative in an EA. The No Action Alternative serves as a baseline to evaluate the impacts of the Proposed Action. Under the No Action Alternative, ABL would not implement the RS1 launch program at LC 576-E at VSFB; therefore, the DAF would not be able to comply with National Space Policy or meet mission requirements to promote national economic interests by promoting commercial investment and space use. The No Action Alternative would thus not meet the purpose of and need for the Proposed Action but is carried forward as a baseline analysis in this EA, as NEPA requires.

3.0 Affected Environment

This chapter describes the existing environment near and within the project area for Alternative 1 (Proposed Action) and the No Action Alternative. The area considered for most resources was the immediate area of the proposed construction (LC 576-E) and the areas potentially impacted by launch engine noise, sonic boom overpressure, and the overflight path. For some environmental resources, a wider regional area was evaluated. **Error! Reference source not found.** 3.0-1 lists justification for the resources that were not analyzed.

Table 3.0-1: Resources Not Analyzed

Resource	Reason not Analyzed
Aesthetics	An existing operational area (LC 576-E) would be used for the RS1 launch program. Proposed activities would be similar to current launch activities that have been performed at this site and nearby launch sites on VSFB. In addition, the visual character of the area would not change or might appear to be somewhat improved when the area is cleaned up to support RS1 program activities. The proposed activities would not result in impacts on visual resources.
Land Use	The Proposed Action would not result in changing land use. Proposed launch activities would not differ in scope, nature, or location from those that already occur at LC 576-E or on VSFB. In addition, the Proposed Action does not include major construction or ground-disturbing activities.
Environmental Justice and Protection of Children	The Proposed Action would occur on VSFB and primarily over open ocean away from populated areas. The USAF controls public access to VSFB and therefore no public member would be present around the launch site during launch operations. Therefore, demographics, environmental justice, and protection of children were not carried forward for further analysis.
Socioeconomics	Implementing the Proposed Action would not result in the influx of new military personnel or creating new jobs. Approximately 25 personnel would be on VSFB during construction of pad improvements at LC 576-E and approximately 30 personnel would be at VSFB to support launch operations. This would be a temporary increase in personnel during each launch. The Proposed Action would not substantially change economic factors.
Floodplains and Jurisdictional Wetlands	LC 576-E is outside of floodplains and wetlands, and floodplains and wetlands would not be affected by the Proposed Action; therefore, floodplains and wetlands are not assessed in this Environmental Assessment.
Farmlands	The Proposed Action would not convert prime agricultural land to other uses or result in a decrease in the land's productivity.

Resource	Reason not Analyzed
Natural Resources	As defined by the FAA in the Order 1050.1F Desk Reference, the Proposed Action would not have a measurable effect on natural resources, such as water, asphalt, aggregate, or wood.
Wild and Scenic Rivers	The Proposed Action would not affect a wild and scenic river because there are none located at or near LC 576-E.

3.1. Air Quality

3.1.1. Regional Setting

The CARB and SBCAPCD operate a network of ambient air monitoring stations throughout Santa Barbara County. These stations measure ambient concentrations of the pollutants and determine whether the ambient air quality meets the California Ambient Air Quality Standards (CAAQS) and the National Ambient Air Quality Standards (NAAQS). The nearest ambient monitoring station to the Proposed Action site is the Lompoc South H Street monitoring station, which measures all criteria pollutants (Table 3.1-1).

Table 3.1-2 presents a summary of ambient air quality measurements for the period from 2018 to 2020. The air monitoring data show that the 8-hour NAAQS for ozone was not exceeded during the period from 2018 to 2020. CAAQS for ozone was not exceeded at the Lompoc South H Street monitoring station during the period from 2018 through 2020. However, both the 1-hour and 8-hour CAAQS for ozone were exceeded multiple times in Santa Barbara County in 2020. Exceeding CAAQS standards may result in additional mitigation requirements, as described in Appendix F (Air Quality – Definition of Resource & Regulatory Requirements). If emissions were to exceed a significance threshold, they and their potential consequences may be further analyzed to assess the likelihood of a significant impact on air quality. The nature and extent of such analysis would depend on the specific circumstances. The analysis could range from a more detailed and precise examination of the activities and equipment resulting in the greatest contribution to emissions, to air dispersion modeling analyses.

Table 3.1-1: Background Ambient Air Quality, Lompoc South H Street Monitoring Station (concentrations in ppm unless otherwise indicated)

Pollutant	Averaging Time	2020	2019	2018	CAAQS (ppm)	NAAQS (ppm)
Ozone	8 hour	0.033	0.033	0.042	0.070	0.070
	1 hour	0.039	0.041	0.044	0.09	-
PM_{10}	Annual Arithmetic Mean	N/A	16.3 µg/m^3	19.7 µg/m^3	20 µg/m^3	-
	24 hour	54.0 µg/m^3	80.0 µg/m^3	60.2 µg/m^3	50 µg/m^3	150 µg/m^3
$PM_{2.5}$	Annual Arithmetic Mean	N/A	4.6 µg/m^3	6.6 µg/m^3	12 µg/m^3	12.0 µg/m^3
	24 hour	18.8 µg/m^3	23.4 µg/m^3	40.6 µg/m^3	-	35 µg/m^3
NO_2	Annual	0.001	0.000	0.000	0.030	0.053
	1 hour	0.028	0.024	0.006	0.18	0.100

CO	8 hour	0.37	0.30	0.55	9.0	9
SO_2	Annual	0.000	0.000	0.000	-	0.030
	24 hour	0.001	0.000	0.001	0.04	0.14

Notes: CAAQS = California Ambient Air Quality Standards, CO = Carbon Monoxide, NAAQS = National Ambient Air Quality Standards, NO_2 = Nitrogen Dioxide, $PM_{2.5}$ = Particulate Matter less than 2.5 microns, PM_{10} = Particulate Matter less than 10 microns, ppm = part(s) per million, µg/m^3 = microgram(s) per cubic meter, N/A = not available from current website data, SO_2 = sulfur dioxide
Source: www.arb.ca.gov

Table 3.1-2: Summary of Santa Barbara County Ozone and Particulate Matter Standards Exceedances

Standard	Limit	2020		2019		2018	
		# of Days Exceeding	Year to Date Max	# of Days Exceeding	Year to Date Max	# of Days Exceeding	Year to Date Max
Ozone 1-hour State Standard	94 ppb	4	103 ppb	--	--	--	--
Ozone 8-hour Federal Standard	70 ppb	6	86 ppb	1	72 ppb	--	--
Ozone 8-hour State Standard	70 pbb	6	86 ppb	1	72 ppb	--	--
Particulate Matter PM_{10} 24-hour State Standard	50 µg/m^3	33	117 µg/m^3	17	137 µg/m^3	27	128 µg/m^3
Particulate Matter PM_{10} 24-hour Federal Standard	154 µg/m^3	--	--	--	--	--	--
Particulate Matter $PM_{2.5}$ 24-hour Federal Standard	35 µg/m^3	10	88.4 µg/m^3	--	--	2	40 µg/m^3

Notes: µg/m^3 = microgram(s) per cubic meter, ppb = parts per billion, $PM_{2.5}$ = Particulate Matter less than 2.5 microns, PM_{10} = Particulate Matter less than 10 microns

3.1.2. Region of Influence

Specifically identifying the Region of Influence (ROI) for air quality requires knowledge of the type of pollutant, emission rates of the pollutant source, proximity to other emission sources, and local and regional meteorology. For inert pollutants (all pollutants other than ozone (O_3) and its

precursors), the ROI is generally limited to a few miles downwind from the source. However, for photochemical pollutant such as O_3, the ROI may extend much farther downwind. O_3 is a secondary pollutant that is formed in the atmosphere by photochemical reactions of previously emitted pollutants, or precursors (reactive organic gases, nitrogen oxides, and Particulate Matter less than 10 microns [PM_{10}]). The maximum effect of precursors on O_3 levels tends to occur several hours after the time of emission during periods of high solar load and may occur many miles from the source. O_3 and ozone precursors transported from other regions can also combine with local emissions to produce high local O_3 concentrations. The ROI for the Proposed Action includes the South Central Coast Air Basin, and more specifically, Santa Barbara county.

Currently, Santa Barbara county is in attainment for all criteria air pollutants according to the Environmental Protection Agency (U.S. Environmental Protection Agency, 2021).

With respect to launch emissions—including both criteria pollutants and greenhouse gases (GHGs)—the effect of the Proposed Action on regional air quality is considered under the mixing height (3,000 ft. [914 m] above ground level). In general, the mixing height is defined as the vertical region of the atmosphere where pollutant mixing occurs. Above this height, pollutants that are released generally do not mix with ground level emissions and do not have an effect on ground level concentrations in the local area. Per FAA-AEE-00-01, DTS-34 (Consideration of Air Quality Impacts by Airplane Operations at or Above 3,000 ft. [914 m] above ground level), emissions above 3,000 ft. (914 m) are not considered for local or regional air quality impacts. Therefore, emissions related to launch activities above the mixing height are outside of the ROI.

3.1.3. Greenhouse Gas Emissions

On 18 February 2010, the CEQ released draft guidance on addressing climate change in NEPA documents. This draft document was revised on 18 December 2014, and CEQ solicited public comments until 23 February 2015. The 2010 draft guidance, which has been issued for public review and comment, recommends quantification of GHG emissions, and proposes a threshold of 25,000 metric tons of CO_2e emissions. The 2010 guidance indicates that use of 25,000 metric tons of CO_2e emissions as a reference point would provide federal agencies with a useful indicator, rather than an absolute standard of significance, to provide action-specific evaluation of GHG emissions and disclosure of potential impacts. This analysis complies with the recommendations of both the 2010 and 2014 versions of the draft guidance.

On 30 April 2015, the SBCAPCD adopted revisions to their Environmental Review Guidelines to the California Environmental Quality Act (CEQA) by adding significance thresholds for GHG cumulative impacts. The SBCAPCD has adopted a screening threshold of 10,000 metric tons of carbon dioxide equivalents (CO_2e) per year. As a lead agency, the SBCAPCD is required to address the cumulative impacts of GHG emissions from the project as part of their CEQA review during the permitting process, should permits be mandated. Should emissions exceed the screening threshold, mitigation measures could be required to reduce emissions of GHGs.

3.2. Sound (Airborne)

3.2.1. Region of Influence

This section describes the noise-sensitive receptors and ambient noise levels in the area potentially affected by the Proposed Action. A detailed description of sound, its characteristics, and sound sources, intensity, weighting, metrics, and propagation is contained in Appendix G (Sound - Background & Regulatory Requirements). Appendix G also addresses ambient sound guidance documents, Federal Interagency Committee on Urban Noise criteria, and U.S. Environmental Protection Agency (EPA) noise standards.

This discussion of noise includes the types or sources of noise and the associated sensitive receptors in the human environment. Noise in relation to biological resources and wildlife species is discussed in Section 3.3 (Terrestrial Biological Resources).

3.2.2. Sensitive Receptors

Noise-sensitive areas are those areas where noise interferes with normal activities associated with its use. Normally, noise-sensitive areas include residential, educational, health, and religious structures and sites; parks; recreational areas (including areas with wilderness characteristics); wildlife refuges; and cultural and historical sites. Individual, isolated, residential structures may be considered compatible within the Day-Night Average Sound Level (DNL) 65 dB noise contour where the primary use of land is agricultural and adequate noise attenuation is provided (FAA Order 10501.F, Paragraph 11-5.b.(10)). Also, transient residential use such as motels may be considered compatible within the DNL 65 dB noise contour where adequate noise attenuation is provided. Users of designated recreational areas are considered sensitive receptors.

The RS1 launch vehicle would be located at LC 576-E on VSFB west of the north end of the VSFB airport runway at the end of Spur Road. The nearest human sensitive receptors are located in Guadalupe, Casmalia, Orcutt, Santa Maria and Lompoc, which include residential areas, hospitals, schools, parks, and libraries. However, these sensitive receptors are all located over 8 mi. (12.8 km) from the project site. No sensitive receptors are located on or near the LC 576-E site.

3.2.3. Ambient Noise Levels of the Proposed Action Area

Existing noise levels on VSFB 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, with louder noise levels found near industrial facilities and transportation routes. While rocket launches and aircraft overflights create louder intermittent noise levels, they do not generally impact hourly noise levels due to their short duration. On VSFB, general ambient 1-hour average sound level measurements range from around 35 to 60 dB (Thorson et al. 2001). Wind and wave noise are the primary drivers of ambient in-air noise levels.

Regularly occurring sources of instantaneous noise near the Proposed Action Area include crashing ocean surf, which generates approximately 78 dBA (6.6 ft. [2 m] tall waves) and can be louder during high surf events (Bolina & Abom 2010). In fact, ambient sound levels were

characterized at Surf Beach, approximately 12 mi. (19.3 km) south of the Proposed Action Area in a very similar location and reported at 45.5 dBA Equivalent Sound Level (L_{eq}) at night (10:00 p.m. to 7:00 a.m.), 51.8 dBA L_{eq} during the day (7:00 a.m. to 5:00 p.m.), and 53.1 dBA L_{eq} during the evening (5:00 p.m. to 10:00 p.m.). Noise levels in the adjacent cities of Lompoc to the south and Santa Maria to the northeast are primarily driven by transportation noise and regional aircraft activities. Depending on regional airport activity, DNLs are typically between 55 and 65 dBA (City of Lompoc 2004; City of Santa Maria 2009).

3.3. Terrestrial Biological Resources

3.3.1. Region of Influence

The existing biological setting includes the regional setting of VSFB, the specific Proposed Action Area, and past and present disturbances in and near the LC 576-E site. Resources on VSFB are abundant and diverse compared to other areas of California because VSFB is within an ecological transition zone where the northern and southern ranges of many species overlap, and because the majority of the land within the base boundaries has remained undeveloped. The ROI considered in this EA for biological resources encompasses the areas subject to noise and physical disturbance as part of the Proposed Action (Figures 3.3-1 through 3.3-9). LC 576-E is located in coastal back dune habitat at the south end of Spur Road, south of Tangair Road.

3.3.2. Methodology

Biological resources near the Proposed Action Area were characterized based on a review of VSFB Geographic Information System (GIS) data, available documents for the Proposed Action, and field assessments conducted by ManTech SRS Technologies, Inc. (MSRS) to support the Proposed Action. Complete lists of plant and wildlife species documented within the Terrestrial Biological Survey Area can be found in Appendix H (Species Observed During Field Surveys). Potential occurrence of special status and sensitive species was determined based on the presence of suitable habitat or records of occurrence of the species. Sources accessed and reviewed to determine potential for occurrence included the California Natural Diversity Database (California Department of Fish and Wildlife [CDFW] 2021) and existing local and regional references.

3.3.3. Vegetation Resources

Vegetation types were classified across VSFB in 2009 using a modified Holland system (Wildscape 2009), with upland vegetation type boundaries refined during March 2021 field assessments. Figure 3.3-1 shows the vegetation (a mix of upland types) within the Terrestrial Biological Survey Area, while

Table 3.3-1 provides areas of each vegetation community anticipated to be impacted by project activities within the Vegetation Management Area. Descriptions of each vegetation type are provided in Appendix I (Terrestrial Biological Resources).

Table 3.3-1: Vegetation Types Present Within the Terrestrial Biological Survey and Vegetation Management Areas

Vegetation Type	Terrestrial Biological Survey		Vegetation Management Area	
	Acres	Hectares	Acres	Hectares
Central Dune Scrub	0.2	0.1	-	-
Central Dune Scrub / Iceplant	8.3	3.3	4.6	1.8
Developed	3.3	1.3	2.9	1.2
Disturbed / Cleared	0.3	0.1	0.3	0.1
Iceplant - Herb / Central Dune Scrub	4.6	1.8	3.2	1.3
Non-Native Grasses / Central Dune Scrub	3.4	1.4	1.8	0.7
Total	**19.8**	**8.1**	**12.8**	**5.2**

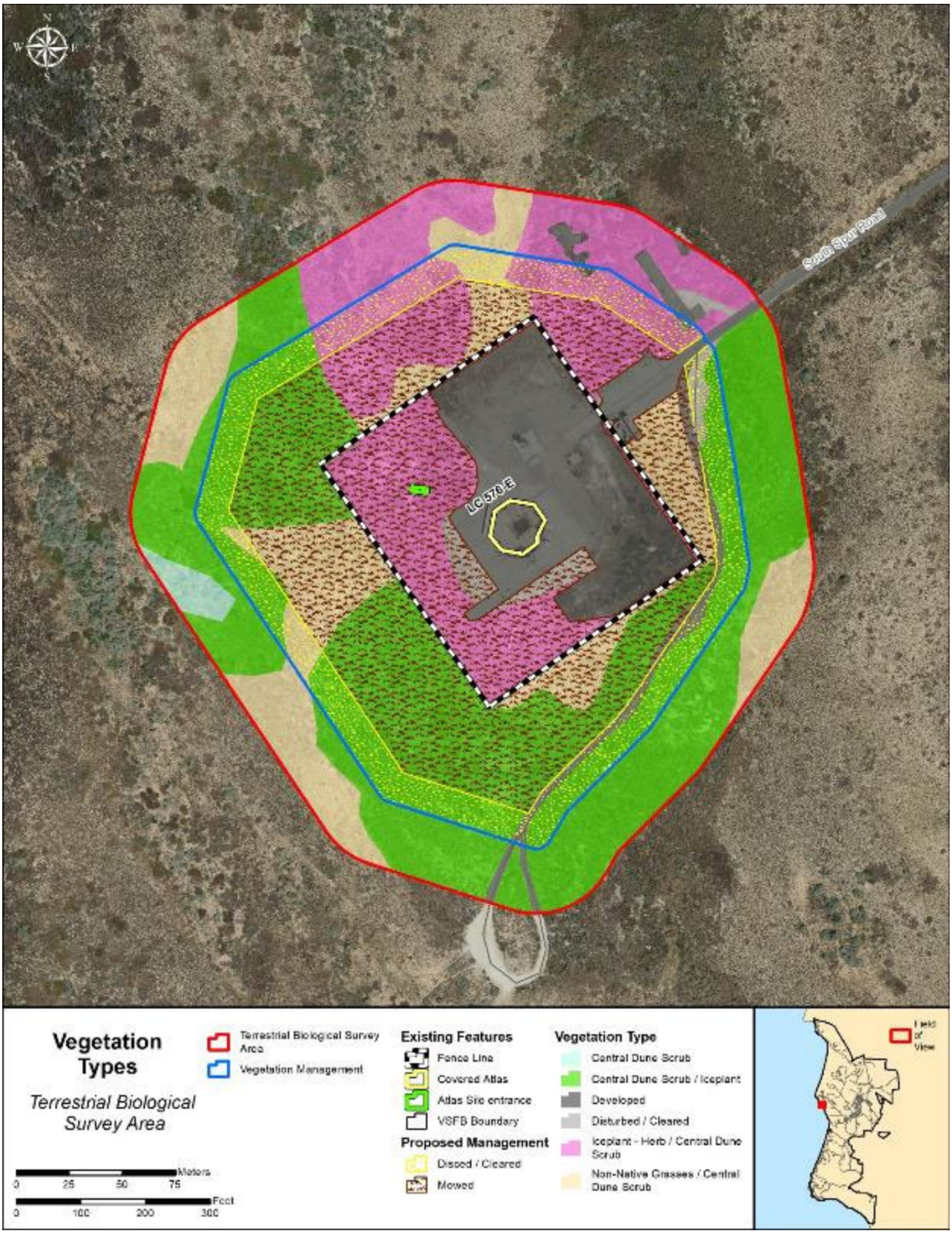

Figure 3.3-1: Vegetation Types within the Terrestrial Biological Survey Area

3.3.4. General Wildlife Resources

Common bird species associated with the Terrestrial Biological Survey Area and adjacent habitats include various birds associated with scrub habitat. Species such as white-crowned sparrow (*Zonotrichia leucophrys*) and Bewick's wren (*Thryomanes bewickii*) were common during March 2021 biological surveys.

Amphibians that occur within the area subject to terrestrial impacts include the Baja California treefrog (*Pseudacris hypochondriaca*). Reptile species observed during biological surveys include western fence lizard (*Sceloporus occidentalis*), and southern pacific rattlesnake (*Crotalus oreganus helleri*).

Various mammal species are also expected to occur within the Terrestrial Biological Survey Area. Those observed during field surveys include brush rabbit (*Sylvilagus bachmani*), coyote (*Canis latrans*), and California ground squirrel (*Otospermophilus beecheyi*). Small mammals include various species such as kangaroo rat (*Dipodomys* spp.) and pocket gopher (*Thomomys bottae*). There is also access to the covered Atlas Silo which may provide roost habitat for bat species such as the big brown bat (*Eptesicus fuscus*).

3.3.5. Special Status Species

Table 3.3-3 lists Federal and state special status species that occur or have the potential to occur within the Proposed Action Area and its vicinity. Potential occurrence nearby the Proposed Action Area was determined based on past documentation and on suitability of habitat and occurrence within the region of a particular species. Several species were excluded from potential occurrence because of the following: they do not occur at the site when project activities would occur; they do not breed within the Proposed Action Area and their special status affords them protection only during their breeding period; or they do not occur in a manner (rookeries or nesting colonies) that affords them special status protection. Species unlikely to be affected by LC 576-E modifications, landscape maintenance, launch and static fire noise, and not present within areas receiving at least 110 dB sound pressure level (SPL), were also not given further consideration. This includes special status plant species occurring outside of the Terrestrial Biological Survey Area.

Special status fish species such as the federally endangered tidewater goby (*Eucyclogobius newberryi*) and federally endangered unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*), were not considered due to water's ability to attenuate sound.

Potential habitat for least Bell's vireo (*Vireo bellii pusillus*, federally endangered species/state endangered species) and southwestern willow flycatcher (*Empidonax traillii extimus*, federally endangered species/state endangered species) exists on VSFB. However, these species have not been documented within the area potentially impacted by a significant launch or static fire related noise and have not been documented breeding in historically occupied habitat on VSFB in the last 10 years (Seavy et al. 2012). Bald eagles (*Haliaeetus leucocephalus*, Federal Bird Species of Conservation Concern, California Endangered Species, California Fully Protected Species) are occasionally seen throughout VSFB and may forage in coastal habitat nearby LC 576-

E. However, this species is rarely sighted and not anticipated to be affected by project activities. Table 3.3-2 lists the types of special status species that were considered in this section of the EA. Federally listed, proposed listed, or candidate plant and wildlife species that are known to occur in the project area are listed in Table 3.3-3.

Table 3.3-2. Terrestrial Special Status Species Considered

Special-Status Biological Resources
✓ Plant and wildlife species that are federally listed, proposed for listing, or candidates for listing
✓ Plant and wildlife species that have been delisted
✓ Plant and wildlife species that are state listed or candidates for listing
✓ California fully protected species
✓ Wildlife species considered California Species of Special Concern by the CDFW
✓ Plant species listed as endangered, threatened, or rare by the state of California
✓ Golden eagles and bald eagles protected under the Bald and Golden Eagle Protection Act
✓ Federal Birds of Conservation Concern
✓ Winter roost locations for monarch butterflies protected under the Local Coastal Plan of Santa Barbara County

Table 3.3-3: Federal and State Special Status Terrestrial Species with Potential to Occur Within the Proposed Action Area

Species	Status		Potential Occurrence within the Proposed Action Area
	USFWS	CDFW	
Invertebrates			
Crotch bumble bee (*Bombus crotchii*)	-	SC	Potential: may forage and nest in the Biological Survey Area.
Buckwheat blue butterfly (*Euphilotes* sp.)	-	-	Likely: documented adjacent to the Biological Survey Area.
Amphibians			
California red-legged frog (*Rana draytonii*)	FT	SSC	Present: documented in aquatic habitats impacted by noise.
Birds			
Allen's hummingbird (*Selasphorus sasin*)	BCC	-	Likely: forages in Biological Survey Area; nests in riparian habitats impacted by noise.
Black oystercatcher (*Haematopus bachmani*)	BCC	-	Likely: forages on rocky coastline impacted by noise.
Black skimmer (*Rynchops niger*)	BCC	-	Likely: forages in nearshore ocean waters impacted by noise.

Species	Status		Potential Occurrence within the Proposed Action Area
	USFWS	CDFW	
Brant (*Branta bernicla*)	-	SSC	Likely: forages in nearshore ocean waters impacted by noise.
Burrowing owl (*Athene cunicularia*)	BCC	SSC	Likely: winters in burrows in grassland areas impacted by noise.
California brown pelican (*Pelecanus occidentalis californicus*)	-	Fully Protected	Likely: forages in nearshore ocean waters and roosts on beaches and rocks impacted by noise.
California least tern (*Sternula antillarum browni*)	FE	SE	Present: nests on Purisima Point impacted by noise.
Costa's hummingbird (*Calypte costae*)	BBC	-	Likely: in canyon and erosional wash habitat impacted by noise.
Lawrence's goldfinch (*Spinus lawrencei*)	BCC	-	Likely: may nest in shrub and riparian habitat impacted by noise.
Loggerhead shrike (*Lanius ludovicianus*)	BCC	SSC Nesting	Likely: may forage in the Biological Survey Area and may nest in shrub and riparian habitat impacted by noise.
Long-billed curlew (*Numenius americanus*)	BCC	-	Likely: may occur on rocky coastline at low tide and beaches impacted by noise.
Marbled godwit (*Limosa fedoa*)	BCC	-	Likely: may occur on rocky coastline at low tide and beaches impacted by noise.
Marbled murrelet (*Brachyramphus marmoratus*)	FT	SE	Likely: forages in nearshore ocean waters impacted by noise.
Northern harrier (*Circus hudsonius*)	-	SSC Nesting	Present: forages in the Biological Survey Area and may nest in grassland impacted by noise.
Nuttall's woodpecker (*Dryobates nuttallii*)	BCC	-	Likely: may nest in riparian habitat impacted by noise.
Oak titmouse (*Baeolophus inornatus*)	BCC	-	Likely: may nest in riparian and non-native tree habitat impacted by noise.
Peregrine falcon (*Falco peregrinus anatum*)	BCC Nesting	Fully Protected Nesting	Likely: hunts on coastal habitat impacted by noise.
Short-billed dowitcher (*Limnodromus griseus*)	BCC	-	Likely: may occur on rocky coastline at low tide and beaches impacted by noise.

Species	Status		Potential Occurrence within the Proposed Action Area
	USFWS	CDFW	
Whimbrel (*Numenius phaeopus*)	BCC	-	Likely: may occur on rocky coastline at low tide and beaches impacted by noise.
Western snowy plover (*Charadrius nivosus*)	FT; BCC	SSC Nesting	Present: may occur on rocky coastline at low tide, nests on sandy beaches impacted by noise.
Willet (*Tringa semipalmata*)	BCC	-	Likely: may occur on rocky coastline at low tide and beaches impacted by noise.
White-tailed kite (*Elanus leucurus*)	-	Fully Protected Nesting	Likely: may forage in the Biological Survey Area and may nest in riparian and non-native tree habitat impacted by noise.
Yellow warbler (*Setophaga petechia*)	BCC	SSC Nesting	Likely: may nest in riparian habitat impacted by noise.
Terrestrial Mammals			
Pallid bat (*Antrozous pallidus*)	-	SSC	Potential: may roost in areas impacted by noise including the Atlas Silo within LC 576-E.
Townsend's big-eared bat (*Corynorhinus townsendii*)	-	SSC	Potential: may roost in areas impacted by noise including the Atlas Silo within LC 576-E.
Spotted bat (*Euderma maculatum*)	-	SSC	Potential: may roost in areas impacted by noise including the Atlas Silo within LC 576-E.
Western red bat (*Lasiurus blossevillii*)	-	SSC	Potential: may roost in areas impacted by noise including the Atlas Silo within LC 576-E.
Western mastiff bat (*Eumops perotis californicus*)	-	SSC	Potential: may roost in areas impacted by noise including the Atlas Silo within LC 576-E.
San Diego desert woodrat (*Neotoma lepida intermedia*)	-	SSC	Potential: may occur in areas impacted by noise.
American badger (*Taxidea taxus*)	-	SSC	Likely: may inhabit grassland habitat impacted by noise.

Notes: FE = Federally Endangered Species; FT = Federally Threatened Species; SE = State Endangered Species; SSC = California State Species of Special Concern; SCE = State Candidate Endangered; SE = State Endangered Species; SSC = State Candidate Species; BCC = Federal Bird of Conservation Concern

3.3.5.1. California Red-Legged Frog (*Rana draytonii*) (Federally Threatened Species)

Detailed information regarding the status and life history of the California red-legged frog (CRLF) is contained in Appendix I (Terrestrial Biological Resources).

3.3.5.1.1. *Occurrence within the Action Area*

CRLF have been documented in nearly all permanent streams and ponds on VSFB as well as most seasonally inundated wetland and riparian sites (Christopher 2002). VSFB is known to support a sizable population of CRLF but there is insufficient information available to accurately estimate the population on VSFB (PBO, Appendix A). CRLF numbers are also expected to vary widely from year to year based on environmental conditions (USFWS 2002).

CRLF have been documented in areas that will be impacted by launch related noise. The nearest CRLF locality is approximately 0.85 mi (1.37 km) east northeast of LC 576-E in ephemeral vernal pool habitat (vernal pool 19-002, Figure 3.3-2). Launch noise will also impact CRLF breeding habitat within the semipermanent pond at the northwest end of the VSFB airfield approximately 1.44 mi (2.32 km) north northeast of LC 576-E (Airfield Pond, Figure 3.3-2) and ABRES II Pond 2.8 0 mi (4.51 km) north of LC 576-E (Figure 3.3-2). No aquatic or riparian habitat likely to support CRLF is present within the Terrestrial Biological Survey Area including the area that will be subject to construction and vegetation management (Figure 3.3-1). No CRLF have been documented in the areas impacted by noise related to static fire operations (Figure 3.3-3).

3.3.5.1.2. *Critical Habitat*

Critical Habitat was designated on 17 March 2010 (50 Federal Register [FR] 12816-12959). This critical habitat designation does not include VSFB because it was excluded under Section 4(b)(2) of the ESA.

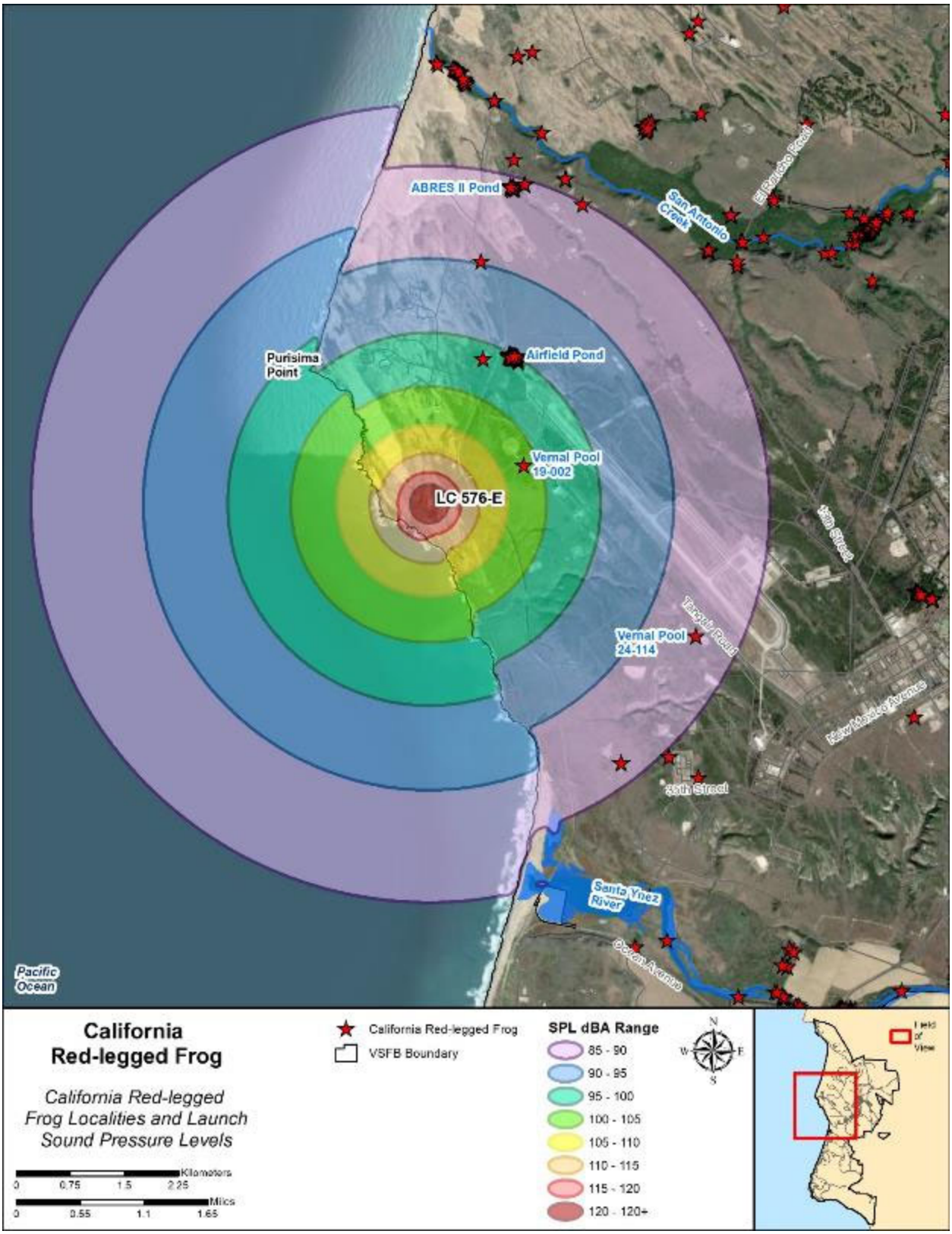

Figure 3.3-2: California Red-legged Frog Localities and Launch Sound Pressure Levels

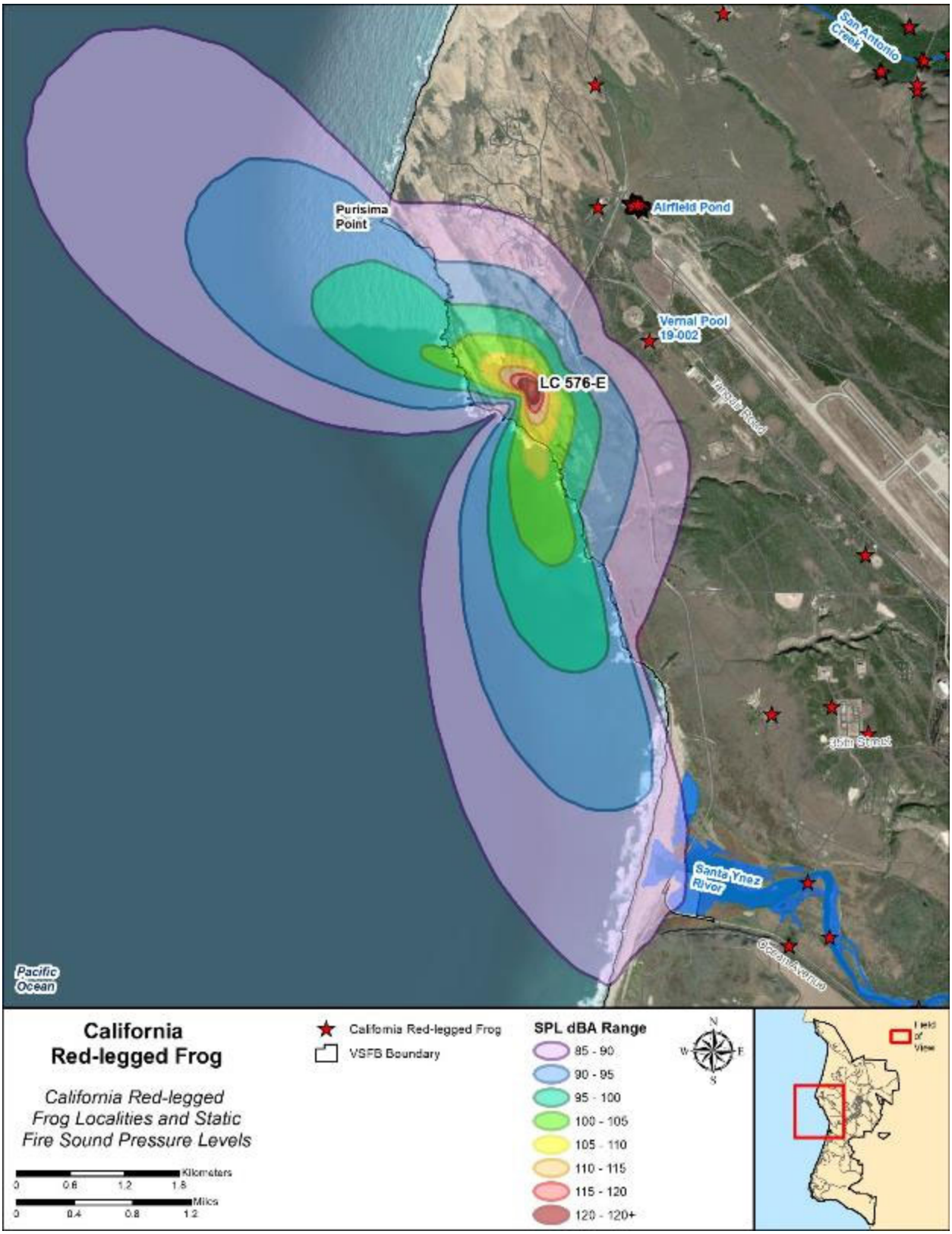

Figure 3.3-3: California Red-legged Frog Localities and Static Fire Sound Pressure Levels

3.3.5.2. California Least Tern (*Sternula antillarum browni*) (Federally Endangered Species)

Detailed information regarding the status and life history of the LETE is contained in Appendix I (Terrestrial Biological Resources).

3.3.5.2.1. *Occurrence within the Action Area*

Historically, LETE nested in colonies in several locations along the coastal strand of the north VSFB coastline. Since 1998, except for two nests established south of San Antonio Creek in 2002, LETE have nested only at the primary colony site, in relatively undisturbed bluff-top open dune habitat at Purisima Point.

VSFB supports a small population of LETE. Robinette et al. (2019) estimate that VSFB supported a breeding population of 84 LETE in 2019. Although populations are small, this is one of only three breeding colonies between Monterey and Point Conception.

The VSFB LETE colony near Purisima Point is approximately 0.71 mi. (1.13 km) north of LC 576-E. The Purisima LETE colony will be subject to noise impacts during both launch and static fire operations (Figures 3.3-4 and 3.3-5).

3.3.5.2.2. *Critical Habitat*

The USFWS has not designated Critical Habitat for the LETE.

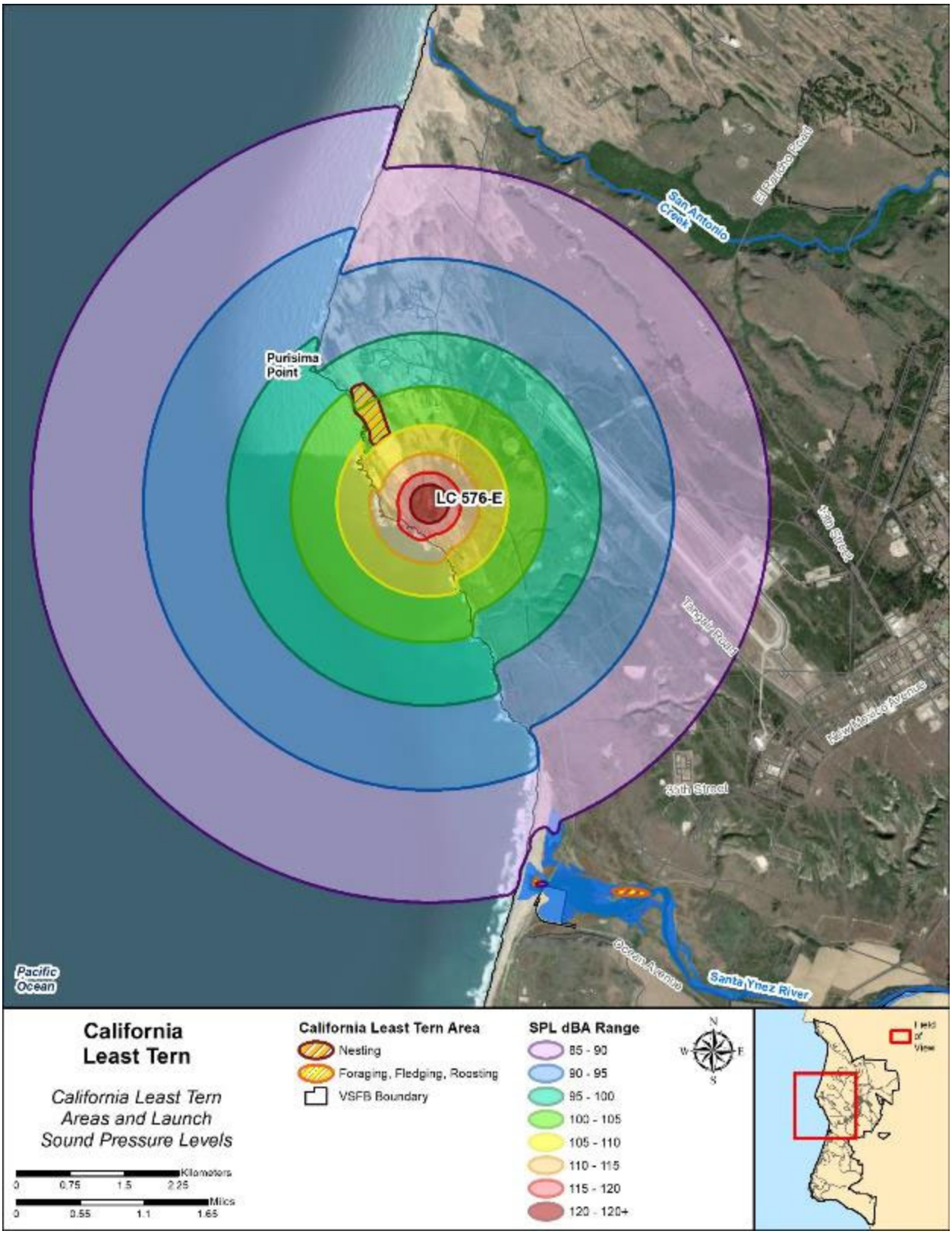

Figure 3.3-4: California Least Tern Areas and Launch Sound Pressure Levels

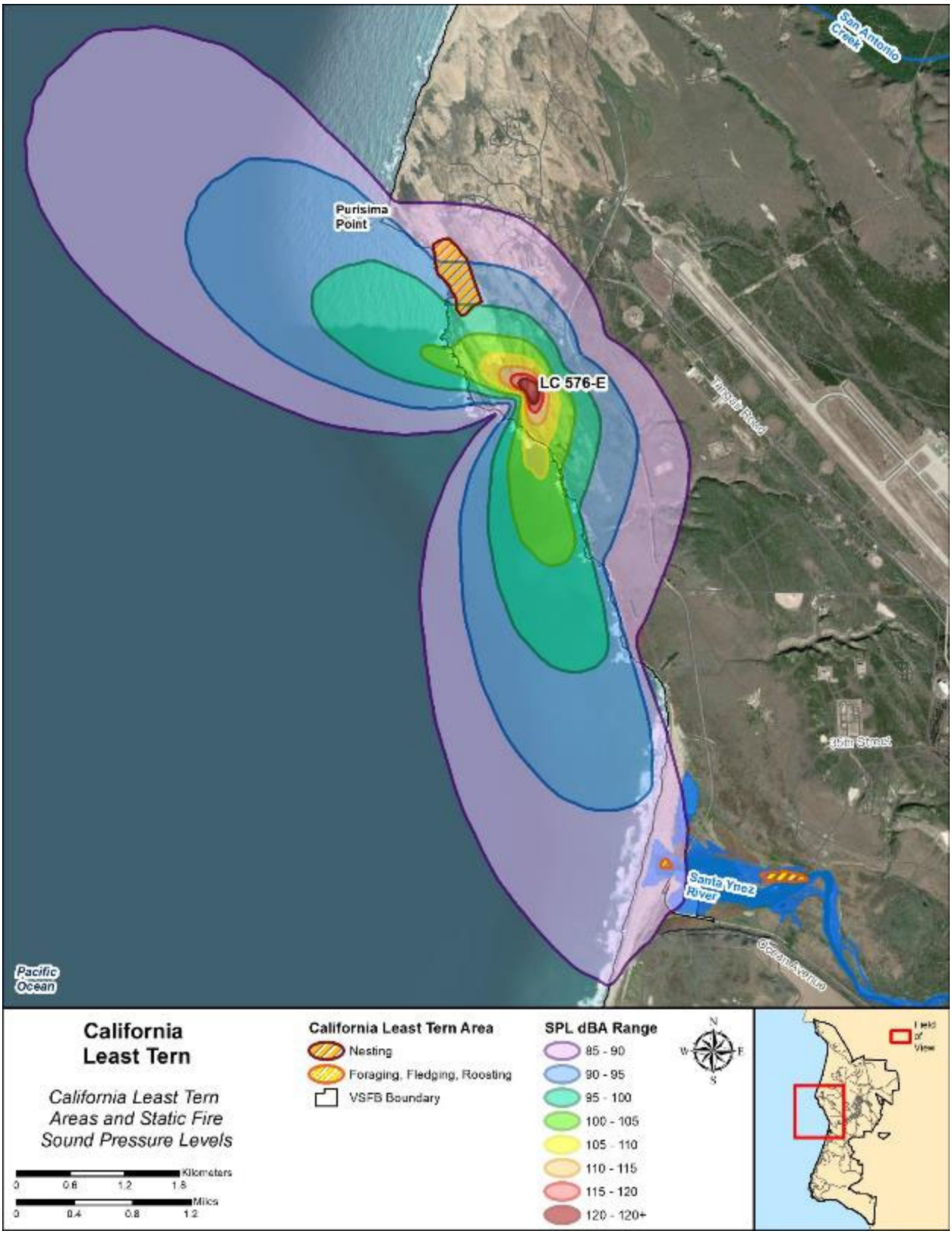

Figure 3.3-5: California Least Tern Areas and Static Sound Pressure Levels

3.3.5.3. Marbled Murrelet (*Brachyramphus marmoratus*) (Federally Threatened Species)

Detailed information regarding the status and life history of the marbled murrelet (MAMU) is contained in Appendix I (Terrestrial Biological Resources).

3.3.5.3.1. *Occurrence within the Action Area*

The species is considered rare to very rare much of the year in Santa Barbara County. However, the species may be somewhat regular north of VSFB in the late summer and would be considered casual in the spring (Lehman 2020).

MAMU have been observed semi-regularly in near shore waters off the coast of VSFB (Lehman 2020; eBird 2021); however, there is no known or suitable breeding habitat for MAMU on VSFB. As such, the species occurs within portions of the Proposed Action Area subject to noise impacts (Figures 3.3-6 and 3.3-7).

3.3.5.3.2. *Critical Habitat*

The USFWS designated Critical Habitat for the MAMU on 24 May 1996 (61 FR 26257) and revised this designation on 4 August 2016 (81 FR 51348–51370). There is no designated Critical Habitat for this species within or adjacent to the Proposed Action Area.

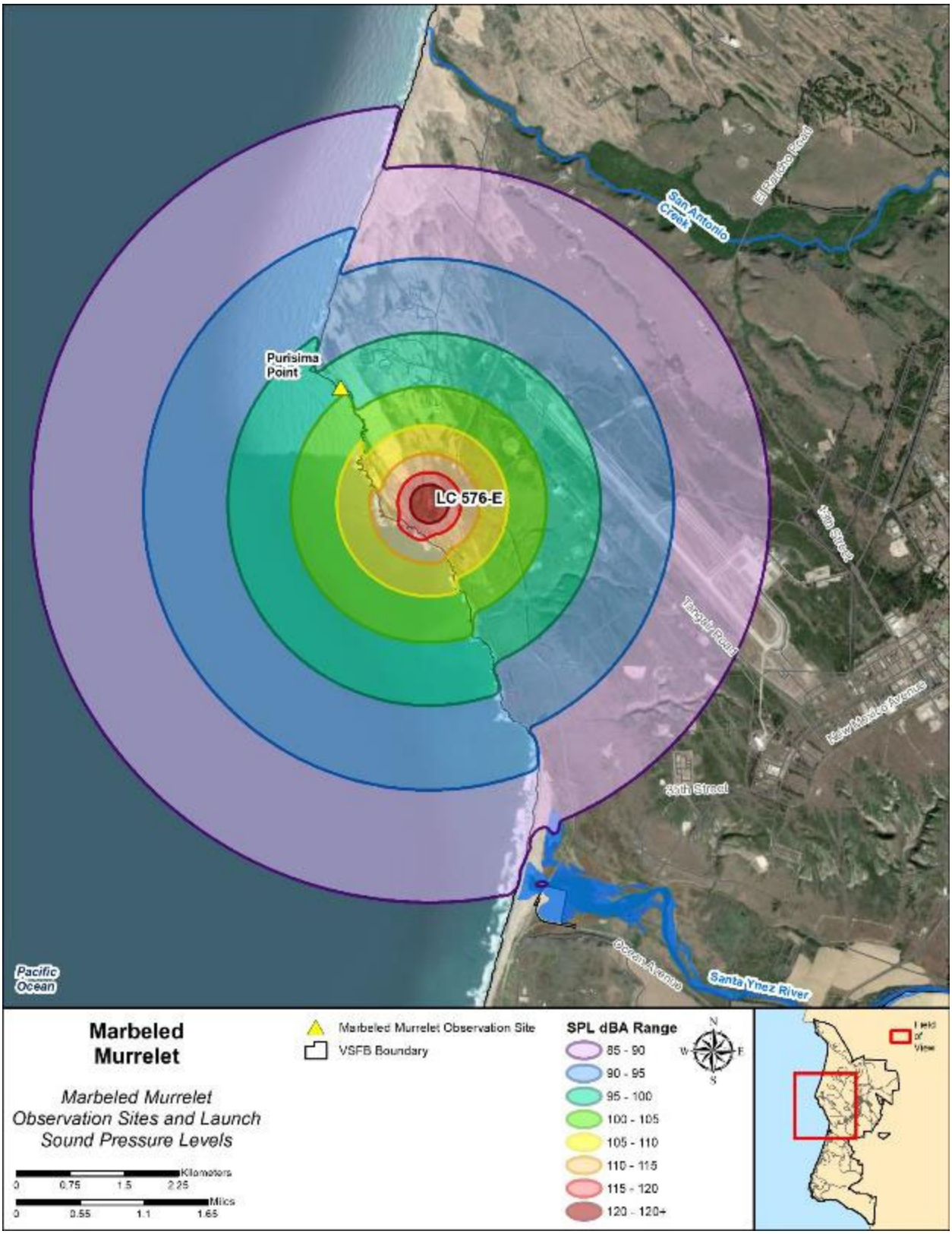

Figure 3.3-6: Marbled Murrelet and Launch Sound Pressure Levels (Note: MAMU Observation Sites are points of observation, not actual localities; MAMU data from eBird 2021)

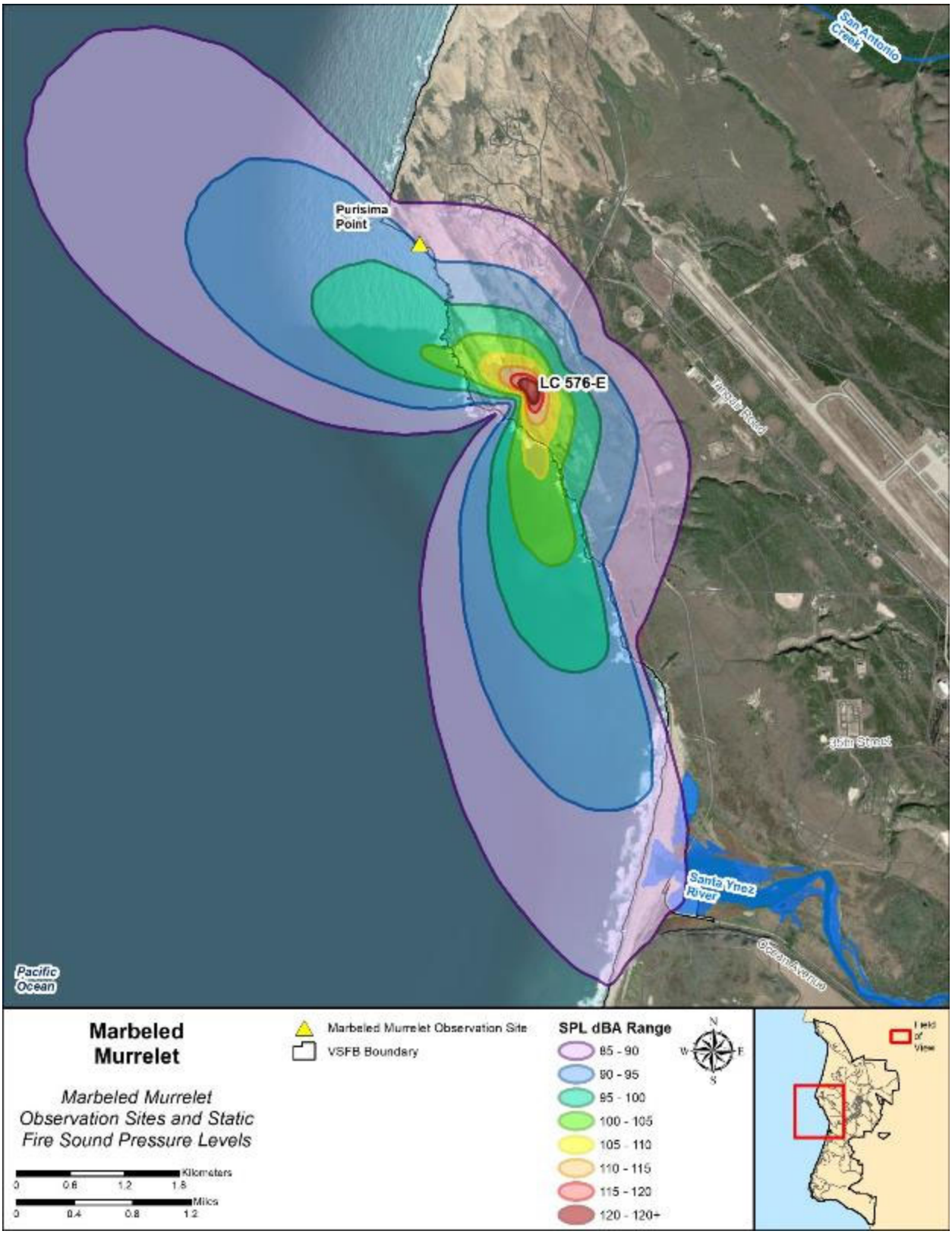

Figure 3.3-7: Marbled Murrelet and Static Sound Pressure Levels (Note: MAMU Observation Sites are points of observation, not actual localities; MAMU data from eBird 2021)

3.3.5.4. Western Snowy Plover (*Charadrius nivosus*) (Federally Threatened Species)

Detailed information regarding the status and life history of the SNPL is contained in Appendix I (Terrestrial Biological Resources).

3.3.5.4.1. *Occurrence within the Action Area*

VSFB provides important breeding and wintering habitat for SNPL, which includes all sandy beaches and adjacent coastal dunes from the rocky headlands at the north end of Minuteman Beach to the pocket beaches and dune areas adjacent to Purisima Point on north VSFB (approximately 7.7 mi. [12.4 km]). Also included are all sandy beaches and adjacent coastal dunes from the rocky headlands at the north end of Wall Beach south to the rock cliffs at the south end of Surf Beach on South VSFB (approximately 4.8 mi. [7.7 km]).

VSFB has consistently supported one of the largest populations of breeding SNPL along the west coast of the United States (Robinette et al. 2016). VSFB has performed annual monitoring of SNPLs since 1993 (Robinette et al. 2016). In 2014, VSFB supported an estimated 11% of California's breeding population (USFWS 2014). The breeding population of SNPLs on VSFB has been highly variable but relatively stable since 2007.

The nearest observation of a SNPL nest to LC 576-E is approximately 0.86 mi. (1.38 km) to the north in the Purisima Point area (Figures 3.3-8 and 3.3-9). SNPL nesting habitat from nearby the San Antonio Creek mouth to the north and the Santa Ynez River mouth to the south falls within portions of the Proposed Action Area subject to noise impacts (Figures 3.3-8 and 3.3-9).

3.3.5.4.2. *Critical Habitat*

The USFWS designated Critical Habitat for this species in 1999 and revised this designation on 29 September 2005 (70 FR 56969–57119) and on 19 June 2012 (77 FR 36727). VSFB was exempted from Critical Habitat designation under Section 4(a)(3) of the ESA. There is no designated Critical Habitat for this species within or adjacent to the Proposed Action Area.

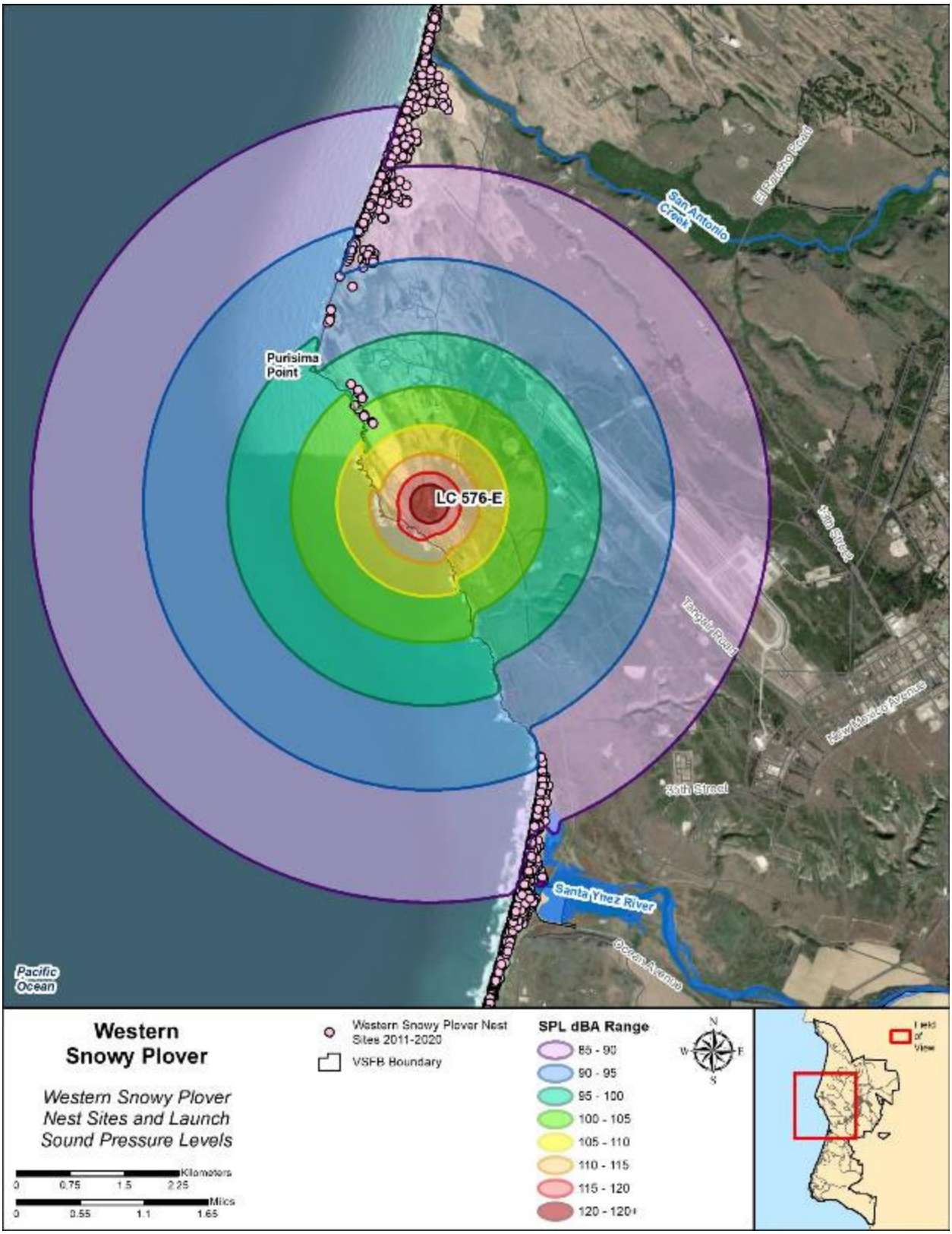

Figure 3.3-8: Western Snowy Plover Nest Sites and Launch Sound Pressure Levels

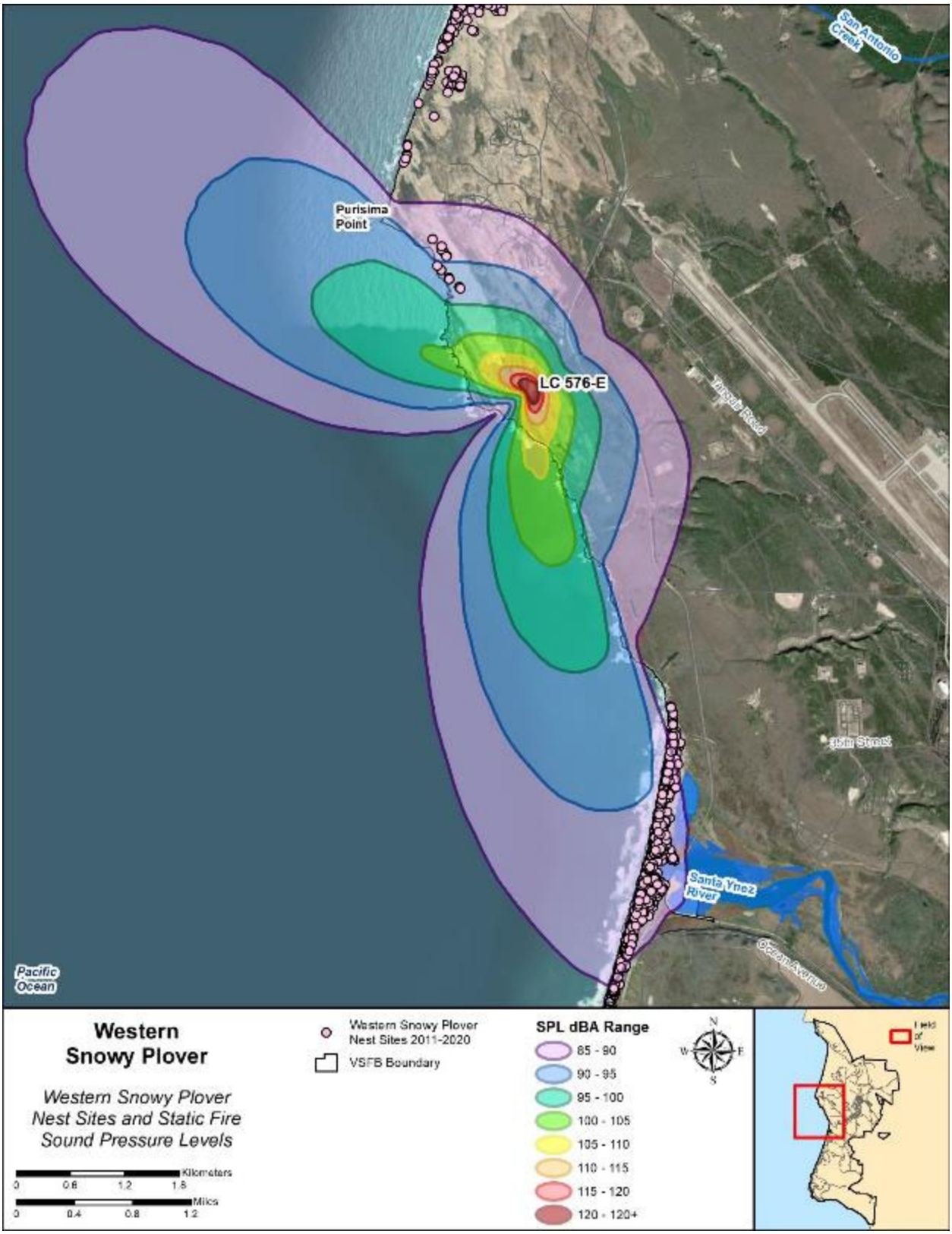

Figure 3.3-9: Western Snowy Plover Nest Sites and Static Sound Pressure Levels

3.4. Marine Biological Resources

Pinnipeds spend significant amounts of time out of the water during breeding, molting, and hauling out periods; therefore, the potential effects of in-air noise as a result of the Proposed Action on pinniped species at haulouts are analyzed below. Southern sea otter locations along the coast of mainland California would also be impacted by the engine noise generated during launches and are discussed below.

3.4.1. Region of Influence

The ROI for marine biological resources is primarily defined by the area impacted by noise and includes coastal areas and the waters offshore of LC 576-E and due south of VSFB within the area potentially impacted by sonic boom during launch (Figures 3.4-1 through 3.4-5). The resources discussed below come from a review of a collection of sources, including the DAF and the NMFS reports and data, the most recent U.S. Department of the Navy (Navy) documents that overlap the ROI, and from peer-reviewed literature concerning species with distributions or seasonal migrations through the ROI. Responses to various aspects of the Proposed Action are dependent on the biology of the species and the overlap of their habitat use and occurrence with the potential impact and exposure zones of the expected environmental stressors (e.g., acoustic, visual, ground disturbance) and are discussed further below.

3.4.2. Marine Mammals

Within the ROI, 5 pinnipeds (seals and sea lions) and 1 mustelid (southern sea otter) occur along the coastlines of VSFB and at the NCI. All marine mammals in the U.S. are protected under the MMPA, and some species receive additional protection under the ESA. The MMPA defines a marine mammal "stock" as "…a group of marine mammals of the same species or smaller taxon in a common spatial arrangement that, interbreed when mature" (16 U.S.C. section 1362; for further details, see Oleson et al. (2013). As provided by NMFS guidance, "…for purposes of management under the MMPA a stock is recognized as being a management unit that identifies a demographically independent biological population" (NMFS 2016a).

The ESA provides for listing species, subspecies, or Distinct Population Segments (DPSs) of species, all of which are referred to as "species" under the ESA. In short, a DPS is a portion of a species' or subspecies' population that is both discrete from the remainder of the population and significant in relation to the entire species, with the DPS then defined geographically instead of biologically. If a population meets the criteria to be identified as a DPS, it is eligible for listing under the ESA as a separate species (NMFS 2016a). Among these species most marine mammal stocks are managed by NMFS; the southern sea otter is managed by the USFWS. These species and stocks are presented in Table 3.4-1. Detailed species status and life history information is included in Appendix J (Marine Species).

Up to 5 sea turtle species, 7 mysticetes (baleen whales), and 22 odontocetes (toothed cetaceans) may be found within the ROI. Sea turtles and cetaceans spend their entire lives in the water and spend most of their time (>90% for most species) entirely submerged below the surface.

Additionally, when at the surface, sea turtle and cetacean bodies are almost entirely below the water's surface, with only the blowhole or head exposed for breathing. This minimizes exposure to in-air noise, both natural and anthropogenic, essentially 100% of the time because their ears are nearly always below the water's surface. As a result, in-air noise caused by sonic boom and engine noise would not have an effect on sea turtle or cetacean species. Therefore, they are not considered further in this EA.

Table 3.4-1: Marine Mammals Within the ROI of the Proposed Action Area

Species	Status	Potential Occurrence within the Proposed Action Area
Marine Mammals		
Guadalupe fur seal - Mexico to California Stock (*Arctocephalus townsendi*)	MMPA, FT	Potential: may occur in coastal waters and on the NCI impacted by noise.
Northern fur seal – California Stock (*Callorhinus ursinus*)	MMPA	Likely: may occur in coastal waters and on the NCI impacted by noise.
Southern sea otter (*Enhydra lutris nereis*)	FE	Present: may occur in coastal waters of VSFB impacted by noise.
Steller sea lion - Eastern U.S. Stock (*Eumetopias jubatus*)	MMPA	Potential: may occur in coastal waters, VSFB rocky coastline, and on the NCI impacted by noise.
Northern elephant seal – California Breeding Stock (*Mirounga angustirostris*)	MMPA	Present: may occur in coastal waters, VSFB beaches, and on the NCI impacted by noise.
Pacific harbor seal – California Stock (*Phoca vitulina richardii*)	MMPA	Present: occurs in coastal waters, VSFB rocky coastline, and on the NCI impacted by noise.
California sea lion – U.S. Stock (*Zalophus californianus*)	MMPA	Present: occurs in coastal waters, VSFB rocky coastline, and on the NCI impacted by noise.

Notes: FE = Federally Endangered Species; FT = Federally Threatened Species; MMPA = Marine Mammal Protection Act, NCI = Northern Channel Islands

3.4.2.1. Southern Sea Otter (Federally Threatened Species)

Detailed background information regarding the southern sea otter is contained in Appendix J (Marine Species). Southern sea otters occur regularly off the coast of VSFB, including offshore of LC 576-E (Figures 3.4-1 and 3.4-2), with animals typically concentrated where there are kelp beds offshore. For the last three annual spring census counts (2017, 2018, and 2019) there is an average of 1 otter within the Action Area (U.S. Geological Survey Western Ecological Resource Center 2017, 2018, 2019). No otters were detected offshore of LC 576-E during MSRS 2021 field surveys. Southern sea otters that occur within the Action Area may be subject to noise impacts (Figures 3.4-1 and 3.4-2). Critical Habitat for this species has not been designated.

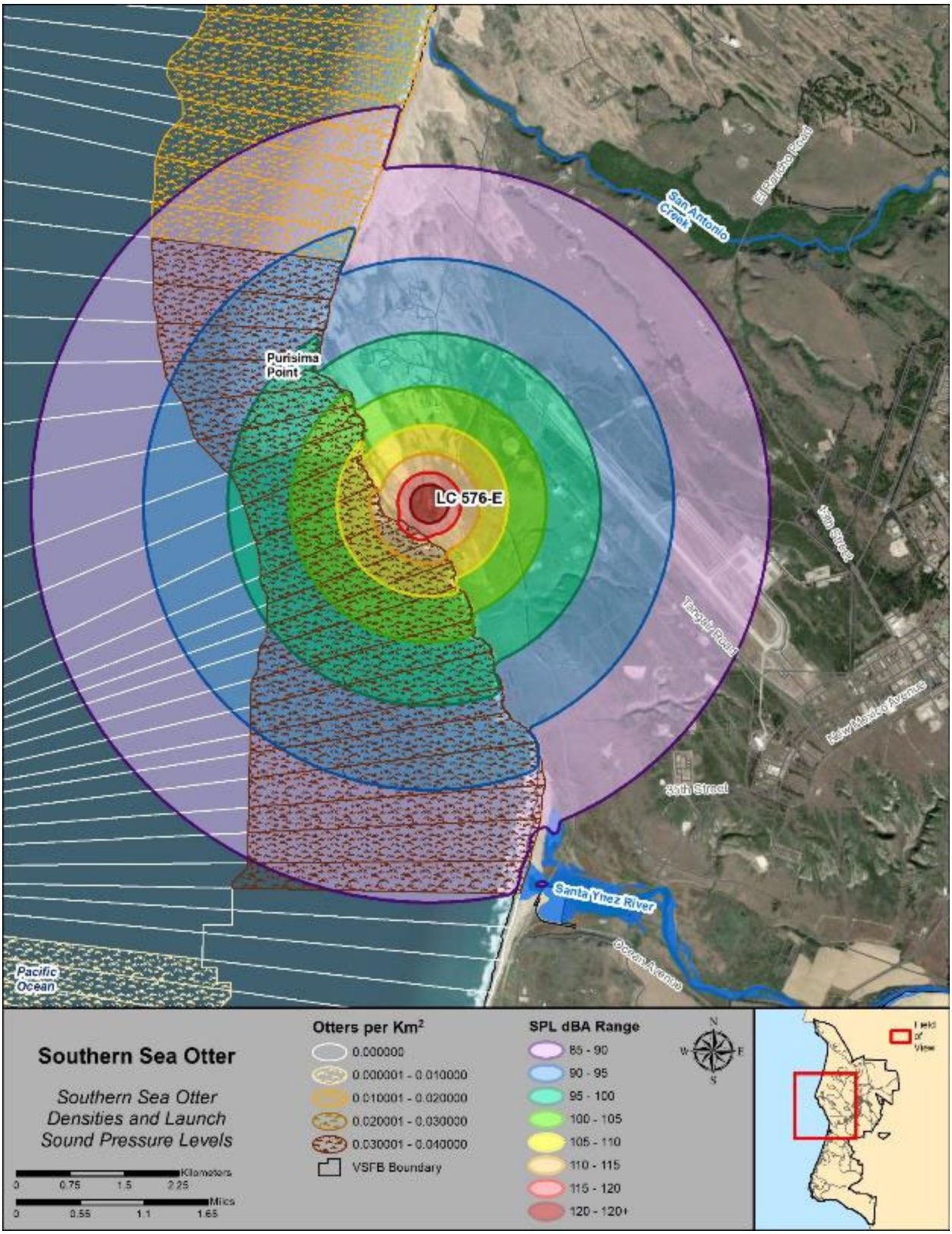

Figure 3.4-1: Southern Sea Otter Densities and Launch Sound Pressure Levels

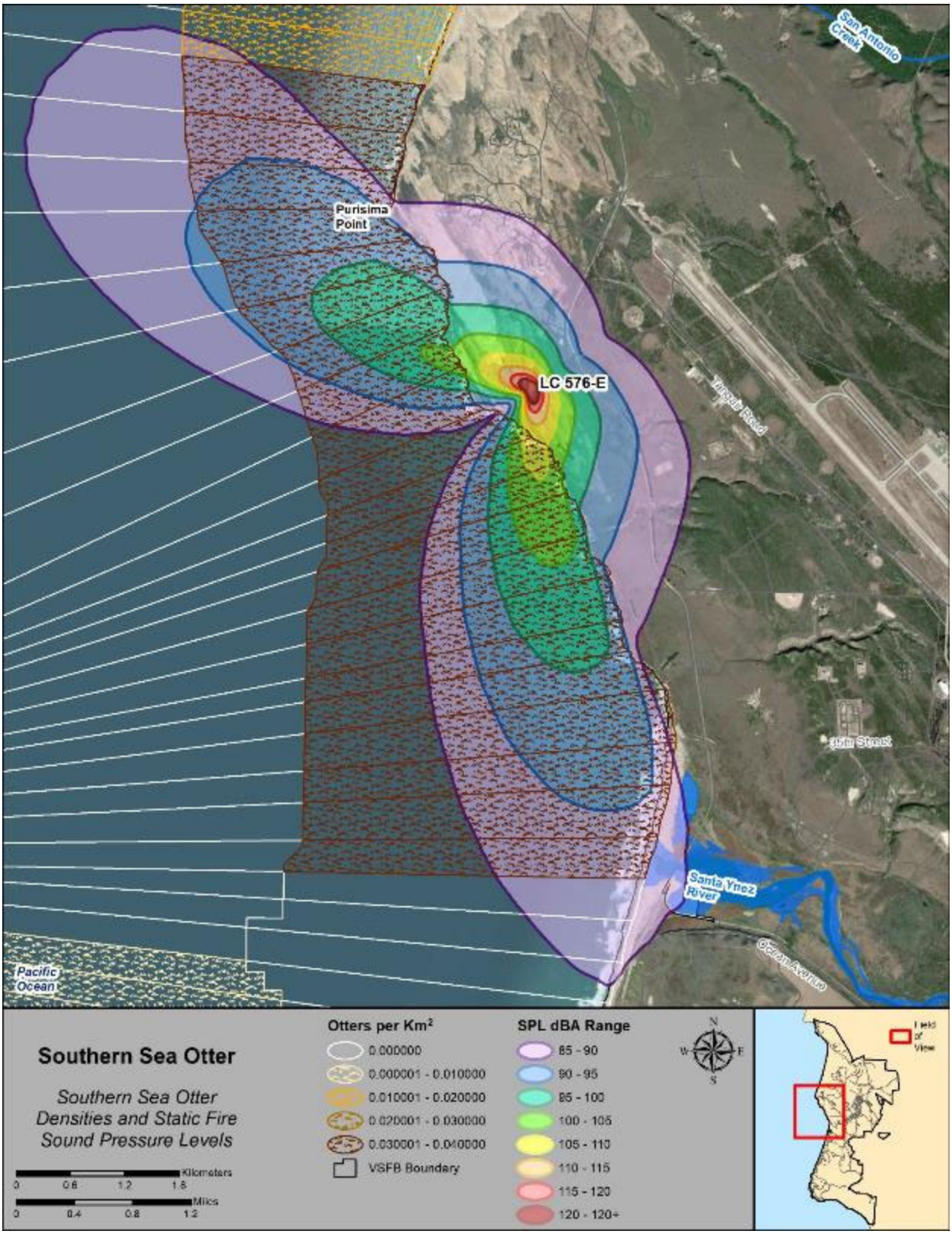

Figure 3.4-2: Southern Sea Otter Densities and Static Sound Pressure Levels

3.4.2.2. California Sea Lion

Detailed background information regarding the California sea lion is contained in Appendix J (Marine Species). California sea lions haul out at sites in the southern portion of VSFB, which are located approximately 11.5 mi. (18.5 km) south of LC 576-E, as well as the NCI (Figure 3.4-3), but have not been observed at any north VSFB haulout locations, including the Purisima Point and South Spur haulouts near LC 576-E, with the exception of infrequent sick animals under influence of domoic acid (Evans 2020; DAF 2021).

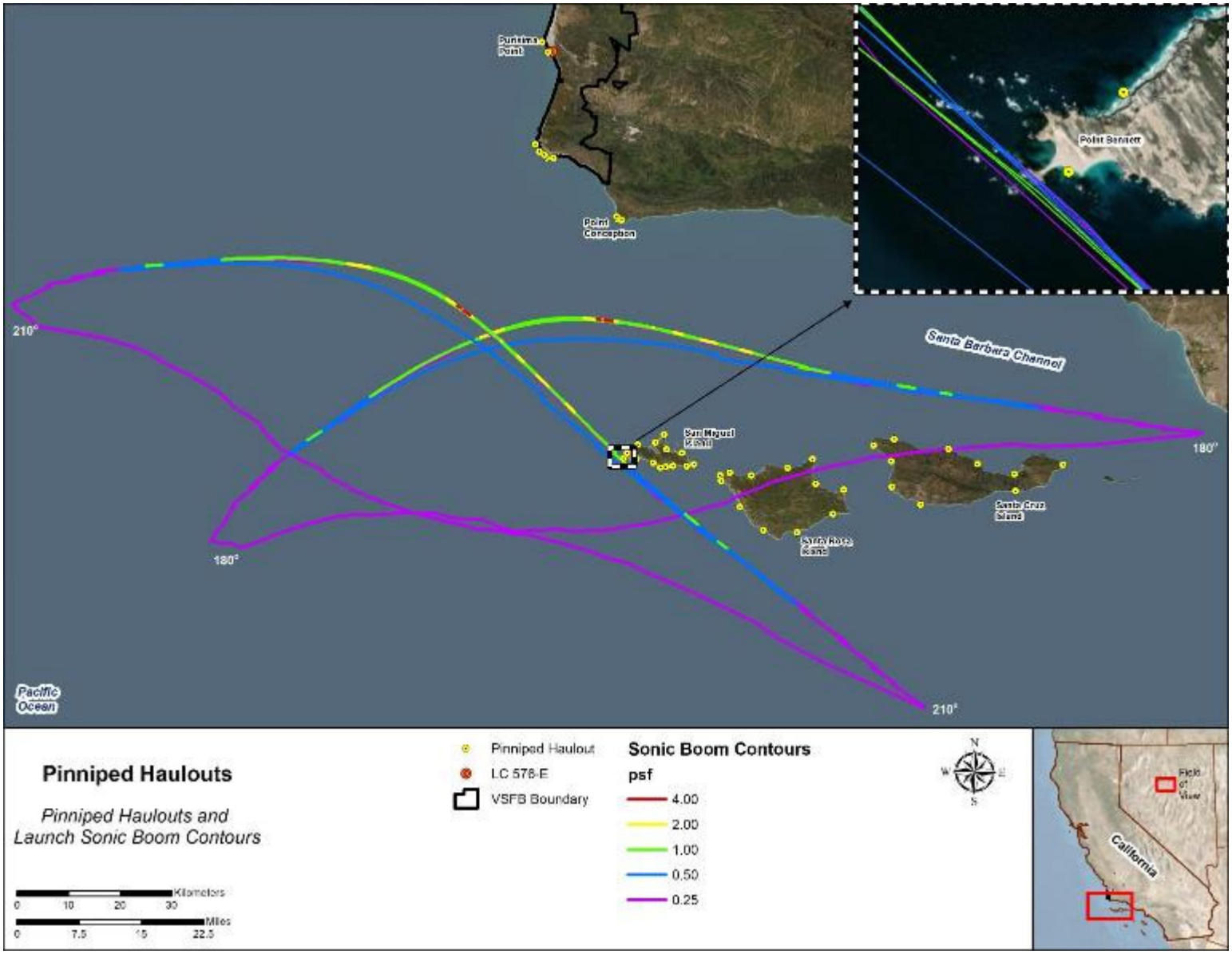

Figure 3.4-3: Pinniped Haulout Locations, the Northern Channel Islands, and Sonic Boom Model Results

3.4.2.3. Northern Fur Seal

Detailed background information regarding the northern fur seal is contained in Appendix J (Marine Species). Northern fur seals have not been observed at any VSFB haulout location (Evans 2020; DAF 2021), but are abundant at San Miguel Island (SMI; Figure 3.4-3), the primary rookery for the California stock.

3.4.2.4. Guadalupe Fur Seal (Federally Threatened Species)

Detailed background information regarding the Guadalupe fur seal is contained in Appendix J (Marine Species). Adult and juvenile males were occasionally observed at SMI, California since the mid-1960s and in the late 1990s a pup was born on SMI (Melin & Delong 1999). In NMFS aerial surveys of the California Channel Islands between 2011 and 2015, Guadalupe fur seals were only observed at SMI (Figure 3.4-3; Lowry et al. 2017; Burke 2017; National Marine Fisheries Service 2019c). On SMI, one to several Guadalupe fur seals were observed annually between 1969 and 2000 (DeLong & Melin 2000), and an adult female with a pup was observed in 1997 (Melin & Delong 1999). From 2010 to 2015, 2–3 pups have been observed annually on SMI, and 13 individuals and 2 pups were observed in 2015. Observations of adult males are rare on SMI and no breeding territories have been established (Harris 2015). NMFS surveys indicate approximately 10–12 individuals regularly use the SMI, with 1–2 pups born each year during June (Melin 2021). Guadalupe fur seals were not observed hauling out on the mainland coast of Santa Barbara County, including VSFB haulout locations (Evans 2020; DAF 2019b).

Critical habitat for the Guadalupe fur seal was not designated since the only areas that meet the definition for critical habitat are outside of U.S. jurisdiction (National Oceanic and Atmospheric Administration 1985).

3.4.2.5. Steller Sea Lion

Detailed background information regarding the Steller sea lion is contained in Appendix J (Marine Species). Steller sea lions used the North Rocky Point haulout on VSFB in April and May 2012 (Marine Mammal Consulting Group & Science Applications International Corporation 2012). This observation was the first this species was reported at VSFB during launch monitoring and monthly surveys conducted over the past two decades. Since 2012, Steller sea lions have been observed frequently in routine monthly surveys, with as many as 16 individuals recorded. In 2019, up to 4 Steller sea lions were observed on south VSFB during monthly marine mammal counts (DAF 2020a); however, none were observed during monthly counts in 2020 (DAF 2021). These locations are approximately 11.5 mi. (18.5 km) south of LC 576-E.

3.4.2.6. Harbor Seal

Detailed background information regarding the harbor seal is contained in Appendix J (Marine Species). Harbor seals, while primarily aquatic, also use the coastal terrestrial environment, where they haul out of the water periodically, including the shoreline at VSFB. Most haulout sites on VSFB are located on south VSFB. On north VSFB, two haulout locations are near LC 576-E:

Purisima Point is 1.6 mi. (2.6 km) northwest and South Spur is 0.5 mi. (0.8 km) west of LC 576-E (Figures 3.4-4 and 3.4-5). During monthly pinniped counts on VSFB during 2019, a maximum of 23 harbor seals were observed at South Spur (DAF 2020a). In 2020, a maximum of 26 harbor seals were recorded at South Spur (DAF 2021). Purisima Point was not included in recent monthly pinniped counts.

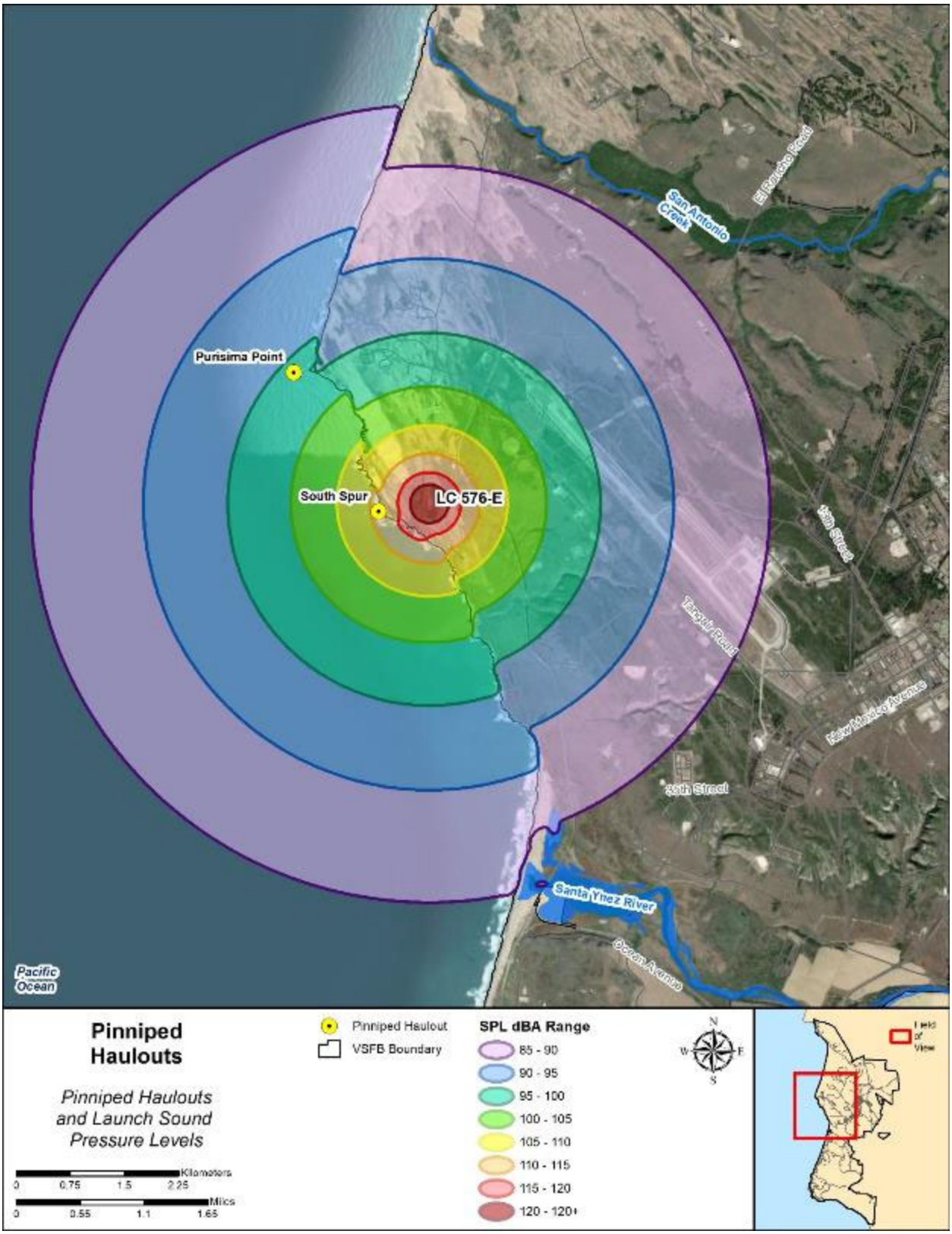

Figure 3.4-4: Pinniped Haulouts in the vicinity of LC 576-E and Launch Sound Pressure Levels

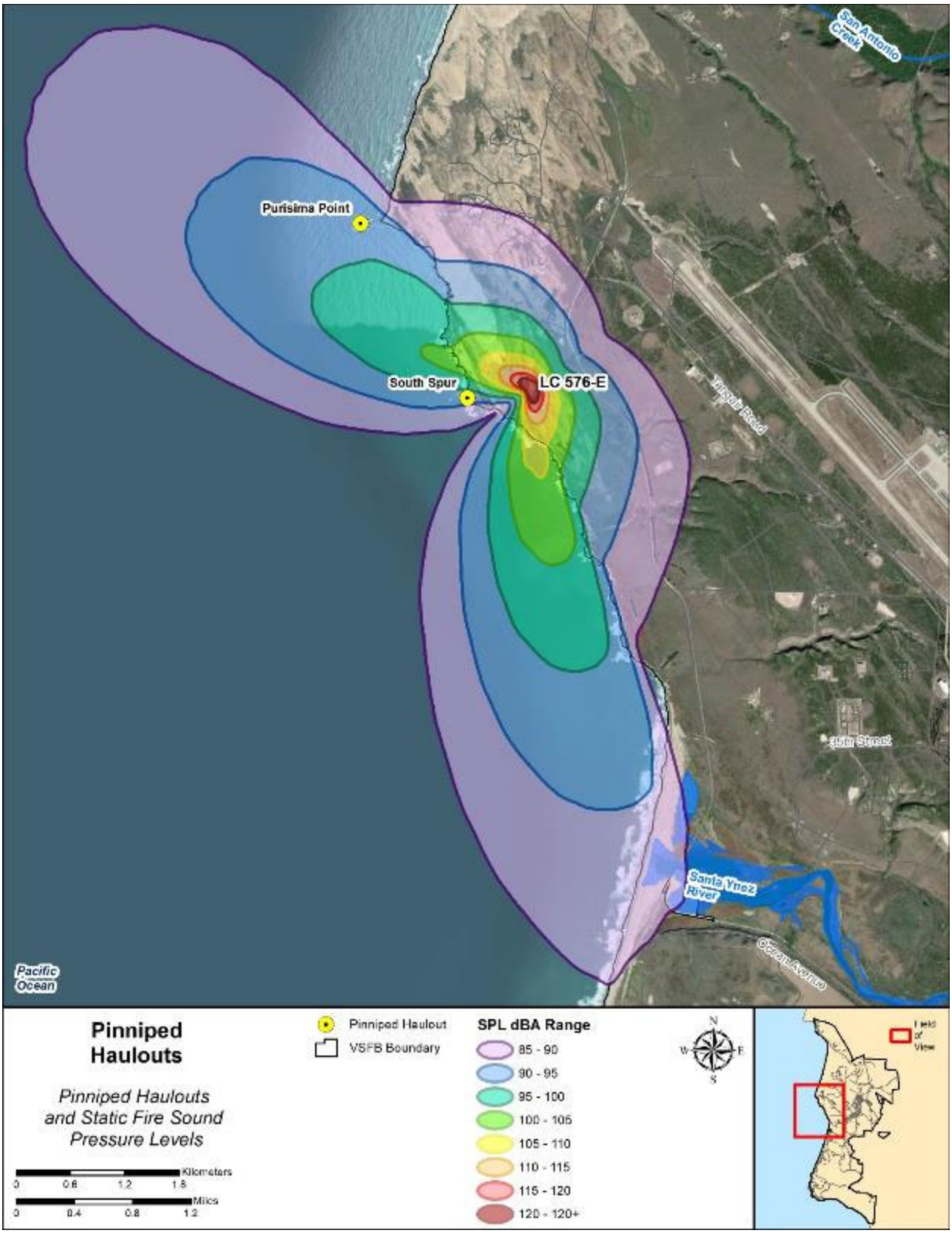

Figure 3.4-5: Pinniped Haulouts in the Vicinity of LC 576-E and Static Fire Sound Pressure Levels

3.4.2.7. Northern Elephant Seal

Detailed background information regarding the northern elephant seals is contained in Appendix J (Marine Species). Although northern elephant seals haul out at south Base locations, they were not observed at north VSFB haulouts in 2019 (DAF 2020a) or in 2020 (DAF 2021). Northern elephant seals occurring on south VSFB were increasing over the past decade, were documented breeding on south VSFB every year since 2017 (DAF 2021), and they may begin to use areas on VSFB where they have not previously been observed.

3.4.3. Marine Reserves

Under the National Marine Sanctuaries Act, the National Oceanic and Atmospheric Administration established national marine sanctuaries for marine areas with special conservation, recreational, ecological, historical, cultural, archaeological, scientific, educational, or aesthetic qualities. The Channel Islands National Marine Sanctuary (CINMS) is a collection of marine reserves and marine sanctuaries located at the Channel Islands approximately 50 mi. (79 km) south of LC 576-E. CINMS regulations listed in 15 C.F.R. 922.71–922.74. Section 922.72(a)(1) prohibits taking any marine mammal, sea turtle, or seabird within or above the CINMS, except as authorized by the MMPA, ESA, Migratory Bird Treaty Act (MBTA), or any regulation promulgated under the MMPA, ESA, or MBTA. An RS1 launch would produce a sonic boom at or slightly above 2.0 psf within the CINMS.

In addition, the coastline from Purisima Point to just north of Point Arguello has been designated as the Vandenberg State Marine Reserve (VSMR) pursuant to the Marine Managed Areas Improvement Act. The VSMR management objectives include providing for complete protection of a diverse area containing shallow hard and soft habitats, kelp beds, and associated marine life. An RS1 launch would produce engine noise up to approximately 120 dB SPL within the VMSR.

3.5. Water Resources

3.5.1. Region of Influence

The ROI for Water Resources include those areas where the Proposed Action may affect surface water, groundwater, and marine waters of the United States. This includes the LC 576-E site on VSFB where ground-disturbing activities would take place, as well as adjacent areas that may be impacted by transport of equipment, establishment of a firebreak, launch and static operations, and implementation of the Proposed Action. There are no surface water resources within the ROI. For groundwater resources, LC 576-E is located on the western edge of the Santa Ynez River Valley Basin (Figure 3.5-1). There are no jurisdictional waters or wetlands within the LC 576-E site (see Table 2.4-1).

3.5.2. Surface Water

A detailed description of the regulatory setting regarding surface water, including a discussion of the Clean Water Act and Regional Water Quality Control Board (RWQCB), is contained in Appendix K (Water Resources). VSFB is in the Region 3 Central Coast RWQCB's jurisdiction.

The Santa Ynez River is considered the dividing line between North and South VSFB and is one of the two major drainages that bracket the action area with the Santa Ynez River to the south and San Antonio Creek to the north (Figure 3.5-1). Drainage from these water ways is predominantly to the west, toward the Pacific Ocean. There are also numerous unnamed minor drainages containing seasonal and ephemeral streams or drainages between these two major water ways. No physical impacts on water resources will take place outside of the bounds of the vegetation management area that encompasses and surrounds LC 576-E.

No surface water resources are present in the Terrestrial Biological Survey Area encompassing LC 576-E. During storms, surface water in this area is confined to paved surfaces including roads and concrete pads (Tetra Tech 2020). There are several unlined drainage ditches located outside of LC 576-E, but there was no indication of recent inundation or historic presence of surface water or connection to surface waters in these areas during MSRS 2021 field surveys.

3.5.3. Groundwater

A detailed description of the regulatory setting regarding groundwater is contained in Appendix K (Water Resources). VSFB includes parts of two major groundwater basins and at least two sub-basins. Most of the northern third of the Base is within the San Antonio Creek Basin, while most of the southern two-thirds of the Base is within the Santa Ynez River Basin and associated Lompoc Terrace and Cañada Honda sub-basins.

Groundwater quality in the region meets all National Primary Drinking Water Regulation standards (California Department of Water Resources 2004). Continued groundwater basins overdraft could lead to degrading the water table levels and compacting the basins. Groundwater monitoring is conducted for basins that are used for drinking water.

LC 576-E is located on the western edge of the Santa Ynez River Valley Basin (Figure 3.5-1). Installation Restoration Program (IRP) groundwater investigations and monitoring of remedial treatment systems nearby LC 576-E have documented a thin groundwater zone present under the facility. The groundwater in this area is located in unconsolidated sand deposits overlying Monterey Shale bedrock at elevations of 20–40 ft. (6–12 m) below the ground surface (Tetra Tech 2020).

Figure 3.5-1: Water Resources in the Vicinity of the RS1 Launch Site

3.6. Cultural Resources

Cultural resources are districts, buildings, sites, structures, areas of traditional use, or objects with historical, architectural, archeological, cultural, or of scientific importance. They include archeological resources (both prehistoric and historic), historic architectural resources (physical properties, structures, or built items), and traditional cultural properties (those important to living Native Americans for religious, spiritual, ancestral, or traditional reasons).

The NHPA establishes national policy for protecting significant cultural resources that are defined as "historic properties." The term "historic property" refers to any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in the National Register of Historic Places (NRHP) (36 C.F.R. Part 800.16).

3.6.1. Region of Influence

The ROI for cultural resources includes VSFB's regional setting and the specific Proposed Action Area, including the cultural resources located therein. These cultural resources within the project area are discussed below, and a cultural setting and history detailed description is contained in Appendix L (Cultural Resources).

Ground disturbing activities under the Proposed Action would be developed at the former Atlas Intercontinental Ballistic Missile (ICBM) Launch Complex identified as Atlas Complex 576-E. The Atlas 576-E launch facility was constructed in 1960–1961 for the Atlas F ICBM operational testing and training program. The facility was decommissioned in 1965 as the Atlas ICBMs were replaced by the Titan II and Minuteman ICMBs. In 1993, the facility was leased to Orbital Sciences Corporation and a launch stand and apron were constructed adjacent to the silo.

In addition, noise produced during launch and static fire events could potentially impact historical properties (architectural/above-ground resources, aka "built environment"). When defining the Area of Potential Effects (APE) for these impacts, the FAA uses the 120 decibel (dB; unweighted linear sound pressure level) noise contour to define the APE for engine noise, because Fenton and Methold (2016) showed no material effect to buildings below 120 dB. Engine noise produced during RS1 launch and static fire events would impact the area between San Antonio Creek and the Santa Ynez River mouth, including Purisima Point. Blue Ridge Research and Consulting (2020) modeled RS1 engine noise for launch and static fire and produced sound level contours (Figure 3.6-1). AE found no historic properties in the built environment within the 120 dB (unweighted, linear) contour.

The FAA uses the 2 psf overpressure contour to define the APE for areas exposed to a sonic boom, based on Haber and Nakaki (1989) who found damage to buildings to be unlikely under 2 psf. Blue Ridge Research and Consulting (2020) modeled potential sonic boom contours for two sample trajectories, one at 180 degrees and one at 210 degrees, using one meteorological profile. During ascent, a sonic boom (overpressure of high energy impulsive sound) up to 5.4 psf would be generated while the first-stage booster is supersonic (Figure 2.3-5). The overpressure would be primarily directed at the Pacific Ocean south of Point Conception, potentially reaching up to 2.0 psf on SMI. Although the modeling results do not predict a boom greater than 1 psf impacting

SMI, atmospheric conditions can vary substantially throughout the year and likewise influence the geographic impact profile to a great degree. The model results suggest an event where a 2 psf sonic boom or greater would impact SMI is unlikely, however, without performing additional boom modeling, ABL and VSFB assume that a boom of up to 2 psf may impact SMI. Therefore, the APE for built environment includes SMI.

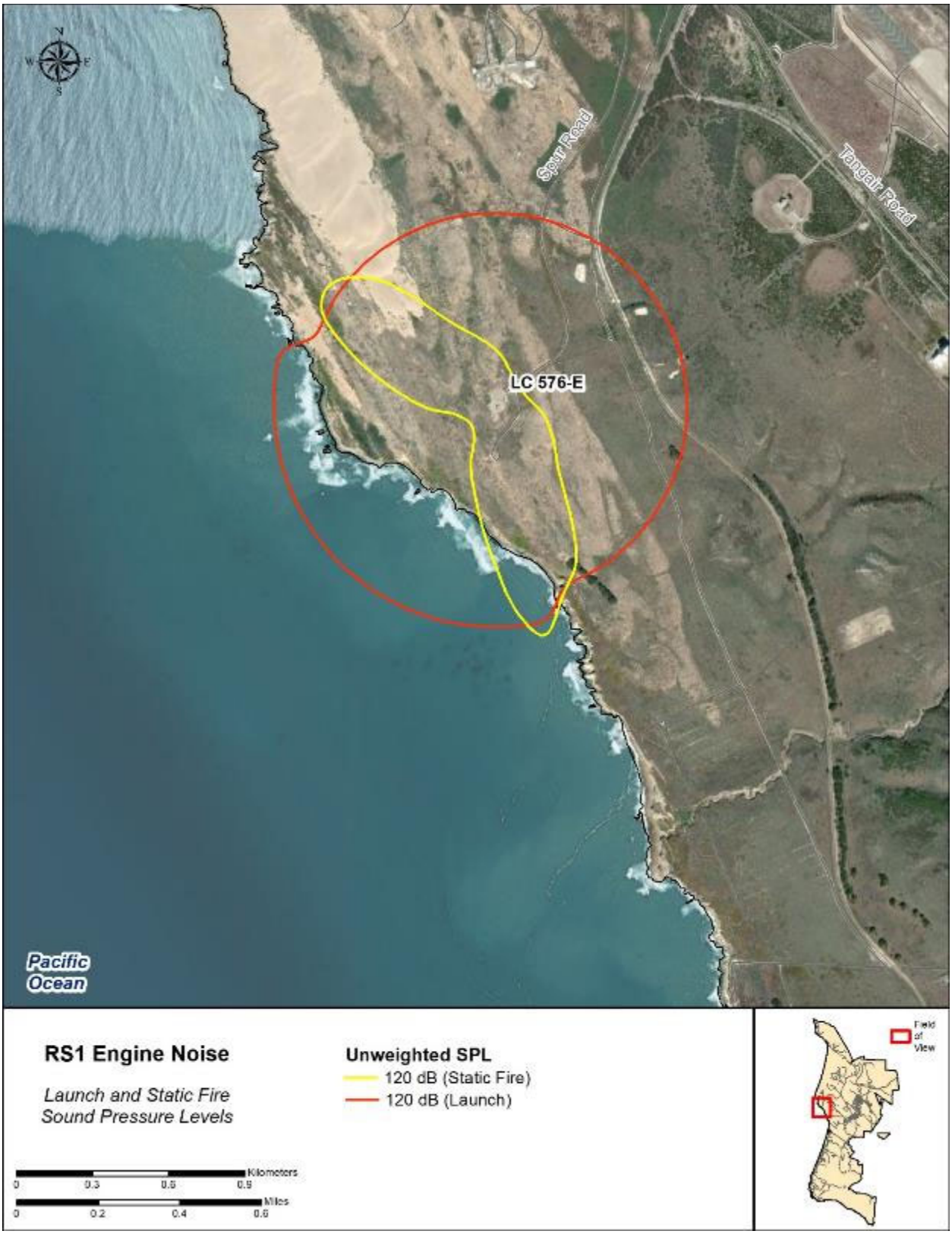

Figure 3.6-1. Launch and static fire unweighted 120 dB sound pressure level contours (Blue Ridge Research and Consulting 2020)

3.6.2. Cultural Resources within the Project Area

Applied EarthWorks, Inc. (AE) conducted Section 106 studies for the Proposed Action that included background research, surface survey, subsurface survey excavations, and excavation to identify and assess the Project's potential effects to cultural resources. AE defined the Area of Direct Impact (ADI) for ground disturbing activities as the fenced LC 576-E facility and the surrounding area proposed for vegetation maintenance, including an approximately 50 to 65-ft. (15 to 20-m) wide firebreak corridor, and the vegetation maintenance area between the facility and the firebreak. The cultural resources Study Area was defined as the ADI plus a 100 ft. (30 m) buffer and the entirety of any cultural resource intersected by the ADI. The results are reported by Gerber and Lebow 2021 and are the basis for the following summary.

In addition, MSRS and AE conducted a literature review of historic properties on SMI. Roberts (1979) assembled a detailed Historic Resource Study of SMI for the Channel Islands National Monument, which Livingston (2016) supplemented and updated for the National Park Service. Livingston (2016) represents the most current and comprehensive Historic Resource Study for SMI, providing a review of Roberts (1979) and supplementing with survey results by National Park Ranger Ian Williams in 1999, and National Park Cultural Resources Manager Ann Huston and Archeologist Don Morris in 1998. In regard to the built environment, no historic buildings remain intact on SMI (Livingston 2016). All historic structures have either been lost to fire or remain in ruins.

3.6.2.1. Background Research

AE completed a cultural resources records and literature search at SLD 30/CEI at VSFB that included reviewing resource records, reports, and site condition assessments, and examining Base GIS and U.S. Geological Society topographic maps. In addition, AE consulted staff at the SLD 30/CEI regarding cultural resources within the Study Area.

Background research indicates that the entire study area has been previously surveyed for cultural resources. Six archaeological sites (CA-SBA-TMP6, -TMP8, -907, -2428, -2429, and -2930) are recorded within the ASA. Four of the archaeological sites (CA-SBA-907, -2428, -2429, and -2430) are mapped in two separate locations. Additionally, the Atlas Complex 576-E facility is a built environment cultural resource (P-42-041224) within the Atlas ICBM Launch Complexes District.

Background research identified eight previous investigations within the Study Area and associated with these resources (

Table 3.6-1). Cultural resources within the Study Area are briefly summarized below. Table 3.6-2 lists cultural resources that are either recorded or mapped within the Study Area, and their NRHP status.

Table 3.6-1: Previous Cultural Resource Investigations Within the Study Area

Author(s)/Year (in chronological order)	VAFB Report No.	Report Title	Site(s)
Spanne 1974	1974-02	*Archaeological Survey of Vandenberg Air Force Base, Santa Barbara County, California 1971-1973*	CA-SBA-907
Schmidt 1991	1991-04	*Standard Small Launch Vehicle (SSLV): Taurus Project, Vandenberg Air Force Base*	SBA-907, 2428, -2429, -2930
McCullough and Nowlan 1997	1997-17	*Cold War Properties Evaluation – Phase III, Inventory and Evaluation of Atlas, Titan, Bomarc, and Blue Scout Junior Launch Facilities at Vandenberg Air Force Base, California, for the United States Air Force.*	P-42-041224
Lebow and Ryan 1998	1998-07	*Cultural Resources Condition on Vandenberg AFB Fiscal Year 1998: Zones 6 and 7*	CA-SBA-907, -2428, -2429, and -2430
Lebow 2011	2011-13	*Assessment of Archaeological Site Condition on Vandenberg Air Force Base, Fiscal Year 2018*	CA-SBA-907, -2428, -2429, and -2430
Murphy 2019	2019-10	*Condition Assessment of Archaeological Sites on Vandenberg Air Force Base, Fiscal Year 2018*	CA-SBA-907
Lebow 2020	-	*Re: Cultural Resources Portion of an Environmental Baseline Survey (EBS), Northrup Grumman Close-Out at Missile Silo 33, Former Atlas 576-E Launch Facility, Vandenberg Air Force Base (AFB)*	P-42-041224, CA-SBA-2428, -2429
Smallwood and Loetzerich 2020	-	*Section 110 National Register Eligibility Evaluation of the Atlas ICBM Launch Complexes District, Vandenberg Air Force Base, California*	P-42-041224

Table 3.6-2: Cultural Resources within the Study Area

Site No.	NRHP Status
Atlas ICBM Launch Complexes District	Determined Not Eligible
Atlas Complex 576-E (P-42-041224)	Determined Not Eligible
CA-SBA-907	Not Evaluated
CA-SBA-2428	Not Evaluated
CA-SBA-2429	Not Evaluated
CA-SBA-2430	Not Evaluated
CA SBA TMP6	Not Evaluated
CA SBA TMP8	Not Evaluated

Note: NRHP = National Register of Historic Places

3.6.2.1.1. *Atlas Complex 576-E and Atlas ICBM Launch Complexes District*

Atlas Complex 576-E (P-42-041224) is one of seven launch complexes built at VSFB to launch Atlas missiles (Smallwood 2017). In the mid-1990s, the U.S. Army Construction Engineering Research Laboratories examined VSFB selected structures and evaluated resource significance using exceptional Cold War properties criteria. They concluded that the integrity of the Atlas 576-E launch facility was insufficient to be eligible for the NRHP (McCullough and Nowlan 1997:109-118).

More recently, Smallwood (2017) recorded an Atlas ICBM Launch Complexes District that includes the 576-E facility. Because the district and the 576-E facility have now crossed the 50-year threshold, Smallwood and Loetzerich (2020) evaluated the district and associated elements using the normal (36 C.F.R. 60.4) criteria for NRHP eligibility. They found that the District is not eligible for the NRHP due to a lack of historical integrity and that the 576-E complex is likewise not individually eligible for the NRHP. The California SHPO concurred with those determinations (Polanco 2020).

3.6.2.1.2. *CA-SBA-907*

CA-SBA-907 was originally recorded in 1971 by Spanne (1974) as a low-density scatter of Monterey chert debitage in a small blowout within a stabilized dune complex. No excavation has been conducted at this site, and it has not been evaluated for NRHP eligibility. Schmidt (1991) was unable to relocate the site during his 1991 survey for the Taurus project. The site was relocated during 1998 condition assessments (Lebow and Ryan 1998), and its description was confirmed.

3.6.2.1.3. *CA-SBA-2428*

CA-SBA-2428 has not been evaluated for NRHP eligibility. Greenwood & Associates recorded the site in 1991 during a survey for the proposed installation of a Taurus launch facility (Schmidt et al. 1991) as a moderate density scatter of chipped stone tools, tested cobbles, and debitage, with associated shellfish remains. In 1998, AE visited the site for a condition assessment (Lebow and Ryan 1998); they described it as a discrete scatter of lithics and shell outside of the facility fence and recommended that it be plotted on the Base GIS. In 2020, AE completed background

research and a letter report in support of an Environmental Baseline Survey (EBS) for the Northrup Grumman close-out of Missile Silo 33 at the LC 576-E complex (Lebow 2020). The letter report notes that the site is currently mis-plotted on the Base GIS.

3.6.2.1.4. *CA-SBA-2429*

CA-SBA-2429 has not been evaluated for NRHP eligibility. Greenwood & Associates recorded the site in 1991 during a survey for the proposed installation of a Taurus launch facility (Schmidt et al. 1991b) as a low-density scatter of chipped stone tools and debitage, with associated shellfish remains. In 1998, AE visited the site for a condition assessment (Lebow and Ryan 1998); they noted that the paucity of material made it difficult to re-locate and recommended that it be plotted on the Base GIS. In 2020, AE completed background research and a letter report in support of an EBS for the Northrup Grumman close-out of Missile Silo 33 at the LC 576-E complex (Lebow 2020). The letter report notes that the site is currently mis-plotted on the Base GIS.

3.6.2.1.5. *CA-SBA-2430*

CA-SBA-2430 has not been evaluated for NRHP eligibility. Greenwood & Associates recorded the site in 1991 during a survey for the proposed installation of a Taurus launch facility (Schmidt et al. 1991c) as a low-density scatter of chipped stone debitage with associated shellfish remains.

3.6.2.1.6. *CA-SBA-TMP6 and CA-SBA-TMP8*

CA-SBA-TMP6 and CA-SBA-TMP8 have not been evaluated for NRHP eligibility. These sites were found during archaeological monitoring of an unexploded ordnance survey. Neither site was recorded at the time of discovery, and only a single Global Positioning System (GPS) point was taken to record each site location. Site records were subsequently completed based on monitoring notes, but neither site location was revisited (Lebow 2014). Consequently, neither site has been formally recorded and site boundaries are unknown (Lebow 2020).

3.6.2.2. Section 106 Studies Conducted for the Proposed Action

In March of 2021, AE performed surface survey and excavated 61 shovel test pits within the ADI to assess potential Project effects. The testing effort focused on Project impact areas within the facility fence line and the firebreak. Fieldwork documented a highly modified landscape that appeared to be the result of previous grading and development of the LC 576-E facility. No archaeological materials were observed on the surface within the ADI, and excavations did not yield any archaeological material. CA-SBA-TMP6 and -TMP8 were found not to be sites. Based on fieldwork and background research, the locations of CA-SBA-907, 2428, -2429, and -2430 were confirmed as mis-plotted in the Base GIS. Updated site records were completed to document the correct locations of these sites outside of the ADI.

3.7. Department of Transportation Act Section 4(f)

Section 4(f) of the U.S. Department of Transportation Act of 1966 (now codified at 49 U.S.C. § 303) protects significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites listed or eligible for listing on the National Register of Historic Places. Section 4(f) provides that the Secretary of Transportation may approve a transportation program or project requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of an historic site of national, State, or local significance, only if there is no feasible and prudent alternative to the use of such land and the program or project includes all possible planning to minimize harm resulting from the use.

Procedural requirements for complying with Section 4(f) are set forth in DOT Order 5610.1D, *Procedures for Considering Environmental Impacts*. The FAA also uses Federal Highway Administration (FHWA) regulations (23 C.F.R. part 774) and FHWA guidance (e.g., Section 4(f) Policy Paper) when assessing potential impacts on Section 4(f) properties. These requirements are not binding on the FAA; however, the FAA may use them as guidance to the extent relevant to FAA projects.

3.7.1. Region of Influence

The ROI for Section 4(f) is defined by the debris impact corridor and noise footprint of the Proposed Action, including noise generated by RS1 engines during launch and the downrange sonic boom footprint that could impact the Northern Channel Islands (see Figures 3.7-1 through 3.7-3).

Potential Section 4(f) properties within or near the debris impact corridor and noise footprint include South Spur, Wall Beach, Surf Beach, County of Santa Barbara Ocean Beach Park, Miguelito County Park, Rancho Guadalupe Dunes County Park, Jalama Beach County Park, Point Sal Beach State Park, Gaviota Beach State Park, and the Channel Islands National Park (Figures 3.7-1 through 3.7-3). South Spur, Wall Beach, County of Santa Barbara Ocean Beach Park, and Surf Beach are closest to LC 576-E.

South Spur, just west of LC 576-E, is a popular on-Base site for tide-pooling and fishing and would be closed during launch and static fire activities. To the south of LC 576-E, Wall Beach is an on-Base beach access point with several cabins for overnight use by VSFB affiliates. Wall Beach would also be closed during launch and static fire activities. Both South Spur and Wall Beach are closed to the public. However, Surf Beach and Ocean Beach Park are open to the general public. Access to these parks is restricted during launches from LC 576-E because an anomaly could impact them, but would not be closed during static fire events. Surf Beach is located southwest of LC 576-E at the end of Ocean Avenue. This is the only public access beach on VSFB and is the site of the Lompoc-Surf Station Amtrak stop for the Pacific Surfliner. Areas north and south of the beach are closed March through September for SNPL nesting season. Ocean Beach Park is a day use-only park, providing recreational opportunities such as bird watching, nature photography, and picnic facilities. South Spur, Wall Beach, Surf Beach, and Ocean Beach Park were closed, typically one to four times each year, during launches from various programs that

operated at SLC-2 from 1966 through 2018. The Firefly Alpha launch program has reactivated SLC-2 and will begin launch activities in 2021, which will require closures of these same properties.

Jalama Beach County Park is located south of VSFB (Figure 3.7-1). It is a popular camping spot, with 98 campsites overlooking the ocean or beachfront and peak attendance over the summer and holiday weekends. In addition to camping facilities, Jalama Beach offers picnicking, surfing, whale watching, bird watching, nature photography, and fishing. Jalama Beach would not be closed during launch or static fire events under the Proposed Action; however, is subject to occasional closures from launch programs originating from other locations on VSFB.

Other nearby Section 4(f) properties that were determined to be outside of the ROI and would not be closed during launch or static fire events include: Miguelito County Park, Rancho Guadalupe Dunes County Park, Point Sal Beach State Park, and Gaviota Beach State Park (Figures 3.7-1 through 3.7-3).

The Channel Islands National Park is within the sonic boom footprint (see Figure 3.7-3). There are no services, such as food or gear stores or rental shops on these five islands. Activities on the islands include hiking, camping, snorkeling, kayaking, whale watching, birdwatching, and taking photographs, among others. Channel Islands National Park would not be closed during launch or static fire events.

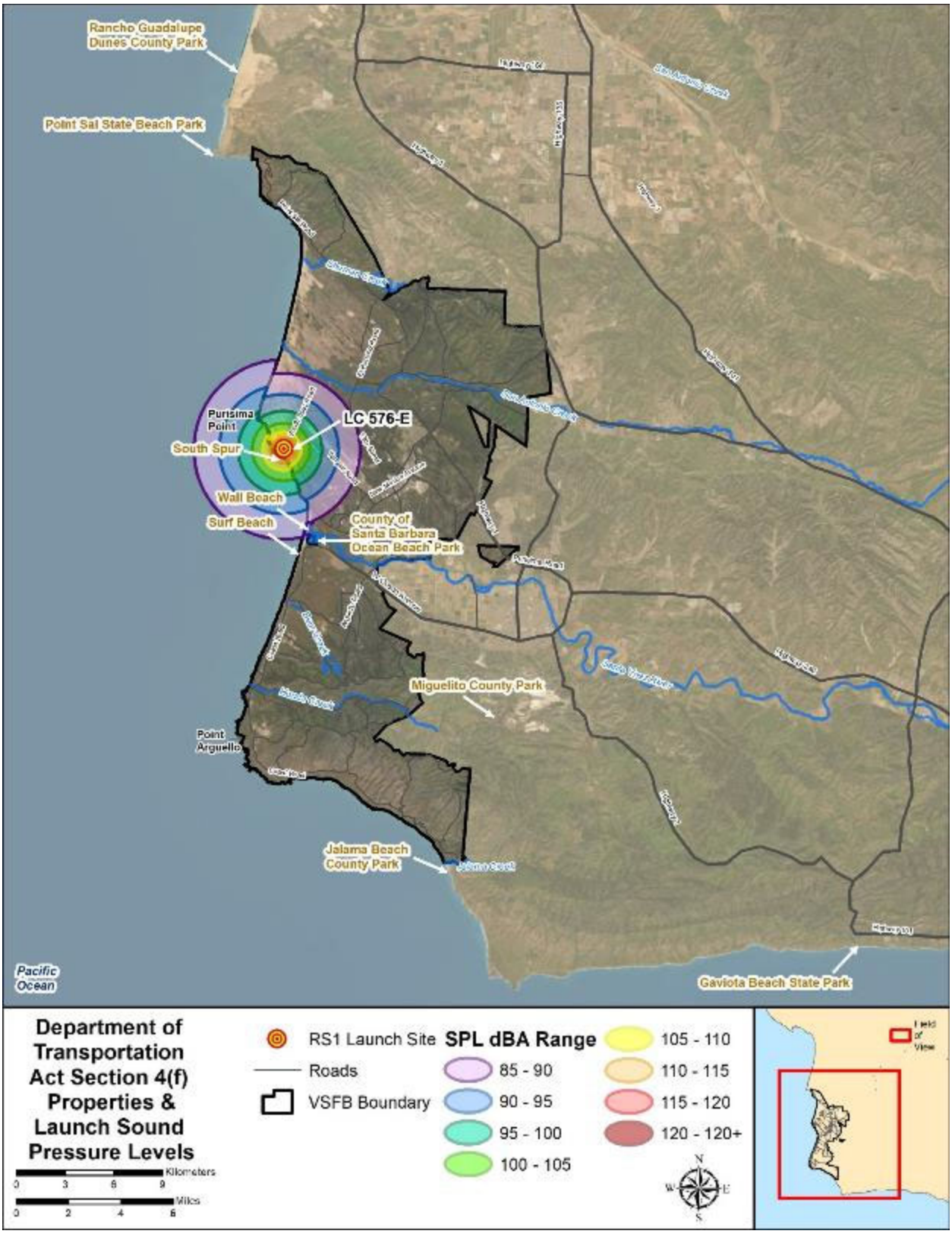

Figure 3.7-1: Potential Department of Transportation Act Section 4(f) Properties and Launch Sound Pressure Levels

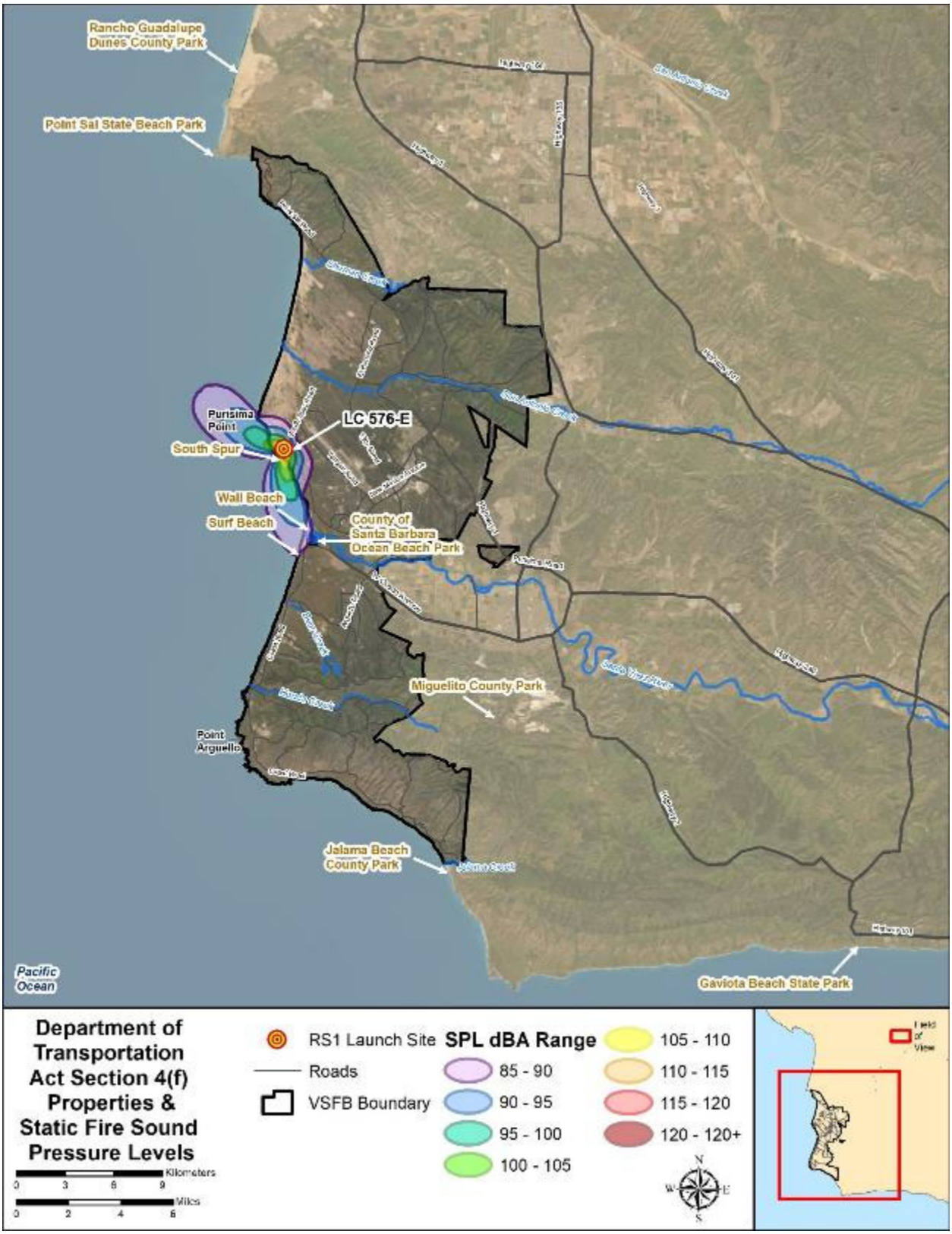

Figure 3.7-2: Potential Department of Transportation Act Section 4(f) Properties and Static Fire Sound Pressure Levels.

Figure 3.7-3: Potential Department of Transportation Act Section 4(f) Properties and Launch Sonic Boom Contours

3.8. Recreation

3.8.1. Region of Influence

The ROI for recreational resources includes all areas where activities associated with the Proposed Action may impact recreation.

The USAF controls access to VSFB and on-Base recreation areas. Public access to VSFB and nearby LC 576-E is not permitted. Personnel and approved contractors may participate in outdoor activities on VSFB, such as camping, picnicking, sunbathing, hiking, bird watching, nature photography, fishing, and hunting. South Spur, just west of LC 576-E (Figure 3.7-1), is a popular on-Base site for tide-pooling and fishing and would be closed during launch and static fire activities. Surf Beach and County of Santa Barbara Ocean Beach Park are open to the general public (Figure 3.7-1). However, access to these parks would be restricted during launches from LC 576-E because an anomaly could impact them. Therefore, for the safety of park visitors, the County Parks Department and the County Sheriff close the parks upon 30 SLD's request.

Recreational and commercial boating and fishing occurs offshore of VSFB, but impacts on offshore activities are unlikely other than the brief *avoidance areas* established from launch trajectories and debris impact corridors. The U.S. Coast Guard would issue a Local Notice to Mariners (NOTMARs) that defines a *public ship avoidance area* for launch events. The avoidance area would be temporary and lifted as soon as the U.S. Coast Guard determines it is safe to do so. Section 3.10 (Human Health and Safety) details additional public safety protocols.

3.9. Transportation

3.9.1. Region of Influence

For the purpose of this EA, the ROI for transportation would be the combination of highway, arterial, and local roads that provide service to VSFB and the Proposed Action Area. Existing roadway conditions are evaluated based on roadway capacity and traffic volume. The capacity reflects the ability of the network to serve the traffic demand of a roadway and depends on the roadway width, number of lanes, intersection control, and other physical factors. Traffic volumes can be reported as the number of vehicles averaged over a daily period (Average Daily Traffic or ADT) or an annual period (Annual Average Daily Traffic [AADT]). Peak-hour volume is defined as the highest volume of traffic in a 24-hour period that is recorded on a roadway or intersection during a 1-hour period.

Roadway performance is generally expressed in terms of Level of Service (LOS). Table 3.9-1 shows the LOS scale ranges from A to F, with each level defined by a range of volume-to-capacity (V/C) ratios. LOS A, B, and C are considered good operating conditions with minor to tolerable delays experienced by motorists. LOS D represents below-average conditions. LOS E reflects a roadway at maximum capacity, and LOS F represents traffic congestion. Most roads on VSFB operate at a LOS between A and C.

Table 3.9-1: Level of Service Scale

LOS	Description	Criteria (V/C)		
		Multi-Lane Arterial	Two-Lane Highway	Delays[(a)]
A	Free flow with users unaffected by presence of other roadway users	0–0.30	0–0.15	<10.0
B	Stable flow, but presence of the users in traffic stream becomes noticeable	0.31–0.50	0.16–0.27	10.0–20.0
C	Stable flow, but operations of single users becomes affected by interaction with others in traffic stream	0.51–0.70	0.28–0.43	20.0–35.0
D	High density, but stable flow, speed and freedom of movement are severely restricted; poor level of comfort and convenience	0.71–0.84	0.44–0.64	35.0–55.0
E	Unstable flow; operating conditions at capacity with reduced speeds; maneuvering difficult and extremely poor levels of comfort and convenience	0.85–1.00	0.65–1.00	55.0–80.0
F	Forced breakdown flow with traffic demand exceeding capacity; unstable stop-and-go traffic	>1.00	>1.00	>80.0

Notes: (a) = Average stop delay at intersections.

VSFB is located approximately 5 mi. (8 km) west of the City of Lompoc. As shown in Figure 3.9-1, the main access route to VSFB is Highway (Hwy) 101, a coastal four-lane divided freeway connecting Northern California to Southern California. The VSFB connections to Hwy 101 are Hwy 1, State Route (SR) 135, and SR 246. Hwy 1, a north-south highway, traverses VSFB and provides access to Santa Maria to the northeast, and Santa Barbara to the southeast. When used with Hwy 101, SR 246, an east-west highway, provides access to Lompoc to the east, and Santa Barbara to the southeast. SR 135 and SR 246 are mostly two-lane undivided highways with four-lane rural expressway portions.

VSFB is a federal military installation. Parts of VSFB can be accessed only by authorized military personnel and their families, Base civilian employees with approved identification, and visitors

with pre-approved authorization. Roadways within the Proposed Action Area are restricted to public access.

The Proposed Action Area is located within north VSFB and is accessible by paved roads from the Santa Maria Gate, Lompoc Gate, and Solvang Gate (Figure 3.9-1). Project personnel and equipment would most likely access the location by entering VSFB through the Lompoc Gate, traveling north on Pine Canyon Road, west on New Mexico Avenue to 35th Street, and continuing to the destination on New Beach Boulevard. LC 576-E facility users would access through any of the three gates and use roads through the cantonment area or 13th Street and potentially Terra Road to access New Beach Boulevard and reach Wall Beach.

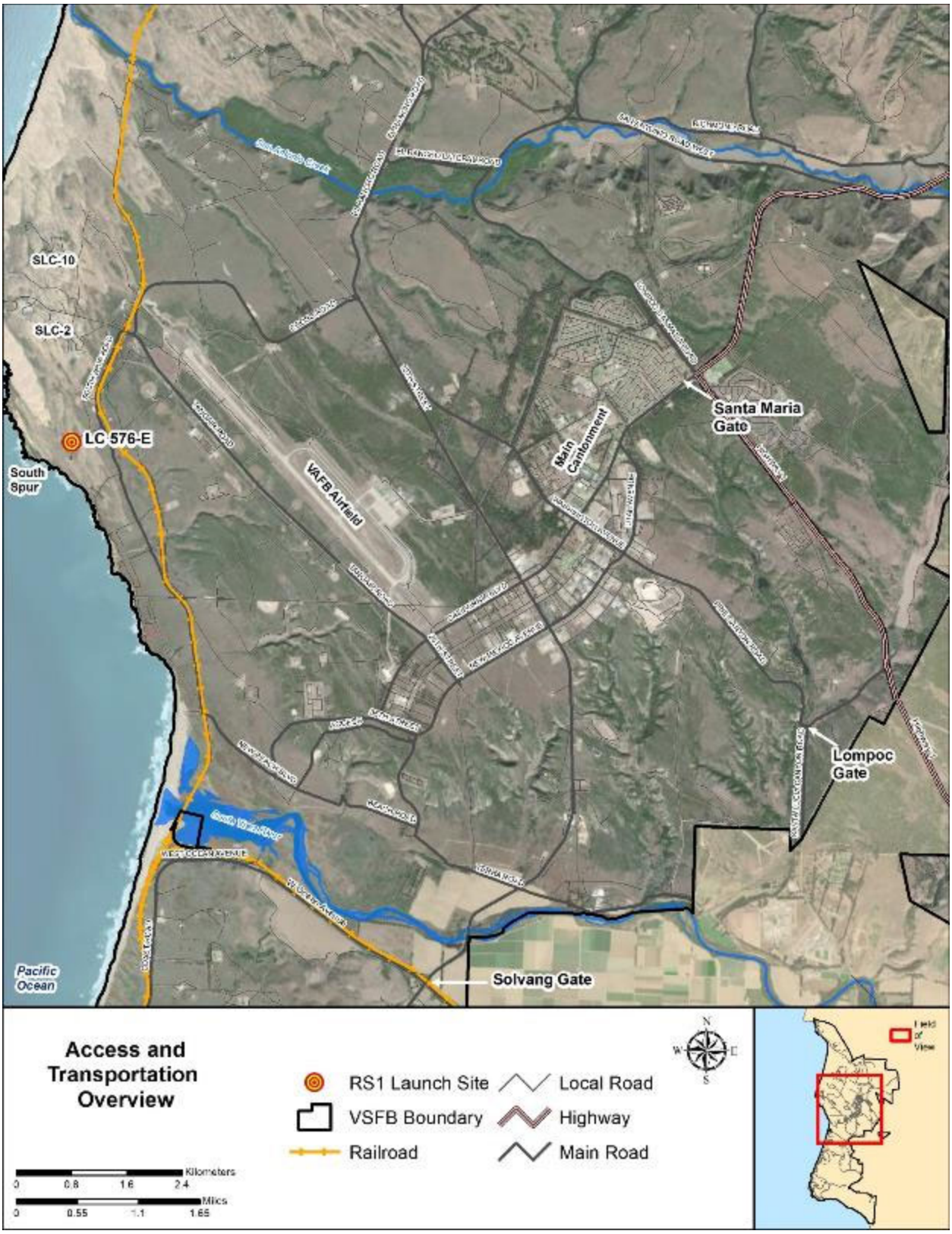

Figure 3.9-1: Main Access and Transportation Routes Associated with the Proposed Action

3.10. Human Health and Safety

3.10.1. Region of Influence

The ROI for Human Health and Safety resources includes all areas where activities associated with the Proposed Action may impact human health and safety. This includes the construction area at LC 576-E and all areas potentially impacted during launch operations. All VSFB activities are subject to Federal OSHA, Air Force Occupational Safety and Health (AFOSH), or California OSHA regulations and procedures requirements. LC 576-E is a federal exclusive jurisdiction area; however, commercial entities may also comply with California OSHA and/or AFOSH requirements.

The affected environment for Human Health and Safety includes all established regulations to minimize or eliminate potential risk to the general public and personnel involved in the proposed project. The Proposed Action would involve construction activities where workers would potentially be exposed to conditions that could adversely impact their health and safety. The ROI of these potential impacts is the Proposed Action area and surrounding vicinity.

Hazards associated with some past and present mission activities and operations on VSFB can limit locations where projects can be sited to ensure the health and safety of workers. The following hazard zones have been established on VSFB to protect workers from various hazards:

- **Toxic Hazard Zones** are areas established downwind of launch site operations to protect workers from exposure to toxic vapors emitted during the transfer or loading of liquid propellants or maintenance of launch systems. These zones can extend 20,000 ft. (6,096 m) or more from a launch site.
- **Missile/Space Launch Vehicle Flight Hazard Zones and Explosive Safety Zones** are established under the flight path of missile or space launch vehicle launches to protect personnel from debris fall-out under the launch trajectory. Explosive safety zones are established from 75 to 5,000 ft. (22.9 to 1,524 m) around launch sites and buildings where rocket propellants are stored to protect personnel from potential explosive hazards. Both of these hazard zones must be evacuated before any launch.
- **Radiofrequency Radiation Hazard Areas** are established around transmitters on VSFB that can present radiation hazards to people and potentially detonate electroexplosive devices. The size varies depending on the transmitter power and antenna reception.
- **Airfield Clear Zones, Lateral Clear Zones (LCZs), and Accident Potential Zones (APZs)** are established around the VSFB airfield runway and contain restrictions on certain land uses. Clear zones and LCZs are areas where the accident potential is so high that land use restrictions prohibit reasonable land use. Clear zones occur at both ends of the runway, and LCZs extend 1,000 ft. (304.8 m) from both sides of the centerline along the length of the runway. The ground surface within the LCZ must be graded to certain requirements and kept clear of fixed or mobile objects, except for necessary navigational aids and meteorological equipment. Two APZs, APZs I and II, are less critical than clear zones but still possess significant potential for accidents. Acceptable uses within APZ I areas include

industrial or manufacturing, communication and utilities transportation, wholesale trade, open space, recreation, and agriculture, but not uses that concentrate people in small areas. Acceptable uses within APZ II areas include business services and commercial retail trade uses of low intensity or scale of operation, but not high-density operations.

- **Air Installation Compatible Use Zones** are areas where certain land uses are restricted due to the combined potential for accidents and noise and the need for clearing obstacles.
- **Unexploded Ordnance Closure Areas** are areas on VSFB that were used as ordnance training ranges and potentially contain UXO. On 27 September 2010, all areas known or suspected to contain UXO on VSFB were closed to non-mission/recreational activities. Any proposed work in these areas must be coordinated with the Weapons Safety and Explosive Ordnance Disposal (EOD) offices. Depending on the area, escorts may or may not be required.

Because of the above conditions, personnel installing and operating launch features me exposed to hazardous materials and hazardous waste. In addition to these more obvious risks to human health and safety, the following physical features may be present nearby the Proposed Action and may adversely impact site personnel's health and safety:

- Physical hazards, including road traffic, confined spaces, holes and ditches, uneven terrain, sharp or protruding objects, slippery soils or mud, unstable ground, and falling equipment/objects (e.g., nuts, bolts, equipment, boxes, containers, and other miscellaneous light-construction tools and materials)
- Biological hazards such as animals and plants (ticks, black widow spiders, rattlesnakes, and poison oak) and disease vectors (ticks, rodents, and common contagions)

3.10.2. LC 576-E Modification & RS1 Launch Activities

ABL and its contractor(s) would be responsible for industrial hygiene and ground safety during LC 576-E modifications and RS1 launch operations. Industrial hygiene responsibilities include monitoring exposure to workplace chemicals, radiation, and physical hazards; hearing and respiratory protection; medical monitoring of workers subject to chemical exposures; and overseeing all hazardous or potentially hazardous operations. Additional precautions would be taken to provide personnel guidance and appropriate countermeasures on infectious disease containment, planning, and emergency response procedures. Ground safety responsibilities include protection from hazardous situations and hazardous materials.

Because of conditions detailed in Section 3.11 (Hazardous Materials and Waste Management), persons participating in ABL construction activities could potentially become exposed to the following hazardous materials and hazardous waste:

- Hazardous materials, primarily petroleum, oil, and lubricants (POLs), would be used to operate heavy equipment during construction and demolition activities under the Proposed Action. Unexpected releases of these POLs would generate hazardous waste.

DOT-certified commercial transporters would convey hazardous material used in or resulting from the Proposed Action. Transporting these materials is discussed in Section 3.11 (Hazardous Materials and Waste Management).

3.10.3. General Public and On-Base Personnel Safety

The SLD 30 Safety Office is responsible for ensuring launch support personnel and the general public are safe from all launch operations and potential emergency public health risks as defined in Air Force Instruction (AFI) 91-202 (U.S. Air Force Mishap Prevention Program), Department of Defense Instruction (DoDI) 6055.17, and 6200.03. AFI 10-2501 and AFI 10-2519 provide further guidance for DAF emergency management readiness and response to public health and safety issues. The SLD 30 Safety Office would assess proposed mission profiles to ensure public safety criteria are met. Their evaluation would assess hazards associated with debris, toxics, and blast distant focusing overpressure for a normal launch. All launch, high-risk offshore, and airspace areas would be controlled and monitored to ensure public safety during launch operations. Launch day meteorological conditions would also be accounted for to ensure compliance with acceptable risk criteria.

3.10.4. Debris Impact Corridors

All VSFB launch programs are required to establish debris impact corridors as a part of their program's safety review, in case of a launch anomaly that requires flight termination. When any launch, including a commercial launch, is scheduled to take place from VSFB, the Space Launch Delta 30, Launch Safety (SLD 30/SEL) notifies the 2nd Range Operations Squadron (2 ROPS) of the associated hazard areas. ABL would perform a debris analysis for its RS1 program before launching. SLD 30/SEL would review and approve these analyses prior to authorizing any launch activities. Impact debris corridors would be established off the Santa Barbara County coast between Point Sal and Point Conception to meet security requirements and reduce hazards to persons and property during launch activities. Based on a mission's specific trajectory, specific debris impact areas would be determined for each launch. Once SLD 30/SEL notifies the 2 ROPS of hazard areas, 2 ROPS notifies the FAA so that appropriate airspace restrictions are in place during launches. The U.S. Coast Guard issues a Local NOTMARs before launches from VSFB that defines the times and locations of Public Ship *avoidance areas* related to launch activities. Local NOTMARs are broadcast via radio, posted in harbors along the coast, and published in the weekly U.S. Coast Guard Long Beach Broadcast to Mariners.

Offshore oil rigs located west of 120 degrees 15 minutes longitude also have evacuation or shelter-in-place procedures in place for use during launch operations. The 2 ROPS notifies the Minerals Management Service to notify oil rig personnel of launch operations.

On north VSFB, the Union Pacific Railroad track passes approximately 0.5 mi. (0.8 km) east of the launch facility, and would be overflown by the RS1 vehicle. To reduce potential risk to people and property, railroad schedules and close coordination between train engineers and VSFB personnel would ensure that trains are never overflown. SLD 30/SEL defines appropriate railroad

mile markers to 2 ROPS, who coordinates with the Manager Road Operations to ensure trains are kept clear of debris area.

3.10.5. Security and Anti-Terrorism

Site security requirements, including those for security lighting and intrusion detection, are part of the requirements integral to launch program safety and detailed in Department of Defense (DoD) Manual 5220.22-M. Unified Facilities Criteria 4-010-01 was issued in January 2007 under the authority of DoD Instruction 2000.16, Antiterrorism Standards. This guidance requires DoD components to adopt and adhere to common definitions, criteria, and minimum construction standards for building to mitigate vulnerabilities and terrorist threats. Modifications to LC 576-E made by ABL would be required to meet these construction standards.

3.10.6. Existing Noise Environment

For a detailed description of noise as it relates to the Proposed Action, please see Section 3.2.3 (Ambient Noise Levels of the Proposed Action Area) and Appendix G (Sound). In addition to the information provided in that section, on VSFB, general ambient L_{eq1H} (the continuous sound level that would contain the same acoustical energy for 1 hour as the fluctuating sound levels during the same period) measurements have been found to range from around 35 to 60 dB (Thorson et al. 2001). Most activities associated with the Proposed Action would generate relatively continuous noise throughout the implementation period.

3.11. Hazardous Materials and Waste Management

3.11.1. Region of Influence

The ROI for hazardous materials and waste management resources includes all areas, such as the construction area at LC 576-E and all areas potentially impacted during launch operations, where activities associated with the Proposed Action may be impacted by using hazardous materials and generating hazardous waste.

Hazardous materials and wastes are those substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; 42 U.S.C. Chapter 103), as amended by the Superfund Amendments and Reauthorization Act (26 U.S.C. section 9507); the Environmental Health Standards for the Management of Hazardous Waste (California Code of Regulations [C.C.R.] Title 22); the Toxic Substances Control Act (15 U.S.C. sections 2601–2671); the Solid Waste Disposal Act (42 U.S.C. section 6903), as amended by the Resource Conservation and Recovery Act (RCRA; 42 U.S.C. 6901-6992); and as defined in Title 8 C.C.R. section 5161. In addition, federal and state OSHA regulations govern protecting workplace personnel. In general, the definitions within the citations include substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health and welfare, to workers, or to the environment.

3.11.2. Hazardous Materials at VSFB

Hazardous materials are compounds with the potential to harm human health and the environment through improper use, treatment, transportation, storage, or disposal in commercial, military, and industrial applications. They are harmful to life due to their concentrations and amounts, or physical and chemical attributes. Component hazardous materials, or hazardous constituents, are defined as hazardous materials with low concentrations that will not cause acute adverse effects. Hazardous constituents are present in propellants, batteries, fuels, hydraulic fluids, and munitions, and may harm human and environmental health through water, soil, or air contact.

Operations at VSFB and associated properties require military personnel and on-base contractors to use hazardous chemicals in varying quantities throughout the base. Using hazardous material on VSFB is regulated by the Hazardous Materials Management Process (HMMP; DAF 2019a), per AFM 32-7002, *Environmental Compliance and Pollution Prevention*. Emergency response procedures for hazardous materials spills are established in SLD 30's Hazardous Materials Emergency Response Plan (HMERP; 30th Space Wing Plan 32-4002-A; DAF 2014). ABL would be responsible for preparing its own Emergency Response Plan for the RS1 program per the SLD 30 HMERP. This Plan would ensure that adequate and appropriate guidance, policies, and protocols regarding hazardous material incidents and associated emergency response are available to and followed by all installation personnel and commercial entities. For a spill, ABL would also be responsible for completing a Community Awareness and Emergency Response reporting form per local Santa Barbara County hazardous material and hazardous waste spill reporting requirements.

3.11.2.1. Hazardous Materials Transportation Safety

Hazardous materials such as propellants, ordnance, chemicals, and other hazardous material payload components must be transported to and on VSFB per DOT regulations for interstate and intrastate shipment of hazardous materials (Title 49 C.F.R. 100–199).

3.11.3. Hazardous Waste at VSFB

Hazardous wastes contain hazardous materials that may exist as any state of matter, which may cause, or significantly contribute to, an increase in the likelihood of mortality or serious illness. Substantial human and environmental risks may be present when hazardous wastes are improperly used, stored, transported, or disposed.

Hazardous waste at VSFB complies with RCRA Subtitle C (40 C.F.R. sections 260-273) and with California Hazardous Waste Control Laws as administered by the California Environmental Protection Agency Department of Toxic Substances Control (22 C.C.R. section 66260.10; 8 C.C.R. section 5192). These regulations require that hazardous wastes be handled, stored, transported, disposed of, or recycled according to defined procedures. The SLD 30 Hazardous Waste Management Plan (HWMP; 30 SW Plan 32-7043-A; DAF 2019b) details hazardous waste packaging, turn-in, transportation, storage, recordkeeping, and emergency procedures. ABL

would be required to follow all federal, state, and local laws regulating generating, storing, transporting, and disposing hazardous waste. ABL would also be required to obtain an EPA Generator identification number for to manage and dispose hazardous waste generated from its site operations.

3.11.3.1. Toxic Release Contingency Plans and Toxic Hazard Corridors

Toxic hazard assessments would be required for the ABL RS1 program to determine program-specific toxic material used for launches, payloads, ground support equipment, and at facilities. SLD 30 has detailed procedures in place to control using toxic gases. SLD 30 maintains 30 SWI 91-106, Toxic Hazard Assessments, which defines control measures and procedures for conducting operations involving toxic fuels. SLD 30/SEL runs atmospheric and dispersion computer models to predict toxic hazard corridors (THCs) for nominal and aborted launches, as well as for spills or releases of toxic materials from storage tanks or that occur during loading or unloading propellants. 2 ROPS uses THCs to reduce the risk of exposure of launch personnel and the general public from toxic materials, including toxic gases. Dispersion modeling for the RS1 program would be run for nominal and abort scenarios before each launch. If the model predicts THCs overpopulated areas, the launch would be delayed until meteorological conditions allowed for the launch to occur without this risk.

3.11.3.2. Exposure Criteria

Air Force Manual (AFMAN) 48-146, *Occupational and Environmental Health Program Management*, [superseded 15 October 2018] defines the Occupational Exposure Limit (OEL) as, "[T]he most conservative limit between the OSHA PEL or ACGIH TLV unless a specific OEL is designated by the BE Associate Corps Chief on the BE Hive and EOSH Service Center." Unless directed by higher authority, the SLD 30 Medical Group Bioenvironmental Engineering Chief would determine the OEL for chemicals estimated to pose the most significant health concerns to the public and launch facility workers. The exposure criteria are factored into the exposure prediction and risk management models, and the launch commit decisions SLD 30/SEL uses.

3.11.4. Environmental Restoration Program at VSFB

In 1975, DoD facilities began implementing the Environmental Restoration Program (ERP), formerly known as the IRP, to identify, characterize, and restore hazardous substance release sites, and provide a method of management under section 211 of CERCLA. The ERP is comprised of three programs: IRP, Military Munitions Response Program (MMRP), and building demolition and debris removal (AFI 32-7020). Once areas and constituents have been identified, the IRP is tasked to remove or monitor the hazards in an environmentally responsible manner. IRP sites are remediated through the Federal Facilities Site Remediation Agreement, a working agreement between the DAF and the RWQCB Central Coast Region and the Department of Toxic Substances Control Region 3. 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 or presence of a hazardous substance. To ensure the health and safety

of personnel on VSFB, an analysis of MMRP, IRP, AOC, and AOI sites within the Proposed Action area was performed.

LC 576-E is located within IRP Site SD033 (Figure 3.11-1). Previous missile launches operations and maintenance at LC 576-E between 1962 and 1964, and 1994 and 2017, resulted in releasing hazardous materials to the environment. ERP site investigations revealed evidence of contaminants in soils, sediment, surface water, silo water, and groundwater. Two removal actions were completed at the IRP site prior to the Final Site 33 Record of Decision (ROD):

- A 1992 excavation test confirmed the prior removal of two 15,000-gallon underground storage tanks that were utilized for emergency RP-1 (rocket propellant) pumping and diesel fuel storage (Tetra Tech 2020).
- During the 1992 and 1993 construction of the Taurus launch pad, an unspecified amount of surface soil was excavated and removed. The soil was removed due to construction efforts and not because of previously identified contamination. However, the removed soil did originate from an area that was identified as having the highest concentrations of metals on the property. A subsequent Human Health Risk Assessment conducted in 2006 concluded that there was no potential exposure risk to industrial and construction workers at the site, because unrestricted land use was not granted at that time (Tetra Tech 2020).

The California Department of Toxic Substances Control (DTSC) and Central Coast RWQCB approved a final ROD in 2010. Groundwater monitoring was issued with Land Use Controls as the final IRP Site remedy. Eventually, by 2016, the last monitoring well was destroyed after readings determined that trichloroethene (TCE) concentrations had declined to levels below the Maximum Contaminant Level of 5 milligrams per liter. No further actions were identified at the site by 2015 and no impacts on human health or the environment were present, allowing for a hypothetical residential land use. DTSC and the RWQCB granted closure approval for SD033 in 2016 (Tetra Tech 2020). Due to IRP Site SD033 being designated as closed, and no other IRP, AOC, or AOI sites located within the Proposed Action Area, potential impacts of hazardous materials resulting from IRP sites, AOCs, and AOIs are not carried forward for analysis.

3.11.5. Military Munitions Response Program

The MMRP was established to address UXO, discarded military munitions, and munitions constituents located on current and former defense sites (10 U.S.C. Section 2710). These sites are separate from operational ranges or munitions storage facilities.

The Proposed Action is located within the boundary of MU809, an inactive training range that utilized rifle grenades, hand grenades, mortars, rockets, and small arms between 1941 and 1954 (Figure 3.11-2). LC 576-E was bisected in 2005 by a pedestrian survey transect that found no evidence of munitions. However, evidence of subsurface anomalies were detected immediately north of the Proposed Action. Between 2009 and 2010, surface clearing efforts removed two items that were located within 1.0 mi. (1.6 km) from LC 576-E. VSFB implemented Land Use Controls in 2018 as a provisional remedy for MU809. Subsurface removal to detection depth is required for an area located more than 1.0 mi. (1.6 km) northwest of LC 576-E that contains

above-normal lead munitions constituents. Any future construction or intrusive activities within MU809 would require anomaly avoidance prior to the start of work or onsite EOD/UXO technicians to monitor construction activities (Tetra Tech 2020). Anomaly avoidance and construction support would be implemented according to DESR6055.09_AFMAN 91-201 [Superseded 21 March 2017].

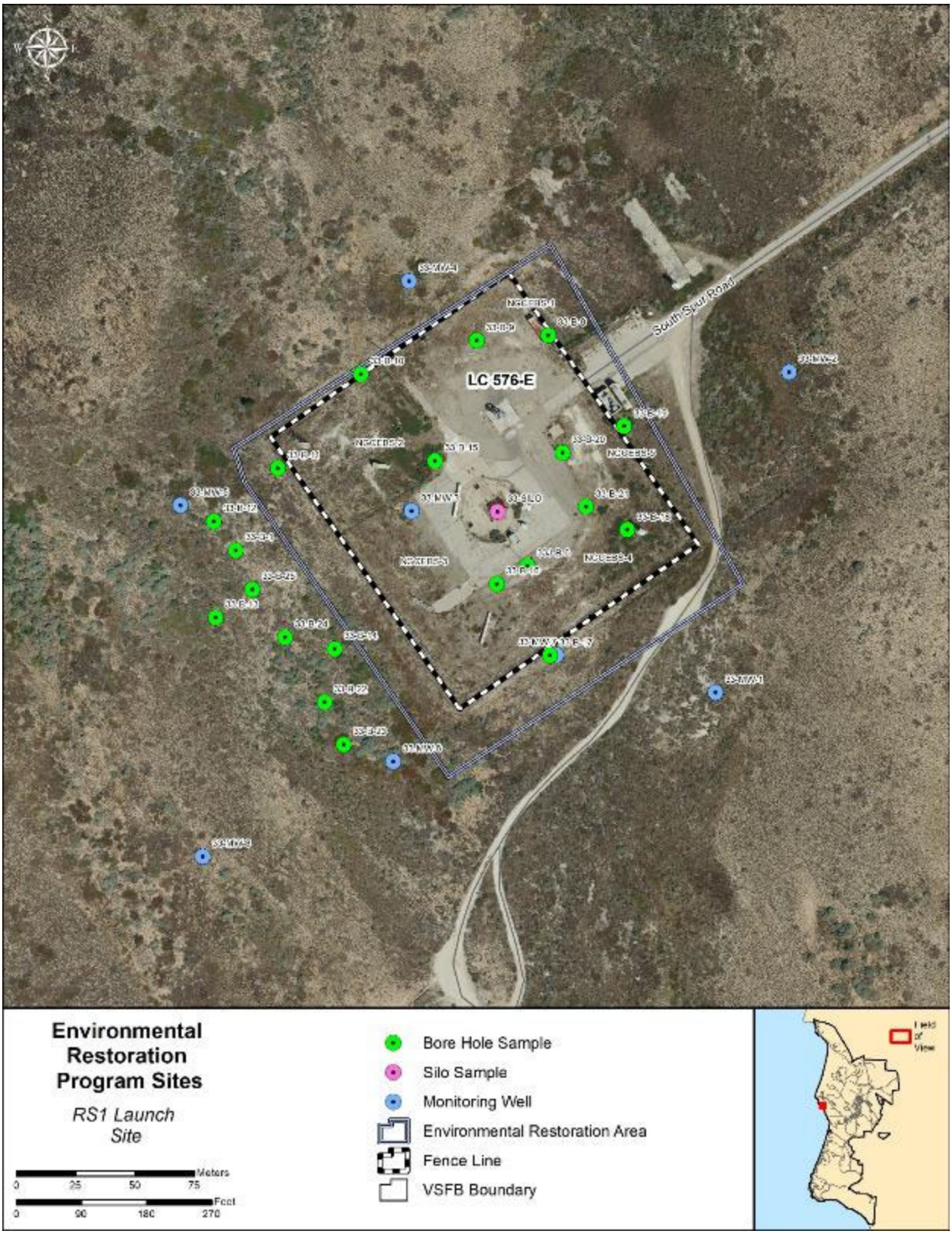

Figure 3.11-1: IRP Sites in the Vicinity of the Action Area

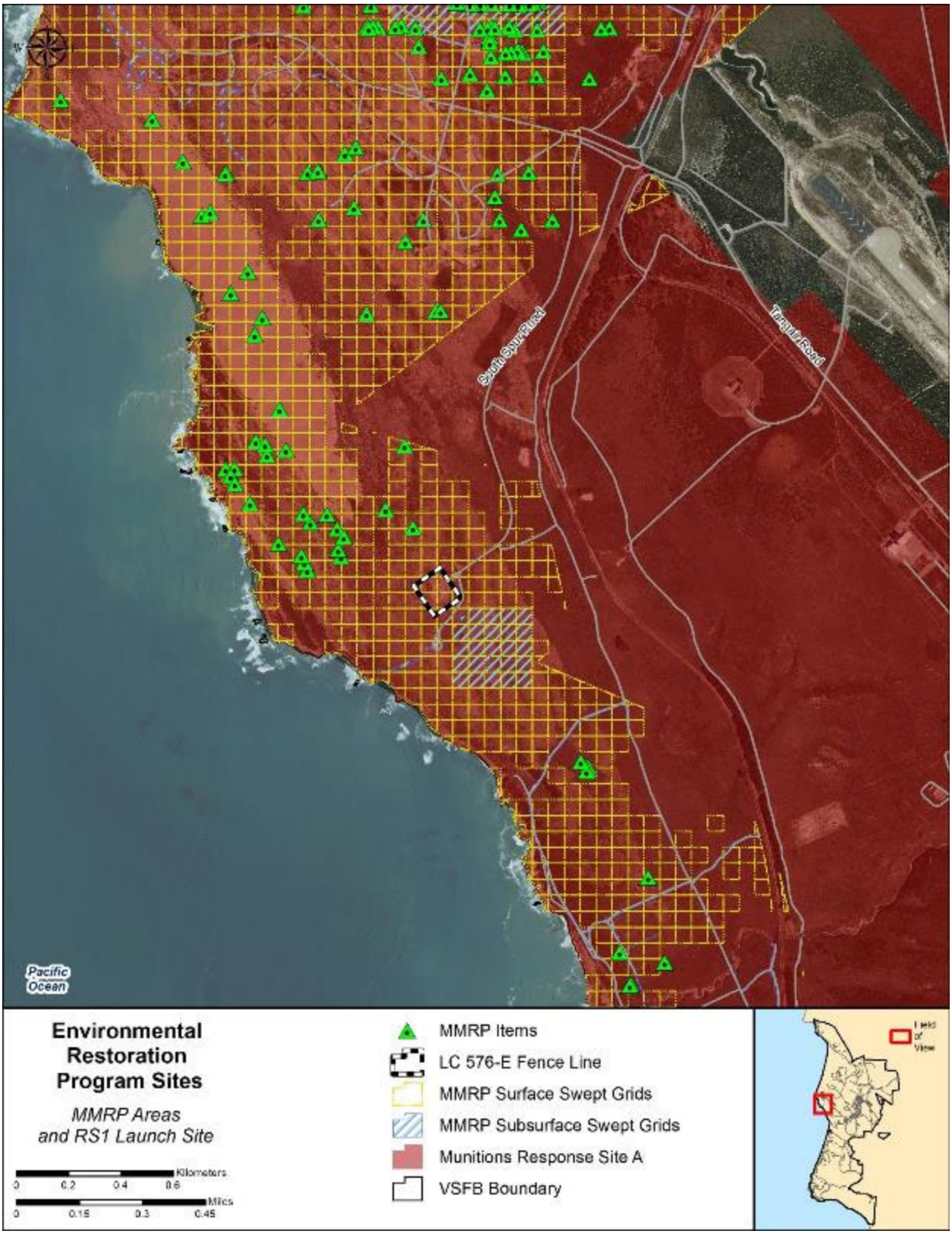

Figure 3.11-2: MMRP Areas in the Vicinity of the Action Area

3.12. Solid Waste Management

3.12.1. Region of Influence

The ROI of potential impacts on solid waste management as a result of the Proposed Action is VSFB. The regulatory environment for solid waste management establishes control of construction debris and promotes pollution prevention associated with the Proposed Action.

Solid waste is generally defined as any discarded material that is not characterized by other specific regulatory requirements detailed in the RCRA (40 C.F.R. part 261.2). Solid waste is subject to corrective action under RCRA section 3004(u) and (v), and 3008(h). The regulatory environment for solid waste management reflects comprehensive federal, state, and local approaches to minimize waste generation and increase reuse and recycling.

Solid waste management on VSFB is directed by DoDI 4715.23 (Integrated Recycling and Solid Waste Management) and implemented in VSFB's Integrated Solid Waste Management Plan (ISWMP; DAF 2015). The Air Force's Environmental Compliance and Pollution Prevention Manual (AFMAN 32-7002) details requirements and programs that installations must comply with to successfully divert as much solid waste as economically feasible. The VSFB ISWMP requires source segregation of recyclable materials to the greatest extent possible.

In 1989, the California Integrated Waste Management Act (Assembly Bill 939) mandated a 50% percent reduction of the quantity of solid waste disposed of in California landfills from a 1990 baseline, to be accomplished by 1 January 2000. To bolster the positive effects of AB 939, the Mandatory Commercial Recycling Regulation (Assembly Bill 341) became law in 2012 and mandated CalRecycle to increase statewide solid waste diversions to 75% by 2020.

The DoD Strategic Sustainability and Performance Plan (SSPP) listed a solid waste diversion goal of 50% and a construction and demolition (C&D) debris diversion rate of 60%. The Air Force is committed to achieving these goals.

3.12.2. Construction Debris

The State of California passed Senate Bill 1374 on 12 September 2002, amending the Public Resources Code, Section 42912, which addresses the issue of C&D debris, diversion requirements, and the development of a model ordinance to be implemented by local jurisdictions (e.g., Santa Barbara County). Santa Barbara County Code of Ordinances stipulates that 50% of C&D debris must be recycled (Ord. No. 4689, § 1). EO 13693 Section 3(j)(iii) mandates the diversion of at least 50% of non-hazardous construction and demolition materials and debris by Federal agencies.

3.12.3. Pollution Prevention

The Pollution Prevention Act of 1990 (42 U.S.C. sections 13101-13109) focused the national approach to environmental protection toward pollution prevention (P2). Implementing the USAF Environmental Management System (EMS; DoDI 4715.17) carries P2 a step further toward

mission sustainability principles. The P2 program is detailed in the SLD 30 HMMP and is aimed at achieving SLD 30 EMS objectives and targets, through documented practices, procedures, and operational requirements. SLD 30 implements EMS and its associated P2 program elements by following the P2 hierarchy:

- Reduce (source reduction to prevent the creation of wastes)
- Reuse (keep item or material for its intended purpose)
- Recycle (use item or material for some other beneficial purpose)
- Disposal (in an environmentally compliant manner, only as a last resort)

3.13. Coastal Zone Management

California Coastal Act of 1976 (CCA) Section 30008 defines the authority of the California Coastal Management Plan (CCMP). The CCMP enforces the Coastal Zone Management Act (CZMA) and other federal laws that are related to planning or managing California coastal resources. The CCA defines the coastal zone as the water extending seaward to the outer limits of the state's jurisdiction; land extending inland approximately 1,000 yards from the mean high tide line; or land in significant coastal estuarine, habitat, and recreational areas, extending inland to the first major ridgeline paralleling the sea or 5 mi. (0.8 km) from the mean high tide line of the sea, whichever is less (Div. 20 P.R.C. California Coastal Act, 1976 part 30103). Federally controlled lands are not part of the coastal zone (15 C.F.R. Section 923.33).

Per the CZMA of 1972, Federal activity in, or affecting, a coastal resource or use requires the Federal entity to prepare either a negative determination (ND) (no affect to a coastal resource or use) or a consistency determination (CD) (affect to a coastal resource or use, but the activity is consistent to the maximum extent practicable). Here, the DAF is responsible for making either ND a CD for its activities occurring within the state coastal zone or having effects on it. The CCC reviews federally authorized projects for consistency with the California CZMA.

The project launch site (LC 576-E) is located within VSFB's boundary and owned by the DoD. Although the CZMA federal lands definition excludes federal lands from the coastal zone, actions within them must be reviewed for consistency with the CCMP. In addition, proposed ABL activities outside the coastal zone may affect a coastal use or resources and therefore are subject to CCA provisions. The FAA may not issue a license, permit, or authorization to an applicant unless an applicant's proposed action meets the consistency requirements of the state's coastal management program.

3.14. Utilities

3.14.1. Region of Influence

The ROI for utilities includes the LC 576-E complex and North VSFB utilities (e.g., communications, electricity, domestic water supply, and domestic wastewater). The affected environment for utilities summarizes the utility systems available in the project area and nearby. LC 576-E is an

above-ground launch pad with some utility services available for use, including power and communications (located within 50-100 ft. from the LC 576-E entrance gate). These utilities would require simple above-ground modifications to provide routing to their final destinations and would be extended from their current location to provide services to the concrete pad at LC 576-E. Utility lines and light poles would require sub-surface modifications at LC 576-E to meet launch and security requirements (Figure 2.3-3). Trenching of utilities up to 12 inches below surface grade would occur under the newly constructed launch pad to connect the GSO and RS1 with ground fluid and electrical systems (Figure 2.3-3).

3.14.2. Electrical

Existing electrical infrastructure immediately outside the fence line of LC 576-E area would be used to the greatest extent practicable to reduce requirements for trenching. ABL would rely on a portable 80 hp backup generator for electricity during inadequate power supply.

3.14.3. Communications

An existing commercial fiber connection is located approximately 50-100 ft. from the entrance gate at LC 576-E. This existing connection would allow the DAF to avoid making a fiber connection at another location on VSFB to execute the Proposed Action.

3.14.4. Water

Water would be provided by a water truck and therefore not rely on VSFB infrastructure.

3.14.5. Wastewater Treatment

Portable toilets would collect sewage on-site and be serviced by a commercial contractor.

4.0 Environmental Consequences

This chapter presents the results of the analysis of potential environmental effects of implementing Alternative 1 and the No Action Alternative as described in Chapter 2 (Description of the Proposed Action and Alternatives). For each environmental component, anticipated impacts are assessed considering short- and long-term effects.

The FAA uses thresholds that serve as specific indicators of significant impact for some resource areas. FAA actions that would result in impacts at or above these thresholds require the preparing an EIS, unless impacts can be reduced below threshold levels. The FAA has not defined significance thresholds for all resource areas; however, the FAA has identified factors that should be considered in evaluating the significance of potential environmental impacts (FAA Order 1050.1F, Paragraph 4-3.3). The FAA's significance thresholds are considered in assessing potential environmental consequences in this EA because the FAA plans to adopt this EA to support its environmental review of ABL's license application.

4.1. Air Quality

Potential impacts on air quality from the Proposed Action would be associated with the following activities:

- Infrastructure improvements at LC 576-E.
- RS1 launch activities conducted at LC 576-E.

Emissions are estimated for each of the above operations based on established emission factors and conservative operational assumptions. Significant air quality impacts would occur if implementing the Proposed Action would directly or indirectly:

- expose people to localized (as opposed to regional) air pollutant concentrations that potentially violate federal or state ambient air quality standards, or
- exceed caps (limits) imposed by federal and state GHG regulations.

Per FAA Order 1050.1F, impacts would be significant if the action would cause pollutant concentrations to exceed one or more of the NAAQS, as established by the Environmental Protection Agency under the Clean Air Act, for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations.

On 18 February 2010, the CEQ released draft guidance on addressing climate change in NEPA documents. This draft document was revised on 18 December 2014, and CEQ solicited public comments until 23 February 2015. The 2010 draft guidance, which has been issued for public review and comment, recommends quantification of GHG emissions, and proposes a threshold of 25,000 metric tons of CO_2e emissions. The 2010 guidance indicates that using 25,000 metric tons of CO_2e emissions as a reference point would provide federal agencies with a useful indicator, rather than an absolute standard of significance, to provide action-specific evaluation of GHG emissions and disclose potential impacts. This analysis complies with the recommendations of both the 2010 and 2014 versions of the draft guidance.

Standard dust control measures (see Section 2.3.4.1, Air Quality) must be implemented for any discretionary project involving earth-moving activities. Some projects have the potential for construction-related dust to cause a nuisance. Since Santa Barbara County violates the state standard for PM_{10}, dust mitigation measures are required for all discretionary construction activities regardless of the significance of the fugitive dust impacts, based on the policies in the 1979 Air Quality Attainment Plan.

In attainment areas, if the estimated emissions are less than the significance indicators, then the emissions are considered not to have significant impacts.

For purposes of this air quality analysis, project emissions within the VSFB region would be potentially significant if they exceed these thresholds. This is a conservative approach, as the analysis compares emissions from both project-related stationary and mobile sources to these thresholds.

If Proposed Action emissions were determined to increase ambient pollutant levels from below to above a national or state ambient air quality standard, these emissions would be significant.

4.1.1. Alternative 1 (Proposed Action)

The Proposed Action is to conduct up to 12 launches and 12 static fire operations annually of the RS1 launch vehicle from the Launch Complex LC 576-E site located on VSFB. To improve the existing infrastructure to meet ABL's requirements, ABL would install lighting and utility lines in the areas depicted in Figure 2.3-3 and described in Section 2.3.2 (Launch Complex 576-E Infrastructure Improvements). Launches would be conducted from 2021 and beyond.

4.1.1.1. Launch Complex 576-E Infrastructure Improvements

Section 2.3.2 (Launch Complex 576-E Infrastructure Improvements) describes the activities related to facility improvements at LC 576-E. The emissions associated with this portion of the Proposed Action, including trenching, and worker commutes, were calculated using the Air Force's Air Conformity Applicability Model (ACAM). The results of the ACAM model are presented in the Construction row of Table 4.1-1.

4.1.1.2. RS1 Launch

Launch activities include the 12 RS1 launches and 12 RS1 static fire operations; see Section 2.3.3 (RS1 Launch Program Operations) for detailed information on these activities. The emissions associated with launch activities–including launches and static fires–were calculated using the emissions factors established in the FAA's Final Programmatic Environmental Impact Statement (EIS) for Streamlining the Processing of Experimental Permit Applications (Federal Aviation Administration 2009). The results of this analysis are presented in the 12 Launches and 12 Static Fire rows of Table 4.1-1.

Launch operations include setting up the RS1 vehicle and command center for launches and static fire operations; see Section 2.3.1 (Launch Complex 576-E Site Plan and Facility Operation) for detailed information on these activities. The emissions associated with launch operations,

including establishing the command center and worker commutes, were calculated using the USAF's Air Conformity Applicability Model. The results of the ACAM model are presented in the Operations row of Table 4.1-1.

4.1.1.3. Summary of Impacts on Air Quality

Table 4.1-1 summarizes the potential impacts on air quality from the Proposed Action. Based on the analysis provided in the sections above, no significance thresholds are predicted to be exceeded as a result of the Proposed Action.

Table 4.1-1: Emission Units by Activity

	Tons						
Activity Phase	**CO**	**NOx**	**VOC**	**SOx**	**PM2.5**	**PM10**	**Lead**
Construction	0.024	0.042	0.007	0.000	0.001	0.002	0.00
Operations	0.010	0.013	0.002	0.000	0.000	0.000	0.00
12 Launches	18.467	0.000	0.000	0.000	0.000	0.000	0.00
12 Static Fires	6.201	0.000	0.000	0.000	0.000	0.000	0.00
Screening Threshold	250	250	250	250	250	250	25
Below Threshold?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grand Totals	**24.701**	**0.055**	**0.010**	**0.000**	**0.002**	**0.002**	**0.000**

Notes: Values report as 0.000 are less than .0005 units; Screening Thresholds are 250 tons per year since Santa Barbara county is in attainment for all Criteria Pollutants; and Screening Thresholds for lead are 25 tons per year no matter attainment status.
CO = Carbon Monoxide; NOx = Nitrogen Oxides; VOC = Volatile Organic Carbons; SO_x = Sulfur Oxides; $PM_{2.5}$ = Particulate Matter less than 2.5 Microns in Diameter; PM_{10} = Particulate Matter less than 10 Microns in Diameter

4.1.1.4. Greenhouse Gas Emissions

For the Proposed Action, GHG emissions include emissions associated with combustion of fuel, which occurs as part of the activities in Figure 4.1-1.

- Using construction equipment for site modifications, electrical line installation, and vegetation removal for the firebreak.
- Using gasoline-fired generators contingent upon power outages or higher-than-expected electricity demand.
- Emissions associated with the launch activities of the RS1 launch vehicle.

Figure 4.1-1: Activities Associated with Greenhouse Emissions

Table 4.1-2 summarizes the annual GHG emissions associated with the Proposed Action.

Table 4.1-2: Annual Greenhouse Emissions

Phase	Metric Tons CO_2e
Construction	12.789
Operations	3.991
12 Launches	486.146
12 Static Fires	19.628
SBCAPCD's Significance Threshold	10000
Below Significance Threshold	Yes
Grand Total	**522.553**

Overall, we expect the Proposed Action to produce a maximum of approximately 523 metric tons of carbon dioxide equivalent (CO_2e) during all activities under the Proposed Action, well below the SBCAPCD's significance threshold of 10,000 metric tons of CO_2e per year. Therefore, the Proposed Action GHG emissions would not have a significant adverse environmental impact on GHG emissions or climate change.

Airspace closures associated with launches could result in temporarily grounding aircraft at any affected airports and re-routing en-route flights on established alternate flight paths. The FAA has rarely, if ever, received reportable departure delays associated with launches. Aircraft could be temporarily grounded if airspace above or around the airport is closed. Ground delays are also used under some circumstances to avoid airborne reroutes.

Airspace closures associated with launches would result in additional aircraft emissions, including CO_2 (a GHG), primarily from aircraft being re-routed and subsequently expending additional fuel. However, emissions from aircraft being re-routed would occur above 3,000 feet (the mixing layer) where NAAQS would not be applicable; therefore, no impact to air quality would occur from aircraft re-routing from airspace closures. We expect the number of aircraft that would be impacted per launch to not produce additional GHG emissions that would have a notable impact on climate.

Regarding potential departure delays, airspace-related impacts could increase up to a maximum of 12 times per year; however, only a negligible amount of emissions would be generated from any aircraft departure delays associated with launches. Therefore, we do not expect any air emissions increase from departure delays to result in an exceedance of a NAAQS for any criteria pollutant. Emissions from aircraft being re-routed would occur above 3,000 ft. and thus would not affect ambient air quality. Therefore, we expect airspace closures associated with launches to not result in significant air quality or climate-related impacts.

4.1.2. No Action Alternative

Under the No Action Alternative, ABL would not implement the RS1 launch program at LC 576-E at VSFB. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impact on air quality or GHG emissions from the Proposed Action as implemented.

4.2. Sound (Airborne)

Per FAA Order 1050.1F, noise impacts would be significant if the action would increase noise by DNL 1.5 dB or more for a noise-sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the No Action Alternative for the same timeframe. For example, an increase from DNL 65.5 dB to 67 dB is considered a significant impact, as is an increase from DNL 63.5 dB to 65 dB. The CNEL may be used in lieu of DNL for FAA actions in California.

4.2.1. Alternative 1 (Proposed Action)

4.2.1.1. Launch Complex 576-E Infrastructure Improvements

To improve the existing infrastructure to meet ABL's requirements, ABL would install a 40 to 50-ft. (12 to 15-m) wide firebreak around LC 576-E. Between the firebreak and the facility, vegetation would be mowed to 6 inches in height. Construction would involve using diesel-powered heavy equipment for tasks, including limited excavation, delivering materials, mixing cement, and backfilling excavated areas. Earth-moving equipment (e.g., excavators, tractors, and trucks) could generate temporary noise levels between 82 and 88 dBA at a distance of 50 ft. (15 m). Based on data for typical noise ranges (Washington State Department of Transportation 2012), materials-handling equipment (concrete mixers) could generate noise levels ranging from 75 to 85 dBA at 50 ft. (15 m). Therefore, in general, noise levels generated from non-pile driving construction activities could range from 75 to 88 dBA at 50 ft. (15 m) (Table 4.2-1).

Table 4.2-1: Anticipated Construction Equipment Used and Typical Sound Levels

Equipment Description	Impact Device?	Actual Measured Average L_{max} at 50 feet	Approximate Received L_{max} at 300 feet
Compactor (ground)	No	83	67
Concrete Mixer Truck	No	79	63
Concrete Pump Truck	No	81	65
Dump Truck	No	76	60
Excavator	No	81	65
Grader	No	89	73
Paver	No	77	61
Pickup Truck	No	75	59
Roller	No	80	64
Tractor	No	84	68

Note: L_{max} = maximum sound level
Source: (Washington State Department of Transportation 2012)

These construction activities are far removed from any human sensitive receptors. As described in Appendix G (Sound), sound levels decay with increasing distance. Within 1,500 ft., the received level of construction activities would be below 60 dB. Given that the closest sensitive receptors

are over 8 mi. (13 km) away, no construction noise would be audible at sensitive receptor locations. Therefore, we anticipate that construction activities at LC 576-E would not represent a notable degradation of the acoustic environment.

4.2.1.2. RS1 Launch

ABL proposes to conduct up to 12 launches and 12 static fire operations of the RS1 launch vehicle at LC 576-E per year. Engine noise would be produced during the launch and static fire events, impacting the area between San Antonio Creek and the Santa Ynez River mount, including Purisima Point (Figures 2.3-7 and 2.3-8). During static fire, when the vehicle is positioned horizontally position on the pad, engine noise would be focused primarily along the coastline between Purisima Point and the Santa Ynez River mouth (Figure 4.2-1). Rocket launch noise would extend further into VSFB than noise from static fire. In both cases, noise above 85 dB would be restricted to within the VSFB boundary.

Although sound propagates away from the source, received level decreases as the distance from the source increases. Without accounting for atmospheric conditions, terrain, or vegetation, for each doubling of distance from the source, the sound level attenuates (or drops off) at a rate of 6 dBA. As a result, noise from static firing or launches would be audible outside buildings. However, at the closest human sensitive receptors (Lompoc, approximately 9.5 mi. [15 km] distant), we anticipate the received noise level to be less than 60 dB.

Figure 2.3-8 presents the A-weighted CNEL contours from 60 to 85 dBA. As described in Chapter 2 (Description of the Proposed Action and Alternatives), CNEL is a cumulative metric that accounts for all noise events in a 24-hour period. The CNEL 65 and 60 dBA contours over land extend approximately 0.36 and 0.62 mi. (0.58 and 1.0 km) from the LC 576-E, respectively and do not extend past the VSFB boundary. In locations such as Lompoc or Santa Maria, normal CNELs vary between 55 dB and 65 dB. Given the distance to the sensitive receptors from LC 576-E, the acoustic energy received at the sensitive receptor locations would not be sufficient to increase the CNELs. Although the noise from the firing event would be audible, it would not increase the CNELs at these locations and would not be considered a degradation of the acoustic environment.

Lastly, during ascent, we predict a sonic boom (overpressure of high energy impulsive sound) up to approximately 5.4 psf to be generated while the first-stage booster is supersonic (Figure 2.3-5). The overpressure would be primarily directed at the Pacific Ocean south of Point Conception. The sonic boom would not overlap any portion of the coast but would potentially impact a small portion of the NCI. The land area affected by the RS1 sonic boom footprint is modeled to experience peak overpressure levels less than 2 psf. Thus, the potential for structural damage is unlikely for well-maintained structures and the potential for hearing damage (with regards to humans) is negligible (Blue Ridge Research and Consulting 2020). These overpressure levels are similar to sonic boom levels that have been experienced on the NCI during prior VSFB launches. The maximum modeled C-weighted (dBC) CNEL near the NCI is less than 53 dBC (Blue Ridge Research and Consulting 2020), well below the FAA's noise significance threshold. Given the small area of potential impact over the NCI and the short duration of the event, noise impacts resulting from the sonic boom overpressure would not result in significant impacts on the NCI. The impacts of sonic booms to biological resources are discussed in Section 4.3.2.

Given the distance to human sensitive receptors and the small amount of acoustic energy that would reach a sensitive receptor, the Proposed Action would not result in significant impacts related to noise and noise-compatible land use.

Airspace closures associated with launches could result in temporarily grounding aircraft at affected airports and re-routing of en-route flights on established alternate flight paths. The FAA has rarely, if ever, received reportable departure delays associated with launches. Aircraft could be temporarily grounded if airspace above or around the airport is closed. Ground delays are also used under some circumstances to avoid airborne reroutes. If aircraft were grounded, noise levels at the airport could temporarily increase as the planes sit idle. Also, depending on the altitude at which aircraft approach an airport, there could be temporarily increases in noise levels in communities around the airports. However, aircraft would travel on existing en-routes and flight paths that are used on a daily basis to account for weather and other temporary restrictions. Re-routing associated with launch-related closures represents a small fraction of the total amount of re-routing that occurs from all other reasons in any given year. Any incremental increases in noise levels at individual airports would only last the duration of the airspace closure on a periodic basis and are not expected to meaningfully change existing day-night average sound levels at the affected airports and surrounding areas. Therefore, we expect airspace closures due to launches to not result in significant noise impacts. Furthermore, we expect airspace management advancements to further reduce the number of aircraft that would contribute to noise at the affected airports and surrounding areas.

4.2.2. No Action Alternative

Under the No Action Alternative, ABL would not implement the RS1 launch program at LC 576-E at VSFB. No additional impacts would be associated with the No Action Alternative. Therefore, the No Action Alternative would have no impacts on the noise environment.

4.3. Terrestrial Biological Resources

Factors considered in determining if implementing an alternative may result in significant impacts on biological resources include the extent or degree to which implementing an alternative would result in the following:

- unmitigable loss of important quantities of declining vegetation communities (including wetlands) that are considered rare;
- impacts on endangered, threatened, or protected species; or
- altering regionally and locally important wildlife corridors that would severely and permanently limit their use.

Per FAA Order 1050.1F, impacts would be significant if the USFWS or NMFS determines that the action would be likely to jeopardize the continued existence of a federally listed threatened or endangered species or would result in destroying or adversely modifying federally designated critical habitat.

Impacts on biological resources would occur if species (endangered, threatened, rare, candidate, or species of concern) or their habitats, as designated by federal and state agencies, would be affected directly or indirectly by project-related activities. These impacts can be short- or long-term impacts. For example, short-term or temporary impacts can be from noise and dust during activities related to site access and water diversion and long-term impacts can be from the lost habitat supporting wildlife populations.

Potential impacts on biological resources as a result of the Proposed Action include the following:

- long-term (permanent) lost habitat from construction-related activities such as vegetation management;
- lost individuals within the project area due to crushing, or physical injury;
- abandoning breeding or roosting sites due to project-related noise; and
- disrupting foraging or roosting activities due to project-related noise.

4.3.1. Vegetation Resources

4.3.1.1. Alternative 1 (Proposed Action)

As discussed in Section 3.3.3 (Vegetation Resources), native vegetation occurs within the Proposed Action Area (Table 4.3-1). The extant plant communities in the Vegetation Management Area would be disced or mowed to create necessary clear areas and establish a firebreak. Vegetation that has colonized historically developed and disturbed areas would also be removed.

Table 4.3-1: Impacts on Extant Vegetation Types

Action	Vegetation Type	Affected Area	
		Acres	Hectares
Firebreak: Disced / Cleared	Central Dune Scrub / Iceplant	1.8	0.7
	Developed	0.2	0.1
	Disturbed / Cleared	0.1	0.0
	Iceplant - Herb / Central Dune Scrub	0.6	0.3
	Non-Native Grasses / Central Dune Scrub	0.2	0.1
	Total Disced / Cleared:	**2.9**	**1.2**
Mowed	Central Dune Scrub / Iceplant	2.8	1.1
	Developed	0.1	0.0
	Disturbed / Cleared	0.2	0.1
	Iceplant - Herb / Central Dune Scrub	2.6	1.1
	Non-Native Grasses / Central Dune Scrub	1.6	0.6
	Total Mowed:	**7.3**	**2.9**
	Grand Total	**10.2**	**4.1**

Due to the abundance of native vegetation outside of the Vegetation Management Area, we consider the small amount of vegetation loss from implementing the Proposed Action to be

insignificant; therefore, the Proposed Action would not have a significant impact on vegetation resources.

4.3.1.2. No Action Alternative

Under the No Action Alternative, no modifications would occur to the LC 576-E facility and no launches or static fire operations would occur. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impacts on vegetation resources.

4.3.2. General Wildlife Resources

4.3.2.1. Alternative 1 (Proposed Action)

4.3.2.1.1. *Direct Impacts*

Discing or mowing vegetated areas in the Vegetation Management Area would have potential adverse effects on wildlife species if they are injured or killed as a result this activity. A total of 9.6 ac. (3.9 hectares) of predominantly vegetated habitat (native and non-native) would be disced or mowed during the Proposed Action.

If practicable, vegetation clearing will occur outside of bird nesting season. If vegetation clearing occurs during nesting season, a qualified biologist would survey the area for nesting birds and delineate buffers around any found nests that are of sufficient size to prevent disturbance. Additional EPMs described in Section 2.3.4.2 (Terrestrial Biological Resources) would also be implemented to further avoid and minimize impacts on wildlife resources. As a result, potential impacts on wildlife species as a result of vegetation management would be less than significant.

4.3.2.1.2. *Noise Impacts*

Modifications to the LC 576-E facility and clearing of vegetation would also generate noise and disturbance that could result in temporary impacts on wildlife species. Temporary disturbances due to noise and human presence related to these activities could disrupt foraging and roosting activities or cause wildlife species to avoid the work areas.

We expect wildlife species to experience some level of noise disturbance during the day; however, construction activities would be temporary and only create noise above ambient levels over a relatively small area. We expect individuals to experience temporary behavioral disruption and likely move to adjacent suitable habitat until the noise disturbance ceases. A qualified biological monitor would oversee activities to ensure implementing EPMs designed to minimize and avoid impacts on native wildlife species (Section 2.3.4.2, Terrestrial Biological Resources). As a result, potential impacts on wildlife species resulting from noise associated with construction and vegetation management would be less than significant.

Temporary disturbances to terrestrial wildlife species within the Action Area would also occur during the launch and static fire events from noise caused by the firing and flight of the vehicles.

Wildlife responses to noise can be physiological, ranging from mild, such as an increase in heart rate, to more damaging effects on metabolism and hormone balance; or behavioral. Because responses to noise are species specific, exact predictions about hearing thresholds of a particular species based on data from another species, even those with similar hearing patterns, cannot be validly made.

During launches and static firings, noise levels of 120 dB would be produced near the LC 576-E. Although exact predictions cannot be made, these noises are expected to elicit a startle response in terrestrial wildlife species with developed hearing abilities. Potentially, wildlife hearing thresholds could shift either permanently or temporarily in wildlife if they are active on the surface close to LC 576-E during launch and static fire events. Exceptionally little sound is transmitted between the air-water interface; thus, in-air sound would not have a significant effect on submerged animals (Godin 2008). Likewise, wildlife present below the ground surface would be insulated from noise impacts. Because the affected area is relatively small and the launch and static fire events are infrequent and temporary, we expect behavioral disruptions and potential hearing threshold shifts to not have population-level impacts and therefore would not have a significant effect on wildlife resources.

4.3.2.2. No Action Alternative

Under the No Action Alternative, no modifications would occur to the LC 576-E facility and no launches or static fire operations would occur. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impacts on wildlife resources.

4.3.3. Special Status Wildlife Species

Special status wildlife species occur or potentially occur within or near the Proposed Action Area and its associated activities that may be adversely effected. Table 4.3-2 summarizes potential project-related impacts on special status wildlife species. Figure 4.3-1 shows the maximum expected noise exposure levels for federally threatened and endangered species. Physical disturbances associated with the Proposed Action are not within designated or proposed Critical Habitat for any species.

Table 4.3-2: Potential Impacts on Special Status Wildlife Observed Within Proposed Action Area

Species	Status		Potential Impacts
	USFWS	CDFW	
Invertebrates			
Buckwheat blue butterfly (*Euphilotes* sp.)	-	-	Direct physical impacts if seacliff buckwheat host plants or surrounding soil is crushed or disturbed, and loss of habitat
Crotch's bumblebee (*Bombus crotchii*)	-	SSC	Direct physical impacts, and loss of habitat

Species	Status		Potential Impacts
	USFWS	CDFW	
Amphibians			
California red-legged frog (*Rana draytonii*)	FT	SSC	Disturbance due to noise
Birds			
Allen's hummingbird (*Selasphorus sasin*)	BCC		Disturbance due to noise
Black oystercatcher (*Haematopus bachmani*)	BCC	-	Disturbance due to noise
Black skimmer (*Rynchops niger*)	BCC	-	Disturbance due to noise
Brant (*Branta bernicla*)	-	SSC	Disturbance due to noise
Burrowing owl (*Athene cunicularia*)	BCC	SSC	Disturbance due to noise
California brown pelican (*Pelecanus occidentalis californicus*)	-	Fully Protected	Disturbance due to noise
California least tern (*Sternula antillarum browni*)	FE	SE	Disturbance due to noise
Costa's hummingbird (*Calypte costae*)			Disturbance due to noise
Lawrence's goldfinch (*Spinus lawrencei*)	BCC		Disturbance due to noise
Loggerhead shrike (*Lanius ludovicianus*)	BCC	SSC Nesting	Disturbance due to noise
Long-billed curlew (*Numenius americanus*)	BCC	-	Disturbance due to noise
Marbled godwit (*Limosa fedoa*)	BCC	-	Disturbance due to noise
Marbled murrelet (*Brachyramphus marmoratus*))	FT	SE	Disturbance due to noise
Northern harrier (*Circus hudsonius*)		SSC Nesting	Disturbance due to noise
Nuttall's woodpecker (*Dryobates nuttallii*)	BCC		Disturbance due to noise
Oak titmouse (*Baeolophus inornatus*)	BCC		Disturbance due to noise
Peregrine falcon (*Falco peregrinus anatum*)	BCC Nesting	Fully Protected Nesting	Disturbance due to noise

Species	Status		Potential Impacts
	USFWS	CDFW	
Short-billed dowitcher (*Limnodromus griseus*)	BCC	-	Disturbance due to noise
Whimbrel (*Numenius phaeopus*)	BCC	-	Disturbance due to noise
Western snowy plover (*Charadrius nivosus*)	FT; BCC	SSC Nesting	Disturbance due to noise
Willet (*Tringa semipalmata*)	BCC	-	Disturbance due to noise
White-tailed kite (*Elanus leucurus*)		Fully Protected Nesting	Disturbance due to noise
Yellow warbler (*Setophaga petechia*)	BCC	SSC Nesting	Disturbance due to noise
Terrestrial Mammals			
Pallid bat (*Antrozous pallidus*)		SSC	Disturbance due to noise
Townsend's big-eared bat (*Corynorhinus townsendii*)		SSC	Disturbance due to noise
Spotted bat (*Euderma maculatum*)		SSC	Disturbance due to noise
Western red bat (*Lasiurus blossevillii*)		SSC	Disturbance due to noise
Western mastiff bat (*Eumops perotis californicus*)		SSC	Disturbance due to noise
San Diego desert woodrat (*Neotoma lepida intermedia*)		SSC	Disturbance due to noise
American badger (*Taxidea taxus*)		SSC	Disturbance due to noise

Notes: BGEPA = Bald and Golden Eagle Protection Act; FE = Federally Endangered Species; FT = Federally Threatened Species; SE = State Endangered Species; SSC = California State Species of Special Concern; SCE = State Candidate Endangered; SE = State Endangered Species; SSC = State Candidate Species; BCC = Federal Bird of Conservation Concern, USFWS = U.S. Fish and Wildlife Service, CDFW = California Department of Fish and Wildlife

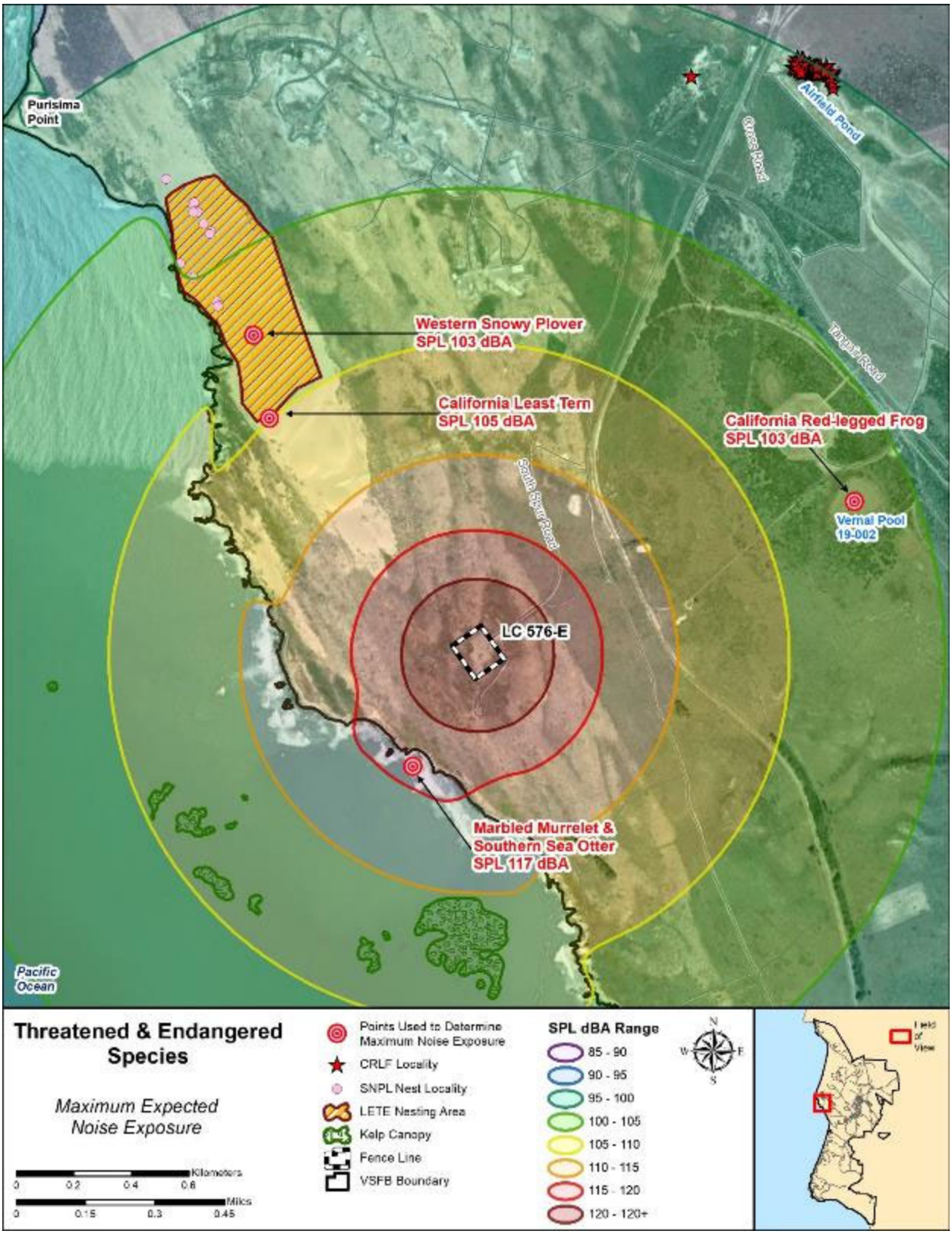

Figure 4.3-1: Maximum Expected Noise Exposure Levels for Federally Threatened and Endangered Species

4.3.3.1. Alternative 1 (Proposed Action)

4.3.3.1.1. *California Red-legged Frog*

Table 4.3-3 provides the impacts and conclusion for the CRLF.

Table 4.3-3: California Red-legged Frog Impacts and Conclusion

California Red-legged Frog (CRLF) Impacts and Conclusion	
Direct Impacts	No aquatic or riparian habitat is present in or adjacent to the Vegetation Management Area and no CRLF have been documented nearby. We anticipate no direct impacts on CRLF resulting from the Proposed Action.
Noise Impacts	Launch noise may trigger a startle response in CRLF, causing them to flee to water or attempt to hide in place. Any reaction would likely depend on the sensitivity of the individual, the behavior in which it is engaged when it experiences the noise, and the sound level (e.g., higher stimuli would be more likely to trigger a response). As a result, CRLF behaviors such as foraging, calling, and mating (during the breeding season) could be temporarily disrupted. However, frogs tend to return to normal behavior quickly after being disturbed. All life stages of CRLF can detect noise and vibrations (Lewis & Narins 1985). Although no studies have been conducted on hearing damage in CRLF, Simmons et al. (2014) found that consistent morphological damage of hair cells in the hearing structures of American bullfrogs (*Lithobates catesbeianus*), which are within the same family as the CRLF (*Ranidae*), were observed with exposure to sound levels greater than 150 dB SPL. Even after such hearing damage, bullfrogs showed full functional recovery within 3–4 days; thus, the hearing damage was temporary Simmons et al. (2014). SPLs of around 95 dB L_{max} will extend into CRLF breeding habitat at the at the Airfield Pond and SPLs of around 103 dB L_{max} will extend into vernal pool 19-002 where CRLF were historically documented and may still function in seasonal aquatic habitat (Figure 4.3-1Figure 4.3-1). Sound levels at these locations will be below thresholds expected to cause hearing damage, and CRLF reactions are expected to be limited to a startle response. Impacts on the broader CRLF population are not expected. Since CRLF habitat is not present near the LC 576-E facility where construction and vegetation management activities will occur, sound related to these activities is unlikely to affect CRLF.
Conclusion	Potential impacts on CRLF would be limited to temporary behavioral reactions. Therefore, the DAF has determined that the Proposed Action may affect, but is not likely to adversely affect the CRLF. VSFB conducted programmatic consultation with the USFWS in 2015 for routine mission operations, including launches, and maintenance activities at VSFB. The USFWS determined that the actions covered in the consultation would not jeopardize the continued existence of any federally listed species or destroy or adversely modify any critical habitat and issued a PBO (Appendix A). VSFB determined the Proposed Action is

	commensurate with those covered under the PBO and ABL must comply with all relevant terms and conditions in the PBO, including avoidance and minimization measures and reporting requirements, during RS1 launches at LC 576-E. Therefore, the Proposed Action would not result in significant impacts on the CRLF.

4.3.3.1.2. *California Least Tern*

Table 4.3-4 provides the impacts and conclusion for the LETE.

Table 4.3-4: California Least Tern Impacts and Conclusion

California Least Tern (LETE) Impacts and Conclusion	
Direct Impacts	Direct impacts on LETEs are not expected since there is no overlap with LETE breeding habitat and areas experiencing physical impacts.
Noise Impacts	LETE nest and forage within portions of the Proposed Action Area that will experience noise impacts. LETE nests at the Purisima Point nesting area on VSFB may experience up to 105 dB L_{max} (Figure 4.3-1). At VSFB, LETE monitoring has been conducted for five Delta II launches from SLC-2 on north VSFB. SLC-2 is 0.4 mi. (0.6 km) from the Purisima Point nesting colony. LETE responses to launch noise varied. Pre- and post-launch monitoring of non-breeding LETE for the 7 June 2007 Delta II COSMO-1 launch and monitoring of nesting LETE during the 20 June 2008 Delta II OSTM and 10 June 2011 Delta II AQUARIUS launches did not document any mortality of adults, young, or eggs, or any abnormal behavior resulting from launches (ManTech SRS Technologies Inc. 2007, 2008, 2011). However, the May and July 1997 Delta II launches potentially caused abandoning of up to five nests and a chick's death from exposure, although predation of adult LETE by owls may have been responsible for some of the losses observed (BioResources 1997). In addition, Delta II launches from SLC-2 in 2002 and 2005, when terns were arriving at the colony, may have caused temporary or permanent emigration from the colony because there was decreased attendance following the launches (Robinette et al. 2003; Robinette & Rogan 2005). These data imply that LETE response to noise relates to timing with the nesting cycle. For instance, at the beginning of the nesting season when LETE are arriving at the breeding colony, the adults seem to be more disturbed, but once courtship and nest-tending begins, the adults are more tenacious. The sound profile for the 15 April 1999 Delta II launch vehicle noise at SLC-2 was characterized at the Purisima Point nesting area (SRS Technologies 1999). Sound reaching the recording site had an unweighted peak of 135.5 dB (roughly 2.3 psf) (SRS Technologies 1999). These launch noises exceed the noise impacts anticipated from the Proposed Action. On 12 June 2019, LETE response was documented during a SpaceX Falcon 9 launch with first stage recovery efforts in which the first stage of the rocket separated and returned to land at SLC-4 on VSFB. The launch and landing produced a 2.66 psf sonic boom and 136 dB SPL and 128 dB sound equivalent

California Least Tern (LETE) Impacts and Conclusion	
	level as measured at the Purisima LETE colony. LETE response to the launch and boost-back landing was documented via pre- and post-launch monitoring and video recording during the launch event. LETE response during the launch was difficult to determine since birds flushed before sonic boom impact. All LETE returned to their nests minutes after the launch event. One LETE egg was found to be damaged. The damaged LETE egg was from a one egg clutch and was inspected when it was a week past hatch date. The cause of the damage to the egg was inconclusive (Robinette & Rice 2019). Audible and visual components of the Proposed Action (e.g., launch and static fire noise and vehicle lift off) could cause LETE to respond behaviorally. This stimulus could trigger a startle response that alerts predators to nest locations and causes temporary (minutes) abandonment of nests. The proposed environmental protection measures (see Appendix I, Terrestrial Biological Species) would be employed to characterize any impact on LETE during and following the proposed launch and static fire events.
Conclusion	The DAF has determined that the Proposed Action may affect, and is likely to adversely affect, the LETE. VSFB conducted programmatic consultation with the USFWS in 2015 for routine mission operations, including launches, and maintenance activities at VSFB. The USFWS determined that the actions covered in the consultation would not jeopardize the continued existence of any federally listed species or destroy or adversely modify any critical habitat and issued a PBO (Appendix A). VSFB determined the Proposed Action is commensurate with those covered under the PBO and ABL must comply with all relevant terms and conditions in the PBO, including avoidance and minimization measures and reporting requirements, during RS1 launches at LC 576-E. Therefore, the Proposed Action would not result in significant impacts on the LETE.

4.3.3.1.3. *Marbled Murrelet*

Table 4.3-5 provides the impacts and conclusion for the MAMU.

Table 4.3-5: Marbled Murrelet Impacts and Conclusion

Marbled Murrelet (MAMU) Impacts and Conclusion	
Direct Impacts	Since there is no overlap with MAMU foraging habitat and areas experiencing physical impacts, we expect no direct impacts on MAMUs.
Noise Impacts	Based on observations of MAMU in nearshore waters off of Purisima Point (Figure 3.3-6), we assumed that they may also occur off the coast due west of LC 576-E. MAMU in this area during a launch event would be subject to noise levels of about 117 dB L_{max} (Figure 4.3-1). MAMU do not nest on VSFB, so exposure to noise impacts would be limited to foraging adults. We expect MAMU to startle when exposed to noise impacts. Bellefleur et al. (2009) examined the response of MAMU to boat traffic. MAMU response depended on the bird's age, the distance and speed of the boats encountered,

Marbled Murrelet (MAMU) Impacts and Conclusion	
	and the season. MAMU either showed no reaction, flew, or dove in response. Late in the season (July–August), some MAMU flew completely out of feeding areas when approached by boats traveling in excess of 17.9 miles per hour (28.8 kilometers per hour). However, the MAMU dominant response to boats approaching was to dive and resurface a short distance away. Therefore, we expect MAMU to exhibit a startle response that will cause birds to dive and resurface, but they should return to normal behavior soon after each launch or static fire event has been completed.
Conclusion	Potential impacts on MAMU would be limited to temporary behavioral reactions. Therefore, the DAF has determined that the Proposed Action may affect, but is not likely to adversely affect the MAMU based upon discountable effects. VSFB initiated informal consultation with the USFWS and was issued concurrence on 27 April 2021 (08EVEN00-2021-I-0293, Appendix A). Therefore, the Proposed Action would not result in significant impacts on the MAMU.

4.3.3.1.4. *Western Snowy Plover*

Table 4.3-6 provides the impacts and conclusion for the SNPL.

Table 4.3-6: Western Snowy Plover Impacts and Conclusion

Western Snowy Plover (SNPL) Impacts and Conclusion	
Direct Impacts	Since there is no overlap with SNPL breeding habitat and areas experiencing physical impacts, we expect no direct impacts on SNPL .
Noise Impacts	During launch events, SNPL would be exposed to noise levels of about 103 dB L_{max} at their nearest documented nesting locality in the Purisima Point area (Figure 4.3-1). SNPL monitoring for impacts from launch-related engine noise was conducted during numerous VSFB launches. Wintering birds were directly observed during a Titan IV and Falcon 9 launch from SLC-4E (SRS Technologies, Inc. 2006; Robinette & Ball 2013). The Titan IV launches were 130 dBA. SNPLs did not exhibit any adverse reactions to these launches (SRS Technologies, Inc. 2006; Robinette & Ball 2013), except one. During a 1998 Titan II launch from SLC-4W, SNPL monitoring found the nest located closest to the launch facility had one of three eggs broken after the launch (Applegate & Schultz 1998). The cause of the damaged egg was not determined. On 12 June 2019, SNPL response was documented during a SpaceX Falcon 9 launch and first stage recovery SLC-4. The return flight of the first stage to VSFB produced a 3.36 psf sonic boom and landing engine noise of 138 dB L_{max} and 130 dB SEL, as measured on South Surf Beach. SNPL response to the noise impacts was documented via pre- and post-launch monitoring and video recording during the launch event. Incubating SNPL captured on video were observed to startle and either jump or hunker down in response to the sonic boom. One SNPL egg showed signs of potential damage. This egg was part of a three-egg clutch in which the other two eggs successfully hatched. It is not uncommon for one or more eggs from a successful nest to not

Western Snowy Plover (SNPL) Impacts and Conclusion	
	hatch. Whether or not the failure of the egg to hatch was related to the launch event was inconclusive (Robinette & Rice 2019). Given the magnitude of the launch noise and the concurrent visual disturbance, the Proposed Action may trigger a startle response. The proposed EPMs (see Table 2.3-7) would be employed to monitor any impact on SNPL during test events and quantify acoustic impacts.
Conclusion	The DAF has determined that the Proposed Action may affect, and is likely to adversely affect the SNPL. VSFB conducted programmatic consultation with the USFWS in 2015 for routine mission operations, including launches, and maintenance activities at VSFB. The USFWS determined that the actions covered in the consultation would not jeopardize the continued existence of any federally listed species or destroy or adversely modify any critical habitat and issued a PBO (Appendix A). VSFB determined the Proposed Action is commensurate with those covered under the PBO and ABL must comply with all relevant terms and conditions in the PBO, including avoidance and minimization measures and reporting requirements, during RS1 launches at LC 576-E. Therefore, the Proposed Action would not result in significant impacts on the SNPL.

4.3.3.1.5. *Migratory Birds*

Table 4.3-7 provides the impacts and conclusion for migratory birds.

Table 4.3-7: Migratory Birds Impacts and Conclusion

Migratory Birds	
Direct Impacts	Removing and mowing vegetation within the Vegetation Management Area during the Proposed Action would result in losing existing breeding and roosting habitat for migratory birds adjacent to and within LC 576-E. However, given the abundance of nearby suitable habitat this adverse impact would be less than significant. In addition, conducting initial vegetation management during the non-nesting season for avian species (September–February) would prevent losing eggs or young. If vegetation clearing occurs during nesting season (March–August), a qualified biologist would survey the area for nesting birds and delineate buffers around any nests that are found that are of sufficient size to prevent disturbance. Therefore, direct impacts on migratory birds nesting within the Vegetation Management Area are unlikely.
Noise Impacts	Noise and visual disturbance associated with the Proposed Action may disturb breeding migratory birds. Disturbances to breeding birds include abandonment of breeding sites, egg breakage by "panicked" adults, physical damage or injury to the eggs or chicks due to heating and cooling from exposure, and increased vulnerability to predation during periods of nest abandonment. Chicks may also panic and leave the nest prematurely resulting in potential injury or death. Impact severity would depend on the activity-related disturbance timing and noise exposure level (i.e., proximity of the breeding birds to LC 576-E). If

Migratory Birds	
	disturbance occurs after nesting has already been initiated, project-related noise could adversely impact reproductive success. Noise associated with the Proposed Action may also cause threshold shifts in hearing sensitivity to birds. This would be most likely to occur to birds breeding on or in close proximity to LC 576-E. However, vegetation management around LC 576-E would eliminate most nesting habitat within the area to receive the highest sound levels.
Conclusion	The EPMs outlined in Table 2.3-7 should serve to avoid or minimize potential adverse effects on migratory birds during implementing the Proposed Action. Therefore, the Proposed Action would not have a significant effect on migratory birds.

4.3.3.2. No Action Alternative

Under the No Action Alternative, no modifications would occur to the LC 576-E facility and no launches or static fire operations would occur. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impacts on special status species.

4.4. Marine Biological Resources

4.4.1. Marine Mammals

There are two statutes that dictate the approach to determining impacts on marine mammals, the MMPA and the ESA. The MMPA defines Level B harassment as "any act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering, but does not have the potential to injure a marine mammal or marine mammal stock in the wild." 50 C.F.R. § 216.3. Level A harassment includes "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild." 50 C.F.R. § 216.3. Under the ESA, any marine mammal that could potentially be in the ROI during the Proposed Action would be considered potentially affected by that action. Furthermore, unless the exposure to the action had a demonstratively beneficial effect, then the determination must be that the exposure would result in an adverse effect according to guidelines jointly prepared by NMFS and USFWS (U.S. Fish and Wildlife Service & National Marine Fisheries Service 1998).

4.4.1.1. Alternative 1 (Proposed Action)

4.4.1.1.1. *Southern Sea Otter (Federally Threatened Species)*

Table 4.4-1 provides the impacts and conclusion for the southern sea otter.

Table 4.4-1: Southern Sea Otter

Southern Sea Otter	
Direct Impacts	Since there is no overlap with southern sea otter habitat and areas that would experience physical impacts (infrastructure improvements at LC 576-E), we expect no direct impacts on the southern sea otter.
Noise Impacts	Otters that are irregularly present in transit or foraging off the coast west of LC 576-E may be impacted by launch noise of up to 117 dB L_{max} and static fire noise up to 110 dB L_{max} as a result of the Proposed Action (Figures 3.4-1 and 3.4-2). Otters in this area historically experienced similar launch noise, with sound levels of 124 dBA recorded on the coast west of LC 576-E associated with historic Taurus launches from the LC 576-E (SRS Technologies, Inc. 1998). Past studies indicate that sea otters may acclimate to sound exposures exceeding those anticipated from the Proposed Action. Davis et al. (1988) conducted a study of the closely related northern sea otter's (*Enhydra lutris kenyoni*) reactions to various underwater and in-air acoustic stimuli. The purpose of the study was to identify a means to move sea otters away from a location if an oil spill occurred. Anthropogenic sound sources used in this behavioral response study included truck air horns and an acoustic harassment device (10–20 kilohertz at 190 dB) designed to keep dolphins and pinnipeds from being caught in fishing nets. The authors found that the sea otters often remained undisturbed and quickly tolerated various sounds. When a harassing sound caused a fleeing response, sea otters generally moved only 328 to 656 ft. (100 to 200 m) before resuming normal activity (Davis et al. 1988). Permanent threshold shift and temporary threshold shifts in hearing sensitivity have not been determined for the sea otter. However, because of biological similarities, one assumes that the thresholds would be similar to those developed by NMFS for otariid pinnipeds (Finneran and Jenkens 2012). Per the latest guidance, the lower limit for temporary threshold shifts for otariids is 170 dB SPL and the lower limit permanent threshold shift is 176 dB SPL (U.S. Department of the Navy 2017). These levels are above maximum predicted exposure levels for sea otters due to the Proposed Action (117 dBA SPL) so we expect no temporary or permanent hearing loss. Launch and static fire noise and the visual disturbance associated with launch events may cause temporary behavioral disturbances to sea otters. We expect disturbance responses to be no more than temporary startle-responses.
Conclusion	Potential impacts on southern sea otter would be limited to temporary behavioral reactions. VSFB conducted programmatic consultation with the USFWS in 2015 for routine mission operations, including launches, and maintenance activities at VSFB. The USFWS determined that the actions covered in the consultation would not jeopardize the continued existence of any federally listed species or destroy or adversely modify any critical habitat and issued a PBO

Southern Sea Otter	
	(Appendix A). VSFB determined the Proposed Action is commensurate with those covered under the PBO and ABL must comply with all relevant terms and conditions in the PBO, including avoidance and minimization measures and reporting requirements, during RS1 launches at LC 576-E. Therefore, the Proposed Action would not result in significant impacts on the southern sea otter.

4.4.1.1.2. *Guadalupe Fur Seal (Federally Endangered Species)*

Table 4.4-2 provides the impacts and conclusion for the Guadalupe fur seal.

Table 4.4-2: Guadalupe Fur Seal

Guadalupe Fur Seal	
Direct Impacts	Since there is no overlap between Guadalupe fur seal occurrence and areas that would experience physical impacts (infrastructure improvements at LC 576-E). We expect no direct impacts on Guadalupe fur seals.
Noise Impacts	Sonic boom modeling of the planned trajectories predicts RS1 would produce a maximum sonic boom up to 5.4 psf over the Pacific Ocean and approximately 1.0 to 2.0 psf on the NCI (Figure 2.3-5). This is similar to sonic boom levels that were measured on the NCI during prior VSFB launches, which have typically ranged from 0.4 to 1.34 psf (Marine Mammal Consulting Group and Science Applications International Corporation 2012); thus, likely to cause a similar level of impacts on pinnipeds. Noise and visual disturbance can cause variable levels of disturbance to pinnipeds that may be hauled out within the areas of exposure, depending on the species exposed and the level of the sonic boom. Typical reactions range from no response, to raising head and moving from a resting position, to flushing to water. Behavioral reactions to noise can depend on relevance and association to other stimuli. When an animal detects increased background noise, or possibly when an animal recognizes a biologically relevant sound, it makes a behavioral decision. An animal's past experience with the sound-producing activity or similar acoustic stimuli can affect its behavior choice. Competing and reinforcing stimuli may also affect its decision. Other stimuli present in the environment can influence an animal's behavior decision. These stimuli can be other acoustic stimuli not directly related to the sound-producing activity; visual, olfactory, or tactile stimuli; conspecifics or predators in the area; or the strong drive to engage in a natural behavior. Competing stimuli tend to suppress behavioral reactions. For example, an animal involved in mating or foraging may not react with the same degree of severity to acoustic stimuli as it may have otherwise. Reinforcing stimuli reinforce the behavioral reaction caused by acoustic stimuli. For example, awareness of a predator in the area coupled with the acoustic stimuli may elicit a stronger reaction than the acoustic stimuli itself otherwise would have. The visual stimulus of the launch vehicle would not be coupled with the sonic boom, since the RS1 would be at significant altitude when the overpressure impacts land. This

Guadalupe Fur Seal	
	would decrease the likelihood and severity of a behavioral response. Guadalupe fur seals are relatively insensitive to disturbance, occur in low numbers at SMI in isolated locations, and are adept at jumping into the water if they do flee from a disturbance (Harris 2015); therefore, we expect the Proposed Action to not cause more than temporary startle-responses.
Conclusion	Potential impacts on Guadalupe fur seal would be limited to temporary behavioral reactions. The DAF determined that the impacts from sonic boom as a result of the Proposed Action may affect but are not likely to adversely affect the Endangered Species Act-listed Guadalupe fur seal based upon insignificant effects. NMFS concurred that the action may affect, but is not likely to adversely affect the Guadalupe fur seal on 20 April 2021 (WCRO-2021-00737, Appendix B).

4.4.1.1.3. *Marine Mammals Protected Under the MMPA*

During an RS1 launch, engine noise levels would be approximately 110–115 dB Lmax at the nearest pinniped haulout at South Spur (Figure 3.4-4). During static fire, engine noise levels at South Spur would be 90 to 95 dB Lmax (Figure 3.4-5). These levels are less than those generated by the Delta II launch vehicle, which was measured at approximately 125 dBA at South Spur in 1996 (ENSR Consulting and Engineering 1996).

Sonic boom modeling of the planned trajectories predicts RS1 would produce a maximum sonic boom up to 5.4 psf over the Pacific Ocean and approximately 1.0–2.0 psf on the NCI (Figure 2.3-5). This is similar to sonic boom levels that were measured on the NCI during prior VSFB launches. These levels typically ranged from 0.4 to 1.34 psf (Marine Mammal Consulting Group and Science Applications International Corporation 2012). Thus, they are likely to cause similar impact levels on pinnipeds. Noise and visual disturbance can cause variable levels of disturbance to pinnipeds that may be hauled out within the areas of exposure, depending on the species exposed and the level of the sonic boom. The DAF has monitored pinnipeds during launch-related sonic booms on the NCI during numerous launches over the past two decades and determined there are generally no substantial behavioral disruptions by sonic booms less than 1.0 psf (reviewed in Marine Mammal Consulting Group and Science Applications International Corporation 2012). Even above 1.0 psf, only a portion of the animals present tend to react to sonic booms. Reactions between species are also different. For example, harbor seals and California sea lions tend to be more sensitive to disturbance than northern elephant seals. Guadalupe fur seals also tend to be less sensitive to disturbance than other pinniped species (Harris 2015). Monitoring of past sonic booms has shown that normal behavior and numbers of hauled out pinnipeds typically return to normal within 24 hours or less after a launch event. No observations of injury or mortality to pinnipeds during monitoring were attributable to past launches. As a result, we expect the Proposed Action's potential impacts on MMPA protected pinnipeds to be limited to brief behavioral reactions (Table 4.4-3).

Under the MMPA, NMFS issued a Final Rule for taking marine mammals incidental to DAF launches (NMFS 2019a), and a LOA (NMFS 2019b). The LOA allows launch programs to unintentionally take small numbers of marine mammals during launches. The SLD 30 is required

to comply with the LOA listed conditions and address NMFS concerns regarding marine mammals at VSFB and the NCI. Under the LOA, monitoring of marine mammals at VSFB and the NCI is required during launches, including the proposed RS1 launch activity at LC 576-E, under the following (also see Section 2.3.4.3, Marine Biological Resources):

- Monitoring of pinnipeds during launches on the NCI is required if a sonic boom greater than 2 psf is predicted between 1 March and 31 July; if a sonic boom greater than 3 psf is predicted between 1 August and 30 September; or if a sonic boom greater than 4 psf is predicted between 1 October and 28 February 28.

Given the authorizations and EPMs in place (Section 2.3.4.3, Marine Biological Resources), including the required monitoring, the Proposed Action would not result in significant impacts on MMPA protected pinnipeds.

Table 4.4-3: Potential Impacts on Special Status Wildlife with Potential to Occur Within the Proposed Action Area

Species	Status		Potential Impacts
	USFWS	CDFW	
Marine Mammals			
Guadalupe fur seal (*Arctocephalus townsendi*)	FT		Disturbance due to noise
Northern fur seal (*Callorhinus ursinus*)	MMPA		Disturbance due to noise
Southern sea otter (*Enhydra lutris nereis*)	FE		Disturbance due to noise
Steller sea lion (*Eumetopias jubatus*)	MMPA		Disturbance due to noise
Northern elephant seal (*Mirounga angustirostris*)	MMPA		Disturbance due to noise
Pacific harbor seal (*Phoca vitulina richardii*)	MMPA		Disturbance due to noise
California sea lion (*Zalophus californianus*)	MMPA		Disturbance due to noise

4.4.1.2. No Action Alternative

Under the No Action Alternative, no modifications would occur to the LC 576-E facility and no launches or static fire operations would occur. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impacts on marine mammals.

4.4.2. Marine Reserves

4.4.2.1. Alternative 1 (Proposed Action)

4.4.2.1.1. *Channel Islands National Marine Sanctuary*

The CINMS prohibitions do not apply to military activities carried out by the DoD, according to Section 3.5.9 of the CINMS Final EIS, entitled "Department of Defense Activities" ("pre-existing activities") as indicated in Section 922.72(b)(1). Section 3.5.9.1 (Vandenberg Air Force Base) of the CINMS Final EIS describes spacelift operations originating from VSFB and potential sonic booms from these activities as "pre-existing activities" (NMFS 2007). In addition, impacts to the CINMS would be temporary. Therefore, the Proposed Action would not result in significant impacts on CINMS.

4.4.2.1.2. *Vandenberg State Marine Reserve*

The CDFW and VSFB established a mutual Memorandum of Understanding. Within the VSMR, no take of living marine resources is permitted except take incidental to the mission critical activities of VSFB. Those activities include ones that are important for supporting and defending U.S. launch, range, expeditionary, exercise, test, training, and installation operations, including, but not limited to, space-launch vehicles. Impacts on marine resources within the VSMR would be temporary and limited to sonic boom and landing noise. Therefore, the Proposed Action would not result in significant impacts on VSMR.

4.4.2.2. No Action Alternative

Under the No Action Alternative, no modifications would occur to the LC 576-E facility and no launches or static fire operations would occur. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impacts on sensitive marine habitats.

4.5. Water Resources

Factors considered in determining if implementing an alternative may have significant adverse impacts on water resources include the extent or degree to which implementing an alternative would cause substantial flooding or erosion; reduce surface water quality of creeks, rivers, streams, lakes, or the ocean; reduce surface or groundwater quality or quantity; or result in a net loss of wetland area or habitat value.

The FAA has established the following significance thresholds for water resources:

- **Surface Waters** – The action would:
    - Exceed water quality standards established by Federal, State, local, and tribal regulatory agencies; or
    - Contaminate public drinking water supply such that public health may be adversely affected.

- **Groundwater** – The action would:
    - Exceed groundwater quality standards established by Federal, State, local, and tribal regulatory agencies; or
    - Contaminate an aquifer used for public water supply such that public health may be adversely affected.

4.5.1. Alternative 1 (Proposed Action)

4.5.1.1. Surface Water

There are no surface water resources or drainage channels near LC 576-E. Preparing LC 576-E as described under the Proposed Action would remove vegetation, expose soils, and potentially release hazardous materials and wastes because of work with heavy machinery onsite. However, given the lack of extant drainage channels there would not be an opportunity for such materials to be carried offsite in runoff. EPMs would be implemented as described in detail in Section 2.3.4.4 (Water Resources). Therefore, the Proposed Action would not have significant impacts on surface water.

4.5.1.2. Groundwater

LC 576-E is located on the western edge of the Santa Ynez River Valley Basin. As noted in Section 3.5.3 (Groundwater), IRP monitoring wells indicated groundwater was between 20 and 40 ft. (6 and 12 m) below ground surface (Tetra Tech 2020). Because installing utilities would not require ground disturbance at this depth, direct interaction with groundwater is unlikely. However, installing light poles up to 20 ft. deep may reach the upper extent of groundwater. The base of the pole would be encased in concrete and we expect no contamination of groundwater. During GSO operation, potentially accidental pollutants discharge could occur during equipment operation and fueling. Proper materials and wastes management (as described in Section 4.11, Hazardous Materials and Waste Management) would reduce or eliminate potential contaminated runoff that could infiltrate groundwater. In addition, implementing EPMs to protect water resources (Section 2.3.4.4, Water Resources) would further help protect groundwater resources. Therefore, the Proposed Action would not have significant impacts on groundwater.

4.5.2. No Action Alternative

Under the No Action Alternative, no modifications would occur to the LC 576-E facility and no launches or static fire operations would occur. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impacts on water resources.

4.6. Cultural Resources

The Proposed Action is subject to NHPA Section 106 compliance and AFMAN 32-7003, Cultural Resources Management. Section 106 compliance also satisfies federal agencies' NEPA responsibilities to consider potential project-related effects on cultural resources. The NHPA, Section 106, requires federal agencies to consider the effects of proposed federal undertakings on historic properties that are listed in or eligible for listing in the NRHP. If a cultural resource is listed in, or eligible for, the NRHP it is considered a "historic property" for purposes of Section 106 and is significant. Compliance with Section 106 requires the federal agency to determine either that the undertaking would have no effect, no adverse effect, or an adverse effect to historic properties (that is, to significant cultural resources). The Section 106 implementing regulations (36 C.F.R. Part 800) prescribe the process for making these determinations. The FAA has not established a significance threshold for cultural resources.

Cultural resources would be adversely affected if the Proposed Action would cause loss of the value or characteristics that qualify the resource for listing on the NRHP, or if the Proposed Action substantially alters the natural environment or access to it in such a way that traditional cultural or religious activities are restricted. The Proposed Action would comply with all relevant authorities governing cultural resources, including Section 106 of the NHPA and AFI 32-7065. To comply with Section 106 of the NHPA and 36 C.F.R. 800, VSFB consulted with the California SHPO, the Chumash Band of Santa Ynez Indian Tribe, and other interested parties regarding the project.

The following section discusses the consequences of implementing the Proposed Action on cultural resources within the ADI. SLD 30 requires archaeological and Native American monitoring during construction through or adjacent to any known archaeological site, regardless of a site's NRHP eligibility. Archaeological and Native American monitoring is also typically required in areas where buried sites are possible. If previously undocumented cultural resources are discovered during construction activities, the extent and significance of the discovery would be initially assessed by a qualified archaeologist. Recommendations for appropriate treatment of the discovery will be developed in consultation with the VSFB cultural resources manager and the appropriate Native American representative(s).

Gerber and Lebow (2021) includes a detailed cultural resources study completed for the Proposed Action to support AF and FAA compliance with Section 106 of the NHPA. The following discussion of environmental consequences is based on that report.

4.6.1. Alternative 1 (Proposed Action)

The ADI for Alternative 1 (Proposed Action) consists of the fenced LC 576-E facility and a surrounding fuels maintenance area up to and including an approximately 50 to 65-ft. (15 to 20-m) wide firebreak corridor. The APE includes the area encompassed by the 120 dB SPL noise contour produced during launch and static fire, as well as the 2 psf sonic boom contour that may impact SMI. As noted in Section 3.6 (Cultural Resources) there are no historic properties that may be affected in this APE. VSFB reinitiated consultation with the SHPO on 23 June 2021, providing an analysis of noise impacts on historic properties (built environment). The SHPO

concurred with our no historic properties affected determination on 28 July 2021 (USAF_2021_0427_001; Appendix C).

AE conducted background research, pedestrian survey, and excavation to assess potential project effects on historic resources (Gerber and Lebow 2021). Based on the results of that work, the following section discusses the consequences of the Proposed Action on cultural resources.

4.6.1.1. Atlas ICBM Launch Complexes District and 576-E Facility

The Atlas ICBM Launch Complexes District and the Atlas Complex 576-E facility have been determined ineligible for the NRHP (Polanco 2020); thus, neither is an historic property.

4.6.1.2. CA SBA 2428, -2429, and -2430

Fieldwork confirmed that the mapped locations of CA-SBA-2428, -2428, and -2429 within the ADI do not contain archaeological material. Background research and fieldwork confirmed that these sites are located outside of the ADI.

4.6.1.3. CA SBA TMP6 and -TMP8

Surface survey and subsurface testing revealed that CA-SBA-TMP6 and -TMP8 do not contain archaeological material; therefore, are not archaeological sites. In summary, background research and subsurface testing found no archaeological resources within the ADI, and neither the Atlas ICBM Launch Complexes District nor the Atlas Complex 576-E facility are eligible for the NRHP. Therefore, the DAF determined that Alternative 1 (Proposed Action) would have no effect on historic properties. The SHPO concurred with this finding on 21 May 2021 (USAF_2021_0427_001, Appendix C).

4.6.2. No Action Alternative

Under the No Action Alternative, the launch pad modifications at LC 576-E and the RS1 launch program would not occur at VSFB. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no effect on historic properties.

4.7. Department of Transportation Act Section 4(f) Properties

Impacts on Section 4(f) properties would be significant if the FAA's proposed action of issuing a license to ABL involves more than a minimal physical *use* of a Section 4(f) resource or constitutes a *constructive use* based on an FAA determination that the project would substantially impair the Section 4(f) resource. The concept of *constructive use* is that a project that does not physically use land in a park, for example, may still, by means of noise, air pollution, water pollution, or other impacts, dissipate its aesthetic value, harm its wildlife, restrict its access, and take it in every practical sense. *Constructive use* occurs when the impacts of a project on a Section 4(f) property are so severe that the activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired. Substantial impairment occurs only

when the protected activities, features, or attributes of the Section 4(f) property that contribute to its significance or enjoyment are substantially diminished. This means that the value of the Section 4(f) property, in terms of its prior significance and enjoyment, is substantially reduced or lost. For example, noise would need to be at levels high enough to have negative consequences of a substantial nature that amount to a taking of a park or portion of a park for transportation purposes.

4.7.1. Alternative 1 (Proposed Action)

Construction of the launch pad at LC 576-E would not result in a physical use of any Section 4(f) property. Construction activities would not restrict access to any Section 4(f) property. As discussed in Section 4.2.1.1 (Launch Complex 576-E Infrastructure Improvements), noise levels from construction activities would not be audible above typical ambient noise levels at the closest noise sensitive areas, including the potential Section 4(f) properties near LC 576-E. Construction noise would be intermittent and last approximately 45 to 60 days. Therefore, construction would not result in a *constructive use* of any Section 4(f) property.

RS1 launches would close public access temporarily to South Spur, Surf Beach, Wall Beach, and Ocean Beach Park, because these beaches and parks fall within the flight hazard area. Although the beaches and parks may not be directly overflown by the launch vehicle, a launch anomaly could impact them. Therefore, for public safety reasons, upon SLD 30's request the County Parks Department and the Santa Barbara County Sheriff close public access. Since 1979, an evacuation and closure agreement had been in place between USAF and Santa Barbara County (see Appendix M). The agreement recently expired, and the parties are in the process of renewing it. The renewed agreement is expected to be executed by 1 October 2021. The agreement includes closing public access to Surf Beach, Ocean Beach, and Jalama Beach County Parks during launches. Under this agreement, the DAF must provide notice of a launch at least 72 hours prior to the closure, and the closure is not to exceed 48 hours. The notice will state a hazardous operation will occur. Under Alternative 1, closure of the beaches and parks would have the potential to occur up to 12 times per year. Each closure would only last as long as necessary to assure the public is safe during a launch, with coastal access restricted for a short period of time (6 to 8 hours).

South Spur, Wall Beach, Surf Beach, and County of Santa Barbara Ocean Beach Park would experience various noise levels during launch activities. South Spur, the nearest property to LC 576-E, may experience up to 120 dBA during static fire and launch events (Figures 3.7-1 and 3.7-2). Wall Beach, Ocean Beach Park, and Surf Beach would experience between 85 and 90 dBA (Figures 3.7-1 and 3.7-2). The other potential Section 4(f) properties would experience sound at lower levels during launches. Launches would potentially create a sonic boom over small portions of the Channel Islands National Park at a maximum of 2 psf (see Figure 3.7-3). Both launch noise and sonic booms are classified as short-duration events. Given the small area of potential impact over the NCI and the short duration of the event, impacts resulting from sonic boom overpressure would not result in significant impacts to the Channel Islands National Park.

Given the history of beach and park closures for VSFB launches, the formal evacuation agreement in place, and the temporary nature of the closures, the FAA preliminary determined that the

Proposed Action would not substantially diminish the protected activities, features, or attributes of any of the potential Section 4(f) properties; therefore, the Proposed Action would not result in a *constructive use* of any Section 4(f) property. Thus, the FAA's proposed action of issuing ABL a license would not result in significant DOT Act Section 4(f) impacts. The FAA will make a final determination based on any public input received during the draft EA comment period and include the final determination in the final EA.

4.7.2. No Action Alternative

Under the No Action Alternative, the launch pad modifications at LC 576-E and the RS1 launch program would not occur at VSFB. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impacts on Section 4(f) properties.

4.8. Transportation

Factors considered in determining if implementing an alternative may have significant adverse impacts on transportation include the extent or degree to which implementing an alternative would:

- result in a primary roadway no longer being able to service existing traffic demands, or
- result in traffic to shift to a roadway that was incompatible with those traffic increases (e.g., inadequate pavement structure or design capacity), or could cause potential safety problems.

The criteria for determining the significance of project-generated traffic were obtained from Santa Barbara County Planning and Development Department guidelines (Santa Barbara County Planning and Development Department 1992). Impacts would be considered adverse for the following reasons:

The addition of project trips at an intersection causes an increase in the V/C ratio by the value shown in

Table 4.8-1 or the number of project trips using an intersection is greater than the values shown in

- Table 4.8-1. Project traffic would use a substantial portion of an intersection(s) capacity where the intersection is currently operating at acceptable levels of service (A-C) but with cumulative traffic would degrade to or approach LOS D (V/C 0.81) or lower. Substantial is defined as a minimum change of 0.03 for intersections that would operate from 0.80 to 0.85 and a change of 0.02 for intersections that would operate from 0.86 to 0.90, and 0.01 for intersections operating at anything lower.
- Project access to a major road or arterial road would require a driveway that would create an unsafe situation or a new traffic signal or major revisions to an existing traffic signal.

Potential safety problems could occur if a project adds traffic to a roadway that has limiting design features or receives use that would be incompatible with substantial increases in traffic. These limiting design features include narrow width, roadside ditches, sharp curves, poor sight distance, and inadequate pavement structure. Some examples of a roadway receiving incompatible use are large number of heavy trucks on rural roads used by farm equipment, livestock, horseback riding, or residential roads with heavy pedestrian or recreational use.

Table 4.8-1: LOS Significance Thresholds

LOS	Threshold
A	An increase of V/C > 0.20
B	An increase of V/C > 0.15
C	An increase of V/C > 0.10
D	Adding 15 Trips to baseline conditions
E	Adding 10 Trips to baseline conditions
F	Adding 5 Trips to baseline conditions

Note: V/C = Volume-to-Capacity

4.8.1. Alternative 1 (Proposed Action)

Given the short duration, low ADT volumes, good LOS currently experienced on the roadways that would be affected by project activities on VSFB and nearby, and the relatively small increase in daily vehicle traffic that would be generated by the Proposed Action, no adverse effects to capacity would occur in the study-area roadways. All roadway sections would continue to operate at a LOS in the range of A to B with project-added traffic.

Increased vehicle activity affects the integrity of roadway sections by increasing the flexures of the pavement. The design life for asphalt pavement, generally selected as either 10 or 20 years, drives engineering specifications for the road based upon the strength of the base soil and the Traffic Index (TI) for the design life. The TI is calculated based upon the number of truck trips

that are expected during the design life of the pavement. The theory states that the pavement, during its lifetime, can tolerate a finite number of flexures due to loaded trucks. If the number of truck trips is increased, the life of the pavement is shortened. For example, if a 20-year design were based upon an AADT of 1,000 trucks for 20 years and the volume increases to 2,000 ADT, the structural life of the pavement would be reduced to 10 years. While the current condition of the pavement on all of the affected roads is fair to good, added project-related vehicle traffic could cause faster-than-estimated deterioration of the pavement surface and require additional maintenance. Although an adverse effect, it would not be considered significant given that the number of vehicle trips per day anticipated from the Proposed Action are not high. Therefore, we anticipate the Proposed Action will noy create any significant impacts to transportation. In addition, the recommended EPMs, described in Section 2.3.4.6 (Transportation) would further reduce the potential for adverse effects on transportation.

4.8.2. No Action Alternative

Under the No Action Alternative, the launch pad modifications at LC 576-E and the RS1 launch program would not occur at VSFB. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impacts on existing transportation resources.

4.9. Recreation

Numerous recreational areas are found within the ROI for the Proposed Action (Figure 3.7-1). Current VSFB launch functions observe well-established public health and safety and recreational management protocols that have been effectively followed for decades (Section 3.10, Human Health and Safety). Impacts on recreation would be considered significant if severe or permanent restrictions and/or damage were to affect outdoor recreational land and/or activities.

4.9.1. Alternative 1 (Proposed Action)

Closures to recreation areas would not occur during construction activities at LC 576-E. However, the Proposed Action would result in brief (non-permanent) closures of public and on-Base parks and beaches, commercial and recreational boating areas, and commercial and recreational airspace. Spur Road and access to South Spur would be closed for up to 8 hours for each launch and static fire event, totaling up to 24 days per year (up to 12 each annually). These closures would be brief (6–8 hours) and infrequent (up to 12 times per year) and would not substantially diminish the protected activities, features, or attributes of Surf Beach, Wall Beach, and Ocean Beach Park. Additionally, the U.S. Coast Guard would issue a Local Notice to Mariners defining a Public Ship Avoidance Area for launch events. The avoidance area would be temporary and lifted as soon as the U.S. Coast Guard determines it is safe to do so. Because the impacts to recreation resources are only infrequent and temporary restrictions the Proposed Action would not have a significant impact on recreation resources.

4.9.2. No Action Alternative

Under the No Action Alternative, the launch pad modifications at LC 576-E and the RS1 launch program would not occur at VSFB. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impacts on recreation resources.

4.10. Human Health and Safety

An impact to Human Health and Safety would be considered significant if it were to create a potential public health hazard or to involve the improper use, production, or disposal of materials that pose a hazard to people in the affected area. An impact would also be considered significant if project activities were to pose a serious risk of fire, especially wildland fires, or were to involve potential obstruction of emergency response or evacuation routes in and around the project area.

4.10.1. Alternative 1 (Proposed Action)

4.10.1.1. LC 576-E Construction Activities

Modifications to LC 576-E would expose construction workers to hazards associated with construction activities. These hazards include the potential for trips, slips, falls, and vehicular accidents. Other potential biological hazards include spider and snake bites, disease vectors, and attacks from wild animals. Because of the above conditions, potential exists for persons participating in the construction activities to become exposed to hazardous materials and hazardous waste. Health and safety guidelines that would be followed in the handling and transportation of hazardous materials and waste are described in Section 3.11 (Hazardous Materials and Waste Management).

To minimize potential adverse impacts from biological hazards and physical hazards (such as from rocky and slippery surfaces), awareness training would be incorporated into the worker health and safety protocol. Contractors would be required to develop a site-specific safety plan that would address these potential hazards. Daily safety briefings would be conducted and workers would be expected to comply with federal OSHA and Air Force Occupational and Environmental Safety regulations. ABL would coordinate with SLD 30, Weapons Safety Office (SLD 30/SEL) to ensure VSFB policies on UXO safety for construction work is incorporated into the site safety plan. The safety program would include coordinating with the Air Force Civil Engineer Center/Environmental Management Operations MMRP manager and contacting the SLD 30/SEW weapons safety specialist. Site security requirements detailed in Section 3.10 (Human Health and Safety) would be implemented with any facility modifications.

While complying with industrial and ground safety procedures detailed above and in Section 3.10 (Human Health and Safety) and EPMs described in Section 2.3.4.7 (Human Health and Safety) we expect no impacts to Safety and Occupational Health from the construction activities at LC 576-E. As described in Section 4.2 (Sound [Airborne]), the Proposed Action would have no significant impacts on Human Health and Safety associated with noise.

4.10.1.2. General Safety

Base personnel and general public safety during RS1 launches would be ensured by federal emergency management readiness and response protocols detailed in Section 3.10 (Human Health and Safety). After SLD 30 Safety evaluates all launch hazards and variables, it would provide safety measures. Security and anti-terrorism requirements outlined in Section 3.10 (Human Health and Safety) would provide launch program safety compliance. While adhering to these safety measures and procedures and EPMs described in Section 2.3.4.7 (Human Health and Safety), we expect no impacts to human health and safety.

4.10.2. No Action Alternative

Under the No Action Alternative, the launch pad modifications at LC 576-E and the RS1 launch program would not occur at VSFB. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impacts on human health and safety.

4.11. Hazardous Materials and Waste Management

Factors considered in determining if implementing an alternative may have significant adverse impacts on hazardous materials and waste management include the extent or degree to which implementing an alternative would result in the following:

- Non-compliance with applicable regulatory requirements; or
- Human exposure to hazardous materials and wastes, or environmental release above permitted limits.

The FAA has not established a significance threshold for hazardous materials and pollution prevention.

Potential impacts resulting from hazardous materials and hazardous waste are evaluated using federal, state, and local regulatory requirements, contract specifications, and base operating constraints, as outlined in Chapter 3 (Affected Environment). Hazardous materials management requirements can be found in federal and state EPA and OSHA regulations and the HMMP (DAF 2019a). Hazardous waste management requirements are found in federal, state, and local regulations and the VSFB HWMP (DAF 2019b). Non-compliance with applicable regulatory requirements, human exposure to hazardous materials and wastes, or environmental release above permitted limits, would be considered adverse impacts.

4.11.1. Alternative 1 (Proposed Action)

4.11.1.1. Hazardous Materials and Waste

Compliance with all pertinent federal, state, and local laws and regulations, and applicable VSFB plans would govern all actions associated with implementing the Proposed Action and would minimize the potential for significant impacts.

Using hazardous materials during LC 576-E construction and modifications would be limited to vehicle and equipment maintenance (e.g., fuels, oils, and lubricants). Materials that contain POLs would be required to be properly contained, manifested, and managed per all federal, state, and local regulations, AFIs, DoD Directive, the site-specific health and safety plan, and associated EPMs.

Accidental POLs releases from vehicles, equipment, and transformer leaks would generate hazardous wastes, resulting in potential adverse impacts on the Proposed Action Area. All hazardous wastes and spills would be properly managed and disposed of per applicable federal, state, and local hazardous waste regulations and the VSFB HWMP (DAF 2019b). Hazardous materials and waste management regulations would follow procedures outlined in the Hazardous Materials Management Plan (DAF 2019a) and the VSFB HWMP (DAF 2019b).

To protect water resources, any potentially contaminated wastewater would be collected, analyzed, and disposed of per C.C.R. Title 22 & Title 27, Division 2, and the RWQCB General Waiver for Specific Discharges. Additional EPMs described in Section 2.3.4.8 (Hazardous Materials and Waste Management) and 2.3.4.4 (Water Resources) would further ensure that the Proposed Action would not have a significant impact on water resources.

Solid waste would be collected in on-site refuse containers and transported to an appropriate landfill or recycling center. Human sewage would be collected in temporary on-site portable toilets subject to spill-prevention EPMs and serviced by a commercial contractor. The amount of hazardous materials needed and the waste generated by the Proposed Action would have little to no impact on waste processing capacity. Before implementing the project, the contractor would prepare a hazardous material Spill Prevention and Response Plan and obtain SLD 30/CEI concurrence. In addition, the EPMs described in Section 2.3.4.8 (Hazardous Materials and Waste Management) would be implemented. Therefore, due to using and generating hazardous materials and hazardous wastes the Proposed Action would not have a significant impact.

With adherence to existing policies and procedures as outlined in the applicable federal, state, and local regulations, as well as the EPMs described in Section 2.3.4.8 (Hazardous Materials and Waste Management), impacts from using hazardous materials associated with the Proposed Action would not be significant.

4.11.1.2. Military Munitions Response Program

Since LC 576-E is located within MU809, anomaly avoidance and UXO monitors would be required for all trenching, digging, and heavy equipment operations. By adhering to LUCs and the DoD Explosives Safety Board and all DoD/DAF protocols detailed in Section 3.11.5 (Military Munitions Response Program), and the EPMs described in Section 2.3.4.8 (Hazardous Materials and Waste Management) and Section 2.3.4.7 (Human Health and Safety), the Proposed Action would have no significant impacts under the MMRP.

4.11.2. No Action Alternative

Under the No Action Alternative, the launch pad modifications at LC 576-E and the RS1 launch program would not occur at VSFB. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impacts on hazardous materials and waste management.

4.12. Solid Waste Management

Solid waste impacts are evaluated using federal, state, and local laws and regulations; permit conditions; and contract specifications. Adverse impacts would occur from noncompliance with applicable regulatory requirements or an increase in the amount of waste disposal that would exceed available waste management capacities. The FAA has not established a significance threshold for solid waste and pollution prevention.

4.12.1. Alternative 1 (Proposed Action)

Solid waste would be collected in on-site refuse containers and transported to an appropriate landfill or recycling center. Sewage would be collected in temporary on-site portable toilets subject to spill-prevention EPMs and serviced by a commercial contractor. Before implementing the project, the contractor would prepare a hazardous material Spill Prevention and Response Plan and obtain SLD 30/CEI concurrence. In addition, the EPMs described in Section 2.3.4.8 (Hazardous Materials and Waste Management) would be implemented.

Generating construction waste during implementing the Proposed Action does not have the potential to adversely affect waste diversion rates on VSFB as any solid waste would be transported to a municipal landfill. Unrecyclable wastes generated during LC 576-E construction and RS1 launch program operation would be disposed of off-Base by ABL. However, to the greatest extent practicable, ABL would segregate all waste generated during the Proposed Action and manage the wastes separately. To the extent practicable, waste and debris would be reused or transported to a recycler. Therefore, with adhering to disposal and recycling requirements and EPMs described in Section 2.3.4.9 (Solid Waste Management), the Proposed Action would not have a significant impact on solid waste management.

4.12.2. No Action Alternative

Under the No Action Alternative, the launch pad modifications at LC 576-E and the RS1 launch program would not occur at VSFB. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impacts on solid waste management.

4.13. Coastal Zone Management

The state of California has an approved Coastal Management Plan, administered by the CCC, codifying the CCA of 1976 (California Public Resources Code, section 30000 et seq.). The CCA includes policies to protect and expand public access to shorelines, and to protect, enhance, and

restore environmentally sensitive habitats, including intertidal and nearshore waters, wetlands, bays and estuaries, riparian habitat, certain woods and grasslands, streams, lakes, and habitat for rare and endangered plants and animals.

Under the CZMA, Section 307, each Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs. An impact on coastal resources could be considered significant if a project were inconsistent with the enforceable policies of the CCA. The FAA has not established a significance threshold for coastal resources.

4.13.1. Alternative 1 (Proposed Action)

Because ABL launch activities would be conducted at an existing launch complex (LC 576-E) on VSFB, which DoD wholly owns and operates, this component of the Proposed Action is excluded from the coastal zone. However, under Alternative 1, launch operations would result in launch engine noise and a sonic boom within and outside the coastal zone. Therefore, those activities are subject to the provisions of the CCA.

Based on the evaluation of potential effects of the Proposed Action by resource area in this EA and the enforceable policies of the CCMP, and pursuant to 15 C.F.R. section 930.35, implementing ABL launch activities at LC 576-E would not significantly impact natural resources, cultural and paleontological resources, access to the coast, or coastal and visual qualities. Therefore, implementing the Proposed Action would not result in adverse impacts on coastal resources and a consistency determination is not required. The CCC concurred with a ND on 8 September 2021 for LC 576-E infrastructure improvements and the RS1 launch program operation (ND-0020-21; Appendix D).

4.13.2. No Action Alternative

Under the No Action Alternative, the launch pad modifications at LC 576-E and the RS1 launch program would not occur at VSFB. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impacts on coastal resources.

4.14. Utilities

Impacts associated with utilities are related to changes in the supply or demand of a particular resource. The supply of a utility is also referred to as its capacity. As long as the capacity of a particular utility is higher than the demand for that resource, no impact occurs. However, if the demand exceeds the capacity or if the demand is increased beyond the resource's projected rate of increase, an impact would occur, and the significance of the impact is determined based on the degree to which the capacity is strained. The FAA has not established a significance threshold for energy supply.

4.14.1. Alternative 1 (Proposed Action)

Ground based communication and electrical power is required under the Proposed Action. Existing infrastructure around the LC 576-E area would be used as much as practicable to reduce needing any additional construction. The existing utilities (electrical and communications) at the project site would be extended from their current location, with extensions occurring in already-disturbed areas. Utility connection points would occur at existing LC 576-E infrastructure and run above ground to the ground fluid and electrical systems. RS1 and GSO systems would then connect via U-trenches 12 inches below surface grade within the fence line at LC 576-E. Under Alternative 1, no new utility usage above what has previously been experienced at the project site or nearby would occur and VSFB has adequate capacity to support the RS1 launch program's utility needs. Therefore, the Proposed Action would not have a significant impact on utilities at VSFB.

4.14.2. No Action Alternative

Under the No Action Alternative, the launch pad modifications at LC 576-E and the RS1 launch program would not occur at VSFB. As no additional impacts would be associated with the No Action Alternative, the No Action Alternative would have no impacts on utilities.

5.0 Glossary

Table 5.0-1: Glossary of Terms

Term	Definition
Space Launch Delta (SLD 30)	SLD 30 at VSFB is the U.S. Space Force organization responsible for DoD space and missile launch activities on the west coast of the United States. Satellites destined for polar or near-polar orbit are launched from VSFB, and ballistic missiles are tested. The wing supports West Coast launch activities for the DAF, DoD, Missile Defense Agency, NASA, NRO, foreign nations, and various private industry contractors.
Interagency and Intergovernmental Coordination for Environmental Planning (IICEP)	The DAF implements a process known as IICEP, which is used for the purpose of agency coordination and implements scoping requirements.
Section 7 of the Endangered Species Act (ESA)	Under Section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.), federal agencies are required to assess the effect of projects authorized, funded by, or carried out by federal agencies on federally listed threatened or endangered species. Section 7 consultations with the USFWS and NMFS are required for federal projects if such actions have the potential to directly or indirectly affect listed species or destroy or adversely modify critical habitat.

Term	Definition
Executive Order (EO) 13175	EO 13175, *Consultation and Coordination with Indian Tribal Governments*, directs Federal agencies to coordinate and consult with Native American tribal governments in the development of Federal policies that have tribal implications.
Coastal Zone Management Act (CZMA)	Under the CZMA of 1972 (16 U.S.C. 1451-1466), a federal action that may affect any coastal use or resource must be carried out in a manner that is consistent with state coastal zone management programs (15 C.F.R. § Subpart C).
National Historic Preservation Act (NHPA)	Native American traditional cultural properties are protected by the NHPA of 1966, as amended (16 U.S.C. 470). Traditional cultural properties are eligible for listing in the National Register of Historic Places because of their association with cultural practices or beliefs of a living community that (1) are rooted in that community's history, and (2) are important in maintaining and continuing cultural identity of the community. Traditional cultural properties may be identified by Native Americans or other living communities. Even if resources that are significant to Native American Tribes may not be considered traditional cultural properties, these resources may be afforded protection by other laws, regulations, or EOs. Section 106 of the NHPA requires federal agencies to consider the effects of their actions on historic properties listed in or eligible for inclusion in the National Register and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. The regulations implementing Section 106 (36 C.F.R. § 800) specify a consultation process to assist in satisfying this requirement.
LC 576-E	LC 576-E was originally established in 1962 for the Atlas F launch program. After 1964 it was decommissioned; however, was refurbished in the 1990's to support the Minotaur-C and Taurus launch programs. It is currently decommissioned but includes an established pad that would be refurbished to support launches of the RS1 vehicle.
CEQ Regulations for Implementing the Procedural Provisions of NEPA	*CEQ Regulations for Implementing the Procedural Provisions of NEPA* require federal agencies to use the NEPA process to identify and assess the reasonable alternatives to the Proposed Action that would avoid or minimize adverse effects of those actions on the quality of the human environment.
Environmental Protection Measures (EPMs)	Mandatory EPMs (denoted by "shall" or "would") are part of the project design and would be implemented as part of the Proposed Action so as to avoid, minimize, reduce, or compensate for the anticipated potential environmental impacts. Discretionary measures (denoted by "may" or "could") may or

Term	Definition
	may not be implemented to further reduce environmental impacts.
RS1	RS1 is a deployable, fully containerized two stage vehicle capable of launching 1,350 kg of payload on demand. It combines simple architecture with modern manufacturing processes and minimal infrastructure to achieve low cost, reliability, and flexibility.

6.0 List of Preparers

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7.0 List of Agencies, Organizations, and Persons Contacted

Sam Cohen, Santa Ynez Band of Chumash Indians Elder's Council, Santa Ynez, California

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APPENDIX A
United States Fish and Wildlife Service Consultations

DEPARTMENT OF THE AIR FORCE
UNITED STATES SPACE FORCE
30TH SPACE WING

5 April 2021

Ms. Beatrice L. Kephart
30 CES/CEI
1028 Iceland Avenue
Vandenberg AFB CA 93437-6010

Mr. Stephen Henry
United States Fish and Wildlife Service
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, CA 93003

Dear Mr. Henry:

Vandenberg Air Force Base (VAFB) is providing information on the ABL Space Systems (ABL) RS1 launch program at VAFB. The information described below and in the attachment is intended to assist in the analysis of effects on a species protected by the Endangered Species Act (ESA) that may occur as a results of the proposed RS1 launch program. The marbled murrelet (*Brachyramphus marmoratus*) is not currently included within the Programmatic Biological Opinion maintained by VAFB (8-8-13-F-49R), but they are included within a revised PBA, for which we hope to receive a new PBO in late calendar year 2021.

The Air Force has determined that actions as described below and in the attachment are "Not Likely to Adversely Affect" the marbled murrelet on a basis of "discountable" or unlikely. Murrelets are uncommon at VAFB; when they are present, they are entirely at sea (there is no suitable roosting or breeding habitat on VAFB). We request your concurrence on this determination.

Under the Proposed Action, ABL would conduct space launch activities of the RS1 vehicle at Launch Complex 576-E (LC 576-E) at VAFB in support of commercial and government customers. LC-576 E is on north VAFB, about 3 miles north-northwest of the Santa Ynez River estuary and 1.6 miles southeast of Purisima Point. ABL proposes to conduct as many as 12 launches and 12 static fire tests per year. Launch trajectories departing from VAFB will be unique to the vehicle configuration, mission, and environmental conditions but within a range of potential launch azimuths between 180° and 210°. During ascent, a sonic boom (overpressure of high energy impulsive sound) as much as 5.4 pounds per square foot (psf) would be generated while the first-stage booster is supersonic. The overpressure would be primarily directed at the Pacific Ocean south of Point Conception, the sonic boom would not impact VAFB or mainland California. "Local" engine noise would also be produced during the launch and static fire events, which would impact the coastal area between San Antonio Creek and the Santa Ynez River mouth, including Purisima Point. Static fire engine tests would be conducted two to four weeks prior to each launch. During static fire, when the vehicle is in a horizontal position on the

launch pad, engine noise would be focused primarily toward the coastline between Purisima Point and the Santa Ynez River estuary. Impacts of local noise to the Western snowy plover (*Charadrius nivosus*) and California least tern (*Sternula antillarum browni*) are expected to be minimal, but are authorized in the aforementioned PBO.

Please contact me at (805) 605-7924 or Rhys Evans at (805) 606-4198 (rhys.evans@spaceforce.mil) if you have any questions.

Sincerely,

4/5/2021

X Beatrice L Kephart

Signed by: KEPHART.BEATRICE.LINDA.1166122291
BEATRICE L. KEPHART
Chief, Installation Management Flight

1 Attachment: Project specific information

1. Purpose and Overview

The purpose of the Proposed Action is to provide reliable U.S. enterprise access to space through an efficient and deployable ground-based launch system with minimal infrastructure requirements. This action supports compliance with the National Space Policy.

The need for ABL's proposal is to fulfill the requirements of commercial and governmental entities in the small satellite orbital and suborbital market. The satellite industry is changing and leading to an interest in small, responsive, efficient, and commercially focused launch vehicles that are low-cost solutions for government and commercial clients. Implementation of Proposed Action will fulfill the FAA's responsibilities as authorized by Executive Order (EO) 12465, Commercial Expendable Launch Vehicle Activities, and the Commercial Space Launch Act for oversight of commercial space launch activities. The Proposed Action would also fulfill the U.S. expectation to reduce space transportation costs and ensure continued exploration, development, and the use of space more affordable.

The economical and efficient design and manufacturing of the RS1 vehicle and ground support system and minimization of ground infrastructure would enable ABL to efficiently conduct lower cost launch missions from VAFB in support of commercial and government clients. In addition, the Proposed Action supports VAFB's vision of becoming the "world's most innovative space launch and landing team".

The portion of the Proposed Action that would potentially impact the federally threatened marbled murrelet (*Brachyramphus marmoratus*), under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS) is described below, followed by an analysis of the potential impacts as required by section 7 of the Endangered Species Act (ESA).

2. Proposed Action

ABL proposes to conduct space launch activities of the RS1 vehicle at LC 576-E at VAFB in support of commercial and government customers. RS1 s an 88-foot (ft.) two-stage, ground-launched vehicle that is deployable and fully containerized. ABL proposes to conduct up to 12 launches and 12 static fire operations of the RS1 launch vehicle at LC 576-E per year. Launch trajectories departing from VAFB will be unique to the vehicle configuration, mission, and environmental conditions but within a range of potential launch azimuths from 180° and 210°. During ascent, a sonic boom (overpressure of high energy impulsive sound) up to 5.4 pounds per square foot (psf) would be generated while the first-stage booster is supersonic. The overpressure would be primarily directed at the Pacific Ocean south of Point Conception, potentially reaching up to 2.0 psf on the Northern Channel Islands. Engine noise would also be produced during the launch and static fire events, which would impact the area between San Antonio Creek and the Santa Ynez River mount, including Purisima Point (Figures 1 and 2). Static fire engine tests would be conducted two to four weeks prior to each launch. During static fire, when the vehicle is in a horizontal position on the pad, engine noise would be focused primarily along the coastline between Purisima Point and the Santa Ynez River mouth (Figure 1).

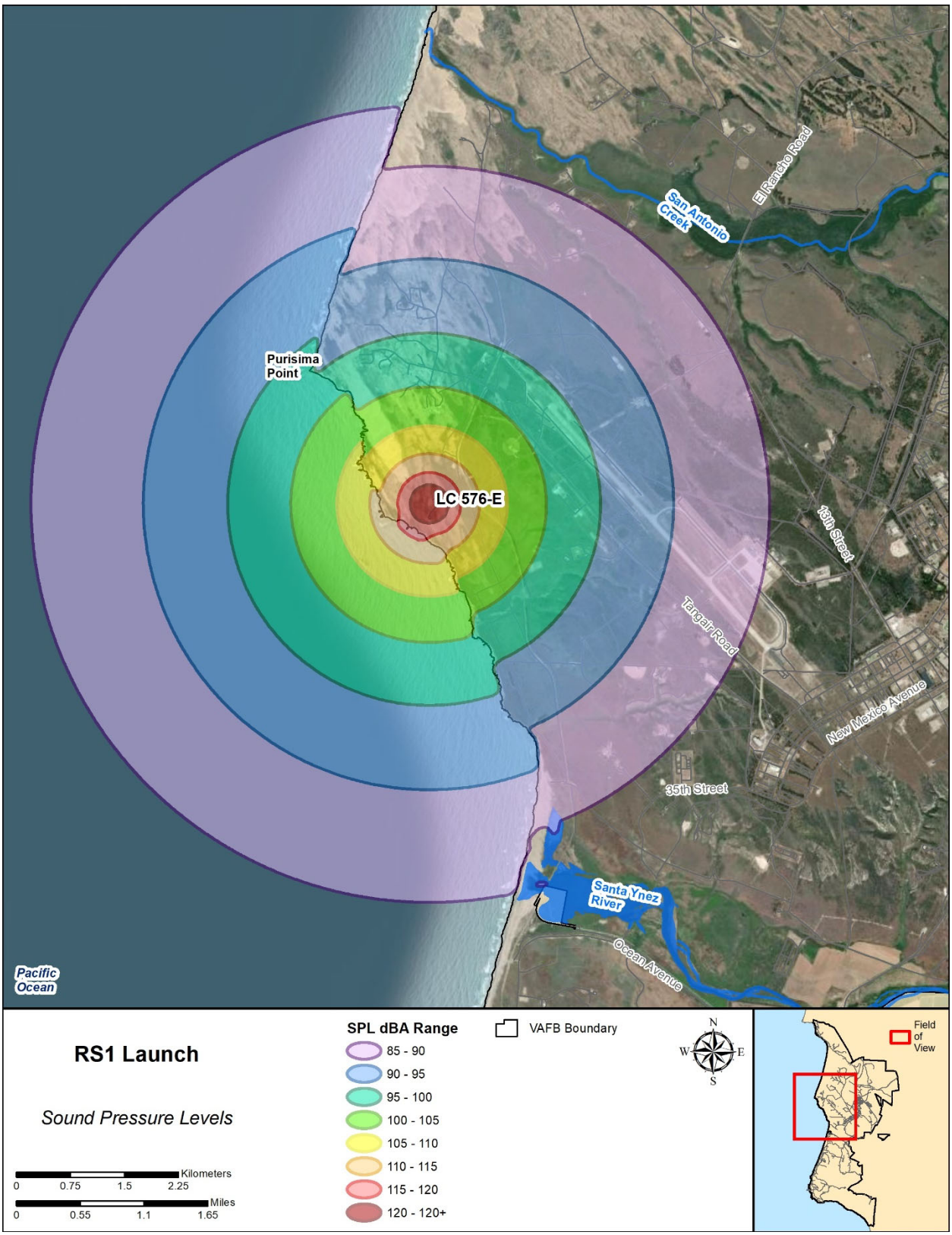

Figure 1. Maximum A-Weighted Engine Noise Distribution During Launch.

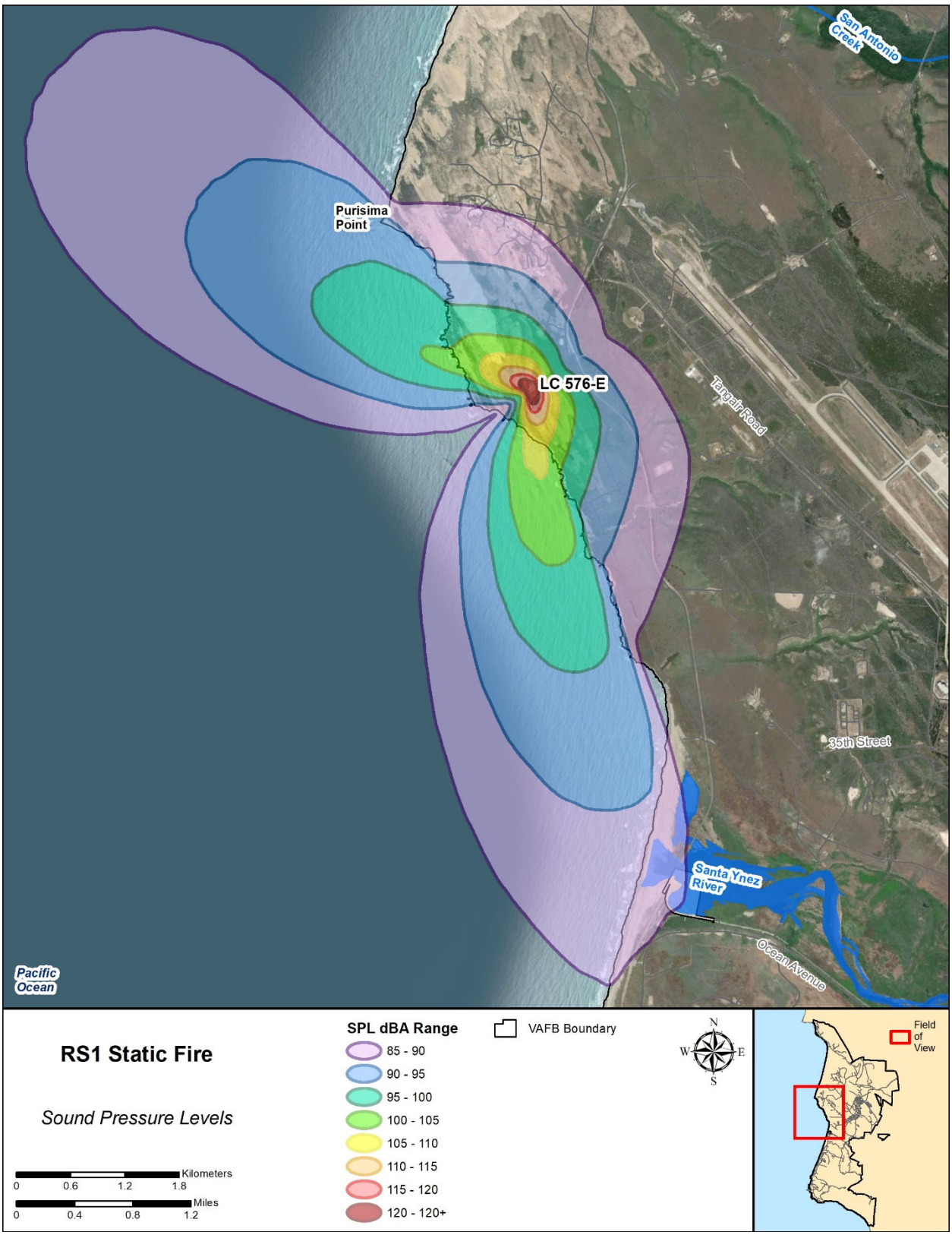

Figure 2. Maximum A-Weighted Engine Noise Distribution During Static Fire.

3. Description of ESA-listed Species Potentially Occurring in the Proposed Action Area

3.2 Marbled Murrelet (*Brachyramphus marmoratus* [Federally Threatened Species])

Status

The USFWS listed the marbled murrelet as threatened on 1 October 1992 (57 FR 45328) and published a Recovery Plan for the species in 1997 (USFWS 1997). The USFWS completed a 5-year review of the species in 2009 (USFWS 2009).

Life History

The marbled murrelet is a small seabird that breeds along the Pacific coast, foraging in nearshore marine waters on small fish and invertebrates, and flying inland to breed. The species requires nearshore marine habitats with abundant prey (fish and invertebrates). Among alcids, the species is unique because it uses old-growth coniferous forests and mature trees for nesting (USFWS 1997). Marbled murrelet are wing-pursuit divers. Although little has been known about the marbled murrelet movement and home range, more information is becoming available. The first marbled murrelet nest was not documented until 1974. Since then, the marbled murrelet's home range has been observed as 655 square kilometers (km^2) for non-nesters and 240 km^2 for nesters within California. In addition, at-sea resting areas have also been observed an average of 5.1 km from the mouths of drainages. Marbled murrelets spend nighttime hours resting in the ocean at these areas and commute to foraging areas during the day. Nests have been observed from sea level to 5,020 ft. (USFWS 2009).

Marbled murrelets range from Alaska to California and may occur as far south as Baja California. The species is considered rare to very rare much of the year in Santa Barbara County. However, the species may be somewhat regular north of VAFB in the late summer and would be considered casual in the spring (Lehman 2020).

Occurrence within the Action Area

Marbled murrelets have been observed semi-regularly in near shore waters off the coast of VAFB (Lehman 2020; eBird 2021). As such, the species occurs within portions of the Proposed Action Area subject to noise impacts (Figures 3 and 4). There is no breeding habitat on or near VAFB.

Critical Habitat

The USFWS designated Critical Habitat for the marbled murrelet on 24 May 1996 (61 FR 26257) and revised this designation on 4 August 2016 (81 FR 51348–51370). There is no designated Critical Habitat for this species within or adjacent to the Proposed Action Area.

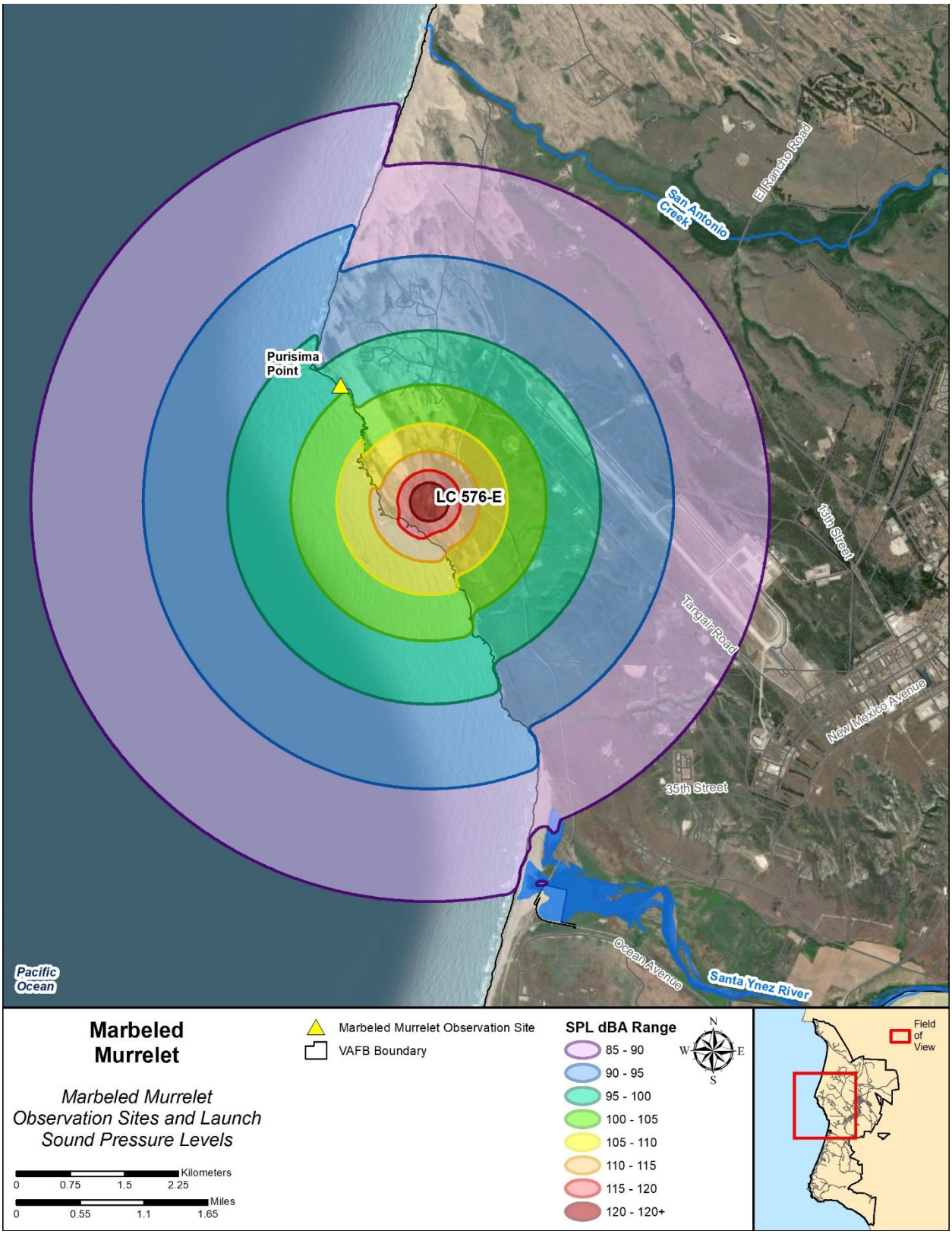

Figure 3. Marbled Murrelet and Launch Sound Pressure Levels (Note: MAMU Observation Sites are points of observation, not actual localities; MAMU data from eBird 2021).

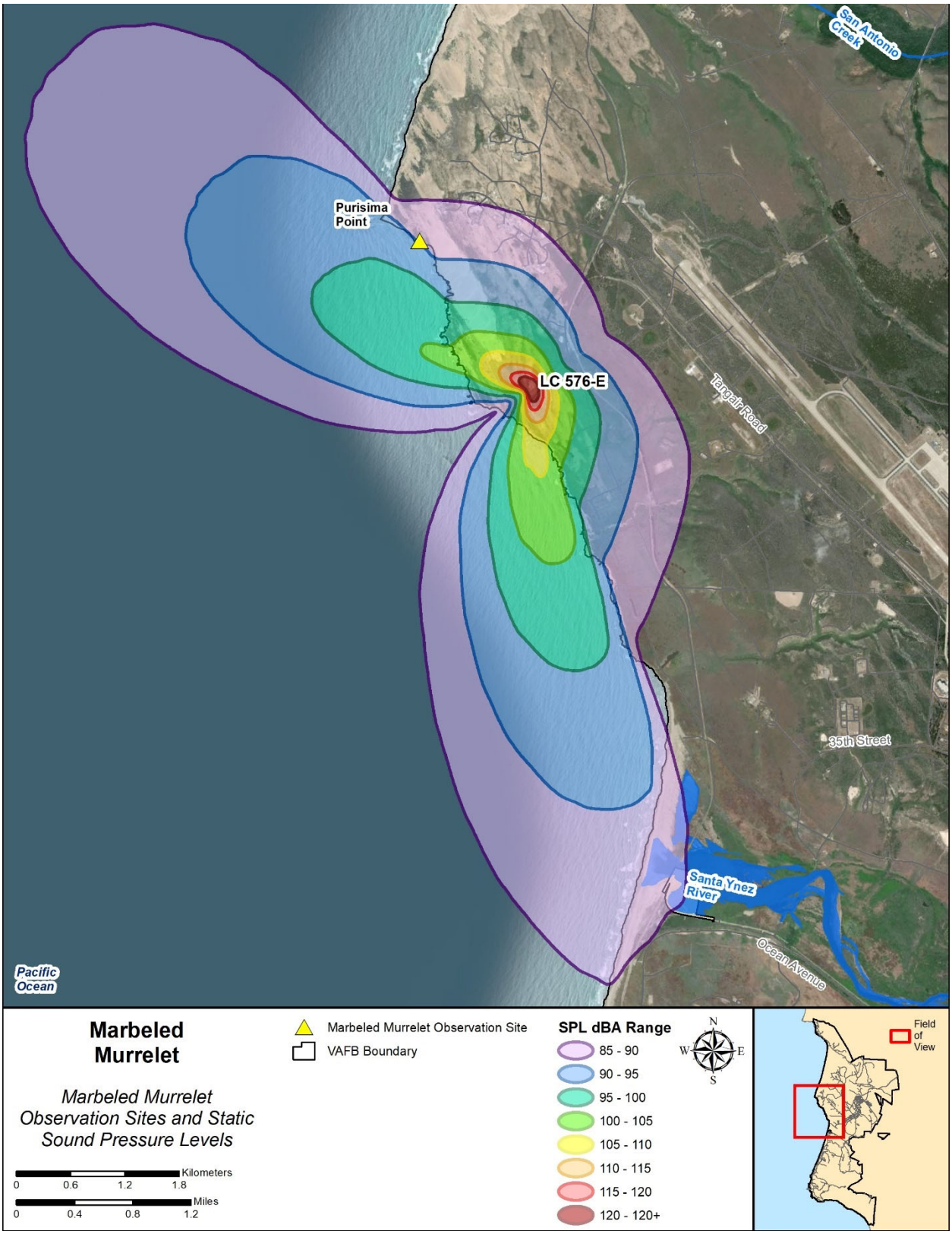

Figure 4. Marbled Murrelet and Static Sound Pressure Levels (Note: MAMU Observation Sites are points of observation, not actual localities; MAMU data from eBird 2021).

4. Analysis of Effects

The Proposed Action includes one potential environmental stressor that may cause adverse effects on ESA-listed species: noise. This stressor is analyzed below.

4.2 Marbled Murrelet

Direct Impacts

Direct impacts to marbled murrelet are not expected since there is no overlap with marbled murrelet foraging habitat and areas experiencing physical impacts.

Noise Impacts

Based on observations of marbled murrelet in nearshore waters off of Purisima Point (Figure 3.3-6), it is assumed that they may occur off the coast due west of LC 576-E as well. Marbled murrelet in this area during a launch event would be subject to noise levels of about 117 dBA SPL (Figure 4.3-1). Marbled murrelets do not nest on or near VAFB, so exposure to noise impacts would be limited to foraging adults.

Marbled murrelet are expected to startle when exposed to noise impacts. Bellefleur et al. (2009) examined the response of marbled murrelet to boat traffic. Marbled murrelet response was found to depend on the age of the birds, the distance and speed of the boats encountered, and the season. Marbled murrelet either showed no reaction, flew, or dove in response. Late in the season (July—August), some marbled murrelets were found to fly completely out of feeding areas when approached by boats traveling in excess of 17.9 miles per hour (28.8 kilometers per hour). The dominant response of marbled murrelet to approach by boats was, however, for birds to dive and resurface a short distance away. Marbled murrelets are therefore expected to exhibit a startle response that will cause birds to dive and resurface, but they should return to normal behavior soon after each launch or static fire event has been completed.

5. Conclusion

Potential impacts on marbled murrelet would be limited to temporary behavioral reactions. VAFB. Therefore, VAFB has determined that the Proposed Action may affect, but is not likely to adversely affect the marbled murrelet.

6. References

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United States Department of the Interior
U.S. FISH AND WILDLIFE SERVICE
Ecological Services
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO:
08EVEN00-2021-I-0293

April 27, 2021

Beatrice L. Kephart
30 CES/CEI
1028 Iceland Avenue
Vandenberg Air Force Base, California 93437

Subject: Informal Consultation for the ABL Space Systems RS1 Project at Launch Complex 576-E, Vandenberg Airforce Base, Santa Barbara County, California

Dear Beatrice Kephart:

We are responding to the Air Force's letter, dated and received in our office April 5, 2021, on the ABL Space Systems (ABL) RS1 Project at Launch Complex 576-E (project) on Vandenberg Air Force Base (VAFB), Santa Barbara County, California. You are requesting the U.S. Fish and Wildlife Service's (Service) concurrence with your determination that the Air Force's authorization of the project activities described within your request letter may affect, but is not likely to adversely affect, the federally threatened marbled murrelet (*Brachyramphus marmoratus*). Your request and our response are made pursuant to section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

Project Overview

ABL proposes to conduct space launch activities of the RS1 vehicle at Launch Complex 576-E (LC 576-E) at VAFB. LC 576-E is on north VAFB, approximately 3 miles (4.82 kilometers) north-northwest of the Santa Ynez River estuary and 1.6 miles (2.57 kilometers) southeast of Purisima Point. ABL plans to conduct up to 12 launches and 12 static fire operations per year of the RS1 launch vehicle at LC 576-E with fewer launches expected in the first few years (R. Evans, Air Force, pers. comm. 2021). The launches and static fire operations would occur throughout the year and, due to logistical considerations, ABL does not expect to exceed two launches per month (Evans, pers. comm. 2021). Launch trajectories departing from VAFB would be unique to the vehicle configuration, mission, and environmental conditions but within a range of potential launch azimuths (angular measurement) between 180 degrees and 210 degrees.

The first-stage booster of the launch vehicle will generate a sonic boom (overpressure of high energy impulsive sound) of up to 5.4 pounds per square foot while it is supersonic during ascent. The resulting overpressure has no substantial possibility of impacting VAFB or coastal

California as the launch trajectory would direct overpressure primarily at the Pacific Ocean south of Point Conception. Noise from sonic booms last for about 3 seconds (Evans, pers. comm. 2021). The launch and static fire operations would also produce engine noise, impacting the area between San Antonio Creek and the Santa Ynez River mouth, including Purisima Point. ABL plans to conduct static fire engine tests 2 to 4 weeks prior to each launch. During static fire, the vehicle is in a horizontal position on the pad and therefore focuses engine noise primarily along the coastline between Purisima Point and the Santa Ynez River mouth. Launch noise extends to about 3 minutes with the peak noise at about 30 to 60 seconds after engine ignition (Evans, pers. comm. 2021).

Marbled Murrelet

Marbled murrelets range from Alaska to California and may occur as far south as Baja California during the non-breeding season; however, they are rare to very rare much of the year in Santa Barbara County. Marbled murrelets use old-growth coniferous forests and mature trees for nesting during their breeding season which occurs from mid-April through the end of August (Service 1997). Breeding habitat is not available on or near VAFB and observations of marbled murrelets occur only semi-regularly in near shore waters off the coast of VAFB, typically during the non-breeding season (Lehman 2020; eBird 2021). Marbled murrelets wintering near VAFB are foraging and roosting on the open water and do not come to land. During the breeding season, marbled murrelets forage within 1.24 miles (2 kilometers) of the shore but can forage farther away during the non-breeding season, i.e., when they occur near VAFB (Strachan et al. 1995). They mostly forage in pairs throughout the year and flock sizes in the southern populations rarely number more than 10 individuals (Strachan et al. 1995). Most recently, observers reported two marbled murrelets on March 17, 2020, in the northern section of VAFB, south of Purisima Point (eBird 2021). In the next most recent sighting, observers reported four marbled murrelets in the same area on February 21, 2018 (eBird 2021).

Project Effects

We do not expect the proposed project will have direct impacts on marbled murrelets. No marbled murrelet nesting habitat exists within the project's action area; however, marbled murrelets that may be foraging offshore at the time of the launch and static fire operations will be subject to noise impacts. Based on the observations in nearshore waters off Purisima Point, it is possible marbled murrelets can occur off the coast due west of LC 576-E at the time of the launches and static fire operations. If marbled murrelets were present in this area during a launch event, they could be subject to noise levels of about 117 dBA SPL (sound pressure level) at the high end of the range, and during a static fire operation could be subject to noise levels of about 107 dBA SPL also at the high end of the range. These noise levels decrease outward from the shore and the level to which the marbled murrelets would be exposed would depend on how close they are to the shoreline at the moment of the launch and static fire operations (see Figures 3 and 4 in Biological Assessment).

Although there is not currently any research or observations directly addressing marbled murrelet response to launch activities, we expect marbled murrelets to startle when exposed to noise impacts. Bellefleur et al. (2009) examined the response of marbled murrelets to boat traffic. Marbled murrelets' response depended on the age of the birds, the distance and speed of the boats encountered, and the season. Marbled murrelets showed either no reaction, flew, or dove in response. Late in the season (July through August), some marbled murrelets flew completely out of feeding areas when approached by boats traveling more than 17.9 miles per hour (28.8 kilometers per hour). The dominant response, however, was to dive and resurface a short distance away. We therefore expect marbled murrelets to exhibit a startle response to project noise that will cause birds to dive and resurface, but they should return to normal behavior soon after each launch or static fire operation has completed. As marbled murrelets occurring here are not breeding, individuals potentially dropping fish intended for their nestlings and indirectly affecting nesting success is not a concern for this project (Speckman et al. 2004).

Given the scarcity and transitory nature of marbled murrelets occurring in the project's action area, it is unlikely marbled murrelets will be present at the exact moment of each launch and static fire operation as well as unlikely to be directly physically impacted by the noise. Although it is unknown how various dBA SPL levels can affect their hearing capabilities, we expect them to dive underwater in response to the noise—which will be of a short duration and infrequent throughout the year—and return to normal behavior (Bellefleur et al. 2009). Additionally, as marbled murrelets will be in the ocean at an unknown distance from shore, it will be difficult for biologists to meaningfully measure and detect effects on marbled murrelets which may or may not be present or may be far from shore outside the range of high dBA SPL levels.

Conclusion

We concur with your determination that the proposed activities may affect, but are not likely to adversely affect, marbled murrelets on the basis of discountable effects. Our concurrence is based on the following:

- Marbled murrelets occur within the project area in an inconsistent and unpredictable basis. When they do occur, they are present in low numbers on the ocean.

- There is no nesting present at VAFB. Marbled murrelets would be foraging offshore in the ocean if they are present the day of the launches and static fire operations.

- We expect marbled murrelets to exhibit a startle response in which they dive and resume normal behavior after each launch or static fire operation has completed.

- The sound produced by the sonic boom and launch activities will occur for a short duration of time (approximately 3 minutes in total).

- Launches and static fire operations will be infrequent throughout the year.

- Biologists cannot meaningfully measure or detect effects from noise produced during launch activities on marbled murrelets as their locations are unknown and may cover a vast area of open ocean.

Further consultation pursuant to section 7(a)(2) of the Act is not required. If the proposed action changes in any manner that may affect a listed species or critical habitat, you must contact us immediately to determine whether additional consultation is required. If you have any questions regarding this matter, please contact Erin Arnold at (805) 677-3343 or by electronic mail at erin_arnold@fws.gov.

Sincerely,

Christopher J. Diel
Assistant Field Supervisor

LITERATURE CITED

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PERSONAL COMMUNICATIONS

Evans, R. 2021a. Biological Scientist, Environmental Section, Vandenberg Air Force Base, U.S. Air Force. Electronic mail to Erin Arnold, Biologist, U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, regarding additional clarifications and measures for listed species for the ABL Space Systems RS1 Launch at Vandenberg Air Force Base. Dated April 19, 2021.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO:
08EVEN-2013-F-0430

December 3, 2015

Beatrice L. Kephart
30 CES/CEI
1028 Iceland Avenue
Vandenberg Air Force Base, California 93437

Subject: Programmatic Biological Opinion on Routine Mission Operations and Maintenance Activities, Vandenberg Air Force Base, Santa Barbara County, California (8-8-13-F-49R)

Dear Ms. Kephart:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the U.S. Air Force's (Air Force) programmatic biological assessment and subsequent request to reinitiate consultation on routine mission operations and maintenance activities at Vandenberg Air Force Base (VAFB). We received your request for reinitiation, dated August 22, 2013, in our office on August 29, 2013. At issue are the effects of Air Force activities on the federally threatened California red-legged frog (*Rana aurora draytonii*), vernal pool fairy shrimp (*Branchinecta lynchi*), western snowy plover (*Charadrius nivosus nivosus*), and southern sea otter (*Enhydra lutris nereis*); the federally endangered beach layia (*Layia carnosa*), Gambel's watercress (*Nasturtium gambelii*), Gaviota tarplant (*Deinandra increscens* ssp. *villosa*), Lompoc yerba santa (*Eriodictyon capitatum*), El Segundo blue butterfly (*Euphilotes battoides* ssp. *allyni*), tidewater goby (*Eucyclogobius newberryi*), unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*), California least tern (*Sterna antillarum browni*), and southwestern willow flycatcher (*Empidonax traillii extimus*). Your request and our response are in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act)(16 U.S.C. 1531 et seq.).

Your reinitiation request included a description of anticipated effects on, what was at the time, the federally proposed endangered Vandenberg monkeyflower (*Diplacus vandenbergensis)* and requested a conference opinion. The Vandenberg monkeyflower has since been listed as endangered (79 FR 50844). Therefore, our analysis for this species is included in our biological opinion rather than as a conference opinion. Your request to reinitiate consultation also included the California brown pelican (*Pelecanus occidentalis*). The brown pelican has been delisted and is not discussed further in this biological opinion.

After reviewing the information provided by the Air Force and the status of the species for the Gambel's watercress, southwestern willow flycatcher, and the southern sea otter, we have

concluded that the proposed project activities are not likely to adversely affect these species. The bases for our determinations follow:

Gambel's Watercress

VAFB contains the only known extant population of the federally endangered Gambel's watercress. Approximately 100 individual plants were found along a deep, slow moving channel that runs along the south side of the Purisima Hills, which is part of the San Antonio Creek watershed and just north of the main entrance gate to VAFB (Keil and Holland 1998). This population occupies less than 1 acre. A historical population that was located at Barka Slough has been extirpated or has introgressed (i.e., hybridized) with the common watercress (*Nasturtium officinale*) (M. Elvin, Service biologist, pers. comm. 2008). Base-wide surveys for Gambel's watercress in suitable habitat were completed on VAFB in 1996 and the Air Force conducted surveys in 2008 and 2009.

The Air Force identified a primary buffer consisting of the area within 500 feet of the extant population of Gambel's watercress. A secondary buffer that encompasses the headwaters of the San Antonio Creek watershed beyond the primary buffer includes the area beyond already developed facility boundaries between the north cantonment area boundary and Firefighter Road. The closest existing infrastructure to the occupied habitat is a culvert and barbed wire fence located approximately 430 feet to the east. Both structures are within the primary buffer area.

While the Air Force would perform periodic maintenance of this culvert and fence, they would restrict all other activities within this primary buffer area. In addition, the Air Force proposes to avoid adversely affecting the Gambel's watercress and its habitat by implementing measures that include accessing the occupied area by foot only, conducting surveys for, and removal of, the common watercress if observed in occupied habitat, flagging individual Gambel's watercress plants to avoid, using only manual methods to remove invasive plant species, restricting heavy equipment used in invasive species control efforts to existing roads and trails, using backpack sprayers and extension hoses in upland areas, cleaning all equipment (including footwear) prior to entering occupied habitats, mixing chemicals in non-sensitive areas, and a Service-approved biologist familiar with Gambel's watercress will inform all project personnel of the occupied habitat location and the restrictions afforded to this area.

The Air Force would also implement a suite of measures within the secondary buffer area to minimize the potential impacts to the headwaters of the watershed, and within historical locations and areas that contain suitable habitat. The Air Force will minimize areas of disturbance to the maximum extent practicable, conduct maintenance and refueling of vehicles and equipment on existing roads and paved areas, restrict access for maintenance activities to existing roads, implement measures to minimize sedimentation, erosion, and the downstream deposition of project-related toxic compounds (i.e. cement), and coordinate project activities with 30 CES/CEI prior to conducting any project activities within this secondary buffer area. The Air Force will conduct surveys during the flowering and fruiting period (April through September) at least every 3 years contingent upon funding. Based on habitat and soil

characteristics, which may occur at various locations throughout the base, surveys will focus on areas with high potential for the occurrence of the species. Because the federally endangered Marsh Sandwort (*Arenaria paludicola*) is currently not known to occur on VAFB but it occurs in similar habitat, the Air Force proposed to survey for this species concurrently with Gambel's watercress during the base-wide survey efforts. The Air Force's botanist, or another botanist familiar with the Gambel's watercress and who are approved by the Service prior to conducting the surveys, would be the only biologists who could conduct the base-wide surveys.

The activities proposed by the Air Force would not affect Gambel's watercress because of the measures the Air Force would implement to avoid adverse effects to the extant population of the species. Thus, we are not discussing Gambel's watercress further in this biological opinion.

Southwestern Willow Flycatcher

A small population of the southwestern willow flycatchers, between one and five adults, consistently occurred on VAFB during the spring and summer months between 1995 and 2004. This population was distributed between two sites in willow riparian habitat along the Santa Ynez River, the Wildlife Natural Resources Area and near 13th Street. At the 13th Street site, two abandoned nests were found in 1995 and breeding was documented in 1998 (Farmer et al. 2003); however, this nesting site was destroyed by high water flows during the winter storms of 2000-2001. Southwestern willow flycatchers were documented from 1992 through 1994 near the Miguelito Wetland on the south bank of the Santa Ynez River east of the remnants of the 35th Street Bridge, with breeding confirmed in 1992 (Farmer et al. 2003). The northernmost nesting sites along the coastal California recovery unit were documented on the Santa Ynez River (Service 2002a); however, southwestern willow flycatchers have not been observed in this area in subsequent years.

Although there have been no confirmed sightings or observed breeding activity at VAFB since 2004, the Air Force proposes to implement measures to avoid and (or) minimize potential adverse effects to southwestern willow flycatchers if individuals are observed on base. A biologist familiar with southwestern willow flycatchers will conduct surveys in riparian habitats during the breeding season (May 15 through August 15) every third year contingent upon funding, and conduct pre-activity surveys if project activities are planned to occur in suitable habitat between May through August. If southwestern willow flycatchers are observed, project activities will be confined to already developed areas, or if the project requires new areas to be cleared only those areas outside of a 500-foot buffer from the nest would be disturbed. In addition, the Air Force will monitor the first two launches of any new or louder space vehicle or program from Space Launch Complex (SLC)-3 between May 15 and August 15 (surveys will be conducted before each launch, during the launch for daytime launches, if safety allows, and following each launch). The Air Force will also monitor at the Santa Ynez River during launches from SLC-4 if flycatchers are present. The Air Force will also direct all visitors to stay on established trails at the Wildlife Natural Resources Area, remove brown-headed cowbird eggs and chicks from parasitized nests, conduct maintenance of trails near historically occupied areas outside of the breeding season (unless nests are not present), and apply herbicides at least 100

feet from occupied habitat; only chemicals approved for use in aquatic habitats will be authorized.

Because the Air Force has not observed southwestern willow flycatchers on the base since 2004, breeding birds or migrants, and they propose to implement measures to avoid and (or) minimize potential effects of the project activities on individuals and suitable habitat, we determined that the project activities contained within this biological opinion are not likely to adversely affect southwestern willow flycatchers. Therefore, we are not discussing this species further in this biological opinion.

Southern Sea Otter

Southern sea otters currently inhabit shallow coastal waters in San Mateo, Santa Cruz, Monterey, San Luis Obispo, and Santa Barbara Counties. The range extends from around Half Moon Bay in the north to approximately Gaviota in the south. Sea otters inhabit the nearshore waters along VAFB. A small experimental population also occurs at San Nicolas Island in Ventura County; the result of translocation efforts conducted in 1987.

Following a period of decline between 1995 and 2000, the southern sea otter population appears to be moving toward recovery, with an average growth rate of approximately 5 percent per year over the 2001 to 2007 period (U.S. Geological Survey (USGS) 2007). Most of this increase has occurred at the south end of the range (south of Estero Bay), with a more sluggish rate of growth in the northern and central portions of the range where densities are highest, suggesting that sea otters may be approaching local carrying capacity in some areas (Tinker et al. 2006). The current population is estimated at approximately 2,800 individuals (USGS 2007).

The Air Force has attained monitoring data during their launch activities since 1998 that indicate launch noise and security overflights do not substantially affect the number or activities of this species in the nearshore marine environments of VAFB. The Air Force is controlling activities such as maintenance dredging and boat traffic within the harbor such that sea otters will not be affected. No other proposed project activities would affect sea otters. Therefore, we determined that the project activities contained within this biological opinion are not likely to adversely affect the sea otter, and we are not discussing this species further in this biological opinion. Likewise, activities conducted by the Air Force at the harbor are not expected to affect any other listed species and are not discussed further.

This biological opinion was prepared using information provided in your request for formal consultation, electronic and telephone communications between our staffs, and information in our files. A complete record of this consultation can be made available at the Ventura Fish and Wildlife Office.

CONSULTATION HISTORY

On September 22, 2011, we issued a programmatic biological opinion (PBO) to the Air Force for routine mission operations and maintenance activities at VAFB. Over forty projects have been covered under the PBO during the first 3 years of implementation. On August 22, 2013, the Air Force requested reinitiation of formal consultation to update species distributions, refine some specific covered activity descriptions, and to include the Vandenberg monkeyflower. The Air Force provided additional information via a letter dated February 24, 2014 and via email throughout the development of this biological opinion. We met with Air Force staff on March 13, and April 15, 2014, regarding the reinitiation measures.

Superseded Existing Biological Opinions

Several existing section 7 consultations for projects similar to the project activities described in this programmatic biological opinion have been recently completed or are currently in effect. This programmatic biological opinion would supersede the existing consultations that contain similar actions to those that are analyzed within this document. The superseded biological opinions include: Titan Space Launch Program at SLC-4 (biological opinion number 1-8-96-F/C-29), Delta II/SLC-2 Space Launch Rate Increase (1-8-96-F-53R), Theater Missile Targets Program (1-8-98-F-24), Delta II/SLC-2 and Taurus LF-576-E Launch Programs (1-8-98-F-25R), Atlas Launch Program (1-8-99-F/C-79), Landfill Operations and Cell Closure (1-8-06-F-2), IRP Site 32 Cluster Project (1-8-06-F-26), Small Missile Launch Site LF-06 (1-8-06-F-17), Firebreaks and Access Roads (1-8-06-F-43), Military Munitions Response Program (MMRP) (1-8-07-F-54, 8-8-09-F-39R, 8-8-10-F-27R), Reinitiation of the Atlas Launch Program at SLC-3E (1-8-08-F-6R), Closure of Solid Waste Disposal Cell at the VAFB Landfill (1-8-06-F-2).

Some existing biological opinions will remain in place because the projects' actions are not similar or are larger in scope than the actions analyzed within this programmatic biological opinion. These include: Beach Management and Water Rescue Training (8-8-12-F-11R), San Antonio Creek Restoration (8-8-09-F-49R), Borrow Pits (8-8-10-F-5), Military Family Housing (1-8-06-F-7), Modification and Operation of SLC-4E (8-8-10-F-38), and the Expandable Evolved Launch Vehicle (EELV) Program and Firebreak and Landscape Maintenance at SLC-6 (1-8-99-F-27, 1-8-06-F-18, 1-8-07-F-1R).

Qualifying Language

On September 11, 2008, we submitted comments to the Air Force regarding their use of qualifying language (e.g., "when practicable") in the avoidance and minimization measures. We stated that if such qualifying language is associated with the measures, we do not have an adequate level of certainty that the measures will be implemented and therefore we must analyze the effects of the proposed activities without the avoidance and minimization measures being implemented.

On January 15, 2010, the Air Force stated that the avoidance and minimization measures without the qualifying language implements spatial and temporal constraints that represent an unacceptable level of restriction to the Air Force's mission (T. Devenoge, Chief of Natural

Resources at VAFB, pers. comm. 2010). Consequently, the Air Force re-proposed to incorporate qualifying language into the avoidance and minimization measures in an effort to reduce the spatial and temporal constraints because the Air Force stated that it would be on a rare occasion when they could not implement the avoidance and minimization measures as part of a project's actions. In addition, as part of the pre-project notification requirement, the Air Force stated that it would inform us when implementing the measures would not be feasible as part of a project's actions, and they would implement the measures a vast majority of the time. Therefore, we agreed to analyze the effects of the actions as if the measures would be implemented, even if the qualifying language is incorporated; however, if the Air Force informs us in the pre-project notification that a measure is not feasible, thus not implemented, the Service will make a determination whether or not implementing a particular measure would result in effects to a federally listed species beyond our analysis. The following two scenarios would occur based on our determination:

1. If the Service determines that there is no change to the effects analysis and the project is within the scope of this biological opinion, the project could go forth as planned.

2. If the Service determines that the project would result in a change to the effects analysis and (or) is not within the scope of this biological opinion, the subject project would not be covered by this biological opinion and the Air Force must either: (a) reinitiate this biological opinion, or (b) submit a request for a separate consultation pursuant to section 7 of the Act.

Federal regulations which implement section 7 of the Act require reinitiation of consultation when new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered (50 Code of Federal Regulations (CFR) 402.16). Taking of federally listed species that results from Federal agency actions not analyzed in a biological opinion, and not exempted by an associated incidental take statement, is prohibited pursuant to section 9 of the Act.

BIOLOGICAL OPINION

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DESCRIPTION OF THE PROPOSED ACTIONS

The 30th Space Wing (30 SW) at VAFB is the Air Force Space Command organization responsible for Department of Defense (DOD) space and missile launch activities on the West Coast of the United States. The 30 SW supports launch activities for the Air Force, DOD, National Aeronautics and Space Administration (NASA), foreign nations, and various private industry contractors. VAFB supports the processing and launch of a variety of expendable vehicles including Atlas V, Delta IV, Delta II, Pegasus, Minotaur, Taurus, and Falcon. The 30 SW also supports Force Development Evaluation of intercontinental ballistic missiles as well as Missile Defense Agency (MDA) tests and operations. VAFB's major tenant units include the Joint Functional Component Command for Space, 14th Air Force, 576th Flight Test Squadron, MDA, 381st Training Group, National Reconnaissance Office, 50th Space Wing, and NASA.

All actions at VAFB directly or indirectly support mission-critical defense and national security programs and objectives of the United States Air Force. For organizational purposes, supporting requirements of VAFB's mission are classified into specific program headings. The Air Force conducts numerous mission and mission-related activities and operations on VAFB. For the purposes of this consultation only, the actions proposed by the Air Force consist of five core programs (Mission Operations, Infrastructure Support, Infrastructure Development, Environmental Management, and Fire Management) that occur throughout VAFB and are likely to adversely affect one or more of the aforementioned species and their respective habitats. The subsequent paragraphs comprise a brief description of these five programs and further describe diverse categories of launch-related, construction, and maintenance activities that would occur in accordance to these core programs. Proposed projects that exceed the scope and intensity of the anticipated work described in this document would require separate consultation pursuant to section 7 of the Act.

The Air Force will implement a suite of avoidance and minimization measures as part of its activities, which are listed following the description of the five core programs below. These measures are designed to avoid and minimize the adverse effects of all the proposed project activities on the federally listed species. Because this programmatic biological opinion contains diverse project activities and multiple species that require differing conservation strategies, the measures are arranged to include: (1) base-wide best management practices that the Air Force will implement for all project activities conducted under this biological opinion; and (2) species specific measures that the Air Force will implement to reduce adverse effects to each species. Furthermore, we have included a description of VAFB internal environmental review process that is designed to alert the 30th Space Wing Installation Management Flight (30 CES/CEI) of activities with the potential to affect sensitive resources on the Base.

1. Mission Operations

1.1 Space and Missile Launch Operations

VAFB is the only military installation in the United States from which government and commercial satellites are launched into polar orbit. It is also the only location from which intercontinental ballistic missiles (ICBMs) are launched to verify their accuracy and reliability. In addition, the MDA is one of the many tenants on VAFB and conducts interceptor launches that engage targets over the broad ocean area to test their defensive missile system and has interceptors on 24-hour alert to defend the continental United States from incoming missile threats. The unique coastal geography of the base, with the north coastline facing west and much of the south coastline facing south, provides a wide range of azimuths for space and missile launches without flying over populated areas and is the principal reason why such a variety of launches are possible from VAFB.

Space Launch Programs

Current space launch facilities include six active SLCs with vehicle payload checkout and processing assemblies for heavy, medium, and small lift operations. Expendable boosters launched or planned to launch from VAFB include, but are not limited to, Atlas V, Delta II, Delta IV, Taurus, Minotaur, Pegasus, and Falcon 9. South base accommodates SLC-3E (Atlas V), SLC-4E (Falcon 9), SLC-6 (Delta IV), and SLC-8 (Minotaur). SLC-2 (Delta II) and LF-576E (Taurus) are located on north base.

Space lift launch vehicle booster stages fall into the Pacific Ocean after their propellant has been consumed; the next stage is then fired to resume powered flight. Jettisoned objects sink to the ocean floor and are not recovered due to the extreme difficulty in locating and recovering such objects in deep ocean waters. On rare occasions launch anomalies may occur; however, because of the very low probability of this occurring, we are not analyzing the effects of launch anomalies. In fact, launch success at VAFB between 1960 and 2000 was approximately 94 percent (U.S. Air Force (USAF) 2008).

Launch frequency is variable and future launch rates are subject to change based on mission need. For the last 5 years, the Air Force has not exceeded 12 combined space and missile launches per year; however, the Air Force proposes to conduct a maximum of 50 launches in any calendar year (35 space and 15 test/missile launches), including those by the MDA and commercial operators such as United Launch Alliance (a joint venture of Boeing and Lockheed Martin).

Missile Launch Operations

The Air Force operates the Minuteman III ICBM program at VAFB from Launch Facilities (LF) 04, 09, 10, 26, which are located on north base. Operational missiles are selected from the current force; the warheads are removed and are launched into the Kwajalein Atoll at the Reagan

Test Site. The Air Force conducts approximately three Minuteman Force Development and Evaluation launches per year. LF-06 is a Developmental Test and Evaluation launch facility to test new systems and upgrades for the Minuteman fleet using retired Minuteman II missiles. LF-06 is also used to launch Minuteman II missiles as target missiles for MDA interceptors. LF-08 is a non-operational training launch site used to train Minuteman III maintenance personnel. Currently unused Minuteman and Peacekeeper launch facilities include LF-05, LF-07, and LF-25. TP-01, also on north base, under current operational plans would utilize the Minotaur IV Lite or a similar conventional strike missile.

In 2004, under Presidential Directive 23 issued on December 16, 2002, the Ground-based Midcourse Defense (GMD) program began deploying a set of missile defense capabilities at VAFB. This directive provides for the Limited Defensive Operations, which is the ability to detect and track a limited number of long-range ballistic missiles, and launch missiles to intercept and destroy them in defense of the nation. GMD facilities consist of interceptor launch and multiple processing facilities. Five currently operational interceptor/test launch sites are LF-02, LF-03, LF-21, LF-23, and LF-24.

The MDA Targets and Countermeasures Program includes a plan to launch a variety of target launch vehicles from north base. Target vehicles provide threat representative profiles against which the performance and capability of defensive systems can be tested and measured. Any future construction related to MDA activities would be considered minor construction, which is included in this consultation and described below, or they would require independent formal section 7 consultations because the activities could be beyond the scope of this biological opinion. Other planned and possible MDA modifications include an operationally capable GMD interceptor launch site, the Flexible Target Family of larger targets, missile processing facilities, and an administrative and storage facility likely to be located within VAFB's main cantonment

The Air Force is developing a small targets launch site to launch targets for the Airborne Laser and Space Tracking and Surveillance System. The location of this new launch site is adjacent to LF-06 and is designated LF-06A. Additionally, the Air Force may add the capability for fixed and portable rail launchers for target vehicles, some of which are identified in the Theater Ballistic Missile Targets Programmatic Environmental Assessment (USAF 1997).

As part of the space and missile launch programs, the Air Force may reactivate existing silos and expand existing facilities. In most cases, these activities would occur within previously disturbed or developed areas. To reactivate, operate, and maintain existing launch facilities at VAFB, the Air Force may demolish and (or) remove existing equipment, fences, antenna towers, and power poles; install structures above and below ground such as subsurface communication lines and utilities, new power poles and power lines, firebreaks, diesel-powered generators, security barriers, fences, and lighting; and repave access roads.

Fires resulting from a launch are atypical but may occur near a launch site. To minimize the potential for a fire, the Air Force clears firebreaks around launch facilities to keep the fuel loads

to a minimum. In addition, the vegetation around security fences is mowed to establish a 50-foot security clear zone around each facility. These areas are typically mowed twice per year.

1.2 Security and Antiterrorism Operations

Security and antiterrorism operations primarily include aerial patrols, law enforcement patrols, pre-space and missile launch patrols, poacher patrols, search and rescue operations, and boundary evaluation. These operations could include using all-terrain-vehicles (ATVs) to conduct the patrols, which typically traverse the base via existing roads and trails; installing high-powered lights; and removing vegetation to improve visibility at secure facilities, gates, and similar locations. Fence maintenance and repair is another key component of security and antiterrorism operations.

1.3 Air Operations

Airfield and Flight Test Operations

Unlike most Air Force installations, use of the airfield is not the dominant activity. VAFB does not maintain an active flying mission; however, approximately 120 fixed wing aircraft flights are scheduled and approximately 6,000 take-offs and landings occur per year.

The frequency of low level airplane testing is highly variable with a maximum frequency of three flights per week with four to five passes per flight. The number of flights could range from 0 to 50 flights per year. An average of 10 flights per year, including 50 fly-over low altitude passes over the airfield per year, is a reasonable estimate.

Restrictions to airfield and Flight Test Operations are described in 30 SW Instruction 13-201, *Base Airfield Operations.* With notable exceptions including search and rescue missions, security incidents, or aircraft emergencies, these restrictions include:

1. Pilots climb to 1,900 feet above sea level (asl) over the Purisima Point area during the California least tern and western snowy plover breeding seasons (March 1 through September 30).

2. Year-round avoidance of Point Sal/Lion Rock by at least 1,000 feet in all directions. This area supports pinnipeds [i.e., Pacific harbor seals (*Phoca vitulina richardsi)* and California sea lions (*Zalophus californianus*)].

3. Maintaining a year-round, minimum 500-foot altitude from Minuteman Beach to Purisima Point, Wall/Surf Beach, and Jalama Beach because this area contains western snowy plover habitat.

4. Maintaining a year-round minimum 1,000-foot altitude over the Vandenberg Marine Ecological Reserve (shoreline between Point Pedernales and Oil Well Canyon) to protect marine mammals and nesting seabirds.

Aircraft are likely to cause disruptions in the area of Purisima Point during standard (southwest of runway) visual flight rules traffic pattern operations. Therefore, the following procedures are enforced from March 1 to September 30:

1. Circling approaches to the southwest are prohibited unless flight safety dictates otherwise.

2. For right traffic to Runway 12, aircraft conducting rectangular/closed traffic patterns must delay base turn until abeam Point Purisima.

3. For left traffic to Runway 30, aircraft conducting rectangular/closed traffic patterns must execute a crosswind turn prior to the departure end of the runway. If unable to execute crosswind turn prior to the departure end of the runway, then they must fly runway heading and climb to 1,900 feet above mean sea level before turning crosswind.

Limited expansion of existing airfield operations and maintenance facilities is projected under the future land use development plan, including expanded use of Unmanned Aerial Vehicles likely beginning in 2011. The Air Force anticipates constructing a new air traffic control tower with associated utilities and infrastructure northeast of the existing tower within the airfield development area.

Helicopter Operations

Helicopter operations at VAFB decreased in 2007 with the deactivation of the VAFB helicopter squadron, although other squadrons and units continue to use VAFB for purposes such as transit, exercises, and launch mission support. All helicopters maintain a 1,000-foot avoidance area of pinniped haul-out sites and maintain 1,900-feet asl over the Purisima Point area during the California least tern and western snowy plover breeding seasons, and fly no lower than 500 feet above western snowy plover habitat. Exceptions may occur when performing a search and rescue mission, when responding to a security incident, or during an aircraft emergency.

1.4 Miscellaneous Mission Operations

VAFB is serviced by a boat dock located within the marine ecological reserve, near Rocky Point on south base. As part of the launch operation at SLC-6, the Air Force may dredge the harbor and pier area twice per year to accommodate vessels that unload rocket motors and large booster segments. These actions are controlled primarily by other regulatory agencies and we have previously analyzed the effects of this dredging activity in a separate biological opinion (1-8-99-F-27). We recognize that dredging activities would occur as part of VAFB's EELV launch program; the EELV launch program is not within the scope of this biological opinion.

The Air Force conducts emergency preparedness drills on a routine basis. The Emergency Management Program examines potential emergencies and disasters, develops and implements programs aimed to reduce the impacts of these types of events, prepares for risks that cannot be eliminated, and prescribes actions to deal with and recover from such events. The drills may involve personnel responding to a simulated emergency, such as a fire, flood, airplane crash, and earthquake. Large drills occur quarterly and smaller units are involved in drills approximately once per month. The frequency and extent of drills increases with external Operational Readiness Inspections, typically once every 2 years. Some drills occur entirely within buildings and utilize only simulated emergency response assets. Field drills occur most frequently at the Northstar training area, the fire burn area, the airfield, the explosive ordnance disposal range, and other previously disturbed areas. Activities that may occur as part of the drills include limited off-road driving, digging, or using hazardous material response equipment.

Prior to overseas deployment actions, and as part of specialized training for positions at the base such as base security and conservation law enforcement operations, a limited number of Air Force personnel are trained in the safe operation of off-highway and ATVs. This training is restricted to previously disturbed areas and the existing off-highway vehicle course, which is within the cantonment area and has been used for more than 20 years. Recreational off-highway vehicle use is not included in this consultation.

2. Infrastructure Support

The general types of operations and maintenance projects that routinely occur on VAFB include: repair and maintenance of paved and unpaved roads and parking lots; demolition of structures and buildings; maintenance, inspection, repair, and replacement of drinking water, wastewater, storm water, natural gas, and other compressed gas pipelines; installation of under- and above-ground utilities such as fiber-optic cables, conduits, power lines, and sensors and poles; landscaping and mowing; maintenance and replacement of fences; and slope stabilization. Projects that would take place entirely within an existing building, such as electrical work, plumbing, repair of heating, ventilation, air conditioning, and fire alarm systems, and repair and replacement of roofs are not discussed in this biological opinion.

2.1 Road Maintenance

Paved Road Maintenance

The Air Force maintains more than 288 miles of paved roads that vary from one to four lanes in width (10 to 48 feet). Approximately 58 miles of these roads are in the highly developed north cantonment area, and approximately 230 miles occur elsewhere throughout the base. The average life span for most roads is anticipated to be 20 years before complete replacement. Repair activities may range from filling potholes to replacing road segments. Under most circumstances, replacement would require removal, grading, curb repair, placing new foundation and pavement, painting, and installation of reflectors or other warning devices.

Unpaved Road Maintenance

Approximately 330 miles of unpaved roads occur on VAFB, which are subdivided into three categories (primary, secondary, and tertiary) for the purposes of this document only. Unpaved roads are used by security, operations, maintenance, and other personnel at all times of the year. Primary unpaved roads (approximately 120 miles) are used daily, secondary roads (approximately 90 miles) are used at least weekly, and tertiary roads (approximately 120 miles) are used at least quarterly. VAFB's 30 SW Civil Engineer Squadron (30 CES) maintains roads annually after the rainy season, finishing in sensitive areas by the end of June to the maximum extent practicable. Primary unpaved roads are maintained more often using various tracked and wheeled heavy equipment.

The Air Force performs unpaved road maintenance activities to make the roads usable by standard and four-wheel drive vehicles. These actions include, but are not limited to, installing and grading gravel material or shale to improve road stability and decrease washouts and weathering, installing water bars on steep slopes and drainage culverts where needed, filling holes, and repairing any areas where erosion has impacted the road.

2.2 Utility Installation, Maintenance, and Removal

Water Lines

The water system, largely installed during the 1940's, currently consists of approximately 300 miles of pipeline, including approximately 230 miles of active lines and 70 miles of abandoned lines. A 39-inch pipeline near Firefighter Road and U.S. Highway 1 delivers water to the base; a pipeline then conveys the water from this connection to a blending station located at the main reservoir. The existing distribution system includes two 36-inch diameter backbone pipelines that run from the main reservoir facility to the cantonment area and are critical for providing capacity for water transmission and fire flow demands. These are primarily unmetered service connections with five major pumping stations and one 8-inch pipeline connecting north and south base. Much of the system was replaced over the last 10 years, but many miles of the pipeline are still in need of replacement, including much of the main cantonment area and several segments on south base.

The existing water distribution system is monitored for water quality on a routine basis and bacterial testing is performed at various locations. Because the existing distribution system has many dead-end segments (areas with low flow and long detention times), maintenance with disinfectant is difficult. Therefore, to correct water quality concerns the Air Force is upgrading existing water distribution pipes from ductile iron to polyvinyl chloride (PVC). In addition, automatic water flushers were installed at the most critical dead ends of the pipeline to eliminate stagnant water problems. These flushers periodically dissipate 5,000 to 7,500 gallons of water to flush the system.

Water pipeline replacement and installation of new pipelines may occur throughout any area of the base. The maintenance and repair of damaged pipelines occurs as needed and the frequency of pipeline repairs is directly related to the age of the pipeline. The number of breaks requiring heavy equipment for repairs is approximately 20 per year. While replacement could occur throughout the 230 miles of the active distribution system, new water pipelines would usually be installed within roads and on road shoulders.

Open trenching technology is the primary method for replacing pipelines along roads. Trenching involves excavating the soil up to 10 feet wide and up to 20 feet deep on the side of the road as vehicles travel along the road. Temporarily displaced soil is stockpiled immediately adjacent to the trench, backfilled after the pipeline is in place, and then mechanically compacted over the buried pipeline. A work area up to 30 feet wide is excavated for these operations and to maneuver equipment. Water line repairs requiring excavation occur on a monthly basis, generally in disturbed areas such as roads and parking lots; however, on occasion (three to four times per year) water breaks occur in remote, vegetated areas requiring exploratory excavations to locate the break.

Directional drilling is used in areas where construction and engineering specifications rule out the possibility of trenching (i.e. railroad crossings within unstable roadfill) or where base resources require avoidance (i.e. cultural and natural resources). Directional drilling involves drilling a borehole into the ground until it reaches the designated end point, wherein the borehole terminates at the ground surface. A surface-operated drilling device is angled into the ground and directed to its destination using a radio-controlled mole equipped with a cutter head. Personnel directing the mole control its depth and direction of excavation. 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. After the bore is complete, excess slurry is removed from the site and either reused or disposed of at an appropriate facility. A work area approximately 50 feet wide by 100 feet long is required at the bore entry and exit points. Bore lengths can extend up to 2,000 feet and can reach maximum depths of 25 feet below grade.

To protect pipelines from corrosion, cathodic protection systems are installed that generate a shield of electrons around metallic surfaces and prevents the corrosion process. These systems are installed in the same trench as, and concurrently with, the pipeline and include anode test stations placed along the length of the waterline. Each anode test station is arranged horizontally and parallel to the pipeline, within a radius of 5 to 10 feet from the bottom half of the exterior wall of the pipeline. Trenches that contain anode test stations are approximately between 5 and 15 feet deep and between 9 and 19 feet wide. Wires from the anode test station are routed above ground to a terminal board that measures approximately 4 feet high, 6 feet long, and 6 inches wide. Tests are conducted on variable schedules, usually only requiring an individual to walk to the test site and take a reading from a meter. Off-road vehicles may be used on certain lines; however, they are typically limited to existing dirt roads. Vegetation clearance is required less often, when personnel on foot or an ATV cannot approach the sensors. Frequently serviced

utilities would be cleared first, and vegetation would be selectively cleared when a utility needs servicing, maintenance or repair.

Wastewater Lines

Wastewater lines carry sewage and other wastewater, excluding industrial wastewater, from various buildings on base to the City of Lompoc treatment facility on Central Avenue. Approximately 96 miles of pipelines averaging 12 inches in diameter have been in place for decades. Maintenance and repair of damaged pipelines occurs as needed and would require excavating the site using mechanized equipment. A project's footprint is dependent upon the requirements of each activity; however, similar to water line repairs, a general work area 30 feet wide is required.

Most facilities not located within the main cantonment are serviced by septic tanks and leach fields. Septic tanks are inspected, pumped, removed, and replaced. Inspections could have a small impact on federally listed species but pumping would not result in adverse effects. Removal and replacement, which occurs on average less than once every 20 years, would require significant ground disturbance.

Petroleum, Oil, and Lubricant Lines and Tanks

VAFB has initiated a comprehensive program to install aboveground storage tanks to replace underground storage tanks and lines for petroleum, oil, and lubricants. The vast majority of underground tanks have already been replaced. Maintenance, inspection, removal, and replacement of aboveground tanks generally occur in previously disturbed areas. The Air Force also plans to perform maintenance, inspect, and replace less than 1 mile of pipeline. Most of these pipelines are less than a few hundred feet, but the replacement of these pipelines would require considerable ground disturbance.

The oil pipeline from offshore platform Irene (operated by Freeport-McMoRan Oil & Gas, formerly Plains Exploration and Production Company) is not within the scope of this biological opinion. Therefore, all actions related to this pipeline would be subject to independent section 7 consultation, if needed.

Electrical Lines and Poles

VAFB receives electrical power from Pacific Gas and Electric Company, via the divide substation in the City of Orcutt. VAFB contains 574 miles of electrical lines and the majority of these lines are aboveground on poles and towers. VAFB maintains seven government owned substations. Starting in 1993 the core electrical system was rebuilt. Substations A, B, C, D, and K were also entirely rebuilt in recent years; substation E was upgraded. Improvements included new transformers, steel towers, conduits, and replacement of old oil circuit breaker controls with sulfur hexafluoride gas circuit breakers. To meet Federal environmental compliance regulations,

all transformers containing polychlorinated biphenyl (PCB) (greater than 50 parts per billion) were removed. All newly installed transformers are PCB-free.

Installation or replacement of overhead power lines requires the delivery of wooden or steel poles and associated hardware, erecting the poles, and hanging the line. Heavy-duty trucks equipped with augers drill holes in the ground that can range in diameter from 3 feet for wooden poles to 10 feet for steel poles and may be up 25 feet deep depending on the length of the poles. Wooden poles are hoisted into place with guy wires anchored in the ground and positioned to relieve stress. Steel poles do not require the use of guy wires because they are bolted to pre-manufactured concrete casings previously placed in the holes. Concrete is then poured to hold them in place. The disturbance area around each hole during installation is 800 square feet for wooden poles and 4,000 square feet for steel poles. The power lines are drawn from a reel truck and installed with the aid of pulleys.

The maintenance and operation of the electrical distribution system requires routine travel under the 545 miles of power lines to inspect, repair, and improve the system. Maintenance and repair of existing overhead power lines includes the replacement of hardware, power lines, or deteriorated poles. Vehicles typically used are four-wheel drive trucks, larger four wheel drive bucket trucks, heavy equipment such as bulldozers, loader/backhoe graders, bobcats, excavators, post-drilling rigs, and other equipment. This travel occurs weekly, mostly on unpaved roads, but occasionally crosses unimproved terrain. To keep the system operational, electricians frequently climb poles, use mechanical lifts to replace equipment, and wash down porcelain insulators that may flash over due to excessive soot or dust.

The Air Force clears a 15 to 20 foot wide right-of-way around all installed power lines and around all poles. Most of the maintenance and repair work is accomplished within this right-of-way corridor. Trees and bushes are trimmed to remove any branches that reach within 5 feet of a point directly beneath the conductor. In general, the VAFB's electric shop strives to clear a zone described as a 45 degree trapezoid with a 12 foot wide base, centered on the power poles, which is standard throughout North America for most power lines. These efforts occur approximately 2 days per month and are strictly controlled in riparian areas. Maintenance is required more frequently during inclement weather due to power outages. In addition, for some space lift or ballistic launch missions, the removal of trees near power lines is required to enhance the reliability of a particular electrical circuit to a particular launch site. Mowing under power lines is conducted on an as needed basis. For overhead power line installation, the Air Force implements avian protection measures following the Avian Protection Plan Guidelines and Suggested Practices for Avian Protection on Power Lines (Avian Powerline Interaction Committee 2006).

Installation of underground power lines involves trenching, installation of a concrete encasement, and placement of conduits. Trenches are a maximum 6 feet deep and 6 feet wide, but the width and length of the trench is dependent on the location and the capacity of the power line(s) being installed. Underground installation usually occurs across roads, thus vegetation clearance is minimal, occurring only at the entry and exit points that are typically within the

work area of a power pole. Construction equipment would be restricted to the roadways and road shoulders.

Communication Lines and Access Points

VAFB has approximately 3,000 miles of communications cables. Most of the twisted-pair copper telephone cable was installed during the 1940s and 1950s and has reached, or is close to, the end of its useful life. Communication line installation consists of subsurface placement of 0.75-inch cables inside tubular high-density polyethylene or PVC conduits that range in size from 1.25 to 4 inches in diameter. The methods for installing fiber-optic cable depends upon topography and may include trenching with a backhoe, trenching with a rock wheel, direct burial by plowing, and directional drilling.

Trenching is the preferred installation method in open flat areas and on hills where plowing is not feasible and it is also used in areas where shale or rocky soils exist and when small areas are accessed. Trenching is almost exclusively used in repair operations where plowing would damage existing lines. The trenches would be a maximum of 1 foot wide and 3 feet deep. Temporarily displaced soil is stockpiled immediately adjacent to the trench and backfilled after the conduit is placed. The work area for trenching may be up to 30 feet wide.

Direct burial by plowing is preferred when the terrain is relatively even and free of rock outcroppings, there is a wide road area in which to work, and few underground utilities exist along the route. The conduit and subduct system are simultaneously plowed into the ground at an angle of 30 degrees vertical with respect to grade. Soil is initially pushed aside during plowing, but falls back around the newly laid conduit. At a plow depth of 36 inches, the temporarily displaced soil spreads out to a width of approximately 12 inches. The overall work area is generally 10 feet wide.

Directional drilling is used to place conduit or cables under roads, parking lots, buildings, and other structures where trenching is not possible. The directional drilling method to install communication lines is the same method as to install the water lines mentioned above.

The maintenance, upgrade, and repair of existing fiber-optic lines require access to a manhole, a handhole, or a pullbox. An adequate work area at any one of the manholes to conduct the needed activities is approximately 200 square feet. An additional 10-foot wide track is required for vehicle access between roads and the manholes and handholes that are located off roadways.

Storm water Lines

Storm water runoff on VAFB is gravity flow directed by surface or open drainage swales and underground structures. It is dependent upon a variety of factors including soil conditions, grade, and the amount of paved and concrete areas. The base infrastructure includes approximately 85 miles of underground storm drain lines and approximately 115 miles of concrete and asphalt curbs and gutters. This system directs the flow of rainfall into hundreds of

drainage structures such as catch basins and culverts. On north base, most surface drainage flows to San Antonio Creek or the Santa Ynez River, and is also channeled by an underground pipeline to three detention ponds in Lake Canyon. On south base, storm water drains to the Santa Ynez River, Honda Creek, or other natural watercourses.

The majority of the base is undeveloped and has highly permeable sandy soils, with the exception of the main cantonment area where storm water run-off is common due to impervious asphalt and concrete roadways. The main cantonment area also contains an impermeable hardpan clay layer, approximately 2 to 3 feet below the permeable sand that creates a perched water table. In these areas, the presence of standing water is common during the rainy season or when the grass is over-irrigated.

The Air Force encounters common problems in the storm drainage system that includes culvert backups, erosion, and minor flooding. Routine maintenance of blocked culverts and drainage ditches are performed during the dry season (May through October). Maintenance activities include visual inspections of culverts and drainage ditches and the removal of debris and vegetation. While most of these activities are accomplished manually or with minimal use of mechanized equipment (i.e. machetes and weed whackers), blocked culverts sometimes require more intensive maintenance such as mechanical clearing of vegetation, excavation to clear debris and sediment build-up, and use of a high-pressure water distributor or sewer jet. The work area for culvert and drainage ditch maintenance is generally restricted to the immediate area; however, the work footprint is dependent upon the location of the culvert.

Compressed Gas Distribution System

The Southern California Gas Company supplies natural gas to the base. The distribution network consists of steel pipe from the 1940's and polyethylene pipe installed between 1996 and 1998. Two main regulating stations control 83 miles of underground lines throughout the base. From the regulating stations, 10-inch supply lines are reduced to 8-inch feeder lines, and again to 0.75-inch pipe at the laterals.

Underground installation of 22 miles of polyethylene piping was initiated in June 1997 and is currently ongoing. The north base distribution system consists of approximately 85 percent polyethylene pipe. South base contains 90 percent of the original steel pipe installed in the 1940s, which is routinely monitored for corrosion and leakages. Testing of this pipe is similar to cathodic testing described under the water lines program mentioned above. The Air Force is considering creating looped lines that would add redundancy to the system, prevent isolated (dead end) areas, and ensure consistent supply in the event of a gas line break or closure. Installation of underground gas lines involves excavation along road shoulders up to 3 feet wide and 5 feet deep and similar construction methods as water lines. A work area approximately 30 feet wide is required for these operations.

On a monthly basis, VAFB utilities shop personnel access two or three valves not located near paved roads. Personnel generally travel on foot to these locations, but occasionally need to drive

on unimproved terrain using a 4-wheel drive pickup truck. Additionally, infrequent gas line ruptures require the excavation of a 6-foot cube pit to make repairs. Though most of these ruptures occur in already disturbed areas, some of the pipeline is located in remote or unimproved areas. Most such actions cannot be anticipated.

Other compressed gases are transported between facilities, including gaseous nitrogen between SLC-4 and SLC-6 (a total linear distance of approximately 8 miles). Liquid and gaseous propane lines are located in several areas, generally limited to short distances of less than 50 feet between above- and below-ground storage tanks and various emergency generators. The total length of these lines is less than 1 mile. Inspection, maintenance and replacement of these lines involves limited ground disturbance and could include mowing and vegetation removal.

2.3 Landscaping

Landscaping activities include planting, trimming and mowing, and the removal of turf, shrubs, and flowerbeds. Landscaped areas include areas within the main and south base cantonments, along distinguished visitor tour routes, at high visibility facilities, and in the vicinity of the airfield and flight line. The Air Force may remove existing vegetation and landscape areas associated with the construction of new facilities in areas not previously landscaped.

Mowing

The Air Force determined that they mow approximately 3,542 acres on base: 1,500 acres along roadsides, 200 acres in landscaping, 300 acres within the airfield area, 242 acres within space launch sites, and 1,300 acres in utility corridors. Routine mowing occurs for safety and security at the airfield, around launch facilities and buildings, and along roadway shoulders; for reduction of vegetation surrounding water detainment and treatment ponds; and for aesthetic purposes in planted turf areas and open spaces within the cantonment areas. Mowing occurs for water, wastewater, storm water and compressed gas pipeline maintenance, underground storage tank maintenance and removal, communication line and access point maintenance and removal, electrical line and pole maintenance and replacement, and other similar utility maintenance actions. Vegetation around security fences at launch facilities is mowed to establish a 50-foot security clear zone. Mowing along road shoulders extends 15 to 20 feet from the edge of the pavement or asphalt. A 15 to 20 foot wide right-of-way is cleared around all installed power lines and around all power poles. Utility corridors are mowed the least frequently, and in some remote areas they may only be mowed if access is required to conduct maintenance activities.

Mowing may occur weekly, depending on the time of year and the growth rate of vegetative material, and is accomplished with gasoline and diesel mowers (manual, ride-on, or commercial mowers), hedge trimmers, and weed whackers. Vegetation around buildings and facilities, along roadways, and in landscaped areas is generally kept to 6 inches or less.

Tree Trimming and Removal

The Air Force conducts tree trimming and removal activities for security, safety, fire prevention, utility and road maintenance and inspection, access to facilities, and new construction. Tree removal may also occur for invasive species removal programs and ecosystem restoration. Tree trimming and removal may require the use of heavy equipment along an existing access and (or) work corridor. The Air Force conducts tree trimming and removal actions in compliance with the Migratory Bird Treaty Act. Typically, the Air Force avoids active nests; however, the Air Force may take a migratory bird in the event of an over-riding military readiness activity (72 FR 8931). To date, the Air Force has yet to take a migratory bird on VAFB due to a military readiness activity. A biologist would inspect trees for active nests prior to trimming or removal.

2.4 Fencing Installation, Maintenance, and Removal

To enhance security and protect assets and resources, fences are erected throughout VAFB around buildings, facilities, and areas containing natural and cultural resources. Fences may also be used to contain cattle, prevent pedestrian access at beaches, and to demarcate various areas. Total fence length exceeds 500 miles and the type (chain link, barbed wire, snow fencing, electric) and height of fences vary based on the fence's purpose. Fence installation, maintenance, and replacement involves clearing brush, digging holes mechanically or by hand, and installing new poles and fencing. Maintenance schedules are highly variable and depend on the condition of the fence and the asset it is protecting. Fences exposed to harsh coastal weather deteriorate rapidly and require more intensive, continuous maintenance throughout the March through September western snowy plover and California least tern breeding seasons.

The Air Force repairs or replaces 1,000 to 4,000 feet of chain link fencing each year. In addition, due to changing security requirements, the Air Force may install approximately 10,000 feet of new chain link fence at all SLCs, LFs, and other critical facilities over the next 5 years. The zone cleared surrounding the fence may be up to 50 feet wide.

3. Infrastructure Development

3.1 Development Pattern

The existing development pattern provides a basic guidance for the future development of land resources and attempts to integrate future requirements with decisions made over the last 50 years. The development pattern attempts to balance the need to maintain a maximum capability for the base mission, locate new facilities in economical and convenient locations, and protect the long-term productivity of the bases' natural resources.

Because launch operations are the primary mission of the Air Force at VAFB, the land use is a high priority in regards to facility planning. The purpose of the launch operations area designation is twofold: to reserve land for the location of new launch facilities, and to protect the

capabilities of existing launch facilities by excluding the development of non-launch-essential facilities from the launch zone.

VAFB has two cantonment areas: the main cantonment and the south base cantonment. These cantonment areas accommodate urban land uses and facilities that do not directly support launch operations. The main cantonment encompasses 6,100 acres and is divided into five zones: housing, community service, administrative, industrial, and outdoor recreational. The south base cantonment covers 72 acres and consists of offices, warehouses, and other structures.

3.2 Future Development

North Base

Land use on north base generally consists of various mission-related developments. Minuteman, Peacekeeper, and other older missile system launch facilities occur in dispersed groupings, each having specific requirements, safety considerations, and launch impact zone requirements.

The future land use plan provides a pattern to accommodate the changing scale and nature of missions. The Air Force projects limited expansion of existing community and industrial facilities under the Future Land Use Development Plan. Most community land use areas containing service and commercial uses are currently located in the main cantonment. Future community facilities would also be located in the general area of the main cantonment using land that becomes available due to the demolition of wooden World War II structures. Thus, new disturbance in undeveloped areas is expected to be minimal. The main industrial zone is located in the southern portion of the main cantonment. Limited expansion of existing industrial facilities is projected under the Future Land Use Development Plan.

The Air Force also projects space for additional recreational facilities that serve the base population. The Cocheo Park expansion, Community Park development, and the expansion of Bicentennial Park are examples of outdoor recreation land use growth areas. These are located adjacent to housing and the dormitories in the urbanized portion of the cantonment area. Expansion of these recreational areas would incorporate landscaping and recreational equipment for children and adults.

Anticipated construction in support of the MDA program includes the development of new sites and upgrading and expanding existing sites. Some of the projects may be out of the scope of this biological opinion; however, construction activities that occur at previously used facilities are anticipated to be covered. MDA projects would require actions such as demolishing and removing existing equipment, fences, antenna towers, and power poles; upgrading existing and installing new launch support equipment, including utilities, above and below ground; and installing security barriers, fences, and lighting. Activities that would occur outside these fenced facilities include clearing vegetation 30- to 50-foot around the security fence to establish security clear zones, maintaining and repairing facility infrastructure, and repaving of existing access roads.

South Base

South base land uses consist primarily of industrial and launch operations related facilities, including SLC-3, SLC-4, SLC-5, SLC-6, and SLC-8. Open space is the largest land use on south base, accounting for 95 percent of the total land acreage.

As future south base space launch activities increase, placing specific facilities must complement present and long-term launch capabilities. Suitable locations for new launch operations facilities are somewhat limited; therefore, the focus of future development is on modifying existing launch facilities and locating new construction within existing launch operations land use areas. These new facilities must be directly related to the launch operation and have an identifiable need to be located in close proximity to a launch facility. Once the Evolved Expendable Launch Vehicle program is fully operational, an excess of operational launch facilities would exist. It is likely that future launch programs would require larger safety zones, which are typically 300 to 800 feet. In addition, any future south base road network changes will continue to provide appropriate levels of service to existing and proposed land uses. Potential future DOD, civilian and commercial space programs point to an increasing need for testing space launch vehicles and the delivery of payloads to high inclination orbits.

Minor Construction Projects

The Air Force expects that minor construction projects would have minimal effects to federally listed species, such as the project that modified LF-24 (1-8-07-F-55). Types of minor construction projects may include new security structures, storage sheds, gates and fences, sidewalks, a new concrete pad for a utility box, and other mission support facilities. Each project could have a ground disturbance footprint of up to one-quarter acre. As part of an ecosystem management approach, the 30 CES/CEI encourages project proponents to place their projects in previously disturbed areas. Therefore, these projects are anticipated to be within the scope of this biological opinion and preclude the need for independent section 7 consultations.

Slope Stabilization

Slope stabilization could involve a variety of activities to reduce erosion and protect roads, facilities, and other assets. These activities may involve clearing vegetation, digging, grading, installing culverts and (or) protective matting, planting new vegetation, and erecting protective walls. The extent of activities depends on the needs at each specific location. Slope stabilization is a recurring need, but it is not required on a continuous basis. It most often occurs where access to mission-critical facilities and equipment are at risk. Existing roadways along Honda Ridge, Santa Ynez Ridge, and San Antonio Creek have been especially problematic over the past 10 years as a result of winter weather because debris, mud, and other hazards enter the roadways. Heavy equipment crews would routinely clear debris from these roadways following major storm events.

4. Environmental Management Programs

4.1 Installation Restoration Program (IRP)

The IRP is a congressionally authorized DOD program for identification, investigation and remediation of past DOD waste releases (prior to January 1, 1984). The IRP is designed to identify and correct problems arising from past releases of hazardous substances and petroleum products into the environment. VAFB is not a National Priority List site; however, the Air Force is required to address IRP sites in a manner consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, and the Resource Conservation and Recovery Act (RCRA). The California Department of Toxic Substances Control (DTSC) and the California Regional Water Quality Control Board (RWQCB), Central Coast Region, are the lead regulatory agencies for the investigation and cleanup of contaminated areas.

Investigation and cleaning up of hazardous substances started in the early 1980's with a base-wide record search that identified 44 IRP sites for further investigation. Base-wide assessments and investigations, including a mid-1990s base-wide preliminary assessment requested by the RWQCB and the DTSC increased the total number of IRP sites requiring further evaluation to 146, and identified 261 Areas of Concern (AOCs), 573 Areas of Interest (AOIs), 18 Military Munitions Response Program (MMRP) sites, and 872 underground storage tank sites. These contaminated sites include former launch sites, storage tanks, landfills, drainage areas, fire training areas, spill areas, radioactive waste sites, and waste disposal pits. Primary contaminants in soil and water include fuels, solvents, metals, PCBs, and low-level radioactive waste.

IRP Areas

The Air Force has completed actions at 119 out of 146 IRP sites identified on VAFB (classified as either response complete or site closed). Of the remaining 27 sites, 25 are in the study phase and two are in the cleanup phase. Remedial actions and associated operations are expected to continue at eight sites through 2018, with work continuing at one site until 2029. Long-term monitoring is anticipated to be completed at all but one site by 2025; monitoring at this one site would continue through 2034.

Areas of Concern and Areas of Interest

The AOI designation was created to classify anything that did not directly match the criteria for an IRP site or AOC. Originally distinguished from AOC as areas thought to have less potential for chemical release, an AOI is an area that may potentially cause environmental concern, but poses no serious immediate human or ecological risk. Base-wide investigations for additional hazardous waste sites were discontinued due to insufficient evidence. Nevertheless, the Air Force will continue to investigate AOCs when normal base operations uncover potentially contaminated areas. The biological assessment provides more detail on the current number and status of AOCs and AOIs (USAF 2008).

Underground Storage Tanks and Pipelines

Further investigation is necessary for 56 IRP underground storage tank petroleum sites to determine the nature and extent of contamination. Underground storage tanks and pipelines were fuel distribution lines that were installed during World War II as part of U.S. Army Base Camp Cooke.

Site Investigations and Remediation Methods

A substantial amount of investigation was completed under the IRP to characterize the nature and extent of contamination and the potential response actions for each location. A typical methodology to determine the type and extent of contamination at a site is collecting soil samples from varying depths, depending on the specific site and the known historical contaminants. Some soil samples may be as shallow as 1 to 2 feet while others may exceed 50 feet. Soil samples are collected with hand-held or mechanical tools (e.g. drill rigs with augers).

Monitoring of groundwater at contaminated sites typically involves installing groundwater monitoring wells measuring 2 square feet. The wells are completed either at the surface within a box or aboveground and protected by steel outer casing surrounded by three steel guard posts. Sampling at these monitoring wells occurs quarterly. Most sampling requires a single truck with a 1- or 2-person crew extracting water at each well

Remediation activities may include excavating, hauling, backfilling, and capping soil, chemical or biological amendment injections to groundwater, single or multiphase extraction and aboveground treatment, in-ground permeable reactive barrier or barrier wall, air sparging, and thermal treatment. Most of these methodologies would require installation and access to down-gradient monitoring wells for periodic monitoring of the treatment system. The nature and area of disturbance associated with each of these activities varies greatly as noted below:

- Soil excavation involves removing contaminated soil; the footprint may range from 10 square feet to 3 acres.

- Soil capping is often applied to former landfill sites and involves covering contaminated sites with a few feet of soil or a layer of concrete to prevent contact with the contaminated material. The footprint may range from 10 square feet to less than 1 acre. This remediation method has not been utilized in the VAFB program and is not foreseen for any known areas.

- Chemical or biological amendment injection is the subsurface injection of compounds either through the use of a direct push rig or an injection well network. This remediation method involves injection of compounds into the subsurface either through the use of a direct push rig or an injection well network. The footprint may range from 100 square feet to 2 acres.

- Installing a permeable reactive barrier involves placing a narrow barrier into the groundwater that contains a material that enhances treatment. The reactive material varies and could include iron filings, bark mulch, oxygen, or ozone injection. Permeable reactive barrier remediation could also include driving sheet piling into the surface or using direct push rigs to create a grout curtain to direct the flow of groundwater though a localized barrier. The barrier could range from 100 to 3,000 feet long.

- Multiphase extraction or air sparging with aboveground treatment involves trenching to install piping that would connect one to 50 or more wells to an aboveground treatment system. The size of the trenches may range from 10 to 3,000 feet per trench and a concrete treatment pad that contains the equipment can range from 100 to 2,500 square feet.

- Thermal treatment includes the installation of subsurface heating elements and thermal couples on 10- to 20-foot centers over the extent of the treatment zone, and also includes installing a multiphase extraction system with associated aboveground treatment system as described above. The size of the trenches may range from 10 to 3,000 feet per trench and a treatment pad can range from 500 to 2,500 square feet. This remediation method has not been used in the VAFB program and is not currently being considered, but may be tested in the next 5 years.

4.2 Military Munitions Response Program (MMRP)

The MMRP addresses issues related to munitions and explosives of concern (MEC) and munitions constituents (MC) associated with munitions response areas (MRAs), as well as related hazardous substances, pollutants, and potential contaminants of concern on range areas that are no longer operational. The goal of the MMRP is to make MRAs safe for reuse and to protect human health and the environment. Like the IRP, the MMRP fulfills the requirements of the CERCLA, as amended by the Superfund Amendments and Reauthorization Act, and the RCRA.

The Air Force is currently executing phase two of the MMRP to address contamination as a result of past military training activities. The Air Force completed the Comprehensive Site Evaluation (CSE) Phase II in 2008 and a scoping surface clearance action that commenced in September 2009.

Munitions Response Areas

MRAs are defined as any area on a defense site that is known or suspected to contain MEC. The Air Force is addressing 19 MRAs under the CSE Phase II effort to determine whether the MRAs warrant additional munitions response activities, designation to a presumptive remedy (i.e. small arms ranges), definition as munitions response sites (MRS), or do not require further action. Preliminary results from the CSE suggest a need for subsequent response actions that can be

grouped into two primary categories, MEC removals and MC contaminated soils excavation. These response actions are described in more detail below.

MEC removal areas are defined by the presence of large concentrations of MEC and munitions debris (MD) that are suspected to be associated with a MEC target or target area. The Air Force has observed 28 MRSs containing these characteristics that total approximately 20,630 acres of the base. MEC removal actions could include the following activities:

- Construct access routes in areas inaccessible by motorized vehicles. The selected routes would minimize affects to vegetation but also minimize the travel time. The Air Force would trim vegetation to clear a pathway for vehicles and equipment to pass. Vehicles and equipment would follow the same routes for the duration of the activities. Project personnel, in consultation with onsite biological monitors, 30 CES/CEI, and explosive ordnance disposal specialists would determine the access routes.

- Establish a 200-foot by 200-foot grid system using a global positioning system (GPS) or licensed professional surveyor. Each grid node would be marked with a wooden stake, installed by hand by the GPS technician or surveyor. The grid system would extend across the removal area.

- Selectively trim or remove vegetation where it affects personnel safety and project quality. The vegetation would be trimmed using mechanized equipment such as a weed eater or chain saw. Dense vegetation that impairs accessibility would not be cut unless future land use requires an extension of the MEC removal beyond accessible areas. To the extent feasible, on-site biological monitors will be consulted prior to vegetation removal. The footprint would range from individual plants to a removal grid.

- Conduct instrument-aided MEC surface removals using hand held instruments to visually identify metallic material, traversing parallel transects spaced between 3 to 20 feet apart to achieve 100 percent visual and (or) instrument-aided coverage. Areas inaccessible to the unexploded ordnance (UXO) technicians due to dense vegetation, steep terrain, or water hazards would not be traversed.

- Remove all visible MEC, MD, range-related debris, and scrap metal observed from the project site; partially buried material would also be recovered. UXO technicians may use hand tools such as shovels and picks to excavate around a partially buried item for removal. Heavy objects may be removed with ATVs. The extent of the excavation would depend on an item's size. For example, disturbance based on a 75-mm high explosive projectile may range from 1 foot to several (2 to 3) feet in diameter. Soil removed from around the item would be backfilled and tamped once the removal has been completed.

- Conduct blow in place (BIP) activities when a MEC item is observed. If a UXO technician determines that the item is safe to move, the item would be destroyed at a pre-

designated area; however, the item would be blown in place if it is unsafe to move. It may be necessary to reduce the fragmentation distance of a subject MEC item. Therefore, UXO technicians may establish engineering controls constructed over the item, using a sandbag enclosure, loose tamped sand (wetted), or water suppression methods. Sandbags would be made of either a polypropylene material or biodegradable burlap. MEC items that are unsafe to relocate and are recovered in remote sections of the removal area away from structures and public access may be treated without engineering controls. Once the MEC item is treated by demolition, all remaining MD and debris would be removed from the blowhole. Intact sandbags would be stored for reuse and shredded sandbags may be used to backfill blowholes.

- Using digital geophysical mapping (DGM) to identify remaining subsurface items to further evaluate the removal area. DGM sensors and associated equipment could be carried or towed in parallel lines, ranging from 1.5 to 3.5 feet apart across the entire removal area. DGM sensors can be mounted on a cart or a man-carried instrument during data collection. No parts of the man-carried instrument contact the ground surface. Multiple DGM sensors can be mounted on a platform and towed using an ATV, Gator, or similar equipment. This towed sensor platform may be up to 10 feet wide supported by two to four wheels. Equipment used for DGM and mapping will be determined by the field team in consultation with onsite biological monitors and 30 CES/CEI.

MC contaminated soils identified in two of the MRA's during MMRP activities would require excavation and removal. MC contaminated soils excavation could include the following activities:

- Delineating the contaminated area using onsite analytical instrumentation or offsite laboratory samples prior to excavation. A 3-inch diameter hand auger may bore more than 3 feet deep to determine the vertical extent of contamination.

- Mechanically excavate soil to a depth that would remove the contaminated soils. The Air Force would haul the soil offsite with dump trucks, and to the extent possible, this equipment would use existing roads and trails. Project personnel, in consultation with onsite biological monitors, would determine if it is necessary for the equipment to go off-road to reach the contaminated area. Excavated sites could range from 10 square feet to a few acres.

- Two MRAs previously designated as small arms ranges contaminated with lead from small arms require lead-contaminated soil treatment and removal. All vegetation would be removed from existing berms and then heavy equipment would remove the soil from the site. Fill may be placed after excavation is complete as part of the site restoration. The total area for lead removal is approximately 1.3 acres.

4.3 Environmental Compliance

The VAFB sanitary landfill is located within the main cantonment, southeast of the intersection of Washington and New Mexico Avenues and southwest of Pine Canyon Road. The Landfill has been in operation since 1941. From 1941 to 1958, the Army operated the Landfill. From 1958 to the present, the Air Force has been the sole operator of the landfill. The current operating permit, issued January 10, 2000, lists the facility size as 172 acres. The Subtitle D footprint within the landfill facility (the area occupied by land-filled waste as of October 9, 1993) is 46 acres.

The landfill is a Class III solid waste disposal facility. The landfill currently accepts residential, commercial, and industrial garbage and inert wastes such as construction and demolition debris. Special wastes, such as non-friable asbestos and small animal carcasses, are also disposed of at designated sites. The local enforcement agency approved an expansion of the non-friable asbestos disposal area in May 1997 to accommodate the needs of the base through the expected life of the facility. The landfill also accepts used tires (for recycling at an offsite location) and wood waste (tree stumps, limbs, and pallets for chipping and mulching within the landfill boundary).

The landfill's lifespan is dependent on the volume of material currently being accepted and projected future acceptance rates. The Air Force used the average annual accepted waste volume of 9,041 tons to determine the remaining lifespan of the landfill. This yearly average was determined using historical data collected from the past 5 years. Therefore, the remaining lifespan of the landfill is approximately 80 years (through 2089).

4.4 Archeological Support

Implementation of the cultural resources management program on VAFB includes surveying areas to determine the extent of a cultural resource, identifying the type of cultural resource, and developing conservation and mitigation plans. Cultural resource surveys can occur anywhere throughout the base. Three types of field surveys occur that accomplish these tasks.

Phase I surveys are pedestrian surveys that occur prior to potential ground-disturbing activities in areas not previously surveyed and utilize parallel transects spaced no more than 50 feet apart. Because much of the base is covered with dense vegetation and surface visibility is poor, it is usually necessary to examine rodent back dirt piles, soil exposures around the edges of brush thickets, and ground exposed around rock outcrops. Surveyors also investigate cut banks from roads, streams, and erosion to look for buried sites.

Phase II subsurface surveys are exploratory investigations where samples are collected to document the presence and depth of buried cultural material. These surveys are appropriate where alluvial or colluvial sediments cover types of landforms known to be associated with archaeological sites, surface indications suggest the possibility of a buried site, the undefined boundary of a known archaeological sites exists within approximately 100 feet of the area of

potential effects, or documentary evidence, oral history, or other information suggests the presence of a subsurface archaeological site. Subsurface excavations are restricted to the footprint of a particular project and may incorporate several procedures. Cultural resource project managers determine what areas are subject to these surveys.

Shovel test pits are hand excavated with a shovel and used to define site boundaries and provide information about the intra-site distribution of archaeological remains. Placement of shovel test pits is flexible, and in all cases, they are placed in areas that avoid sensitive biological resources. In all other cases, shovel test pits are placed in areas with the least amount of vegetation. These shovel test pits have a maximum diameter of approximately 20 inches and a maximum depth of approximately 39 inches. If the cultural deposit extends below that depth, or if the project site has the potential to extend below that depth, an auger or backhoe trenching may be used.

Auger borings are used to dig to depths not achievable by shovel test pits. Augers may be used at the bottom of a shovel test pit to sample deposits deeper than 39 inches. The auger diameter is a maximum of 8 inches and the probes can extend up to 10 feet below the surface. Typically, auger borings are manually excavated but under certain circumstances they may be mechanically excavated.

Backhoe trenches are a method of non-controlled excavation used to identify buried cultural deposits. Trenches are usually a maximum of 5 feet deep, which permits archaeologists to enter the trench without violating the Occupational Safety and Health Act. Archeologists are not permitted to enter trenches deeper than 5 feet. Because the purpose of backhoe excavation during a subsurface survey is to establish the absence or presence of cultural materials, trenches are usually less than 7 feet long. Equipment can vary from bobcat to D-6.

Phase III data recovery involves the manual excavation of units that are approximately 11 square feet in surface area and of variable depths. Units may be adjacent to each other, creating a larger exposed block. Vegetation is often removed from the surface because the units are situated based on a sampling strategy rather than the presence or absence of plant material.

4.5 Invasive and Pest Species Management

Invasive Exotic Plants

The control of invasive plant species and the protection of native habitats and sensitive species are major issues of management concern on VAFB. According to a report on exotic plant management (Earth Tech 2001), six invasive plant species are of particular concern on VAFB: veldt grass (*Ehrharta calycina*), jubata grass (*Cortaderia jubata*), European beach grass (*Ammophila arenaria*), German ivy (*Senecio mikanioides*), highway iceplant (*Carpobrotus edulis*), and blue gum eucalyptus (*Eucalyptus globulus*). Other invasive species identified on VAFB include giant reed (*Arundo donax*), and yellow star thistle (*Centaurea solstitialis*). Methods available for the control and eradication of invasive species may include physical

(manual and mechanical), chemical, and biological control. Removal of invasive plants will be based upon site-specific conditions and may include a combination of these methods.

Manual removal methods are labor intensive and costly for large infestations. Hand-pulling seedlings has shown to be very effective at inhibiting new growth of some invasive species; however, a shovel or Pulaski would be used for removing well-established clumps of larger plants such as jubata grass. Manual removal may be the most desirable method in areas where invasive plant species are interspersed with other sensitive and federally protected species such as beach layia or seacliff buckwheat (*Eriogonum parvifolium),* the host plant to the federally endangered El Segundo blue butterfly.

Mechanical removal methods include the use of bulldozers and backhoes to remove invasive plant species. The equipment may be used in areas of homogeneous invasive plant species and infestations adjacent to pavement. This control method, however, is likely to result in adverse impacts on surrounding vegetation and soils due to the need for heavy equipment access routes.

Chemical control is an effective method for some invasive species such as jubata grass. All herbicides and pesticides used on VAFB are in accordance with Natural Resource Conservation Service (NRCS) best management practices and are regulated by many agencies. In addition, the DOD must approve herbicides used at VAFB. Glyphosate (e.g., Roundup Pro®, Glyfos® Pro, Glypro™ Plus) is a non-selective, systemic herbicide that carries plant toxins to the roots, and may be the most effective method for extensive infestations in disturbed areas with little desirable vegetation. Effective control can also be achieved by using a broadleaf herbicide that does not harm grasses. In areas where aquatic resources are present, only a glyphosate-based herbicide without toxic surfactants approved for use in aquatic environments is used.

Chemicals are applied using spot treatments with a backpack sprayer or truck mounted spray tank with hose. When applied in the summer and fall the herbicide is taken up more rapidly due to photosynthetic byproducts being transported downward into the root mass at a faster pace (Costello 1986). However, applying herbicide in the spring before viable seed maturation and again in the fall during this intense photosynthetic process may be necessary to prevent re-growth (Bossard et al. 2000).

Biological removal methods would make use of grazing by domestic livestock. Cattle, sheep, and goats can provide an alternative to herbicides for controlling some invasive plant species and can be used to move plant community composition in a desired direction. While grazing alone does not eradicate the invasive species, it is effective in reducing infestation and slowing the spread of some undesirable species, and can make some species more susceptible to herbicide application. The grazing regime must be correctly timed to be effective and not adversely affect native or federally listed species.

Pest Management (Fauna)

Predators taking advantage of anthropogenic food sources that may impact sensitive shorebird and seabird populations include coyotes (*Canis latrans*), feral pigs (*Sus scrofa*), raccoons (*Procyon lotor*), red fox (*Vulpes vulpes*), which are not presently common at VAFB, skunks (*Mephitis mephitis* and *Spilogale gracilis*), rodents, and Virginia opossums (*Didelphis virginianus*). Feral pigs are known to significantly impact federally protected plant species, including Lompoc yerba santa and beach layia, by digging and rooting in occupied habitat areas. The North American beaver (*Castor canadensis*) can be a pest and negatively impacts unarmored threespine stickleback habitat by damming creeks and reducing water flow. The Air Force may trap or shoot some pest species.

The Air Force conducts the non-lethal removal of raptors under a permit from the Service's Migratory Bird Permit Office. A similar permit allows VAFB personnel and contractors to lethally remove common ravens (*Corvus corax*) and several species of gulls from areas with nesting western snowy plovers and California least terns using traps, rifles, and shotguns. Some amphibian species that may require removal include barred tiger salamanders (*Ambystoma mavortium)*, tiger salamanders (*A. tigrinum)*, and bullfrogs (*Rana catesbeiana*). These species, in addition to non-native fish, would be removed using seine nets, traps, and other commonly used devices.

4.6 Grazing and Livestock

VAFB accommodates agricultural outleasing as a major land use. Approximately 30,000 acres are suitable and available for farming and grazing activities. This acreage is permitted to the Bureau of Prisons, U.S. Penitentiary at Lompoc, and all of the work for both farming and grazing operations is performed with minimum security inmate labor. The farmland falls under the definition of prime and unique farmland in the Farmland Protection Policy Act. Activities associated with the agricultural outleasing program on VAFB include cattle grazing, roto-tilling for planting crops; fence installation, maintenance and replacement; access road maintenance; and installation and maintenance of water troughs.

Grazing lands occupy approximately 23,970 acres and are broken down into seven management units: Antenna Farm (468 acres), Point Sal (1,110 acres), San Antonio (3,809 acres), Santa Lucia (1,620 acres), Surf (2,626 acres), Honda (2,320 acres), and Sudden (12,017 acres). The Bureau of Prisons runs a year-round 800 head cow-calf operation on the grazing lands and maintains a stable of approximately 20 quarter horses and mustangs for day-to-day operational chores. Herds are rotated through the various pastures in each of the seven units in accordance with the VAFB Range Management Plan. This rotation system provides the opportunity for plant re-growth, seed production, and seedling establishment after grazing to maintain healthy vegetative communities. Requirements include a minimum residual dry matter level (amount of forage left in pasture after it has been grazed) of 1,000 pounds per acre.

The Air Force installs water troughs by leveling the area with a shovel or a load of gravel. Four holes approximately 2 feet deep are hand dug around the trough to hold it in place and prevent it from being pushed by the cattle. Water is supplied to the trough either from an existing base waterline or from a spring that has a headbox already installed. The headboxes, equipped with a steel screen, fill and drain into a steel pipe laid on the ground surface. If digging is required to connect the headbox to a steel pipe it would measure less than 4 square feet. An escape ramp is attached inside the trough to prevent accidental entrapment of wildlife. Trough maintenance may be needed to prevent significant spillage of water (which may or may not be chlorinated) and potential soil erosion. The Air Force typically cleans out troughs approximately once every 18 to 24 months. Because there are more than 100 troughs on base, escort by a qualified 30 CES/CEI biologist is not possible for every visit; however, grazing management personnel will be briefed and instructed to notify 30 CES/CEI of any significant findings prior to maintaining any trough that has indications of California red-legged frogs being present. The Air Force uses pick-up trucks or ATV-like vehicles to carry materials and maintenance supplies to a site. Likewise, the Air Force conducts fence installation and maintenance driving a pick-up truck, ATV-like vehicle, or tractor along fence lines to distribute materials. A tractor or caterpillar is used when a new fence is installed in heavy brush. Personnel riding horses normally maintain fencing, unless major maintenance is needed such as replacing posts or wire.

The Air Force does not install new access roads within grazing units; however, existing access roads within grazing units are maintained either by the Bureau of Prisons or by the 30 CES/CEI. The access roads range from 8 to 13 feet wide. Maintenance may entail the addition of fill, especially if cultural sites are present in the area, and the use of a grader to level the roads. In areas where access roads are washed out, repairs may require the use of a backhoe to clear blocked culverts or replace damaged culverts.

4.7 Sensitive Species Management

Sensitive species management uses an ecosystem approach because some areas contain more than one species and support multiple activities. The intent of sensitive species management activities are to enhance habitat of a sensitive species or contribute to scientific understanding of its life history and habitat requirements and includes all activities intended to manage sensitive species at VAFB to support the implementation of the Integrated Natural Resources Management Plan (INRMP) and biological opinion requirements. On occasion, a permitted monitor for one species may be required to escort personnel surveying for another species (e.g. surveys for the El Segundo blue butterfly may occur in western snowy plover or California least tern habitat). Researchers would be briefed by 30 CES/CEI biologists prior to fieldwork to make them aware of any potential impacts to sensitive species in the area. Sensitive species management actions could include: removing invasive plant species in dune areas, removing invasive wildlife, prescribed livestock grazing, installing new and maintaining existing fencing in sensitive plant and wildlife areas, collecting native seeds for restoration, and conducting surveys.

5. Fire Management

There are five fire stations operating on VAFB. Stations 1, 2, and 3 are located on north base and stations 4 and 5 are located on south base. Fire management at VAFB is guided by the 2001 Federal Wildland Fire Management Policy that mandates the following priorities:

1. Firefighter and public safety is the highest priority at all times.
2. Ecosystem sustainability, including the interrelated components of ecological, economic, and social components.
3. Integration of wildland fire response with consideration of public safety and welfare, natural and cultural resource protection, and other protected values.
4. Restoration and rehabilitation of all values.
5. Cooperate and protect the Wildland Urban Interface to the fullest extent.
6. Strategy of protection plan to be documented in a Fire Management Plan.
7. Use science and research to provide the basis for a management plan.
8. Fires are to be suppressed at minimum cost.
9. Prevent arson or unauthorized fire ignitions.
10. Standardize funding mechanisms, training, and qualifications, suppression and fuels techniques.
11. Cooperate with partners, especially interagency cooperation.

Air Force activities that affect wildland fire management include the launching and tracking of satellites in space, training missile crews, testing and evaluating ICBM systems, and supporting aircraft tests in the Western Range. Consideration of these activities would impact how and when fire suppression operations and hazardous fuel treatment projects would occur. Historically, human activities, such as power line failures and missile launches have started most fires on VAFB.

Suppression of wildland fires with resulting impacts to listed species would be subject to the emergency consultation procedures, although some fires could result from conducting activities to remove UXO. Much of the coastline is not likely to sustain fires, unless there are unnatural fuels (invasive plants) or heat and ignition sources resulting from Air Force activities. Usually, the maritime influence on VAFB decreases the effects of the summer drought conditions that are prevalent in the rest of Santa Barbara County; however, the fire risk increases in areas that are farther from the fog drip line and as the summer progresses.

Fuels management is a major influence on fire behavior because it modifies the size, arrangement, and kind of vegetative fuels. This modification reduces the ignition potential, flame length, and the heat output of a fire. Fuels management can also be used to protect certain natural resources, such as particular vegetation stands which dry up in summer. It may also be useful in the control of specific invasive species within federally listed species habitat. A system of strategic roads and fire and fuel breaks divide VAFB into six major compartments consisting of 18 units. This system is combined with vegetation treatments to create a mosaic of fuels and age classes within the compartments.

Firebreaks

Firebreaks are used to prevent or hinder the spread of fire and are usually blocks or strips of land cleared to bare mineral soil and are planned, maintained, or rehabilitated to prevent erosion. Approximately 50 miles of existing firebreaks that are 50 to 100 feet wide (300 to 600 acres) are strategically located throughout VAFB, primarily around key assets, active launch facilities, and along the base perimeter.

Fuel breaks are narrower than firebreaks in which the cover of vegetation is manipulated to reduce fuel volume and they can serve as potential fire control lines. Vegetation of lower volume remains to prevent erosion and excessive runoff. The width of a fuel break is site-specific and dependent on fuel type, terrain features, and expected fire weather conditions, especially wind direction and speed. Fuel breaks are usually 9 to 10 feet wide and are generally located near or along an access road. Approximately 20 miles of existing fuel breaks are strategically located on VAFB, totaling up to 24 acres.

As part of wildfire suppression and fuels management activities, the Air Force uses access roads that are single-lane secondary dirt roads (10 to 15 feet wide) to access remote portions of the base. These roads are used to break-up contiguous fuel loads and provide a line of defense to execute fire-fighting actions. The Air Force maintains approximately 185 miles (224 to 336 acres) of these roads on VAFB once a year, after the rainy season.

For certain fuel-reduction projects, mastication may be used. The result of the mastication is about a 6-inch mulch layer left in place on top of the soil. This mulch is left in place to limit the amount of invasive weeds that establish within the area and to assist in erosion control.

6. Environmental Review Process

The Environmental Review process internal to VAFB personnel is designed to alert the 30 CES/CEI of activities with the potential to affect sensitive resources. Most routine maintenance, development and inspection activities on VAFB require natural resources approval through a process managed by the Base Civil Engineer. Project proponents begin this approval process with an Air Force work order submitted to the Comprehensive Planning office. Before the planning office can authorize the action, a 30 CES/CEI biologist must review all projects that may negatively impact natural resources, including ground disturbing activities and projects for which permits, clearances, or surveys may be required. The review process is adapted as needed as new concerns are identified.

The objectives of Environmental Review are to: (1) alert the 30 CES/CEI of proposed projects that may adversely affect sensitive resources, (e.g. listed species, cultural resources, waters or wetlands, contaminated sites, or projects with the potential to result in hazardous waste generation or spills); (2) ensure 30 CES/CEI assesses proposed projects through site surveys and (or) referencing GIS databases or other sources of information to identify resources that may be affected; (3) alert the project proponent of potential adverse effects of a proposed project and the

required and (or) recommended mitigation, minimization, and avoidance measures; (4) identify and prepare environmental documentation, including but not limited to, a National Environmental Policy Act Record of Consideration, Environmental Assessment, or Environmental Impact Statement; and (5) determine if the project has no effect on listed species, if the project is allowed under this or another existing biological opinion, or if the project requires an independent formal or informal section 7 consultation.

7. Avoidance and Minimization Measures

As part of its routine operations and maintenance activities, the Air Force will implement a variety of measures that are intended to avoid or minimize the adverse effects of all the proposed project activities on the aforementioned federally listed species. This programmatic biological opinion contains diverse project activities and multiple species that require differing conservation strategies; therefore, the measures are arranged to include (1) base-wide best management practices that the Air Force will implement for all project activities conducted under this biological opinion, and (2) species-specific measures that the Air Force will implement to reduce adverse effects to each species.

7.1 Base-wide Best Management Practices

1. Through the internal project review process at VAFB, 30 CES/CEI biologists will identify projects that meet the scope and intensity of the anticipated work described in this programmatic consultation prior to any project activities commencing.

2. Qualified biologists will conduct pre-activity surveys at each project site for all project activities that may affect the federally listed species analyzed within this biological opinion.

3. Qualified biologists will brief all project personnel prior to participating in activities included in this biological opinion annually or on an as-needed basis. At a minimum, the briefing will include a summary of the proposed actions, a description of the federally listed species that may occur in the project area, and a summary of the measures that the Air Force will implement to avoid or minimize the adverse effects to the federally listed species within a projects' footprint.

4. Prior to conducting any project activities, a qualified biologist will clearly mark sensitive species habitats within the project site and the immediate area to prevent workers or equipment from adversely affecting species or habitats that are not expected to be damaged during the project.

5. The Air Force will minimize the footprint of proposed projects to the maximum extent practicable.

6. The fueling of vehicles and equipment will occur on impervious surfaces to the maximum extent practicable. Spill containment equipment will be present at all project sites where fuels or other hazardous substances are brought to the site. In addition, qualified personnel will conduct daily inspections of the equipment and the staging and maintenance areas for leaks of hazardous substances.

7. When it is not practical to stage or operate project vehicles or equipment on paved or existing roadways and trails, the Air Force will stage and operate vehicles and equipment on nonnative vegetation to the maximum extent practicable.

8. The Air Force will utilize the most suitable vehicle to minimize erosion potential and will adhere to delineated access routes.

9. The Air Force will apply all herbicides in accordance with the pesticide label and Department of Defense recommendations. All applications within or adjacent to aquatic resources will use appropriately labeled products only. All pesticides applied will be DOD approved.

10. Sites for invasive species treatment and (or) removal will usually be in the nearest appropriate area in relation to the project site and will be selected by a qualified biologist from 30 CES/CEI.

11. Feral pig removal efforts will be coordinated with 30 CES/CEI biologists to avoid damaging listed plant species and their suitable habitat.

12. If project activities affect native habitat, and at the discretion of 30 CES/CEI botanist, native seeds will be planted in the disturbed area after the completion of project activities. A biodegradable material may be used to cover the seeds to prevent erosion. Additionally, native vegetation may be removed before beginning the project activities, be mulched, and spread over the native seed mix.

13. VAFB has identified six nonnative invasive plant species as having the most impact or potential impact upon their native ecosystems: veldt grass, jubata grass, European beachgrass (*Ammophila arenaria*), cape ivy (*Delairea odorata*), iceplant, and eucalyptus. The Air Force is presently collecting information regarding the distribution of these species to incorporate into the VAFB Geographic Information System (GIS). Chemical control of nonnative species will follow label directions and pest management requirements, and will incorporate the following guidelines:

    a. Brief personnel prior to invasive species control efforts to familiarize them with all sensitive species.

b. Removal of invasive species would occur within, nearby, or adjacent to occupied areas of affected federally listed species at ratios specified per species, as stated in section 7.2 below.
c. Limiting heavy equipment used in control efforts to existing roads and trails (i.e. use of sprayers attached to 100-foot extension hoses or backpack sprayers for remote areas).
d. Limiting drift of chemicals by not spraying when wind speeds exceed 10 miles per hour or as indicated by label instructions.
e. Mixing of chemicals in non-sensitive areas, in accordance with the VAFB Integrated Pest Management Plan.

14. The Air Force will implement best management practices (BMPs) that are appropriate to the site and situation to reduce soil erosion, sedimentation, and adverse effects to water quality.

15. The introduction of nonnative fish species into streams is prohibited and nonnative fish species will be removed from streams to the maximum extent practicable.

16. Grazing will be managed in part to promote the conservation and recovery of federally listed species.

17. Project proponents will clean all equipment and vehicles frequently to reduce the spread of invasive plant species.

18. Project proponents will remove garbage at the end of each day or secure it in an approved container; project spoils will be removed from work sites as often as necessary.

19. The Air Force will cover trenches, holes, and pipeline routes at the conclusion of project activities to avoid the entrapment of animals. If a project lasts for more than 1 day, the Air Force will cover these areas or provide an escape route.

20. The Air Force will not conduct BIP actions when the wind speed is in excess of 20 miles per hour, except at the discretion of VAFB Fire Department personnel. Fire prevention measures will be employed prior to conducting BIP actions, including spreading a minimum of 5 gallons of water on nearby vegetation (unless fuel moisture is determined to be sufficient by appropriately trained Fire Department personnel), maintaining a fire extinguisher at the closest safe distance, and having a fire truck or water truck on stand-by at the nearest existing paved or unpaved road. When a deflection device such as sand bags is required to minimize the explosion effects to buildings and infrastructure, the contents of sand bags will consist of the same general soil type as the habitat that is adversely affected. In addition, prior to conducting a BIP action in occupied habitat of a federally listed species, a qualified biologist that has knowledge of the species that the BIP action may affect, will provide recommendations to project personnel on how to minimize the impacts of the BIP action.

21. To the maximum extent feasible, projects at VAFB will be scheduled to avoid sensitive breeding/blooming seasons in habitat occupied by federally listed species. The following actions may occur year-round and in any location: space and missile launches, security and antiterrorism operations; emergency utility repair; IRP monitoring activities; sensitive species management; firebreak maintenance; and mowing/landscaping activities around launch sites to provide safety and security for launches.

22. If the launch frequency increases to more than 12 combined rocket launches from SLC-2, SLC-4, LF-576E, and TP-01 between March 1 and September 30, all subsequent launches will be monitored to determine adverse effects to the western snowy plover at Minuteman, Wall, and Surf Beaches.

7.2 Species-specific Measures

Vandenberg Monkeyflower

1. When practicable, the Air Force will not conduct project activities in areas occupied by Vandenberg monkeyflower. The Air Force will minimize impacts to suitable habitat by either confining the work to existing disturbed areas or rerouting the project area to avoid the habitat completely. Methods to minimize disturbance to occupied habitat include: (a) when practicable, relocate or redesign projects to avoid the sensitive areas completely; (b) use low impact equipment, such as hand tools and rubber-tired vehicles to minimize disturbance, and (c) install temporary or permanent fencing to delineate and keep personnel and equipment out of areas of high habitat value that consists of intact chaparral or native species habitat.

2. Any ATV used within suitable Vandenberg monkeyflower habitat will be cleaned prior to entering.

3. All minor construction projects (described in section 3.2) within any areas occupied by Vandenberg monkeyflower will be restricted when feasible.

4. When maintaining firebreaks within suitable monkeyflower habitat, the Air Force will clean equipment prior to entering any firebreak segments where veldt grass is absent.

5. Established roads, both paved and unpaved, will be used to the maximum extent practicable as fire lines. In areas where this is not possible, preexisting disturbed areas will be used to the maximum extent practicable. A GIS layer incorporating all potential suitable habitat areas will be available to fire response crews for use during actual fire events.

6. The Air Force will collect the topsoil whenever any covered activity will disturb less than 108 square feet (10 square meters) of habitat occupied by Vandenberg monkeyflower.

When feasible, the topsoil should be salvaged after seed set and spread in a nearby area within suitable habitat.

7. Removal of invasive plants after project implementation will occur in areas adjacent to high quality Vandenberg monkeyflower habitat. The removal of invasive plants will occur on a 2:1 basis (habitat enhanced: habitat affected).

8. The Air Force will conduct surveys for Vandenberg monkeyflower, contingent upon funding, in suitable habitat areas at least once every 3 years.

Beach Layia

1. The Air Force will monitor the beach layia population for the first two launches of any launch vehicle from SLC-4 that uses solid rocket motors or boosters. Monitoring will include: (a) testing for acid cloud deposition on beach layia or within the habitat using strips of pH paper during the launch event, or (b) conducting pre- and post-launch monitoring for stippling of leaves, necrotic lesions, and general plant vigor of beach layia, or plants with similar morphological characteristics within the habitat if individual beach layia plants are absent.

2. The Air Force will minimize access and the area of disturbance of maintenance activities to within 10 feet of the utility or infrastructure within occupied habitat. Any maintenance of Coast Road will require work activities to remain within the road footprint to the maximum extent practicable.

3. The Air Force will install fencing or similar barriers to prevent the removal, disturbance, or unauthorized vehicle entry into areas if additional populations near mowed roadsides are discovered. A portion of the area occupied by beach layia is currently fenced along the roadside to prevent mowing.

4. If the removal of the seed bank is expected to occur in occupied habitat, the Air Force will collect the topsoil containing seeds, set it aside, and spread it near the project area or in adjacent suitable habitat.

5. For project-related disturbances, the Air Force will remove invasive plant species at a 2:1 ratio (habitat enhanced: habitat affected).

6. The Air Force will conduct surveys, contingent upon funding, in suitable habitat areas at least once every three years during germinating and through the fruiting period (February through September). The surveys will focus in areas between Ocean Avenue and Honda Canyon based on habitat and soil characteristics.

Gaviota Tarplant

1. Projects that do not require the excavation of soil will be implemented primarily after the Gaviota tarplant has senesced and set seed; however if the ground is wet or project activities occur while plants are flowering, the disturbance will be minimized.

2. Clearing vegetation in non-developed areas will occur primarily after seed has set and before the rainy season. The 30 CES/CEI biologist(s) will verify when a particular area has gone to seed and inform project proponents and contractors of the optimal period to work in the subject area; however, project activities may occur while the ground is wet or while the plants are flowering.

3. Where projects would create a temporary soil disturbance, the Air Force will preserve the seed bank by scraping the top soil, setting it aside, and replacing it after completing a project; or the method resulting in the least disturbance to soil will be implemented (i.e. slicing a cable trench while laying down cable without a vibrator).

4. Removal of invasive plants after project implementation will occur in areas adjacent to high quality Gaviota tarplant habitat. The removal of invasive plants, particularly iceplant and jubata grass, will occur on a 2:1 basis (habitat enhanced: habitat affected).

Lompoc Yerba Santa

1. Maintenance of existing infrastructure requires periodic maintenance in areas of occupied and suitable habitat. The main objective is to avoid any impacts to habitat by either confining the work to existing disturbed areas or rerouting the project area to avoid the habitat completely. Methods to minimize disturbance to occupied habitat include: (a) when practicable, relocating or redesigning of projects to avoid the sensitive areas completely; (b) using low impact equipment, such as hand tools and rubber-tired vehicles to minimize disturbance, and (c) installing temporary or permanent fencing to delineate and keep personnel and equipment out of areas of high habitat value that consists of intact chaparral or native species habitat.

2. Contingent upon funding, the Air Force will conduct surveys for the Lompoc yerba santa at least once every 3 years during the flowering period (May and August). Surveys will focus on areas with high potential for this species to occur based on the habitat and soils where these populations are known to occur.

3. When practicable, the Air Force will restrict all minor construction activities within the occupied habitat and buffer areas that are defined as 100 feet around all known locations.

4. Established roads, both paved and unpaved, will be used to the maximum extent practicable as fire lines. In areas where this is not possible, preexisting disturbed areas will be used to the maximum extent practicable. A GIS layer incorporating all potential

suitable habitat areas will be available to fire response crews for use during actual fire events.

5. For project-related disturbances, the Air Force will remove invasive plant species at a 3:1 ratio (habitat enhanced: habitat affected).

Vernal Pool Fairy Shrimp

1. The Air Force will maintain a GIS database of occupied pools and buffer zones and make the maps available to project proponents as needed.

2. When practicable, the Air Force will avoid working within occupied habitat until the soil is dry to the touch. The following project activities could occur year round: removing unexploded ordnance that is randomly located and not part of MMRP survey efforts, conducting security and antiterrorism operations, repairing utilities when broken or leaking, conducting well monitoring actions as part of IRP activities, grazing on south base, and conducting sensitive species management actions.

3. When paved and unpaved road maintenance activities permanently removes the vegetative buffer between the road and occupied habitat, the area will be reseeded with a seed mixture approved by a 30 CES/CEI biologist and invasive plants will be removed at a 1:1 ratio (habitat enhanced: habitat affected) from a nearby buffer area for temporary disturbances and at a 5:1 ratio for permanent disturbances.

4. The Air Force will not place or transport fill material into occupied habitats or the designated buffer zones, except potentially during the removal of UXO as part of the MMRP actions to protect military assets.

5. The Air Force will place appropriate sedimentation barriers down-slope of a project site and place construction fencing or other appropriate protective fencing around pools. Fencing will be used in locations where project equipment and (or) personnel is situated adjacent to, or in the near vicinity of, occupied fairy shrimp habitat.

6. If project activities result in the alteration of the hydrological integrity of a buffer zone, the Air Force will restore the topography to allow the lateral movement of water to occupied habitats. Altering the topography of occupied habitat is unlikely; however, if this occurs, the area of impact will be reevaluated for two seasons with at least average rainfall to determine if the effects are permanent or temporary.

7. When digging is required within occupied habitat during the dry season; the cyst bank will be temporarily removed before the project begins. Using a hand trowel, a one liter sample per pool/swale of the top 1 to 3 centimeters (cm) (0.4 to 1.2 inches) of pool sediment will be collected. Whenever possible, soil samples shall be collected in chunks to best protect the cysts. Soil samples containing any residual moisture initially shall be

adequately ventilated and allowed to air dry thoroughly before storage of the sample. The bags containing the soil samples shall be kept out of direct sunlight in order to avoid excessively heating the sample. After the project is completed, the samples will be placed back into the pool.

8. If permanent loss occurs in occupied pools, the pool will be replaced at a 1:1 ratio (habitat enhanced: habitat affected) with an occupied pool. Cysts from a known occupied pool may be used to seed the new pool's cyst bank. Narlon Loamy sand may be taken from an area that is not occupied and is outside of the buffer zones. Once the pool is created, the Air Force will monitor it for 3 years to ensure success.

9. If any of the following activities occurs in occupied habitat or the buffer zone, the Air Force will conduct protocol level surveys within 1 year to determine if the effect of these actions is permanent or temporary: UXO is detonated, access routes that were required for disposal alter the topography, or any fill material is placed within these areas.

10. During routine security and antiterrorism patrols, security forces using vehicles and ATVs will stay on the existing paved and unpaved roads. However, patrols may need to respond to law enforcement incidents or anti-terrorism activities that require them to drive off existing roadways and possibly through occupied habitat. If this occurs, they will notify a 30 CES/CEI biologist within 48 hours after driving through occupied habitat.

11. No ATVs or carts will be driven in the occupied pools during MMRP activities. When ATVs are used in the buffer zones surrounding occupied habitat, they will be used when the topography is level and will not alter the hydrology of the pools.

12. The release of mosquito fish into occupied habitat is prohibited.

El Segundo Blue Butterfly

1. The Air Force will maintain a GIS database of butterfly point locations, suitable habitat, and areas surveyed. The 30 CES/CEI biologist will provide maps of the occupied areas to project proponents, the VAFB Fire Department, and other organizations as deemed appropriate.

2. Contingent upon funding, service-approved biologists will conduct surveys in suitable habitat areas during the flight season to refine habitat suitability of the butterfly. The Air Force and Service will annually review survey results and continue to discuss the need for future survey efforts.

3. When practicable, project activities will avoid working within habitat known to be occupied from June 1 through September 15. The following project activities could occur year round: conducting unplanned security and antiterrorism operations, repairing

utilities when broken or leaking, monitoring wells as part of IRP activities, grazing on south base, conducting sensitive species management actions, and fire management.

4. During routine security and antiterrorism patrols, security forces using vehicles and ATVs will stay on the existing paved and unpaved roads. However, patrols may need to respond to law enforcement incidents or anti-terrorism activities that require them to drive off existing roadways and possibly through occupied habitat. If this occurs, they will notify a 30 CES/CEI biologist within 48 hours after driving through occupied habitat.

5. The Air Force will only plant buckwheat varieties that are native to VAFB.

6. The Air Force will enhance habitat at a 3:1 ratio (habitat enhanced: habitat affected) for adverse effects to occupied El Segundo blue butterfly habitat. Enhancement will occur in suitable but not known to be occupied habitat that is nearby occupied habitat. Enhancement activities will include herbicide treatment and hand removal of invasive species, planting native seedlings, and sowing native seed. The Air Force will implement these actions contingent upon funding.

7. Herbicides will not be applied in occupied habitat during the flight season (June 1 through September 15), and will not be applied within suitable but not known to be occupied habitat between August 1 and September 15, when diapausing pupae are most likely to be above ground. Only certified herbicide applicators with the capability of identifying seacliff buckwheat will apply herbicides in suitable habitat. To minimize herbicide drift when applying herbicide within suitable habitat (occupied or not known to be occupied), treatments within 10 meters of any seacliff buckwheat plants would be performed with the truck-mounted sprayer pressure reduced by at least 25%; areas within 1 meter of any seacliff buckwheat will only be treated by applying a slow trickle of herbicide, during cool to cold conditions with little to no wind.

8. Service-approved biologists could collect up to 10 pounds of native seed annually to be used for sowing and propagating up to 2,500 buckwheat seedlings. During previous seed collection, the Air Force has collected only a small fraction of the seed produced by a given stand and no bushes were entirely denuded of seed.

9. When practicable, ATVs or carts will not be driven through coast dune scrub vegetation, chaparral, or riparian woodland vegetation except during the following circumstances: conducting search and rescue operations and emergency response actions, conducting unplanned security and antiterrorism operations, or repairing utilities when broken or leaking.

California Red-legged Frog

1. When practicable, the Air Force will schedule activities that may affect California red-legged frogs outside of the peak breeding period season (November through March). The following project activities could occur year round: conducting search and rescue operations and emergency response actions; conducting unplanned security and antiterrorism operations; conducting well monitoring actions as part of IRP activities; repairing utilities when broken or leaking; and grazing and livestock operations, excluding non-emergency trough and head box maintenance.

2. When feasible, construction or ground disturbing projects will avoid California red-legged frog habitat (i.e. bore underneath habitat). The 30 CES/CEI biologist will determine the feasibility in consultation with the project proponent.

3. Prior to conducting construction activities, a Service-approved biologist will conduct daily pre-project surveys, and relocate all life stages of California red-legged frogs found within the project area to the nearest suitable habitat outside of the project area but within the same watershed.

4. Stream contours will be returned to their original condition at the end of project activities, unless it is determined by the 30 CES/CEI biologist that it is not feasible or beneficial to the species.

5. If temporary dewatering is required, the intakes of diversion pipes will be screened with a mesh not to exceed 0.125 inches. Water will be released downstream of the project area at an appropriate rate to maintain downstream flows.

6. When herbicide application occurs during the breeding season and within riparian habitat, surveys will be conducted to ensure there are no egg masses or tadpoles within 100 feet downstream or downslope of the application area.

7. When practicable, equipment maintenance and refueling will be conducted at least 250 feet away from riparian habitats and wetlands.

8. Service-approved biologists will permanently remove introduced nonnative species found within California red-legged frog habitat during specific project activities to the extent possible.

9. Grazing will be managed to maintain or improve riparian conditions and will consider potential benefits to California red-legged frogs.

10. Post-project restoration activities will consider potential benefits to California red-legged frogs. The restoration of areas may occur during the rainy season; however, if seeding must occur in the dry season, extra thick hydromulch or watering is recommended. In

unimproved areas, the seed mix shall be approved by 30 CES/CEI. It may also be desirable to set aside the first four inches of topsoil as a seed base.

Tidewater Goby and Unarmored Threespine Stickleback

1. When practicable, the Air Force will not conduct project activities during the peak breeding periods within occupied tidewater goby habitat from April through July, or during peak breeding periods within occupied unarmored threespine stickleback habitat from March through July except during the following circumstances: conducting search and rescue operations and emergency response actions, conducting unplanned security and antiterrorism operations, repairing utilities when broken or leaking, or conducting sensitive species management activities.

2. Two days prior to beginning project activities in occupied habitats, the Air Force will install nets with mesh no larger than 0.125 inch to exclude tidewater gobies and unarmored threespine stickleback from the project area. These nets will be set up within the main channel of the creek 50 feet upstream and 50 feet downstream of the project area. These nets will be removed immediately following the completion of project activities.

3. A Service-approved biologist will relocate all tidewater gobies and unarmored threespine stickleback observed within the project site to suitable habitat immediately downstream of the project site.

4. A Service-approved biologist will monitor the project area every work day, including the exclusion nets, until all tidewater gobies and unarmored threespine sticklebacks are removed from the work site. At that point, the Service-approved biologist may appoint project personnel to periodically monitor the exclusion nets for the duration of the project; however, the Service-approved biologist must be on-call for immediate assistance, if needed, until project completion.

5. If temporary dewatering is required, the intakes of diversion pipes will be screened with a mesh not to exceed 0.125 inches. Water will be released downstream of the project area at an appropriate rate to maintain downstream flows.

6. When practicable, project equipment and holding tank storage, maintenance and refueling will be conducted at least 250 feet away from habitat that is occupied by the tidewater goby or unarmored threespine stickleback, in pre-designated areas approved by the 30 CES/CEI.

7. The Air Force will minimize the disturbance and removal of native willow riparian woodland and freshwater marsh vegetation.

8. The Air Force will return stream contours to their original condition at the end of project activities, unless 30 CES/CEI determine that it is not feasible or beneficial to the species.

9. Prior to conducting project activities in occupied tidewater goby or unarmored threespine stickleback habitat, the Air Force will develop a contingency plan for the recovery and salvage of these species in the event of an accidental toxic spill or dewatering.

10. Use appropriate drainage techniques to prevent the formation of erosion gullies due to focused flow within stream channels. The effectiveness of drainage techniques will be evaluated after rain events and additional BMPs will be implemented as needed.

11. If the Air Force determines at any point during a project that excavation may cause a release of contaminated water into San Antonio Creek, they will halt the project pending further evaluation by the Air Force and Service.

California Least Tern

1. A Service-approved biologist will monitor all project activities in occupied areas during the breeding season to avoid adverse effects on breeding success.

2. The Air Force will maintain the existing electric fence at the Purisima Point nesting site.

3. When practicable, the Air Force will not conduct ground-disturbing projects in breeding areas between March 1 and September 30 except during the following circumstances: repair and maintenance of existing signage and fencing, and conducting search and rescue operations and emergency response actions.

4. For projects that occur within the Santa Ynez River, San Antonio Creek, or their tributaries, the Air Force will follow the best management practices, described above, in the design and implementation of project activities to prevent downstream transport and deposition of project-generated sediments.

5. All non-mission essential aircraft must maintain a minimum altitude of 1,900 feet at Purisima Point and the neighboring terrain along the shoreline to LF-576E from 1 March through 30 September. Specific flight operations discussed in the Description of the Proposed Action (including security, search and rescue and antiterrorism actions) may necessitate actions not in accordance with the parameters described above.

6. Service-approved biologists will monitor nesting least terns to assess potential adverse effects on reproductive success from space vehicle launch programs from SLC-2, SLC-4 and LF-576E. Monitoring will consist of two pre-launch and two post-launch population surveys in least tern habitat closest to the launch facility. In addition, the Air Force will monitor at the Santa Ynez River mouth during the first three launches from SLC-4 when terns are present. Nesting least terns will be video recorded during diurnal launches that

originate from SLC-2 and LF-576E to document their reaction to launches. The biologists will select a representative area that minimizes additional disturbances to nesting least terns. Depending on results, video recordings will be conducted until the Air Force and Service reach a mutual agreement regarding the impacts to this species.

Western Snowy Plover

1. A Service-approved biologist will monitor all project activities in occupied habitat areas during breeding season to avoid adverse effects on breeding success.

2. When practicable, the Air Force will not conduct ground-disturbing projects in snowy plover breeding areas between March 1 and September 30 except during the following circumstances: repair and maintenance of existing signage and fencing that demarcates the closed beach areas during snowy plover breeding season, and conducting search and rescue operations and emergency response actions.

3. Between March 1 and September 30, Service-approved biologists will monitor snowy plovers to assess potential adverse effects on reproductive success from rocket launches. The Air Force will monitor the first two launches of new or louder space vehicle launch programs from SLC-2, SLC-3, TP-01, and LF-576E, and the first three launches of any launch vehicle from SLC-4. Monitoring will consist of two pre-launch and two post-launch population surveys in the snowy plover habitat area nearest to the SLC or LF. For daytime launches, if launch safety restrictions allow it and a snowy plover nest is present within the habitat area being surveyed, the Service-approved biologist will monitor the nest during the launch to record any abnormal behavior by incubating adults. If safety dictates that a Service-approved biologist cannot be within a reasonable distance to observe the plover's reaction, the biologists will use video recording equipment to record the reaction of the plovers.

4. Routine flight operations will be restricted along the coast from Minuteman Beach to 3.7 miles south of the Santa Ynez River, and Jalama Beach. A 500-foot minimum altitude requirement is in effect year round in these areas. All non-mission essential aircraft must maintain a minimum altitude of 1,900 feet at Purisima Point and the neighboring terrain along the shoreline to LF-576E from 1 March through 30 September. Specific flight operations discussed in the Description of the Proposed Action (including security, search and rescue and antiterrorism actions) may necessitate actions not in accordance with the parameters described above.

5. Security patrols and safety ground reconnaissance activities performed by Security Forces and Conservation Law Enforcement Officers will be conducted by foot or horseback and restricted to wet sand in closed areas to the maximum extent practicable. During the breeding season all-terrain vehicles (ATVs) will only be used in emergency situations when human health and safety is at risk and/or is construed to be mission essential. ATV use will be restricted to wet sand areas of the beach and a 15 mph speed

limit will not be exceeded. During the non-breeding season ATVs may be used on the beach for beach clean-up efforts and to patrol for poachers; however the 15 mph speed limit will still be imposed to minimize adverse effects to wintering plovers.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY DETERMINATION

Section 7(a)(2) of the Endangered Species Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02).

The jeopardy analysis in this biological opinion relies on four components: (1) the *Status of the Species*, which evaluates the range-wide condition of the Vandenberg monkeyflower, beach layia, Gaviota tarplant, Lompoc yerba santa, vernal pool fairy shrimp, El Segundo blue butterfly, California red-legged frog, tidewater goby, unarmored threespine stickleback, California least tern, and western snowy plover, the factors responsible for that condition, and the species' survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of these species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of these species; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on these species; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on these species.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the current status of each of these species, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of these species in the wild.

STATUS OF THE SPECIES

Vandenberg Monkeyflower

We proposed the Vandenberg monkeyflower to be listed as an endangered species under the Act on October 29, 2013 (78 FR 64840) and designated the species as endangered on August 26, 2014 (79 FR 50844). We designated critical habitat for Vandenberg monkeyflower on August 11, 2015 (80 FR 48142), but exempted habitat within VAFB based on the implementation of conservation measures in the Air Force's Integrated Natural Resource Management Plan (INRMP).

The Vandenberg monkeyflower is a small, annual herbaceous plant that grows from 0.5 to 10 inches tall that may have wide fluctuations in population numbers from year to year. Seeds germinate during winter rains, typically between November and February (Thompson 2005), which is similar to other small annual species that grow in sandy openings in chaparral and are

adapted to the Mediterranean climate zone of California. Vandenberg monkeyflower blooms from late March through June with fruits maturing from late April through July (Thompson 2005), although this species needs early rainfall along with continued rains in late winter or early spring for a substantial number of seeds to germinate, and do not respond well when only later rainfall is available (Thompson 2005; Fraga pers. comm. 2012). The annual differences in the numbers of individuals of above-ground plants indicate the presence of a seed bank. The large size of the flower relative to the size of the plant suggests that Vandenberg monkeyflower typically breeds through outcrossing and is dependent on pollinators to achieve seed production (Fraga pers.comm. 2012). Species of *Diplacus* are predominantly bee-pollinated, although the genus also includes species that are pollinated by hummingbirds, hawk moths (Sphingidae), beeflies (Bombyliidae), and other flies (order Diptera) (Wu et al. 2008). The most important class of pollinators are likely small- to medium-sized solitary bees.

Vandenberg monkeyflower is currently only known to occur at low elevations and close to the coast in a distinct region in western Santa Barbara County known as Burton Mesa (Wilken and Wardlaw 2010). Burton Mesa is a physiographic region situated between the Purisima Hills to the north and the Santa Ynez River to the south and supports a mosaic of several native vegetation types, including maritime chaparral, maritime chaparral mixed with coastal scrub, oak woodland, and small patches of native grasslands (Wilken and Wardlaw 2010). The maritime chaparral on Burton Mesa is referred to as Burton Mesa chaparral (Odion et al. 1992; Sawyer et al. 2009), and is dominated by evergreen shrubs and scattered multi-trunked *Quercus agrifolia* (coast live oak) [which is an important dominant in many places] that form open stands to almost impenetrable thickets over large areas of Burton Mesa (Gevirtz et al. 2007). The vegetation transitions to coastal sage scrub habitat as it nears the ocean and into other terrestrial habitats east of Purisima Canyon on the eastern side of La Purisima Mission State Historic Park (SHP) (Gevirtz et al. 2005).

Within a given substrate, the chaparral composition is a reflection of stand age or shrub canopy cover, disturbance history (whether the area was cleared in the past or nonnative species were planted), history of wildfire, and distance from the coast (Davis et al. 1988; Gevirtz et al. 2007). The overall structure of Burton Mesa chaparral, and thus Vandenberg monkeyflower habitat, is a mosaic of vegetation patches interspersed with sandy openings (canopy gaps) that varies from place to place and would likely shift over time because individual shrubs continue to mature and increase in cover or die, creating temporary gaps in the shrub canopy.

Vandenberg monkeyflower does not grow beneath the canopy of shrubs or oaks, but rather in the sandy openings that occur between shrubs. Sandy openings are noted for their high abundance and diversity of annual and perennial herbaceous species in comparison to those found in the understory of the shrub canopy (Hickson 1987, Davis et al. 1989; Keeley et al. 1981; Horton and Kraebel 1955).

Vandenberg monkeyflower is currently known to be extant at nine occurrences (locations): Four occurrences on Vandenberg Air Force Base; two occurrences on Burton Mesa Ecological Reserve (Reserve); one occurrence that is spread across private land and the Reserve; and two

occurrences on La Purisima Mission State Historical Park (SHP). One additional location is potentially extirpated on the Reserve. Because Vandenberg monkeyflower likely persists as a metapopulation within the mosaic structure of the habitat, and portions of Burton Mesa are inaccessible and difficult to survey, Vandenberg monkeyflower has the potential to occur in areas where it has not yet been observed. However, not all sandy openings (canopy gaps) appear to be currently suitable because structurally some seem more consolidated and currently do not support this species (Rutherford *in litt.* 2012).

The amount of Vandenberg monkeyflower habitat currently available has decreased over time. Prior to 1938, approximately 23,550 acres of maritime chaparral was present on Burton Mesa (Hickson 1987). In 2012, we estimated that approximately 10,057 acres of maritime chaparral habitat remain on Burton Mesa, which represents a loss of 53 percent of the original upland habitat (78 FR 64840).

Most of the historical loss of Burton Mesa chaparral was due to military, residential, and commercial development that occurred in the past and resulted in many developed areas that have existed for decades. The majority of remaining habitat where Vandenberg monkeyflower occurs is federally- (VAFB and U.S. Department of Justice) and State-owned lands (Reserve and SHP) and is relatively protected from development. Large-scale future development is not likely to occur and thus is not a significant threat to Vandenberg monkeyflower. However, smaller scale private property development; access to easements; maintenance of utility, oil, and gas pipelines; fire and fire suppression activities; and authorized and unauthorized recreational activities (e.g., mountain biking and off-road vehicle use) may continue to take place throughout Burton Mesa and threaten Vandenberg monkeyflower.

Currently, the most significant threat to the Vandenberg monkeyflower is loss of habitat due to the presence and expansion of invasive, nonnative plants. Nonnative annual species that are known to occur in Vandenberg monkeyflower habitat include (but are not limited to): ripgut brome (*Bromus diandrus*) and smooth cat's ear (*Hypochaeris glabra*) (Meyer pers. comm. 2010). Nonnative perennial species include: veldt grass, iceplant, Sahara mustard (*Brassica tournefortii*), and jubata grass. Many of the nonnative species that occur on Burton Mesa are species deemed to pose significant ecological concerns because they outcompete and displace native vegetation.

We have not prepared a recovery plan for this species. Therefore, we have no recovery criteria with which to compare the current and future status of the species. In the absence of a recovery plan, we default to the general conservation of the species, and recovery would focus on determining the species' distribution and the conservation of much of the remaining habitat that supports the species. In general terms, where suitable habitat exists, it should be conserved and, where possible, degraded habitat should be restored.

Beach Layia

Beach layia is a small, succulent plant in the sunflower family (Asteraceae) that was listed as endangered on June 22, 1992 (57 FR 27848). Critical habitat has not been designated for this plant. Information contained in this account was obtained primarily from the final rule for listing and the Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly (Service 1998a).

Historically, 17 occurrences of beach layia were known from seven dune systems from Santa Barbara County to Humboldt County. Five of the historical occurrences in San Francisco, Monterey, and Humboldt Counties are thought to be extirpated.

The San Francisco Peninsula population occurred on the dune habitat in Golden Gate Park. This population was last collected from that area in 1904 and is assumed to be extirpated because of loss of the dunes to the development of Golden Gate Park and urbanization of San Francisco (California Natural Diversity Database (CNDDB), 2011).

In Monterey County, the Monterey Peninsula dune system had four occurrences, although two have been extirpated, according to the CNDDB (2011). One of the extirpated locations was the type locality at Point Pinos, and the other was at Asilomar State Beach. The population at Asilomar State Beach was rediscovered following the removal of iceplant. Additional occurrences have been discovered on neighboring private property (Service 1998a). Two beach layia populations exist on north Spyglass Hill and on the nearby Spyglass Hill dunes.

The largest populations of beach layia are in Humboldt County. Of the Humboldt County occurrences, three are located on the Samoa Peninsula in the Humboldt Bay dune system, and two have been extirpated. Two other Humboldt County populations include one that is associated with dunes at the mouth of McNutt Gulch and one that is in dunes south of the Mattole River. The two extirpated populations were in the Little River area of Humboldt County; the northernmost population was probably removed when the river mouth naturally meandered north, eliminating the dune flora that was collected by Joseph Tracy in the early 20th century. The other population was extirpated by construction of Highway 101 and invasion of nonnative plant species in the 1960s.

The Marin County populations occur in Point Reyes National Seashore, near the Kehoe Beach Dunes and Abbott's Lagoon. Surveys by California Native Plant Society volunteers have recorded 13 colonies along the dune complex at Point Reyes National Seashore (Norris *in litt.*, 1994 cited in Service 1998a).

A population thought to be extirpated on Vandenberg Air Force Base in Santa Barbara County, was rediscovered in 1995. This is the southernmost occurrence of the species.

The species is restricted to coastal sand dunes, at elevations from 0-100 feet. In northern California it occurs in northern dune scrub community; in Monterey County, the species occurs

in the central dune scrub community. Generally the beach layia occurs behind the northern foredune community, occupying sparsely vegetated open areas on semi-stabilized dunes. The foredune community experiences some drifting sand and has low-growing herbaceous and perennial native species. The beach layia also occurs in open areas, such as along trails and roads. The cover of associated vegetation protects the species from sand dune movement and erosion. Associated species include coast buckwheat, beach pea (*Lathyrus japonicas*), beach sagewort (*Artemisia pycnocephala*), sand-dune bluegrass (*Poa douglasii*), dune goldenrod (*Solidago spathulata*), sand verbena (*Abronia umbellata*), and beach-bur.

This winter annual germinates during the rainy season from fall to mid-winter, blooms from April to June in northern California (March to June on VAFB) and completes its life cycle before the dry season. It tends to grow in patches, and population numbers vary annually (Botanica Northwest Associates 1992). Little or nothing is known about the pollination ecology of beach layia. Threats to beach layia include displacement by invasive, nonnative vegetation, recreational activities by pedestrians and off road vehicles, and urban development.

Gaviota Tarplant

The Gaviota tarplant was federally listed as endangered on March 20, 2000 (65 FR 14888). We designated critical habitat for the Gaviota tarplant on November 7, 2002 (67 FR 67968); VAFB was excluded from this designation under section 4(b)(2) of the Act. The subspecies is also listed by the State of California as endangered.

Gaviota tarplant germinates in response to substantial rainfall. Seedlings have been observed as early as January (URS Corporation 1988). Plants grow through the spring and peak flowering ranges from late May to late July, depending on climatic conditions. By late summer or fall, most plants have died although a few continue to flower and produce seed (All American Pipeline Company (AAPC) 1992). Nearly all plants will have died by mid-October.

As is typical of annual plant species, the number of individuals present above-ground from one year to the next varies dramatically and most likely depends on climatic conditions such as amount and timing of rainfall, and temperature regimes during critical stages of germination and seedling growth. In some years, patches may contain few to no individuals, but a seed bank likely persists in the soil (Howald 1989).

Threats to the Gaviota tarplant include destruction of individual plants, habitat loss and degradation from the development and decommissioning of oil and gas facilities and pipelines, incompatible fire management practices, residential and commercial development, and competition with nonnative weeds (65 FR 14888). Within the last few years, two aggressive nonnative grasses, veldt grass, and harding grass (*Phalaris aquaticus*), have invaded the Gaviota coast and pose a serious threat to Gaviota tarplant and the remaining coastal prairie habitat (Meyer, pers. comm. 2001).

Generally, Gaviota tarplant appears to have few predators. Grazing and browsing animals such as horses, cattle, and deer avoid the strong smelling, resinous plants when feeding. Some predation on immature fruit (usually disk achenes) by small black flower beetles has been noted in wild populations (AAPC 1995).

Gaviota tarplant responds positively to some types of soil disturbance, which may increase seed coat permeability through abrasion. Light disturbance during the dry season such as occasional foot, livestock, or vehicular traffic seem to enhance tarplant growth. This response to disturbance is reflected by its presence along footpaths, livestock trails, and roadsides (URS Corporation 1988; AAPC 1990). More intense disturbance, however, such as excavation of the soil profile, temporarily enhances germination but also may stimulate growth of competitive nonnative species. Disturbance when the soil is wet is likely to kill tarplant seeds as well as young seedlings (AAPC 1995).

At the time the taxon was first described in 1982, Gaviota tarplant was known only from marine terraces in the immediate vicinity of Gaviota with plants only known to occur up to several kilometers in either direction along the immediate coast (Tanowitz 1982). Gaviota tarplant is associated with grasslands comprised of native needlegrass (*Nassella* spp.), nonnative wild oats (*Avena* spp.), ripgut brome, and other herbs and grasses. The grasslands intergrade with coastal sage scrub composed of California sagebrush (*Artemisia californica*), coyote brush (*Baccharis pilularis*), sawtooth golden bush (*Hazardia squarrosa*), and California buckwheat (*Eriogonum fasciculatum*) (California Natural Diversity Database (CNDDB 2007). Gaviota tarplant found on sandy soils associated with marine terraces and uplifted marine sediments ranged from 150 feet in elevation along the lowest terraces to 1000 feet (Hendrickson et al.1998; CNDDB 2001; Dieter Wilken, *in litt.*, 1998). At the higher elevation, the taxon occurs in grasslands above the 700 foot contour line west of Sudden Peak (CNDDB 2001; D. Wilken, *in litt.*, 1998).

When we designated critical habitat in 2002, the Gaviota tarplant was reported to occur on VAFB near Point Arguello and Point Sal. VAFB has been performing base-wide surveys for this species since 2005 and had observed the Gaviota tarplant in various vegetative communities on base. The Gaviota tarplant established in disturbed areas such as mowed road shoulders, borrow pits, firebreaks, and cattle grazed fields where competitive grasses are reduced; however, plants on VAFB identified as the Gaviota tarplant expressed slight characteristic differences from other populations in Santa Barbara County that were not distinguished in the taxonomic key. Introgression with the grassland tarplant (*Deinandra increscens* ssp. *increscens*) was evident, and the two subspecies, Gaviota tarplant and grassland tarplant, often co-occurred on disturbed and undisturbed sites. Regardless of the slight differences and due to the similarity of appearance (section 4(e) of the Act), we managed the plants identified as Gaviota tarplant on VAFB as such, effectively expanding the distribution from the distribution known at the time of listing in 2000 (65 FR 14888).

In 2006 and 2007, Dr. Bruce Baldwin collected samples of Gaviota tarplant for genetic analysis to clarify the distribution of the population because collections of *Dienandra increscens* from outside the Gaviota area express morphological similarities to Gaviota tarplant that had left their

identities uncertain, (i.e., as to whether such plants should be treated as Gaviota tarplant, grassland tarplant, or yet a different taxon). The research focused on resolving the identities of those and other populations and, more broadly, to re-examine the infraspecific taxonomy of *D. increscens* from a molecular phylogenetic perspective.

We will have a formal position consistent with the results of Baldwin's work when we publish the Gaviota tarplant 5-year review. In the interim, the following information is referenced from Baldwin (2007 and 2009), which contains more detailed taxonomic and genetic information pertaining to *Deinandra* spp. that we will not repeat herein.

As a result of Baldwin's research, he concluded that plants treated in The Jepson Manual (Hickman 1993) as *Deinandra increscens* represent both *D. increscens* and *D. paniculata* (in part), and reiterated that two subspecies should be recognized within *D. increscens:* ssp. *increscens* and ssp. *villosa*. Therefore, in central California, *D. paniculata* occurs away from the immediate coast in the outer south Coast Ranges, to the interior of populations of *D. increscens*. By comparison, *D. increscens* occurs along the immediate coast and in areas of strong coastal influence in the outermost south Coast Ranges. The Gaviota tarplant is recognized as having a highly localized distribution in western Santa Barbara County, with seven main populations: Lion's Head (near Point Sal), Point Arguello, Tranquillon Mountain/Sudden Peak, Point Conception, Hollister Ranch, Santa Ynez Mountains, and Gaviota (Consortium of California Herbaria 2010; CNDDB 2010; Baldwin 2009, 2010; Elvin 2007, 2010a, 2010b). Populations may also occur in unsampled locations.

Lompoc Yerba Santa

The Lompoc yerba santa was federally listed as endangered on March 20, 2000 (65 FR 14888). We designated critical habitat for the Lompoc yerba santa on November 7, 2002 (67 FR 67968); VAFB was excluded from this designation under section 4(b)(2) of the Act. The Lompoc yerba santa was listed as rare by the State of California in 1979 (California Department of Fish and Game 1992).

The Lompoc yerba santa is a shrub in the waterleaf family (Hydrophyllaceae) with sticky stems up to 10 feet tall. The sticky leaves are narrowly linear. The head-like inflorescence has lavender corollas that are 0.2 to 0.6 inch long. It is distinguished from related species by its narrow, entire leaves and its head-like inflorescence (Halse 1993). The fruits of the Lompoc yerba santa are 4-valved capsules that are 0.03 to 0.1 inch wide, and contain up to five seeds (Halse 1993); however, seed set is typically much less.

The Lompoc yerba santa occurs in maritime chaparral with bush poppy (*Dendromecon rigida*), scrub oaks (*Quercus berberidifolia* and *Q. parvula*), and buck brush (*Ceanothus cuneatus*), and in southern bishop pine (*Pinus murricata*) forests that intergrade with manzanita (*Arctostaphylos* spp.) and black sage (*Salvia mellifera*) (Smith 1983). These maritime chaparral and bishop pine forests are found inland from the active dunes, where there are remnants of prehistoric uplifted dunes that have formed a weakly cemented sandstone that has weathered to produce a sandy,

extremely well drained, and nearly infertile soil (Davis et al. 1988). Central coast maritime chaparral is considered threatened and sensitive by the California Department of Fish and Game's (CDFG) Natural Heritage Division (Holland 1986). The soils associated with the Lompoc yerba santa are extremely variable, but all tend to be slightly to strongly acidic. Permeability of the soil ranges from low (high clay content), in the Santa Ynez Mountains, to excessively drained (Arnold sands with a low clay content) in the Solomon Hills. The Burton Mesa population occurs on an upper highly permeable soil (Tangair sands) underlain by a shale substrate of low permeability. The Pine Canyon population occurs in the bottom of the drainage in a highly gullied landscape (C. Gillespie, VAFB, pers. comm., 2002).

The four known locations of the Lompoc yerba santa occur in western Santa Barbara County. Two of these locations, composed of three groups, are on VAFB. The other two locations are on private land in the oilfields south of Orcutt, referred to as the Solomon Hills location (comprising one group) and at the western end of the Santa Ynez Mountains (made up of three groups). Based on enzyme analysis, Elam (1994) determined that all of the Santa Ynez Mountains groups, and one of the VAFB groups, were made up of several genetically distinct individuals (genets). Each genet is typically composed of many ramets produced by its spreading root system. A ramet is a general term used to describe above-ground stems for plants that spread vegetatively, regardless of their underground physiological connection. The Lompoc yerba santa also spreads vegetatively through the production of rhizomes. New stems were found to be emerging 100 feet or more away from the nearest visible ramet, suggesting there is a long distance spread of the root system (Diane Pratt and Connie Rutherford, Service, pers. obs., 2002; Chris Gillespie, VAFB, pers. comm., 2002). The other two VAFB groups are composed of a single genet, which is to say that there is only one genetic individual with several above surface ramets encompassing a large area (Elam 1994). The Solomon Hills location was not studied due to inaccessibility.

The Lompoc yerba santa is self-incompatible (i.e., it requires pollen from genetically different plants to produce seed), and its fruits appear to be parasitized by an insect (Elam 1994). Flowers that were intentionally cross-pollinated produced a mean of 1.77 seeds per fruit, while flowers that were intentionally self-pollinated produced an average of 0.03 seed per fruit (Elam 1994).

Incompatible fire management practices (e.g., prescribed fires that are too frequent or poorly-timed), invasive nonnative vegetation, low seed productivity, residential and commercial development, and naturally occurring catastrophic events pose substantial threats to the long-term survival of this species. No known predation threats affect this species.

Central maritime chaparral and bishop pine forest are threatened habitat types with limited distribution and rich in plant species of limited distribution (Holland 1986). Most of the central maritime chaparral has been converted to a variety of land uses and degraded by development, weed invasion, habitat fragmentation, and other factors (Hoover 1970; Davis et al. 1988; Odion et al. 1992; CNDDB 1998). Iceplant invasion threatens to convert the maritime chaparral into a habitat dominated by mats of the exotic succulent (Odion et al. 1992). Iceplant was documented as an invasive in habitat occupied by Lompoc yerba santa following a prescribed fire (Jacks et al.

1984). After establishment, each plant can grow to over 18 feet in diameter (Vivrette 1993), virtually replacing all other vegetation. Veldt grass, seeded in controlled burns and used for soil stabilization at VAFB, has become widespread and naturalized (Smith 1976; Jones and Stokes Associates 1997). These fast-spreading species are difficult to control, particularly after an area has been denuded by wildfire.

The Lompoc yerba santa occupies habitats that experience periodic fires and fire likely plays an important role in the persistence and reproduction of populations of this taxon. Fire cues, such as heat and charate (charred wood) have been found to significantly increase germination of other *Eriodictyon* species (Keeley 1987). If a seed bank remains within a location of the Lompoc yerba santa, it may be expressed following fire; however, if the soil is impoverished, an intense burn that kills existing plants may eliminate an entire clone or population. A study of one of the groups at VAFB showed that this species resprouted successfully from the base of the plant after a prescribed fire; however, several stems died and no seedling recruitment occurred. This is consistent with Jacks et al. (1984) theory that a single genetic, self-incompatible individual would be expected to produce little or no seed. Following a burn in 1999, the group potentially composed of one genet at VAFB expanded from approximately 80 to 150 individual ramets. Since that time, there have been no observations of evidence of seed production at this location (C. Gillespie, *in litt*, 2002).

Wildfire frequencies and intensities are not known, but estimates of historic burn intervals exceed 30 years. The highly fragmented nature of the remaining chaparral habitat has ended the occurrence of large wildfires that burn under natural conditions. Wildfires naturally occur during high wind events that force the fire quickly through a stand of fuel, resulting in short burn durations and generally cooler ground temperatures. The Air Force is developing a prescribed burning plan and will submit it to the Service for review before being implemented.

Some biologists have suggested that disturbance other than fire (*e.g.*, road scraping) favors persistence, growth, and reproduction of populations of the Lompoc yerba santa (Dr. Neil Havlik, botanist, City of San Luis Obispo, *in litt.*, 2002). The population of the Lompoc yerba santa in the Solomon Hills appears to have responded well to ongoing disturbance along roads and near facilities associated with fire control practices (Sue Foley, Nuevo Energy Company, pers. comm. 2002). Such disturbance may encourage stem production and the spread of individual genets; however, road scraping and ongoing maintenance and removal of vegetation for fire control may destroy individual ramets or damage the root structure of Lompoc yerba santa plants. It is not known how these activities may affect sexual reproduction and influence the dispersal and expression of the soil seed bank.

Vernal Pool Fairy Shrimp

The Service listed the vernal pool fairy shrimp as threatened on September 19, 1994 (59 FR 48136). Critical habitat was designated on August 6, 2003 (68 FR 46684), but was remanded on November 2, 2006. The court ordered the Service to reconsider its decision and issue a new critical habitat rule. During this time, the existing critical habitat will remain in place. The

recovery plan for vernal pool ecosystems of California and southern Oregon (Service 2005a) also addresses this species; however, the populations in coastal San Luis Obispo County were not known at the time the recovery plan was made final. The following account summarizes information contained in the final rules for listing and designation of critical habitat, as well as the recovery plan and the vernal pool fairy shrimp 5-year review (Service 2007a).

The vernal pool fairy shrimp is a small freshwater crustacean (0.12 to 1.5 inches long) belonging to an ancient order of branchiopods, the Anostraca. Like other anostracans, it has stalked compound eyes and eleven pairs of phyllopods (swimming legs that also function as gills). The vernal pool fairy shrimp is genetically distinct from other *Branchinecta* species, and is distinguished by the morphology of the male's second antenna and the female's third thoracic segment (on the middle part of its body) (Belk and Fugate 2000, in Service 2005a). The species was first collected between 1874 and 1941, when it was described incorrectly as *Branchinecta colorodensis* (Linder 1941 in Service 2005a). Its identity as a separate species was resolved only in 1990. Subsequent genetic analysis has confirmed that the vernal pool fairy shrimp is a distinct species (Fugate 1992).

The vernal pool fairy shrimp has an ephemeral life cycle and exists only in vernal pools or vernal pool-like habitats; the species does not occur in riverine, marine, or other permanent bodies of water. Roughly 80 percent of observations are from vernal pools (Helm 1998; Helm and Vollmar 2002). When the temporary pools dry, offspring persist in suspended development as desiccation-resistant embryos (commonly called cysts) in the pool substrate until the return of winter rains and appropriate temperatures allow some of the cysts to hatch (Eriksen and Belk 1999). The time to maturity and reproduction is temperature dependent, varying between 18 days and 147 days, with a mean of approximately 40 days (Helm 1998). Individuals hatch from cysts during cold-weather winter storms; they require water temperatures of 50 degrees Fahrenheit (F) or lower to hatch (Helm 1998; Eriksen and Belk 1999). Immature and adult shrimp are known to die off when water temperatures rise to approximately 75 degrees F (Helm 1998). Vernal pool fairy shrimp females produce an unknown number of cysts per clutch over their lifetime. The cysts are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks. Fairy shrimp cysts are capable of withstanding heat, cold, fire and prolonged desiccation and may persist in the soil for an unknown number of years until conditions are favorable for successful hatching. Not all cysts are likely to hatch in a season, thus providing a mechanism for survival if the inundation period is too short in a given year.

Vernal pool habitats form in depressions above an impervious substrate layer, or claypan/duripan, in alluvial fans and terraces that are known primarily from the eastern side of the Central Valley of California (Helm and Vollmar 2002). Due to local topography and geology, the depressions are part of an undulating landscape, where soil mounds are interspersed with basins, swales, and drainages. Both flooding and the movement of wildlife within vernal pool complexes allow fairy shrimp to disperse between individual pools. These movement patterns, as well as genetic evidence, indicate that vernal pool fairy shrimp populations are defined by entire vernal pool complexes, rather than individual pools (King et al. 1996; Fugate

1998). Upland vegetation communities associated with vernal pool fairy shrimp habitat include native and nonnative grassland, alkaline grassland, alkaline scrub, and coastal sage scrub.

The vernal pool fairy shrimp is endemic to California and the Agate Desert of southern Oregon. It has the widest geographic range of the federally-listed vernal pool crustaceans, but it is seldom abundant where found, especially where it co-occurs with other species (Eriksen and Belk 1999). The range of the species extends from disjunct locations in Riverside County and the Coast Ranges, north through Central Valley grasslands to Tehama County, and then to an area of remnant vernal pool habitat in the Agate Desert of Oregon. In general, the vernal pool fairy shrimp has a sporadic distribution within the vernal pool complexes, with most pools being uninhabited by the species (59 FR 48136). The species is typically associated with smaller and shallower vernal pools (approximately 6 inches deep) that have relatively short periods of inundation (Helm 1998) and relatively low to moderate total dissolved solids and alkalinity (Eriksen and Belk 1999); however, at the southernmost extremes of the range, the shrimp is present only in large, deep pools. In some cases vernal pool fairy shrimp will cease to be found in pools where they were formerly found (Jones and Stokes 2005; Eriksen and Belk 1999). Long-distance dispersal of anostracan cysts is thought to be enabled by waterfowl and other migratory birds that ingest cysts, and by animals that provide for movement of mud and cysts in feathers, fur, and hooves (see authors cited in Fugate 1992; Eriksen and Belk 1999; Figuerola and Green 2002). Because the cysts are dispersed by other animals, they can be dispersed into locations that will never provide suitable habitat, or into waters that provide conditions allowing individuals to hatch in some years, but where conditions are not suitable for maintaining viable populations. Elevations at which the species is typically found range from 33 feet to 4,000, although it has been found at 5,600 feet in the Los Padres National Forest.

Anostracans, including the vernal pool fairy shrimp, are non-selective filter-feeders that filter suspended solids from the water column. Detritus, bacteria, algal cells, and other items between $1.2x10^{-5}$ to $3.9x10^{-3}$ (0.3 to 100 microns) may be filtered and ingested. Conversely, fairy shrimp are food for a wide variety of wildlife, including beetles, insect larvae, frogs, salamanders, toad tadpoles, shorebirds, ducks, and even other fairy shrimp.

Maintaining the integrity of surrounding upland habitat is critical to the proper ecological functioning of vernal pool fairy shrimp habitat. Habitat loss and fragmentation is the largest threat to the survival and recovery of vernal pool fairy shrimp and other species restricted to vernal pool and other ephemeral wetland habitats. Habitat loss is generally a result of urbanization, agricultural conversion, and mining although loss also occurs in the form of habitat alteration and degradation as a result of changes to natural hydrology, competition from invasive species, incompatible grazing regimes (including insufficient grazing for prolonged periods), infrastructure projects (e.g., roads, water storage and conveyance, utilities), recreational activities (e.g., off-highway vehicles and hiking), erosion, mosquito abatement activities, climatic and environmental change, and contamination.

El Segundo Blue Butterfly

The El Segundo blue butterfly was federally listed as endangered on June 1, 1976 (41 FR 22041). Critical habitat for the subspecies has not been designated. We issued a recovery plan for the El Segundo blue butterfly on September 28, 1998 (Service 1998b). The El Segundo blue butterfly was formally described by Oakley Shields (1975) based on specimens that had been collected in the city of El Segundo, California.

The El Segundo blue butterfly is in the family Lycaenidae. It is one of five subspecies comprising the polytypic species, the square-spotted blue butterfly *(Euphilotes battoides)*. Like all species in the genus *Euphilotes*, the El Segundo blue butterfly spends its entire life cycle in intimate association with a species of buckwheat, in this case seacliff buckwheat. However, the nearly complete association of all life stages with a single plant is unique among North American butterflies. El Segundo blue butterfly adults mate, nectar, lay eggs, perch, and in most cases probably die on seacliff buckwheat flower heads (Mattoni 1990).

The adult stage of the El Segundo blue butterfly begins in early June and concludes in early to mid-September. The onset of this stage is closely synchronized with the beginning of the flowering season for seacliff buckwheat (Mattoni 1990). Typically, adult females survive up to 2 weeks whereas a male may survive up to 7 days (G. Pratt, Department of Entomology, University of California Riverside, pers. comm. 2006a). Upon emergence as adults, females fly to seacliff buckwheat flower heads where they mate with males that are constantly moving among flower heads (Service 1998b). Eggs hatch within 3 to 5 days. The larvae then undergo four instars to complete growth, a process that takes 18 to 25 days (Service 1998b). By the third instar, the larvae develop honey glands, and are thereafter usually tended by ants (e.g., *Iridiomyrmex humilis*, *Conomyrmex* spp.), which may protect them from parasitoids (e.g., Branchoid wasp (*Cortesia* spp.)) and small predators (Mattoni 1990). The larvae remain concealed within flower heads and initially feed on pollen, then switch to feeding on seeds sometime during the first and second instar (Pratt, pers. comm. 2006a). Larvae are highly polymorphic, varying from almost pure white or yellow to strikingly marked individuals with a dull red-to-maroon background broken by a series of yellow or white dashes (Mattoni 1990). By September, seacliff buckwheat plants have generally senesced and the larvae fall or crawl to the ground and diapause in the soil. They emerge as adults the following June. Some pupae may remain in diapause for 2 or more years (Service 1998b). At least 0.5 inch of rain must penetrate the soil to accumulate enough moisture for the pupae to undergo a life stage change (Pratt, pers. comm. 2006a).

Population dynamics of this species are closely allied with the seacliff buckwheat. Although individual plants may live 20 years or more, young plants generally do not flower until their second year of growth (Arnold and Goins 1987). Juveniles and older plants do not produce as many flowers as middle-aged buckwheat plants, which support the most butterflies (Arnold and Goins 1987). Field observations suggest that most solitary buckwheat plants less than about 5 years of age do not produce enough flowers for larvae to effectively utilize them (Arnold 1983).

Thus, survival of the El Segundo blue butterfly is dependent upon maintenance of middle-aged buckwheat plants, plus recruitment of younger plants to replace older individuals that senesce. The range of seacliff buckwheat is greater than the known range of the El Segundo blue butterfly; seacliff buckwheat occurs from San Diego County to the northern end of Monterey County (Pratt, pers. comm. 2006b). However, the southern extent of the El Segundo blue butterfly's known distribution is Malaga Cove in Los Angeles County; before 2005 when the butterfly was discovered in Santa Barbara County, the northern extent of the subspecies' known distribution was the Ballona Wetlands, which is also in Los Angeles County. The El Segundo blue butterfly appears further limited to areas with high sand content (Service 1998b).

In general, the El Segundo blue butterfly is negatively impacted by competition with non-native vegetation; competition, predation, and parasitism by other insects utilizing seacliff buckwheat; and habitat fragmentation. Relatively fast-growing exotics such as acacia (*Acacia* spp.), iceplant, other buckwheat species (*Eriogonum* spp.), and non-native grasses compete with seacliff buckwheat by inhibiting seedlings from sprouting and maturing to juveniles (Mattoni 1990). Pratt (1987) observed numerous insects living in seacliff buckwheat inflorescences along with El Segundo blue butterfly larvae, including lepidopterous larvae in the families of Cochylidae, Gelechiidae, Geometridae, Riodinidae, and even other Lycaenidae.

Habitat fragmentation is detrimental to small, isolated populations and produces edge effects that facilitate the introduction of invasive plant species that can out-compete and displace seacliff buckwheat. Urbanization and land conversion have fragmented the historic range of the El Segundo blue butterfly such that extant populations now operate as independent units rather than parts of a metapopulation or a single, cohesive, wide-ranging population. Small populations have higher probabilities of extinction than larger populations because their low abundance renders them susceptible to inbreeding, loss of genetic variation, high variability in age and sex ratios, demographic stochasticity, and other random, naturally occurring events such as droughts or disease epidemics (Soulé 1987). Isolated populations are more susceptible to elimination by stochastic events because the likelihood of recolonization following such events is negatively correlated with the extent of isolation (Wilcox and Murphy 1985). Given the low dispersal potential of El Segundo blue butterflies, it is unlikely that this subspecies will naturally recolonize a site.

For several decades following the subspecies' description, the El Segundo blue butterfly was presumed to be endemic to southwestern Los Angeles County in coastal southern California. Museum records reveal that the El Segundo blue butterfly was once widespread on the El Segundo sand dunes and specimens were collected at El Segundo, Redondo Beach, Manhattan Beach, and at several locations on the Palos Verdes peninsula (Donahue 1975). There are known populations at four locations in Los Angeles County: the Ballona Wetlands, the Airport Dunes, the Chevron Preserve, and Malaga Cove. Four recovery units, based on geographic proximity, habitat similarity, and possible genetic exchange, encompass these areas with the known populations and (or) areas with restorable habitat (Service 1998b).

Population in Santa Barbara County

The El Segundo blue butterfly was reported to occur at VAFB in 2005 by Dr. Gordon Pratt and by Dr. Pratt and Dr. Richard Arnold in 2007 (Pratt, pers. comm. 2006a; E. Bell, Vandenberg Air Force Base biologist, pers. comm. 2007), although it is not absolutely clear whether the individuals observed at VAFB are actually the El Segundo blue butterfly or morphologically similar species. Clarifying the taxonomic status of these populations is not trivial as *Euphilotes* is a diverse genus with known cryptic speciation (i.e., some species are very similar morphologically) (Mattoni 1988). Wing characters are notoriously unreliable due to individual variability so single individuals usually cannot be confidently determined without other clues such as location, flight season, and larval host plant (G. Ballmer, Department of Entomology, University of California Riverside, pers. comm. 2006). Given the geographic separation between VAFB and the El Segundo Dunes (approximately 120 miles) and the relatively limited dispersal capability of El Segundo blue butterflies, it is possible that the butterflies observed at VAFB are not El Segundo blue butterflies but rather an undescribed species. Conversely, it is also possible that suitable habitat for the El Segundo blue butterfly was once contiguous from the El Segundo sand dunes to Santa Barbara County and has been displaced in some areas by development and other anthropogenic causes resulting in a disjunction in the species' distribution. Based on wing morphology, flight period, genitalia, and host plant association; these individuals were determined to be more similar to the El Segundo blue butterfly than to any other known *Euphilotes battoides* group taxon (Ballmer, pers. comm. 2006; Pratt, pers. comm. 2006c).

Butterflies in the genus *Euphilotes* can be very similar morphologically yet significantly different genetically (Mattoni 1990; Pratt 1994). To try to conclusively determine the identity of these butterflies, individual male butterflies were collected to compare the genetic signatures among the butterflies from VAFB with known El Segundo blue butterflies. We have reviewed the results of the genetic study and determined that the resulting information was not conclusive enough to make a determination that the butterfly in question is not the El Segundo blue butterfly. Therefore, we consider this species to be the El Segundo blue butterfly until we receive definitive information demonstrating otherwise.

Based on the most recent surveys conducted at VAFB in 2010, the Air Force observed 361 El Segundo blue butterflies; 217 on north base and 145 on south base. In 2009, 329 butterflies were observed; 154 on north base and 175 on south base. Arnold (1986) conducted capture-recapture studies in Los Angeles County and reported that the majority of El Segundo blue butterflies moved 100 feet or less between captures; 79 percent and 87 percent for females and males, respectively. Approximately 93 percent of females and males moved 200 feet or less, and only 3 percent of females and 4 percent of males moved more than 500 feet. The farthest distance moved by any individual butterfly was approximately 7,200 feet (1.36 miles). Therefore, taking into account that the vast majority of individual El Segundo blue butterflies move 200 feet or less, calculating a 200-foot buffer around each known occupied location produces a figure of approximately 801 acres of known occupied habitat at VAFB (USAF 2010).

It is worth noting, however, that the 200-foot buffer was derived from studies at the Chevron Refinery in El Segundo. This preserve is 1.5 acres and is completely surrounded by urban areas. The area contains high concentrations of seacliff buckwheat plants that grow in close proximity to one another. Therefore, the adult butterflies would not have to disperse very far to locate suitable buckwheat flower heads. In contrast, the preserve at the Los Angeles International Airport is 200 acres and contains widely scattered seacliff buckwheat plants. At this site, El Segundo blue butterflies were detected dispersing up to 1.4 miles (Arnold 1986). Additionally, adult butterflies dispersed up to 0.5 mile from occupied locations to colonize restoration sites in Los Angeles and Redondo Beach. Because the El Segundo blue butterfly has been observed to disperse farther distances in larger areas that contain more widely scattered plants, such as VAFB, the 200-foot buffer may represent the lower end of the dispersal distance capability of the El Segundo blue butterfly (USAF 2010).

Surveys were also conducted within habitat accessible to the public outside of VAFB. These sites included Sweeney and Santa Rosa Roads in Lompoc. The butterflies observed were morphologically consistent with the El Segundo blue butterfly and were found in association with flowering seacliff buckwheat stands. Subsequently, both Dr. Richard Arnold and Dr. Gordon Pratt determined these butterflies to be the El Segundo blue butterfly through examination of genitalia. A total of 18 El Segundo blue butterflies and approximately 26 acres of occupied habitat were documented in these areas (USAF 2010).

California Red-legged Frog

The California red-legged frog was federally listed as threatened on May 23, 1996 (61 FR 25813) and critical habitat was designated for the subspecies on April 13, 2006 (71 FR 19243). The Service completed a recovery plan for the subspecies in 2002 (Service 2002b).

The historic range of the California red-legged frog extended coastally from southern Mendocino County and inland from the vicinity of Redding, California, southward to northwestern Baja California, Mexico (Jennings and Hayes 1985, Storer 1925). The California red-legged frog has been extirpated or nearly extirpated from 70 percent of its former range. Historically, this subspecies was found throughout the Central Valley and Sierra Nevada foothills. Four additional occurrences have been recorded in the Sierra Nevada foothills since listing, bringing the total to five extant populations, compared to approximately 26 historical records (Service 2002b). Currently, California red-legged frogs are known from three disjunct regions in 26 California counties and one region in Baja California, Mexico (Grismer 2002; Fidenci 2004; and R. Smith and D. Krofta, *in litt.* 2005). California red-legged frogs have been found at elevations that range from sea level to about 5,000 feet. In the Sierra Nevada Mountains, California red-legged frogs typically occur below 4,000 feet in elevation (Service 2002b).

The California red-legged frog uses a variety of habitat types, including various aquatic systems, riparian, and upland habitats. The diet of California red-legged frogs is highly variable. Tadpoles probably eat algae (Jennings et al. 1992). Hayes and Tennant (1985) found invertebrates to be the most common food item of adults. Vertebrates, such as Pacific chorus

frogs (*Pseudacris regilla*) and California mice (*Peromyscus californicus*), represented over half of the prey mass eaten by larger frogs (Hayes and Tennant 1985). Feeding activity probably occurs along the shoreline and on the surface of the water. Hayes and Tennant (1985) found juveniles to be active diurnally and nocturnally, whereas adults were largely nocturnal.

California red-legged frogs breed in aquatic habitats from November through March; earlier breeding has been recorded in southern localities (Storer 1925). Males appear at breeding sites from 2 to 4 weeks before females (Storer 1925). Female California red-legged frogs deposit egg masses on emergent vegetation so that the masses float on the surface of the water (Hayes and Miyamoto 1984). Egg masses contain about 2,000 to 5,000 moderately-sized, dark reddish brown eggs (Storer 1925, Jennings and Hayes 1985). Eggs hatch in 6 to 14 days (Storer 1925). Larvae undergo metamorphosis for 3.5 to 7 months after hatching (Storer 1925, Wright and Wright 1949). Sexual maturity can be attained at 2 years of age by males and 3 years of age by females (Jennings and Hayes 1985); adults may live 8 to 10 years (Jennings et al. 1992) although the average life span is considered to be much lower. The California red-legged frog is a relatively large aquatic frog ranging from 1.5 to 5 inches from snout to vent (Stebbins 1985).

Larvae, juvenile, and adult California red-legged frogs have been collected from streams, creeks, ponds, marshes, plunge pools and backwaters of streams, dune ponds, lagoons, and estuaries. California red-legged frogs frequently breed in artificial impoundments such as stock ponds, if conditions are appropriate. Although this species successfully breed in streams and riparian systems, high seasonal flows and cold temperatures in streams often make these sites risky environments for eggs and tadpoles. The importance of riparian vegetation for the California red-legged frog is not well understood. When riparian vegetation is present, California red-legged frogs spend considerable time resting and feeding in it; the moisture and camouflage provided by the riparian plant community likely provide good foraging habitat and may facilitate dispersal in addition to providing pools and backwater aquatic areas for breeding.

Juvenile and adult California red-legged frogs may disperse long distances from breeding sites throughout the year. They can be encountered living within streams at distances exceeding 1.8 miles from the nearest breeding site, and have been found up to 400 feet from water in adjacent dense riparian vegetation (Bulger et. al 2003). During periods of wet weather, starting with the first rains of fall, some individuals may make overland excursions through upland habitats; most of these overland movements occur at night. Bulger et al. (2003) found marked California red-legged frogs in Santa Cruz County making overland movements of up to 2 miles over the course of a wet season. These individual frogs were observed to make long-distance movements that are straight-line, point to point migrations over variable upland terrain rather than using riparian corridors for movement between habitats. Suitable habitat for California red-legged frogs is considered to include all aquatic and riparian areas within the range of the species and includes any landscape features that provide cover and moisture (61 FR 25813).

Habitat loss and degradation, combined with over-exploitation and introduction of exotic predators, were important factors in the decline of the California red-legged frog in the early to mid-1900s. Continuing threats to this species include direct habitat loss due to stream alteration

and loss of aquatic habitat, indirect effects of expanding urbanization, competition or predation from nonnative species including the bullfrog, catfish (*Ictalurus* spp.), bass (*Micropterus* spp.), mosquitofish (*Gambusia affinis*), red swamp crayfish (*Procambarus clarki*), and signal crayfish (*Pacifasticus leniusculus*). Chytrid fungus (*Batrachochytrium dendrobatidis*) (Bd) is a waterborne fungus that can decimate amphibian populations, and is considered a threat to California red-legged frog populations.

Tidewater Goby

The tidewater goby was listed as endangered on March 7, 1994 (59 FR 5494). On June 24, 1999, the Service proposed to remove the populations occurring north of Orange County, California, from the endangered species list (64 FR 33816). In November 2002, the Service withdrew this proposed delisting rule and determined to retain the tidewater goby's listing as endangered throughout its range (67 FR 67803).

We originally designated critical habitat for the tidewater goby on November 20, 2000 (65 FR 69693). In January 2008, we finalized a revised designation of critical habitat (73 FR 5920). On October 19, 2011, another revision to critical habitat was proposed (76 FR 64996), and on February 6, 2013, we published a final rule designating revised critical habitat for the tidewater goby (78 FR 8745). A recovery plan for the tidewater goby was completed on December 12, 2005 (Service 2005b). Much of the information in this species account is summarized from the following sources: Wang (1982), Irwin and Soltz (1984), Lafferty et al. (1999a, 1999b), Swift et al. (1989, 1993, 1997), Worcester (1992), Swenson (1995, 1999), and Swenson and McCray (1996).

The tidewater goby is endemic to California and typically inhabits coastal lagoons, estuaries, and marshes; preferring relatively low salinities of approximately 12 parts per thousand (ppt). Tidewater goby habitat is characterized by brackish estuaries, lagoons, and lower stream reaches where the water is fairly still but not stagnant. They tend to be found in the upstream portions of lagoons. Tidewater gobies can withstand a range of habitat conditions and have been documented in waters with salinity levels that range from 0 to 42 ppt, temperatures from 46 to 77 degrees Fahrenheit, and depths from approximately 10 inches to 6.5 feet.

The tidewater goby is primarily an annual species in central and southern California, although some variation in life history has been observed. If reproductive output during a single season fails, few (if any) tidewater gobies survive into the next year. Reproduction typically peaks from late April or May to July and can continue into November or December depending on the seasonal temperature and amount of rainfall. Males begin the breeding ritual by digging burrows (3 to 4 inches deep) in clean, coarse sand of open areas. Females then deposit eggs into the burrows, averaging 400 eggs per spawning effort. Males remain in the burrows to guard the eggs and frequently forego feeding, which may contribute to the mid-summer mortality observed in some populations. Within 9 to 10 days, larvae emerge and are approximately 0.20 to 0.27 inch in length. They live in vegetated areas in the lagoon until they are 0.60 to 0.70 inch long. When they reach this life stage, they become substrate-oriented, spending the majority of time on the

bottom rather than in the water column. Both males and females can breed more than once in a season, with a lifetime reproductive potential of 3 to 12 spawning events. Vegetation is critical for over-wintering tidewater gobies because it provides refuge from high water flows.

Tidewater gobies feed on small invertebrates, including mysids, amphipods, ostracods, snails, aquatic insect larvae, and particularly chironomid midge larvae. Tidewater gobies of less than 0.30 inch probably feed on unicellular phytoplankton or zooplankton similar to many other early stage larval fishes.

Historically, the tidewater goby occurred in at least 126 California coastal lagoons and estuaries from Tillas Slough near the Oregon border south to Agua Hedionda Lagoon in northern San Diego County. The southern extent of its distribution has been reduced by approximately 8 miles. The species is currently known to occur in about 98 locations, although the number of sites fluctuates with climatic conditions. Currently, the most stable populations are in lagoons and estuaries of intermediate size (5 to 124 acres) that are relatively unaffected by human activities.

In Santa Barbara County during the fall of 1994, tidewater gobies were reported as common in the Santa Ynez River 4 miles above the lagoon (Swift et al. 1997); however, by January 1995, they were absent at the upstream sites. Tidewater gobies that are found upstream of lagoons in summer and fall tend to be juveniles. The highest densities of tidewater gobies are typically present in the fall.

Tidewater gobies enter the marine environment when sandbars are breached during storm events. The species' tolerance of high salinities (up to 60 ppt) for short periods of time enables it to withstand marine conditions where salinities are approximately 35 ppt, thereby allowing the species to re-establish in or colonize lagoons and estuaries following flood events. However, genetic studies indicate that individual populations rarely have contact with other populations so natural recolonization may be rare.

Native predators are not known to be important regulators of tidewater goby population size in the lagoons of southern California. Rather, population declines in this region are attributed to environmental conditions. During high flows, streams flood and breach lagoon barriers creating strong tidal conditions. As a result, tidewater goby populations plummet. Populations typically recover quickly in summer, with mean densities of between 54 and 323 fish per square foot recorded. Tidewater goby densities are greatest among emergent and submergent vegetation (Moyle 2002).

The decline of the tidewater goby is attributed primarily to habitat loss or degradation resulting from urban, agricultural, and industrial development in and around coastal wetlands. Tidewater gobies have been extirpated from water bodies that are impaired by degraded water quality (e.g., Mugu Lagoon, Ventura County), but still occur in others (e.g., Santa Clara River, Ventura County). Some extirpations are believed to be related to pollution, upstream water diversions,

and the introduction of nonnative predatory fish species (most notably, centrarchid sunfish and bass). These threats continue to affect some of the remaining populations of tidewater gobies.

Unarmored Threespine Stickleback

The unarmored threespine stickleback was federally listed as endangered in 1970 primarily due to competition with or predation by nonnative fish, loss of habitat through urbanization and channelization, and introgression with other subspecies of sticklebacks (35 FR 16047). Critical habitat for the unarmored threespine stickleback was proposed in 1980 for two reaches of the Santa Clara River, and single reaches of both San Francisquito Creek and San Antonio Creek; designation of critical habitat remains pending (45 FR 76012). The unarmored threespine stickleback is a fully protected species under California law (see California Fish and Game Code, Section 5515 (b)(9)). The recovery plan for the unarmored threespine stickleback (Service 1985a) provides additional information on the biology of the species, reasons for its decline, areas of essential habitat, and the actions needed for recovery of the species.

Unarmored threespine sticklebacks are small fish (up to 2.36 inches) inhabiting slow moving reaches or quiet water microhabitats of streams and rivers. Favorable habitats usually are shaded by dense and abundant vegetation. In more open reaches, algal mats or barriers may provide refuge for the species. Unarmored threespine sticklebacks feed primarily on benthic insects, small crustaceans, and snails, and to a lesser degree, on flat worms, nematodes, and terrestrial insects. Unarmored threespine sticklebacks reproduce throughout the year with a minimum of breeding activity occurring from October to January. Reproduction occurs in areas with adequate aquatic vegetation and gentle flow of water where males establish and vigorously defend territories. The male builds a nest of fine plant debris and algal strands and courts all females that enter his territory; a single nest may contain the eggs of several females. Following spawning, the males defend the nests and the newly hatched fry, which hatch after approximately 6 days. Unarmored threespine sticklebacks are believed to live for only 1 year (Service 1985a).

Unarmored threespine sticklebacks historically were distributed throughout southern California but are now restricted to the upper Santa Clara River and its tributaries in Los Angeles and Ventura Counties, San Antonio Creek on VAFB in Santa Barbara County, Shay Creek (tributary to Baldwin Lake) in San Bernardino County, and San Felipe Creek in San Diego County. A population was transplanted into San Felipe Creek in the Salton Sea drainage and into Cañada Honda Creek on VAFB. Transplanted populations tend not to persist (Moyle 2002). In fact, no individuals have been observed in Cañada Honda Creek in 13 years (R. Evans, VAFB Natural Resource Lead, pers. comm. 2008). The population in San Antonio Creek on VAFB is extant and considered a natural occurrence (i.e., not introduced).

Habitat degradation in the form of flood control and channelization are the primary threats to the survival of the unarmored threespine stickleback. Other forms of habitat degradation can occur when people or livestock trample stream banks, causing increased soil erosion and sedimentation in streams and breeding pools and reducing the availability of plants and insects that serve as habitat and food for the species. Damage to, or destruction of, the emergent vegetation along the

stream banks also degrades the shallow, weedy nursery areas that provide abundant food and shelter for the unarmored threespine stickleback.

Other threats to unarmored threespine stickleback often occur in popular riparian areas near campgrounds where humans dam pools for wading and inadvertently trample adjacent sand or gravel bars during streamside recreational activities. These activities force the unarmored threespine stickleback to constantly move away from human traffic or be driven into areas where they are more susceptible to injury or mortality due to predation or recreational activities.

Exotic predators such as African clawed frogs (*Xenopus laevis*), bullfrogs, mosquitofish, red swamp crayfish, and green sunfish (*Lepomis cyanellus*), prey on or compete for resources with unarmored threespine sticklebacks. In addition, certain non-native species may serve as vectors for the Ich parasite (*Ichthyopthirius multifilis*) that could infect populations of unarmored threespine stickleback. Populations of unarmored threespine stickleback in the Angeles National Forest were severely affected by the introduction of Ich in 1995 (U.S. Forest Service 2000). Introduced goldfish (*Carasius auratus*) were suspected to be the source of the Ich infestation.

California Least Tern

The California least tern, which is one of three subspecies of least tern in the United States, was listed as endangered in 1970 (35 FR 16047). No critical habitat has been designated for this subspecies; we issued a revised recovery plan in 1985 (Service 1985b). The State of California listed the California least tern as endangered in 1971. In addition, the California least tern is a fully protected species under California law.

California least terns are the smallest members of the subfamily Sterninae (family Laridae), measuring about 9 inches long with a 20-inch wingspread. Sexes look alike being characterized by a black cap, gray wings with black wingtips, orange legs, and a black-tipped yellow bill. Immature birds have darker plumage and a dark bill, and their white heads with dark eye stripes are quite distinctive. The California least tern cannot be reliably differentiated from other subspecies of the least tern on the basis of plumage characteristics alone (Burleigh and Lowery 1942).

The California least tern was historically concentrated in three southern California counties: Los Angeles, Orange, and San Diego. Between Ventura County and the San Francisco Bay area, only Mussel Rock Dunes (formerly called Guadalupe Dunes), and Purisima Point (VAFB) have been used regularly by California least terns (Marschalek 2006). Nesting sites have also been documented at the Mexican border (Marschalek 2006), and in Mexico within the Gulf of California and on the west coast of Baja California from Ensenada to San José del Cabo at the tip of the peninsula (Lamb 1927, Grinnell 1928, Patten and Erikson 1996). In 1991 and 1992, a survey of the west coast of the Baja peninsula documented 13 breeding colonies at 5 different locations, from Ensenada through Bahía Magdalena with 1 to 6 sites at each location. Large nesting colonies along the California coast have been discontinuous and are spread out along beaches at the mouths of larger estuaries.

At the time of listing in 1970, a census revealed only 600 pairs of breeding California least terns in California, but recovery efforts instituted since the time of listing have helped raise levels of breeding birds. Statewide surveys conducted in 1995 counted 2,598 pairs (Caffrey 1995) and the population increased to approximately 7,100 pairs by 2005. In addition, the number of California least tern sites have nearly doubled since the time of listing with most of the colonies occurring in southern California.

The California least tern breeding season typically begins in April. California least terns nest in colonies on relatively open beaches kept free of vegetation by natural scouring from tidal action. In addition, nesting areas are relatively flat sandy beaches in close proximity to foraging habitat, and have relative seclusion from disturbance and predation. California least terns are very gregarious and forage, roost, nest, and migrate in colonies, although there are many records of solitary pairs nesting at certain sites or low densities, or low densities of limited nesting pairs over several miles of beach habitat (Service 1985b). A typical colony size is 25 pairs; a typical clutch is 2 eggs. Eggs are laid in the first part of May and hatch in early June. After the eggs are laid, the nest is sometimes lined with shell fragments and small pebbles. Eggs are incubated primarily by the female for 20 to 25 days. Chicks usually fledge by late June. California least terns can re-nest up to two times if eggs or chicks are lost early in the breeding season.

Both the male and female select a suitable site to begin scraping their nest if it is located on sand. If no sand is available in their nesting location, the birds will select a natural depression in the ground, such as a boot or tire depression in dried mud. Currently, there are no beaches at which least tern nesting occurs that are devoid of human recreation, development, or military pressure. The majority of sites are on developed or anthropogenically created lands such as airfields, landfills, vacant parking lots, and sand-topped islands especially created for the birds (Marschalek 2006). California least terns appear to have strong nesting site fidelity and most return to their natal breeding beach year after year. Mass relocations have been documented when a breeding site has been destroyed or heavy predation has occurred.

Parents and fledglings remain close to the breeding site before beginning their fall migration, which commences the last week of July and first week of August. Little is known about actual migration routes south of the California border, but California least terns presumably move along the west coast of Baja California, cross to the west coast of mainland Mexico, and continue along the coast to the south (Thompson et al. 1997). Their wintering localities are not well known. California least terns are sporadically common in Costa Rica during the fall and spring migrations at sites where shorebirds gather (Stiles and Skutch 1989). Some banded birds have been located on the Colima coast (Massey 1981) and along the Pacific Coast of Guatemala. In addition, California least terns were observed in the winter months at Chomes on the west coast of Costa Rica and the Pacific Coast of Panama (Vaucher 1988). Scattered sightings of the California least tern have been made in coastal Peru in all seasons; one was seen in association with the closely related Peruvian tern (*Sterna lorata*) and was easily distinguished from it (Schulenberg et al. 1987). This distributional information does not create a comprehensive description of the California least tern's migratory route or winter range.

California least terns forage primarily in near-shore ocean waters and in shallow estuaries and lagoons (Massey 1987). At colonies where feeding activities have been studied, the birds foraged mostly within 2 miles of the breeding area and primarily in near-shore ocean waters less than 60 feet deep (Collins et al. 1979, Atwood and Minsky 1983). Prey items include northern anchovy (*Engraulis mordax*), topsmelt (*Atherinops affinis*), California grunion (*Leuresthes tenuis*), and killifish (*Fundulus parvipinnis*). Severe El Nino Southern Oscillations can affect the California least tern's food supply.

Predators consume California least terns at all life stages (i.e., egg, hatchling, fledgling, juvenile, adult, and as scavenged prey). Predators of the California least tern in California that are known to consume or break eggs include: Virginia opossum, spotted skunk , striped skunk, northern harrier (*Circus cyaneus*), American crow (*Corvus brachyrhynchos*), common raven, coyote, red fox, rats (*Rattus* sp.), Norway rats, (*Rattus norvegicus*), California ground squirrel (*Spermophilus beecheyi*), and feral cat (*Felis domesticus*) (Marschalek 2006). Avian predators of chicks include the American kestrel (*Falco sparverius*), northern harrier, loggerhead shrike (*Lanius ludovicianus*), and gull-billed tern (*Sternula nilotica*) (Densmore 1990). The American kestrel, peregrine falcon (*Falco peregrinus anatum*), great horned owl (*Bubo virginianus*), burrowing owl (*Athene cunicularia*), and feral cats prey upon fledglings and adults. Diminutive invasive species that predate California least terns have included southern fire ants (*Solenopsis xyloni*) (Hooper-Bui et al. 1998) and Argentine ants (*Linepithema humile*) (Suarez et al. 2005). In addition to the direct and indirect mortality, native and nonnative predators can also have significant effects on California least tern reproductive success and cause nest failure, re-nesting, and site abandonment (Massey and Fancher 1989).

Though predation has been marginally reduced through intensive management, it remains a serious threat to the California least tern. At intensively managed locations, the use of fencing and lethal or non-lethal predator control measures have reduced the potential for high levels of predation; however, numerous mortalities still occur during the breeding season. These predatory species and individuals can cause substantial loss to a California least tern colony in a matter of days or over the course of a nesting season.

The decline of the California least tern is attributed primarily to the loss and fragmentation of breeding and foraging habitat, although the rate of habitat loss in recent years is reduced because almost all coastal habitats have already been fragmented and degraded. Most colonies are small patches of degraded nesting habitat surrounded on all sides by human activity. Additionally, there is a lack of undisturbed or moderately-disturbed suitable breeding habitat available for population expansion. The level of human coastal use is expected to continue the conflict between resurging California least tern populations and limited habitat availability. Although most of the important nesting sites are in public ownership, competing land uses continue to be a major threat for disturbance to, or elimination of, nesting habitat. These remaining nests sites must be intensively managed to conserve suitable nesting habitat.

Western Snowy Plover

The Pacific coast population of the western snowy plover was federally listed as threatened on March 5, 1993 (58 FR 12864), and critical habitat was designated on September 29, 2005 (70 FR 56970). The proposed project site is not within designated critical habitat for the western snowy plover. We issued a recovery plan for the western snowy plover in September 2007 (Service 2007b).

The western snowy plover, a small shorebird in the family Charadriidae, weighs from 1.2 to 2 ounces and ranges in length from 5.9 to 6.6 inches (Page et al. 1995). It is pale gray-brown above and white below, with a white hindneck collar and dark lateral breast patches, forehead bar, and eye patches. The bill and legs are blackish. In breeding plumage, males usually have black markings on the head and breast; in females, usually one or more of these markings are dark brown. Early in the breeding season, a rufous crown may be evident on breeding males, but it is not typically seen on females. In non-breeding plumage, sexes cannot be distinguished because the breeding markings disappear. Fledged juveniles have buffy edges on their upper parts and can be distinguished from adults until approximately July through October, depending on when in the nesting season they hatched. After this period, molt and feather wear makes fledged juveniles indistinguishable from adults. Individual birds 1 year or older are considered to be breeding adults. The mean annual life span of western snowy plovers is estimated at about 3 years, but at least one individual was at least 15 years old when last seen (Page et al. 1995).

Historical records indicate that nesting western snowy plovers were once more widely distributed and abundant in coastal Washington, Oregon, and California. Prior to 1970, western snowy plovers bred at 53 coastal locations in California. Between 1970 and 1981, western snowy plovers stopped breeding in parts of San Diego, Ventura, and Santa Barbara counties, most of Orange County, and all of Los Angeles County (Page and Stenzel 1981). In 2007, there were two nesting attempts documented on Los Angeles County beaches (SWCA 2007).

The current Pacific Coast population of the western snowy plover is sparse in Washington, Oregon, and northern California. In 2006, estimated populations were 70 adults along the Washington coast (Pearson et al. 2006), 177 to 179 adults along coastal Oregon (Lauten et al. 2006), and 2,231 adults in coastal California and San Francisco Bay (window survey including correction factor) (Page 2006, Service 2007b). The California population of western snowy plovers comprises at least 90 percent of the listed Pacific Coast population. Eight geographic areas support over three-quarters of the California coastal breeding population: San Francisco Bay, Monterey Bay, Morro Bay, the Callendar-Mussel Rock Dunes area, the Point Sal to Point Conception area (VAFB), the Oxnard lowland, Santa Rosa Island, and San Nicolas Island (Page et al. 1991). A recent population estimate suggests the Baja California, Mexico population is approximately 1,000 breeding adults (E. Palacios, Pers. Comm. 2008).

The Pacific Coast population of western snowy plovers nests near tidal waters along the mainland coast and offshore islands from Damon Point, Washington, to Bahía Magdelena, Baja California, Mexico. Most nesting occurs on unvegetated to moderately vegetated, dune-backed

beaches and sand spits. Other less common nesting habitats include salt pans, dredge spoils, and salt pond levees. Nests consist of a shallow scrape or depression, sometimes lined with beach debris (e.g., small pebbles, shell fragments, plant debris, and mud chips); nest lining increases as incubation progresses. Nests are usually located within 328 feet of water, but can be farther away when there is no formative vegetative barrier between the nest and water (Page and Stenzel 1981). The majority of western snowy plovers are site-faithful (returning to the same breeding area in subsequent breeding seasons); some also disperse within and between years (Warriner et al. 1986, Stenzel et al. 1994).

The nesting season of the western snowy plover extends from early March through late September. Generally, the breeding season may be 2 to 4 weeks earlier in southern California than in Oregon and Washington. The earliest nests on the California coast occur during the first week of March in some years and by the third week of March in most years (Page et al. 1995). Peak initiation of nesting is from mid-April to mid-June (Warriner et al. 1986; Powell et al. 1997). On the Oregon coast, nesting may begin as early as mid-March, but most nests are initiated from mid-April through mid-July (Wilson-Jacobs and Meslow 1984). Peak nest initiation occurs from mid-May to early July (Stern et al. 1990). On the Washington coast, most adults arrive during late April, with maximum numbers present from mid-May to late June.

The typical clutch size of western snowy plovers is three with a range from two to six (Warriner et al. 1986, Page et al. 1995). Both sexes incubate the eggs, which take about 27 days to hatch, with the female tending to incubate during the day and the male at night (Warriner et al. 1986). After losing a clutch or brood or successfully hatching a nest, western snowy plovers may re-nest at the same site or move up to several hundred kilometers to nest at other sites (Stenzel et al. 1994, Powell et al. 1997). Re-nesting occurs 2 to 14 days after failure of a clutch, and up to five re-nesting attempts have been observed for a pair (Warriner et al. 1986).

Western snowy plover chicks are precocial (capable of a high degree of independence from birth), feeding on their own within hours of hatching. However, they are unable to fly until 1 month after hatching. Females generally desert males and broods by the sixth day, and thereafter the chicks are typically accompanied by only males. Females obtain new mates and initiate new nests while males rear the broods (Page et al. 1995).

Western snowy plovers are primarily visual foragers, using the run-stop-peck method of feeding typical of *Charadrius* species. They forage on invertebrates in the wet sand and amongst surf-cast kelp within the intertidal zone, in dry sand areas above the high tide, on salt pans, on spoil sites, and along the edges of salt marshes, salt ponds, and lagoons. Western snowy plovers sometimes probe for prey in the sand and pick insects from low-growing plants. Their food sources consist of immature and adult forms of aquatic and terrestrial invertebrates. Little quantitative information is available on food habits. The recovery plan (Service 2007b) identifies specific prey items for coastal western snowy plovers.

In western North America, the western snowy plover winters mainly in coastal areas from southern Washington to Central America (Page et al. 1995); however, the majority of birds

winter south of Bodega Bay, California (Page et al. 1986). In winter, western snowy plovers are found on many of the beaches used for nesting, as well as some beaches where they do not nest. They also occur in man-made salt ponds and on estuarine sand and mud flats. In California, the majority of wintering western snowy plovers assemble on sand spits and dune-backed beaches. Some also occur on urban and bluff-backed beaches, which are rarely used for nesting (Page et al. 1986). Western snowy plovers that breed on the coast and inland are very site-faithful in winter.

Western snowy plover habitat is subject to erosion and accretion and is highly susceptible to degradation by mechanized beach cleaning; construction of seawalls, breakwaters, jetties, piers, homes, hotels, parking lots, access roads, trails, bike paths, day-use parks, marinas, ferry terminals, recreational facilities, and support services that may cause direct and indirect losses of breeding and wintering habitat for the western snowy plover. Urban development has permanently eliminated valuable nesting habitat on beaches in southern Washington (Brittell et al. 1976), Oregon (Oregon Department of Fish and Wildlife 1994), and California (Page and Stenzel 1981). Increased development increases human use of the beach, thereby increasing disturbance to nesting plovers. Human activities such as walking, jogging, fishing, fireworks, unleashed pets, horseback riding, and off-road vehicles can destroy the western snowy plover's cryptic nests and chicks.

In addition to causing direct loss of habitat, urban development can result in additional adverse impacts to western snowy plovers. Human activities can interfere with foraging activities by disrupting the ability of adults and chicks to get to the wet beach to feed and return to the dunes or their nest (Burger and Fry 1993). Chicks can also become separated from their parents as a result of human disturbance of broods. Such disturbance could cause or contribute to chick mortality by interfering with essential chick-rearing behaviors or by causing intolerable stresses directly to the chicks (Cairns and McLaren 1980). For example, separation of chicks and their parent can lead to lethal exposure to wind and cold temperatures or disturbance that interferes with foraging could result in the starvation of western snowy plover chicks. In some instances, disturbance associated with these types of recreational activities is expected to temporarily flush western snowy plovers and not affect the birds in such a substantial manner. In other cases, such disturbance could interfere with the metabolism and thermoregulation of western snowy plover chicks and migrating or wintering adults such that they starve or egg production is impaired during the subsequent nesting season (Cairns 1982). The available information regarding the energetics of western snowy plovers is inadequate to assess the likelihood that such injury or mortality would result.

As has been shown with piping plovers (*Charadrius melodus*), a species that is behaviorally and ecologically similar to the western snowy plover, kites flown by people may be perceived as potential predators by western snowy plovers. Stunt kites may cause a greater response from western snowy plovers than traditional, more stationary kites. Hoopes et al. (1992) found that piping plovers responded to kites at an average distance of 279 feet, moved an average distance of over 328 feet, and responded for an average duration of 70 seconds. At Ocean Beach in San Francisco, California, western snowy plovers' reaction to kites ranged from increased vigilance

while roosting in close proximity to the kite flying to walking or running approximately 33 to 82 feet away and resting again while remaining alert (Hatch 1997). Other kite-like instruments or sails, such as parachutes used to wind-surf or para-surf, can have the same adverse effect on western snowy plovers as kites, especially if parachutes are raised over the beach or in the surf near the shoreline.

West Nile virus, a mosquito-borne disease which can infect birds, reptiles, and mammals, has spread rapidly across the United States from the initial introduction in New England (National Audubon Society 2006). In 2004 to 2006 the disease was reported from two coastal counties (Lane and Lincoln) in Oregon but has not been reported from any coastal counties in Washington (U.S.G.S 2006). The virus has been identified in dead piping plovers and killdeer (*Charadrius vociferus*), both of which are closely related to the western snowy plover (Center for Disease Control 2004).

Predator density is an important factor affecting the quality of western snowy plover nesting habitat (Stenzel et al. 1994). The presence of humans near western snowy plover nesting areas can increase the presence of predators due to improper disposal of trash. Predation can result in the loss of adults, chicks, or eggs. Predators can also separate chicks from adults, which can lead to chick mortality. Predation by both native and nonnative species limits western snowy plover reproductive success at many Pacific Coast sites. Nonnative predators include eastern red foxes (*Vulpes vulpes regalis*), domestic and feral dogs, and Virginia opossums. Coyotes, American crows, common ravens, American kestrels, loggerhead shrikes, and several gull species (*Larus* spp.) are native predators of the western snowy plover. Domestic and feral cats are widespread predators. The threat of predation by domestic cats intensifies when housing is constructed near western snowy plover breeding habitat. In addition, unnatural habitat features such as landscaped vegetation (e.g., palm trees), telephone poles, transmission towers, fences, buildings, and landfills near western snowy plover nesting areas attract predators (Service 2007b).

One of the most dramatic causes of habitat loss for coastal breeding western snowy plovers has been the encroachment of introduced European beachgrass and American beachgrass (*Ammophila breviligulata*). European beachgrass was introduced to the west coast around 1898 to stabilize dunes (Wiedemann 1987); it has spread up and down the coast and now is found from British Columbia, Canada, to Ventura County in southern California. American beachgrass is native to the East Coast and the Great Lakes region. Currently, American beachgrass is the dominant introduced beachgrass species in much of the western snowy plover's range in the State of Washington (Seabloom and Wiedemann 1994).

In addition to the loss of nesting habitat, introduced beachgrass may adversely affect western snowy plover food sources. Slobodchikoff and Doyen (1977) found that beachgrass markedly depressed the diversity and abundance of sand-burrowing arthropods at coastal dune sites in central California. The beachgrass communities may also provide habitat for western snowy plover predators that historically would have been largely precluded by the lack of cover in the dune community (Stern et al. 1991).

Other nonnative plant species that have invaded coastal dunes, thereby reducing western snowy plover breeding habitat, include Scotch broom (*Cytisus scoparius*), gorse (*Ulex europaeus*), highway iceplant, pampas grass (*Cortaderia selloana*), jubata grass, and fig marigold (*Mesembryanthemum* sp.). Shore pine (*Pinus contorta*) is a native plant species that has invaded coastal dunes and resulted in similar impacts to western snowy plovers (Schwendiman 1975, California Native Plant Society 1996, Powell 1996). Many nonnative weed species also occur on and along San Francisco Bay salt pond levees, resulting in unsuitable nesting habitat for western snowy plovers (Service 2007b).

The Pacific Coast population of the western snowy plover has experienced widespread loss of nesting habitat and reduced reproductive success at many nesting locations. The reasons for the decline and degree of threats vary by geographic location; however, the primary threat is habitat destruction and degradation. Habitat loss and degradation can be primarily attributed to human disturbance, urban development, introduced beachgrass, and expanding predator populations. Natural factors, such as inclement weather, have also affected the quality and quantity of western snowy plover habitat (Service 1993).

ENVIRONMENTAL BASELINE

The implementing regulations for section 7(a)(2) of the Act define the "action area" as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For the purposes of this biological opinion and based on the information provided by the Air Force, we consider the action area to include the entire 99,000-acre base because the proposed activities could occur throughout the base.

VAFB includes 41 miles of Pacific Ocean shoreline (USAF 2008). Because of the nature of the space and missile launch operations, the base requires large open buffer areas. Consequently, less than 15 percent of the total land area of the base is disturbed through some form of development.

VAFB is located in a dry, subtropical climate zone that experiences semi-wet winters, dry summers, and mild temperatures throughout the year. VAFB also experiences coastal weather including ocean winds, fog and cloudiness, and marine inversions due to its proximity to the Pacific Ocean. The surface topography is varied, with the highest topographic relief in the southern parts of the property. The generally moderate slopes of north base contrast with the much steeper canyons of south base. Geologically, VAFB is a complex area that includes the transition zone between the Southern Coast Range and Western Transverse Range Geomorphic Provinces of California.

Dominant soil types on base include the Tangair-Narlon association, on nearly level to strongly sloping terrain; the Marina-Oceano association, on mesas and dunes; the Chamise-Arnold-Crow Hill association, on high terraces and uplands; the Concepcion-Botella association, on nearly level to steep terrain; the Sorrento-Mocho Camarillo association, on nearly level to moderately sloping terrain, such as floodplains and alluvial fans; the Shedd-Santa Lucia-Diablo association,

on uplands in strongly sloping to very steep topography; and the Los Osos-San Andreas-Tierra association, on strongly sloping to very steep terrain.

The major freshwater resources of VAFB include six streams, comprising two major and four minor drainages. The major drainages are San Antonio Creek and the Santa Ynez River. The minor drainages are Shuman, Cañada Honda, Bear, and Jalama Creeks. These freshwater resources are divided into four geographic areas. The northern area includes Shuman Canyon and several seasonal stream drainages. The north-central area includes the San Antonio Creek drainage, the Santa Ynez River drainage north of the river, and several smaller drainages. This area is heavily influenced by human activity because it contains the main cantonment area of the base and agricultural land both inside and outside the base. The south-central area includes the southern part of the Santa Ynez River drainage, Cañada Honda, and several small, seasonal stream drainages. The southern area consists primarily of Sudden Ranch and contains small streams and two permanent ponds (Engineering Science, Inc., and Sea World Research Institute 1988).

The action area supports approximately 13 major habitats, including bishop pine forest, tanbark oak forest, oak woodland, riparian woodland, wetlands, freshwater marsh, central coast maritime chaparral, coastal scrub, coastal strand, and grasslands. Other habitats include saltwater (coastal salt marsh and estuarine) and freshwater habitats, coastal bluffs and rocky headlands, and ruderal vegetation. A detailed description of VAFB's environmental setting and habitats is provided in the biological assessment (USAF 2008).

Vandenberg Monkeyflower

Four populations of Vandenberg monkeyflower occur on VAFB: Santa Lucia Canyon, Lake Canyon, Pine Canyon, and Oak Canyon. Lake Canyon has the greatest number of known individual Vandenberg monkeyflower plants. Surveys conducted in 2010 reported approximately 5,183 individual plants overall covering a total of 5.66 acres in medium to high quality habitat in all but Oak Canyon (MSRS 2010). The medium and low quality habitats support invasive veldt grass.

Surveys conducted May through June 2012 were concentrated in openings of chaparral habitat adjacent to known locations, recently burned areas in upper Lake Canyon, and California Natural Diversity Database (CNDDB) locations (Scientific Applications International Corporation (SAIC) 2012). Biologists also found an additional 0.05 acres of occupied habitat in Lake Canyon supporting 91 individual Vandenberg monkeyflower plants.

Of the 10,057 acres of maritime chaparral habitat we estimate remain on the Burton Mesa (78 FR 64840), approximately half occurs on VAFB, all within the southeast portion of north base (78 FR 64446). While Vandenberg AFB was exempted from the critical habitat proposed to be designated for Vandenberg monkeyflower, we considered the base to include 4,159 acres that support the plant communities and soil types in which Vandenberg monkeyflower is found, and

that maintain connectivity of occurrences, and provide for the sandy openings mixed within dominant vegetation that the species requires (78 FR 64446).

Beach Layia

Beach layia was assumed extirpated from Santa Barbara County until it was discovered on VAFB in 1995 where a population of about 80 individuals was observed on south base, scattered in coastal dune scrub vegetation on the west side of Coast Road. One-half of this site was inadvertently destroyed in 1997 during road maintenance activities. In 1998, a second occurrence was discovered approximately 300 yards west of the plants observed in 1995. This second location, on the edge of the bluff overlooking the beach, covered a much larger area than the 1995 location. The population in 1998 was estimated at 250 to 500 individuals.

In 2006, approximately 354 acres of potential beach layia habitat was surveyed on VAFB. Less than 50 plants were sparsely distributed along the unconsolidated scarp of a dune slump amidst central dune scrub vegetation at the intersection of Coast and Kelp Roads. Beach layia was not found within the historically documented sites and suitable habitat was dominated by iceplant, veldt grass, and acacia. Surveys in February and March 2009, however, documented several plants in a 0.065 acre area that is within a location where plants were observed in 1995. Five additional locations were observed, resulting in a total of 1.17 acres occupied by beach layia. Surveys conducted in 2010 revealed approximately 3,000 individual plants within coastal bluff/dune scrub vegetation. In addition to the known stands, the Air Force documented eight more stands, including several discovered in the vicinity of a historical locality that was documented in 1998. The new stands include the largest extant stand on base with 1,743 plants, and a new location, which was the first documented locality east of Coast Road.

The Air Force identified a new population of beach layia on north base in late February 2011, consisting of approximately 1,316 individuals covering an area of about 2 acres. With the discovery of the north base population, the Air Force concentrated the 2012 surveys in the north base San Antonio Terrace dunes area. A total of 892 acres of surveyed area resulted in 53 new beach layia localities just east of the foredunes covering about 3.3 acres from 1,100 yards northeast of the San Antonio Creek to just north of the inactive Space Launch Complex 10. Currently, the known distribution of beach layia on north base is estimated at approximately 4.96 acres.

Gaviota Tarplant

The Air Force has been performing base-wide surveys for this species since 2005 (SRS Technologies 2007). The Gaviota tarplant may occur in various vegetative communities on base because as an early successional annual, Gaviota tarplant may become established in disturbed areas such as mowed road shoulders, firebreaks, and cattle-grazed fields where competitive grasses are reduced. Based on the most recent surveys and research, the Gaviota tarplant occurs on VAFB within populations at Lion's Head (near Point Sal), Point Arguello, and Tranquillon

Mountain/Sudden Peak. Populations of the Gaviota tarplant may also occur in other locations that have not been surveyed for the species.

Lompoc Yerba Santa

The Air Force surveyed approximately 3,400 acres of potential habitat dominated by Burton Mesa chaparral for Lompoc yerba santa on north base in 2006. The Lompoc yerba santa was observed in four localities totaling approximately 5 acres; these populations are referred to as the Pine Canyon population, the Lake Canyon population, a population in an unnamed drainage between the Lake and Pine Canyon populations, and the 35th Street population. The populations at Pine Canyon, Oak Canyon, and 35th Street are closely associated with Burton Mesa chaparral. The unnamed population is associated with Burton Mesa chaparral and oak woodland. It is approximately 2,800 feet south/southeast of the Lake Canyon population and approximately 2,400 feet northeast of the Pine Canyon population. A terrace separates this population from the others. VAFB is considered essential to the conservation of this species because it contains the majority of known localities of Lompoc yerba santa, and includes the location (Pine Canyon) with the greatest number of known genetically different individuals. The population most affected by project activities is the 35th Street population.

Vernal Pool Fairy Shrimp

Protocol-level surveys for vernal pool fairy shrimp were conducted between November 2004 and April 2006 in 222 wetlands and wetland complexes on VAFB (SRS Technologies 2006). Approximately 612 acres of potential habitat were identified, resulting in the discovery of 82 acres of occupied habitat. The largest known vernal pool complex is located south of New Mexico Avenue and 13th Street, adjacent to an existing building and encompasses approximately 34 acres, accounting for more than 40 percent of the base's total. This area has been impacted by anthropogenic factors such as a railroad berm, parking lot, and dirt roads. In addition, it is estimated that approximately 15 acres of potential habitat occurs on VAFB that has not been surveyed to Service-protocol levels because these areas were not identified until after the initial 2005 survey. These areas will be protected as occupied habitat until protocol level surveys can be conducted to determine the presence or absence of vernal pool fairy shrimp.

The Air Force also created buffers around occupied areas to delineate upland habitat or hydrological connections to more than one occupied pool. There are nine buffered zones ranging from 3 to 280 acres; some only surround one pool while others surround as many as ten pools.

Most road shoulder depressions or road shoulder pools do not support vernal pool fairy shrimp, based upon the 621 miles of paved and unpaved roads on base; however, a small number of road shoulder pools are occupied. These pools had similar soil characteristics and were generally set back from the road, typically with a vegetative buffer between the road and pool (SRS Technologies 2006). Of the 82 acres of occupied habitat, almost 80 percent (65.7 acres) occurs within 100 feet of a paved road. North base contains 98 percent of the occupied habitat.

El Segundo Blue Butterfly

The flight season surveys conducted since 2007 by ManTech-SRS biologists, Dr. Richard Arnold, Dr. Gordon Pratt, and Air Force staff found that El Segundo blue butterflies are mostly concentrated in two main areas. On north base, generally around San Antonio Terrace, butterflies were observed in dune scrub habitat with varying degrees of invasive veldt grass, and along the dune scrub/central coast scrub interface and dune scrub bordering riparian habitats. On south base, El Segundo blue butterflies were observed in the vicinity of Tranquillon Peak and adjacent hilltops to the south and east. Butterflies were found in habitat characterized by central coast scrub dominated by coyote brush, California sagebrush, and sticky monkey flower (*Mimulus aurantiacus*). Observations in grassland to the south and east tended to be associated with rock outcrops and dominated by California sagebrush and purple sage (*Salvia leucophylla*) with fewer occurrences of coyote brush (ManTech-SRS Technologies Inc. (MSRS) et al. 2007). Surveys in 2008 documented the first, and to date the only, location on coastal south base, an area intermediate between the two known main populations. El Segundo blue butterflies have not been observed at this location since. New locations were also observed in areas previously surveyed. Surveys conducted in 2010 at Oak Mountain represented the third year of surveys at this location; despite the fact that this site was surveyed three times in 2010 under good conditions butterflies were only documented during one of the visits. Surveys conducted in 2010 also represent the second year of surveys at Harris Grade, but the first to document El Segundo blue butterflies. The 2010 surveys are also the first to document butterflies on eastern north base, near Lompoc-Casmalia Road. Overall, surveys in 2009 revealed 329 butterflies; surveys in 2010 revealed 361 butterflies (USAF 2010).

For the purposes of this consultation, we define occupied habitat as seacliff buckwheat plants that have been observed to be occupied by the El Segundo blue butterfly, including a 200-foot buffer around each occupied plant to account for the distance typically moved by adult butterflies. By taking into account this 200-foot buffer, occupied habitat includes approximately 802 acres. This estimate accounts for the overlap of buffers in the calculation of the estimated occupied habitat, for instance if occupied plants are adjacent to or within the buffer of another buckwheat plant.

The total extent of seacliff buckwheat on VAFB is difficult to quantify. Vegetation types that contain seacliff buckwheat include dune scrub, coastal sage scrub, chaparral, grasslands, oak woodlands and tanbark oak forests, although the relative abundance of the seacliff buckwheat within these vegetation types is quite low. Seacliff buckwheat is an early successional plant, and may be abundant in areas subjected to periodic disturbance. Seacliff buckwheat can be found in areas where dune scrub transitions into central coast scrub, central coast scrub grades into chaparral, or surrounding wetlands in dune systems. It is also sparsely distributed in grasslands, especially those within dune systems and those that may historically have been occupied by scrub species. Seacliff buckwheat plants are naturally being lost as habitats as some communities mature; however, at the same time, new plants are able to colonize openings created by events such as human disturbances, wildfire, and landslides (MSRS et al. 2007).

Previous studies have estimated the abundance of seacliff buckwheat in coastal vegetative communities, namely Williams (1974), Williams and Williams (1984), Gray (1982), and Keil and Holland (1996). Williams and Williams (1984) estimated that within coastal dune scrub, seacliff buckwheat constituted about 2 percent of the plants in areas having vegetation. Gray (1982) estimated that the relative cover of seacliff buckwheat in coastal sage scrub was 4 percent. Holland and Keil's Flora of Vandenberg (1996) only list two vegetative communities that have seacliff buckwheat as a dominant species: coastal dune scrub and seabluff scrub, which is incorporated within the coastal dune scrub vegetation type. Based upon recent surveys of vegetation on base, the Air Force estimated that seacliff buckwheat was present in approximately 25 percent of the 8,200 acres of coastal dune scrub vegetation on base.

Because seacliff buckwheat is more widespread than the El Segundo blue butterfly, we need to account for the areas that contain the seacliff buckwheat plant but have not been determined to be occupied or unoccupied by the El Segundo blue butterfly. For the purposes of this consultation, we define these areas as suitable but unknown to be occupied habitat. The Air Force estimated that approximately 17,500 acres of suitable habitat is within 1 mile of the known occupied habitat, and the seacliff buckwheat is distributed over at least 60,000 acres of the base. Many of these areas contain seacliff buckwheat plants at low densities. The acreage estimates for suitable habitat do not include a 200-foot buffer; thus, calculations for known occupied and suitable but unknown to be occupied habitats are not determined the same way.

We assume that any seacliff buckwheat plant on VAFB could be occupied by the El Segundo blue butterfly. We also assume that not all buckwheat plants would be occupied in all years. In addition, the El Segundo blue butterfly could occupy different areas in different years and may only occupy some areas periodically. Low density of butterflies and seacliff buckwheat plants, weather dependent flight, a short flight season, and the ability of *Euphilotes* sp. to stay in diapause for multiple years under unfavorable environmental conditions are factors that make documenting butterflies difficult. Furthermore, not all buckwheat plants are equally suitable to the El Segundo blue butterfly. The peak flowering time may differ between micro-habitats, and El Segundo blue butterflies prefer middle-aged plants over younger plants that may not produce enough flower heads and older senescing plants. The combination of all these factors makes it difficult to establish presence or absence in suitable habitat.

For the purposes of this consultation, unsuitable habitat would be ecosystems that would not support the El Segundo blue butterfly. These habitats include bishop pine forest, coastal salt marsh, croplands, estuaries, freshwater marshes and riparian woodlands. Other unsuitable habitat includes improved and semi-improved land areas where there is little native vegetation, such as buildings, parking lots and cantonment areas.

California Red-legged Frog

Christopher (2002) documented that the California red-legged frog occurred in nearly all permanent streams and ponds on VAFB; of 109 ephemeral, wetland, and riparian sites only 11 sites did not have any life stage of the California red-legged frog. The highest concentrations are

in San Antonio Creek and permanent ponds. Christopher (2002) observed the California red-legged frog in small numbers in Shuman Creek, Cañada Honda, lower Bear Creek, Jalama Creek and Santa Lucia Canyon. In addition, adults have been observed in small and large vernal pools, SLC-6 wastewater ponds, cattle troughs, ditches, created ponds, and in the dune swale ponds of San Antonio Terrace. Overwintering tadpoles have been observed in nearly all surveyed years. California red-legged frogs have also recently been observed within the cantonment area. They have not been detected in the Lake Canyon, ephemeral ponds or ephemeral/seasonal wetlands. They were also not observed in upper Barka Slough or upper and middle Bear Creek, although they have been recorded in the lower portions of Barka Slough and lower Bear Creek (Christopher 2002).

Christopher (2002) found significant differences in the maximum depths, mean depths, and aquatic vegetation density studying ponds on VAFB. Ponds with California red-legged frogs averaged a maximum depth of 7.87 feet and a mean depth of 2.62 feet, compared to ponds without them, which were much shallower with maximum depths of 2.30 feet and mean depth of 1.31 feet. Ponds with California red-legged frogs also had a high density of aquatic vegetation. Upland vegetation types and density surrounding the ponds did not differ between occupied and unoccupied ponds. Telemetered adults occurred in pond areas with cattails and sedges and not usually in areas of open water or with bulrushes, emphasizing the importance of cattails and sedges (Christopher 1997). Radio-tagged frogs were frequently found under these cattail mats, and individuals showed high fidelity to particular mats. In addition, floating fragments of dead cattails were regularly used as perches by calling males and by both sexes while feeding.

Different life stages were observed in different microhabitats within ponds. For oviposition sites, Christopher (2002) found that those egg masses attached to cattails and floating aquatic vegetation had greater survivorship than those attached to bulrushes or fallen willow branches. In addition, the highest capture rate for tadpoles occurred in the bottom of ponds with water depth of 1.31 to 1.64 feet. About one-quarter of all captured tadpoles were in open water, at the bottom. Post-metamorphic juveniles were more likely to be observed in shallower water (0.98 foot) that had warmer temperatures without much emergent vegetation.

The Air Force determined that there are 19 permanent ponds encompassing approximately 40 acres and another 340 ponds covering approximately 515 acres, for a total of approximately 555 acres of suitable habitat for the California red-legged frog to breed, shelter, and overwinter. They determined this baseline by reviewing aerial photos and reviewing multiple years of field data collected during the wet and dry seasons. The Air Force estimated that the 19 permanent ponds could support between 30 and 90 individuals, and the other 340 ponds could each support 20 individuals on average, resulting in an estimated population of 7,400 to 8,500 California red-legged frogs on base.

Pescadero Marsh supports large numbers of California red-legged frogs and is one of the few places throughout its range that supports more than 350 adult frogs (Service 2002b). Rancho San Carlos, a private ranch on the upper portion of the Carmel River Valley is another locality where more than 350 adults have been observed (M. Jennings et al. *in litt.* 1992). The numbers of

California red-legged frogs at a site or series of sites can vary widely from year to year. When conditions are favorable, California red-legged frogs may experience extremely high rates of reproduction and produce large numbers of dispersing young, which may result in an associated increase in number of occupied sites. Conversely, frogs may temporarily disappear from a normally occupied area (Service 2002b).

We believe the Air Force's population estimate is high; however, we assume that VAFB supports a substantial population of California red-legged frogs because they have previously captured 262 larval and adult frogs in San Antonio Creek in 2008 (MSRS 2009b). Overall, there is not enough existing data to accurately estimate the California red-legged frog population on base. Christopher (2002) determined that there were significant differences in the maximum depths, mean depths, and aquatic vegetation density when studying occupied and unoccupied ponds on VAFB. Therefore, at this time we are not able to propose an estimated population.

VAFB is known to contain California red-legged frogs infected with the chytrid fungus. During the spring and summer of 2008, biologists captured and sampled Ranid frogs from Shuman, San Antonio, Santa Ynez, Honda, and Jalama watersheds, as well as select isolated wetlands (MSRS 2009a). The infection is widespread on base, being present at all but one site that was sampled. Forty-one percent of all California red-legged frogs (n=100) tested positive for chytrid fungus; however, chytrid fungus did not have a negative effect on post-metamorphic frogs. Frogs with higher infection loads did not show clinical signs of Bd infection, nor were infected frogs thinner than non-infected frogs.

Tidewater Goby

The following baseline information for the tidewater goby is based on the final report of the biology and distribution of the tidewater goby on VAFB, Santa Barbara County, California (Swift et al. 1997) and the tidewater goby recovery plan (Service 2005b).

Tidewater gobies have been found in all four drainages on the base where they had been previously recorded; namely Shuman, San Antonio, Santa Ynez, and Jalama drainages. In addition, a small reproducing population was established in Honda lagoon after February 1995. This population was extant in September 1997. The mouth of Bear Creek appears to have been large enough to have had tidewater goby habitat, but it was filled in with the road bed of the railroad and the coastal road on south base a long time ago. The size of the habitats and of the populations varied considerably between sites and seasonally within sites. There is also considerable variation in the extent of upstream migration of gobies in each system.

All four permanent populations (excluding Honda) fluctuate strongly with the season, having relatively low numbers of fish in the early to late spring. Only the two largest systems, San Antonio and Santa Ynez lagoons have about 10,000 or more tidewater gobies in the spring before reproduction commences. At the other two permanent sites, Shuman and Jalama lagoons, the population fell to very low numbers in the spring before reproduction commenced, probably

to a few hundred fish or less. The tidewater goby was the most abundant fish species in each of the lagoons they inhabited on the base (Swift et al. 1997).

At the two larger sites with low gradient and habitat continuity between the lagoon and tributary stream, San Antonio and Santa Ynez, the gobies invade several kilometers upstream in the fall. High winter flows cause them to retreat or migrate back downstream to the lagoon. The tidewater goby has been documented in ponded freshwater habitats as far as 7.3 miles upstream from the ocean in the Santa Ynez River and 4.6 miles (7.4 kilometers) upstream from the ocean in San Antonio Creek (Swift et al. 1997). The tidewater goby populations at Shuman and Jalama, as well as those recently discovered at Honda are almost entirely dependent on the lagoon habitat for their persistence since they do not invade upstream significantly. At Jalama the high gradient and rapid flow are inappropriate for the species. At Shuman, an impassable barrier falls blocks their upstream movement, and the tributary stream is small and typically flows for half of the year or less. Tidewater gobies are also prevented from moving upstream at Honda Canyon because of falls at the lower end of the culverts at the road crossing about 60 meters (197 feet) above the lagoon.

The available tidewater goby habitat at Shuman encompasses approximately 0.6 to 1.0 hectare (1.5 to 2.5 acres); habitat at San Antonio encompasses approximately 2.0 to 3.0 hectares (4.9 to 7.4 acres); habitat at Santa Ynez encompasses approximately 300 hectares (750 acres); habitat at Jalama encompasses approximately 0.4 to l.2 hectares (0.8 to 3.0 acres); and at Honda habitat encompasses approximately 0.1 to 0.2 hectare (0.2 to 0.5 acre) (Service 2005b).

Unarmored Threespine Stickleback

Unarmored threespine sticklebacks are native to San Antonio Creek. The San Antonio Creek watershed has a drainage area of 154 square miles. The upper reaches of San Antonio Creek (i.e., upstream of Barka Slough) have intermittent flows, generally as runoff from the winter rains (November through April). The lower reaches of San Antonio Creek (i.e., downstream of Barka Slough) are perennial and are fed by surfacing groundwater in Barka Slough, a central dividing point in the San Antonio Creek watershed. Barka Slough is formed by underground, continuous bedrock between the Purisima and Casmalia Hills, just west (or downstream) of the slough. This bedrock forms a barrier to underground flows down the watershed through the unconsolidated deposits (Conoco 1985, URS 1987; in MSRS 2009b). In the lower San Antonio Creek basin, the creek flows west-northwest to the Pacific Ocean. Extensive emergent wetlands are located along part of the flood basin. The creek ends in a small lagoon that is generally confined from flow to the ocean by a sand berm, breaking through to the ocean only during large storms, at which time it is subject to tidal inundation (URS Corporation 1987, U.S. Department of Interior 1981; in MSRS 2009b). The lower portion of San Antonio Creek is known to support the only native population of unarmored threespine stickleback in Santa Barbara County. The upstream portion of San Antonio Creek is characterized by a relatively straight and narrow stream course confined between steep incised banks. The lower portion where the unarmored threespine stickleback dominates is less constrained.

Dr. Camm Swift (1999) conducted surveys for special-status fish in San Antonio Creek from near the Lompoc-Casmalia Road crossing downstream to the lagoon, which is equivalent to the lower 8 kilometers (4.97 miles) of the creek above the lagoon. Dr. Swift estimated the average number of sticklebacks per square meter and total number of sticklebacks throughout this lower 8 kilometers of the creek. Surveys in the upstream 5 kilometers (3.1 miles) resulted in a total of approximately 47,700 individuals. In the downstream 2.5 kilometers (1.56 miles) of creek above the lagoon, the surveys resulted in a total of approximately 7,200 individuals. Adding both estimates results in approximately 55,000 individuals in the lower 5 miles of the creek above the lagoon. Additional sticklebacks occur upstream, and were recorded upstream in at least one tributary just east of El Rancho Road south of the main stream. However, undoubtedly most of the stickleback population is in the 4 or 5 kilometers of stream centered on El Rancho Road where the stream gradient was lower, stream velocity was slower, the channel was more spread out, and native and nonnative predators were lacking (Swift 1999).

In June 2008, MSRS and Aquatic Resource Specialists (ARS) personnel repeated and expanded upon fish surveys conducted by Camm Swift in 1999 (MSRS 2009b). The previous seven 100 meter segments that Swift surveyed were repeated. The additional segments were located from Marshallia Golf Course upstream to the U.S. Highway 1 Bridge. A total length of 860 meters of main-stem stream channel was sampled in this study, which represents approximately 24 percent of the estimated 7,800 meters length of San Antonio Creek within VAFB boundaries.

Densities of the unarmored threespine stickleback observed during this survey were considerably higher than those observed by Swift in 1999, which could be due to a variety of factors. Swift's survey followed the El Niño of 1997-1998 during which VAFB received 36 inches of rainfall, the highest on record since 1952. The 1998-1999 rainy season was also well above average at 20 inches (average 15 inches) and this level of precipitation caused creeks to reach peak flow rates that were two orders of magnitude greater than mean yearly peak flow over the past 30 years. Such high flows resulted in the removal of most herbaceous bank species, some creek side woody species, and beaver dams. Many fish could have been killed or swept out to sea. Only one major scour event during the winter of 2005-2006 has occurred in the period between the surveys conducted by Swift in 1999 and the 2008 survey conducted by MSRS and ARS and did not approach the intensity of the 1998 flows. Rainfall totals for the two years preceding the 2008 survey were below average and the reduced flow may have allowed for the proliferation of in-stream vegetation and the accumulation of woody debris within the channel.

Based on the 2008 survey data, the Air Force estimated the population in San Antonio Creek to be approximately 462,500 individuals. They observed 18,653 individuals within 0.4 mile of creek, and then assumed that the density of sticklebacks throughout the 10 miles of San Antonio Creek within the base, from the lagoon to the Highway 1 overpass, has a density similar to the areas surveyed. However, the 2008 data show that very small to no unarmored threespine stickleback upstream of site 12. In addition, Swift (1999) determined that the densities of the unarmored threespine stickleback were highest for the four transects about 2 kilometers above and below the El Rancho Road crossing and less concentrated downstream above the lagoon.

Furthermore, populations can fluctuate substantially between years/season. Therefore, we do not estimate a population size for the unarmored threespine stickleback on VAFB.

Unarmored threespine sticklebacks were introduced into Cañada Honda Creek in 1984 (Service 1985a); however, no individuals have been found in Cañada Honda Creek in the last 12 years.

California Least Tern

We attained the following baseline information mostly from the 2008 report of the Monitoring and Management of the California Least Tern Colony at Purisima Point, VAFB (Robinette and Howar 2009).

Historically, California least terns have bred at various locations along the VAFB coastline from the Santa Ynez estuary to San Antonio Creek, an area spanning 10 km (6.2 miles). Since 1978, least terns have used the Purisima Point colony site on a regular basis (Schultz and Applegate 2000). In addition to the Purisima Point colony, least terns have bred at the Beach 2 colony during six breeding seasons between 1990 and 2003 with populations ranging from 1 to 15 pairs.

The Purisima colony has been characterized by a small population (especially when considering the amount of available breeding habitat) and variable annual productivity (Robinette and Howar 2008). The mean ± standard deviation (SD) number of breeding pairs per year at Purisima from 1995 to 2007 was 34.54 ± 23.56 (n=13) with a peak of 79 pairs in 2003. The mean ± SD productivity from 1995 to 2007 was 0.43 ± 0.40 fledglings per pair (n=13) with a peak of 1.32 in 2001. Productivity appears to alternate between above average and below average in brief, 3 to 4 year periods. The period from 1995 to 1997 showed below average productivity and was followed by above average productivity from 1998 to 2002, with the exception of 2000 which was very close to the 13-year average. The period from 2003 to 2006 was again low with the latter 3 years of the period having the worst productivity on record; there was only one fledgling produced through the entire 3-year period. Productivity in both 2007 and 2008 was well above this mean and marks a strong deviation from the prior three years when virtually no fledglings were produced. There was no change in breeding population size between 2007 and 2008 (Robinette and Howar 2008).

Point Reyes Bird Observatory (PRBO) estimated the 2008 breeding population to be 18 pairs. All nests were distributed relatively evenly throughout the central and southwest colony with no new areas being used by nesting terns. The 2008 breeding season was the second most productive season on record for least terns breeding at Purisima Point; despite having one of the smallest populations on record. The high productivity appears to be the result of a large mean clutch size and high hatching success. Hatching success in 2008 was the highest on record for the Purisima Point colony (94 percent); however, fledging success was low compared to previous years and this may have resulted from a lack of northern anchovies in the diet. Using data from 2001 through 2006, PRBO has shown that reproductive success at Purisima Point is closely tied to the occurrence of anchovies in the terns' diet. There was a low occurrence of anchovies in the 2008 diet compared to other years with high reproductive success (Robinette and Howar 2008).

The three most persistent predators observed in the vicinity of the Purisima colony were great horned owls, coyotes, and red-tailed hawks (*Buteo jamaicensis*), although red-tailed hawks have never been documented to prey on a tern. The avian predators that cause concern at VAFB include northern harriers, American kestrels, loggerhead shrikes, and great horned owls that nest close to the Californialeast tern colony. Kestrels, harriers and shrikes are efficient chick predators while owls take mostly adults. The number of predators sighted per hour of observation in 2007 and 2008 was moderate when compared to prior years. The years with the lowest number of sightings also had the relatively high colony attendance by adult terns (2001-2002), while years with the highest number of sightings had the lowest colony attendance (2004-2006). Despite the moderate number of predator sightings, predation did not appear to be a major contributing factor to reproductive success during the 2008 season. The only documented predation events for 2008 were one adult and one fledgling taken by owls (Robinette and Howar 2008).

Western Snowy Plover

We attained the following baseline information mostly from the 2008 annual report of the Breeding Activities of the western snowy plover on VAFB, California (MSRS 2008a).

Sandy beaches on VAFB stretch almost continuously from south of Lion's Head, an area of rocky outcrops on north base, to approximately 4 miles south of the Santa Ynez River on south base. Outside of this area, the coastline of VAFB is rocky or has steep coastal bluffs with occasional sandy coves that do not support western snowy plover breeding habitat. Snowy plover breeding activities on VAFB occur on approximately 13.8 miles of sandy beach. These beaches are separated into three major clusters (North beaches, Purisima beaches, and South beaches) for the purposes of monitoring and reporting. The Air Force allows recreational beach access to 1.25 miles of western snowy plover nesting habitat; however, all other sandy beaches designated as western snowy plover habitat on Vandenberg are closed during the breeding season (March 1 to September 30), in compliance with the Biological Opinion for Beach Management for the Western Snowy Plover (1-8-05-F-5R), as amended. These closed sections of beach are fenced and signed indicating the reason and timing of the closure. Fences run perpendicular to the ocean from the back dunes to at least the mean high tide line. The fencing is removed, in whole or part, at the end of the breeding season.

The mean number of adult snowy plovers recorded in the 2008 breeding adult censuses marks the first increase in population since 2004. Adult breeding snowy plovers during the 2008 season consisted of returning breeders, immigrants, and yearlings from the previous season returning to breed. While the 2008 mean population represents a 21 percent increase from 2007, it is still 23 percent lower than in 2006, 25 percent lower than in 2005 and 51 percent lower than in 2004. Base-wide egg hatch success during the 2008 breeding season was estimated at 41 percent, similar to the base-wide clutch hatch success rate (43 percent). The number of chicks hatched in 2008 (324) is the lowest recorded on VAFB since 2001.

The estimated base-wide chick fledging success in 2008 (21 percent) was lower than any prior year on VAFB with the exceptions of 1998 (6 percent) and 2004 (19 percent). Based on the fledging rate of 21 percent at least 67 chicks fledged from VAFB in 2008. However, this number may not represent an accurate estimate given the difficulty of detecting all chicks in a brood that may be present at a given time, and the fledging rate is extrapolated from confirmed banded chicks that fledged. This number may be underestimated as a result of not being able to distinguish between individual brood members once fledging occurs.

The factors affecting breeding success of snowy plovers are numerous and varied. Observations made over the past seven breeding seasons indicate a number of environmental factors, such as wind, temperature, and prey availability, in addition to human disturbance and predation (mostly by coyotes and common ravens), have the potential to considerably affect snowy plover nest site selection, hatching success and chick survivorship. Base-wide nest failure in 2008 was 57 percent. The primary cause of nest failures was attributed to predation, which accounted for 61 percent of nest failures. The secondary cause of nest failures was high surf events that occurred most commonly during late spring, and which accounted for 18 percent of nest failures.

EFFECTS OF THE ACTION

The project activities included within this biological opinion could directly and indirectly adversely affect the Vandenberg monkeyflower, beach layia, Gaviota tarplant, Lompoc yerba santa, El Segundo blue butterfly, vernal pool fairy shrimp, California red-legged frog, tidewater goby, unarmored threespine stickleback, California least tern, and western snowy plover. This biological opinion contains numerous launch-related and routine maintenance activities that the Air Force would conduct at VAFB; however, not all of the project activities detailed in the Description of the Proposed Action would affect all species. Therefore, for the following effects analysis, we only describe the project activities that may affect species and their respective habitats and do not analyze the projects that we concluded would have no adverse effects. As part of the project description, the Air Force proposes to implement base-wide best management practices and species-specific minimization measures to avoid and reduce the adverse effects of their project activities on the aforementioned species. We incorporated the suite of minimization measures into the following analysis.

Emergency Actions

Emergency actions, as defined by [50 CFR 402.05], are not analyzed as part of this consultation because we cannot anticipate the location, timing, or whether the emergency and the Air Force's response would adversely affect a particular species or its habitat. An emergency is a situation involving an act of God, disasters, casualties, national defense, or security emergencies, and includes response actions that must be taken to prevent imminent loss of human life or property [50 CFR 402.05]. Emergency actions cannot be predicted, but we believe that it is reasonable to assume based on past history that these types of events could occur sometime during the life of this biological opinion. Therefore, in the event that emergency actions are required that may

affect a federally listed species, the Air Force should follow the emergency consultation procedures.

Similarly, we are not analyzing hazardous waste spills and the associated cleanup efforts as part of this consultation because like emergency actions, waste spills and the cleanup activities could occur anywhere on the base and we are not able to anticipate the effects, if any, to listed species or their habitats.

Routine Mowing

We analyze base-wide routine mowing actions as a distinct activity because the regularly mowed areas are subject to continuous disturbance and we assume these areas would not provide long-term, high-quality habitat for any listed species. The routinely mowed areas have been mowed in the past and will continue to be mowed in the future. Therefore, we assume that 2,000 acres of the routinely mowed areas (road shoulders, landscaping, and the airfield area) would be void of any habitat value for any listed species. Utility corridors (1,300 acres), however, may provide temporary habitat to listed plant and animal species that depend on plants (e.g., El Segundo blue butterfly) because these areas are mowed less frequently and the vegetation can grow for some time before being subjected to mowing impacts. Nonetheless, these areas are not expected to provide permanent, high-quality habitat because any vegetation present in the utility corridors would be removed at least once sometime in the future. Additionally, nonnative invasive plants could encroach into these disturbed areas due to the repeated disturbances and outcompete native plants, effectively degrading the habitat within the utility corridors over the long term.

Occupied vernal pool fairy shrimp habitat within the routinely mowed areas is an exception to our assumption that mowing would cause these areas to be void of any habitat value or not provide long-term habitat. The vehicles and equipment could crush cysts within occupied habitat; however, because these areas would only be mowed during the dry season, we do not expect the mowing actions to eliminate the ability of the habitat to maintain the proper inundation period that allows remaining vernal pool fairy shrimp to complete their life cycle through the wet season. We do not know the long-term effects to the population or its habitat due to the routine mowing impacts.

We note that areas that are not currently mowed may contain key habitat features for a particular species analyzed in this biological opinion. Consequently, mowing previously unmowed areas could degrade or remove suitable habitat and is not included within the analysis and assumptions afforded the 3,300 acres that is routinely mowed as described above.

Firebreaks

Approximately 50 miles of existing firebreaks that may be up to 100 feet wide (approximately 600 acres total) are strategically located throughout the base, primarily around key assets, active launch facilities, and along the base perimeter. The Air Force would clear the existing firebreaks and maintain the existing access roads using graders, dozers, and other heavy equipment to repair

erosion. These proposed activities could occur at any time of the year. Therefore, we assume that these areas, similar to routinely mowed areas described above, could provide temporary habitat for listed plants, and animal species that depend on plants, but would be void of any long-term, high-quality habitat for listed species. Individual Lompoc yerba santa and Vandenberg monkeyflower plants may germinate along firebreak sections within suitable habitat between maintenance periods that will likely be killed during annual routine maintenance. While seacliff buckwheat, the host plant for El Segundo blue butterfly, may also germinate along firebreak sections within suitable habitat, because they are routinely cut, they are not likely to grow large enough to provide suitable habitat for butterflies. Firebreak maintenance may facilitate the spread of invasive plant species that may then degrade suitable habitat for listed plants.

Minor Construction

Minor construction projects are limited to 0.25-acre each in scope and could affect one or more listed species; however, the effects of minor construction actions can be incorporated into other programs, and therefore are not analyzed individually. Minor construction projects could occur throughout the base. Types of minor construction projects may include, but are not limited to, new security structures, gates and fences, sidewalks, a new concrete pad for a utility box, and other mission-support facilities. The Vandenberg monkeyflower, Gaviota tarplant, El Segundo blue butterfly, vernal pool fairy shrimp, and to a lesser extent, California red-legged frog, tidewater goby, unarmored threespine stickleback, California least tern, and western snowy plover may be affected by minor construction activities. The effects of minor construction projects could range from permanent direct effects such as the removal of occupied habitats to indirect effects such as the introduction of nonnative species into an occupied habitat area. We assume that many of these minor construction-type projects would occur in previously disturbed areas. Per the avoidance and minimization measures proposed by the Air Force, the actions would occur outside of the peak breeding and germinating periods for all of the species that may be affected, and the Air Force would use Service-approved biologists to capture and relocate some animal species that may be affected by these actions prior to beginning the construction activities. Therefore, we do not anticipate that minor construction projects would substantially adversely affect high-quality occupied or suitable habitat for listed species. Listed animal species that inhabit adjacent habitats could be adversely affected due to presence and associated noise of project personnel and machinery at the work sites; however, these effects are expected to only be temporary.

Species-Specific Effects Analysis

The next section of the effects analysis describes the anticipated effects of the project actions to the Vandenberg monkeyflower, beach layia, Gaviota tarplant, Lompoc yerba santa, El Segundo blue butterfly, vernal pool fairy shrimp, California red-legged frog, tidewater goby, unarmored threespine stickleback, California least tern, and western snowy plover. We analyzed each program as written in the Description of the Proposed Action (Mission Operations, Infrastructure Support, Infrastructure Development, Environmental Management Programs, and Fire

Management); however, not all programs affect all species. A summary of effects concludes each individual species analysis.

Vandenberg Monkeyflower

Project activities that may adversely affect the Vandenberg monkeyflower include mission operations (security and antiterrorism operations), infrastructure support (road and utility maintenance, fencing installation and maintenance), infrastructure development, and environmental management programs (IRP, MMRP, archeological support, invasive species management, grazing and livestock, sensitive species management, fire management).

Mission Operations

Security and antiterrorism operations could damage Vandenberg monkeyflower plants when required to drive off existing roadways to respond to law enforcement incidents or anti-terrorism activities, but neither we nor the Air Force can predict when or where these circumstances would occur. Individual plants could be crushed if these patrols drive through occupied Vandenberg monkeyflower habitat. ATV use could also indirectly affect the Vandenberg monkeyflower by transporting vegetative material of invasive species into occupied areas.

Infrastructure Support

There are currently no occurrences of the Vandenberg monkeyflower within areas where infrastructure support activities occur. However, should the Vandenberg monkeyflower be found in currently unoccupied but suitable habitat, road maintenance, utility installation, maintenance and removal, and fencing installation, maintenance, and removal may affect the species.

Any Vandenberg moneyflower plants that grow along roadsides could be crushed by road maintenance activities; however, the Air Force will contain their work within the road footprint during any maintenance activities near occupied habitat to minimize this effect. Utility installation, maintenance and removal projects may also have direct impacts to Vandenberg monkeyflower. Vandenberg monkeyflower plants along access routes may be crushed, destroyed or temporarily disturbed. Heavy equipment could also compact soil and may affect establishment of new Vandenberg monkeyflowers.

Fencing installation, maintenance and removal may directly impact Vandenberg monkeyflower plants. Plants may be damaged or removed when new postholes are dug, fencing material is laid down at a work site, or crushed by work vehicles. At times, it may be necessary to remove plants growing under and around the fence for security concerns or structural concerns.

Environmental Management Programs

Areas currently occupied by the Vandenberg monkeyflower do not contain any IRP sites and are outside of the major munitions area, but both IRP and MMRP actions could occur within suitable Vandenberg monkeyflower habitat as personnel and vehicles traverse occupied habitat searching for UXO. The Air Force estimates that approximately 28 acres of IRP sites and approximately 190 acres of MMRP areas overlap with suitable Vandenberg monkeyflower habitat. Individual plants could be crushed and killed or injured and its seed bank could be removed if they are within the same area as contaminated sites or a UXO item that is determined unsafe to move and is required to be blown in place.

While the nearest known occurrence is approximately 2,000 feet east of the landfill boundary, approximately 67 acres of the designated sanitary landfill overlaps with suitable Vandenberg monkeyflower habitat and any individual plants that may be present at the time will likely be killed as landfill activities expand into undisturbed areas.

Invasive species removal actions may have limited adverse effects to the Vandenberg monkeyflower due to soil disturbance, but the overall intent of these programs is to benefit this species by reducing invasive species and improving the quality of occupied habitat areas. Mechanical removal methods are likely to result in soil disturbance and could directly affect individual plants and remove the seed bank. Manual removal methods are preferred where invasive plant species are interspersed with other sensitive species. Because we do not have enough information to analyze the use of chemical control, we are not analyzing the effects of herbicides on the Vandenberg monkeyflower.

While none of the seven grazing units overlap with areas known to be occupied by the Vandenberg monkeyflower, a portion (approximately 101 acres) of one of the units overlaps with suitable habitat, so grazing activities could adversely affect the species because cattle may trample and/or graze on individual plants.

Sensitive species management actions, which could include actions such as surveys for other listed species on VAFB and collecting native seeds for restoration, could affect a limited number of Vandenberg monkeyflower plants and their habitat. Qualified biologists would conduct the sensitive species management actions, and therefore, most impacts can be avoided and these actions are expected to provide an overall benefit to the Vandenberg monkeyflower and its habitat.

Summary of Effects to the Vandenberg Monkeyflower

We do not expect many of the covered actions to adversely affect the Vandenberg monkeyflower. Security and anti-terrorism actions would not affect the Vandenberg monkeyflower unless personnel are required to drive ATVs through occupied habitat areas in the event of a security operation. This circumstance is expected to be rare. Firebreak, road, utility, and fence maintenance actions are not expected to substantially affect the Vandenberg

monkeyflower because habitats along firebreaks, roadsides, utility corridors and fencelines are routinely mowed or disturbed and do not provide high quality Vandenberg monkeyflower habitat. However, any new firebreak, road, utility, or fencing projects within Vandenberg monkeyflower habitat may directly crush, injure, and kill individual plants. Environmental Management Program activities IRP, MMRP, environmental compliance (landfill) and grazing may also directly affect the Vandenberg monkeyflower, but because only a small portion of suitable monkeyflower habitat overlaps with these activities, the effects are expected to be minor. Invasive species removal and sensitive species management activities may have a temporary adverse effect on Vandenberg monkeyflower habitat, but the intent is to improve the habitat quality in the long term.

Beach Layia

Project activities that may adversely affect the beach layia include mission operations (space launches); infrastructure support activities (road and utility maintenance); and environmental management programs (the MMRP, invasive species removal, and sensitive species management).

Mission Operations

Launches from SLC-2, SLC-3, and SLC-4 could adversely affect the beach layia due to the potential for deposition of exhaust products from launch vehicles; however, only launch vehicles that use solid rocket motors or boosters would produce an acid cloud upon launch. The principle effluents from solid rocket motors are hydrogen chloride (HCl), aluminum oxide ($Al_2O_{3)}$, water (H_2O), carbon monoxide (CO), carbon dioxide (CO_2), and aluminum chloride ($AlCl_3$). Exhaust constituents of primary concern are Al_2O_3 and HCl, whereas the other combustion products are nontoxic, react to form nontoxic compounds, or are present in insignificant quantities (Schmalzer et al. 1998).

The exhaust plume that forms may contain 10 to 25 percent of the total effluent from the rocket, as well as steam from injected cooling water and launch platform sand and debris (Radke et al. 1982). The ground cloud evolves with time due to the internal physical and chemical processes and the interaction with the ambient air. Fall out or rain out of the material from the cloud can produce localized effects from acid or particulate deposition. In addition, the potential exists at each launch facility for disposal and (or) deposition of trace metals and organics, depending on propellant and facility characteristics. The metals and organics may be derived from minor constituents in propellants or rocket components eroded in the firing process or from paints and construction materials eroded and dispersed from the facility (Schmalzer et al. 1998).

Exhaust constituents and environmental effects of expendable launch vehicles, such as Delta, Atlas, and Titan have been compared with those of the Space Shuttle. Vegetation changes from Space Shuttle launches include loss of sensitive species, loss of plant community structure, reduction in total cover, and replacement of some species by weedy invaders (Schmalzer et al. 1998). Repeated exposure to the Space Shuttle exhaust cloud caused community level changes

that included reduction in species richness as a result of the elimination of sensitive species; grasses, sedges, and weedy herbs replaced shrubs and small trees which could not survive repeated defoliation; and a decrease in total vegetative cover as strata and individual species were lost (Schmalzer et al. 1985). No structural changes were observed in dune and strand communities with only one exposure to the launch cloud (Schmalzer et al. 1985). The launch vehicles used at VAFB differ in the number and size of solid rocket boosters and all are smaller and use less water than the Space Shuttle. Therefore, the launching of vehicles at VAFB is expected to result in less effluent and a smaller impact zone than the Space Shuttle.

The phytotoxicity of products released from the ground cloud of a Space Shuttle launch was studied by the Statewide Air Pollution Research Center at the University of California, Riverside. The non-toxic nature of Al_2O_3 was confirmed in laboratory tests. Large necrotic areas, bifacial and interveinal, were typical symptoms of foliar injury from HCl. Similar necrotic lesions were produced on most species tested with an HCl mist applied in greenhouse studies. Leaves were the most likely part of the plant to be injured, with lower surfaces more sensitive than upper surfaces. Injury effects of two or more short exposures to HCl were additive for the plants tested. The acidity of HCl mist was more important than the length of exposure in determining the extent of injuries to vegetation. The magnitude of these effects depends on the plant species, the buffering capacities of soils, and the intensity and frequency of acid deposition (Granett 1984).

No direct pH measurements or visual monitoring of beach layia has been done to determine the effects of acid deposition resulting from launches. Thus, we are not able to determine short- or long-term adverse effects to beach layia resulting from acid deposition. The beach layia population on south base is approximately 1.3 miles northwest of SLC-3 and 0.56 mile north-northwest of SLC-4. The nearest active launch site to the beach layia population on north base is SLC-2, approximately 1 mile to the southwest. The prevailing winds at VAFB are from the north-northwest, and we could assume that the winds would typically transport potential deposition away from the occupied habitat. To help determine more accurately if launch vehicle effluents adversely affect the beach layia and its habitat, the Air Force proposes to monitor acid deposition for the first two launches of any launch vehicle from SLC-4 that uses solid rocket motors or boosters, and if no adverse impacts are observed, the Air Force would cease monitoring for effects of acid deposition on the beach layia for future launches.

Launch anomalies may occur on rare occasions. We have previously stated that the beach layia could be adversely affected by launch vehicle malfunctions or failures because an explosion could disperse hazardous materials to an area occupied by beach layia. While this may be true, a launch vehicle malfunction or failure is unlikely to occur, and as a result, we are not analyzing this unlikely adverse effect in this biological opinion.

Infrastructure Support

Road maintenance may directly affect occupied beach layia habitat. Work on the shoulder of Coast Road could result in crushing individual plants and the seed bank; however, the Air Force

will contain their work within the road footprint during any maintenance activities near occupied habitat to minimize this effect.

Utility maintenance may directly affect the beach layia because the Air Force would conduct maintenance and repairs on an existing water line that is within the shoulder of Coast Road. The Air Force uses different methods to maintain, repair, and install utility pipelines. Trenching is the primary method for repairing pipelines along roads. A maximum work area of 30 feet wide would be required for personnel and maneuvering equipment. Direct burial by plowing could also result in soil excavation, but this method would have a smaller footprint than trenching. Directional drilling requires a work area approximately 50 feet wide by 100 feet long at the bore entry and exit points. Using this method is intended to avoid or reduce the disturbance to sensitive species because the ground disturbing actions at the entry and exit point would not be within occupied habitat areas. Because it is not clear which method would be used to work on utility lines in beach layia habitat, we assume the open trenching method as the default because it would generally result in the most ground disturbance to occupied habitat areas due to the larger work footprint.

Utility maintenance actions, similar to road maintenance actions, could result in crushing and killing or injuring individual plants and the seed bank. If the existing water line requires maintenance within occupied habitat, the Air Force will minimize the area of disturbance to within 10 feet of the pipeline to reduce the effects to the occupied habitat and seed bank that most likely surrounds known occupied areas. To reduce permanent removal of the seed bank, the Air Force will preventatively scrape the topsoil prior to conducting actions that would adversely affect the seed bank and then return it to adjacent suitable habitat upon completion of the project. In addition, the Air Force will remove invasive plants species at a 2:1 ratio if project actions disturb occupied habitat areas.

Beach layia plants could also be adversely affected as the Air Force removes existing power poles along Coast Road, one or more of which are in beach layia habitat. Power poles are typically cut at the base and allowed to fall to the ground. Depending upon which direction the pole falls, beach layia plants could be crushed. On rare occasions, the poles may be dragged from their location, which could not only crush individual plants but disturb soil as the pole is dragged. Personnel accessing the site could also trample and kill or injure beach layia plants, although a qualified biologist will clearly mark beach layia plants within the project site and delineate the known occupied area of previous blooming seasons to prevent workers and equipment from adversely affecting plants that are outside of the work footprint. We do not expect maintenance of recently installed power poles to adversely affect beach layia because the actions can be accomplished from Coast Road.

Environmental Management Programs

MMRP actions could affect the beach layia as personnel and vehicles traverse occupied habitat searching for UXO. Individual plants could be crushed and killed or injured and its seed bank could be removed if they are within the same area as a UXO item that is determined unsafe to

move and is required to be blown in place. Based on preliminary surveys, however, occupied beach layia habitat is outside of the major munitions area and is not proposed for further action. Therefore, we do not expect UXO actions to occur in the vicinity of known and historic beach layia populations.

Invasive species removal actions have a potential to adversely affect a small quantity of beach layia plants or temporarily disturb the habitat due to the different methods the Air Force would use to remove invasive species. Manual removal methods would be the preferred method where invasive plant species are interspersed with other sensitive species, but may not be practical in all situations, particularly when attempting to control veldt grass. Mechanical removal methods could use bulldozers and backhoes to remove invasive plant species in areas of homogeneous invasive plant species and infestations adjacent to pavement, although this control method is likely to result in adverse impacts on surrounding vegetation and soils due to the need for heavy equipment access routes. Chemical control can be an effective method to remove invasive plants. Chemical control is not anticipated to affect the beach layia because actions would occur outside of the germinating and blooming seasons and control efforts will follow label directions and incorporate the guidelines detailed in the Base-wide Best Management Practices #13. Invasive species removal actions overall may adversely affect the beach layia, but the intent of these actions is to improve the habitat conditions by removing nonnative, invasive plant species that degrade the quality of the occupied habitat areas.

Similarly, sensitive species management actions, which could include actions such as surveys for other listed species on VAFB and collecting native seeds for restoration, could affect a limited number of beach layia plants and their habitat. Qualified biologists would conduct the sensitive species management actions, and therefore, these actions are expected to provide an overall benefit to the beach layia and its habitat.

Summary of Effects to the Beach Layia

In summary, we do not expect that the beach layia would be substantially adversely affected as a result of implementing the actions analyzed in this biological opinion. The beach layia occurrence that is closest to Coast Road, the same occurrence that was affected by previous power pole maintenance, is expected to be the only location affected by road and (or) utility maintenance activities. Previous utility maintenance of existing power poles resulted in 0.065 acre of disturbance to occupied habitat; however, maintenance of these poles in the future would be conducted from the road and therefore power pole maintenance of new poles in this location is not expected to adversely affect the beach layia. Occupied beach layia habitat is outside of the major munitions area and is not proposed for further action; thus, we do not expect adverse effects to the beach layia from the MMRP. Invasive species removal and sensitive species management actions would occur outside of the germinating and blooming seasons and conducting surveys for other sensitive species would be accomplished by qualified biologists, which we expect would minimize the potential trampling of individual plants. We do not know for certain whether beach layia is affected by acid deposition, but overall, we anticipate that up to

approximately 0.065 acre out of 1.17 acres (approximately 5 percent) of occupied beach layia habitat could be adversely affected.

Gaviota Tarplant

Project activities that may affect the Gaviota tarplant include mission operations (space and missile launches and antiterrorism operations); infrastructure support (road and utility maintenance); and environmental management programs (grazing and invasive species removal).

Mission Operations

Gaviota tarplant in the vicinity of Point Arguello and Lions' Head, near Point Sal, could be affected by space launch operations and missile launch operations, respectively, due to routine mowing or landscape maintenance actions for safety and security purposes that are associated with launch activities. Gaviota tarplant may occur within the routinely maintained areas or firebreaks associated with the launch facilities or along the roadsides leading to and from the facilities. The level of impact would depend on the time of year that the Air Force would mow. If the Air Force clears vegetation after the Gaviota tarplants have dried out and set seed (usually late summer to fall) and prior to germination (usually around February), it would reduce the level of impact. But if the Air Force mows when the plants are in a vegetative state or in flower, the Gaviota tarplants would die and it may result in the prevention of plants replenishing the seed bank. In addition, the level of affect would depend upon the frequency of the activities. The Gaviota tarplant responds positively to some level of soil disturbance, such as light grazing by cattle, but frequent disturbances could adversely affect the tarplant and may stimulate the growth of competitive nonnative plants, degrading the habitat over the long term. Although the Air Force would clear Gaviota tarplant after the seed has set and prior to the rainy season to the maximum extent practicable, because the vegetation must be cleared in association with a launch event, the Gaviota tarplant could be affected at any time of year.

Security and antiterrorism operations could affect the Gaviota tarplant because security personnel may be required to drive ATVs off existing roadways to respond to law enforcement incidents or anti-terrorism activities. Security patrols normally drive on existing paved and unpaved roadways, but in rare circumstances, Air Force personnel may be required to drive off existing roadways to respond to law enforcement incidents or anti-terrorism activities. Driving through occupied habitat during the peak blooming or geminating periods could kill or injure the Gaviota tarplant. Neither we nor the Air Force can predict when or where these circumstances would occur.

Infrastructure Support

Road and utility maintenance actions could affect the Gaviota tarplant because work on road shoulders or within utility corridors may crush and kill or injure individual plants. Road maintenance may directly affect occupied habitat by crushing individual plants and removing the seed bank; however, the Air Force would minimize the impact by scraping the topsoil to preserve

the seeds prior to ground disturbance, and conduct actions after the seed has set, to the maximum extent possible. A maximum work area 30 feet wide would be required for personnel and maneuvering equipment. We assume the Air Force would use open trenching as the default method of construction because it would generally result in the most ground disturbance to occupied habitat areas due to the larger work footprint.

Utility maintenance actions, similar to road maintenance actions, could result in crushing and individual tarplants and removing the seed bank within a maximum work area of 30 feet wide. Some of the utility corridors may be subject to routine mowing, the effects of which were addressed above.

Environmental Management Programs

Invasive species removal actions could adversely affect the Gaviota tarplant, but the overall intent is to benefit this species by reducing competition from invasive plants and improving the quality of the occupied habitat areas. Mechanical removal methods is likely to result in adverse impacts on surrounding vegetation and soils due to the need for heavy equipment access routes. Manual removal methods would be the preferred method where invasive plant species are interspersed with other sensitive species. Because we do not have enough information to analyze the effects of chemical control, we are not analyzing the effects of herbicides on the Gaviota tarplant.

Grazing could adversely affect Gaviota tarplant because cattle may trample individual plants, although browsing of Gaviota tarplant is not likely. Grazing and browsing animals such as horses, cattle, and deer avoid the strong smelling, resinous plants when feeding. In addition, the Air Force's Range Management Plan rotates an 800 head cow-calf operation through various pastures within six grazing units. The system is intended to maintain healthy vegetative communities by providing an opportunity for plant re-growth after grazing, seed production, and seedling establishment.

Installation and maintenance of water troughs could adversely affect the Gaviota tarplant. These actions are accomplished by accessing the location with a pick-up truck or ATV-type vehicle that carries the materials or maintenance supplies to the work site. The area where the trough is placed is then leveled with hand shovels or with a load of gravel.

Fencing installation and maintenance actions could directly affect the Gaviota tarplant because plants could be crushed when personnel access a work site. Personnel riding horseback normally accomplish fence maintenance, unless major maintenance is needed. In that case, fence installation could include driving a pick-up truck, ATV-like vehicle, or tractor along fence lines to distribute materials and could crush vegetation to make way for a new fence if needed. Vegetation along fence lines is often cleared for security and (or) structural purposes. The cut vegetation would be left in place.

Summary of Effects to the Gaviota tarplant

Because the Gaviota tarplant populations on base are known to occur in the vicinity of Sudden Peak, Point Arguello, and Point Sal, many project actions are not expected to affect this species. Launch operations could affect the Gaviota tarplant due to the landscaping, vegetation clearance, and patrols for safety and security. Infrastructure support could affect this species; however, some of the occupied habitat may be less than high-quality because of ongoing mowing and other maintenance actions. Grazing and maintaining the associated infrastructure and facilities are the activities that would mostly affect the Gaviota tarplant in the vicinity of Sudden Peak; however as stated above, cattle browsing this species is unlikely due to the nature of the plant and the implementation of the Air Force's Range Management Plan. Maintenance actions and mowing along roads, utility corridors, or fence lines could also affect the Gaviota tarplant in this area, although these frequently disturbed areas would only provide marginal habitat. While the Gaviota tarplant would be adversely affected by project activities, we do not expect the Gaviota tarplant population on base to be substantially reduced below its current condition.

Lompoc Yerba Santa

Project activities that may adversely affect the Lompoc yerba santa include mission operations (security and antiterrorism operations), infrastructure support (road and utility maintenance), and environmental management programs (invasive species removal). The population that would be the most affected by maintenance activities is the 35th Street population.

Mission Operations

The Air Force uses ATVs to conduct security and antiterrorism operations, normally driving on existing paved and unpaved roadways; however, in rare circumstances, Air Force personnel may be required to drive off existing roadways to respond to law enforcement incidents or anti-terrorism activities, but neither we nor the Air Force can predict when or where these circumstances would occur. Individual plants could be crushed if these patrols drive through occupied Lompoc yerba santa habitat. ATV use could also indirectly affect the Lompoc yerba santa by transporting vegetative material of invasive species that degrade the native chaparral and oak woodland habitat.

Infrastructure Support

Road maintenance activities could adversely affect the Lompoc yerba santa because there is a road within 100 feet of occupied habitat at the 35th Street population, but no Lompoc yerba santa plants occur immediately adjacent to the paved road. The Air Force will install a fence between the occupied habitat and 35th Street, and between the occupied habitat and an adjacent dirt road to discourage personnel and vehicles from accessing the occupied area. Therefore, we do not expect that road maintenance actions to directly affect the Lompoc yerba santa.

Utility maintenance and repair actions could adversely affect the Lompoc yerba santa because an existing communications line is within occupied habitat. Work on this line may require a work area up to 30 feet wide for personnel and maneuvering equipment. Excavation of soil could remove individual plants. Personnel and vehicles moving within occupied habitat could crush individual plants. The Air Force estimated that approximately 0.4 acre would be directly adversely affected as a result of conducting utility maintenance actions in occupied Lompoc yerba santa habitat. They will minimize the disturbance to the maximum extent practicable by relocating or redesigning projects to avoid the sensitive areas, using low impact equipment such as hand tools and rubber-tired vehicles, and installing temporary or permanent fencing to keep personnel and equipment out of areas of high habitat value that consists of intact chaparral or native species habitat. Furthermore, the Air Force will enhance occupied habitat by removing invasive plant species at a 3:1 ratio for project-related disturbances.

Environmental Management Programs

Invasive species removal actions may have limited adverse effects to the Lompoc yerba santa due to soil disturbance, but the overall intent of these programs is to benefit this species by reducing invasive species and improving the quality of occupied habitat areas. Mechanical removal methods are likely to result in soil disturbance and could directly affect individual plants and remove the seed bank. Manual removal methods are preferred where invasive plant species are interspersed with other sensitive species. Because we do not have enough information to analyze the use of chemical control, we are not analyzing the effects of herbicides on the Lompoc yerba santa.

The Air Force anticipates removing eucalyptus (*Eucalyptus* spp.) and Monterey Pine (*Pinus radiata*) from occupied habitat. Removal of these trees may benefit the Lompoc yerba santa because these trees can reduce available soil moisture, increase shading, and in the case of eucalyptus, produce/release growth-inhibiting terpenes (Service 2008a). Lompoc yerba santa is specially adapted to exploit open conditions, such as those after fire (Jacks et al. 1984). Therefore, removing invasive plants from occupied habitat may have a similar benefit by creating open spaces that Lompoc yerba santa can utilize.

Summary of Effects to the Lompoc Yerba Santa

We do not expect many of the actions to adversely affect the Lompoc yerba santa. Launch-related actions would not affect the Lompoc yerba santa unless security personnel are required to drive ATVs through occupied habitat areas in the event of a security operation. This circumstance, however, is rare and cannot be predicted or quantified. Road maintenance actions are not expected to affect the Lompoc yerba santa because the Air Force will install a fence around the occupied habitat to ensure personnel and vehicles do not access the occupied area. Utility maintenance actions could affect up to 0.4 acre of occupied habitat as the Air Force needs to conduct utility maintenance actions on an existing utility line within occupied habitat. Invasive species removal activities may have a temporary adverse effect, but the intent is to improve the habitat quality in the long term. These actions may improve occupied habitat

conditions by removing eucalyptus and Monterey pine trees. Overall, we anticipate that up to 0.4 acre (approximately 10 percent) of occupied habitat could be adversely affected by the project activities.

Vernal Pool Fairy Shrimp

Project activities that may adversely affect vernal pool fairy shrimp include mission operations (security and antiterrorism operations), infrastructure support activities (road and utility maintenance, fencing maintenance, and mowing), and environmental management programs (the IRP and MMRP, invasive species removal, grazing, and firebreak maintenance).

The Air Force delineated buffer zones that surround known occupied habitat to provide a safeguard to the adjacent upland areas and minimize adverse impacts to the natural hydrology that contributes to the quality of occupied habitat. Vernal pool fairy shrimp occupy 82 acres of habitat surrounded by nine buffered zones that range from 3 to 280 acres. Some buffer zones only surround one pool while others surround as many as 10 pools; however, not all pools have buffer zones because they occur next to developed lands or pavement. The buffer zones encompass approximately 520 acres.

Mission Operations

Air Force security forces use ATVs and vehicles during routine security and antiterrorism patrols. Personnel would generally stay on the existing paved and unpaved roads; however, patrols may need to respond to law enforcement incidents or anti-terrorism activities that require them to drive off existing roadways and possibly through occupied habitat at any time of year. During the dry season, the patrols could crush and kill or injure cysts. Soil particles surrounding cysts may provide cushioning for some cysts, allowing greater weight to be applied before crushing occurs. However, Hathaway et al. (1996) found that small forces less than 1 newton, which is less than 100 grams, crushed even the sturdiest cysts. In addition, many cysts that survive disturbance with only external damage to the cyst shell may later become unviable due to sun exposure or sand abrasion (Hathaway et al. 1996). Encroachment into occupied habitat during the wet season could kill and injure individual shrimp and cysts because even less force caused crushing when wet; 70 percent of vernal pool fairy shrimp cysts crushed under the weight of a microscope slide (Hathaway et al. 1996).

Patrols could also adversely affect the habitat to such an extent that may affect the natural hydrology and not allow the habitat to pond for a period of time sufficient for the vernal pool fairy shrimp to complete its life cycle. No real world events have ever necessitated security forces to disturb occupied habitat. Nonetheless, if such an event occurs and patrols encroach into occupied habitat areas, security personnel will notify a 30 CES/CEI biologist within 48 hours in order to determine the level of impact.

Infrastructure Support

Approximately 80 percent (65.7 acres) of occupied habitat occurs within 100 feet of a paved road. Typically, these pools are set back from the road with a vegetative buffer between the main road and pool. Approximately 2 percent of occupied habitat (1.9 acres) occurs within 50 feet along 0.5 mile of unpaved roads. Road maintenance could adversely affect vernal pool fairy shrimp, but road maintenance actions would occur within the existing footprint of the paved or unpaved road. In addition, these actions would only occur when the soil is dry to the touch, thus cysts would be subject to mortality or injury and we do not expect that the habitat would be degraded by the movement of vehicles and equipment. Road maintenance actions could generate sediments that could reach occupied habitat, but the Air Force will place appropriate sedimentation barriers down slope of a project site and place appropriate protective fencing around pools to reduce the probability of sedimentation. If road maintenance activities permanently remove the vegetative buffer between the road and occupied habitat, the Air Force will revegetate the impacted area with a seed mixture approved by a 30 CES/CEI biologist and remove invasive plants from a nearby buffer area at a 1:1 ratio for temporary disturbances and at a 5:1 ratio for permanent disturbances.

Utility maintenance actions could adversely affect vernal pool fairy shrimp because VAFB has approximately 2.6 miles and 14 miles of underground utilities beneath occupied habitat areas and the buffer zones, respectively. Utility maintenance actions would be scheduled to occur when the soil is dry to the touch unless a utility is determined to be broken or leaking, in which case the work could be conducted at any time of year. The Air Force estimated that approximately 0.3 acre of occupied habitat exists on top of underground utilities and another 1.7 acres of habitat occurs on top of a buffer zone, but their estimate is based on an average utility of 12 inches in diameter. The footprint to conduct utility maintenance actions could be larger than 12 inches wide because the maximum disturbance footprint from trenching is 30 feet wide. Therefore, if all buried utilities within occupied habitat required maintenance actions, 11.4 acres of habitat would be affected. Likewise, if all buried utilities in the buffer zone required maintenance, 31.4 acres would be affected. We assume this to be a worse-case scenario because not all utilities would require maintenance at the same time; however, the Air Force expects that all buried utilities would eventually require some maintenance actions in the future.

The Air Force may also utilize directional drilling, which would reduce the direct impacts to occupied habitat areas. During the drilling process, however, a frac-out could occur in which the bentonite slurry can leak from the borehole through fissures or cracks in the soil and reach the surface. A frac-out can occur at any point along the directional bore, but the risk for a frac-out is greatest at the bore entry and exit points and the risk declines as the depth of the drill head increases. If a frac-out occurs within aquatic habitat, the released bentonite could increase the turbidity of the water, depending on the amount of drilling fluid released, the length of time it was released, and the volume of water in occupied habitat at the time of release (Service 2007c). Bentonite, a very fine clay with positive and negative charges on its surface, is attracted to oppositely charged surfaces, such as gill membranes, and could adhere to them. This makes bentonite particularly detrimental to aquatic organisms because affected organisms may

suffocate if exposed to high concentrations of the slurry and overwhelm the animal's ability to clear impacted gill filaments through physiological processes (National Marine Fisheries Service 2003).

Electrical power pole maintenance and removal actions could adversely affect vernal pool fairy shrimp because the maintenance and operation of the electrical distribution system requires weekly travel under the power lines. Currently, 31 power poles occur within occupied habitat and 123 power poles are present inside a buffer zone or within 20 feet of a buffer zone. A 15 to 20 foot wide right-of-way is cleared around all installed power lines and around all power poles where most of the maintenance and repair work is accomplished. Project personnel would access each power pole via a pre-designated 8 foot wide path, which could affect approximately 1.4 acres of occupied habitat and 3.2 acres of buffer zone. The removal of power poles and underground power lines would only occur during the dry season; therefore these actions could cause mortality or injury to cysts. Power poles are typically cut at the base and allowed to fall to the ground. On rare occasions, the poles may be dragged from their location, which could not only crush individual plants but disturb soil as the pole is dragged. If poles are allowed to fall freely onto occupied habitat, the structure of the habitat could also be adversely affected depending on the force of the fallen pole. The Air Force will minimize this impact and avoid dropping poles onto occupied habitat areas to the maximum extent possible.

Excavating soil within occupied habitat could kill and injure the vernal pool fairy shrimp. Trenching could also alter the natural hydrology of occupied vernal pool fairy shrimp habitat and the upland buffer area that is hydrologically connected to the pool. Adversely affecting the natural hydrology may preclude the vernal pool fairy shrimp from completing its life cycle. When digging is required within occupied habitat during the dry season; the cyst bank will be temporarily removed before the project begins, as described in minimization measure #7 for the vernal pool fairy shrimp. If excavation within occupied habitat is required during the dry or wet seasons, the area will be monitored for two seasons following the completion of the project and when there is sufficient rainfall for the habitat to pond in order to determine presence/absence of vernal pool fairy shrimp. If after 2 years no vernal pool fairy shrimp are detected, then seed cysts from a nearby pool will be collected per measures 7 and 8 and used to restore the affected pool. The pool will then be surveyed for another two seasons to determine occupancy.

The Air Force does not anticipate altering the topography or hydrological integrity of occupied vernal pool fairy shrimp habitat; however, if alteration does occur the Air Force will restore the topography to allow the habitat to function as it did prior to the disturbance, to the greatest extent possible. The pool impacted will be reevaluated for two seasons when there is sufficient rainfall for the area to pond to determine if the effects are permanent or temporary. If permanent loss of an entire occupied pool occurs, the pool will be replaced at a 1:1 ratio with a new occupied pool. In this circumstance, the Air Force will submit a plan to the Service that uses the appropriate methods, and get our approval, prior to creating a new occupied pool. Cysts from another occupied pool may be used to seed the new pool’s cyst bank. Narlon Loamy sand or soil that is consistent with the damaged pool may be taken from an area that is not occupied and is outside

of the buffer zones. Once the pool is created, it will be monitored for 2 years when there is sufficient rainfall for the subject area to pond to determine if the replacement pool is successful.

Routine mowing during the dry season could directly affect vernal pool fairy shrimp because the vehicles and equipment could crush cysts, as described above. The Air Force determined that mowing would occur in parts of 7 pools and affect approximately 8.3 acres of occupied vernal pool fairy shrimp habitat.

Fence maintenance actions could affect vernal pool fairy shrimp because one occupied pool contains existing fence posts that would require maintenance actions. The clear zone is 30 feet on either side of a fence. Approximately 25 percent (0.09 of 0.38 acre) of one pool that is located within 100 feet of a building or 30 feet of a fence would be mowed to meet this requirement. Mowing around existing fences could crush and kill or injure cysts, but we do not expect it to adversely affect the natural hydrology of the habitat. Maintenance activities on the fence posts and fence would occur when the soil is dry.

If new fencing is installed, mowing would occur on both sides of the fence. The Air Force hypothesized that there may be instances when placing a fence through a pool, rather than around the pool, would result in less overall mowing occurring in the pool. While this would result in fewer impacts from mowing, placing a fence post within occupied habitat could damage the water-holding capacity of the habitat. 30 CES/CEI biologists will provide recommendations to project personnel to avoid occupied habitat and the buffer zones prior to fencing maintenance and (or) installation.

Environmental Management Programs

IRP actions could adversely affect the vernal pool fairy shrimp because 14 occupied pools occur within an IRP/AOC/AOI site. Seventeen monitoring sites occur within occupied habitat. The Air Force must monitor these wells year-round to capture data as the water table rises during the wet season. The monitoring actions will occur for many years into the future. The existing monitoring wells are each approximately 50 square feet. The Air Force estimated that accessing these wells would affect a total of 6,300 square feet (approximately 0.15 acre). Six remediation activities would occur within occupied habitat and would only occur during the dry season over the next 4 years. The Air Force estimated that remediation actions would affect approximately 18,295 square feet (0.42 acre). Furthermore, actions to clean up the IRP sites may provide a long-term benefit because a goal of the IRP is to remediate past contamination.

MMRP actions could adversely affect vernal pool fairy shrimp because approximately 27 percent of the occupied habitat (22 acres out of 82 acres) on base occurs within MEC surface removal areas, including the largest and most undisturbed vernal complex on VAFB. Activities within this area may include access route construction, walking surveys, trimming vegetation with weed eater and chainsaws, utilizing ATVs to survey the areas, pulling a cart with equipment for geophysical mapping, and conducting BIP actions. The movement of vehicles and personnel during survey actions could crush and kill or injure cysts during the dry season. If access routes

are created, project personnel, in consultation with onsite biological monitors, 30 CES/CEI, and explosive ordnance disposal specialists would determine the access routes. Upland vegetation may be cleared to access particular areas, which could affect the hydrology of occupied habitat down slope if the nearby occupied pools receive water from aboveground sheet flow. MMRP actions would only occur within occupied habitat when the soil is dry to the touch. No ATVs or carts would be driven in occupied pools during MMRP activities. When ATVs are used in the buffer zones surrounding occupied habitat they will be used when the topography is level and will not alter a pool's hydrology.

Vernal pool fairy shrimp cysts could be killed or injured if UXO is discovered within occupied habitat areas. Exploding an item in place could alter the natural hydrology of occupied habitats to such an extent that the inundation period is not sufficient for vernal pool fairy shrimp to complete their life cycle. If an item is determined safe to move, personnel would simply pick up the item and no or very minimal soil disturbance would be required. An unmitigated demolition of a typical UXO (75-milimeter high explosive projectile) is anticipated to result in 3 to 5 square feet of soil disturbance, 6 to 10 square feet of vegetation disturbance, and 1 foot of vertical disturbance at each site. Project personnel may employ engineering controls such as sand bags to reduce the fragmentation distance of the exploded item, although the use of these controls could increase the vertical disturbance to 2 feet. In addition, depending on the number and size of the BIP actions near occupied areas, the impacts to the surrounding vegetation and the subsequent drainage to and from these areas could eliminate the conditions that are favorable for hatching success. Impacts to the natural hydrology of occupied habitats during the dry season may not be able to be determined until the following rainy season. If UXO is detonated, the detonation of UXO resulted in a fire that burned within occupied habitat or a buffer zone, access routes that were required for disposal alter the topography, or any fill material is placed within these areas, the Air Force will conduct protocol-level surveys within 1 year to determine if the effect is permanent or temporary.

Invasive species removal actions could involve hand pulling of vegetation or herbicide application near occupied habitat. Hand-pulling of vegetation is not expected to affect vernal pool fairy shrimp. The Air Force proposes to use glyphosate-based herbicides without a toxic surfactant when applying herbicides near aquatic habitats. But because we do not have enough information pertaining to the effects of herbicides on vernal pool fairy shrimp, we are not analyzing the use of herbicides and its effect on vernal pool fairy shrimp.

Grazing may affect vernal pool fairy shrimp because approximately 0.77 acre of occupied habitat occurs within active pastures on VAFB that have been grazed for at least 80 years. The grazed pools are on south base and every pool in the grazing unit contains vernal pool fairy shrimp. The Air Force will operate the grazing program under current conditions with continual monitoring to ensure that the current conditions do not worsen.

Fire management activities are located several miles away from all the occupied pools on north base. The occupied habitat on south base occurs much closer to a firebreak. One occupied pool is within 40 feet of a firebreak, but it will be avoided during firebreak maintenance. There is a

potential for sedimentation and erosion to adversely affect vernal pool fairy shrimp, but the Air Force will implement BMPs to reduce this effect.

Summary of Effects to the Vernal Pool Fairy Shrimp

In summary, we determined that up to 44 acres (approximately 54 percent) of occupied vernal pool fairy shrimp habitat could be adversely affected by various project activities. The buffer zones would be subject to an unknown amount of disturbance. We assume this to be a worse-case scenario because we analyzed the maximum disturbance footprint for each action. Many of the actions would only occur during the dry season, resulting in permanent effects to vernal pool fairy shrimp cysts (i.e. mortality) but only result in temporary effects to the habitat. Actions that require soil excavation within occupied habitats could not only kill fairy shrimp and cysts, but also degrade the habitat to such an extent that eliminates the conditions that are favorable for hatching success, and thus, the vernal pool fairy shrimp would not be able to complete its life cycle. Some actions are repetitive (i.e. mowing) or occur within the same footprint at a later time. These actions could cause mortality of cysts and temporary effects to occupied habitat. Cyst banks are presumably large to buffer against pre-reproductive losses, but it is unknown what impact repeated loss of a significant portion of a cyst bank may have on branchiopod populations. We expect that the buffer zones delineated by the Air Force that are intended to provide a safeguard to the adjacent upland areas, in conjunction with the measures that the Air Force will impose as part of the project description, would minimize adverse impacts to occupied vernal pool fairy shrimp habitats. Furthermore, if a pool is permanently lost, the Air Force will mitigate the loss and create a pool, which would be monitored for 3 years to determine the success.

El Segundo Blue Butterfly

Project activities that may adversely affect the El Segundo blue butterfly include mission operations (space launches and security and antiterrorism operations), infrastructure support (road and utility maintenance, landscaping, and fence maintenance), infrastructure development (minor construction), environmental management programs (the IRP and MMRP, archeological support, invasive species removal and sensitive species management, and grazing), and fire management (firebreaks).

For this biological opinion, suitable El Segundo blue butterfly habitat on VAFB is classified into three categories: (1) occupied habitat, (2) suitable but unknown to be occupied habitat, and (3) unoccupied habitat. Occupied habitat includes areas where the El Segundo blue butterfly has been observed to occur and a 200-foot buffer around all known locations. The suitable but unknown to be occupied habitat areas contain seacliff buckwheat plants but we do not have enough information to determine presence or absence and we assume these areas have the potential to be occupied by the El Segundo blue butterfly. Unoccupied habitat is areas where the seacliff buckwheat is not present and therefore the El Segundo blue butterfly would not be present.

Mission Operations

Similar to the description in the effects analysis for the beach layia, acid deposition can adversely affect vegetation in the vicinity of launch complexes. The magnitude of the effects depends upon the distance the launch facility is from seacliff buckwheat plants, the meteorological conditions at the time of the launch, the buffering capacity of the soil, and the intensity and frequency of the acid deposition. Previous monitoring of seacliff buckwheat plants during launches has not documented adverse effects from acid deposition.

The vegetation around and within active launch facilities is cleared frequently and prior to launch events for safety and security purposes. Individual butterflies that occupy seacliff buckwheat plants adjacent to the cleared areas may periodically forage within the cleared zones between mowing cycles, but because the vegetation is not afforded the time to complete its life cycle we do not anticipate the El Segundo blue butterfly to permanently occupy seacliff buckwheat plants within these cleared zones.

Security and antiterrorism operations could affect the El Segundo blue butterfly because security personnel may be required to drive ATVs off existing roadways to respond to law enforcement incidents or anti-terrorism activities. Security patrols normally drive on existing paved and unpaved roadways; however, these patrols may be required to drive through occupied El Segundo blue butterfly habitat. Neither we nor the Air Force can predict when or where these circumstances would occur. Driving ATVs through occupied habitat during the flight season could crush and kill or injure all life stages of the butterfly. In addition, ATVs could damage and/or kill buckwheat plants and reduce available habitat, both occupied and suitable but unknown habitat areas. ATVs could also indirectly adversely affect the quality of occupied habitat by unintentionally transporting invasive plant species into occupied habitat as the ATVs move between different areas of the base. To reduce the potential of ATVs or other security vehicles traveling through occupied and suitable habitat areas during routine patrols, the Air Force will maintain a GIS database of occupied and suitable habitat areas and will provide maps to security personnel as needed. If security personnel travel off existing roadways through occupied habitat, they will notify a 30 CES/CEI biologist within 48 hours to determine the impact.

Infrastructure Support

Road and utility maintenance could adversely affect the El Segundo blue butterfly. Road maintenance and trenching for utilities require a maximum 30-foot wide work zone for personnel and to maneuver equipment. The Air Force estimated that approximately 140 acres of suitable but unknown to be occupied habitat along road shoulders would be subject to road maintenance impacts. In addition, 6 acres of occupied habitat and 236 acres of suitable but unknown to be occupied habitat occurs within utility right-of-ways. Landscaping, including mowing, could directly affect approximately 5 acres of occupied habitat and 137 acres of suitable but unknown to be occupied habitat. Many of these road shoulders, utility right-of-ways, and landscaped areas overlap and sometimes road and utility maintenance occurs within areas that are frequently

mowed. Therefore, we assume that these maintenance actions would not have any additional impacts to the El Segundo blue butterfly beyond the mowing impacts. No occupied habitat on south base is mowed.

Seacliff buckwheat plants can colonize areas along roadsides and above underground utility lines that are mowed less frequently, although plants that grow within these areas are generally small and have fewer flowers. Because the vegetation can grow for some time before being subjected to mowing impacts, El Segundo blue butterflies present in occupied habitats adjacent to cleared areas may be able to utilize the smaller plants as a nectar source; however, even if seacliff buckwheat plants grow within cleared or frequently maintained areas to produce flowers, we assume that these areas would not provide long-term habitat because any vegetation present could be removed at any time.

Maintenance actions occurring outside of mowed areas could damage or remove seacliff buckwheat plants and its seed bank. We expect that these actions would infrequently kill adult butterflies in known occupied areas because planned maintenance work would occur outside of the flight season. However, even if the areas are avoided during the flight season, actions that occur outside of the flight season and disturb the soil within occupied habitat could negatively affect future generations of butterflies by adversely affecting diapausing pupae. In addition, depending on where the occupied habitat is affected, removing or damaging host plants could fragment the habitat and reduce adult butterflies' ability to move into nearby areas, which is important for this species because it persists as a metapopulation. Furthermore, damaging or removing seacliff buckwheat plants could indirectly affect adult butterflies as they emerge from diapause to mate and nectar. If host plants are no longer present the emerging adults would have to expend more energy to fly to other buckwheat plants in the near vicinity, if any exist. The removal of the host plant could therefore prohibit or reduce reproduction efforts. Maintenance actions that occur within suitable but unknown to be occupied habitat could occur during the flight season. This could affect all life stages of the butterfly and reduce the amount and quality of the suitable habitat in the same way as maintenance actions would affect occupied habitat outside of the flight season, as described above. In the event that a utility is deemed to be leaking or broken, the Air Force may not be able to avoid working during the flight season, and as a result, the repair actions could adversely affect all life stages of the El Segundo blue butterfly.

Fencing maintenance may directly affect the El Segundo blue butterfly because buckwheat plants could be damaged or removed to place fence posts. In addition, vegetation along the fence lines is regularly cleared for security and structural purposes. Approximately 1.5 miles of fencing is located within occupied habitat on south base and less than 1 mile of fencing is located within occupied habitat on north base. Suitable but unknown to occupied habitat occurs along approximately 11 miles of fencing, or approximately 134 acres of habitat.

Environmental Management Programs

IRP actions may directly affect the El Segundo blue butterfly because seacliff buckwheat plants occur within areas that require remediation and monitoring actions. The Air Force estimated that approximately 4 acres of occupied habitat and 20 acres of suitable but unknown to be occupied habitat would be affected per year. Sites are distributed throughout the base, but nearly all IRP sites which require actions that may affect the El Segundo blue butterfly are located on north base.

Remediation actions within occupied habitat would occur outside of the flight season; therefore, we do not anticipate that adult or larval butterflies would be killed or injured by these activities; however, disturbing soil could result in adverse effects to diapausing pupae that are within the project footprint. Damaging or removing seacliff buckwheat plants could indirectly affect adult butterflies because it could fragment the habitat and reduce adult butterflies' ability to move into nearby areas, and cause adults to expend more energy if the adults have to fly to buckwheat plants farther away as they as they emerge from diapause to mate and nectar. The removal of the host plant could prohibit or reduce reproduction efforts.

Monitoring activities would occur year round in occupied and suitable but unknown to be occupied habitat areas in order to capture the necessary data from the wells. All life stages of the El Segundo blue butterfly could be adversely affected if the movement of personnel and vehicles crush adult butterflies or damage an occupied seacliff buckwheat plant as they access a site. The Air Force will reduce this effect by clearly marking seacliff buckwheat plants within the project site and the immediate vicinity to prevent workers from trampling species or habitats that are not expected to be damaged during a project.

MMRP actions could directly adversely affect the El Segundo blue butterfly because activities could include walking surveys, use of ATVs to survey the areas and to pull a cart with equipment for DGM, trimming vegetation with weed eater and chainsaws, and access route construction. The Air Force would conduct surveys to locate UXO and then treat the subject areas by removing the ordnance item or blowing it in place. Ordnance that is discovered as a result of the surveys is necessary to remove due to human health and safety.

We do not expect adult or larval El Segundo blue butterflies in known occupied areas to be adversely affected as personnel conduct surveys on foot or when using DGM to identify remaining subsurface items because these actions would occur outside of the flight season. In suitable but unknown to be occupied habitat areas, adult and larval butterflies could be adversely affected because MMRP activities could occur at any time. Personnel may also tow a sensor platform that is up to 10 feet wide and supported by two to four wheels. Using vehicles to tow a sensor platform, and to a lesser extent walking surveys, could damage seacliff buckwheat plants. Currently, there are no known adverse effects of walking transects on diapausing pupae. Project personnel along with a 30 CES/CEI biologist would determine the need to use DGM equipment. As stated above, damaging seacliff buckwheat plants could indirectly affect emerging adult butterflies because injuring host plants could adversely affect reproductive efforts and reduce

available habitat. MMRP personnel will not drive ATVs or carts through coast dune scrub vegetation, chaparral, or riparian woodland vegetation under normal conditions.

Trimming vegetation and constructing access roads may be required in areas that are inaccessible to motorized vehicles, depending on where the UXO is observed. The footprint could range from the removal of individual plants to an unspecified removal grid. These actions would occur outside of the flight season in known occupied habitat, thus adult butterflies would not be directly affected but diapausing pupae could be. These actions could occur at any time in suitable but unknown to be occupied habitat and affect all life stages of the butterfly. The removal or damaging of the host plant could reduce the amount of available habitat, fragment the habitat, and reduce reproductive success.

The Air Force estimated that BIP actions could adversely affect approximately 8 acres of occupied habitat and 30 acres of suitable but unknown to be occupied habitat per year for the next 5 years within closed zones, which are zones where UXOs are suspected or have been confirmed. BIP actions would also occur outside of the flight season in occupied habitat, and therefore, we do not anticipate that adult butterflies would be directly affected; however, diapausing pupae could be killed or injured due to the vertical disturbance of a typical ordnance removal. Within suitable but unknown to be occupied habitat we anticipate all life stage could be adversely affected because actions could occur during the flight season. BIP actions could result in the removal or damage to seacliff buckwheat plants because soil excavation could range up to several acres in size, but most likely would be much less. If an ordnance item is deemed safe to move, it would simply be picked up and no or very minimal soil disturbance would be required.

Archeological support actions could affect the El Segundo blue butterfly because placing fabric over occupied habitat areas to prevent erosion and site degradation could trap emerging adults, preventing them from reaching flowers to feed and mate. Placing fabric could also damage seacliff buckwheat plants and prevent seeds from dispersing and regenerating stands of native plants.

Invasive species removal actions could adversely affect the El Segundo blue butterfly because seacliff buckwheat plants could be damaged or removed, especially if mechanical removal methods are employed. However, due to safety concerns from UXO, mechanical removal of invasive plants may be impossible. Manual removal methods are preferred where invasive plant species are interspersed with other sensitive species, but may not be practical in all situations, particularly when attempting to control veldt grass. These actions would not occur in El Segundo blue butterfly occupied habitat during the flight season, or in suitable but unknown to be occupied habitat during the period when diapausing pupae are most likely to be above ground. Invasive species removal actions are intended to have an overall benefit to the El Segundo blue butterfly by removing invasive plants such as veldt grass, iceplant, and pampas grass. The Air Force will incorporate guidelines detailed in the base-wide best management practices #13. We do not have any information to determine if the herbicides affect diapausing pupae, which are

commonly found in the soil underneath the buckwheat plant. Therefore, we are not analyzing the effects of herbicides on the El Segundo blue butterfly or its habitat.

The grazing program offers an inexpensive and effective way of controlling invasive plants. Grazing and livestock activities may affect the El Segundo blue butterfly because domestic cattle in June and July could remove seacliff buckwheat flowers and vegetative parts. Browsing of seacliff buckwheat can result in direct mortality of eggs and larvae that may be present in the flowers. Livestock could also trample and damage seacliff buckwheat plants and immature stages (eggs, larvae, and pupae) of the El Segundo blue butterfly. Impacts are expected to be minimal, however, as rapidly growing annual grasses are the preferred forage during the time of year when butterflies and larvae are on the buckwheat plants, and shrubs like seacliff buckwheat are typically not selected for browsing. Proper rangeland and livestock management techniques, such as moving cattle to new pastures as proper use levels of grass forage are reached would reduce the potential adverse effect of browsing seacliff buckwheat plants.

Similarly, sensitive species management, which could include actions such as surveys for other listed species on base and collecting native seeds for restoration, may affect the El Segundo blue butterfly by disrupting normal behavioral patterns. Only Service-approved biologists will collect seacliff buckwheat seeds; mature seed will be collected from flower heads with largely brown, dried flowers. Vandenberg Air Force Base contains a large quantity of seacliff buckwheat plants, and previously collecting up to 10 pounds of seed did not appear to affect the stability of the buckwheat population. The seeds will be broadcast every year in the fall or winter to build up the native seed bank. We anticipate these actions to provide an overall benefit to the El Segundo blue butterfly and its habitat.

Summary of the Effects to the El Segundo Blue Butterfly

In summary, we have concluded that an unknown amount of habitat could be affected by mission operations, specifically from security and antiterrorism operations because these actions respond to law enforcement or anti-terrorism incidents which cannot be predicted. Infrastructure support actions could affect up to 11 acres of known occupied habitat and affect approximately 647 acres of suitable but currently unknown to be occupied habitat. Some of this acreage is anticipated to be permanently degraded because it is within the areas subject to routine mowing and along roadsides that could incur mowing or repeated utility maintenance actions. Environmental management program actions are anticipated to have the largest effect on the El Segundo blue butterfly and its habitat in terms of acreage. Approximately 4 acres of occupied habitat and 20 acres of suitable but unknown to be occupied habitat occurs within active IRP, AOC, and AOI sites that would be affected per year. The Air Force further estimated that approximately 8 acres of occupied habitat and 30 acres of suitable but unknown to be occupied habitat could be affected per year during MMRP actions. Therefore, the environmental management program could affect up to 60 acres of occupied habitat and 250 acres of suitable but unknown to be occupied habitat cumulative over 5 years. We anticipate the environmental program actions to mostly result in temporary effects to habitat because the actions would most likely occur once in a given location to rid the ordnance and the area would be allowed to recover, sometimes aided

by restoration activities such as spreading seeds or removing nonnative, invasive plants. However, it would take a few seasons for the buckwheat plants that reestablish to produce enough flowers to support El Segundo blue butterflies. Including the 11 acres affected by infrastructure support actions, and assuming worse-case scenario because we analyzed the maximum disturbance footprint for each action, the suite of program activities could affect up to 71 acres of occupied habitat and up to 900 acres of suitable but unknown to be occupied habitat over the next 5 years.

California Red-legged Frog

Project activities that may adversely affect the California red-legged frog include mission operations (space and missile launches and security and antiterrorism operations), infrastructure support (road and utility maintenance), infrastructure development (minor construction), and environmental management programs (the IRP, MMRP, environmental compliance, invasive species management, grazing, and sensitive species management).

Mission Operations

Space and missile launch operations may adversely affect the California red-legged frog because some launch facilities are located near riparian areas occupied by the California red-legged frog. In addition, water used to cool launch equipment is collected into concrete-lined ponds and transferred to evaporation ponds, which then may provide habitat for the California red-legged frog. The water in these evaporation ponds is rarely present long enough for frogs to complete their life cycle.

California red-legged frog could be adversely affected by elevated noise levels, light flashes, and acidic emissions created by launch operations. California red-legged frogs would likely treat disturbance caused by elevated noise in much the same way as they respond to the approach of a potential predator, by diving and remaining below the water's surface (Christopher 1996). Water would attenuate high-decibel sound to some degree. Similarly, California red-legged frogs that are exposed to light flashes from launch activities may also react by diving into water.

Reduced pH due to the acidification of water would correspond with areas directly impacted by the ground cloud deposition. The probability of adverse effects from acidification would depend upon the distance the launch pad is from the subject water, trajectory of the launch vehicle, meteorological conditions at the time of the launch, the frequency and intensity of deposition, and the buffering capacity of the water. Surface waters reflect the buffering capacity of watershed soils (Hoffman et al. 1995), and the effectiveness of the soil as a chemical filter of acidic inputs depends upon the buffering capacity and the rate of deposition (Spiro and Stigliani 2003). The buffering capacity of most soils is sufficient to neutralize naturally occurring acids; however, over time the capacity can be overwhelmed by high inputs of acid deposition. In general, the primary buffers of soil are the basic cations calcium (Ca^{2+}), magnesium (Mg^{2+}), sodium (Na^{+}), and potassium (K^{+}), with calcium being the most important.

There is also potential for disposal and (or) deposition of trace metals and organics, depending on the propellant and facility characteristics. Metals become more soluble and their concentrations in the water column increase dramatically during the period of reduced pH, but as pH levels return to normal, metal concentrations return to pre-launch levels (Schmalzer et al. 1993). At high pH, metal ions in well-buffered soils are generally retained at the exchange sites; their concentrations in soil solution are low. However, as the pH declines from 7 to 4, the leaching velocity at which an ion migrates through the soil may increase by an order of magnitude. Thus, at near neutral pH, the soil will accumulate heavy metals only to release them as the soil acidifies. Once in the aqueous phase, ions are mobile and biologically active. They can be transported to lakes via surface or subsurface flow, transferred to ground waters, or taken up by vegetation with toxic effects (Spiro and Stigliani 2003).

Aluminum, the most common metal in the Earth's crust, becomes mobilized and changes its species with reduced pH. This metal is readily leached from acidified watersheds and can accumulate to potentially toxic levels in water; however, the toxicology in water depends on the concentration, organism, pH, concentration of ligands that alter its availability, and calcium. At pH greater than 6.0, aluminum solubility is low and most precipitates onto sediments or substrates. Below pH 5.5, aluminum solubility increases and more of it is in inorganic forms, which are usually more toxic than organically bound aluminum. Other metals may also be mobilized and become more toxic with reduced pH (Hoffman et al. 1995).

Dale et al. (1985) found no relation between pH and presence/absence data of 11 amphibian species among 159 potential breeding sites in Nova Scotia. Similarly, there was no correlation between pH and amphibian species richness or abundance in 51 mildly acidic breeding sites in Wisconsin (Kutka and Bachmann 1990). However, interspecific, interpopulational, and genetic differences in pH tolerances seem to be substantial among amphibians (Clark and LaZerte 1987).

Sublethal effects of reduced pH on amphibians include decreased growth rates, delayed metamorphosis, and impaired development of embryos. Delays in hatching and metamorphosis can be critical to species breeding in ephemeral ponds that may dry before development is complete. In permanent ponds, delayed development can make a species less competitive or more subject to predation (Hoffman et al. 1995).

On VAFB, previous water quality monitoring data has shown that the pH did not substantially change as a result of launches. Furthermore, the numbers of California red-legged frogs present before and after launches have been similar. Honda Creek has been monitored pre- and post-launch of Titan II, Titan IV, and Delta II launch vehicles and no adverse effects have been documented. At other sites at which similar solid rocket motors are used, most of the component in the ground cloud that is formed at ignition (aluminum oxide and hydrogen chloride) would be expected to fall from the cloud to the land surface within several hundred feet of the launch complex (USAF 1991).

Security and antiterrorism operations may adversely affect the California red-legged frog. Personnel would generally stay on the existing paved and unpaved roads; however, patrols may

need to respond to law enforcement incidents or anti-terrorism activities that require them to drive off existing roadways at any time of the year. Security patrols do not travel down riparian corridors but do cross streams, creeks, and rivers when water is present as part of their normal operations. During a high water event, these waterways may temporarily flood over the top of the roadway, which could result in individual frogs being crushed and killed or injured if they are present on these flooded crossings and roadways; however, this result is unlikely. Because California red-legged frogs utilize a variety of habitats, there is also a small potential for security personnel to encounter individual frogs in upland habitats during wet weather. Starting with the first rains of fall, California red-legged frogs can travel up to 1.8 miles from their nearest breeding site through upland habitats. Most of these overland movements generally occur at night and therefore the probability of encountering California red-legged frogs in upland habitats would be low.

Infrastructure Support

Road maintenance actions could adversely affect California red-legged frogs because maintenance of paved and unpaved roads that are nearby or adjacent to aquatic or riparian habitats could produce loose sediment and degrade these areas. The Air Force will implement BMPs to reduce the effects of soil erosion and sedimentation. Road maintenance actions that may affect California red-legged frogs will occur outside of the breeding season, thus there would be no effect to reproduction. We do not anticipate effects to frogs dispersing through upland habitats because most movements away from riparian vegetation generally occur at night when road maintenance actions would not be occurring.

Routine utility maintenance actions could adversely affect California red-legged frogs. Planned maintenance activities would occur outside of the California red-legged frog breeding season, work would occur during daylight hours, and the Air Force will implement BMPs when working in the vicinity of aquatic or riparian habitats. Therefore, utility maintenance actions are expected to have minimal effects to California red-legged frogs. In the event that a utility is found to be leaking or broken, the Air Force will need to repair the utility regardless of the time of year, thus every life stage of California red-legged frogs could be affected. Normal behavioral patterns may be affected and reproduction could be reduced if the maintenance actions occur where California red-legged frogs are breeding. Individuals and egg masses would be subject to crushing as personnel move about; however, a Service-approved biologist will capture and relocate all California red-legged frogs prior to beginning any maintenance activities. For this reason, we do not anticipate that California red-legged frogs would be killed or injured by the maintenance actions. Utility maintenance could indirectly affect California red-legged frogs because these actions may temporarily disturb or even remove suitable habitat features.

Storm water drainage on base is directed via drainage and culverts. Blocked culverts can result in flooding of roadways and possibly create a higher potential for individual frogs to move onto the road and be struck by vehicles; however, this is unlikely. Cleaning of culverts reduces the probability that roadways would become inundated. The work area for culvert and drainage ditch maintenance is generally restricted to the immediate area, but it is dependent upon the

culvert's location. Most maintenance is accomplished manually, but sometimes more intensive maintenance actions are necessary that requires mechanical clearing of vegetation. Restoring proper drainage in blocked culverts has the potential to affect California red-legged frogs as the movement of personnel could crush individuals. This effect is also unlikely because the Air Force would conduct these maintenance actions during the dry season and a Service-approved biologist will relocate all life stages of California red-legged frogs prior to conducting these activities. Therefore, we do not anticipate that California red-legged frogs would be killed or injured by culvert clearing actions.

Environmental Management Programs

IRP actions could adversely affect California red-legged frogs. Accessing existing monitoring wells within aquatic or riparian habitats could temporarily disrupt normal behavioral patterns or result in crushing individual frogs. It is unlikely that personnel would encounter California red-legged frogs in upland habitats as frogs disperse away from riparian vegetation at night. There are 23 IRP sites and 40 AOC/AOI sites consisting of approximately 107 acres and 95 acres, respectively, that contain suitable habitat for the California red-legged frog. Thirty two acres of this suitable habitat are expected to be removed during remediation activities throughout the sites. Because a Service-approved biologist would survey for, and capture and relocate California red-legged frogs from the project site prior to conducting work actions, we do not expect individual frogs to be killed or injured as a result of IRP actions. Excavation of soil or removal of vegetation within suitable habitat would temporarily indirectly affect the California red-legged frog.

MMRP actions could adversely affect California red-legged frogs because MEC surface removal areas may overlap with suitable habitat. Activities may include access route construction, walking surveys, trimming vegetation with weed eater and chainsaws, utilizing ATVs to survey the areas, pulling a cart with equipment for geophysical mapping, and conducting BIP actions. The movement of vehicles and personnel during survey actions are not expected to kill or injured California red-legged frogs because Service-approved biologists will capture and relocate individual frogs out of the project's footprint. Removing UXO within occupied habitats could injure or kill individual frogs because the item may be required to be blown in place and a biologist may not be allowed to access the site to capture and relocate California red-legged frogs prior to conducting the BIP action. We assume that California red-legged frogs would be able move out of harm's way to some extent, but some may not. If access routes are created, project personnel, in consultation with onsite biological monitors, 30 CES/CEI, and explosive ordnance disposal specialists would determine the access routes. MMRP actions would not affect California red-legged frog reproduction because these actions would only occur in aquatic habitat outside of the breeding season.

Invasive species removal actions could affect the California red-legged frog. Manual and mechanical removal could occur within aquatic habitats to remove invasive vegetation such as *Arundo* and *Tamarix*. The Air Force will capture and move California red-legged frogs out of the project areas prior to removing invasive vegetation to minimize the potential to trample

individual frogs. Chemical applications would mostly occur outside of the riparian areas and outside of the main breeding season, and only herbicides without toxic surfactants approved for aquatic habitats would be used. When chemical application does occur within the breeding season, the Air Force will conduct surveys to ensure there are no egg masses or tadpoles within 100 feet downstream or down slope of the application area. The Air Force will incorporate guidelines detailed in the Base-wide Best Management Practices #13; however, we are not analyzing the effects of herbicides to California red-legged frogs.

Livestock grazing could affect California red-legged frogs and its habitat. Grazing cattle could directly crush egg masses (S. Chubb *in litt.* 1998), larvae, and metamorphosing frogs. Numerous studies, summarized by Behnke and Raleigh (1978) and Kauffman and Krueger (1984), have shown that livestock grazing can negatively affect riparian habitat, marshes, and ponds. Cattle have an adverse effect on riparian and other wetland habitats because they tend to concentrate in these areas, particularly during the dry season (Marlow and Pogacnik 1985). Unmanaged cattle trample and eat emergent and riparian vegetation, often eliminating or severely reducing plant cover (Gunderson 1968, Duff 1979). The loss of riparian vegetation results in increased water temperatures (Van Velson 1979) and decreases the habitat suitability for California red-legged frogs and encourages the reproduction of bullfrog and nonnative warm water fishes. Loss of streamside vegetation also reduces habitat for insects and small mammals that are important dietary components for the California red-legged frog (Cordone and Kelley 1961). Cattle overgrazing also can increase erosion in the watershed (Lusby 1970, Winegar 1977), accelerating the sedimentation of deep pools (Gunderson 1968) used by California red-legged frogs. High levels of sediment introduced into streams can alter primary productivity and fill interstitial spaces in streambed materials with fine particulates, which impede water flow, reduce dissolved oxygen levels, and restrict waste removal (Chapman 1988). Livestock grazing can also cause a nutrient loading problem due to urination and defecation in areas where cattle are concentrated near the water (Doran et al. 1981). Moreover, when cattle drink from small ponds and streams they can draw down water levels, leaving egg masses above the water level and subjecting them to desiccation and/or disease (e.g., fungal infections) (S. Chubb *in litt.*1998). In many areas, but not at VAFB, California red-legged frogs may be present only because livestock operators have artificially created ponds for livestock water where there were none before. In such ponded habitat, grazing may help maintain habitat suitability by keeping ponds clear where they might otherwise fill in with cattails, bulrushes, and other emergent vegetation (S. Bobzien *in litt.* 1998, G. Fellers *in litt.* 1998, N. Scott and G. Rathbun *in litt*. 1998). The Air Force's current cattle management practices keep livestock away from most riparian areas and the stocking rate is kept within manageable levels. Grazing will be managed in part to maintain or improve riparian conditions and will consider potential benefits to California red-legged frogs.

Sensitive species management activities could affect the California red-legged frog. For example, biologists may enter occupied habitats while conducting surveys for other sensitive species such as the unarmored threespine stickleback, or biologists may enter a pond to set up mist nets for either bats or birds. Personnel entering occupied habitats could crush and kill or injure California red-legged frogs; however, we assume this effect to be unlikely as we assume frogs would be able to move out of harm's way. Sensitive species management activities would

be conducted by qualified biologists, which we expect possess the skills to minimize any adverse effects to California red-legged frogs. Therefore, these actions would not have a substantial adverse effect on the California red-legged frog or its habitat.

Summary of Effects to the California Red-legged Frog

In summary, we do not expect the majority of the proposed actions to substantially affect California red-legged frogs. It is more likely that project actions would temporarily adversely affect an unquantifiable amount of suitable habitat, and possibly permanently remove suitable habitat features. We do not anticipate launch activities would adversely affect California red-legged frogs because previous monitoring of launches has not detected changes to the water quality of nearby occupied habitats due to fallout of the launch constituents. Actions such as road and utility maintenance, culvert cleaning and repairs, and environmental management programs could temporarily remove and degrade suitable habitat for the California red-legged frog due to the influx of sedimentation into riparian areas or aquatic habitats; however, the Air Force would implement BMPs as part of the project to reduce this effect. Typically, utility maintenance actions would occur outside of the breeding season, but in rare circumstances the maintenance actions could occur at any time of year. Working in occupied habitat during the breeding season could reduce the productivity of California red-legged frogs, but we do not anticipate these actions to result in mortality or injury. Service-approved biologists would capture and relocate California red-legged frogs from project footprints prior to conducting any actions. We assume some frogs could perish during the capture and relocation efforts, but the vast majority of California red-legged frogs would only be temporarily affected and the intent is to minimize the adverse effects to the population.

Grazing has been shown to adversely affect riparian and aquatic habitats of California red-legged frogs; however, under proper management grazing practices can also positively affect California red-legged frogs. The Air Force will manage the grazing programs to maintain or improve riparian conditions and will consider potential benefits to California red-legged frogs. Thus, we do not expect cattle grazing activities to adversely affect California red-legged frogs on VAFB beyond current conditions.

Tidewater Goby and Unarmored Threespine Stickleback

Project activities that may adversely affect the tidewater goby and unarmored threespine stickleback include mission operations (space launches and security and antiterrorism operations), infrastructure support activities (road and utility maintenance), and environmental management programs (the IRP, MMRP, cropland management, grazing, archeological support, and sensitive species management).

Mission Operations

Space and missile launch operations could acidify waters on VAFB, and similar to the analysis for the California red-legged frog, the probability of acidification would depend upon the

distance the launch pad is from occupied habitat areas, trajectory of the launch vehicle, meteorological conditions at the time of the launch, the intensity and frequency of acid deposition, and the buffering capacity of the water. There is also the potential for disposal and (or) deposition of trace metals and organics, depending on propellant and facility characteristics.

Direct effects of reduced pH from acidification on fish differ with species, life stage, and interaction with other chemicals. The primary effect of reduced pH on fish is the interference with ion regulation. Fish exposed to high levels of hydrogen (H^+) lose cations, which may be fatal. For most fish species, toxic pH levels are around 5.0, but some species of fish are more tolerant than others (Hoffman et al. 1995). Hawkins et al. (1984) found that the rapid drop in pH produced severe damage to the gill lamellae of fish exposed to the near-field launch deposition. Field surveys conducted after each space shuttle launch have verified this event, which is generally limited to the shallow shoreline closest to the pad and the stormwater ditches. In deeper open water, fish may dive below the area of acidification avoiding the rapid drop in pH (Schmalzer et al. 1993). Calcium ameliorates the effect of pH by reducing the permeability of the gill membrane, thus decreasing the net efflux of ions (Hoffman et al. 1995). Extensive studies on lakes in Norway have shown that those with Ca^{2+} to H^+ ratios of less than 3:1 are usually devoid of fish, whereas those with ratios greater than 4:1 support good fisheries (Hoffman et al. 2003).

Sublethal effects of acidification in fish include behavioral changes, reduced growth, ventilation problems, deformations, and bone abnormalities. Indirect effects on fish can occur through alterations of the habitat or macrophytes, or by changing the abundance and species composition of food organisms. Macrophytes, which are important features of fish habitat, provide cover and food for a few species of herbivorous fish, serve as breeding areas for many species of macroinvertebrates and zooplankton eaten by fish, and help oxygenate the water (Hoffman et al. 1995). As stated previously, launch monitoring data has not observed any adverse effects to the water quality resulting from the constituents of a launch vehicle's exhaust.

Security and antiterrorism operations may require security personnel to enter occupied tidewater goby or unarmored threespine stickleback habitat to look for trespassers. Patrols would be conducted on foot or by ATV. Foot patrols entering occupied tidewater goby or unarmored threespine stickleback habitat may cause small localized sediment plumes, but we expect individual fish to move out of harm's way, but some may not be able to. If the patrols use ATVs to conduct the activities in occupied habitat areas, the probability of individual fish being killed or injured would increase. ATVs may also create a larger sediment plume in the patrol area that could affect fish downstream of the patrolled area. Sediment plumes would be temporary and the overall probability of patrols occurring within occupied habitat areas is small.

Infrastructure Support

Road maintenance actions have the potential to affect the tidewater goby and unarmored threespine stickleback due to the influx of sediment into nearby habitat. The Air Force will implement BMPs to reduce soil erosion and sedimentation. Therefore, we do not expect road

maintenance actions that occur adjacent to occupied habitat areas to adversely affect the tidewater goby, unarmored threespine stickleback, or degrade their respective habitats.

Utility maintenance actions that would occur adjacent to occupied habitat could also generate an influx of sediment into occupied habitat, but similar to road maintenance actions, implemented BMPs would reduce the probability of habitat degradation due to sedimentation. In general, utility maintenance actions occur away from the aquatic and riparian zones. If utility maintenance actions are required in occupied habitat, the Air Force could use directional drilling in areas where construction and engineering specifications rule out the possibility of trenching and where base resources require avoidance (i.e. cultural and natural resources). A frac-out, as described previously, could adversely affect the tidewater goby and unarmored threespine stickleback because released bentonite would increase the turbidity of the water at the release point and for some distance downstream, depending on the amount of drilling fluid released, the length of time it was released, the velocity of the water at the release site, and the volume of water at the time of release (Service 2007c). Bentonite is attracted to oppositely charged surfaces, such as gill membranes and could adhere to them, which makes bentonite particularly detrimental to aquatic organisms because affected organisms may suffocate if exposed to high concentrations of the slurry and overwhelm the animal's ability to clear impacted gill filaments through physiological processes (National Marine Fisheries Service 2003).

Tidewater gobies are able to adapt to sedimentation to a certain extent because they breed in sandy substrates, but increased sedimentation can create large amounts of shallow, warm habitats that may be unsuitable (Moyle 2002). Sticklebacks are visual feeders and they specialize in feeding on a limited number of organisms and are rather slow to learn to exploit new sources of food (Moyle 2002). Therefore, increased turbidity could reduce the stickleback’s ability to capture food or impair other normal behaviors that are essential to growth and survival.

Environmental Management Programs

Two, nearly adjacent IRP sites, overlap with suitable habitat for the tidewater goby in the Santa Ynez River. Both sites combined measure approximately 0.93 acre. These two sites are closed, meaning that no actions are planned in these areas within the next 10 years. Therefore, we do not anticipate IRP actions to adversely affect the tidewater goby. No IRP sites are found in San Antonio Creek, thus no adverse effects to the unarmored threespine stickleback are expected.

Archeological support actions could adversely affect the tidewater goby and unarmored threespine stickleback because cultural resource personnel may conduct surveys within occupied habitat areas. Tidewater gobies and unarmored threespine stickleback could be killed or injured by personnel as they encroach into occupied habitat, but we expect that most fish would move out of harm’s way. Personnel working within occupied habitat could damage burrows and nests, crush eggs, generate sedimentation downstream that could bury eggs and nests, and reduce mating success.

Project activities that may adversely affect the tidewater goby and unarmored threespine stickleback would be minimized because the Air Force will install nets to exclude tidewater gobies and unarmored threespine sticklebacks from project areas. Service-approved biologists would capture and relocate any individual fish present within the project area prior to beginning excavation or construction actions; some fish could be killed or injured during capture. In addition, if temporary dewatering is required, the intakes of diversion pipes will be screened with a mesh not to exceed 0.125 inches and water will be released downstream of the project area at an appropriate rate to maintain downstream flows. Furthermore, routine project activities would avoid occupied habitat during these species respective peak breeding seasons.

Sensitive species management activities could affect the unarmored threespine stickleback and tidewater goby. For example, biologists may walk through occupied habitats while conducting surveys for California red-legged frogs or walking into a pond to set up mist nets for either bats or birds. Both of these activities could cause a minor sediment flux that could be detrimental to tidewater goby and unarmored threespine stickleback. Tidewater gobies and unarmored threespine stickleback could be crushed and killed or injured as personnel encroach into occupied habitat, although we assume most fish would be able to move out of harm's way. Personnel entering occupied habitat during peak breeding periods could damage burrows and nests, crush eggs, generate sedimentation downstream that could bury eggs and nests, and reduce mating success. Sensitive species management activities would be conducted by qualified biologists, who we expect to possess the skills to minimize any adverse effects to unarmored threespine sticklebacks and tidewater gobies. Therefore, these actions would not have a substantial adverse effect on the tidewater goby, unarmored threespine stickleback or their respective habitats.

Summary of Effects to the Tidewater Goby and Unarmored Threespine Stickleback

In summary, we do not anticipate the majority of the proposed actions to adversely affect the tidewater goby or unarmored threespine stickleback. Similar to the California red-legged frog, we do not anticipate launch activities would adversely affect the tidewater goby or unarmored threespine stickleback because previous monitoring of launches has not detected changes to the water quality of nearby occupied habitats due to fallout of the launch constituents. Also similar to the California red-legged frog, actions such as road and utility maintenance and environmental management programs could temporarily degrade suitable habitat for the tidewater goby or unarmored threespine stickleback due to the influx of sedimentation into occupied aquatic habitats; however, the Air Force would implement BMPs as part of the project to reduce this effect. Typically, utility maintenance actions would occur outside of the breeding season, but in rare circumstances such as when a utility is broken or leaking, the maintenance actions would occur at any time of year. Working in occupied habitat during the breeding season could reduce the productivity of the tidewater goby or unarmored threespine stickleback for that season. Service-approved biologists would capture and relocate individual fish from project areas prior to conducting project activities. We assume some fish could perish during the capture and relocation efforts, but the vast majority of tidewater gobies and unarmored threespine

sticklebacks would only be temporarily affected and the intent is to minimize the adverse effects to the population.

California Least Tern and Western Snowy Plover

Project activities that may adversely affect the California least tern and western snowy plover include mission operations (space and missile launches and security and antiterrorism operations) and environmental management programs (the IRP, archeological support, invasive species removal, and sensitive species management).

Mission Operations

Space and missile launch program activities conducted from all LF's, SLC-2, SLC-3, SLC-4,SLC-6, SLC-8, TP-01 and LF-576E may directly and indirectly adversely affect California least terns and western snowy plovers. Launch activities conducted from SLC-6 and SLC-8 will not affect the California least tern because these launch complexes are located on south base near Point Arguello miles away from Purisima Point, the vehicles are launched in a southerly or western direction, and the pre-launch security overflights do not occur at Purisima Point. Launch vehicles with associated noise, helicopter overflights, and ground reconnaissance immediately prior to a launch could provoke temporary or permanent emigration from nesting sites, trigger a startle response that alerts predators to nest locations, cause temporary abandonment of nests, mask biologically significant sounds (e.g., predators) that make abandoned eggs and young more vulnerable, and reduce overall fitness.

The Delta II launch vehicle, a commonly launched space vehicle from SLC-2, produces a sound level of 198 decibels (dB) at the launch pad upon liftoff. The launch vehicle is producing approximately 124 dB at 0.62 mile and the sound attenuates to 60 dB at a distance of 9.9 miles (Darryl York, VAFB wildlife biologist, pers. comm. 2009). Monitoring data obtained since 1995 have concluded that western snowy plovers may crouch and observe objects such as helicopters or launch vehicles that mimic avian predators, and flush at launch but soon return to normal behavior. No evidence of injury, mortality, or post-launch abnormal behavior of any monitored western snowy plovers has been observed. Startle responses are rare and reproductive success does not seem to be affected by launch activities, even near SLC-2 where Delta II vehicles are launched within approximately 0.5 mile of nesting snowy plovers with a dB level of at least 124. During a launch event of a Titan II launch vehicle from SLC-4W in 1998, monitoring of snowy plovers found the nest located closest to the launch facility had one of three eggs broken after the launch, although the cause of the damaged egg was not determined.

California least terns may be more sensitive to launch disturbances than western snowy plovers because past monitoring has observed temporary or permanent emigration from the breeding colony. The California least tern nesting area at Purisima Point is 0.4 mile west of SLC-2 and 0.7 mile north of LF-576E. Two launches of Delta II vehicles from SLC-2 during the 1997 least tern breeding season are believed to have caused reduced nesting and reproductive success. A Delta II vehicle launched from SLC-2 in 2002 when terns were arriving at the colony caused at

least temporary emigration from the colony because there was decreased attendance following the launch (Robinette et al. 2003). In 2004, a Taurus vehicle launched from LF-576E had a similar effect (Robinette and Rogan 2005). In 2005, a Delta II vehicle launched from SLC-2 when terns were arriving at the colony again may have caused temporary or permanent emigration from the colony (Robinette and Rogan 2006). Conversely, past monitoring has failed to observe adverse effects to California least terns during a launch event. For example, during a Delta II launch in June 2008, California least terns were in the courtship and nest initiation phase. Prior to the launch, 8 to 16 adults were observed attending the colony on a daily basis and 20 to 29 adults were observed daily post-launch. Additionally, three nests were initiated and regularly attended prior to the launch; the day after the launch nine additional nests were initiated, and all 12 nests hatched 100 percent of their eggs successfully. No evidence of injury, mortality or abnormal behavior of any monitored least terns was observed during this launch event (MSRS 2008b). This data implies that the response of California least terns is related to where they are in the nesting cycle. For instance, at the beginning of the nesting season when California least terns are arriving at the breeding colony, the adults seem to be more readily disturbed, but once serious courtship and nest-building begins the adults are more tenacious.

Security and antiterrorism operations may adversely affect western snowy plovers and California least terns because patrols could destroy nests and disturb nesting activity, chick rearing, and foraging behavior. Patrols would be conducted on foot or horseback and restricted to wet sand to the maximum extent practicable. ATVs would only be used in emergency situations when human health and safety is at risk.

California least terns and western snowy plovers both nest above the high tide line. Western snowy plovers forage in areas such as the wet sand and amongst surf-cast kelp within the intertidal zone. Patrols remaining within or near the wet sand would reduce the potential to crush nests, but individual plovers could be killed or injured by the movement of personnel and vehicles. Maintaining a speed limit of 15 mph should reduce the potential for birds to be crushed or injured by these patrols. Moreover, separation of adults from their nests and broods can result in mortality of chicks and eggs through exposure to heat, cold, wind-blown sand, and predators. Burger (1993) observed that piping plovers, in response to human disturbance, spent more energy on vigilance and avoidance behavior at the expense of foraging activity, and sometimes abandoned preferred foraging habitat. California least terns forage in near-shore ocean waters and in shallow estuaries and lagoons, thus they may be adversely affected by the increased human disturbance but California least terns would be less likely to be directly killed or injured by the patrols.

Outside of the breeding season, ATVs may be used on the beach for clean-up efforts and to patrol for poachers; however, the 15 mph speed limit would still be imposed to reduce adverse effects to wintering plovers. Wintering plovers frequently roost and forage in loose flocks. They usually sit in small depressions in the sand, or in the lee of kelp, other debris, or small dunes because these areas provide some shelter. When roosting snowy plovers are disturbed, they frequently run a few meters to a new spot where they sometimes displace other individuals, or alternatively, the whole flock may fly to a new location (Service 2007b). California least terns

migrate south for the winter so there would be no effect to California least terns outside of the breeding season. Adverse effects to western snowy plovers and California least terns associated with security patrols in the past have been temporary and occurred only in support of launches and safety of the installation and personnel.

Infrastructure Support

The Air Force installed fencing and signage delineating western snowy plover breeding areas, as described in the Biological Opinion for Beach Management for the Western Snowy Plover on VAFB (1-8-05-F-5R). The maintenance is usually conducted prior to the start of the breeding season. If maintenance actions occur during the breeding season, project personnel will coordinate with qualified monitors to avoid adversely affecting western snowy plovers. Overall, the fencing benefits western snowy plovers because the purpose of the fence is to demarcate the areas closed to recreational beach activities during the breeding season, thereby reducing adverse effects to the breeding population from human disturbance.

Environmental Management Programs

Environmental Management Program activities that may adversely affect California least terns and western snowy plovers include the IRP, the MMRP, archaeological support, and sensitive species management. The IRP, MMRP, and archeological support actions would occur outside of the breeding season, avoiding adversely affecting breeding adults and their young. However, wintering plovers could be subject to temporary disturbances. The IRP, MMRP, and archaeological support actions could result in the permanent loss of a small portion of existing breeding, foraging, and roosting habitat for these species, but it is more likely that the proposed actions would only result in the temporary loss of suitable habitat for the snowy plover.

Sensitive species management actions in western snowy plover breeding habitat, such as conducting surveys for the El Segundo blue butterfly and (or) the beach layia, may occur to support the conservation of these species. The surveys have the potential to adversely affect breeding snowy plovers due to increased human presence, but the surveys would only be conducted under the guidance of a Service-approved biologist and will adhere to all conservation measures outlined in the Biological Opinion for Beach Management for the Western Snowy Plover on VAFB for the 2005-2009 Breeding Seasons (1-8-05-F-5R).

Summary of Effects to the Western Snowy Plover and California Least Tern

In summary, we do not expect that California least terns or western snowy plovers would be adversely affected by the majority of the actions within this biological opinion. The Air Force has averaged 12 combined space and missile launches per year over the last 5 years and more than 10 years of monitoring has not detected evidence of injury, mortality, or post-launch abnormal behavior of any monitored western snowy plovers. The Air Force proposes to increase their launch frequency from 12 to 50 combined space and missile launches per year. We continue to anticipate that the launch activities would only result in temporary flushing from

nests and would not cause mortality or a reduction of breeding success of western snowy plovers at VAFB. To determine if the increased launch frequency demonstrates adverse effects to the western snowy plover, the Air Force will monitor all launches from all facilities that may affect the western snowy plover if the Air Force conducts more than 12 launches during the breeding season. In addition, the Air Force will monitor the first two launches of new or louder space vehicle launch programs from SLC-2, SLC-3, TP-01, and LF-576E, and the first three launches of any launch vehicle from SLC-4.

Effects from launches to California least terns are harder to predict. Past monitoring suggests that effects from launches have ranged from no observed effect to temporary and permanent emigration from the colony and caused reduced nesting and reproductive success. The effects to California least terns from launches depends upon when the launches occur during the breeding season, for instance whether the launch occurs prior to or after nest initiation. Based on the monitoring data and because we are analyzing the worst-case scenario, we assume that the launches from VAFB will cause California least terns to emigrate from the colony whenever a launch occurs during the breeding season and cause reduced nesting and reproductive success.

The other actions that could adversely affect California least terns and western snowy plovers include security patrols and conducting environmental management program actions. Security patrol vehicles have the potential to kill or injure California least terns and western snowy plovers, but because the patrol vehicles will stay within the wet sand to the maximum extent practicable and patrols will maintain a speed of 15 mph, we conclude that most individual birds would move out of harm's way. Therefore, we only expect patrols to temporarily disturb these species. However, during the breeding season even a temporary disturbance that flushes adults could reduce the productivity and reduce the survivorship of eggs and young. Wintering plovers could be temporarily disturbed due to environmental management program actions, but we assume that any snowy plovers that are present would just move to a different area. California least terns migrate during the winter so any actions outside of the breeding season would not affect this species. Overall, we expect that the presence of Service-approved monitors during project activities occurring within occupied habitats would reduce the potential for permanent effects. Therefore, we do not anticipate any of the activities to cause mortality of western snowy plovers or California least terns.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Because the entire base is a federal installation, we are not aware of any non-Federal actions that are reasonably certain to occur in the action area.

CONCLUSION

After reviewing the current status of the Vandenberg monkeyflower, beach layia, Gaviota tarplant, Lompoc yerba santa, El Segundo blue butterfly, vernal pool fairy shrimp, California red-legged frog, tidewater goby, unarmored threespine stickleback, California least tern, and western snowy plover, the environmental baseline, the effects of the action, and the cumulative effects, it is the Service's biological opinion that the suite of actions within this programmatic biological opinion will not jeopardize the continued existence of these species. We reached this conclusion for the following reasons:

Vandenberg Monkeyflower

Most of the covered project activities occur outside of habitat occupied by Vandenberg monkeyflower. Combined, IRP, MMRP, landfill, and grazing activities overlap with approximately 268 acres of suitable habitat for Vandenberg monkeyflower, representing less than 3 percent of the estimated 10,057 acres of suitable habitat for the species in the action area (78 FR 64446). Additional effects would result from utility and firebreak maintenance actions that may increase invasive plant species within suitable habitat. The Air Force will implement measures to avoid and reduce adverse effects to the Vandenberg monkeyflower from other project activities analyzed within this biological opinion. Therefore, because only a small portion of occupied habitat would be affected, the Vandenberg monkeyflower's reproduction, numbers, and distribution on VAFB would not be substantially reduced. Consequently, we also do not expect a substantial effect on the species' rangewide condition, so we conclude that the proposed actions are not likely to reduce appreciably the Vandenberg monkeyflower's survival and recovery in the wild.

Beach Layia

We have concluded that the combined effects from the project activities would not substantially adversely affect the beach layia. The project activities would only affect up to approximately 1 percent (0.065 acre) of the occupied habitat. In addition, the Air Force will implement measures to reduce adverse effects of project activities. The beach layia is much more abundant in northern California, with locations on the Monterey and San Francisco peninsulas, Marin County, and the largest populations of beach layia occurring in Humboldt County. Because the actions contained within this biological opinion would only impact a very small portion of the population, and the Air Force actively removes invasive plants from suitable beach layia habitat, the effects of the actions would not reduce the range of the beach layia by causing a substantial reduction in the population at VAFB, which is the southern-most population of this species. Because the local effects to the species are not substantial, the actions are not likely to reduce appreciably the survival and recovery of the beach layia in the wild.

Gaviota Tarplant

We do not have an estimate of the amount of Gaviota tarplant individuals or acreage that would be adversely affected due to project activities, but we anticipate that the sum of the actions would not reduce the quality of the Gaviota tarplant or its habitat on VAFB beyond its current condition. Some of the existing occupied habitat may be less than high-quality because of ongoing mowing and other maintenance actions. Because the Air Force will implement minimization measures to avoid and reduce the adverse effects to the Gaviota tarplant; implement a range management plan to guide the grazing practices, in which grazing may improve the habitat over the long term; and because the Gaviota tarplant can persist and may benefit from slight disturbances to its habitat, we determined that the sum of the actions analyzed within this biological opinion would not reduce the reproduction, numbers, and distribution of the species . Because we conclude that the species' local status would not be diminished, we likewise conclude that the rangewide status will not be substantially affected. Therefore, we conclude that the proposed actions will not reduce appreciably the likelihood of the Gaviota tarplant's survival and recovery in the wild.

Lompoc Yerba Santa

We estimate that the Air Force would adversely affect up to approximately 10 percent (0.4 acre) of the population of Lompoc yerba santa on the base. This impact results from utility maintenance actions that are not likely to occur every year. The Air Force will implement measures to avoid and reduce adverse effects to the Lompoc yerba santa from other project activities analyzed within this biological opinion. Therefore, because only a small portion of occupied habitat would be affected, the reproduction, numbers, and distribution of the Lompoc yerba santa population on VAFB would not be substantially reduced. Given that VAFB contains the majority of the known populations of this species throughout its range, we determined that the sum of the actions analyzed within this biological opinion would not reduce appreciably the likelihood of the survival and recovery of the Lompoc yerba santa because the rangewide status of the species would not be reduced below its current condition.

Vernal Pool Fairy Shrimp

We estimate that the Air Force could adversely affect up to approximately 44 acres (54 percent) of the occupied habitat on the base. Many of the adverse effects would occur during the dry season and are not expected to permanently remove functioning habitat. In addition, the Air Force will implement measures to avoid and minimize the adverse effects to vernal pool fairy shrimp and its habitat, including replacing permanently affected pools at at a 1:1 ratio. Consequently, the proposed actions are not likely to reduce the reproduction, numbers, and distribution of the vernal pool fairy shrimp. Because the range of the vernal pool fairy shrimp extends from Riverside County and the Coast Ranges, north through Central Valley grasslands to Tehama County, and then to an

area in the Agate Desert of Oregon, and we have concluded that the effects in the action area would not be substantial, the sum of the actions analyzed in this biological opinion would not reduce appreciably the survival and recovery of the vernal pool fairy shrimp in the wild.

El Segundo Blue Butterfly

We estimate that implementing the project activities could result in adverse effects of up to 71 acres of occupied habitat and up to approximately 900 acres of suitable but unknown to be occupied habitat over the next five years. For this species, we analyzed the effects for five years because the adverse effects resulting from environmental management activities such as the IRP and MMRP are only calculated for five years. The majority of occupied habitat would be avoided, as 71 acres represent only 9 percent of the occupied habitat known to occur on the base. Vandenberg Air Force Base contains many more acres of suitable habitat than occupied habitat; however, because the seacliff buckwheat is present does not mean that the El Segundo blue butterfly will occupy that area if the currently occupied habitat is adversely affected and uninhabitable.

Other populations of the El Segundo blue butterfly occur within approximately 25 acres of habitat in Lompoc, and in seven sites within three disjunct locations in Los Angeles County, which is more than 100 miles to the south of VAFB (two sites at the Airport Dunes location; the Chevron Preserve, and four sites near or north of Malaga Cove). The total occupied and restorable habitat in Los Angeles County areas is approximately 451 acres (Service 2008b). We note that this estimate of acreage was not determined the same way as the acreage was determined in this biological opinion.

Taking into account that our analysis of the effects of the proposed actions is based on the worse-case scenario and the uncertainty whether El Segundo blue butterflies would occupy suitable but currently unknown habitat areas if occupied habitat is adversely affected, we have determined that the sum of the project actions could result in up to approximately 9 percent of the habitat to be lost over the next five years. However, because the Air Force will implement minimization measures to avoid and reduce adverse effects to the El Segundo blue butterfly and its habitat; the effects from the environmental management program, which is the program that could have the largest adverse effect on this species, are short term and do not consist of repeated disturbances; and natural recruitment of buckwheat plants may occur, buffered by enhancement of suitable habitat such as removing nonnative invasive plants, we have determined that the sum of the actions contained within this biological opinion would not reduce the species' reproduction, numbers, and distribution . Because the El Segundo blue butterfly would have the ability to continue to survive and its range would not be substantially reduced beyond its current condition, we conclude that the proposed actions will not reduce appreciably the likelihood of the El Segundo blue butterfly's survival and recovery in the wild.

California Red-legged Frog

The California red-legged frog occupies numerous sites on VAFB and is known from three disjunct regions in 26 California counties and one region in Baja California, Mexico. We anticipate that the majority of the actions analyzed within this biological opinion would not result in mortality or injury to individual California red-legged frogs. It is more likely that suitable habitat features could be temporarily adversely affected. In addition, the Air Force will implement measures to avoid and minimize adverse effects to the California red-legged frog and its habitat. Because this species occurs in 26 California counties and one region in Baja California, Mexico, and project actions would temporarily affect a small proportion of the available habitat on VAFB, we have determined that the sum of the actions would not reduce the reproduction, numbers, or distribution of the species. Because we conclude that the species' rangewide status will not be substantially affected, we further conclude that the proposed actions will not reduce appreciably the likelihood of the California red-legged frog's survival and recovery in the wild.

Tidewater Goby

Most of the project activities would not occur within habitat of the tidewater goby. In the event that project actions would occur in tidewater goby habitat, the Air Force will implement measures to avoid and minimize adverse effects. The tidewater goby occurs in more than 100 locations, including four drainages on base. Because the majority of the actions within this biological opinion would not affect the tidewater goby or its habitat, the proposed actions would not reduce the species' reproduction, numbers, or distribution. Because the tidewater goby persists in many other locations outside of VAFB, the sum of the actions, we conclude that the species' rangewide status will not be substantially affected, and we further conclude that the proposed actions will not reduce appreciably the likelihood of the tidewater goby's survival and recovery in the wild.

Unarmored Threespine Stickleback

San Antonio Creek is the only location on VAFB that is occupied by the unarmored threespine stickleback, and one of three locations known to be occupied throughout its range. Most of the project activities would not occur within unarmored threespine stickleback habitat. As with the tidewater goby, the Air Force will implement measures to avoid and minimize adverse effects to unarmored threespine sticklebacks if a project activity may affect this species. Because most of the actions contained within this biological opinion would not affect this species, the population of the unarmored threespine stickleback would not be affected and its reproduction, numbers, and distribution would not be reduced. Therefore, the sum of the actions would not reduce appreciably the likelihood of the survival and recovery in the wild of the unarmored threespine stickleback.

California Least Tern

The majority of the project activities in this biological opinion would not adversely affect the California least tern. Space launches and associated security patrols are the actions that would affect this species. Launch activities could reduce nesting and reproductive success of the least tern at the Purisima Point breeding colony, but the effects to this species depend upon when the launches occur during the breeding season. In the past, emigration from the colony has ranged from temporary to permanent. Over the past 15 years, the population has fluctuated with years of high and low reproductive success due to factors such as predation, prey availability, and other unknown factors. The Air Force has been launching space vehicles for many years and the effect to California least terns from launches is hard to predict. The Air Force will continue to monitor nesting least terns during launches that may affect this species.

The Purisima Point colony on VAFB is a relatively small breeding colony for California least terns. This species is concentrated in Los Angeles, Orange, and San Diego Counties. An estimated 7,000 to 7,700 California least tern breeding pairs established approximately 8,200 nests and produced approximately 2,500 fledglings at 47 documented locations. Therefore, even if a launch activity causes reduced nesting and reproductive success at the Purisima Point colony, we have determined that these activities would not would not reduce the reproduction, numbers, and distribution of the California least tern. Because the population and the range of this species would not be reduced beyond its current condition, we conclude that the proposed actions would not reduce appreciably the likelihood of the California least tern's survival and recovery in the wild

1. Western Snowy Plover

Most of the project activities in this biological opinion would not adversely affect the western snowy plover. Space launches and security patrols are the actions that could affect breeding western snowy plovers. Launch vehicles have not shown to substantially affect this species, nor have they shown to adversely affect reproductive success. Vandenberg Air Force Base is within Recovery Unit 5, which supports the greatest number of western snowy plovers, thus disturbances that displace or reduce the productivity of western snowy plovers on VAFB could substantially affect the overall population. However, because monitoring data has shown launches do not substantially affect this species, and the security patrols and other project actions could at most temporarily flush nesting or wintering birds, we have determined that the proposed actions would not reduce the reproduction, numbers, and distribution of the western snowy plover. Because the population and the range of this species would not be reduced below its current condition, we conclude that the proposed actions would not reduce appreciably the likelihood of the western snowy plover's survival and recovery in the wild.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened wildlife species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this incidental take statement.

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species; however, limited protection of listed plants is provided at section 9(a)(2) to the extent that the Act prohibits the removal and reduction to possession of federally listed plants or the malicious damage of such plants on areas under Federal jurisdiction, or the destruction of endangered plants on non-Federal areas in violation of State law or regulation or in the course of a violation of a State criminal trespass law. Consequently, this biological opinion does not include an incidental take statement, reasonable and prudent measures, or terms and conditions for the Vandenberg monkeyflower, beach layia, Gaviota tarplant, or Lompoc yerba santa.

This biological opinion does not exempt any activity from the prohibitions against take contained in section 9 of the Act that is not incidental to the action as described in this biological opinion. Take that occurs outside of the action area or from any activity not described in this biological opinion is not exempted from the prohibitions against take described in section 9 of the Act.

For some species, anticipating levels of take we expect to result from the effects of the proposed actions is difficult for several reasons: (1) many of these species are small and difficult to find whether dead or alive; (2) numbers fluctuate throughout the year and between years so predicting how many individuals may be encountered is not possible; (3) predators and scavengers may remove dead or injured individuals before they can be recovered or observed; and (4) ascribing a cause of injury or mortality to a specific activity may not be possible as some natural mortality and injury or mortality from other causes is likely. Regardless, we must provide a level at which formal consultation must be reinitiated, so we use the Reasonable and Prudent Measures and associated Terms and Conditions to set limits at which consultation must be reinitiated. What follows immediately is our assessment, based upon the effects analyzed, of what types of take we expect to occur.

Vernal Pool Fairy Shrimp

We anticipate that the vernal pool fairy shrimp would be subject to take in the form of harm, injury, and mortality. An unquantifiable number of vernal pool fairy shrimp and cysts may be crushed, buried, or displaced in any occupied habitat within a project's action area. Antiterrorism patrols, infrastructure support activities, and environmental management program actions that require the movement of vehicles and personnel through occupied habitat during the dry season could result in injury or mortality of cysts. Most of these project activities would occur outside of the wet season when occupied habitat is dry, except under circumstances that require immediate attention such as repairing malfunctioning utilities, monitoring existing wells, and conducting emergency security patrols. Working in occupied habitat inundated with water could result in injury or mortality of vernal pool fairy shrimp. Moreover, activities that require soil excavation within occupied habitat could result in the degradation or destruction of occupied habitats. Adversely affecting occupied habitat could reach the level of harm, injuring vernal pool fairy shrimp by significantly impairing essential behavioral patterns, including breeding, feeding, and sheltering. We anticipate that grazing would take vernal pool fairy shrimp and cysts as cattle walk within occupied habitats. Fire management (i.e. firebreak maintenance) is not expected to result in take because occupied habitat would be avoided. We do not anticipate, nor do we exempt take for any other activities not analyzed in this consultation. Vernal pool fairy shrimp may be taken only within the boundaries of the action area.

El Segundo Blue Butterfly

We anticipate that the El Segundo blue butterfly would be subject to take in the form of harm, injury, and mortality. Project actions that damage or remove seacliff buckwheat plants could result in injury or mortality of individual butterflies because this species spends the vast majority of its life in close association with the seacliff buckwheat plant. Removing the host plant, or otherwise damaging it to a point that the plant would not provide the adequate life-supporting attributes for the El Segundo blue butterfly could harm individual butterflies by significantly impairing essential behavioral patterns, including breeding, feeding, and sheltering. In addition, activities that require soil excavation within occupied habitat are likely to result in mortality or injury of diapausing pupae, essentially taking future generations of adult butterflies. The Air Force would avoid working during the flight season in known occupied habitat, except for certain project actions that require immediate attention such as repairing malfunctioning utilities, monitoring existing wells, and conducting emergency security patrols. The Air Force would work year round in suitable but unknown to be occupied habitat. We cannot predict the number of individual butterflies that would be taken as a result of the proposed actions. Because of their cryptic nature, fluctuations in abundance from one generation to the next and from one flower head to another and potentially high parasitism and natural mortality rates (Arnold, pers. comm. 2007), detecting dead or injured El Segundo blue butterflies as a result of the proposed actions would be very difficult. We do not anticipate, nor do we exempt take for any other activities not analyzed in this consultation. El Segundo blue butterfly may be taken only within the boundaries of the action area.

California Red-legged Frog

We anticipate that California red-legged frogs would be subject to take in the form of capture, harm, injury, and mortality. All California red-legged frogs found within project footprints would be subject to take because the Air Force will attempt to capture and relocate all life stages of California red-legged frogs out of work areas prior to the onset of any project activities that may result in adverse effects to California red-legged frogs. We assume that a very small percentage of the captured California red-legged frogs could succumb to injury or mortality; however, the purpose is to reduce the overall risk to California red-legged frogs that could result from implementing project actions. Individual California red-legged frogs that are not detected by the pre-construction surveys may be killed or injured anywhere within the action area. Suitable habitat would be affected mostly due to infrastructure support activities and environmental management programs that could require moving personnel and vehicles through suitable habitat, excavating soil, and temporarily dewatering wet areas. Adverse effects to, or permanent removal of, suitable habitat features could reach the level of harm, injuring California red-legged frogs by significantly impairing essential behavioral patterns, including breeding, feeding, and sheltering. We anticipate adverse impacts to suitable habitat to only be temporary and these actions would normally occur outside of the breeding season. We do not anticipate take of California red-legged frogs due to launch operations because launches have not shown to adversely affect water quality. We do not anticipate grazing activities to take California red-legged frogs because the Air Force would manage the grazing program to maintain or improve riparian conditions. Overall, we are unable to predict how many California red-legged frogs would be taken as a result implementing the project activities. We do not anticipate, nor do we exempt take for any other activities not analyzed in this consultation. California red-legged frogs may be taken only within the boundaries of the action area.

Tidewater Goby and Unarmored Threespine Stickleback

We anticipate tidewater gobies and unarmored threespine sticklebacks would be subject to take in the form of capture, harm, injury, and mortality. All tidewater gobies and unarmored threespine sticklebacks found within project footprints would be subject to take because the Air Force will attempt to capture and relocate all life stages of tidewater gobies and unarmored threespine sticklebacks out of work areas prior to the onset of any project activities. During the capture and relocation efforts, it is likely that individual fish will die. Individual tidewater gobies and unarmored threespine sticklebacks that are not detected by the pre-construction surveys may be killed or injured anywhere within the action area. Suitable habitat would be affected mostly due to infrastructure support activities and environmental management programs that could require moving personnel and vehicles through suitable habitat, shifting soil and vegetation on creek and stream banks, and temporarily dewatering wet areas. Degradation of suitable habitat could reach the level of harm, injuring tidewater gobies and unarmored threespine sticklebacks by significantly impairing essential behavioral patterns, including breeding, feeding, and sheltering. The adverse impacts to suitable habitat would only be temporary and normally occur outside of the breeding season. We do not anticipate take of tidewater gobies or unarmored threespine sticklebacks due to launch operations because launches

have not shown to adversely affect water quality. We do not anticipate the grazing program to take tidewater gobies or unarmored threespine sticklebacks because the Air Force would manage the grazing program to maintain or improve riparian conditions. Overall, we are unable to predict how many tidewater gobies or unarmored threespine sticklebacks would be taken as a result of implementing the project activities. We do not anticipate, nor do we exempt take for any other activities not analyzed in this consultation. Tidewater gobies and unarmored threespine sticklebacks may be taken only within the boundaries of the action area.

Western Snowy Plover and California Least Tern

We anticipate western snowy plovers and California least terns would be subject to take in the form of harm. During the breeding season, launch activities may cause western snowy plovers to temporarily flush from their nests, but we anticipate that the flushed plovers would return to their nests shortly thereafter. California least terns have shown to be more affected by launch activities, ranging from no visible effects to permanent emigration from the breeding colony and reduced nesting and reproduction success, depending on when during the breeding season the launches occur. Security patrols may also cause western snowy plovers and California least terns to flush from their nests. The combined effect of these two activities may reach the level of harm, injuring western snowy plovers and California least terns by significantly impairing essential behavioral patterns, including breeding, feeding, and sheltering. This is especially possible with an increase from 12 to 50 combined launches from VAFB. We cannot anticipate how many western snowy plovers or California least terns would be taken due to the variation of the population on VAFB and nest locations from year to year. During the non-breeding season, wintering plovers may temporarily flush, but we do not expect effects to wintering plovers to reach the level of harm. We do not anticipate, nor do we exempt take for any other activities not analyzed in this consultation. Western snowy plover and California least terns may be taken only within the boundaries of the action area.

The measures described below are non-discretionary and must be undertaken by the Air Force for the exemption in section 7(o)(2) to apply. The Air Force has a continuing duty to regulate the activity covered by this incidental take statement. If the Air Force fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the Air Force must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

REASONABLE AND PRUDENT MEASURES

We believe the following reasonable and prudent measures are necessary and appropriate to minimize take of the El Segundo blue butterfly, vernal pool fairy shrimp, California red-legged frog, tidewater goby, unarmored threespine stickleback, California least tern, and western snowy plover during the project activities conducted pursuant to this biological opinion:

1. The Air Force must ensure that the level of incidental take that occurs during project implementation is commensurate with the analysis contained herein.

2. The Air Force must use qualified personnel to minimize incidental take of the federally listed species during project implementation.

3. The Air Force must use well-defined operational procedures to minimize incidental take of the federally listed species during project implementation.

4. The Air Force must notify us prior to conducting any project activities that may adversely affect any federally listed species analyzed within this programmatic biological opinion. Exceptions to this notification measure include subheadings 1.1, Space and Missile Launch Operations; 1.2, Security and Antiterrorism Operations; 1.3, Air Operations; 2.3, Landscaping-specifically routine mowing; and 4.6, Grazing and Livestock-specifically implementing the existing Range Management Plan.

TERMS AND CONDITIONS

To be exempt from the prohibitions in section 9 of the Act, the Air Force must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. The following terms and conditions implement reasonable and prudent measure 1:

   a. We assume that the average coast buckwheat plant contains about 300 flower heads and may produce 30 El Segundo blue butterfly adults; however, the population at VAFB occurs in much less dense numbers than other known populations (Pratt, pers. comm. 2007). Generally, El Segundo blue butterflies are not common anywhere they are observed and finding dead or injured individuals is unlikely. Despite the difficulty in finding dead or injured individuals and ascribing that death or injury to the proposed activities, we must provide take limits at which, if exceeded, formal consultation must be reinitiated. Therefore, if more than five (5) El Segundo blue butterflies are killed or injured due to project activities, or if the infrastructure support project actions result in adverse effects to more than 11 acres of occupied habitat, or if the IRP and MMRP project activities adversely affect more than 4 and 5 acres of occupied habitat per year, respectively, over the next 5 years, or if the project activities adversely affect more than 900 acres of suitable but unknown to be occupied habitat over the next 5 years, we will conclude that the amount or extent of incidental we anticipate based upon the effects we analyzed will have been exceeded. When the amount or extent of incidental take in any form listed above is exceeded, the exemption issued pursuant to section 7(o)(2) will have lapsed and any further take would be

a violation of section 4(d) or 9. Consequently, we recommend that any operations causing such take cease pending reinitiation.

b. For the vernal pool fairy shrimp, we expect the buffer zones delineated by the Air Force to provide a safeguard to the adjacent upland areas, and many of the actions would only occur during the dry season. Because we are unable to anticipate with certainty the number of vernal pool fairy shrimp that may be affected, the Air Force must notify the Ventura Fish and Wildlife Office immediately if two (2) pools occupied by vernal pool fairy shrimp are degraded by project activities to a point that either can no longer support this species. When the amount or extent of incidental take associated with the loss of two occupied vernal pools occurs, we will conclude that the amount of incidental take we anticipate has been exceeded and the exemption issued pursuant to section 7(o)(2) will have lapsed and any further take would be a violation of section 4(d) or 9. Consequently, we recommend that any operations causing such take cease pending reinitiation.

c. Based on the diversity of the project activities, the number of California red-legged frogs observed on VAFB, and the measures that the Air Force will implement to avoid and minimize adverse effects, we anticipate that no more than 30 adults, 60 metamorphs/juveniles/tadpoles and 2 eggs masses will be captured and relocated; and no more than 15 adults, 20 metamorphs/juveniles/tadpoles, and 1 egg mass could be killed or injured annually due to project activities. The cause of death or injury must be determined by a Service-approved biologist. In instances where the amount or extent of incidental take is exceeded, the exemption issued pursuant to section 7(o)(2) will have lapsed and any further take would be a violation of section 4(d) or 9. Consequently, we recommend that any operations causing such take cease pending reinitiation.

d. If more than 20 tidewater gobies are captured, or more than 10 are injured or killed annually due to project activities, the Air Force must contact the Ventura Fish and Wildlife Office immediately. We will then review the project's actions to determine if additional protective measures are needed. The cause of death or injury must be determined by a Service-approved biologist. In instances where the amount or extent of incidental take is exceeded, the exemption issued pursuant to section 7(o)(2) will have lapsed and any further take would be a violation of section 4(d) or 9. Consequently, we recommend that any operations causing such take cease pending reinitiation.

e. If more than 20 unarmored threespine sticklebacks are captured or more than 10 are injured or killed annually due to project activities, the Air Force must contact the Ventura Fish and Wildlife Office immediately. We will then review the project's actions to determine if additional protective measures are needed. The cause of death or injury must be determined by a Service-approved biologist. In instances where the amount or extent of incidental take is exceeded, the

exemption issued pursuant to section 7(o)(2) will have lapsed and any further take would be a violation of section 4(d) or 9. Consequently, we recommend that any operations causing such take cease pending reinitiation.

f. If 1 or more western snowy plovers or California least terns are killed or injured annually, or if 1 nest of either species, regardless of how many eggs are present, is destroyed due to project activities, the Air Force must contact the Ventura Fish and Wildlife Office immediately. We will then review the project's actions to determine if additional protective measures are needed. The cause of death or injury must be determined by a Service-approved biologist. In instances where the amount or extent of incidental take is exceeded, the exemption issued pursuant to section 7(o)(2) will have lapsed and any further take would be a violation of section 4(d) or 9. Consequently, we recommend that any operations causing such take cease pending reinitiation.

2. The following terms and conditions implement reasonable and prudent measure 2:

a. The Air Force must request our approval of any biologist it wishes to employ as a Service-approved biologist at least 30 days prior to any such activities being conducted. In the request, the Air Force must include the names of the biologist(s), qualifications, references, for which species the biologist(s) is requesting authorization to monitor, and what monitoring activities the biologist(s) would complete. Please be advised that possession of a 10(a)(1)(A) permit for the covered species does not substitute for the implementation of this measure. Authorization of Service-approved biologists is valid for this consultation only.

b. A Service-approved biologist must provide recommendations to project personnel on ways to reduce any adverse effects to wintering western snowy plovers prior to any project activities occurring during the non-breeding season that may affect wintering plovers.

c. For project activities that would occur during the time period when El Segundo blue butterflies are typically active (June 1 to September 15), and that have the potential to adversely affect seacliff buckwheat plants within areas that are defined as suitable but currently unknown to be occupied habitat, the Air Force will select one of the following three approaches:

i. The Air Force could conduct at least five pre-activity surveys, with one survey effort per day, using Service-approved biologists. If the surveys are positive: the seacliff buckwheat plants would be considered occupied and afforded the appropriate avoidance and minimization measures stated in the Description of the Proposed Action section of this biological opinion. If the surveys are negative: the seacliff buckwheat plants would

be considered unoccupied habitat for the remainder of the season. For surveys to be determined negative they must occur at a time when the environmental conditions would support adults emerging from diapause and a reference site, which is nearest to the project site and that is known to be occupied, must have El Segundo blue butterflies present. The following conditions should be met and are based on standard protocols for determining presence or absence of the El Segundo blue butterfly: the surveys must occur between no earlier than 2 hours after sunrise and no later than 2 hours before sunset and weather conditions must include no rain or drizzle, air temperatures of at least 60 degrees Fahrenheit, and winds of less than 10 miles per hour. However, if these variables at the reference site are outside one or more of the wind, temperature, and time limits and butterflies are active at the reference site, and the project site has at least near-identical environmental conditions, the survey results at the project site would be considered valid even if the survey occurs outside of the environmental conditions stated above.

ii. The Air Force could assume that the project area in the suitable but unknown to be occupied habitat area is occupied and incorporate the appropriate avoidance and minimization measures stated in the Description of the Proposed Action section of this biological opinion. Thus impacts to this assumed occupied area would be debited against the 71 acres of impacts we estimated would occur to known occupied habitat.

iii. The Air Force could not conduct surveys because scheduling pre-activity surveys is not logistically feasible, or the environmental conditions and activity at the reference site cannot be met to determine absence as stated in 2(c)(i); the proposed project area would then still be considered suitable but unknown to be occupied habitat and impacts to the suitable habitat would be debited against the 900 acres of impacts that we estimated would occur to the suitable but unknown to be occupied habitat over the 5-year period covered by this biological opinion.

d. All project activities that may affect California red-legged frogs, tidewater gobies, and unarmored threespine sticklebacks, or their respective aquatic habitats must be monitored by a Service-approved biologist.

e. California red-legged frogs, tidewater gobies, and unarmored threespine sticklebacks must be relocated from the project site and from all areas where construction activities may result in adverse effects to these species. California red-legged frogs may only be captured by hand or dip net and transported in buckets separate from other species. When capturing and removing California red-legged frogs, tidewater gobies, and unarmored threespine sticklebacks from the project area, the Service-approved biologist(s) must minimize the amount of

time that animals are held in captivity. In addition, California red-legged frogs, tidewater gobies, and unarmored threespine sticklebacks must be maintained in a manner that does not expose them to temperatures or any other environmental conditions that could cause injury or undue stress.

f. California red-legged frogs that are captured prior to or during project activities must be relocated no more than 2 miles from the capture site and within the same watershed.

3. The following terms and conditions implement reasonable and prudent measure 3:

a. The Air Force must manage their grazing program to ensure that grazing practices do not adversely affect federally listed species, their respective habitats, and riparian habitats beyond the existing conditions.

b. All vehicles that are used for a project activity must use existing roads to the maximum extent practicable during the implementation of any project.

c. If project activities occur within flowing water, the Air Force must divert the water around the project site and ensure unimpeded flow downstream at a proper rate in order for aquatic species to have the ability to bypass the project site.

d. All project-related dewatering actions should only occur during daylight hours; however, if it is necessary to dewater at night, the duration of the dewatering activity must occur under the guidance of a Service-approved biologist.

e. To avoid transferring disease or pathogens between aquatic habitats during the course of surveys and handling of California red-legged frogs, the Service-approved biologist(s) must follow the Declining Amphibian Population Task Force's Code of Practice. A copy of this Code of Practice is enclosed. You may substitute a bleach solution (0.5 to 1.0 cup of bleach to 1.0 gallon of water) for the ethanol solution. Care must be taken so that all traces of the disinfectant are removed before entering the next aquatic habitat.

f. If a California red-legged frog, tidewater goby, or unarmored threespine stickleback is observed within a designated work area and cannot be avoided, all work must stop until the animal is relocated by a Service-approved biologist to outside of the work area or until it leaves the work area on its own accord.

g. Restoration activities within occupied or suitable habitat for the California red-legged frog, tidewater goby, and unarmored threespine stickleback must avoid working within flowing water during these species' peak breeding seasons, to the maximum extent practicable, to minimize adverse effects to their productivity:

California red-legged frog (November through March), tidewater goby (April through July), and unarmored threespine stickleback (March through July).

h. If vernal pool fairy shrimp habitat is going to be restored or created as mitigation for adverse effects during project implementation, per vernal pool fairy shrimp minimization measure 8, the Air Force must submit a plan to the Service prior to mitigation efforts. At a minimum, the plan must include a description of the mitigation actions; identification of the proper environmental variables, such as soil type, hydrology, and vegetation to ensure the habitat can properly support vernal pool fairy shrimp; and a monitoring plan to ensure the created/restored habitat is successful.

4. The following term and condition implements reasonable and prudent measure 4:

a. The Air Force must notify us in writing of its intention to conduct project activities under this programmatic biological opinion at least 30 days in advance of starting a project. The Air Force may submit the pre-project notification as a written letter or an electronic mail. The Service will respond in the same manner that the Air Force submits their request.

b. We assume that the base-wide and species-specific minimization measures will be implemented as part of the project actions. Therefore, all notices must include: (1) a brief summary of the project actions, including a discussion of which minimization measures (base-wide and species-specific) cannot be implemented and how not implementing the measure(s) would change the effects of the proposed project; (2) a description of the adverse effects to, and potential levels of take of, any federally listed species resulting from implementing the project; and (3) the Air Force's determination, with brief explanation, why the proposed project is within the scope of this biological opinion. The project and its effects to federally listed species would be summarized in the annual report.

REPORTING REQUIREMENTS

The Air Force must provide us a written report by March 1 for each year that activities are conducted pursuant to this biological opinion. The annual report must include: documentation of the impacts of the proposed activities on the federally listed species covered within this biological opinion; results of biological surveys and observation records; documentation of the number of individuals of federally listed species harassed (*e.g.*, flushed or relocated from an area), captured, or injured or killed; the date, time, and location of any form of take; approximate size and age of those individuals taken; a description of relocation sites for captured individuals; and the acreages of habitat for the federally listed species that were temporarily disturbed and permanently lost. The report should also include a discussion of those problems encountered

implementing the terms and conditions and other protective measures, recommendations for modifying the terms and conditions to enhance the conservation of federally listed species, and any other pertinent information. These reports will assist us in evaluating future measures for the protection of federally listed species at VAFB.

As part of the annual report, the Air Force must continue to implement the monitoring program to identify population trends and possible causes for any trends indicating declines that may result from cumulative effects of multiple launches from SLC-2 [as stated in biological opinions 1-8-96-F-53R, and 1-8-98-F-25R]. The Air Force must develop and implement a monitoring program designed to identify population trends of the California least tern in the vicinity of Purisima Point. Information on population trends must include an evaluation of both breeding and non-breeding individuals. The monitoring program will be designed to determine the reason(s) for declines (if appropriate) in populations of California least terns and to assess whether the declines may result from cumulative impacts of multiple launches from SLC-2.

DISPOSITION OF DEAD OR INJURED SPECIMENS

Upon locating a dead vernal pool fairy shrimp, El Segundo blue butterfly, California red-legged frog, tidewater goby, unarmored threespine stickleback, California least tern, or western snowy plover, resulting from the implementation of the project activities analyzed in this biological opinion, initial notification must be made to the Ventura Fish and Wildlife Office by facsimile at (805) 644-3958 immediately and in writing at the letterhead address within 3 working days. Notification must include the date, time, and location of the carcass; cause of death, if known; and any other pertinent information.

Care must be taken in handling injured specimens to ensure effective treatment and care and in handling dead specimens to preserve biological material in the best possible state for later analysis. The finder of injured specimens has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed, unless to remove it from the path of further harm or destruction. Should any listed species survive injury, the Service must be contacted regarding their final disposition.

The remains must be placed with educational or research institutions holding the appropriate State and Federal permits, such as the Santa Barbara Natural History Museum (Contact: Paul Collins, Santa Barbara Natural History Museum, Vertebrate Zoology Department, 2559 Puesta Del Sol, Santa Barbara, California 93460, (805) 682-4711, extension 321).

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The Air Force should continue conducting El Segundo blue butterfly surveys of any areas at VAFB that contain seacliff buckwheat to refine our knowledge of the subspecies' distribution.

2. The Air Force should continue conducting Vandenberg monkeyflower surveys within suitable habitat at VAFB to refine our knowledge of the species' distribution.

3. The Air Force should remove invasive plant species to the maximum extent possible within all proposed project areas, and reseed the disturbed areas with a native seed mix.

4. The Air Force should remove invasive animal species, particularly feral pigs, to the maximum extent possible, throughout VAFB to reduce the spread of invasive plant species and protect suitable habitat for threatened and endangered plants and animals,.

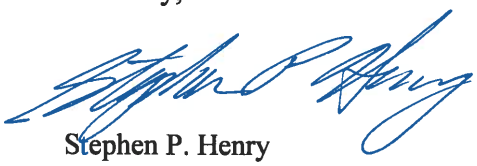
5. The Air Force should wash/clean their project equipment and vehicles between work sites to reduce the spread of invasive plant seeds and vegetative parts.

REINITIATION NOTICE

This concludes formal consultation on the effects of the programmatic activities analyzed under this biological opinion at Vandenberg Air Force Base. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by this action (50 CFR 402.16). Provided all avoidance and minimization measures in the project description and the reasonable and prudent measures with associated terms and conditions herein are implemented, this biological opinion is valid for 5 years from the date of issue. After 5 years, the Air Force should discuss with the Service the need to reinitiate or to amend this biological opinion to extend the time validity of this document. In instances where the amount or extent of incidental take is exceeded, the exemption issued pursuant to section 7(o)(2) will have lapsed and any further take would be a violation of section 4(d) or 9. Consequently, we recommend that any operations causing such take cease pending reinitiation.

If you have any questions regarding this biological opinion, please contact Bill Standley of my staff at (805) 644-1766, extension 315.

Sincerely,



Stephen P. Henry
Field Supervisor

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APPENDIX B
National Marine Fisheries Service Consultations

DEPARTMENT OF THE AIR FORCE
UNITED STATES SPACE FORCE
30TH SPACE WING

5 April 2021

Ms. Beatrice L. Kephart
30 CES/CEI
1028 Iceland Avenue
Vandenberg AFB CA 93437-6010

Barry Thom
Regional Adminsitrator
National Marine Fisheries Service
501 West Ocean Blvd, Ste 4200
Long Beach CA 90802-4213

Dear Mr. Thom:

Vandenberg Air Force Base (VAFB) is providing information on the ABL Space Systems (ABL) RS1 launch program at VAFB. The information described below and in the attachment is intended to assist in the analysis of the effects on marine mammals listed under the Endangered Species Act (ESA) that may occur as a result of the proposed RS1 launch program. As for the Marine Mammal Protection Act, all described actions are sufficiently authorized in our Letter of Authorization (dated 10 April 2019, valid through 9 April 2024).

The Air Force has determined that actions as described below and in the attachment are "Not Likely to Adversely Affect" the Guadalupe fur seal (*Arctostaphylos townsendi,* GFS) on the Northern Channel Islands (NCI). We made this determination on a basis of "insignificant" – GFS are uncommon on NCI; when they are present, they have shown little to no detectable reaction to noises such as those generated by previous rocket launches from VAFB (please refer to the similar informal consultation we completed on 5 August 2015 for Space Exploration Technologies, otherwise known as SpaceX). We request your concurrence on this determination.

Under the Proposed Action, ABL would conduct space launch activities of the RS1 vehicle at Launch Complex 576-E (LC 576-E) at VAFB in support of commercial and government customers. LC-576 E is on north VAFB, about 3 miles north-northwest of the Santa Ynez River estuary and 1.6 miles southeast of Purisima Point. ABL proposes to conduct as many as 12 launches per year. Launch trajectories departing from VAFB will be unique to the vehicle configuration, mission, and environmental conditions but within a range of potential launch azimuths between 180° and 210°. During ascent, a sonic boom (overpressure of high energy impulsive sound) up to 5.4 pounds per square foot (psf) would be generated while the first-stage booster is supersonic. The overpressure would be primarily directed at the Pacific Ocean south of Point Conception, potentially impacting the Northern Channel Islands with a sonic boom potentially reaching 2.0 psf on the Northern Channel Islands.

Again, we have determined that this action is “Not Likely to Adversely Affect” the Guadalupe fur seal, and we request your concurrence. If you do not concur with this analysis, please contact me at (805) 605-7924 or Rhys Evans at (805) 606-4198 (rhys.evans@spaceforce.mil) if you have any questions.

Sincerely,

4/5/2021

X Beatrice L Kephart

Signed by: KEPHART.BEATRICE.LINDA.1166122291
BEATRICE L. KEPHART
Chief, Installation Management Flight

1 attachment: Project specific information

1. Purpose and Overview

The purpose of the Proposed Action is to provide reliable U.S. enterprise access to space through an efficient and deployable ground-based launch system with minimal infrastructure requirements. This action supports compliance with the National Space Policy.

The need for ABL's proposal is to fulfill the requirements of commercial and governmental entities in the small satellite orbital and suborbital market. The satellite industry is changing and leading to an interest in small, responsive, efficient, and commercially focused launch vehicles that are low-cost solutions for government and commercial clients. Implementation of Proposed Action will fulfill the FAA's responsibilities as authorized by Executive Order (EO) 12465, Commercial Expendable Launch Vehicle Activities, and the Commercial Space Launch Act for oversight of commercial space launch activities. The Proposed Action would also fulfill the U.S. expectation to reduce space transportation costs and ensure continued exploration, development, and the use of space more affordable.

The economical and efficient design and manufacturing of the RS1 vehicle and ground support system and minimization of ground infrastructure would enable ABL to efficiently conduct lower cost launch missions from VAFB in support of commercial and government clients. In addition, the Proposed Action supports VAFB's vision of becoming the "world's most innovative space launch and landing team".

The portion of the Proposed Action that would potentially impact the federally threatened Guadalupe fur seal (*Arctocephalus townsendi*), under the jurisdiction of the National Marine Fisheries Service (NMFS) is described below, followed by an analysis of the potential impacts as required by section 7 of the Endangered Species Act (ESA).

2. Proposed Action

ABL proposes to conduct space launch activities of the RS1 vehicle at LC 576-E at VAFB in support of commercial and government customers. RS1 s an 88-foot (ft.) two-stage, ground-launched vehicle that is deployable and fully containerized. ABL proposes to conduct up to 12 launches and 12 static fire operations of the RS1 launch vehicle at LC 576-E per year. Launch trajectories departing from VAFB will be unique to the vehicle configuration, mission, and environmental conditions but within a range of potential launch azimuths from 180° and 210°. During ascent, a sonic boom (overpressure of high energy impulsive sound) up to 5.4 pounds per square foot (psf) would be generated while the first-stage booster is supersonic. The overpressure would be primarily directed at the Pacific Ocean south of Point Conception, potentially reaching up to 2.0 psf on the Northern Channel Islands (Figure 1).

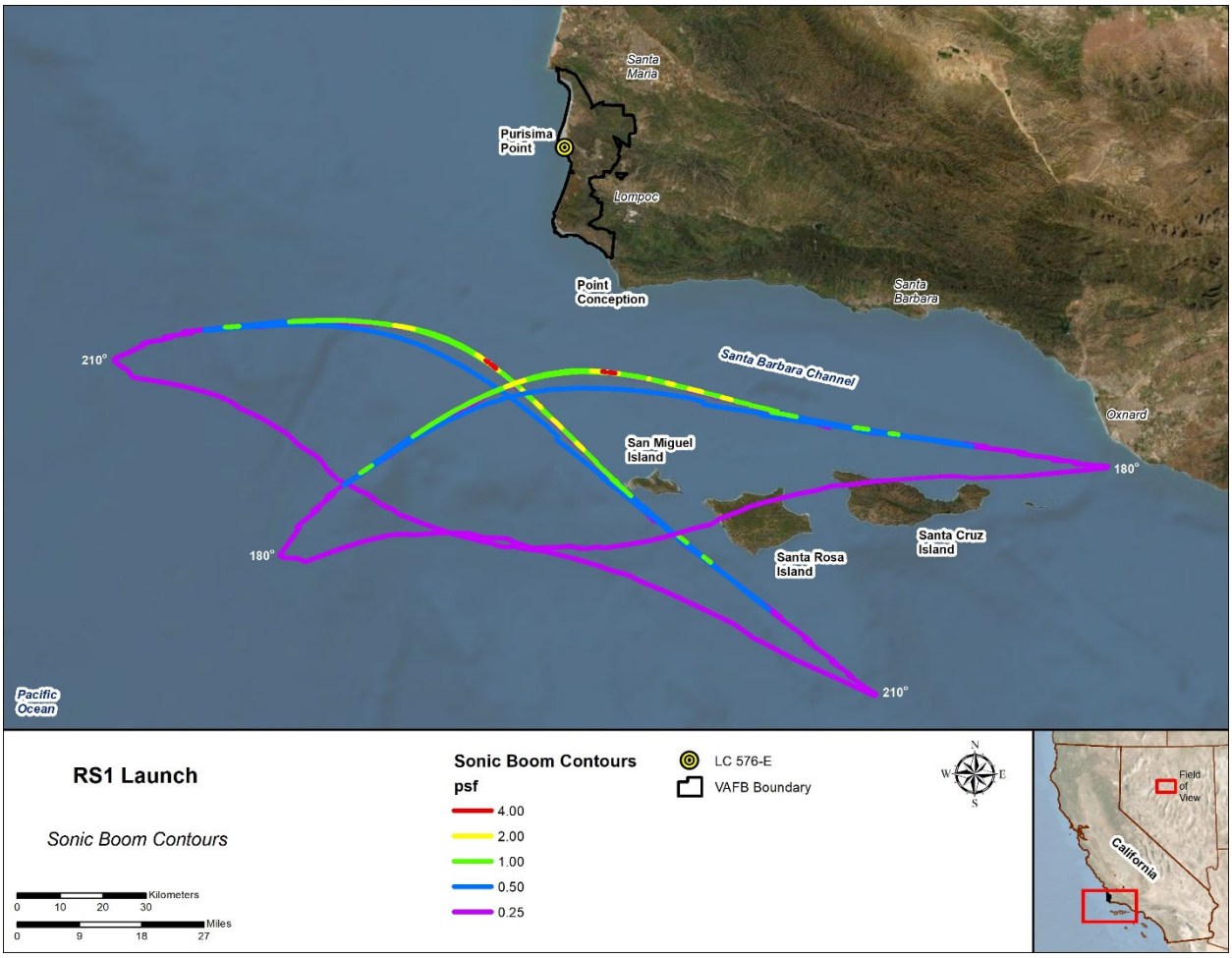

Figure 1. Predicted Sonic Boom Footprint.

3. Description of ESA-listed Species Potentially Occurring in the Proposed Action Area

3.2 Guadalupe Fur Seal (*Arctocephalus townsendi* [Federally Threatened Species])

Status

The Guadalupe fur seal is listed as threatened under the ESA and depleted under the MMPA throughout its range (Carretta et al. 2020). The population has been designated the Mexico to California stock (Carretta et al. 2020).

Life History

Guadalupe fur seals are most common at their primary breeding ground of Guadalupe Island, Mexico (Melin & DeLong 1999). A second rookery was found in 1997 at the San Benito Islands off the Baja Peninsula, Mexico (Maravilla-Chavez & Lowry 1999; Aurioles-Gamboa et al. 2010; Esperon-Rodriguez & Gallo-Reynoso 2012), and they have also been found in La Paz Bay in the

southern Gulf of California (Elorriaga-Verplancken et al. 2016). Satellite tracking data from Guadalupe fur seals tagged at Guadalupe Island have demonstrated movements into the offshore waters between 31 and 186 mi. (50 and 300 km) from the U.S. West Coast (Norris et al. 2015; Norris 2017b, 2017a; Norris & Elorriaga-Verplancken 2020). Satellite tags have also documented the movement of females without pups at least as far as 800 mi. (1,300 km) north of Guadalupe Island (approximately Point Cabrillo in Mendocino County, California) (Norris 2019). Adult males have not been tagged but typically undertake some form of seasonal movement either after the breeding season or during the winter, when prey availability is reduced (Arnould 2009). The most recent stock assessment reports (SARs) reflect the population of Guadalupe fur seals from a survey in 2010, which indicated a total estimated population size of approximately 20,000 animals and an average annual growth rate of 10.3 percent (Carretta et al. 2019). The ongoing Unusual Mortality Event involving Guadalupe fur seals (NOAA 2018; NMFS 2019a) is likely to have impacted the recent population trend (Elorriaga-Verplancken et al. 2016; Ortega-Ortiz et al. 2019). However, based on counts off Mexico in 2018 at Guadalupe Island and the San Benito Archipelago, the minimum population estimate was 29,747 Guadalupe fur seals at those locations (Norris 2019). Valdivia et al. (2019) has noted that since being ESA-listed in 1985, the population of the Guadalupe fur seal increased about nine-fold at a rate of approximately 15 percent per year. The dispersion of Guadalupe fur seal from rookeries off Mexico may be an indicator of potential species recovery (Ortega-Ortiz et al. 2019).

Occurrence within the Action Area

Adult and juvenile males have occasionally been observed at San Miguel Island, California since the mid-1960s and in the late 1990s a pup was born on San Miguel Island (Melin & Delong 1999). Rare sightings of individuals have also occurred at Santa Barbara, San Nicolas, and San Clemente Islands (Stewart 1981; Stewart & Yochem 1984; Stewart et al. 1993). In NOAA Fisheries aerial surveys of the California Channel Islands between 2011 and 2015, Guadalupe fur seals were only observed at San Miguel Island (Figure 3.4-3; Lowry et al. 2017; Burke 2017; NMFS 2019b). On San Miguel Island, one to several Guadalupe fur seals were observed annually between 1969 and 2000 (Melin & Delong 2000) and an adult female with a pup was observed in 1997 (Melin & Delong 1999). From 2010 to 2015, two to three pups have been observed annually on San Miguel Island and 13 individuals and two pups were observed in 2015. Observations of adult males are rare on San Miguel Island and there have not been any breeding territories established (Harris 2015). NOAA Fisheries surveys indicate approximately 10 to 12 individuals regularly use the San Miguel Island, with 1 to 2 pups born each year during June (Melin 2021). Guadalupe fur seals have not been observed hauling out on the mainland coast of Santa Barbara County including VAFB haulout locations (Evans 2020; VAFB 2021).

Critical Habitat

Critical habitat for the Guadalupe fur seal has not been designated since that the only areas that meet the definition for critical habitat are outside of U.S. jurisdiction (NOAA 1985).

4. Analysis of Effects

The Proposed Action includes one potential environmental stressor that may cause adverse effects on ESA-listed marine mammals: sonic boom. This stressor is analyzed below.

4.2 Guadalupe Fur Seal (Federal Threatened Species)

Direct Impacts

Direct impacts on Guadalupe fur seal are not expected since there is no overlap between its occurrence and areas that would experience physical impacts, which are limited to infrastructure improvements at LC 576-E on VAFB.

Noise Impacts

Sonic boom modeling of the planned trajectories predicts RS1 would produce a maximum sonic boom up to 5.4 psf over the Pacific Ocean and approximately 1.0 to 2.0 psf on the NCI (Figure 1). This is similar to sonic boom levels that have been measured on the NCI during prior VAFB launches, which have typically ranged from 0.4 to 1.34 psf (Marine Mammal Consulting Group and Science Applications International Corporation 2012); and thus likely to cause a similar level of impacts on pinnipeds. Noise and visual disturbance can cause variable levels of disturbance to pinnipeds that may be hauled out within the areas of exposure, depending on the species exposed and the level of the sonic boom. Typical reactions range from no response to raising head and moving from a resting position to flushing to water. Behavioral reactions to noise can be dependent on relevance and association to other stimuli. A behavioral decision is made when an animal detects increased background noise, or possibly when an animal recognizes a biologically relevant sound. An animal's past experience with the sound-producing activity or similar acoustic stimuli can affect its choice of behavior. Competing and reinforcing stimuli may also affect its decision. Other stimuli present in the environment can influence an animal's behavior decision. These stimuli can be other acoustic stimuli not directly related to the sound-producing activity; they can be visual, olfactory, or tactile stimuli; the stimuli can be conspecifics or predators in the area; or the stimuli can be the strong drive to engage in a natural behavior.

Competing stimuli tend to suppress behavioral reactions. For example, an animal involved in mating or foraging may not react with the same degree of severity to acoustic stimuli as it may have otherwise. Reinforcing stimuli reinforce the behavioral reaction caused by acoustic stimuli. For example, awareness of a predator in the area coupled with the acoustic stimuli may illicit a stronger reaction than the acoustic stimuli itself otherwise would have. The visual stimulus of the sonic boom would not be coupled with the sonic boom, since the RS1 would be at significant altitude when the overpressure impacts land. This would decrease the likelihood and severity of a behavioral response. Guadalupe fur seals are relatively insensitive to disturbance, occur in low numbers at San Miguel Island in isolated locations, and are adept at jumping into the water in the event that they do flee from a disturbance (Harris 2015), therefore, the Proposed Action is not expected to cause more than a temporary startle-response.

5. Conclusion

Potential impacts on Guadalupe fur seal would be limited to temporary behavioral reactions. VAFB determined that the impacts from sonic boom as a result of the Proposed Action may affect but are not likely to adversely affect the ESA-listed Guadalupe fur seal.

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April 20, 2021

Refer to NMFS No: WCRO-2021-00737

Beatrice L. Kephart
Chief, Installation Management Flight
30 CES/CEI
1028 Iceland Avenue
Vandenberg AFC, California 93437-6010

Re: Endangered Species Act Section 7(a)(2) Concurrence Letter for ABL's space launch at Vandenberg Air Force Base

Dear Mr. Kephart:

This letter responds to your April 5, 2021, request for concurrence from the National Marine Fisheries Service (NMFS) pursuant to Section 7 of the Endangered Species Act (ESA) for the subject action. Your request qualified for our expedited review and concurrence because it contained all required information on your proposed action and its potential effects to listed species and designated critical habitat.

We reviewed Vandenberg Air Force Base's consultation request document and related materials. Based on our knowledge, expertise, and your action agency's materials, we concur with the action agency's conclusions that the proposed action is not likely to adversely affect the NMFS ESA-listed species and/or designated critical habitat.

This letter underwent pre-dissemination review using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The concurrence letter will be available through NMFS' Environmental Consultation Organizer [https://appscloud.fisheries.noaa.gov]. A complete record of this consultation is on file at the NMFS Long Beach Office.

Reinitiation of consultation is required and shall be requested by Vandenberg Air Force Base or by NMFS, where discretionary Federal involvement or control over the action has been retained or is authorized by law and (1) the proposed action causes take; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the written concurrence; or (4) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16). This concludes the ESA consultation.

Please direct questions regarding this letter to Chiharu Mori at Chiharu.Mori@noaa.gov.

Sincerely,

Penny Ruvelas
Long Beach Branch Chief
Protected Resources Division

cc: Rhys Evans, VAFB
Christina Fahy, NMFS, WCR
Administrative Record Number: 151422WCR2021PR00068

Letter of Authorization

The 30th Space Wing, U.S. Air Force (USAF), is hereby authorized to take marine mammals incidental to those activities at Vandenberg Air Force Base (VAFB), California, in accordance with 50 CFR 217, Subpart G--Taking Of Marine Mammals Incidental To Rocket and Missile Launches and Aircraft Operations at Vandenberg Air Force Base (VAFB), California subject to the provisions of the Marine Mammal Protection Act (16 U.S.C. 1361 *et seq.*; MMPA) and the following conditions:

1. This Letter of Authorization (LOA) is valid for five years from the date signed.

2. This Authorization is valid only for rocket, missile, and aircraft activities activities at VAFB, California.

3. General Conditions

    (a) A copy of this LOA must be in the possession of the USAF, its designees, and personnel operating under the authority of this LOA.

    (b) The species authorized for taking by incidental harassment are: Pacific harbor seals (*Phoca vitulina richardsi*); California sea lions (*Zalophus californianus)*; northern elephant seals (*Mirounga angustirostris*); northern fur seals (*Callorhinus ursinus*); Guadalupe fur seals (*Arctocephalus philippii townsendi*); and Steller sea lions (*Eumetopias jubatus*).

    (c) The taking, by Level B harassment only, is limited to the species listed in condition 3(b). See Table 1 (attached) for numbers of take authorized.

    (d) The taking by injury (Level A harassment), serious injury, or death of any of the species listed in condition 3(b) of the Authorization or any taking of any other species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this LOA.

4. The following activities are authorized to take, by incidental harassment only, the species of marine mammals identified in condition 3(b) above and will take place at space launch complexes, launch facilities, and test pads on VAFB:

    (a) Launching of no more than 15 missiles annually;

    (b) Launching of no more than 110 rockets annually;

    (c) Recoveries of no more than 12 Falcon 9 rockets annually;

(d) Unmanned aerial systems (UAS) operations.

5. Mitigation Measures. Unless constrained by human safety or national security the holder of this Authorization is required to implement the following mitigation measures:

(a) Rocket launches must be scheduled to avoid launches which are predicted to produce a sonic boom on the Northern Channel Islands during the harbor seal pupping season of March through June, whenever possible.

(b) Aircraft and helicopter flight paths must maintain a minimum distance of 1,000 ft (305 m) from recognized pinniped haulouts and rookeries whenever possible, except for one area near the VAFB harbor over which aircraft may be flown to within 500 ft of a haulout, and except in emergencies or for real-time security incidents.

(c) For UAS, except during take-off and landing, the following minimum altitudes must be maintained over all known marine mammal haulouts when marine mammals are present: Class 0-2 UAS must maintain a minimum altitude of 300 feet; Class 3 UAS must maintain a minimum altitude of 500 feet; Class 4 or 5 UAS must not be flown below 1,000 feet.

(d) If any incident of injury or mortality of a marine mammal discovered during post-launch surveys or indications of affects to the distribution, size, or productivity of the affected pinniped populations as a result of the authorized activities are thought to have occurred, launch procedures and monitoring methods must be reviewed, in cooperation with NMFS, If necessary, appropriate changes must be made through modification to this Authorization prior to conducting the next launch of the same vehicle.

6. Monitoring. The holder of this Authorization is required to conduct marine mammal monitoring and to conduct acoustic monitoring as described below:

(a) The USAF must either use video recording, or, must designate a qualified on-site individual approved in advance by NMFS, with demonstrated proficiency in the identification of all age and sex classes of both common and uncommon pinniped species found at VAFB and the Northern Channel Islands and knowledge of approved count methodology and experience in observing pinniped behavior, to monitor and document pinniped activity as described in 6(b) through 6(k).

(b) For any launches of space launch vehicles or recoveries of the Falcon 9 First Stage occurring from January 1 through July 31, pinniped activity at VAFB must be monitored in the vicinity of the haulout nearest the launch platform, or, in the absence of pinnipeds at that location, at another nearby haulout, for at least 72 hours prior to any planned launch, and continue for a period of time not less than 48 hours subsequent to the launch and/or recovery.

(c) For any launches of new space launch vehicles that have not been monitored during at least three previous launches occurring from August 1 through December 31, pinniped activity at VAFB must be monitored in the vicinity of the haulout nearest the launch or landing platform, or, in the absence of pinnipeds at that location, at another nearby haulout, for at least 72 hours prior to any planned launch, and continue for a period of time not less than 48 hours subsequent to launching.

(d) For any launches of existing space launch vehicles that are expected to result in a louder launch noise or sonic boom than previous launches of the same vehicle type occurring from August 1 through December 31, pinniped activity at VAFB must be monitored in the vicinity of the haulout nearest the launch or landing platform, or, in the absence of pinnipeds at that location, at another nearby haulout, for at least 72 hours prior to any planned launch, and continue for a period of time not less than 48 hours subsequent to launching.

(e) For any launches of new types of missiles occurring from August 1 through December 31, pinniped activity at VAFB must be monitored in the vicinity of the haulout nearest the launch or landing platform, or, in the absence of pinnipeds at that location, at another nearby haulout, for at least 72 hours prior to any planned launch, and continue for a period of time not less than 48 hours subsequent to launching.

(f) For any recoveries of the Falcon 9 First Stage occurring from August 1 through December 31 that are predicted to result in a sonic boom of 1.0 pounds per square foot (psf) or above at VAFB, pinniped activity at VAFB must be monitored in the vicinity of the haulout nearest the launch or landing platform, or, in the absence of pinnipeds at that location, at another nearby haulout, for at least 72 hours prior to any planned launch, and continue for a period of time not less than 48 hours subsequent to launching.

(g) For any launches or Falcon 9 First Stage recoveries occurring from January 1 through July 31, follow-up surveys must be conducted within two weeks of the launch.

(h) For any launches or Falcon 9 First Stage recoveries, if it is determined by modeling that a sonic boom of greater than 2.0 psf is predicted to impact one of the Northern Channel Islands between March 1 and July 31, greater than 3.0 psf between August 1 and September 30, and greater than 4.0 psf between October 1 and February 28, pinniped activity at the Northern Channel Islands must be monitored. Monitoring must be conducted at the haulout site closest to the predicted sonic boom impact area, or, in the absence of pinnipeds at that location, at another nearby haulout.

(i) Marine mammal monitoring must include multiple surveys each day that record the species, number of animals, general behavior, presence of pups, age class, gender and reaction to launch noise, sonic booms or other natural or human caused disturbances, in addition to environmental conditions such as tide, wind speed, air temperature, and swell.

(j) Marine mammal monitoring of activities that occur during darkness at VAFB must include night video monitoring, when feasible.

(k) For any launches or Falcon 9 First Stage recoveries for which marine mammal monitoring is required, acoustic measurements must also be made.

7. Reporting. The holder of this Authorization is required to:

(a) Submit a report to the Office of Protected Resources, NMFS, and West Coast Regional Administrator, NMFS, within 90 days after each monitored rocket launch, missile launch or rocket recovery. This report must contain the following information:

i. Date(s) and time(s) of the launch,

ii. Design of the monitoring program, and

iii. Results of the monitoring program, including, but not necessarily limited to:

A. Numbers of pinnipeds present on the haulout prior to commencement of the launch.

B. Numbers of pinnipeds that may have been harassed, as noted by the number of pinnipeds estimated to have moved greater than two times the animal's body length, or, if the animal was already moving and changed direction and/or speed, or, if the animal flushed from land into the water in response to launch noise or sonic boom.

C. For any marine mammals that entered the water, the length of time those animals remained off the haulout.

D. Description of observed behavioral modifications by pinnipeds that were likely the result of launch noise or the sonic boom.

E. Results of acoustic monitoring, including the intensity of any sonic boom (psf) and sound levels in SELs, SPL_{peak} and SPL_{rms}.

(b) Submit a draft annual report to the Permits and Conservation Division, Office of Protected Resources, NMFS at 1315 East-West Highway, Silver Spring, MD

20910 and the Assistant Regional Administrator, West Coast Region, NMFS. This report must contain detailed information on the following:

i. Date(s) and time(s) of each missile and rocket launch and/or recovery.

ii. Design of the monitoring program;

iii. Results of the monitoring programs described under conditions 7(a)iii including the following:

A. Dates and times of all monitoring activities;

B. Details of all marine mammal sightings, including the number of pinnipeds, by species and haulout location, that remained ashore and/or fled from the beach in response to authorized activities;

C. The number of marine mammals, by species, returned to the haulout subsequent to the disruption (including estimates of the time it took for pinnipeds to return to haulouts), and estimates of the amount and nature of all instances of harassment; and

D. Information on the weather, including tidal state and horizontal visibility.

E. Date(s) and location(s) of any research activities related to monitoring the effects of launch noise and sonic booms on marine mammal populations; and

F. A summary of observed effects of UAS operations on marine mammals at VAFB.

(c) Submit a final annual report, within 60 days of receipt of any recommendations made by NMFS following review of the draft annual report by the Permits and Conservation Division, Office of Protected Resources, NMFS.

(d) Submit a draft comprehensive report to the Permits and Conservation Division, Office of Protected Resources, NMFS at 1315 East-West Highway, Silver Spring, MD 20910 and the Assistant Regional Administrator, West Coast Region, NMFS, at least 180 days prior to the expiration of the current regulations. This report must:

i. Summarize the activities undertaken and the results reported in all previous reports;

ii. Assess the impacts at each of the major rookeries;

iii. Assess the cumulative impacts on pinnipeds and other marine mammals from VAFB activities; and

iv. State the date(s), location(s), and findings of any research activities related to monitoring the effects of launch noise and sonic booms on marine mammal populations.

(e) Submit a final comprehensive report, within 60 days of receipt of any recommendations made by NMFS following review of the draft comprehensive report by the Permits and Conservation Division, Office of Protected Resources, NMFS, and the West Coast Regional Administrator, NMFS.

(f) Reporting of injured or dead marine mammals:

i. In the event that the specified activity clearly causes the take of a marine mammal in a manner not authorized by this LOA, such as serious injury or mortality, the USAF shall immediately cease the specified activities and immediately report the incident to the NMFS Office of Protected Resources ((301) 427-8401) and the NMFS West Coast regional stranding coordinator ((562) 980-3230). The report must include the following information:

A. Time, date, and location (latitude/longitude) of the incident;
B. Description of the incident;
C. Status of all sound source use in the 24 hours preceding the incident;
D. Environmental conditions (*e.g.*, wind speed and direction, cloud cover, and visibility);
E. Description of all marine mammal observations in the 24 hours preceding the incident;
F. Species identification or description of the animal(s) involved;
G. Fate of the animal(s); and
H. Photographs or video footage of the animal(s).

Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS will work with the USAF to determine what measures are necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. The USAF may not resume their activities until notified by NMFS.

ii. In the event that the USAF discovers an injured or dead marine mammal, and determines that the cause of the injury or death is unknown and the death is relatively recent (*e.g.*, in less than a moderate state of decomposition), the USAF shall immediately report the incident to the NMFS Office of Protected Resources ((301) 427-8401) and the NMFS West Coast regional stranding coordinator ((562) 980-3230). The report must include the same information identified in condition 7(f)(i) of this LOA. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with the USAF to determine whether additional mitigation measures or modifications to the activities are appropriate.

iii. In the event that the USAF discovers an injured or dead marine mammal, and determines that the injury or death is not associated with or related to the specified activities (*e.g.*, previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), the USAF shall report the incident to the NMFS Office of Protected Resources ((301) 427-8401) and the NMFS West Coast regional stranding coordinator ((562) 980-3230), within 24 hours of the discovery. The USAF shall provide photographs, video footage or other documentation of the sighting to NMFS.

8. This Authorization may be modified, suspended or withdrawn if the USAF fails to abide by the conditions prescribed herein or if the authorized taking is having more than a negligible impact on the species or stock of affected marine mammals.

Donna S. Wieting

Donna S. Wieting, Director
Office of Protected Resources

APR 10 2019

Date

Table 1. Numbers of takes authorized annually.

Species (stock)	2019	2020	2021	2022	2023	2024
Harbor seal	19,524	22,733	27,652	35,466	43,489	16,742
California sea lion	28,187	36,019	51,307	63,805	83,385	21,756
Northern elephant seal	4,170	5,283	7,434	9,253	12,036	5,481
Steller Sea Lion	134	168	221	302	387	105
Northern fur seal	1,190	1,530	2,210	2,721	3,571	26
Guadalupe fur seal	46	59	85	104	137	36

APPENDIX C
State Historic Preservation Office & Native American Tribal Consultations

State of California • Natural Resources Agency
Gavin Newsom, *Governor*

DEPARTMENT OF PARKS AND RECREATION
OFFICE OF HISTORIC PRESERVATION
Armando Quintero, *Director*

Julianne Polanco, State Historic Preservation Officer
1725 23rd Street, Suite 100, Sacramento, CA 95816-7100
Telephone: (916) 445-7000 FAX: (916) 445-7053
calshpo.ohp@parks.ca.gov www.ohp.parks.ca.gov

May 21, 2021

Reply in Reference to: USAF_2021_0427_001

Lt. Col. Charles G. Hansen
Commander, 30th Civil Engineer Squadron
1172 Iceland Avenue
Vandenberg AFB, CA 93437-6011

VIA ELECTRONIC MAIL

Re: Section 106 Consultation for Facility 1611 Renovation, Vandenberg Air Force Base, Santa Barbara County

Dear Lt. Col. Hansen:

The United States Air Force (USAF) is initiating consultation with the State Historic Preservation Officer (SHPO) regarding its effort to comply with Section 106 of the National Historic Preservation Act of 1966 (54 U.S.C. 306108), as amended, and its implementing regulation found at 36 CFR Part 800.

The USAF are proposing to renovate Facility 1611 (a.k.a Launch Complex 576-Echo) at Vandenberg. Demolition of launch pad concrete and asphalt within the launch complex will be replaced and utilities including fiber optic and electrical lines will be installed one foot below grade or on the surface.

Constructed in 1960-1961 as element of the Atlas ICBM Launch program, Facility 1611 was formally determined not eligible for National Register of Historic Places inclusion individually or as a potential contributor. The USAF's supporting documentation indicates that based on tribal consultation, and survey and testing efforts no archaeological resources are present within the project's area of potential effects (APE).

The USAF are requesting concurrence with its delineation of the project's and a finding of no historic properties affected. Upon review of the information provided, the SHPO offers the following comments:

1) Pursuant to 36 CFR Part 800.4(a)(1), the SHPO does not object to the USAF's APE definition.

2) The SHPO concurs that a finding of no historic properties affected is appropriate. Be advised that under certain circumstances, such as an unanticipated discovery or a change in project description, the USAF may have future responsibilities for this undertaking under 36 CFR Part 800.

Please notify Historian Ed Carroll at (916) 445-7006 or Ed.Carroll@parks.ca.gov if there are any questions or concerns.

Sincerely,

Julianne Polanco
State Historic Preservation Officer

DEPARTMENT OF THE AIR FORCE
UNITED STATES SPACE FORCE
SPACE LAUNCH DELTA 30

Lieutenant Colonel Charles G. Hansen
Commander, 30th Civil Engineer Squadron
1172 Iceland Ave
Vandenberg SFB CA 93437-6011

Ms. Julianne Polanco
State Historic Preservation Officer
Department of Parks and Recreation
Office of Historic Preservation
P.O. Box 942896
Sacramento CA 94296-0001

Dear Ms. Polanco

The Space Launch Delta 30 (SLD 30) in cooperation with the Federal Aviation Administration (FAA) are supporting the ABL Space System (ABL) operating on Vandenberg Space Force Base (VSFB). The Section 106 consultation for the ABL Facility 1611 Renovation and ABL RS1 Launch at 576-E Project (Project) was recently submitted to and concurred upon by the California State Historic Preservation Office (USAF_2021_0427_001). Subsequently the SLD 30 and FAA determined that the consultation did not analyze the effects of launch noise on historic properties as part of the Environmental Assessment for the project. Therefore, SLD 30 is re-opening Section 106 for this project by submitting this supplemental consultation in order to address this shortcoming.

The ABL contracted ManTech SRS Technologies and Applied Earthworks to prepare an informal memo report specifically addressing the impacts of engine noise and sonic booms associated with proposed launches from Complex 576-E on the historic built environment. This report should be consulted for additional details that are not presented herein. The report considers noise resulting from static tests and launches. A threshold of 120 decibels (dB) has been established above which historic properties are susceptible to damage. An analysis was performed to delineate an area where noise levels are expected to exceed 120 dB and this represents a portion of the newly expanded Area of Direct Impact (ADI) and Area of Potential Effect (APE).

Sonic booms associated with launches were also considered and are measured as pressure in pounds per square foot (psf). The threshold for damage resulting from sonic booms (overpressure) is established at 2 psf or greater. The overpressure would be primarily directed at the Pacific Ocean south of Point Conception, potentially reaching up to 2.0 psf on San Miguel Island (SMI) based on two launch trajectories of 180 and 210 degrees. The ADI and APE were modified accordingly, to include SMI. The ADI, APE, and modeled overpressure are presented in Figures 1 and 2 in the attached memo report.

Additional research was conducted to identify historic properties within the expanded ADI and APE, to include SMI, with the potential to be impacted by noise exceeding 120 dB or sonic booms exceeding 2 psf. A records and literature search determined that no historic built environment properties fall within the ADI on VSFB proper. Similarly, reports for SMI revealed that all the historic built environment resources are in a ruinous state or have been destroyed by fire. The net result is that the no historic properties will be impacted by noise within the modified ADI/APE for the Project.

VSFB, in cooperation with the FAA, and supporting ABL as part of this supplemental consultation, has carried out a reasonable and good-faith cultural resources investigation that fulfills federal agency responsibilities pursuant to 36CFR800.4 (a)-(d) and 36CFR800.5 (a)-(d). VSFB has re-opened this consultation and is consulting with the California SHPO, per §800.3(c-f), and seeks concurrence on the following determinations and project finding:

a. The modified APE, to include SMI, for the Project is adequately delineated; and

b. The effort to identify and conclude that there will be no impacts to historic built environment properties within the 120 dB noise footprint and 2 psf footprint, including SMI, by noise associated with static tests and launches, is sufficient.

Pending agreement with the above determinations, VSFB seeks your concurrence to maintain the previous Section 106 finding of *no historic properties affected* for the proposed ABL Facility 1611 Renovation and ABL RS1 Launch at 576-E Project. Barring objection to this project finding by the SHPO, VSFB has fulfilled its Section 106 responsibilities for this undertaking and no further consultation is required. If project implementation results in an inadvertent discovery, or any project changes that impact cultural resources are made subsequent to this submittal, VSFB will re-open Section 106 consultation for this project with the SHPO and the Santa Ynez Band of Chumash Indians, as appropriate.

If you have any questions or require additional information, please contact Christopher Ryan, Cultural Resource Management, 30 CES/CEIEA, 1028 Iceland Avenue, Building 11146, Vandenberg SFB; phone: 805-605-0748; e-mail: christopher.ryan.7@spaceforce.mil. Thank you for your assistance with this undertaking.

Sincerely

HANSEN.CHARLES.G.1162353914

Digitally signed by HANSEN.CHARLES.G.1162353914
Date: 2021.06.23 18:19:28 -07'00'

CHARLES G. HANSEN, Lt Col, USAF
Commander

Attachment:
Memo to Clarify & Amend Section 106 Consultation for Facility 1611 Renovation (USAF_2021_0427_001) to include RS Launch Coverage

Subject: Memo to Clarify & Amend Section 106 Consultation for Facility 1611 Renovation (USAF_2021_0427_001) to include RS1 Launch Coverage

Prepared by:

ManTech SRS Technologies, Inc. and Applied Earthworks, Inc.

On behalf of ABL Space Systems (ABL), ManTech SRS Technologies, Inc. (MSRS) and Applied EarthWorks, Inc. (AE) were retained to provide cultural resources support for the proposed ABL RS1 Project at Launch Complex 576-E (Project). The Project proposes to operate the ABL RS1 launch vehicle at the existing, decommissioned Launch Complex 576-E (LC 576-E; Facility 1611) on Vandenberg Space Force Base (VSFB) in Santa Barbara County, California. Because the Project is on federal property, it is considered to be an undertaking as defined in 36 CFR 800.16(y) and thus is subject to Section 106 of the National Historic Preservation Act of 1966 (as amended). VSFB is also preparing an Environmental Assessment of this proposed launch program.

Based on information provided by ABL and direction provided by VSFB, AE prepared a report to support U.S. Air Force Section 106 compliance for the Project (Applied Earthworks, Inc. 2021) The report summarized background research and survey results within an Archeological Study Area (ASA), which included the Area of Direct Impact (ADI), consisting of the 4.2-acre fenced LC 576-E facility and the surrounding 8.2-acre area proposed for vegetation maintenance and establishment of an approximately 15-meter wide firebreak, plus a 100-meter buffer. Six archeological sites and the historic LC 576-E facility were identified within the ASA. LC 576-E is one of seven elements of the Atlas ICBM Launch Complexes District (District). Both the District and LC 576-E have been determined ineligible for listing in the National Register of Historic Places due to a lack of integrity. The results of survey and testing for the proposed Project indicated that no archaeological resources are present within the ADI. Therefore, VSFB determined that there are no historic properties within the ADI, and the Project would have no effect to historic properties. VSFB submitted a letter to the State Historic Preservation Officer (SHPO) requesting concurrence with this determination. The SHPO provided concurrence on 21 May 2021 (USAF_2021_0427_001).

The Federal Aviation Administration (FAA), as a cooperating agency with VSFB, requires an applicant to provide enough information for the FAA to analyze the potential environmental impacts associated with issuing a launch license for the proposed launch activities in order to issue a launch license. Recently, while reviewing the Environmental Assessment for the proposed ABL Space Systems RS1 Project at VSFB, the FAA determined that the Section 106 consultation needs to include an analysis of effects of launch noise impacts to historical properties (architectural/above-ground resources, aka “built environment”). When defining the Area of Potential Effects (APE) for these impacts, the FAA uses the 120 decibel (dB; unweighted linear sound pressure level) noise contour to define the APE for engine noise, because Fenton and Methold (2016) showed no material effect to buildings below 120 dB. The FAA uses 2 pounds per square foot (psf) to define the APE for areas exposed to a sonic boom, based on Haber and Nakaki (1989) who found damage to buildings to be unlikely under 2 psf.

Engine noise would also be produced during RS1 launch and static fire events, which would impact the area between San Antonio Creek and the Santa Ynez River mouth, including Purisima Point. Blue Ridge Research and Consulting (2020) modeled RS1 engine noise for launch and static fire and produced sound

level contours. AE found no historic properties in the built environment within the 120 dB (unweighted, linear) contour (Figure 1).

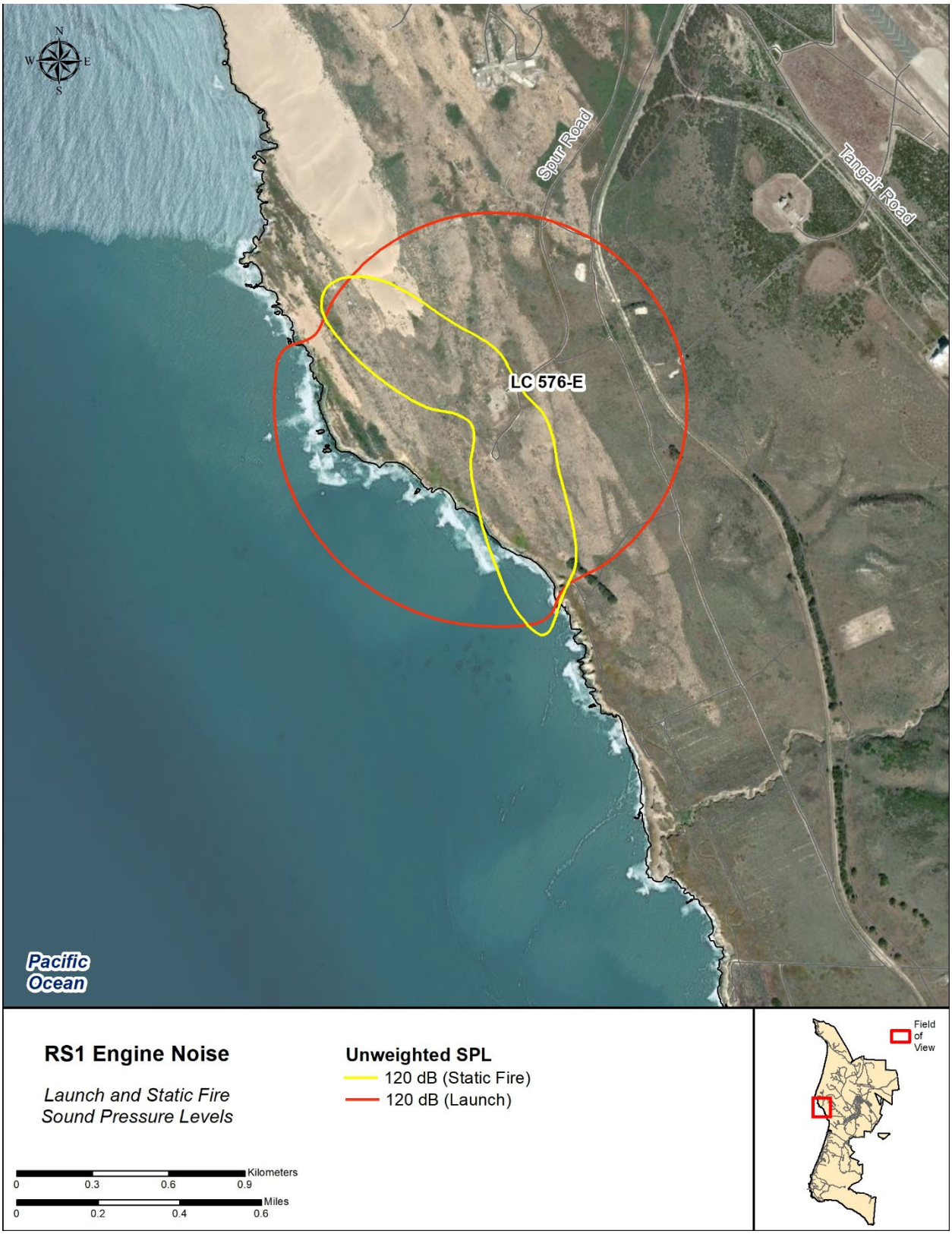

Figure 1. Launch and static fire unweighted 120 dB sound pressure level contours (Blue Ridge Research and Consulting 2020).

During ascent, a sonic boom (overpressure of high energy impulsive sound) up to 5.4 psf would be generated while the first-stage booster is supersonic (Blue Ridge Research and Consulting 2020). The overpressure would be primarily directed at the Pacific Ocean south of Point Conception, potentially reaching up to 2.0 psf on San Miguel Island (SMI). Blue Ridge Research and Consulting (2020) modeled potential sonic boom contours for two sample trajectories, one at 180 degrees and one at 210 degrees, using one meteorological profile (Figure 2). Although the results do not predict a boom greater than 1 psf impacting SMI, atmospheric conditions can vary substantially throughout the year and likewise influence the geographic impact profile to a great degree. The model results suggest an event where a 2 psf sonic boom or greater would impact SMI is unlikely, however, without performing additional boom modeling, ABL and VSFB assume that a boom of up to 2 psf may impact SMI. Therefore, the APE has been amended to include SMI and analysis of potential impacts to historic properties on the island is necessary to ensure the Section 106 consultation is legally sufficient to satisfy FAA requirements.

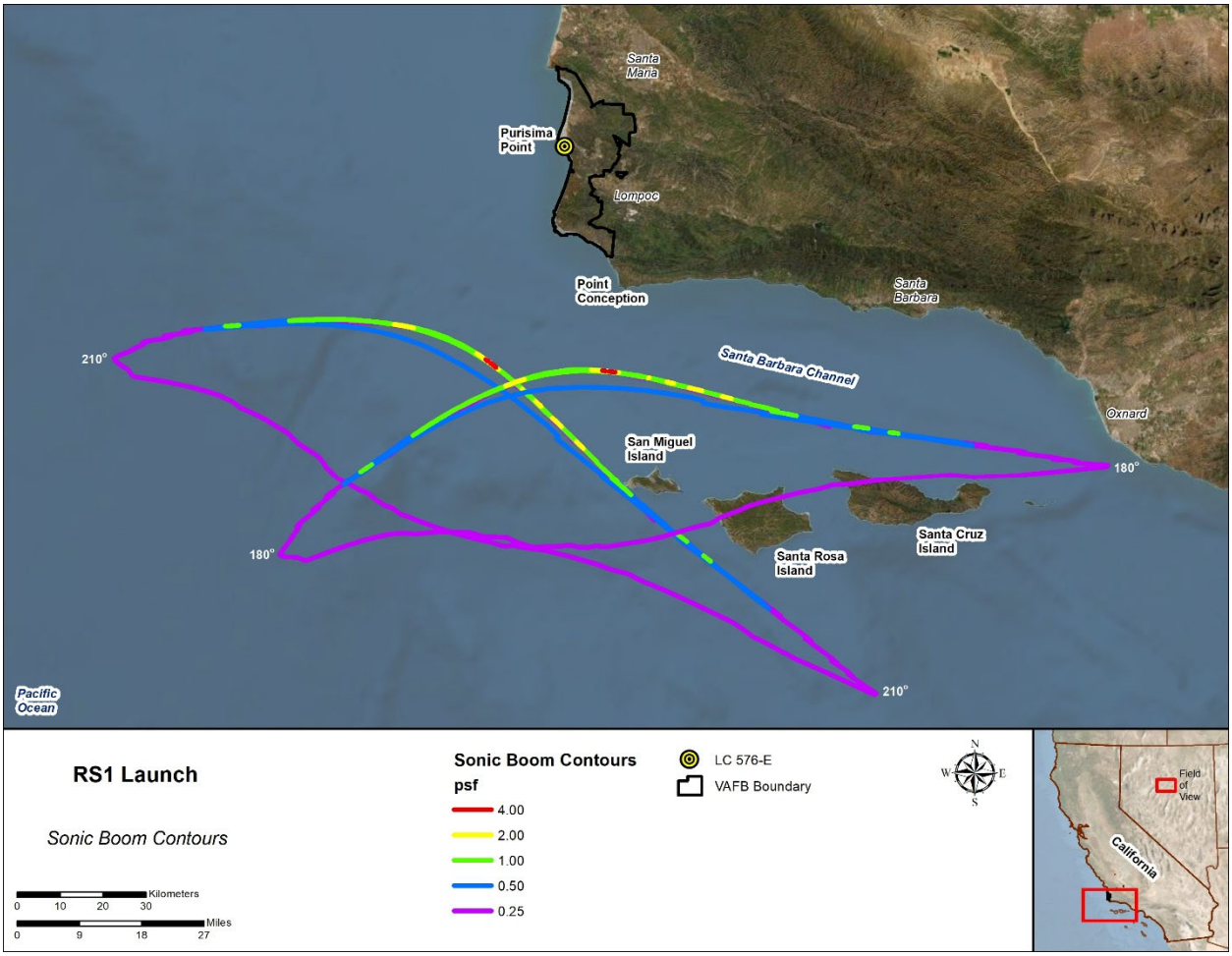

Figure 2. Sonic boom model results for two sample trajectories under one meteorological profile (Blue Ridge Research and Consulting 2020).

MSRS and AE conducted a literature review of historic properties on SMI. Roberts (1979) assembled a detailed Historic Resource Study of SMI for the Channel Islands National Monument, which was supplemented and updated by Livingston (2016) for the National Park Service. Livingston (2016) represents the most current and comprehensive Historic Resource Study for SMI, providing a review of

Roberts (1979) and supplementing with survey results by National Park ranger Ian Williams in 1999, and National Park Cultural Resources Manager Ann Huston and Archeologist Don Morris in 1998. In regard to the built environment, no historic buildings remain intact on SMI (Livingston 2016). All historic structures have either been lost to fire or remain in ruins. Therefore, sonic booms as a result of the proposed ABL RS1 launch program at VFSB would have no impact on historic properties on SMI.

References

Applied Earthworks, Inc. 2021. Archaeological Investigations Supporting Section 106 Compliance for the ABL Space Systems RS-1 Project at Launch Complex 576-E Vandenberg Air Force Base Santa Barbara County, California.

Blue Ridge Research and Consulting, LLC. 2020. Technical Report. Noise Study for ABL Space System's RS1 Launch Vehicle Operations at VAFB Launch Complex 576-E. 11 September 2020. Prepared for ABL Space Systems. 37 pp.

Fenton, R., and R. Methold. 2016. Mod Shoeburyness and Pendine noise and vibration study criteria for the assessment of potential building damage effects from range activities. June 2016. Southdowns Environmental Consultants, Lewes, East Sussex, UK. 55 pp.

Haber, J., and D. Nakaki. 1989. Noise and sonic boom impact technology: sonic boom damage to conventional structures. Prepared for Air Force Systems Command, Brooks Air Force Base, TX. BBN Systems and Technologies Corporation, Canoga Park, CA. 314 pp.

Livingston, D.S. 2016. A history of the islands within Channel Islands National Park, San Miguel Island, Santa Rosa Island, Santa Cruz Island, Anacapa Island, Santa Barbara Island. Historic Resource Study. Prepared for the Department of the Interior, National Park Service, Channel Islands National Park, California. 949 pp.

Roberts, L.W. 1979. Historic Resource Study: Channel Islands National Monument and San Miguel Island, California. Chambers Consultants and Planners.

State of California • Natural Resources Agency
Gavin Newsom, *Governor*

DEPARTMENT OF PARKS AND RECREATION
OFFICE OF HISTORIC PRESERVATION
Armando Quintero, *Director*

Julianne Polanco, State Historic Preservation Officer
1725 23rd Street, Suite 100, Sacramento, CA 95816-7100
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calshpo.ohp@parks.ca.gov www.ohp.parks.ca.gov

July 28, 2021

Reply in Reference to: USAF_2021_0427_001

Lt. Col. Charles G. Hansen
Commander, 30th Civil Engineer Squadron
1172 Iceland Avenue
Vandenberg AFB, CA 93437-6011

VIA ELECTRONIC MAIL

Re: Section 106 Consultation for Facility 1611 Renovation, Vandenberg Air Force Base, Santa Barbara County

Dear Lt. Col. Hansen:

The United States Air Force (USAF) is continuing consultation with the State Historic Preservation Officer (SHPO) regarding its effort to comply with Section 106 of the National Historic Preservation Act of 1966 (54 U.S.C. 306108), as amended, and its implementing regulation found at 36 CFR Part 800.

Having received the SHPO's concurrence on its finding of no historic properties affected, the USAF determined that due to an incomplete effects analysis, additional consultation is required. Specifically, the USAF "determined that the consultation did not analyze the effects of launch noise on historic properties as part of the Environmental Assessment for the project" leading them to request a report " . . . addressing the impacts of engine noise and sonic booms associated with proposed launches from Complex 576-E on the historic built environment."

The USAF expanded the project's APE boundaries to include San Miguel Island (SMI) and " . . . determined that no historic built environment properties fall within the ADI on VSFB proper (and) . . . reports for SMI revealed that all the historic built environment resources are in a ruinous state or have been destroyed by fire."

The USAF are requesting concurrence with its revised APE delineation and that the initial finding off no historic properties affected remains valid. Upon review of the information provided, the SHPO concurs with these determinations. Be advised that under certain circumstances, such as an unanticipated discovery or a change in project description, the USAF may have future responsibilities for this undertaking under 36 CFR Part 800.

Please notify Historian Ed Carroll at (916) 445-7006 or Ed.Carroll@parks.ca.gov if there are any questions or concerns.

Sincerely,

Julianne Polanco
State Historic Preservation Officer

DEPARTMENT OF THE AIR FORCE
UNITED STATES SPACE FORCE
30TH SPACE WING

April 27, 2021

Roscoe Loetzerich
30 CES/CEIEA
1028 Iceland Avenue
Vandenberg AFB, CA 93437-6010

Mr. Sam Cohen
Santa Ynez Band of Chumash Indians
P.O. Box 517
Santa Ynez, CA 93460

Dear Mr. Cohen

ABL Space Systems (ABL), in cooperation with the 30th Space Wing (30SW) of the United States Space Force (USSF), Vandenberg Air Force Base (VAFB), proposes to renovate Facility 1611, also known as Launch Complex (LC) 576-Echo (576-E), to prepare the launch pad to conduct field integration operations, static fire, and launch of its RS1 launch vehicle. The four-acre (ac) fenced launch complex is situated at the southwest end of Spur Road, in the North Base portion of VAFB.

The Project would renovate the launch complex, including demolition and new construction. Nine ac surrounding the four-ac fenced area has been delineated as a firebreak and fuel reductions zone. Vegetation in the fuel reductions zone will be mowed to six inches (in) in height, while the 50-feet (ft)-wide firebreak will be disked to a depth of one ft. All launch pad concrete and asphalt within the launch complex may be removed and replaced with new concrete to support RS1 operations. ABL will anchor a launch stool to the concrete pad for lifting the RS1 launch vehicle, performing static fire, and conducting launch operations. ABL will connect its fiber optic and electrical lines to the existing network demarcations located immediately outside the facility fence at the Spur Road entrance. These cables may lay on the surface or be placed underground at a depth of one ft. Light poles will be installed within the fence line with pylons reaching 20 ft deep. The contractor staging areas for renovations and launch operations will be on existing pavement and parking areas within the fence line and just outside the facility entrance.

VAFB determined the Project is an undertaking subject to compliance with Section 106 of the National Historic Preservation Act of 1966 (54 U.S.C. 306108), as amended, and will comply with Section 106 using the implementing regulations [36 CFR Part 800]. With this letter and the accompanying report, VAFB is initiating consultation with the Tribe.

VAFB carried out a reasonable and good-faith cultural resources investigation that fulfills federal agency responsibilities pursuant to 36 CFR 800.4(a)-(d) and 36 CFR 800.5(a)-(d). The effort to identify historic properties in the Area of Potential Effects (APE) included a review of previous surveys and cultural resources recorded in the area, historical research, conducting a re-survey of the

APE for cultural resources, and an archaeological testing program to establish the presence/absence of buried archaeological deposits within the ADI.

An Archaeological Study Area (ASA) was delineated so that archaeological studies could be conducted to further identify archaeological resources within and adjacent to the Project ADI. The ASA was defined as the ADI plus a 100-meter buffer. Background research indicated that six archaeological sites (CA-SBA-TMP-6, -TMP-8, -907, -2428, -2429, and -2430) are situated within the ASA. However, surface survey and subsurface testing revealed that CA-SBA-TMP-6 and -TMP-8 contain naturally occurring chert rocks which are not cultural material, and therefore, are not archaeological sites or isolates. Furthermore, research indicated that CA-SBA-907, -2428, -2429, and -2430 were misplotted in ArcGIS, likely during the transition from paper maps to GIS mapping. Fieldwork conducted at these four sites confirmed that they are not situated within the Project's 13-ac ADI or the APE. The results of survey and testing for the proposed Project indicate that no archaeological resources are present within the ADI. The archaeological sensitivity of the ADI appears to be low due to a high level of ground disturbance from past construction of the 576-E launch complex in 1960–1961.

Details of the investigation are provided in the attachment, however briefly stated VAFB has determined the following:

a. The APE for the *ABL Space Systems' Facility 1611 Renovation Project* is adequately delineated;

b. No historic properties are known to exist within or immediately adjacent to the Project APE; and

c. The undertaking will have *no effect* on any known historic properties.

In summary, VAFB has reached a Section 106 finding of *no historic properties affected* for this undertaking. However, the Base recognizes that the Santa Ynez Band of Chumash Indians may have concerns beyond the purview of the National Historic Preservation Act. Therefore, I am seeking any comments or concerns you may have about cultural resources with regard to the proposed undertaking. I would appreciate receiving any feedback as part of this consultation within the next 30 calendar days. Please feel free to let me know if you require additional time. I can be reached at (805) 606-9687 or via email at roscoe.loetzerich.1@us.af.mil. Thank you for your assistance with this undertaking.

Sincerely

ROSCOE LOETZERICH
Base Archaeologist
Asset Management Flight

Attachment:
Identification of Historic Properties, ABL Space Systems' Facility 1611 Renovation Project (813-20-049 and 813-21-016)

Fw: 106 Vandenberg AFB ABL Space Systems' Facility 1611 Renovation Project (813-20-049 and 813-21-016)

From: SMALLWOOD, STACY J GS-12 USSF SSC 30 CES/CEIEA <stacy.smallwood.1@spaceforce.mil>

Sent: Thursday, October 7, 2021 11:35 AM
To: Sam Cohen <scohen@santaynezchumash.org>; LOETZERICH, ROSCOE M GS-12 USSF SPOC 30 CES/30 CEIEA <roscoe.loetzerich.1@spaceforce.mil>
Cc: RYAN, CHRISTOPHER D GS-12 USSF SPOC 30 CES/CEANC <christopher.ryan.7@spaceforce.mil>
Subject: RE: 106 Vandenberg AFB ABL Space Systems' Facility 1611 Renovation Project (813-20-049 and 813-21-016)

Hi Sam,
Page 24 of the attached report provides the corrected plot of each of the four archaeological sites.
Thank you,
-Josh

From: Sam Cohen <scohen@santaynezchumash.org>
Sent: Thursday, October 7, 2021 7:57 AM
To: LOETZERICH, ROSCOE M GS-12 USSF SPOC 30 CES/30 CEIEA <roscoe.loetzerich.1@spaceforce.mil>
Cc: RYAN, CHRISTOPHER D GS-12 USSF SPOC 30 CES/CEANC <christopher.ryan.7@spaceforce.mil>; SMALLWOOD, STACY J GS-12 USSF SSC 30 CES/CEIEA <stacy.smallwood.1@spaceforce.mil>
Subject: [Non-DoD Source] RE: 106 Vandenberg AFB ABL Space Systems' Facility 1611 Renovation Project (813-20-049 and 813-21-016)

Can we see a map showing the new locations for the four sites that were incorrectly mapped and then I am good.
Best regards,
Sam Cohen

Sam Cohen
Government Affairs and Legal Officer
Santa Ynez Band of Chumash Indians

Office (805) 688-7997
Mobile (805) 245-9083

From: LOETZERICH, ROSCOE M GS-12 USSF SPOC 30 CES/30 CEIEA <roscoe.loetzerich.1@spaceforce.mil>
Sent: Wednesday, October 6, 2021 4:47 PM
To: Sam Cohen <scohen@santaynezchumash.org>
Cc: RYAN, CHRISTOPHER D GS-12 USSF SPOC 30 CES/CEANC <christopher.ryan.7@spaceforce.mil>; SMALLWOOD, STACY J GS-12 USSF SSC 30 CES/CEIEA <stacy.smallwood.1@spaceforce.mil>
Subject: FW: 106 Vandenberg AFB ABL Space Systems' Facility 1611 Renovation Project (813-20-049 and 813-21-016)

Good afternoon Mr. Cohen,

I believe Mr. Josh Smallwood submitted the attached documents to the Tribe for comment regarding the ABL project back in late April. I believe Chris also met with the Tribe a few months ago and this project was on the agenda. However, it appears we do not have an official response from the Tribe. The attached documents should help in the event you do not recall project specific details. I would appreciate if you could respond with comment at your earliest convenience. If you have any questions or concerns please feel free to speak with Josh Smallwood as he is the Spaceforce Cultural Resource reviewer for this project. If you have already provided comment for this project I apologize for the inconvenience, however, I have been unable to find those comments and they are urgently needed for completing NEPA and Section 106.

Thank you

Roscoe Loetzerich
Base Archaeologist
1028 Iceland Ave
Bldg 11146
Vandenberg SFB CA
93437
W:805.606.9687
C: 661.435.3674

From: Smallwood,Josh <Josh.Smallwood@colostate.edu>
Sent: Tuesday, April 27, 2021 2:48 PM
To: Sam Cohen <scohen@santaynezchumash.org>
Cc: LOETZERICH, ROSCOE M GS-12 USSF SPOC 30 CES/30 CEIEA <roscoe.loetzerich.1@spaceforce.mil>
Subject: [Non-DoD Source] 106 Vandenberg AFB ABL Space Systems' Facility 1611 Renovation Project (813-20-049 and 813-21-016)

Dear Mr. Cohen,

Attached is a transmittal letter to the Tribe and the Section 106 report for the proposed **ABL Space Systems' Facility 1611 Renovation Project (813-20-049 and 813-21-016)**, for your review. Please let us know if you have any questions, comments, or concerns.

Thank you,
-Josh

Josh Smallwood, M.A., RPA
Historic Preservation Manager
Center for Environmental Management of Military Lands
(CEMML)
30 CES/CEIEA
1028 Iceland Avenue, Building 11146
Vandenberg AFB, CA 93437-6010
office: 805-606-2860
mobile: 760-419-0092

Appendix E

RS1 Launch Vehicle & Mission Profile Description

RS1 is a 88-ft two-stage, ground-launched vehicle. Both stages use liquid oxygen (LOX) and rocket propellant (RP-1) as propellants for two E2 engines. RS1 is also provisioned to use Jet-A. The vehicle's primary structure is entirely metallic, employing high-strength, reliable aluminum alloys. RS1 utilizes a common dome tank architecture to minimize structural mass. The front end of the vehicle includes a custom-designed payload adapter fitting and a metallic biconic fairing with acoustic protection.

RS1 stage l, stage 2, and payload would be transported to LC 576-E for final integration. All RS1 processing would occur at the site in an "open-air" environment. Payload processing requirements and operations per customer would be determined on a mission-by-mission basis. ABL would mobilize to the site for each launch, with shipping containers containing all components transporting from El Segundo, California to VSFB. To support transportation and handling operations, all RS1 assemblies can be packaged into standard shipping containers.

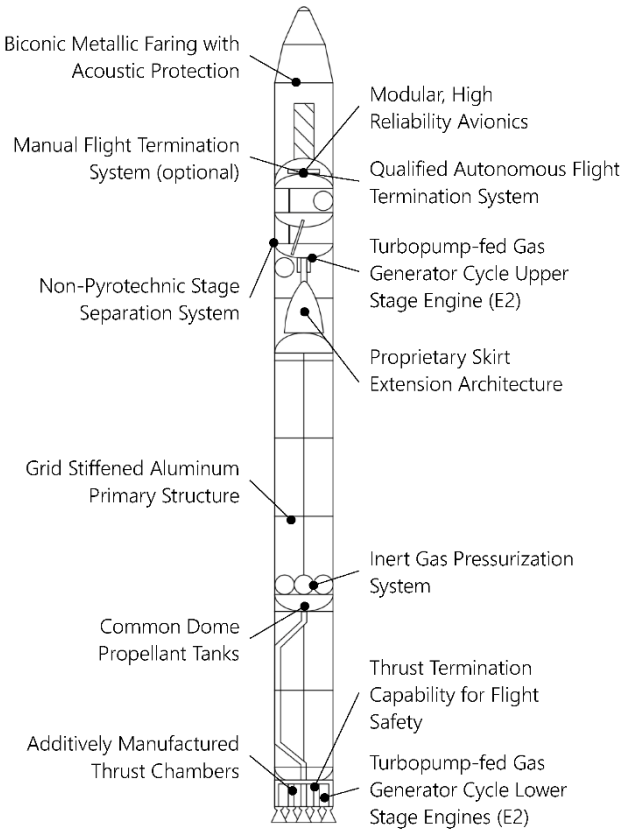

Figure E-1: RS1 Launch Vehicle Architecture

RS1 components and pressurization systems are optimized for simplicity, enabling rapid production and simple operation. Stage, fairing, and payload separation devices are non-pyrotechnic to enable simple handling procedures, minimize payload shock environments, and increase mission assurance. RS1 avionics systems are highly modular and rigorously tested to ensure reliability. The vehicle is provisioned for both classic and autonomous flight terminations systems to provide flight safety, as range safety protocols require. Avionics systems employ hardware redundancy and fault-tolerant software design to ensure high levels of reliability.

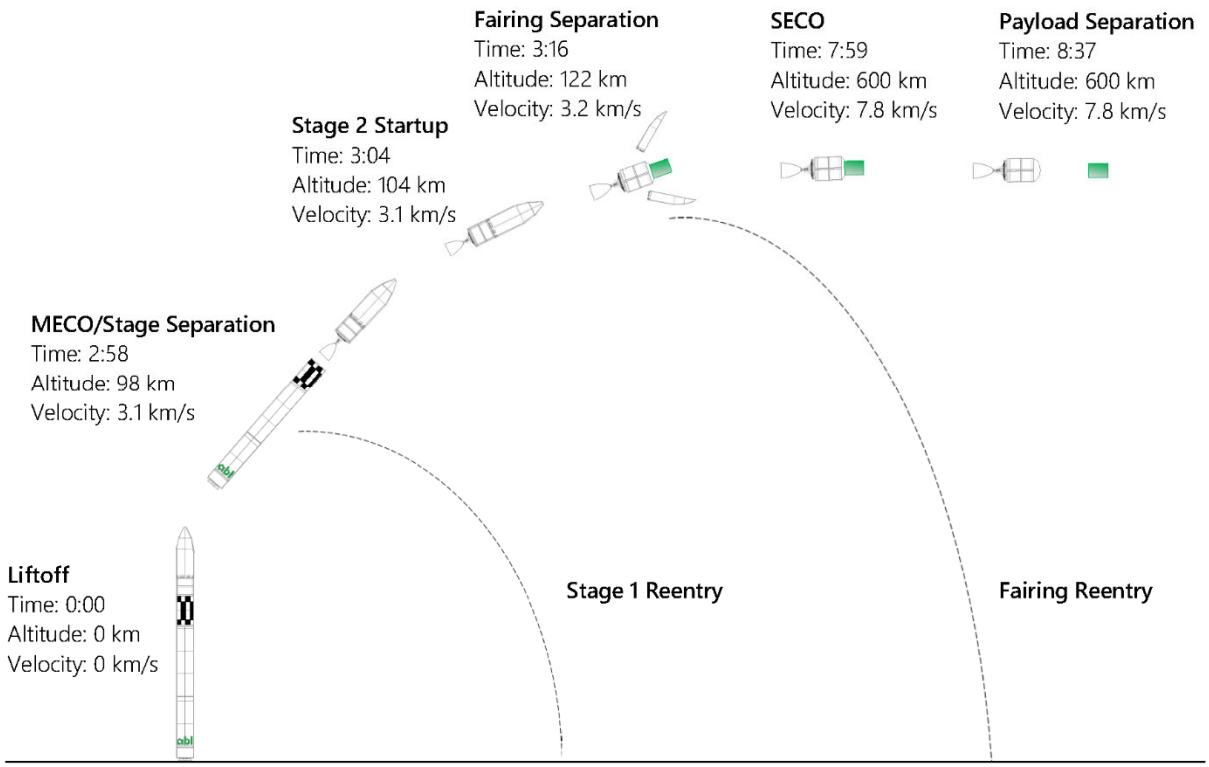

Figure E-2: Reference Mission Timeline and Profile

The E2 engines are turbopump-fed, gas generator cycle engines, and propel Stage 1 and Stage 2 of RS1. ABL executes a rapid "load-and-go" style launch operation. Propellant and gas commodities are loaded quickly through high-capacity systems to minimize the duration the launch vehicle remains loaded on the pad, reducing risk. Up to 10,856 gallons of LOX and 5,486 gallons of RP-1 would be transported to the LC 576-E and stored on the site in bulk storage tankers until loaded onto RS1 prior to launch. The propellants pass to the RSI vehicle through the Fluids Subassembly via a combination of hard lines, flex hoses, and quick disconnects. All propellant tanking and detanking operations are commanded through ABL Launch Control. Pressurized gaseous helium and nitrogen are used for E2 spin start, propellant purging, and the reaction control system. RS1 utilized a Triethylaluminum-Triethylborane (TEA-TEB) ignition source.

RS1 does not use any ordnance. Stage separation is performed using pneumatics and flight termination is achieved via valve actuated thrust termination. RS1 will use off-the-shelf lithium ion flat pack battery cells to power all internal electronics.

Appendix F

Air Quality – Definition of Resource & Regulatory Requirements

F.1 Definition of Resource

Air quality is defined by ambient air concentrations of specific pollutants determined by the EPA to be of concern with respect to the health and welfare of the general public. Six major pollutants of concern, called "criteria pollutants," are carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), suspended particulate matter less than or equal to 10 microns in diameter (PM_{10}), fine particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). The EPA has established National Ambient Air Quality Standards (NAAQS) for these pollutants. An air quality standard defines the maximum amount of a pollutant averaged over a specified period of time that can be present in outdoor air without any harmful effects on people or the environment. Areas that violate a federal air quality standard are designated as non-attainment areas.

Ambient air quality refers to the atmospheric concentration of a specific compound (amount of pollutants in a specified volume of air) that occurs at a particular geographic location. The ambient air quality levels measured at a particular location are determined by the interactions of emissions, meteorology, and chemistry. Emission considerations include the types, amounts, and locations of pollutants emitted into the atmosphere. Meteorological considerations include wind and precipitation patterns affecting the distribution, dilution, and removal of pollutant emissions. Chemical reactions can transform pollutant emissions into other chemical substances. Ambient air quality data are generally reported as a mass per unit volume (e.g., micrograms per cubic meter of air) or as a volume fraction (e.g., ppm by volume).

F.2 Pollutants

Pollutant emissions typically refer to the amount of pollutants or pollutant precursors introduced into the atmosphere by a source or group of sources. Pollutant emissions contribute to the ambient air concentrations of criteria pollutants, either by directly affecting the pollutant concentrations measured in the ambient air or by interacting in the atmosphere to form criteria pollutants. Primary pollutants, such as CO, SO_2, Pb, and some particulates, are emitted directly into the atmosphere from emission sources. Secondary pollutants, such as O_3, NO_2, and some particulates, are formed through atmospheric chemical reactions that are influenced by meteorology, ultraviolet light, and other atmospheric processes. PM_{10} and $PM_{2.5}$ are generated as primary pollutants by various mechanical processes (e.g., abrasion, erosion, mixing, or atomization) or combustion processes. However, PM_{10} and $PM_{2.5}$ can also be formed as secondary pollutants through chemical reactions or by gaseous pollutants condensing into fine aerosols. In general, emissions that are considered "precursors" to secondary pollutants in the atmosphere (such as reactive organic gases [ROG] and NO_x, which are considered precursors for O_3), are the pollutants for which emissions are evaluated to control the level of O_3 in the ambient air.

The State of California has identified four additional pollutants for ambient air quality standards: visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride. The CARB has also established the more stringent California Ambient Air Quality Standards (CAAQS). Areas within California in which ambient air concentrations of a pollutant are higher than the state or federal standard are considered to be non-attainment for that pollutant. Table F-1 shows both the federal and state ambient air quality standards.

Toxic air pollutants, also called hazardous air pollutants, are a class of pollutants that do not have ambient air quality standards but are examined on an individual basis when there is a source of these pollutants. The State of California has identified particulate emissions from diesel engines as a toxic air pollutant.

Table F-1: Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS[1]		CAAQS[2]
		Primary[3]	Secondary[4]	Concentration[5]
Ozone (O_3)	1-Hour	-	Same as Primary Standard	0.09 ppm (180 µg/m^3)
	8-Hour	0.070 ppm		0.070 ppm (137 µg/m^3)
Respirable Particulate Matter (PM_{10})	24-Hour	150 µg/m^3	Same as Primary Standard	50 µg/m^3
	Annual Arithmetic Mean	-		20 µg/m^3
Fine Particulate Matter ($PM_{2.5}$)	24-Hour	35 µg/m^3	Same as Primary Standard	-
	Annual Arithmetic Mean	12.0 µg/m^3	15 µg/m^3	12 µg/m^3
Carbon Monoxide (CO)	8-Hour	9 ppm (10 µg/m^3)	None	9.0 ppm (10 µg/m^3)
	1-Hour	35 ppm (40 µg/m^3)		20 ppm (23 µg/m^3)
Nitrogen Dioxide (NO_2)	Annual Average	0.053 ppm (100 µg/m^3)	Same as Primary Standard	0.030 ppm (56 µg/m^3)
	1-Hour	0.100 ppm (188 µg/m^3)		0.18 ppm (338 µg/m^3)
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	0.030 ppm	-	-
	24-Hour	0.14 ppm	-	0.04 ppm (105 µg/m^3)
	3-Hour	-	1300 µg/m^3 (0.5 ppm)	-
	1-Hour	75 ppb (196 µg/m^3)	-	0.25 ppm (655 µg/m^3)
Lead (Pb)[6]	30-Day Average	-	-	1.5 µg/m^3
	Calendar Quarter	1.5 µg/m^3	Same as Primary Standard	-
	3-Month Rolling Average	0.15 µg/m^3	Same as Primary Standard	-
Hydrogen Sulfide (HS)	1-Hour	No Federal Standards		0.03 ppm (42 µg/m^3)
Sulfates (SO_4)	24-Hour			25 µg/m^3
Visibility Reducing Particles	8-Hour (10 am to 6 pm, Pacific Standard Time)			In sufficient amount to produce an extinction coefficient of 0.23 per km due to particles when the relative humidity is less than 70 percent.

Pollutant	Averaging Time	NAAQS[1]		CAAQS[2]
		Primary[3]	Secondary[4]	Concentration[5]
Vinyl chloride[6]	24 Hour			0.01 ppm (26 µg/m^3)

[1] NAAQS (other than O_3, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The O_3 standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when 99 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard. Contact the EPA for further clarification and current federal policies.
[2] California Ambient Air Quality Standards for O_3, CO (except Lake Tahoe), SO_2 (1- and 24-hour), NO_2, PM_{10}, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded.
[3] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.
[4] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
[5] Concentration expressed first in units in which it was promulgated. Ppm in this table refers to ppm by volume or micromoles of pollutant per mole of gas.
[6] The CARB has identified lead and vinyl chloride as "toxic air contaminants" with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.
Notes: ppm = part(s) per million, µg/m^3 = milligrams per cubic meter
Source: California Air Resources Board (2016)

F.3 Greenhouse Gases

Global temperatures are moderated by naturally occurring atmospheric gases, including water vapor, carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), which are known as greenhouse gases (GHGs). These gases allow solar radiation (sunlight) into the Earth's atmosphere but prevent radiative heat from escaping, thus warming the Earth's atmosphere. Gases that trap heat in the atmosphere are often called GHGs, analogous to a greenhouse. GHGs are emitted by both natural processes and human activities. State law defines GHGs as any of the following compounds: CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (California Health and Safety Code Section 38505(g)). GHGs have varying global warming potential (GWP). The GWP is the potential of a gas or aerosol to trap heat in the atmosphere; it is the "measure of the total energy that a gas absorbs over a particular period of time (usually 100 years), compared to CO_2" (U.S. Environmental Protection Agency 2013). The reference gas for GWP is CO_2; therefore, CO_2 has a GWP of 1. The other main GHGs that have been attributed to human activity include CH_4, which has a GWP of 21, and N_2O, which has a GWP of 310. CO_2, followed by CH_4 and N_2O, are the most common GHGs that result from human activity. CO_2, and to a lesser extent, CH_4 and N_2O, are products of combustion and are generated from stationary combustion sources as well as vehicles. High GWP gases include GHGs that are used in refrigeration/cooling systems such as chlorofluorocarbons and hydrofluorocarbons.

Emissions of GHGs are considered to have a potential incremental impact on global climate. Scientists are in general agreement that the Earth's climate is gradually changing, and that change is due, at least in part, to emissions of CO_2 and other GHG from anthropogenic sources.

On the issue of global climate change, however, there are no adopted federal plans, policies, regulations, or laws mandating reductions in the GHG emissions that cause global climate change. The climate change research community has not yet developed tools specifically intended to evaluate or quantify endpoint impacts attributable to the emissions of GHGs from a single source. In particular, because of the uncertainties involving the assessment of such emissions regionally and locally, the incremental

contribution of the Proposed Action to climate change cannot be determined given the current state of the science and assessment methodology.

On 18 February 2010, the CEQ released draft guidance on addressing climate change in NEPA documents. The draft guidance, which has been issued for public review and comment, recommends quantification of GHG emissions, and proposes a threshold of 25,000 metric tons of CO_2e emissions. The CEQ indicates that use of 25,000 metric tons of CO_2e emissions as a reference point would provide federal agencies with a useful indicator, rather than an absolute standard of significance, for agencies to provide action-specific evaluation of GHG emissions and disclosure of potential impacts.

Under CEQA, the California Natural Resources Agency recently adopted amendments to the CEQA guidelines to address global climate change impacts. According to Appendix G of the CEQA Guidelines, the following criteria are considered to establish a significance threshold for GHG impacts:

Would the project:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment?
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHG?

As discussed in Section 15064.4 of the CEQA Regulations, the determination of the significance of GHG emissions calls for a careful judgment by the lead agency consistent with the provisions included therein. A lead agency should make a good-faith effort, based to the extent possible on scientific and factual data, to describe, calculate, or estimate the amount of GHG emissions resulting from a project. A lead agency shall have discretion to determine, in the context of a particular project, whether to

1. Use a model or methodology to quantify GHG emissions resulting from a project, and which model or methodology to use. The lead agency has discretion to select the model or methodology it considers most appropriate provided it supports its decision with substantial evidence. The lead agency should explain the limitations of the particular model or methodology selected for use; or
2. rely on a qualitative analysis or performance-based standards.

A lead agency should consider the following factors, among others, when assessing the significance of impacts from GHG emissions on the environment:

1. The extent to which the project may increase or reduce GHG emissions as compared to the existing environmental setting;
2. Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project;
3. The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions. Such requirements must be adopted by the relevant public agency through a public review process and must reduce or mitigate the project's incremental contribution of GHG emissions. If there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding compliance with the adopted regulations or requirements, an EIR must be prepared for the project.

On 18 February 2010, the CEQ released draft guidance on addressing climate change in NEPA documents. This draft document was revised on 18 December 2014, and CEQ solicited public comments until 23 February 2015. The 2010 draft guidance, which has been issued for public review and comment, recommends quantification of GHG emissions, and proposes a threshold of 25,000 metric tons of CO_2e

emissions. The 2010 guidance indicates that use of 25,000 metric tons of CO_2e emissions as a reference point would provide federal agencies with a useful indicator, rather than an absolute standard of significance, to provide action-specific evaluation of GHG emissions and disclosure of potential impacts.

F.4 Regional Setting

VSFB is within Santa Barbara County and under the jurisdiction of the SBCAPCD. The SBCAPCD is the agency responsible for the administration of federal and state air quality laws, regulations, and policies in Santa Barbara County, which is within the South Central Coast Air Basin (SCCAB). The SCCAB includes San Luis Obispo, Santa Barbara, and Ventura Counties.

The SCCAB, and all of Southern California, lies in a semi-permanent high-pressure zone of Eastern Pacific Region. The coastal island is characterized by sparse rainfall, most of which occurs in the winter season and hot, dry summers, tempered by cooling sea breezes. In Santa Barbara County, the months of heaviest precipitation are November through April, averaging 14.66 in. annually. The mean temperature in the VSFB area, as reported by monitors in Lompoc, is 58.4 degrees Fahrenheit (°F) and the mean maximum and mean minimum temperatures are 69.8°F and 47.0°F, respectively (Western Regional Climatic Center 2020).

Santa Barbara County is classified as an attainment/unclassified area for the NAAQS for all criteria pollutants. In July 2020, Santa Barbara County was designated as attainment for the CAAQS for ozone. This change was initiated by the CARB Board at their December 2019 public hearing and was later approved by the Office of Administrative Law. Santa Barbara County is currently a nonattainment area for the CAAQS for PM_{10}. Santa Barbara County is classified as an attainment/unclassified area for the CAAQS for all other criteria pollutants. Table F-2 presents the Santa Barbara County Attainment/Nonattainment Classification Summary.

Table F-2: Santa Barbara County Attainment/Nonattainment Classification Summary

Pollutant	Averaging Time	California Standards		National Standards	
		Concentration	Attainment Status	Concentration	Attainment Status
Ozone	8-hour	0.070 ppm	A	0.070 ppm	U/A
	1-hour	0.09 ppm	A	—	—
Carbon Monoxide	8-hour	9.0 ppm (10 mg/m^3)	A	9.0 ppm (10 m/m^3)	A
	1-hour	20.0 ppm (23 mg/m^3)	A	35.0 ppm (40 µg/m^3)	A
Nitrogen Dioxide	annual average	0.030 ppm (56 µg/m^3)	A	53 ppb	U/A
	1-hour	0.18 ppm (338 µg/m^3)	A	100 ppb	U/A
Sulfur Dioxide	annual average	—	—	Revoked	—
	24-hour	0.04 ppm (105 µg/m^3)	A	Revoked	—
	1 hour	0.25 ppm (655 µg/m^3)	A	75 ppb	*

Pollutant	Averaging Time	California Standards		National Standards	
		Concentration	Attainment Status	Concentration	Attainment Status
PM_{10}	Annual Arithmetic Mean	20 µg/m^3	N	Revoked	A
	24-hour	50 µg/m^3	N	150 µg/m^3	A
$PM_{2.5}$	annual arithmetic mean	12µg/m^3	U	12.0 µg/m^3	U/A
	24-hour	—	—	35 µg/m^3	U/A
Lead	30-day average	1.5 µg/m^3	A	—	—
	Rolling 3-month Average	—	—	0.15 µg/m^3	U
Sulfates	24-hour	25 µg/m^3	A	—	—
Hydrogen Sulfide	1 hour	0.03 ppm (42 µg/m^3)	A	—	—
Vinyl Chloride (chloroethene)	24-hour	0.010 ppm (26 µg/m^3)		—	—
Visibility Reducing Particles	8-hour (1000 to 1800 PST)		A	—	—

Notes: * EPA has not yet made final designations on attainment status; A = Attainment; N = Nonattainment; U = Unclassified; U/A = Unclassifiable/Attainment; — = No Standard; mg/m3 = milligrams per cubic meter; µg/m3 = micrograms per cubic meter; ppm = parts per million; ppb = parts per billion

F.5 Federal Requirements

The EPA is the agency responsible for enforcing the Clean Air Act (CAA) of 1970 and its 1977 and 1990 amendments. The purpose of the CAA is to establish NAAQS, to classify areas as to their attainment status relative to the NAAQS, to develop schedules and strategies to meet the NAAQS, and to regulate emissions of criteria pollutants and air toxics to protect public health and welfare. Under the CAA, individual states are allowed to adopt ambient air quality standards and other regulations, provided they are at least as stringent as federal standards. The Clean Air Act Amendments (CAAA) (1990) established new deadlines for achievement of the NAAQS, dependent upon the severity of non-attainment.

The EPA requires each state to prepare a State Implementation Plan (SIP), which describes how that state will achieve compliance with the NAAQS. A SIP is a compilation of goals, strategies, schedules, and enforcement actions that will lead the state into compliance with all federal air quality standards.

The CAAA also require that states develop an operating permit program that would require permits for all major sources of pollutants. The program would be designed to reduce mobile source emissions and control emissions of hazardous air pollutants through establishing control technology guidelines for various classes of emission sources.

New Source Review: A New Source Review is required when a source has the potential to emit any pollutant regulated under the CAA in amounts equal to or exceeding specified major source thresholds (100 or 250 tons per year), which are predicated on a source's industrial category. SBCAPCD Regulation VIII, New Source Review, applies to all new or modified stationary sources which emits or may emit any affected pollutant.

EO 13693: This EO, *Planning for Federal Sustainability in the Next Decade*, was signed by President Obama on 19 March 2015. The EO sets a goal of reducing federal agency GHG emissions by 40 percent over the next decade. The EO sets agency GHG reduction targets and sustainability goals and requires the head of each federal agency to propose to the Chair of the CEQ and the Director of the Office of Management and Budget percentage reduction targets for agency-wide reductions of scope 1 and 2 and scope 3 GHG emissions in absolute terms by the end of fiscal year 2025 relative to a fiscal year 2008 baseline. The EO sets sustainability goals for federal agencies.

EO 13990: This EO, *Protecting Public Health and the Environment and Restoring Science To Tackle the Climate Crisis*, was signed by President Biden on 20 January 2021. This EO aims to promote job growth in fields that will simultaneously decrease emissions from various industries while ensuring that communities of color and low-income are not disproportionately affected by environmental effects including, but not limited to, pesticides, air quality, and water quality. In addition to this, EO 13990 has several other sections promoting actions for environmental wellness along with revocation of several EOs.

General Conformity: Under 40 C.F.R. Part 93 and the provisions of Part 51, Subchapter C., Chapter I, Title 40, Appendix W of the C.F.R., of the CAA as Amended, federal agencies are required to demonstrate that federal actions conform with the applicable SIP. The EPA general conformity rule applies to federal actions occurring in non-attainment or maintenance areas. Because Santa Barbara County is an unclassified/attainment area for all NAAQS, the General Conformity Rule does not apply to the Proposed Action at VSFB.

F.6 Local Requirements

As indicated previously, in Santa Barbara County, the SBCAPCD is the agency responsible for the administration of federal and state air quality laws, regulations, and policies. Included in the local air districts' tasks are monitoring of air pollution, maintenance of air quality standards through programs to control air pollutant emissions, and the promulgation of Rules and Regulations.

SBCAPCD regulations require that facilities building, altering, or replacing stationary equipment that may emit air pollutants obtain an Authority to Construct permit. Further, SBCAPCD regulations require a stationary source of air pollutants to obtain a Permit to Operate. The local air districts are responsible for the review of applications and for the approval and issuance of these permits. The only emission sources associated with the Proposed Action that would require permit or registration are internal combustion engines rated at greater than 50 bhp, which power the generators used during the test events. In addition, the SBCAPCD regulations require a stationary source that would emit 25 tons per year or more of any pollutant except CO in any calendar year during construction to obtain emission offsets.

F.7 Bibliography

California Air Resources Board. 2016. Ambient Air Quality Standards. Retrieved from http://www.arb.ca.gov/research/aaqs/aaqs2.pdf.

U.S. Environmental Protection Agency. 2013. Inventory of Greenhouse Gas Emissions and Sinks: 1990–2011. Washington, DC: U.S. Environmental Protection Agency.

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

1. General Information

- Action Location

Base: VANDENBERG AFB
State: California
County(s): Santa Barbara
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: Pre-launch and Launch Operations of ABL Space Systems RS1 at Launch Complex 576-E, Vandenberg Air Force Base, California

- Project Number/s (if applicable):

- Projected Action Start Date: 5 / 2021

- Action Purpose and Need:

This Environmental Assessment (EA) evaluates the potential environmental impacts associated with operating ABL Space Systems (ABL) RS1 launch vehicle at Launch Complex 576-E (LC 576-E) on Vandenberg Air Force Base (VAFB or Base), California and the associated infrastructure improvements needed to LC 576-E.

- Action Description:

ABL proposes to conduct space launch activities of the RS1 vehicle at LC 576-E at VAFB in support of commercial and government customers. RS1 is a deployable, fully containerized two stage vehicle capable of launching 1,350 kilograms (kg) of payload on demand. It combines simple architecture with modern manufacturing processes and minimal infrastructure to achieve low cost, reliability, and flexibility.
LC 576-E was originally established in 1962 for the Atlas F launch program. After 1964 it was decommissioned; however, was refurbished in the 1990's to support the Minotaur-C and Taurus launch programs. It is currently decommissioned but includes an established pad that would be refurbished to support launches of the RS1 vehicle.

- Point of Contact

Name: Ryan Wright-Zinniger
Title: Associate Environmental Scientist (Contractor)
Organization: ManTech International
Email:
Phone Number:

- Activity List:

	Activity Type	Activity Title
2.	Construction / Demolition	Asphalt
3.	Construction / Demolition	Concrete
4.	Construction / Demolition	Flatbed
5.	Construction / Demolition	Site Prep
6.	Construction / Demolition	Trenching
7.	Construction / Demolition	Trucks
8.	Personnel	Worker Commute

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

2. Construction / Demolition

2.1 General Information & Timeline Assumptions

- Activity Location
County: Santa Barbara
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Asphalt

- Activity Description:

- Activity Start Date
Start Month: 5
Start Month: 2021

- Activity End Date
Indefinite: False
End Month: 5
End Month: 2021

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.007376
SO_x	0.000138
NO_x	0.042143
CO	0.023829
PM 10	0.001624

Pollutant	Total Emissions (TONs)
PM 2.5	0.001277
Pb	0.000000
NH_3	0.000115
CO_2e	14.1

2.1 Paving Phase

2.1.1 Paving Phase Timeline Assumptions

- Phase Start Date
Start Month: 5
Start Quarter: 4
Start Year: 2021

- Phase Duration
Number of Month: 0
Number of Days: 2

2.1.2 Paving Phase Assumptions

- General Paving Information
Paving Area (ft^2): 63220

- Paving Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Cement and Mortar Mixers Composite	4	8
Off-Highway Trucks Composite	4	8

- Vehicle Exhaust

Average Hauling Truck Round Trip Commute (mile): 43.2

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips

Average Worker Round Trip Commute (mile): 32.8

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.1.3 Paving Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour)

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.240	000.004	000.179	002.019	000.047	000.020		000.034	00349.301
LDGT	000.529	000.004	000.390	003.951	000.049	000.022		000.034	00438.299
HDGV	001.133	000.012	002.177	017.401	000.185	000.079		000.045	01175.364
LDDV	000.057	000.003	000.387	000.455	000.084	000.055		000.008	00322.805
LDDT	000.127	000.004	000.747	000.768	000.138	000.107		000.008	00404.546
HDDV	000.429	000.015	008.814	001.758	000.338	000.240		000.029	01587.930
MC	004.838	000.002	001.285	028.044	000.019	000.009		000.050	00181.592

2.1.4 Paving Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (ft^2)

0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase
$VOC_P = (2.62 * PA) / 43560$

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (lb/acre)
PA: Paving Area (ft^2)
43560: Conversion Factor square feet to acre (43560 ft2 / $acre)^2$ / acre)

3. Construction / Demolition

3.1 General Information & Timeline Assumptions

- Activity Location
County: Santa Barbara
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Concrete

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

- Activity Description:

- Activity Start Date
Start Month: 5
Start Month: 2021

- Activity End Date
Indefinite: False
End Month: 5
End Month: 2021

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.002478
SO_x	0.000050
NO_x	0.014656
CO	0.010399
PM 10	0.000530

Pollutant	Total Emissions (TONs)
PM 2.5	0.000482
Pb	0.000000
NH_3	0.000020
CO_2e	5.0

3.1 Building Construction Phase

3.1.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 5
Start Quarter: 2
Start Year: 2021

- Phase Duration
Number of Month: 0
Number of Days: 1

3.1.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (ft^2): 10625
Height of Building (ft): 1
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Cement and Mortar Mixers Composite	4	8
Off-Highway Trucks Composite	4	8

- Vehicle Exhaust

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

Average Hauling Truck Round Trip Commute (mile): 43.2

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips

Average Worker Round Trip Commute (mile): 32.8

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips

Average Vendor Round Trip Commute (mile): 0

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

3.1.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour)

Cement and Mortar Mixers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0085	0.0001	0.0535	0.0414	0.0021	0.0021	0.0007	7.2674
Off-Highway Trucks Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.1369	0.0026	0.7382	0.5475	0.0246	0.0246	0.0123	260.39

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.114	000.003	000.084	000.992	000.047	000.020		000.023	00298.845
LDGT	000.288	000.004	000.178	001.871	000.048	000.021		000.024	00379.038
HDGV	000.600	000.011	001.339	008.875	000.183	000.078		000.045	01128.468
LDDV	000.026	000.003	000.125	000.281	000.060	000.032		000.008	00271.718
LDDT	000.094	000.003	000.533	000.594	000.112	000.082		000.008	00364.857
HDDV	000.194	000.014	004.796	001.133	000.211	000.117		000.028	01514.699
MC	004.452	000.002	001.252	023.791	000.019	000.009		000.054	00187.891

3.1.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase

$VMT_{VT} = BA * BH * (0.38 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)

2000: Conversion Factor pounds to tons

4. Construction / Demolition

4.1 General Information & Timeline Assumptions

- Activity Location
County: Santa Barbara
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Flatbed

- Activity Description:

- Activity Start Date
Start Month: 5
Start Month: 2021

- Activity End Date
Indefinite: False
End Month: 5
End Month: 2021

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.001959
SO_x	0.000053
NO_x	0.016014
CO	0.008450
PM 10	0.102331

Pollutant	Total Emissions (TONs)
PM 2.5	0.000472
Pb	0.000000
NH_3	0.000045
CO_2e	5.4

4.1 Trenching/Excavating Phase

4.1.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 5
Start Quarter: 2
Start Year: 2021

- Phase Duration
Number of Month: 0
Number of Days: 3

4.1.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information
Area of Site to be Trenched/Excavated (ft^2): 73845
Amount of Material to be Hauled On-Site (yd^3): 0

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

Amount of Material to be Hauled Off-Site (yd^3): 750

- Trenching Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Off-Highway Trucks Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 24
Average Hauling Truck Round Trip Commute (mile): 43.2

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 32.8

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

4.1.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour)

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.240	000.004	000.179	002.019	000.047	000.020		000.034	00349.301
LDGT	000.529	000.004	000.390	003.951	000.049	000.022		000.034	00438.299
HDGV	001.133	000.012	002.177	017.401	000.185	000.079		000.045	01175.364
LDDV	000.057	000.003	000.387	000.455	000.084	000.055		000.008	00322.805
LDDT	000.127	000.004	000.747	000.768	000.138	000.107		000.008	00404.546
HDDV	000.429	000.015	008.814	001.758	000.338	000.240		000.029	01587.930
MC	004.838	000.002	001.285	028.044	000.019	000.009		000.050	00181.592

4.1.4 Trenching / Excavating Phase Formula(s)

- Fugitive Dust Emissions per Phase
$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

5. Construction / Demolition

5.1 General Information & Timeline Assumptions

- Activity Location

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

County: Santa Barbara
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Site Prep

- Activity Description:

- Activity Start Date
Start Month: 5
Start Month: 2021

- Activity End Date
Indefinite: False
End Month: 5
End Month: 2021

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.000832
SO_x	0.000013
NO_x	0.005131
CO	0.007384
PM 10	0.000284

Pollutant	Total Emissions (TONs)
PM 2.5	0.000279
Pb	0.000000
NH_3	0.000004
CO_2e	1.2

5.1 Building Construction Phase

5.1.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 5
Start Quarter: 1
Start Year: 2021

- Phase Duration
Number of Month: 0
Number of Days: 4

5.1.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (ft^2): 73845
Height of Building (ft): 1
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- Construction Exhaust

Equipment Name	Number Of	Hours Per Day

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

	Equipment	
Rough Terrain Forklifts Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 0

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 32.8

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 0

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

5.1.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour)

Rough Terrain Forklifts Composite	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0497	0.0008	0.3192	0.4453	0.0172	0.0172	0.0044	70.392

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.114	000.003	000.084	000.992	000.047	000.020		000.023	00298.845
LDGT	000.288	000.004	000.178	001.871	000.048	000.021		000.024	00379.038
HDGV	000.600	000.011	001.339	008.875	000.183	000.078		000.045	01128.468
LDDV	000.026	000.003	000.125	000.281	000.060	000.032		000.008	00271.718
LDDT	000.094	000.003	000.533	000.594	000.112	000.082		000.008	00364.857
HDDV	000.194	000.014	004.796	001.133	000.211	000.117		000.028	01514.699
MC	004.452	000.002	001.252	023.791	000.019	000.009		000.054	00187.891

5.1.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase

$VMT_{VT} = BA * BH * (0.38 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

6. Construction / Demolition

6.1 General Information & Timeline Assumptions

- Activity Location
County: Santa Barbara
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Trenching

- Activity Description:

- Activity Start Date
Start Month: 5
Start Month: 2021

- Activity End Date
Indefinite: False
End Month: 5
End Month: 2021

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.001228
SO_x	0.000021
NO_x	0.007199
CO	0.010765
PM 10	0.242514

Pollutant	Total Emissions (TONs)
PM 2.5	0.000327
Pb	0.000000
NH_3	0.000008
CO_2e	2.0

6.1 Trenching/Excavating Phase

6.1.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 5
Start Quarter: 2
Start Year: 2021

- Phase Duration
Number of Month: 0
Number of Days: 10

6.1.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information
Area of Site to be Trenched/Excavated (ft^2): 73845

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

Amount of Material to be Hauled On-Site (yd^3): 0
Amount of Material to be Hauled Off-Site (yd^3): 750

- Trenching Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Capacity (yd^3): 5
Average Hauling Truck Round Trip Commute (mile): 0

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 32.8

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

6.1.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour)

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.240	000.004	000.179	002.019	000.047	000.020		000.034	00349.301
LDGT	000.529	000.004	000.390	003.951	000.049	000.022		000.034	00438.299
HDGV	001.133	000.012	002.177	017.401	000.185	000.079		000.045	01175.364
LDDV	000.057	000.003	000.387	000.455	000.084	000.055		000.008	00322.805
LDDT	000.127	000.004	000.747	000.768	000.138	000.107		000.008	00404.546
HDDV	000.429	000.015	008.814	001.758	000.338	000.240		000.029	01587.930
MC	004.838	000.002	001.285	028.044	000.019	000.009		000.050	00181.592

6.1.4 Trenching / Excavating Phase Formula(s)

- Fugitive Dust Emissions per Phase
$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

7. Construction / Demolition

7.1 General Information & Timeline Assumptions

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

- Activity Location
County: Santa Barbara
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Trucks

- Activity Description:

- Activity Start Date
Start Month: 5
Start Month: 2021

- Activity End Date
Indefinite: False
End Month: 6
End Month: 2021

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.038026
SO_x	0.000520
NO_x	0.289675
CO	0.178062
PM 10	1.111346

Pollutant	Total Emissions (TONs)
PM 2.5	0.012750
Pb	0.000000
NH_3	0.000260
CO_2e	50.6

7.1 Trenching/Excavating Phase

7.1.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 5
Start Quarter: 3
Start Year: 2021

- Phase Duration
Number of Month: 1
Number of Days: 15

7.1.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information
Area of Site to be Trenched/Excavated (ft^2): 73845
Amount of Material to be Hauled On-Site (yd^3): 0
Amount of Material to be Hauled Off-Site (yd^3): 750

- Trenching Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- Construction Exhaust

Equipment Name	Number Of	Hours Per Day

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

	Equipment	
Off-Highway Tractors Composite	2	8

- Vehicle Exhaust

Average Hauling Truck Capacity (yd^3): 3

Average Hauling Truck Round Trip Commute (mile): 24.8

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips

Average Worker Round Trip Commute (mile): 32.8

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

7.1.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour)

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.240	000.004	000.179	002.019	000.047	000.020		000.034	00349.301
LDGT	000.529	000.004	000.390	003.951	000.049	000.022		000.034	00438.299
HDGV	001.133	000.012	002.177	017.401	000.185	000.079		000.045	01175.364
LDDV	000.057	000.003	000.387	000.455	000.084	000.055		000.008	00322.805
LDDT	000.127	000.004	000.747	000.768	000.138	000.107		000.008	00404.546
HDDV	000.429	000.015	008.814	001.758	000.338	000.240		000.029	01587.930
MC	004.838	000.002	001.285	028.044	000.019	000.009		000.050	00181.592

7.1.4 Trenching / Excavating Phase Formula(s)

- Fugitive Dust Emissions per Phase

$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

8. Personnel

8.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Santa Barbara
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Worker Commute

- Activity Description:

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

CONSTRUCTION ACTIVITIES

- Activity Start Date
Start Month: 5
Start Year: 2021

- Activity End Date
Indefinite: No
End Month: 6
End Year: 2021

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.006610
SO_x	0.000079
NO_x	0.003594
CO	0.042876
PM 10	0.001036

Pollutant	Total Emissions (TONs)
PM 2.5	0.000450
Pb	0.000000
NH_3	0.000530
CO_2e	7.6

8.2 Personnel Assumptions

- Number of Personnel
Active Duty Personnel: 0
Civilian Personnel: 0
Support Contractor Personnel: 14
Air National Guard (ANG) Personnel: 0
Reserve Personnel: 0

- Default Settings Used: No

- Average Personnel Round Trip Commute (mile): 32.8

- Personnel Work Schedule
Active Duty Personnel: 5 Days Per Week
Civilian Personnel: 5 Days Per Week
Support Contractor Personnel: 5 Days Per Week
Air National Guard (ANG) Personnel: 4 Days Per Week
Reserve Personnel: 4 Days Per Month

8.3 Personnel On Road Vehicle Mixture

- On Road Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	37.55	60.32	0	0.03	0.2	0	1.9
GOVs	54.49	37.73	4.67	0	0	3.11	0

8.4 Personnel Emission Factor(s)

- On Road Vehicle Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.114	000.003	000.084	000.992	000.047	000.020		000.023	00298.845
LDGT	000.288	000.004	000.178	001.871	000.048	000.021		000.024	00379.038

HDGV	000.600	000.011	001.339	008.875	000.183	000.078		000.045	01128.468
LDDV	000.026	000.003	000.125	000.281	000.060	000.032		000.008	00271.718
LDDT	000.094	000.003	000.533	000.594	000.112	000.082		000.008	00364.857
HDDV	000.194	000.014	004.796	001.133	000.211	000.117		000.028	01514.699
MC	004.452	000.002	001.252	023.791	000.019	000.009		000.054	00187.891

8.5 Personnel Formula(s)

- Personnel Vehicle Miles Travel for Work Days per Year
$VMT_P = NP * WD * AC$

VMT_P: Personnel Vehicle Miles Travel (miles/year)
NP: Number of Personnel
WD: Work Days per Year
AC: Average Commute (miles)

- Total Vehicle Miles Travel per Year
$VMT_{Total} = VMT_{AD} + VMT_C + VMT_{SC} + VMT_{ANG} + VMT_{AFRC}$

VMT_{Total}: Total Vehicle Miles Travel (miles)
VMT_{AD}: Active Duty Personnel Vehicle Miles Travel (miles)
VMT_C: Civilian Personnel Vehicle Miles Travel (miles)
VMT_{SC}: Support Contractor Personnel Vehicle Miles Travel (miles)
VMT_{ANG}: Air National Guard Personnel Vehicle Miles Travel (miles)
VMT_{AFRC}: Reserve Personnel Vehicle Miles Travel (miles)

- Vehicle Emissions per Year
$V_{POL} = (VMT_{Total} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{Total}: Total Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Personnel On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

RS1 LAUNCH PROGRAM OPERATIONAL ACTIVITIES

1. General Information

- Action Location
Base: VANDENBERG AFB
State: California
County(s): Santa Barbara
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: Pre-launch and Launch Operations of ABL Space Systems RS1 at Launch Complex 576-E, Vandenberg Air Force Base, California

- Project Number/s (if applicable):

- Projected Action Start Date: 7 / 2021

- Action Purpose and Need:
This Environmental Assessment (EA) evaluates the potential environmental impacts associated with operating ABL Space Systems (ABL) RS1 launch vehicle at Launch Complex 576-E (LC 576-E) on Vandenberg Air Force Base (VAFB or Base), California and the associated infrastructure improvements needed to LC 576-E.

- Action Description:
ABL proposes to conduct space launch activities of the RS1 vehicle at LC 576-E at VAFB in support of commercial and government customers. RS1 is a deployable, fully containerized two stage vehicle capable of launching 1,350 kilograms (kg) of payload on demand. It combines simple architecture with modern manufacturing processes and minimal infrastructure to achieve low cost, reliability, and flexibility.

LC 576-E was originally established in 1962 for the Atlas F launch program. After 1964 it was decommissioned; however, was refurbished in the 1990's to support the Minotaur-C and Taurus launch programs. It is currently decommissioned but includes an established pad that would be refurbished to support launches of the RS1 vehicle.

- Point of Contact
Name: Ryan Wright-Zinniger
Title: Associate Environmental Scientist (Contractor)
Organization: ManTech International
Email:
Phone Number:

- Activity List:

Activity Type		Activity Title
2.	Construction / Demolition	Operations - 1
3.	Construction / Demolition	Operations - 2
4.	Construction / Demolition	Operations - 3
5.	Personnel	Worker Commute

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Construction / Demolition

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

RS1 LAUNCH PROGRAM OPERATIONAL ACTIVITIES

2.1 General Information & Timeline Assumptions

- Activity Location
County: Santa Barbara
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Operations - 1

- Activity Description:

- Activity Start Date
Start Month: 7
Start Month: 2021

- Activity End Date
Indefinite: False
End Month: 7
End Month: 2021

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.002331
SO_x	0.000044
NO_x	0.012531
CO	0.009754
PM 10	0.000436

Pollutant	Total Emissions (TONs)
PM 2.5	0.000430
Pb	0.000000
NH_3	0.000005
CO_2e	4.4

2.1 Building Construction Phase

2.1.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 7
Start Quarter: 1
Start Year: 2021

- Phase Duration
Number of Month: 0
Number of Days: 1

2.1.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (ft^2): 1500
Height of Building (ft): 1
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: No

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

RS1 LAUNCH PROGRAM OPERATIONAL ACTIVITIES

Average Day(s) worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Aerial Lifts Composite	1	8
Off-Highway Trucks Composite	4	8

- Vehicle Exhaust

Average Hauling Truck Round Trip Commute (mile): 0

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips

Average Worker Round Trip Commute (mile): 32.8

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips

Average Vendor Round Trip Commute (mile): 0

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

2.1.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour)

Aerial Lifts Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.0238	0.0003	0.1726	0.1676	0.0079	0.0079	0.0021	34.775
Off-Highway Trucks Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM 10**	**PM 2.5**	**CH_4**	**CO_2e**
Emission Factors	0.1369	0.0026	0.7382	0.5475	0.0246	0.0246	0.0123	260.39

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.114	000.003	000.084	000.992	000.047	000.020		000.023	00298.845
LDGT	000.288	000.004	000.178	001.871	000.048	000.021		000.024	00379.038
HDGV	000.600	000.011	001.339	008.875	000.183	000.078		000.045	01128.468
LDDV	000.026	000.003	000.125	000.281	000.060	000.032		000.008	00271.718
LDDT	000.094	000.003	000.533	000.594	000.112	000.082		000.008	00364.857
HDDV	000.194	000.014	004.796	001.133	000.211	000.117		000.028	01514.699
MC	004.452	000.002	001.252	023.791	000.019	000.009		000.054	00187.891

2.1.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

RS1 LAUNCH PROGRAM OPERATIONAL ACTIVITIES

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase
$VMT_{VT} = BA * BH * (0.38 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)

HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

3. Construction / Demolition

3.1 General Information & Timeline Assumptions

- Activity Location
County: Santa Barbara
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Operations - 2

- Activity Description:

- Activity Start Date
Start Month: 7
Start Month: 2021

- Activity End Date
Indefinite: False
End Month: 7
End Month: 2021

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.001247
SO_x	0.000020
NO_x	0.007696
CO	0.011075
PM 10	0.000426

Pollutant	Total Emissions (TONs)
PM 2.5	0.000418
Pb	0.000000
NH_3	0.000006
CO_2e	1.8

3.1 Building Construction Phase

3.1.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 7
Start Quarter: 1
Start Year: 2021

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

RS1 LAUNCH PROGRAM OPERATIONAL ACTIVITIES

- Phase Duration
Number of Month: 0
Number of Days: 2

3.1.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (ft^2): 1500
Height of Building (ft): 1
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Rough Terrain Forklifts Composite	3	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 0

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 32.8

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 0

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

3.1.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (lb/hour)

Rough Terrain Forklifts Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.0497	0.0008	0.3192	0.4453	0.0172	0.0172	0.0044	70.392

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.114	000.003	000.084	000.992	000.047	000.020		000.023	00298.845

LDGT	000.288	000.004	000.178	001.871	000.048	000.021		000.024	00379.038
HDGV	000.600	000.011	001.339	008.875	000.183	000.078		000.045	01128.468
LDDV	000.026	000.003	000.125	000.281	000.060	000.032		000.008	00271.718
LDDT	000.094	000.003	000.533	000.594	000.112	000.082		000.008	00364.857
HDDV	000.194	000.014	004.796	001.133	000.211	000.117		000.028	01514.699
MC	004.452	000.002	001.252	023.791	000.019	000.009		000.054	00187.891

3.1.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)

VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase

$VMT_{VT} = BA * BH * (0.38 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

4. Construction / Demolition

4.1 General Information & Timeline Assumptions

- Activity Location
County: Santa Barbara
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Operations - 3

- Activity Description:

- Activity Start Date
Start Month: 7
Start Month: 2021

- Activity End Date
Indefinite: False
End Month: 7
End Month: 2021

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.001670
SO_x	0.000032
NO_x	0.008876
CO	0.006764
PM 10	0.000302

Pollutant	Total Emissions (TONs)
PM 2.5	0.000298
Pb	0.000000
NH_3	0.000003
CO_2e	3.2

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

RS1 LAUNCH PROGRAM OPERATIONAL ACTIVITIES

4.1 Building Construction Phase

4.1.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 7
Start Quarter: 1
Start Year: 2021

- Phase Duration
Number of Month: 0
Number of Days: 3

4.1.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (ft^2): 1500
Height of Building (ft): 1
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Off-Highway Trucks Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (mile): 0

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (mile): 32.8

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (mile): 0

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

4.1.3 Building Construction Phase Emission Factor(s)

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

RS1 LAUNCH PROGRAM OPERATIONAL ACTIVITIES

- Construction Exhaust Emission Factors (lb/hour)

Off-Highway Trucks Composite								
	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CH_4	CO_2e
Emission Factors	0.1369	0.0026	0.7382	0.5475	0.0246	0.0246	0.0123	260.39

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.114	000.003	000.084	000.992	000.047	000.020		000.023	00298.845
LDGT	000.288	000.004	000.178	001.871	000.048	000.021		000.024	00379.038
HDGV	000.600	000.011	001.339	008.875	000.183	000.078		000.045	01128.468
LDDV	000.026	000.003	000.125	000.281	000.060	000.032		000.008	00271.718
LDDT	000.094	000.003	000.533	000.594	000.112	000.082		000.008	00364.857
HDDV	000.194	000.014	004.796	001.133	000.211	000.117		000.028	01514.699
MC	004.452	000.002	001.252	023.791	000.019	000.009		000.054	00187.891

4.1.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)

1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase
$VMT_{VT} = BA * BH * (0.38 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

5. Personnel

5.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Santa Barbara
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Worker Commute

- Activity Description:

- Activity Start Date
Start Month: 7
Start Year: 2021

- Activity End Date
Indefinite: No

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

RS1 LAUNCH PROGRAM OPERATIONAL ACTIVITIES

End Month: 7
End Year: 2021

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.004486
SO_x	0.000053
NO_x	0.002438
CO	0.029094
PM 10	0.000703

Pollutant	Total Emissions (TONs)
PM 2.5	0.000306
Pb	0.000000
NH_3	0.000360
CO_2e	5.1

5.2 Personnel Assumptions

- Number of Personnel
Active Duty Personnel: 0
Civilian Personnel: 0
Support Contractor Personnel: 19
Air National Guard (ANG) Personnel: 0
Reserve Personnel: 0

- Default Settings Used: No

- Average Personnel Round Trip Commute (mile): 32.8

- Personnel Work Schedule
Active Duty Personnel: 5 Days Per Week
Civilian Personnel: 5 Days Per Week
Support Contractor Personnel: 5 Days Per Week
Air National Guard (ANG) Personnel: 4 Days Per Week
Reserve Personnel: 4 Days Per Month

5.3 Personnel On Road Vehicle Mixture

- On Road Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	37.55	60.32	0	0.03	0.2	0	1.9
GOVs	54.49	37.73	4.67	0	0	3.11	0

5.4 Personnel Emission Factor(s)

- On Road Vehicle Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.114	000.003	000.084	000.992	000.047	000.020		000.023	00298.845
LDGT	000.288	000.004	000.178	001.871	000.048	000.021		000.024	00379.038
HDGV	000.600	000.011	001.339	008.875	000.183	000.078		000.045	01128.468
LDDV	000.026	000.003	000.125	000.281	000.060	000.032		000.008	00271.718
LDDT	000.094	000.003	000.533	000.594	000.112	000.082		000.008	00364.857
HDDV	000.194	000.014	004.796	001.133	000.211	000.117		000.028	01514.699
MC	004.452	000.002	001.252	023.791	000.019	000.009		000.054	00187.891

5.5 Personnel Formula(s)

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

RS1 LAUNCH PROGRAM OPERATIONAL ACTIVITIES

- Personnel Vehicle Miles Travel for Work Days per Year
$VMT_P = NP * WD * AC$

VMT_P: Personnel Vehicle Miles Travel (miles/year)
NP: Number of Personnel
WD: Work Days per Year
AC: Average Commute (miles)

- Total Vehicle Miles Travel per Year
$VMT_{Total} = VMT_{AD} + VMT_C + VMT_{SC} + VMT_{ANG} + VMT_{AFRC}$

VMT_{Total}: Total Vehicle Miles Travel (miles)
VMT_{AD}: Active Duty Personnel Vehicle Miles Travel (miles)
VMT_C: Civilian Personnel Vehicle Miles Travel (miles)
VMT_{SC}: Support Contractor Personnel Vehicle Miles Travel (miles)
VMT_{ANG}: Air National Guard Personnel Vehicle Miles Travel (miles)
VMT_{AFRC}: Reserve Personnel Vehicle Miles Travel (miles)

- Vehicle Emissions per Year
$V_{POL} = (VMT_{Total} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{Total}: Total Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Personnel On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Appendix G

Sound – Background & Regulatory Requirements

G.1 Definition of Sound and Characteristics

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water, and are sensed by the human ear. Noise is defined as unwanted or annoying sound that interferes with or disrupts normal human activities. Although continuous and extended exposure to high noise levels (e.g., through occupational exposure) can cause hearing loss, the principal human response to noise is annoyance. The response of different individuals to similar noise events is diverse and is influenced by the type of noise, perceived importance of the noise, its appropriateness in the setting, time of day, type of activity during which the noise occurs, and sensitivity of the individual.

The perception and evaluation of sound involves three basic physical characteristics:

- Intensity – the acoustic energy, which is expressed in terms of sound pressure, in decibels (dB)
- Frequency – the number of cycles per second the air vibrates, in Hertz (Hz)
- Duration – the length of time the sound can be detected

Noise is defined as unwanted or annoying sound that interferes with or disrupts normal human activities. The primary human response to noise is annoyance, which is defined by the United States (U.S.) Environmental Protection Agency (EPA) as any negative subjective reaction on the part of an individual or group (U.S. Environmental Protection Agency 1974). The response of different individuals to similar noise events is diverse and is influenced by the type of noise, perceived importance of the noise, its appropriateness in the setting, time of day, type of activity during which the noise occurs, and sensitivity of the individual. While aircraft are not the only sources of noise in an urban or suburban environment, they are readily identified by their noise output.

G.2 Sound Intensity and Weighting

The loudest sounds that can be detected comfortably by the human ear have intensities that are a trillion times higher than those of sounds that can barely be heard. Because of this vast range, it is unwieldy to use a linear scale to represent the intensity of sound. As a result, a logarithmic unit known as the decibel represents the intensity or amplitude of a sound, also referred to as the sound level. The dB scale simplifies the broad range of encountered sound pressures detected by the human ear and allows the measurement of sound to be more easily understood. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 and 140 dB are felt as pain (Berglund 1995).

All sounds have a spectral content, which means their magnitude or level changes with frequency, where frequency is measured in cycles per second or Hz. To mimic the human ear's non-linear sensitivity and perception of different frequencies of sound, the spectral content is weighted. For example, environmental noise measurements are usually on an "A-weighted" scale, which places less weight on very low and very high frequencies in order to replicate human hearing sensitivity. The general range of human hearing is from 20 to 20,000 cycles per second, or Hz; humans hear best in the range of 1,000–4,000 Hz. A-weighting is a frequency-dependent adjustment of sound level used to approximate the

natural range and sensitivity of the human auditory system. **Error! Reference source not found.** provides a comparison of how the human ear perceives changes in loudness on the logarithmic scale.

Table G-1: Subjective Responses to Changes in A-Weighted Decibels

Change	Change in Perceived Loudness
3 dB	Barely perceptible
5 dB	Quite noticeable
10 dB	Dramatic – twice or half as loud
20 dB	Striking – fourfold change

Note: dB = decibel(s)

Error! Reference source not found. provides a chart of A-weighted sound levels from typical noise sources (Cowan 1994; Harris 1979). Some noise sources (e.g., air conditioner, vacuum cleaner) are continuous sounds that maintain a constant sound level for some period of time. Other sources are time-varying events and reach a maximum sound level during an event, such as a vehicle passing by. Sounds can also be part of the ambient environment (e.g., urban daytime, urban nighttime) and are described by averages taken over extended periods. A variety of noise metrics has been developed to describe noise, particularly aircraft noise, in different contexts and over different time periods.

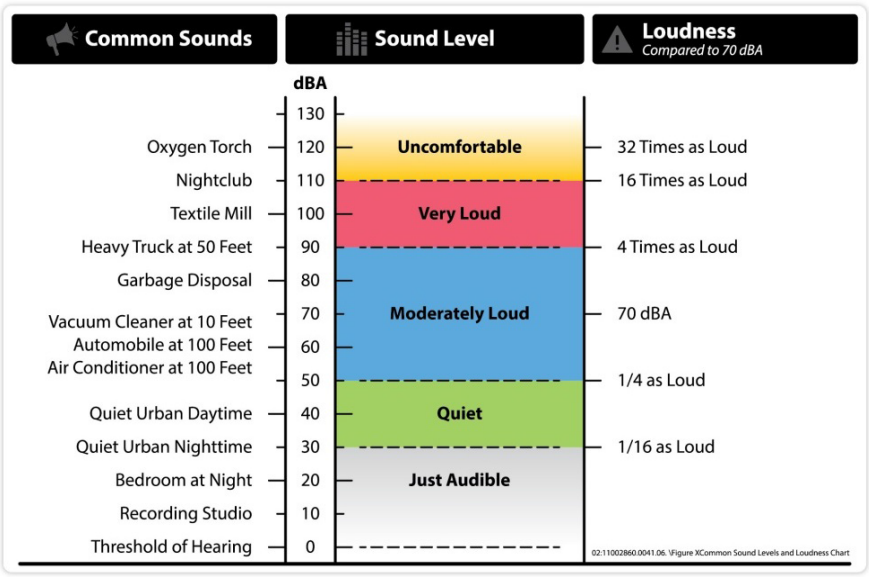

Figure G-1: A-Weighted Sound Levels from Typical Sources

G.3 Sound Metrics

A "metric" is a system for measuring or quantifying a particular characteristic of a subject. Since noise is a complex physical phenomenon, different noise metrics help to quantify the noise environment. The Day-Night Average Sound Level (DNL) metric is the energy-averaged sound level measured over a 24-hour period, with a 10 dB nighttime adjustment to account for heightened human sensitivity to noise when ambient sound levels are low, such as when sleep disturbance could occur. DNL does not represent a sound level heard at any given time but instead represents long-term exposure. Scientific studies have found good correlation between the percentages of groups of people highly annoyed and the level of their

average noise exposure measured in DNL (U.S. Department of the Navy et al. 1978; U.S. Environmental Protection Agency 1999). As such, DNL has been determined to be a reliable measure of long-term community annoyance with noise and has become the standard noise metric used by the U.S. Department of Housing and Urban Development, Federal Aviation Administration (FAA), EPA, and Department of Defense (DoD) for assessing noise exposure.

DNL values are average quantities, mathematically representing the continuous sound level (L_{eq1H}) that would be present if all of the variations in sound level that occur over a 24-hour period were averaged to have the same total sound energy. The DNL metric quantifies the total sound energy received and is therefore a cumulative measure, but it does not provide specific information on the number of noise events or the individual sound levels that occur during the 24-hour day. The DNL metric also adds an additional 10 dB to nighttime (10:00 p.m. to 7:00 a.m., also known as “acoustic night”) sound levels to account for heightened human sensitivity to noise when ambient sound levels are low, such as when sleep disturbance could occur.

While DNL is the primary metric used to determine noise impacts, California has adopted the use of the Community Noise Equivalent Level (CNEL). While CNEL, like DNL, adds a ten times weighting (equivalent to a 10 dBA [A-weighted decibel] "penalty") to each operation between 10:00 p.m. and 7:00 a.m., CNEL also adds a three times weighting (equivalent to a 4.77 dBA penalty) for each operation during evening hours (7:00 p.m. to 10:00 p.m.).

Of note is that methods for quantifying noise depend on the potential impacts in question and on the type of noise. Another useful noise measurement in determining the effects of noise is the 1-hour average sound level, abbreviated L_{eq1H}. The L_{eq1H} can be thought of in terms of equivalent sound; that is, if a L_{eq1H} is 45.3 dB, this is what would be measured if a sound measurement device were placed in a sound field of 45.3 dB for 1 hour. The L_{eq1H} is usually A weighted unless specified otherwise (dBA). 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 as well as humans.

G.4 Sound Propagation

In an ideal setting in which sound propagates away from a point source without any outside influence (e.g., a barrier reflecting or attenuating the sound), sound energy radiates uniformly outward in all directions from the source in a pattern referred to as spherical spreading. As sound energy propagates away from the sound source, both the sound level and frequency change. For each doubling of distance from the source, the sound level attenuates (or drops off) at a rate of 6 dBA.

In a real-world setting, a number of factors can influence how sound propagates in the environment; the ideal case of spherical spreading is at best only an approximation of attenuation with distance. Wind has been shown to be the single most important meteorological factor within approximately 500 feet (152 meters) of the sound source, while vertical air temperature gradients are more important in sound propagation over longer distances. Other atmospheric conditions such as air temperature, humidity, and turbulence also can have a major effect on received sound levels.

Whether natural or manmade, a large object or barrier in the path between a sound source and a receptor can attenuate sound levels substantially. The impact of this shielding depends on the size and material of the object as well as the frequency content of the sound source. Natural terrain, buildings, and walls can serve as noise barriers in which attenuation of 5–10 dB is often not noticeable.

G.5 Noise Control Act

The Noise Control Act (NCA) (42 United States Code 4901 et seq.) sought to limit the exposure and disturbance that individuals and communities experience from noise. It focuses on surface transportation and construction sources, particularly near airport environments. The NCA also specifies that performance standards for transportation equipment be established with the assistance of the U.S. Department of Transportation. Section 7 of the NCA regulates sonic booms and gave the FAA regulatory authority after consultation with the EPA. Furthermore, the 1987 Quiet Community amendment gave state and local authorities greater involvement in controlling noise.

G.6 Ambient Sound Guidance Documents

Ambient sound standards regulate ambient sound levels through time-averaged sound limits. Sound standards for land use compatibility established by DoD and civilian jurisdictions are expressed in terms of the DNL.

G.7 Federal Interagency Committee on Urban Noise Criteria

The federal government has established suggested land use compatibility criteria for different noise zones. However, land use compatibility with differing noise levels is regulated at the local level (Federal Interagency Committee on Urban Noise 1980). Residential areas and schools are considered compatible where the DNL is less than or equal to 65 dBA, and outdoor recreational activities are compatible with noise levels less than or equal to 70 dBA. Furthermore, parks are compatible with noise levels less than or equal to 75 dBA based on Land Use Guidelines.

G.8 U.S. Environmental Protection Agency Noise Standards

The level of environmental noise at which no measurable hearing loss would be expected to occur over a lifetime, as identified by the EPA, is a 24-hour exposure level of 70 dB (U.S. Environmental Protection Agency 1974).

G.9 Bibliography

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Harris, C. 1979. Handbook of Noise Control. New York, NY: McGraw-Hill.

U.S. Department of the Navy, U.S. Department of the Air Force, and U.S. Department of the Army. 1978. Environmental Protection: Planning in the Noise Environment. (AFM 19-10 TM 5-803-2). Washington, DC.

APPENDIX H
Species List

Table H-1. Plant species observed during field surveys in the Biological Survey Area.

Family	Species Name	Common Name	General Status
Aizoaceae	*Carpobrotus spp.*	Iceplant	Non-native
Aizoaceae	*Conicosa pugioniformis*	Narrow leaved iceplant	Non-native
Asteraceae	*Artemisia californica*	California sagebrush	Native
Asteraceae	*Baccharis pilularis*	Coyote brush	Native
Asteraceae	*Centaurea melitensis*	Tacolote	Non-native
Asteraceae	*Corethrogyne filaginifolia*	Common sand aster	Native
Asteraceae	*Deinandra increscens increscens*	Grassland tarweed	Native
Asteraceae	*Ericameria ericoides*	Mock heather	Native
Asteraceae	*Pseudognaphalium californicum*	California everlasting	Native
Asteraceae	*Pseudognaphalium luteoalbum*	Cudweed	Non-native
Boraginaceae	*Amsinkia* sp.	Fiddleneck	Native
Boraginaceae	*Cryptantha intermedia*	Common cryptantha	Native
Brassicaceae	*Descurainia pinnata*	Western tansy mustard	Native
Brassicaceae	*Hirschfeldia incana*	Summer mustard	Non-native
Chenopodiaceae	*Atriplex semibaccata*	Australian saltbush	Non-native
Chenopodiaceae	*Chenopodium californicum*	California goosefoot	Native
Crassulaceae	*Dudleya caespitosa*	Coast dudleya	Native
Cucurbitaceae	*Mara fabaceae*	California manroot	Native
Ericaceae	*Arctostaphylos purissima*	La Purisima manzanita	Native
Fabaceae	*Astragalus nuttallii*	Nuttall's milkvetch	Native
Fabaceae	*Acmispon glaber*	Deer weed	Native
Fabaceae	*Lupinus chamissonis*	Dune bush lupine	Native
Fabaceae	*Medicago polymorpha*	Bur clover	Non-native
Geraniaceae	*Erodium cicutarium*	Red stemmed filaree	Non-native
Lamiaceae	*Salvia melifera*	Black sage	Native
Myrsinaceae	*Lysumachia arvensis*	Scarlet pimpernel	Non-native
Oxalidaceae	*Oxalis pes-caprae*	Bermuda buttercup	Non-native
Plantaginaceae	*Plantago cornonopus*	Cutleaf plantain	Non-native
Poaceae	*Ehrharta calycina*	Veldt grass	Non-native
Poaceae	*Festuca myuros*	Rattail fescue	Non-native
Poaceae	*Pennisetum clandestinum*	Kikuyu grass	Non-native
Polygonaceae	*Eriogonum parvifolium*	Seacliff buckwheat	Native
Polygonaceae	*Rumex crispus*	Curly dock	Non-native
Rhamnaceae	*Frangula californica*	Coffee berry	Native
Rubiaceae	*Galium porrigens*	Climbing bedstraw	Native

Table H-2. Reptile species observed during field surveys in the Biological Survey Area.

Species Name	Common Name	Status
Crotalus oreganus helleri	Southern pacific rattlesnake	Native
Sceloporus occidentalis	Western fence lizard	Native

Table H-3. Bird species observed during field surveys in the Biological Survey Area.

Species Name	Common Name	General Status	Occurrence
Cathartes aura	Turkey vulture	Native	Breeding
Polioptila caerulea	Blue-gray gnatcatcher	Native	Breeding
Sayornis nigricans	Black phoebe	Native	Breeding
Sialia mexicana	Western bluebird	Native	Breeding
Sturnella neglecta	Western meadowlark	Native	Breeding
Zonotrichia leucophrys	White-crowned sparrow	Native	Breeding

Table H-4. Mammal species observed during field surveys in the Biological Survey Area.

Species Name	Common Name	General Status
Canis latrans	Coyote	Native
Chaetodipus californicus	California pocket mouse	Native
Lepus californicus	Black-tailed jackrabbit	Native
Odocoileus hemionus	Mule deer	Native
Otospermophilus beecheyi	California ground squirrel	Native
Sylvilagus bachmani	Brush rabbit	Native
Thomommys bottae	Botta's pocket gopher	Native

Table H-5. Invertebrate species observed during field surveys in the Biological Survey Area.

Order	Species Name	Common Name	General Status
Snails and Slugs			
Stylommatophora	*Helminthoplypta fieldi*	Surf shoulderband snail	Native
Stylommatophora	*Paralaoma servilis*	Pinhead spot snail	Native
Stylommatophora	*Vertigo californica*	California vertigo snail	Native
Arachnids			
Araneae	*Latrodectus hesperus*	Western black widow	Native
Insects			
Blattodea	*Reticulitermes* sp.	Subterranean termite	Native
Coleoptera	*Eleodes* sp.	Darkling beetle	Native
Dermaptera	*Forficula auricularia*	European earwig	Non-native
Diptera	*Ablautus vanduzeei*	Robber fly	Native
Hemiptera	*Largus californicus*	California bordered plant bug	Native
Hymenoptera	*Bombus vosnesenskii*	Yellow-faced bumbe bee	Native
Hymenoptera	*Camponotus vicinus*	Bicolored carpenter ant	Native
Hymenoptera	*Crematogaster hespera*	Acrobat ant	Native
Hymenoptera	*Dorymyrmex insanus*	Black pyramid ant	Native
Hymenoptera	*Formica lasioides*	Field ant	Native
Hymenoptera	*Formica neogagates*	New world black ant	Native
Hymenoptera	*Tapinoma sessile*	Odorous house ant	Native

Appendix I

Terrestrial Biological Resources

I.1 Description of Vegetation Resources

I.1.1 Central Dune Scrub

This vegetation type occurs in undeveloped portions of the survey area on loose sandy soils. Dominant native species include medium and low stature soft woody shrubs such as dune lupine (*Lupinus chamissonis*), California sagebrush, and mock heather (*Ericameria ericoides*). Seacliff buckwheat (*Eriogonum parvifolium*) and deerweed (*Acmispon glaber*) are common constituents as well. This vegetation type also supports many of the uncommon or geographically restricted plant species observed or potentially occurring in the survey area including ocean bluff milk-vetch (*Astragalus nuttallii* var. *nuttallii*), coastal goosefoot (*Chenopodium littoreum*), and California spineflower (*Mucronea californica*).

Shrub cover in this vegetation type is naturally sparse and it is vulnerable to invasion by non-native species. Within the Terrestrial Biological Survey Area, most of the Central Dune Scrub is moderately to heavily infested with veldt grass (*Ehrharta calycina*), a non-native perennial bunch grass. Where veldt grass is the overwhelming dominant species, the vegetation type was classed as Non-Native Grasses/Central Dune Scrub. Where iceplant (*Carpobrotus* spp.) is also a dominant component, the vegetation type was classed as Iceplant – Herb/Central Dune Scrub. Areas with relatively little invasive presence were classed as Central Dune Scrub, and areas where native shrubs co-occurred with iceplant and where native cover exceeded iceplant cover, were classed as Central Dune Scrub/Iceplant.

I.1.2 Developed

Developed areas occur within the LC 576-E fence line and access road. Developed areas are primarily covered by pavement or other man-made surfaces. Due to lack of recent maintenance many of these surfaces have cracked or otherwise degraded. Native Central Dune Scrub species as well as non-native species, such as iceplant, have colonized gaps in pavement.

I.1.3 Disturbed/Cleared

This vegetation type was assigned to areas that are currently or have historically received regular intense disturbance resulting in a predominantly unvegetated areas often with compacted soils. Within the Terrestrial Biological Survey Area, this included unpaved drives and areas bordering existing development within LC 576-E. Native Central Dune Scrub species as well as non-native species such as iceplant and weedy species such as bur clover (*Medicago polymorpha*) and non-native grasses such as rattail fescue (*Festuca myuros*) are present in various densities.

I.2 Terrestrial Special Status Species

I.2.1 California Red-Legged Frog (Federally Threatened Species)

I.2.1.1 Status

The United States Fish and Wildlife Service (UFSWS) listed the California red-legged frog (*Rana draytonii*; CRLF) as threatened on 23 May 1996 (61 Federal Register [FR] 25813-25833). In 2002, USFWS issued a Recovery Plan to stabilize and restore CRLF populations (USFWS 2002).

I.2.1.2 Life History

The CRLF is a member of the family Ranidae and is California's largest native frog. In order to breed, CRLF require water bodies with sufficient hydroperiods and compatible salinity levels to accommodate larval and egg development. Breeding typically takes place from November through April with most egg deposition occurring in March. Eggs require 7 to 28 days, depending on water temperature, to develop into tadpoles (Cook 1997). Tadpoles typically require 11 to 20 weeks to develop into terrestrial frogs (USFWS 2002), although some individuals may overwinter in the tadpole stage (Fellers et al. 2001).

Adult CRLF have been documented traveling distances of over 1 mile (1.6 km) during the wet season and spending considerable time in terrestrial riparian vegetation. Christopher (2018) found that 90 percent of the CRLF observations at Vandenberg Air Force Base within the dry season occurred within 197 ft (60 m) of riparian or other aquatic habitats. It is thought that riparian vegetation provides good foraging habitat, as well as good dispersal corridors, due to canopy cover and presence of adequate moisture (USFWS 2002).

Habitat loss and degradation, combined with over-exploitation and introduction of exotic predators, were important factors in the decline of CRLF in the early to mid-1900s. Continuing threats to CRLF include direct habitat loss due to stream alteration and loss of aquatic habitat and drought, and indirect effects of expanding urbanization, competition or predation from non-native species including the bullfrog (*Lithobates catesbeianus*), catfish (*Ictalurus* spp.), bass (*Micropterus* spp.), mosquitofish (*Gambusia affinis*), and crayfish (*Procambarus clarkii*). Chytrid fungus (*Batrachochytrium dendrobatidis*) is a waterborne fungus that can decimate amphibian populations and is considered a threat to CRLF populations.

I.2.2 California Least Tern (Federally Endangered Species)

I.2.2.1 Status

The USFWS listed the California least tern (*Sternula antillarum browni*; LETE) as federally endangered on 13 October 1970 (35 FR 16047–16048). The USFWS published a Recovery Plan for the species in 1985 (USFWS 1985).

I.2.2.2 Life History

The LETE is the smallest of the North American terns and is found along the Pacific Coast of California, from San Francisco southward to Baja California. It has a distinctive black cap with stripes running across the eyes to the beak. The upperparts are gray and the underparts are white.

The California populations are localized and increasingly fragmented, due to coastal development resulting in habitat loss. LETEs are migratory and winter along the Pacific coast of southern Mexico and the Gulf of California. They usually arrive at breeding grounds by the last week of April and return to wintering grounds in August. This species nests in colonies on relatively open beaches kept free of vegetation by natural scouring from tidal or wind action.

The total population of LETE increased from less than 700 pairs circa 1985 to greater than 7,000 pairs circa 2006. The population has since declined and remains steady at 4,000 to 5,000 pairs since 2006. The majority of the population is south of Point Conception (Robinette et al 2016).

I.2.3 Marbled Murrelet (Federally Threatened Species)

I.2.3.1 Status

The USFWS listed the marbled murrelet (MAMU) as threatened on 1 October 1992 (57 FR 45328) and published a Recovery Plan for the species in 1997 (USFWS 1997). The USFWS completed a 5-year review of the species in 2009 (USFWS 2009).

I.2.3.2 Life History

The MAMU is a small seabird that breeds along the Pacific coast, foraging in nearshore marine waters on small fish and invertebrates, and flying inland to breed. The species requires nearshore marine habitats with abundant prey (fish and invertebrates). Among alcids, the species is unique because it uses old-growth coniferous forests and mature trees for nesting (USFWS 1997). MAMU are wing-pursuit divers. Although little has been known about the MAMU movement and home range, more information is becoming available. The first MAMU nest was not documented until 1974. Since then, the MAMU's home range has been observed as 655 square kilometers (km^2) for non-nesters and 240 km^2 for nesters within California. In addition, at-sea resting areas have also been observed an average of 5.1 km from the mouths of drainages. MAMU spend nighttime hours resting in the ocean at these areas and commute to foraging areas during the day. Nests have been observed from sea level to 5,020 ft. (USFWS 2009). MAMU range from Alaska to California and may occur as far south as Baja California. Western Snowy Plover (Federally Threatened Species)

I.2.4 Western Snowy Plover (Federally Threatened Species)

I.2.4.1 Status

The USFWS listed the Pacific coast population of the western snowy plover (*Charadrius nivosus*; SNPL) as federally threatened in March of 1993 (58 FR 12864–12874).

I.2.4.2 Life History

The SNPL is a small shorebird with pale tan back, white underparts, and dark patches on the sides of the neck reaching around to the top of the chest. The Pacific coast population of snowy plovers is limited to individuals that nest adjacent to tidal waters. The population's range extends from Southern Washington to Baja California, Mexico.

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Appendix J

Marine Species

J.1 Southern Sea Otter (Federally Threatened Species)

J.1.1 Status

The United States Fish and Wildlife Service (USFWS) listed the Southern sea otter as federally threatened on 14 January 1977 (42 Federal Register [FR] 2965) and published a Recovery Plan in 2003 (USFWS 2003). The USWFS completed a 5-year review of the species in 2015 (USFWS 2015).

J.1.2 Life History

The Southern sea otter is the smallest species of marine mammal in North America. It inhabits the nearshore marine environments of California from San Mateo County to Santa Barbara County with a small geographically isolated population around San Nicolas Island. On occasion, Southern sea otters have been observed beyond these limits and have been documented as far south as Baja, Mexico (USFWS 2015).

This species breeds and gives birth year round and pups are dependent for 120–280 days (average 166 days; Riedman & Estes 1990). Sea otters are opportunistic foragers known to eat mostly abalones, sea urchins, crabs, and clams. They play a key ecological role in kelp bed communities by controlling sea urchin grazing.

J.2 California Sea Lion

The California sea lion (*Zalophus californianus*) is not listed under the Endangered Species Act (ESA), and the population has been designated as the United States (U.S.) stock by National Oceanic and Atmospheric Association (NOAA) Fisheries. Typically, during the summer, California sea lions congregate near rookery islands and specific open-water areas. The primary rookeries off the coast of the United States are on San Nicolas, San Miguel, Santa Barbara, and San Clemente Islands (Le Boeuf & Bonnell 1980; Lowry et al. 1992; Carretta et al. 2000; Lowry & Forney 2005; Lowry et al. 2017). Haulout sites are also found on Richardson Rock, Santa Catalina Island, Santa Cruz Island, and Santa Rosa Island in the Southern California Bight (Le Boeuf 2002; Lowry et al. 2017).

In the nonbreeding season, beginning in late summer, adult and subadult males migrate northward along the coast of California to Washington and return south the following spring (Lowry & Forney 2005; Laake 2017). Females and juveniles also disperse somewhat but tend to stay in the Southern California area, although north and west of the Channel Islands (Melin & DeLong 2000; Lowry & Forney 2005; Thomas et al. 2010). Tagging results showed that lactating females foraging along the coast would travel as far north as Monterey Bay and offshore to the 1,000 meter isobath (Melin & DeLong 2000; Melin et al. 2008; Henkel & Harvey 2008; Kuhn & Costa 2014; McHuron et al. 2017). There is a general distribution shift northwest in fall and southeast during winter and spring, probably in response to changes in prey availability (DeLong et al. 2017a; DeLong et al. 2017b; Lowry et al. 2017). California sea lions are usually found in waters over the continental shelf and slope; they are also known to occupy locations far offshore in deep, oceanic waters, such as Guadalupe Island and Alijos Rocks off the Baja Peninsula, Mexico (Zavala-Gonzalez & Mellink 2000; Jefferson et al. 2008; Melin et al. 2008; Urrutia & Dziendzielewski 2012). California sea lions are the most frequently sighted pinnipeds offshore of Southern California during the spring, and peak abundance is during the May through August breeding season (Green et al. 1992; Keiper et al. 2005; Lowry

et al. 2017). Overall, the California sea lion population is abundant and has been generally increasing (Jefferson et al. 2008; Carretta et al. 2010; Lowry et al. 2017; Carretta et al. 2020). Using count and resighting data gathered between 1975 and 2015, NOAA Fisheries researchers showed that California sea lion population growth was above the maximum net productivity level and within the range of the optimal sustainable population (Laake et al. 2018).

J.3 Northern Fur Seal

The California stock of Northern fur seal (*Callorhinus ursinus*) that is present in the Region of Influence (ROI) is not considered depleted under the Marine Mammal Protection Act and is not listed under the ESA (Carretta et al. 2020). Animals from the California stock may remain in or near San Miguel Island throughout the year but after the breeding season in November generally move to the North Pacific in waters off Canada, Washington, Oregon, and Northern California to forage (Koski et al. 1998; Melin et al. 2012; Sterling et al. 2014; Adams et al. 2014; Lowry et al. 2017; Zeppelin et al. 2019). Migrating seals and those along the U.S. West Coast are typically found over the edge of the continental shelf and slope (Kenyon & Wilke 1953; Sterling & Ream 2004; Gentry 2009; Adams et al. 2014). Their offshore distribution has been correlated with oceanographic features (e.g., eddies and fronts) where prey may be concentrated (Ream et al. 2005; Sterling et al. 2014). The abundance of northern fur seals at San Miguel Island, the primary rookery for the California stock, has increased steadily over the past four decades, except for two severe declines associated with El Niño-southern Oscillation events in 1993 and 1998 (DeLong & Stewart 1991; Melin et al. 2006; Melin et al. 2008; Orr et al. 2012; Carretta et al. 2020).

J.4 Guadalupe Fur Seal (Federally Threatened Species)

J.4.1 Status

The Guadalupe fur seal is listed as threatened under the ESA and depleted under the Marine Mammal Protection Act throughout its range (Carretta et al. 2020). The population has been designated the Mexico to California stock (Carretta et al. 2020).

J.4.2 Life History

Guadalupe fur seals are most common at their primary breeding ground of Guadalupe Island, Mexico (Melin & DeLong 1999). A second rookery was found in 1997 at the San Benito Islands off the Baja Peninsula, Mexico (Maravilla-Chavez & Lowry 1999; Aurioles-Gamboa et al. 2010; Esperon-Rodriguez & Gallo-Reynoso 2012), and they have also been found in La Paz Bay in the southern Gulf of California (Elorriaga-Verplancken et al. 2016). Satellite tracking data from Guadalupe fur seals tagged at Guadalupe Island have demonstrated movements into the offshore waters between 31 and 186 miles (mi.). (50 and 300 kilometers [km]) from the U.S. West Coast (Norris et al. 2015; Norris 2017b, 2017a; Norris & Elorriaga-Verplancken 2020). Satellite tags have also documented the movement of females without pups at least as far as 800 mi. (1,300 km) north of Guadalupe Island (approximately Point Cabrillo in Mendocino County, California) (Norris 2019). Adult males have not been tagged but typically undertake some form of seasonal movement either after the breeding season or during the winter, when prey availability is reduced (Arnould 2009). The most recent stock assessment reports reflect the population of Guadalupe fur seals from a survey in 2010, which indicated a total estimated population size of approximately 20,000 animals and an average annual growth rate of 10.3 percent (Carretta et al. 2019). The ongoing Unusual Mortality Event involving Guadalupe fur seals (National Oceanic and Atmospheric Administration 2018; National Marine Fisheries Service 2019a) is likely to have impacted the recent population trend (Elorriaga-Verplancken et al. 2016; Ortega-Ortiz et al. 2019). However, based on counts off Mexico in 2018 at Guadalupe Island and the San Benito Archipelago, the minimum population estimate was 29,747

Guadalupe fur seals at those locations (Norris 2019). Valdivia et al. (2019) has noted that since being ESA-listed in 1985, the population of the Guadalupe fur seal increased about nine-fold at a rate of approximately 15 percent per year. The dispersion of Guadalupe fur seal from rookeries off Mexico may be an indicator of potential species recovery (Ortega-Ortiz et al. 2019).

J.5 Steller Sea Lion

Steller sea lions (*Eumetopias jubatus*) range along the north Pacific from northern Japan to California (Perrin et al. 2009), with centers of abundance and distribution in the Gulf of Alaska and Aleutian Islands (Muto et al. 2020). There have also been reports of Steller sea lions in waters off Mexico as far south as the various islands off the port of Manzanillo in Colima, Mexico (Gallo-Reynoso et al. 2020). The Eastern U.S. stock (or DPS) of Steller sea lion is defined as the population occurring east of 144°W longitude, and it is not listed as threatened or endangered under the ESA (NOAA Fisheries 2016; Muto et al. 2020). The locations and distribution of the Eastern population's breeding sites along the U.S. Pacific coast have shifted northward, with fewer breeding sites in Southern California and more sites established in Washington and Southeast Alaska (Pitcher et al. 2007; Wiles 2015).

San Miguel Island and Santa Rosa Island were, in the past, the southernmost rookeries and haulouts for the Steller sea lions, but their range contracted northward in the 20th century, and now Año Nuevo Island off Central California is currently the southernmost rookery. Steller sea lions pups were known to be born at San Miguel Island up until 1981 (Pitcher et al. 2007; NOAA Fisheries 2008; Muto et al. 2020), and so, as the population continues to increase, it is anticipated that the Steller sea lions may re-establish a breeding colony on San Miguel Island in the future. In the Channel Islands and vicinity and despite the species' general absence from the area, a consistent but small number of Steller sea lions (one to two individuals at a time) have been sighted in recent years. Approximately one to two adult and subadult male Steller sea lions have been seen hauled out at San Miguel Island each year during the fall and winter over the last decade, and adult and subadult males have occasionally been seen on rocks north of Northwest Point at San Miguel Island during the part of the summer in the past few years (Delong 2019). Aerial surveys for pinnipeds in the Channel Islands from 2011 to 2015 encountered a single Steller sea lion at San Nicolas Island in 2013 (Lowry et al. 2017). A lone adult female who gave birth to and reared a pup on San Miguel Island in the summer of 2017 (Delong 2019).

Based on a 2017 survey, the Eastern U.S. stock has increased at a rate of approximately 4.25 percent per year over the last 40 years (Muto et al. 2020), but it remains uncertain how many and what trend there will be for Steller sea lions that are occasionally present in small numbers off Central and Southern California.

J.6 Harbor Seal

The harbor seal (*Phoca vitulina*) is not listed under the ESA and those present in the ROI have been assigned to the California stock of harbor seals (Carretta et al. 2020).

Harbor seals are generally not present in the deep waters of the open ocean, are rarely found more than 20 km from shore, and frequently occupy bays, estuaries, and inlets (Baird 2001; Harvey & Goley 2011; Jefferson et al. 2014). Data from 180 radio tagged harbor seals in California indicated most remained within 10 km of the location where they were captured and tagged (Harvey & Goley 2011).

Harbor seals generally haul out in greatest numbers at low tides and during the afternoon, when it is usually warmest. The period from late May to early June corresponds with the peak molt season when the maximum number of harbor seals are onshore (Lowry et al. 2017). The most recent (2012) statewide

survey of California harbor seal rookeries has indicated that in the Channel Islands the count has been stable or trending as a slight increase since 1995 (Carretta et al. 2020).

J.7 Northern Elephant Seal

The northern elephant seal (*Mirounga angustirostris*) is not listed under the ESA. There are two distinct populations of northern elephant seals: one that breeds in the Baja Peninsula, Mexico; and a population that breeds in California (Garcia-Aguilar et al. 2018). NOAA Fisheries considers northern elephant seals in the ROI to be from the California Breeding stock, although elephant seals from the Baja Peninsula, Mexico, frequently migrate through the ROI (Aurioles-Gamboa & Camacho-Rios 2007; Carretta et al. 2020). Northern elephant seals spend little time nearshore and migrate four times a year as they travel to and from breeding/pupping and molting areas, spending more than 80 percent of their annual cycle at sea (Robinson et al. 2012; Lowry et al. 2014; Lowry et al. 2017; Carretta et al. 2020). Peak abundance in California is during the January–February breeding season and during molting season from April to July (Lowry et al. 2014; Lowry et al. 2017). As presented in the 2019 Stock Assessment Report (Carretta et al. 2020), the population in California continues to increase Lowry et al. (2014).

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Appendix K

Water Resources

K.1 Regulatory Setting

K.1.1 Surface Water

The Clean Water Act (CWA) establishes the structure for regulating discharges of pollutants in waters of the United States. The CWA mandates the National Pollutant Discharge Elimination System (NPDES) program, which requires a permit for the discharge of any pollutant to waters of the United States from point and non-point sources. Point sources include wastewater from any discernible confined and discrete conveyances from which pollutants are or may be discharged. Non-point sources include stormwater runoff from industrial, municipal, and construction sites. The CWA and implementing United States Environmental Protection Agency (EPA) regulations provide the authority and framework for state regulations. In California, the State Water Resources Control Board (SWRCB) administers the NPDES program through the California Porter-Cologne Water Quality Control Act/California Water Code (CWC). The SWRCB and the Regional Water Quality Control Board (RWQCB) administers the NPDES Program for industrial activities, municipalities, and construction activities through General Permits, although certain discharges are authorized and certain discharges require individual permits.

The CWC provides a framework for establishing beneficial uses of water resources and the development of local water quality objectives to protect these beneficial uses. The Central Coast Water Quality Control Plan (Basin Plan) assigns beneficial uses to water bodies and provides local water quality objectives to protect these beneficial uses. The California Ocean Plan provides water quality objectives to protect ocean water quality.

K.1.2 Groundwater

The Sustainable Groundwater Management Act of 2014 (SGMA), and its subsequent enactment in January 2015 mandate that all California groundwater basins designated as high- or medium-priority by the California Department of Water Resources, be managed under a Groundwater Sustainability Plan (GSP; Section 10720.7 CWC). GSPs are currently being formed for the medium-priority Santa Ynez and San Antonio groundwater basins by their associated groundwater sustainability agencies (GSAs). VSFB is a federal institution that is exempt from mandatory SGMA compliance yet has expressed intent to collaborate and assist with pertinent GSAs in their GSP formations per CWC Section 10720.3.

Appendix L

Cultural Resources Background

L.1 Cultural Setting

The prehistory of California's central coast spans the entire Holocene and may extend back to late Pleistocene times. Excavations on Vandenberg Space Force Base (VSFB) reveal occupations dating to the Pleistocene/Holocene transition, around 11,000 years ago (Lebow et al. 2014, 2015). Occupations during the earliest part of the Holocene (9,000 to 10,000 years) have been identified at several sites on the base (Glassow 1996; Glassow et al. 1990; Lebow et al. 2001; Lebow et al. 2006; Lebow et al. 2007; Stevens 2011). These early 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). Human population density remained low throughout the early and middle Holocene (Lebow et al. 2007). Cultural complexity appears to have increased around 3,000–2,500 years ago (King 1981, 1990). At VSFB, that interval also marks the beginning of increasing human population densities and appears to mark the shift from a foraging to a collecting land-use strategy (Lebow et al. 2006; Lebow et al. 2007). Population densities reached their peak around 600–800 years ago, corresponding to the full emergence of Chumash cultural complexity (Arnold 1992).

People living in the VSFB 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. In the Santa Barbara Channel area, the Chumash people lived in large, densely populated villages and had a culture that "was as elaborate as that of any hunter-gatherer society on earth" (Moratto 1984). Relatively little is known about the Chumash in the VSFB region. Explorers noted that villages were smaller and lacked the formal structure found in the channel area (Greenwood 1978). About five ethnohistoric villages are identified by King (1984) on VSFB, along with another five villages in the general vicinity. Diseases introduced by early Euroamerican explorers, beginning with the maritime voyages of Cabrillo in A.D. 1542–1543, substantially impacted Chumash populations more than 200 years before Spanish occupation began (Erlandson and Bartoy 1995, 1996; Preston 1996). Drastic changes to Chumash lifeways resulted from the Spanish occupation that began with the Portolá expedition in A.D. 1769.

L.2 History

VSFB history is divided into the Mission, Rancho, Anglo-Mexican, Americanization, Regional Culture, and Suburban periods. The Mission Period began with the early Spanish explorers and continued until 1820. Mission La Purísima encompassed the VSFB area. Farming and ranching were the primary economic activities at the Mission. The Rancho Period began in 1820 and continued until 1845. Following secularization in 1834, the Alta California government granted former mission lands to Mexican citizens as ranchos. Cattle ranching was the primary economic activity during this period. 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, but severe droughts during the 1860s decimated cattle herds. The combination of drought and change in government from Mexico to the United States caused substantial changes in land ownership. Sheep ranching and grain farming replaced the old rancho system. Increased population densities characterize the Americanization Period (1880–1915). Beginning in the late 1890s, the railroad provided a more efficient means of shipping and receiving goods and supplies, which in turn increased economic activity. Ranching and farming continued during the early part

of the period of Regional Culture (1915–1945), until property was condemned for Camp Cooke. The Suburban Period (1945–1965) began with the end of World War II. In 1956, the army transferred 64,000 ac. (259 km^2) of North Camp Cooke to the U.S. Air Force, and it was renamed the Cooke Air Force Base. In 1958 the base had its first missile launch, the Thor, and was renamed VSFB (Palmer 1999). The first Intercontinental Ballistic Missile launched from VSFB was the Atlas, on 9 September 1959 (Smallwood and Loetzerich 2020).

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APPENDIX M
Evacuation and Closure Agreement – U.S. Air Force & Santa Barbara County

Negotiated Agreement Under Authority of
Section 2304 (a) (10) of Title 10 U.S.C.

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P.O. BOX 532711
LOS ANGELES, CALIFORNIA 90053-2325

Agreement No. DACA09-3-98-0008
Vandenberg Air Force Base, CA.
Tract No. 422

THIS AGREEMENT, made and entered into as of 1 April by and between the STATE OF CALIFORNIA, whose interest in the real property, hereinafter described as that of owners in fee simple as their separate property for themselves, their heirs, executors, administrators, successors, and assigns, hereinafter referred to as the "Grantor" and the UNITED STATES OF AMERICA, hereinafter referred to as the "Government,"

WITNESSETH THAT:

WHEREAS, the Government is maintaining and operating a Missile Testing Base at Vandenberg Air Force Base, California, and has determined that it is necessary to implement range safety procedures at said Air Force Base in order to provide for safety to persons on the land adjoining, or adjacent to said base;

NOW THEREFORE, the parties hereto, for consideration hereinafter set forth, covenant and agree as follows:

a. That Grantor and the Occupant hereby grant to the Government the following rights:

(1) The right to require the Grantor, the Occupant, their families, employees, lessees and any other person or persons occupying or using said land by permission or knowledge of the Grantor, the Occupant, vacate said land for intermittent periods, which shall not exceed twelve (12) consecutive hours for each period, provided the Government shall give to said Grantor, the Occupant, and other authorized persons, no less than twenty four (24) hours prior notice of the necessity to vacate said land.

(2) The right of the ~~Commanding General of the First Strategic - Aerospace Division~~ Wing Commander, 30 Space Wing 61P, Vandenberg Air Force Base, California, or his duly authorized representative, to notify the Grantor, the Occupant, and such other persons as the Grantor may designate, of the dates said land will be vacated, and the duration of each period that said land is to remain unoccupied by the Grantor, the Occupant, and their families, employees, lessees, and other person or persons occupying or using said land by permission or knowledge of the owners, except that their livestock may remain on the land during each vacation period.

(3) The right to enter upon and pass through said land to give notice of evacuation, and to assure that all human beings have vacated said land.

(4) The right to require the Grantor, the Occupant, their heirs, executors, administrators, successors and assigns to give the Government three (3) months notice in writing, of any intention to enter into any contract or agreement for either residential, commercial or industrial subdivision of all or any part of said land, to be addressed to the District Engineer, U.S. Army Engineer District, Los Angeles, ATTN: CESPL-RE-C, P.O. Box 532711, Los Angeles, California 90053-2325.

b. That the term of this agreement shall be **1 APRIL 1998** to **31 MARCH 1999**, provided that unless and until the Government shall give notice of termination in accordance with provision (d) hereof, this agreement shall remain in force thereafter from year to year for the payment of rentals; and provided further this agreement shall in no event extend beyond **31 MARCH 2003**.

c. That the monetary consideration to be paid by the Government to the Grantor shall be at the following rate:

(1) To the Grantor the sum of NINE HUNDRED AND NO/100 DOLLARS ($900.00) per annum or pro rata amount for fractional period of use thereof.

Payment shall be made at the end of each fiscal year by the DFAS-SB/ARF, 1111 EAST MILL STREET, SAN BERNADINO, CALIFORNIA 92408-1621.

d. That the Government may terminate this agreement at any time by giving ninety (90) days notice in writing, to the Grantor. No payment shall accrue after the effective date of termination.

e. That any notice under the terms of this agreement shall be in writing, signed by the duly authorized representative of the party giving such notice, and if by the Government, it shall be addressed to the State, and if notice is given by the State, or the Occupant, it shall be addressed to the Commander, U.S. Army Engineer District, Los Angeles, ATTN: CESPL-RE-C, P.O. Box 532711, Los Angeles, California 90053-2325.

f. That nothing contained herein shall be construed to be a waiver or release of the Government from any liability for loss or damages to buildings, improvements, growing crops, livestock, or other personal property located on the land, which loss or damage may be caused by activities or negligence of the Government, its employees, or its agent. Written notice of any such loss or damage to any such buildings, improvements, growing crops, livestock or other personal property shall be given to the Government within fifteen (15) days after knowledge of such loss, and shall be directed to the Government as stated in provision (e) hereof.

g. That the land covered by the agreement is identified as Tract No. 422, Vandenberg Air Force Base, California, and is more particularly described as follows:

That certain parcel of land described as Lots 2 and 3 of Section 2, Township 9, Range 36 West, and Lots 1 and 2 of Section 35, Township 10 North, Range 36 West, San Bernardino Meridian, in the County of Santa Barbara, State of California, according to the official plat thereof.

h. That the Grantor hereby warrants that no person or selling agency has been employed or retained to solicit or secure this agreement, upon an agreement or understanding for a commission, percentage, brokerage,or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Grantor for the purpose of securing business. For breach or violation of this warranty, the Government shall have the right to annul this agreement without liability, or in its discretion, to deduct from the consideration the full amount of such commission, percentage, brokerage, or contingent fee.

i. That no member of, or delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

j. This agreement superceeds all previous agreements which hereby become null and void.

IN WITNESS WHEREOF, the parties hereto have hereunto subscribed their names as of the date first above written.

STATE OF CALIFORNIA

STEVE ~~TRENOR~~ TREANOR
District Superintendent,
Channel Coast District,
Department of Parks and Recreation
1933 Cliff Drive, Suite 27
Santa Barbara, California 93109

THE UNITED STATES OF AMERICA

BY: _____, COL, USAF
DEPARTMENT OF THE AIR FORCE

GILBERT T. PERRY JR., Colonel, USAF
Deputy Civil Engineer

(To be filled out by someone other than the person signing the agreement)

CERTIFICATE OF AUTHORITY

I, (Enter Name) RICHARD ROZZELLE certify that I
(Name of person certifying)
am the (Enter Title) DISTRICT SUPERINTENDENT of
(Title of person certifying)
STATE OF CALIFORNIA, named as GRANTOR IN AGREEMENT NO. DACA-09-6-98-0009 and that RICHARD ROZZELLE who signed on behalf of the
(Name of person signing license)
GRANTOR, was known to me and was DIST. SUPERINTENDENT ~~of~~ said ORGANIZATION
(Title of person signing license)
That said AGREEMENT was duly signed for and in behalf of said STATE OF CALIFORNIA by authority of its Governing body, and within the scope of its corporate powers.

DATE: 3/26/09 SIGNATURE: _____
(Person certifying)

WITNESS;

(To be filled out by someone other than the person signing the agreement)

Negotiated Agreement Under Authority of
Section 2304 (a) (10) of Title 10 U.S.C.

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P.O. BOX 532711
LOS ANGELES, CALIFORNIA 90053-2325

Agreement No. DACA09-3-98-0009
Vandenberg Air Force Base, CA.
Tract No. 423

THIS AGREEMENT, made and entered into as of 1 April by and between the STATE OF CALIFORNIA, whose interest in the real property, hereinafter described as that of owners in fee simple as their separate property for themselves, their heirs, executors, administrators, successors, and assigns, hereinafter referred to as the "Grantor" and the UNITED STATES OF AMERICA, hereinafter referred to as the "Government,"

WITNESSETH THAT:

WHEREAS, the Government is maintaining and operating a Missile Testing Base at Vandenberg Air Force Base, California, and has determined that it is necessary to implement range safety procedures at said Air Force Base in order to provide for safety to persons on the land adjoining, or adjacent to said base;

NOW THEREFORE, the parties hereto, for consideration hereinafter set forth, covenant and agree as follows:

a. That Grantor and the Occupant hereby grant to the Government the following rights:

(1) The right to require the Grantor, the Occupant, their families, employees, lessees and any other person or persons occupying or using said land by permission or knowledge of the Grantor, the Occupant, vacate said land for intermittent periods, which shall not exceed twelve (12) consecutive hours for each period, provided the Government shall give to said Grantor, the Occupant, and other authorized persons, no less than twenty four (24) hours prior notice of the necessity to vacate said land.

(2) The right of the ~~Commanding General of the First Strategic Aerospace Division~~ Wing Commander, 30 Space Wing GV, Vandenberg Air Force Base, California, or his duly authorized representative, to notify the Grantor, the Occupant, and such other persons as the Grantor may designate, of the dates said land will be vacated, and the duration of each period that said land is to remain unoccupied by the Grantor, the Occupant, and their families, employees, lessees, and other person or persons occupying or using said land by permission or knowledge of the owners, except that their livestock may remain on the land during each vacation period.

(3) The right to enter upon and pass through said land to give notice of evacuation, and to assure that all human beings have vacated said land.

(4) The right to require the Grantor, the Occupant, their heirs, executors, administrators, successors and assigns to give the Government three (3) months notice in writing, of any intention to enter into any contract or agreement for either residential, commercial or industrial subdivision of all or any part of said land, to be addresed to the District Engineer, U.S. Army Engineer District, Los Angeles, ATTN: CESPL-RE-C, P.O. Box 532711, Los Angeles, California 90053-2325.

b. That the term of this agreement shall be **1 APRIL 1998** to **31 MARCH 1999**, provided that unless and until the Government shall give notice of termination in accordance with provision (d) hereof, this agreement shall remain in force thereafter from year to year for the payment of rentals; and provided further this agreement shall in no event extend beyond **31 MARCH 2003**.

c. That the monetary consideration to be paid by the Government to the Grantor shall be at the following rate:

(1) To the Grantor the sum of SIX HUNDRED AND NO/100 DOLLARS ($600.00) per annum or pro rata amount for fractional period of use thereof.

Payment shall be made at the end of each fiscal year by the the DFAS-SB/ARF, 1111 EAST MILL STREET, SAN BERNADINO, CALIFORNIA 92408-1621.

d. That the Government may terminate this agreement at any time by giving ninety (90) days notice in writing, to the Grantor. No payment shall accrue after the effective date of termination.

e. That any notice under the terms of this agreement shall be in writing, signed by the duly authorized representative of the party giving such notice, and if by the Government, it shall be addressed to the State, and if given by the State or the Occupant, it shall be addressed to the Commander, U.S. Army Engineer District, Los Angeles, ATTN: CESPL-RE-C, P.O. Box 532711, Los Angeles, California 90053-2325.

f. That nothing contained herein shall be construed to be a waiver or release of the Government from any liability for loss or damages to buildings, improvements, growing crops, livestock, or other personal property located on the land, which loss or damage may be caused by activities or negligence of the Government, its employees, or its agent. Written notice of any such loss or damage to any such buildings, improvements, growing crops, livestock or other personal property shall be given to the Government within fifteen (15) days after knowledge of such loss, and shall be directed to the Government as stated in provision (e) hereof.

g. That the land covered by the agreement is identified as Tract No. 423, Vandenberg Air Force Base, California, and is more particularly described as follows:

That certain parcel of land described as Lots 4, 5 and 6 of Section 3A, Township 10, Range 36 West San Bernadino Meridian, in the County of Santa Barbara, State of California, according to the official plat thereof.

h. That the Grantor hereby warrants that no person or selling agency has been employed or retained to solicit or secure this agreement, upon an agreement or understanding for a commission, percentage, brokerage,or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Grantor for the purpose of securing business. For breach or violation of this warranty, the Government shall have the right to annul this agreement without liability, or in its discretion, to deduct from the consideration the full amount of such commission, percentage, brokerage, or contingent fee.

i That no member of, or delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

j. This agreement supercedes all previous agreements which hereby become null and void.

IN WITNESS WHEREOF, the parties hereto have hereunto subscribed their names as of the date first above written.

STATE OF CALIFORNIA

STEVE ~~TRENOR~~ TREASOR
District Superintendent,
Channel Coast District,
Department of Parks and Recreation
1933 Cliff Drive, Suite 27
Santa Barbara, California 93109

THE UNITED STATES OF AMERICA

COL, USAF

DEPARTMENT OF THE AIR FORCE

GILBERT T. PERRY JR., Colonel, USAF
Deputy Civil Engineer

EVACUATION AGREEMENT NO. SPCVAN-1-93-0006

SUPPLEMENTAL AGREEMENT NO. 3

THIS SUPPLEMENTAL AGREEMENT entered into this 13th day of JAN, 2009, by and between the County of Santa Barbara, State of California ("County") and Secretary of the Air Force ("Government" or "Air Force"). The Government and the County may be referred to jointly as the "Parties," and each separately may be referred to as a "Party."

RECITALS:

A. On 1 December 1992, the Parties entered into an evacuation agreement for the evacuation of County properties Jalama Beach Park, Ocean Beach Park and Point Sal Road in case of certain government operations for purposes of military necessity, security and public safety.

B. On 05 November 1997, the Parties agreed to extend the Agreement for one additional year through 01 December 1998 and to automatically renew the Agreement for a total additional term of five years from December 1, 1997 and added Surf Station Parking Lot to the Agreement.

C. On 13 May 2003, the Parties agreed to extend the agreement for five years though 30 November 2007.

AGREEMENT:

1. The Agreement is hereby modified in the following particulars, but no others:

   a. Paragraph III. 13, page 5 of the Agreement is rescinded and replaced with paragraph 1.b, below, of this Supplement No. 3.

   b. The term of the Agreement was extended for one additional year through 30 November 2008 and will automatically renew annually on 1 December 2008 and on each subsequent 1 December of the following three years for a total additional term of five years from 1 December 2007, unless otherwise amended or terminated pursuant to paragraph 1.b. of this Supplement Agreement No. 3. The Agreement may be modified, amended, revised, or discharged by either Party upon providing advanced written notice to the other Party. Such advanced notice must be provided at least 120 days in advance of the requested modification, amendment, revision, or discharge. Any notice under the terms of this Agreement shall be in writing, signed by a duly authorized representative of the party giving such notice. If notice is given to the County, it shall be addressed to the

County of Santa Barbara, General Services Department, Office of Real Estate Services, 1105 Santa Barbara Street, Santa Barbara, California 93101. If notice is given to the Government, it shall be addressed to the Installation Commander as follows: "30 SW/CC, Vandenberg AFB, California 93437" and a duplicate shall also be mailed and addressed to "30 CES/CECBR, 1172 Iceland Avenue, Bldg 11432, Vandenberg AFB, California, 93437.

2. All other terms and conditions of the Agreement shall be and remain the same, unless otherwise made void by operation of law.

3. This Supplemental Agreement shall be effective immediately.

Project: Evacuation Agreement
SPCVAN-1-93-0006
Vandenberg Air Force Base, CA
Tract No.: Jalama, Ocean, Surf, Pt Sal Rd
Folio: 003375

IN WITNESS WHEREOF, Government and County have executed this Supplemental Agreement No. 3 to Evacuation Agreement SPCVAN-1-93-0006, by the respective authorized officers as set forth below to be effective as of the date executed by Government.

"COUNTY"
COUNTY OF SANTA BARBARA

By: _____
Salud Carbajal,Chair,
Board of Supervisors
County of Santa Barbara

Date: 11/18/08

ATTEST
MICHAEL F. BROWN
CLERK OF THE BOARD

By: _____
Deputy

APPROVED AS TO FORM:
DENNIS MARSHALL
COUNTY COUNSEL

By: _____

APPROVED:

_____
Ronn Carlentine,
Real Property Manager

APPROVED:

_____
Daniel Hernandez
Parks Director

APPROVED AS TO FORM
ROBERT W.GEIS, CPA
AUDITOR-CONTROLLER

By: _____

APPROVED:

_____
Ray Aromatorio, ARM, AIC
Risk Program Administrator

APPROVED:

_____
Scott McGolpin
Director of Public Works

IN WITNESS WHEREOF, I have set my hand by authority of the Secretary of the Air Force as of the day and year first written above.

DEPARTMENT OF THE AIR FORCE

By: _____

DAVID J. BUCK
Colonel, USAF
Commander, 30th Space Wing

No. SPCVAN-1-93-0006

EVACUATION AGREEMENT

I. THE PURPOSE

This AGREEMENT by and between the UNITED STATES OF AMERICA (hereinafter "GOVERNMENT") and the COUNTY OF SANTA BARBARA, STATE OF CALIFORNIA (hereinafter "COUNTY") is made and entered as of 15th Dec 1992

The GOVERNMENT is maintaining and operating a military installation and conducting government operations including, but not limited to missile testing, at Vandenberg Air Force Base, California. Because of these activities and government interests, GOVERNMENT has determined that military necessity, security, and public safety dictate that the GOVERNMENT must exercise certain controls over the real property herein described. This control shall include the right to evacuate the property and prohibit the use or occupation of said property hy COUNTY employees, agents and business invitees, and members of the general public as permitted hereunder.

II. COUNTY INTEREST AFFECTED

The COUNTY'S interest in Jalama Beach Park is that of fee owner. Jalama Beach Park is in the vicinity of Vandenberg Air Force Base, California. The real property identified as Jalama Beach Park is legally described on Exhibit "A" and the area concerned is outlined in red on Exhibit "B," both of which are attached hereto and incorporated herein by reference.

The COUNTY ' S interest in Ocean Beach County Park is that of fee owner. Ocean Beach County Park is in the vicinity of Vandenberg Air Force Base, California. The real property identified as Ocean Beach County Park is known as Assessor's Parcel Number 95-041-01, designated tract 601. Said parcel of real property is legally described on Exhibit "C" and the area concerned is outlined in red on Exhibit "D," both of which are attached hereto and incorporated herein by reference.

The COUNTY ' S interest in Point Sal Road is that COUNTY has a certain road and road rights of way known as the Point Sal Road. Portions of Point Sal Road lie within Vandenberg Air Force Base, California and the remainder is in the vicinity of Vandenberg Air Force Base, California. The real property identified as the Point Sal is identified as Assessor's Parcel Number 095-020-02, and the Point Sal Road area concerned is more fully described on Exhibit "E" attached hereto and incorporated herein by reference.

III. RIGHTS AND RESPONSIBILITIES

IN CONSIDERATION OF THE MUTUAL PROMISES CONTAINED HEREIN, THE PARTIES HEREIN MUTUALLY AGREE AS FOLLOWS:

1. The GOVERNMENT has the following rights and responsibilities :

a. The right to evacuate and close Jalama Beach park and Ocean Beach County Park during government operations for intermittent periods as required by said operations. The right to evacuate will apply to all occupants and users. The term "all" specifically includes, but is not limited to all COUNTY employees, their families and guests, concessionaires and members of the public. The Term "government operations" as used herein shall be defined as those non-commercial launch-related operations of government which tend to endanger the health and safety of persons present in the area of Jalama Beach Park or Point Sal Road or Ocean Beach Park.

During any period of closure which extends between the hours of 9:00 P.M. and 7:00 A.M., Government shall, and at its own expense, supply temporary substitute quarters either on or off base at the Government's option for resident Park employees who are displaced from their homes. At the present time there are four park rangers and their families who will be affected by this provision. County shall notify Government of the number of persons who will be displaced by government operations within 24 hours following advance written notification of closure.

b. The right to evacuate and close Jalama Road, with the exception of allowing access to the owners (or the agents of the owners) of adjacent privately owned land requiring access to their property for residential, ranching or agricultural purposes via Jalama Road, during intermittent periods as required.

c. The right to evacuate and close those portions of Point Sal Road lying within the military reservation either intermittently or completely for short periods of time (not to exceed 48 consecutive hours), because of the government operations at military facilities near said road right-of-way. During operations the GOVERNMENT shall have exclusive use and control of that portion of Point Sal Road and road rights-of-way between a point where the said road intersects the easterly boundary of the military reservation of the Vandenberg Air Force Base (1.75 miles west of Lompoc-Casmalia Road) and the easterly edge of the said Point Sal Road at its intersection with the Point Sal Beach State Park Road.

d. The right to regulate and control traffic, including the right to close the road entirely to use by the public or use by any persons other than those authorized by the GOVERNMENT, for short periods of time (not to exceed 48 consecutive hours) prior to and during missile launches on that portion of Point Sal Road between a point where the said road intersects the Point Sal Beach State Park Road and the northerly boundary of the military reservation of the Vandenberg Air Force Base.

e. The right of the Installation Commander of Vandenberg Air Force Base, California or the Installation Commander's duly authorized representative to notify any occupants of the real property and such other persons as the occupants may designate, of the dates said land will be vacated and the duration of each period that said land is to remain unoccupied. This includes the right to enter upon or pass through said land to give notice of evacuation and to assure that all human beings have evacuated said land. Livestock may remain on the land during the evacuation period. The particular requirements of the advance notice shall be contained in supplements to this AGREEMENT. Said notice shall be given not less than seventy-two (72) hours in advance of any closure or evacuation undertaken pursuant to this agreement.

f. The right and responsibility to post and remove signs at the following locations for the purpose of giving notice of advance park and road closure dates. The particular requirements of the advance notice shall be contained in supplements to this agreement. The signs may be posted:

(1) At the entrance of Jalama Beach Park,

(2) At the junction of Jalama Road and California State Highway Number 1,

(3) At the entrance to Ocean Beach County Park,

(4) At the junction of Ocean Avenue (formerly "Highway 246") and Ocean Park Road.

g. The right to construct and operate temporary barricades across the following roads to control access to areas evacuated:

(1) On Jalama Road near the intersection of California State Highway Number 1 and said Jalama Road.

(2) On Ocean Avenue near the intersection of Ocean Park Road and Ocean Avenue.

h. The right to require the COUNTY or any successor in interest to give to the GOVERNMENT six (6) months notice, in writing, of any intention to enter into any contract or agreement for residential, commercial or industrial subdivision of all or any part of said land addressed herein that is presently owned by the COUNTY.

2. The COUNTY has the following rights and responsibilities:

a. To advise Government, in writing, to the Installation Commander or the Commander's duly authorized representative, of the name and address of the Director of County Parks and of any changes of the same during this agreement.

b. The right to authorize the attendance of a County Deputy Sheriff on site to assist in the

evacuation of human beings from Jalama Beach Park, Ocean Beach County Park and the County road rights-of-way.

3. The GOVERNMENT will be solely responsible for the negligent and wrongful acts of GOVERNMENT'S agents or employees as such liability is established and specified under the Federal Tort Claims Act, Title 28, United States Code, as amended, and under other laws which may apply as determined by appropriate federal authority.

4. The COUNTY will be solely responsible for the negligent and wrongful acts of COUNTY'S agents or employees as such liability is established and specified under the law of the State of California or other applicable laws.

5. Nothing contained herein shall be construed to be a waiver or release of the GOVERNMENT from any liability for loss or damage to buildings, improvements, growing crops, livestock, other personal property, or other public rights, located on the land, which loss or damage may be caused by the activities or negligence of the GOVERNMENT, its agents or its employees. Written notice of any such loss or damage to any such buildings, improvements, growing crops, livestock or other personal property shall be given to the GOVERNMENT within ninety (90) days after the party discovers or reasonably should have discovered the existence of the act that resulted in the claimed loss, and shall be directed to the GOVERNMENT as required of written notices herein.

6. No government official, nor any member of their families dependent upon the government official for support, shall receive any personal economic benefit, of any kind from this AGREEMENT. However, if this AGREEMENT happens to benefit a corporation so that in general, the shareholders of the corporation receive an economic benefit because of their status of being a shareholder, and if a government official is a shareholder and receives such benefit, the prohibition against personal economic benefit is not violated.

7. GOVERNMENT is not aware of any government official receiving a personal economic benefit, gift or gratuity (in the form of entertainment, gifts, gratuities or otherwise). However, if GOVERNMENT later discovers that such benefits were offered or given to any officer or employee of the GOVERNMENT with a view toward securing an agreement or securing favorable treatment from the GOVERNMENT, then the Secretary of the Air Force or his duly authorized representative shall make such findings as are in issue and may terminate this agreement. These findings and termination may be reviewed in any federal court of competent jurisdiction.

8. In the event this AGREEMENT is terminated as provided in paragraph 7 above, the GOVERNMENT shall be entitled to take all legal remedies against the COUNTY and such other persons as may be responsible for violations of the above prohibitions. These remedies expressly include appropriate penalties as well as any and all damages to which GOVERNMENT may be entitled by law.

9. The rights and remedies of the parties provided herein shall not be exclusive and are in addition to any other rights and remedies provided by law.

10. All terms and conditions of this AGREEMENT relating to expenditures of money by the GOVERNMENT are subject to and contingent upon the availability of and adequate appropriations of funds. This section is included in this AGREEMENT for the purpose of meeting the requirements of the Anti-Deficiency Act, 31 United States Code, Section 1341. All terms and conditions of this AGREEMENT relating to expenditures of money by the COUNTY are likewise subject to and contingent upon the availability of and adequate appropriations of funds.

11. This AGREEMENT does not create any additional cause of action which does not otherwise exist under the law. This AGREEMENT does not grant jurisdiction not already in existence under applicable law. This AGREEMENT does not constitute a waiver of federal supremacy or sovereign immunity as such principles of law exist and are applicable.

12. The GOVERNMENT shall permit the installation and maintenance by the County of water tanks and pipelines drawing water from GOVERNMENT lands in an amount sufficient to supply the water needs of the County Park located at Jalama Beach. The specific quantity and source of the water supply is fully set forth as a special purpose water and pipeline agreement in a separate Memorandum of Agreement. Nothing contained herein obligates the GOVERNMENT to provide an alternative water supply should the spring which is the existing source under the pipeline agreement become insufficient.

The following are currently approved public access areas on Vandenberg Air Force Base:

a. One & one-half miles north of Jalama Beach; beach access only.

b. Three & one-half miles south and one & one-half miles north of Ocean Park Beach; beach access only.

c. Beginning from the one & one-half mile mark north of Ocean Beach Park to the five mile mark (three & one-half miles total) is designated permit fishing only; access is granted by permit only through the Solvang Gate, Highway 246, with a specified route through the base.

The parties shall continue to negotiate in good faith to open additional areas of coastline for public use to include coordination with all other federal, and State and local agencies.

13. This agreement shall automatically renew annually on 1 December 1992 and 1 December of the following four years for a term of 5 years. This agreement may be terminated by GOVERNMENT by written notice to COUNTY of cessation of mission requirement. This agreement may be terminated by County by written notice to government 90 days in advance of 1 December of each year beginning in 1992. If such notice is given, this agreement will terminate on 1 December of that year. Any notice under the terms of this AGREEMENT shall be in writing, signed by a duly authorized representative of the party giving such notice. If notice is given to the COUNTY, it shall be addressed to the County of Santa Barbara, Public

Works Department, Real Property Division, 123 East Anapamu Street, Santa Barbara, California 93101. If notice is given to the GOVERNMENT, it shall be addressed to the Installation Commander as follows: "30th SPW/CC, Vandenberg AFB, California 93437-5000."

THE DULY AUTHORIZED GOVERNMENT REPRESENTATIVE SIGNED THIS AGREEMENT THIS 11th DAY OF December, 1992.

THE UNITED STATES OF AMERICA

BY _____
SEBASTIAN F. COGLITORE, Brig Gen, USAF
Commander, 30th Space Wing
Vandenberg Air Force Base, California 93437-5000

THE DULY AUTHORIZED COUNTY REPRESENTATIVE SIGNED THIS AGREEMENT THIS 15th DAY OF December, 1992.

THE COUNTY OF SANTA BARBARA, STATE OF CALIFORNIA

BY _____

Chairman, Board of Supervisors

ATTEST: ZANDRA CHOLMONDELEY
CLERK OF THE BOARD

BY _____
Deputy Clerk

APPROVED AS TO FORM:
DAVID NAWI, COUNTY COUNSEL

BY _____

APPROVED AS TO FORM:
CHARLES A. MITCHELL, RISK MANAGER

BY _____

APPROVED AS TO FORM:
ROBERT GEIS, AUDITOR-CONTROLLER

BY _____

IT IS HEREBY ORDERED AND RESOLVED, that the Deeds from the following grantors, bearing the dates set forth herein, be and the same are hereby accepted for the uses and purposes therein mentioned, subject to the conditions therein contained:

GRANTOR	DATE OF DEED
Hubbard S. Russell	January 7, 1943
Adolf Kirschenmann and Bertha Kirschenmann	June 7, 1943
Chester Wylie	April 6, 1943
William J. Wylie	May 15, 1943
Chester K. Wylie	May 15, 1943
Martha H. Carlson	March 27, 1943

BE IT FURTHER ORDERED AND RESOLVED that the Clerk of this Board cause said Deeds to be recorded in the office of the Recorder of the County of Santa Barbara.

The foregoing Resolution was passed and adopted by the Board of Supervisors of the County of Santa Barbara, State of California, this 14th day of June, 1943, by the following vote, to wit:

Ayes: Clifford W. Bradbury, Paul E. Stewart,
J. Monroe Rutherford, Ronald M. Adam and
T. A. Twitchell.

Nays: None

Absent: None

J. MONROE RUTHERFORD
Chairman, Board of Supervisors

Attest: J. E. LEWIS
Clerk (SEAL)

State of California,)
) ss.
County of Santa Barbara,)

I, J. E. LEWIS, County Clerk and ex-officio Clerk of the Board of Supervisors in and for the County of Santa Barbara, do hereby certify that the foregoing is a true and correct copy of the original Resolution No. 4655, in the Matter of Acceptance of Deeds Conveying Rights of Way for Public Road Purposes in the Fifth Road District, and the endorsement's thereon, now remaining on file and of record in this office.

WITNESS my hand and the seal of said Board this 14th day of June A. D. 1943

(SEAL OF BOARD OF SUPERVISORS) J. E. LEWIS, Clerk,
By Bernell Warren, Deputy Clerk

RECORDED AT THE REQUEST OF County Clerk, Jun. 16, 1943, A. D. at 30 Min. past 8 o'clock A. M.

File No. 4623 YRIS COVARRUBIAS, County Recorder

Compared by:- Y COVARRUBIAS By [signature] Deputy Recorder

RICHFIELD OIL CORPORATION, ET AL.
TO
COUNTY OF SANTA BARBARA

DMA/md 4/12/43 ORIGINAL L & L 504

DEED

THIS INDENTURE, dated the 28th day of May, 1943, by and between RICHFIELD OIL CORPORATION, a corporation, party of the First Part, hereinafter referred to as "Richfield," and the COUNTY OF SANTA BARBARA, a body politic and corporate, created and existing under and by virtue of the laws of the State of California, party of the Second Part, hereinafter referred to as the "County,"

Jalama Beach Park
Exhibit A & B

Exhibit A

Official Record 571

W I T N E S S E T H:

That Richfield, in consideration of the sum of One Dollar ($1.00) lawful money of the United States of America, to it in hand paid, the receipt of which is hereby acknowledged, does by these presents grant, bargain, sell, convey and confirm unto the County for all of the uses and purposes of a county park, subject to the conditions, exceptions and reservations herein expressed, all that certain piece or parcel of land situate in the County of Santa Barbara, State of California, more particularly described as follows:

Beginning at the NW corner of Tract No. 20 as same is shown on Map of Subdivision of Concepcion Ranch on Sheet No. 6 of 6 Sheets in Book 9, Page 6, of Maps and Surveys, Santa Barbara County Recorder's Office, said NW corner being at the mouth of Jalama Creek;

thence, along the northerly boundary of said Tract No. 20, N 88° 25' E 1207.3 feet to a point on the center line of the Southern Pacific Railroad at the Southern Pacific Engineer's Station 12855+00 as same station is described in the deed recorded in Book 63, Page 617 of Deeds in the County Recorder's Office of Santa Barbara County;

thence, southerly along said center line of said Southern Pacific Railroad to Southern Pacific Railroad Engineer's Station 12865+25.0 of Southern Pacific Railroad;

thence, N 80° 54' W 275.0 feet to a point;

thence, N 9° 06' E 75.0 feet to a point;

thence, N 80° 54' W 275.0 feet to a point;

thence, S 3° 30' E 450.0 feet to a point;

thence, S 21° 24' W 252.0 feet to a point on the westerly boundary of above mentioned Tract No. 20, said point being S 24° 49' E 1644.6 feet from the NW corner of said Tract No. 20;

thence, N 24° 49' W along the west boundary of said Tract No. 20, 1644.6 feet to the point of beginning;

EXCEPTING THEREFROM portions of those parcels of said Tract No. 20 deeded to the Southern Pacific Railroad lying within the boundaries herein described, said parcels being designated as Numbers 1 and 3 as recorded in Book of Deeds 63, Page 617, in the County Recorder's Office of the County of Santa Barbara.

EXCEPTING THEREFROM all of the minerals, oil, gas, petroleum, nap_tha and other hydrocarbon substances in, on or under the above described real property, or recoverable thereon or therefrom, together with the right to prospect for, extract, produce and remove said substances from said real property; provided, however, that said minerals, oil, gas, petroleum, nap_tha and other hydrocarbon substances may be prospected for, extracted, produced and removed only by means of wells,tunnels, or excavations drilled, bored or dug into, through or under said real property from the surface of land other than said real property, or by wells, tunnels or excavations drilled wholly upon land other than said real property so as to drain said substances from under said real property, in a manner which will not utilize the surface.

AND FURTHER EXCEPTING all springs of water on said land and the water therein and produced thereby, provided, however, that the County shall be entitled to use for public park purposes so much of the water from said springs as said springs may produce in excess of any amounts which Richfield may use or desire to use;the right to use and consume such additional water as may be developed by the County hereafter on the land hereby conveyed in excess of the needs of the County for public park purposes, but without duty or obligation on the County to develop any such additional water; the right to one-fourth (¼) of all the water and flow of the spring known as "Las Animas Spring," referred to in that certain

Exhibit A

EXHIBIT A

agreement dated July 8, 1895, between P. W. Murphy, et al., and The Commercial Land Company, et al., recorded in Book 68 at Page 269, Deed Records, Santa Barbara County, California.

AND FURTHER EXCEPTING the right to use the surface of said land for all lawful purposes, including grazing, and to receive and accept rent for such use, during the period ending

(1) when the County elects to occupy said land for public park purposes and erects the fence hereinafter referred to; or

(2) upon the termination of an existing lease executed by Richfield, as lessor, and F. Elizabeth Bixby, as lessee, whichever occurs last.

THIS GRANT IS MADE UPON THE EXPRESS CONDITION that said land shall be used for public park purposes only, commencing not later than one (1) year after the complete cessation of hostilities between the United States and all belligerents with whom the United States is now, or may in the course of the present conflict become, at war, and if not so used for any continuous period of three (3) months thereafter, said land shall revert to Richfield, its successors or assigns, who thereupon shall have the right to re-enter and take and hold possession of said land and exclude all persons therefrom.

AND UPON THE FURTHER EXPRESS CONDITION that the County shall immediately upon termination of said grazing lease and/or before occupying said land for park purposes, erect and thereafter maintain a stockproof fence equipped with no fewer than two (2) gates or cattle guards that permit the use and exercise of the easement expressed and reserved in paragraph numbered 2 of the reservations hereinafter set forth, around all the exterior boundaries of said land except those portions of said boundaries which are common to said land and the Pacific Ocean and except where the natural configuration of the surface is such that live stock cannot pass across the boundary between said land and adjacent land.

AND UPON THE FURTHER EXPRESS CONDITION that in the event the county, at any time after the acceptance of this grant, should prohibit, by zoning ordinance or otherwise, the exploration for, drilling for, or production of minerals, oil, gas, petroleum, nap_tha or other hydrocarbon substances upon all or any part of Tract No. 20, as same is shown on Map of Subdivision of Concepcion Ranch on Sheet No. 6 of 6 Sheets in Book 9, Page 6 of Maps and Surveys, Santa Barbara County Recorder's Office, then said land shall revert to Richfield, its successors or assigns, who thereupon shall have the right to re-enter and take and hold possession of said land and exclude all persons therefrom.

Each of the conditions hereinabove stated as conditions upon which the above described land is granted is hereby declared to be a condition and not a personal covenant.

THERE IS RESERVED to Richfield, its successors and assigns, the following:

1. The right and right of way to construct, reconstruct, renew, repair, change the size of, maintain, operate, remove and abandon pipes and pipe lines for the transportation of petroleum, oil, gas and other hydrocarbons and the products and derivatives thereof, air and water in, over, along and across said land, together with telegraph, telephone and electric power lines necessary or convenient to the operations of Richfield or its successors or assigns.

2. An easement to ride, drive, herd, haul and otherwise transport or convey horses, cattle, sheep, swine and other live stock through, over, upon and across said land by all reasonable routes, which easement shall be appurtenant to and for the benefit of the following described land:

All of Tracts Numbers 4, 15 and 16; also portions of Tracts Numbers 17, 19 and 20 as shown upon the map entitled "Map of The Subdivision of Concepcion Ranch, in 6 sheets, being a portion of the Rancho El Coje, owned by Del Norte Land Co. in the County of Santa Barbara,

Exhibit A

EXHIBIT A

State of California, surveyed by Frank P. Flournoy, County Surveyor," and recorded December 7, 1914, in Book 9, at Pages 1 to 8 inclusive, of Maps and Surveys, in the office of the County Recorder of said County; said portions of Tracts Numbers 17 and 19 being those portions thereof lying Southerly and Westerly of the following described line:

Beginning at the most Northerly corner of said Tract No. 16; thence Northwesterly in a direct line to a point on the Northwesterly line of said Tract No. 17, distant thereon 1640 feet Southwesterly from the most Northerly corner thereof; thence Northwesterly in a direct line to a point on the Northerly line of said Tract No. 19, distant thereon 1550 feet Easterly from the most Northerly corner of said Tract No. 19, which corner is also the most Easterly corner of said Tract No. 20; and further, said portion of Tract No. 20, being all of said Tract 20 excepting therefrom that portion thereof being herein described as being conveyed to Santa Barbara County for park purposes.

EXCEPTING from all of said Tracts above mentioned, any portions thereof conveyed to Southern Pacific Railroad Company by deed dated July 19, 1898, and recorded in Book 63 at Page 617 of Deeds; and by deed dated June 30, 1910, and recorded in Book 128 at Page 126 of Deeds; and by deed dated February 6, 1918, and recorded in Book 167 at Page 133 of Deeds, all records of said Santa Barbara County.

3. The right to protect the springs hereinbefore excepted from this grant and to keep and have the same protected by all reasonable means from contamination or pollution; and the right to install, construct, maintain and remove pipe lines, pumps, tanks and other facilities for producing, storing and transporting water and to connect said facilities to and to take and consume water from all pipes and tanks which may be installed, operated or maintained by or for the County to the extent that the same may be necessary to the full exercise by Richfield, its successors or assigns, of the rights herein reserved.

4. The right of ingress and egress to, from, upon and across said land by all reasonable routes.

SUBJECT TO:

1. Any unpaid taxes, assessments, charges or liens due or delinquent upon the date hereof.

2. All valid, existing leases, conditions, restrictions, reservations, rights of way and easements.

IN WITNESS WHEREOF, Richfield has caused this indenture to be executed by its officers thereunto duly authorized, and its corporate seal to be affixed.

(CORPORATE SEAL OF RICHFIELD OIL CORPORATION)

RICHFIELD OIL CORPORATION

By Frank A. Morgan
Frank A. Morgan Vice President

By Cleve B. Bonner
Cleve B. Bonner Secretary

APPROVED FOR EXECUTION
TERMS C. E. R. R.D.M.
FORM G.C.
DESCRIPTION G. J. F.

STATE OF CALIFORNIA }
COUNTY OF LOS ANGELES } ss.

On this 4th day of June, 1943, before me CHAS. A. ROOT a Notary Public in and for the said County and State, personally appeared FRANK A. MORGAN, known to me to be the Vice President, and CLEVE B. BONNER, known to me to be the Secretary of RICHFIELD OIL CORPORATION, the corporation that executed the within instrument, known to me to be the persons who executed the within instrument on behalf of the corporation herein named, and acknowledged

Exhibit A

EXHIBIT A

to me that such corporation executed the same.

In Witness Whereof, I have hereunto set my hand and affixed my official seal the day and year in this certificate first above written.

CHAS. A. ROOT
NOTARY PUBLIC in and for the County of Los Angeles, State of California.
My Commission Expires Mar. 29, 1944.

(NOTARIAL SEAL)

C O N S E N T

June 2, 1943

For and in consideration of the sum of One Dollar ($1.00) to her in hand paid, the receipt whereof is hereby acknowledged, F. ELIZABETH BIXBY JANEWAY, formerly F. Elizabeth Bixby, holding a grazing lease covering the premises described in the annexed grant, does hereby approve of, join in and consent to said grant.

F. ELIZABETH BIXBY JANEWAY
F. Elizabeth Bixby Janeway

Executed in the presence of:

Arden T. Jensen
Subscribing Witness

STATE OF CALIFORNIA)
) ss
COUNTY OF Santa Barbara)

On this 2nd day of June, 1943, before me, Arden T. Jensen, a Notary Public in and for the said County and State, residing therein, duly commissioned and sworn, personally appeared F. ELIZABETH BIXBY JANEWAY, known to me to be the person whose name is subscribed to the within instrument, and acknowledged to me that she executed the same.

In Witness Whereof, I have hereunto set my hand and affixed my official seal in the County and State aforesaid the day and year in this certificate first above written.

ARDEN T. JENSEN
Notary Public in and for said County and State.

(NOTARIAL SEAL)

My Commission Expires 10/21/46.

RESOLUTION OF THE BOARD OF SUPERVISORS OF THE COUNTY OF SANTA BARBARA, STATE OF CALIFORNIA

RESOLUTION NO. 4631

IN THE MATTER OF ACCEPTANCE OF DEED FROM RICHFIELD OIL CORPORATION TO THE COUNTY OF SANTA BARBARA

WHEREAS, on May 28, 1943, the Richfield Oil Corporation executed a deed in favor of the County of Santa Barbara, which deed was acknowledged on the 4th day of June, 1943, which deed described the following property:

Beginning at the NW corner of Tract No. 20 as same is shown on Map of Subdivision of Concepcion Ranch on Sheet No. 6 of 8 Sheets in Book 9, Page 6, of Maps and Surveys, Santa Barbara County Recorder's Office, said NW corner being at the mouth of Jalama Creek;

thence, along the northerly boundary of said Tract No. 20, N 88° 25' E 1207.3 feet to a point on the center line of the Southern Pacific Railroad at the Southern Pacific Engineer's Station 12855+00 as same station is described in the deed recorded in Book 63, Page 617 of Deeds in the County Recorder's Office of Santa Barbara County;

thence, southerly along said center line of said Southern Pacific Railroad to Southern Pacific Railroad Engineer's Station 12865+25.0 of Southern Pacific Railroad;

Official Record 571

thence, N 80° 54' W 275.0 feet to a point;

thence, N 9° 06' E 75.0 feet to a point;

thence, N 80° 54' W 275.0 feet to a point;

thence, S 3° 30' E 450.0 feet to a point;

thence, S 21° 24' W 252.0 feet to a point on the westerly boundary of above mentioned Tract No. 20, said point being S 24° 49' E 1644.6 feet from the NW corner of said Tract No. 20;

thence, N 24° 49' W along the west boundary of said Tract No. 20, 1644.6 feet to the point of beginning;

EXCEPTING THEREFROM portions of those parcels of said Tract No. 20 deeded to the Southern Pacific Railroad lying within the boundaries herein described, said parcels being designated as Numbers 1 and 3 as recorded in Book of Deeds 63, Page 617, in the County Recorder's Office of the County of Santa Barbara.

WHEREAS, it appears to be for the best interests of the County of Santa Barbara that said deed be accepted, and

WHEREAS, it appears that it is legal and proper for the Board of Supervisors of the County of Santa Barbara to accept such deed,

NOW, THEREFORE, BE IT RESOLVED that the aforesaid deed be and the same is hereby accepted by the County of Santa Barbara; and

BE IT FURTHER RESOLVED that J. E. Lewis, the clerk of the Board of Supervisors of the County of Santa Barbara, be and he is hereby authorized to record said deed.

Passed and adopted by the Board of Supervisors of the County of Santa Barbara, State of California, this 14th day of June, 1943, by the following vote:

Ayes: Clifford W. Bradbury, Paul E. Stewart, J. Monroe Rutherford, Ronald M. Adam and T. A. Twitchell.

Nays: None

Absent: None

J. MONROE RUTHERFORD
Chairman, Board of Supervisors

Attest:

J. E. LEWIS (SEAL)
Clerk.

State of California, }
County of Santa Barbara, } ss.

I, J. E. LEWIS, County Clerk and ex-officio Clerk of the Board of Supervisors in and for the County of Santa Barbara, do hereby certify that the foregoing is a true and correct copy of the original Resolution No. 4631, in the Matter of Acceptance of Deed from Richfield Oil Corporation to the County of Santa Barbara, and the endorsements thereon, now remaining on file and of record in this office.

WITNESS my hand and the seal of said Board this 14th day of June A. D. 1943

(SEAL OF BOARD OF SUPERVISORS) J. E. LEWIS, Clerk,
By Bernell Warren, Deputy Clerk

RECORDED AT REQUEST OF County Clerk, Jun. 16, 1943, at 30 Min. past 8 o'clock A. M.

File No. 4629 E. J. Hom.
Compared by:- E. Covarrubias

TRIS COVARRUBIAS, County Recorder
By [signature] Deputy Recorder

Exhibit A

EXHIBIT B

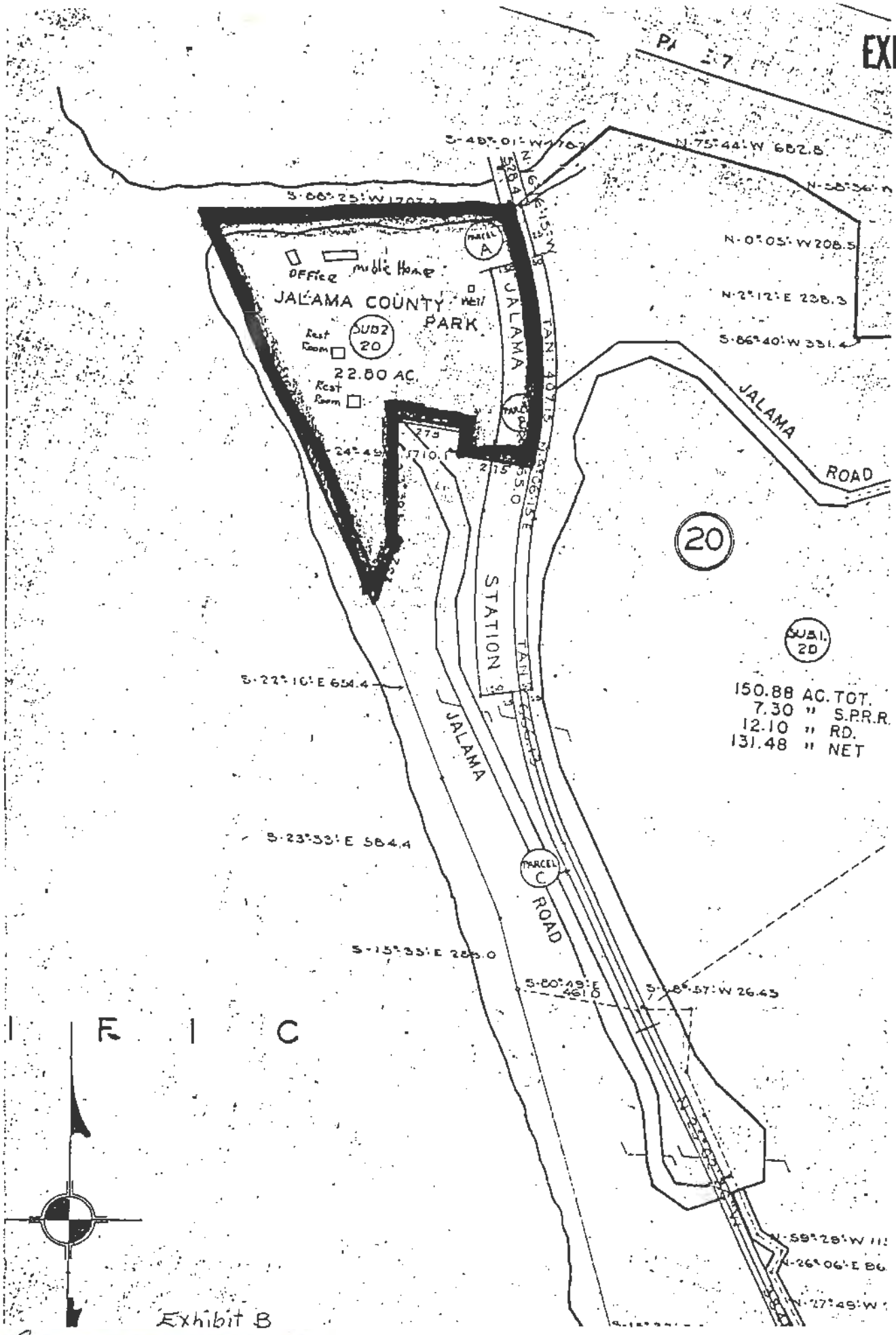


Exhibit B

Jalama Beach Park

EXHIBIT C

DEEDS
142

of the Ranchos Lompoc and Mission Viejo.

Together with all and singular the tenements, hereditaments and appurtenances thereunto belonging or in anywise appertaining, and the reversion and reversions, remainder and remainders, rents, issues and profits thereof.

To have and to hold all and singular the said premises, together with the appurtenances, unto the said party of the second part, and to its successors and assigns forever.

IN WITNESS WHEREOF the said parties of the first part have hereunto set their hands and seals, the day and year first above written.

J.C. Maretti
Anita Maretti
Joseph C. Maretti

State of California)
County of Santa Barbara) ss

On this 30th day of December, in the year nineteen hundred and thirteen, A.D., before me Stephen V.Campodonico, a Notary Public in and for the said county of Santa Barbara, state of California, residing therein, duly commissioned and sworn, personally appeared J.C.Maretti and Anita Maretti, personally known to me to be the persons whose names are subscribed to the within instrument, and acknowledged to me that they executed the same.

IN WITNESS WHEREOF I have hereunto set my hand and affixed my official seal, the day and year in this certificate first above written.

Stephen V.Campodonico, Notary Public in and for Santa Barbara county, state of California.

(Notarial Seal))

My commission expires Oct. 9th, 1916.

State of California)
County of Santa Barbara) ss

On this 7th day of January, in the year one thousand nine hundred and fourteen A.D., before me Fred R. Schauer, Notary Public in and for said county of Santa Barbara, state of California, residing therein, duly commissioned and sworn, personally appeared Joseph C. Maretti, personally known to me to be the person whose name is subscribed to the within instrument, and acknowledged to me that he executed the same.

IN WITNESS WHEREOF I have hereunto set my hand and affixed my official seal, the day and year in this certificate first above written.

Fred R. Schauer, Notary Public in and for Santa Barbara county, state of California

(Notarial Seal)

RECORDED AT REQUEST of County Auditor at 30 min. past 9 o'clock A.M. Jan 7, 1914.

Mark Bradley
County Recorder

Exhibit 1

EXHIBIT C

Witnesseth:- That the said parties of the first part, for and in consideration of the sum of seven thousand dollars, lawful money of the United States of America, to them in hand paid by the said party of the second part, the receipt whereof is hereby acknowledged, have granted, bargained and sold, conveyed and confirmedand by these presents do grant, bargain and sell, convey and confirm unto the said party of the second part, and to its successors and assigns forever, all that certain lot, piece or parcel of land situate, lying and being in the county of Santa Barbara, state of California, and bounded and particularly described as follows, to wit:-

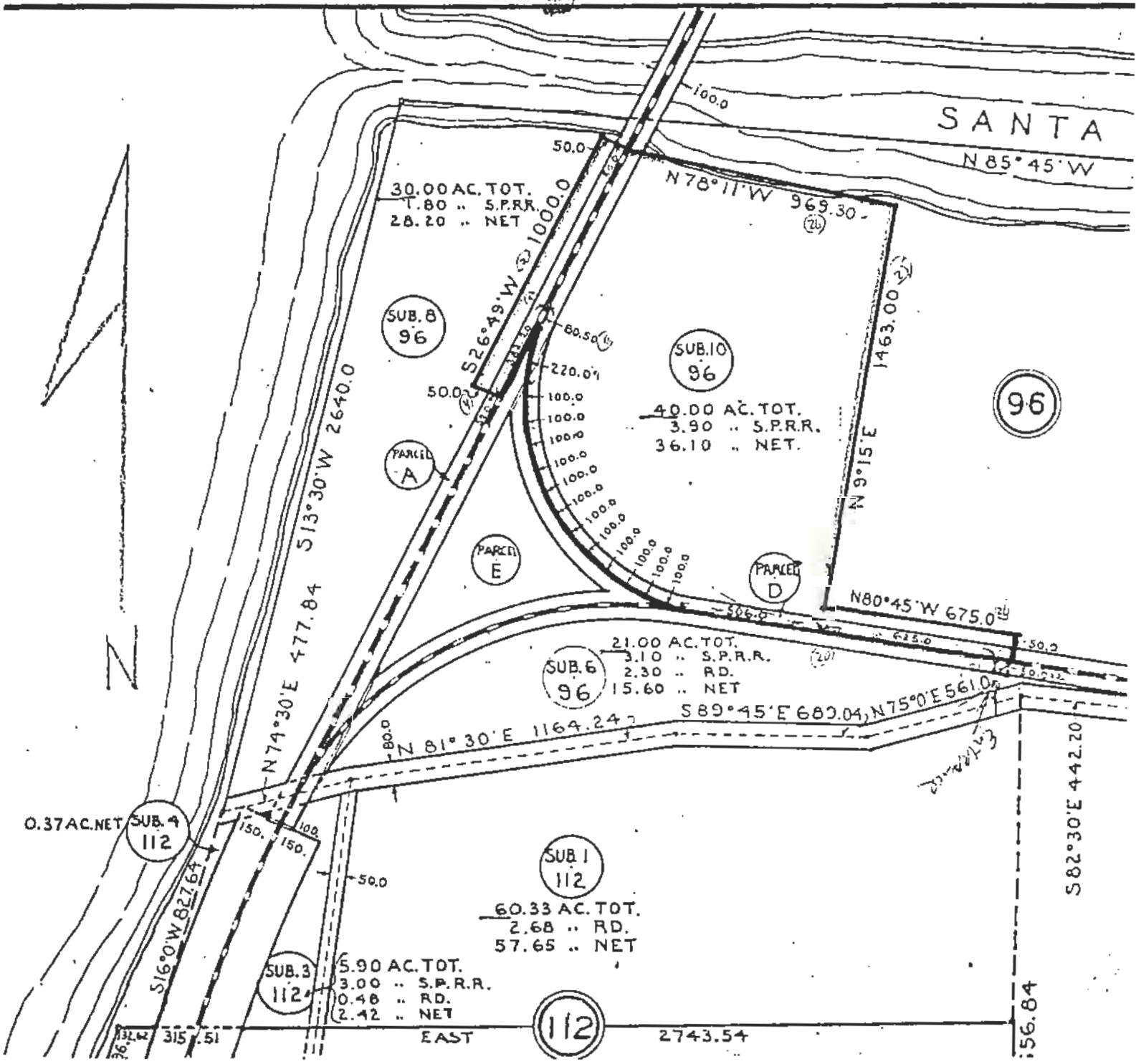
Commencing at a point in the center of the Southern Pacific Railroad bridge and in the center of the Santa Ynez River where said river empties into the Pacific Ocean, from which the southerly end of bridge in center of tract (steel structure) bears S. 26° 49' W. 274.2 feet; said point being Engineer's Station L 11876+93.7 of said Southern Pacific Railroad; thence 1st at right angles with the center line of said railroad N. 63° 11' W. 100 feet; thence 2nd, S. 26° 49' W. parallel with said center line of Railroad, 1000 feet; thence 4th at right angles, S. 63° 11' E., 100 feet to center of said Railroad; thence 5th, N. 26° 49' E., along the center line of said Railroad 302.2 feet; thence 6th, S. 23° 25' W. leaving the main line of said Southern Pacific Railroad and along the center line of the branch road to Lompoc, 80.8 feet to center of tract and northerly side of steel switch board; thence 7th, on an angle to the left 2° 39', 220 feet to a point in the center of track; thence 8th, 2° 39' to the left, 100 feet to the center of track; thence 9th, 9° 09' to the left, 100 feet to the center of track;; thence 10th, 9° 52' to the left, 100 feet to the center of track; thence 11th 9° 41' to the left, 100 feet to the center of track; thence 12th, 10° 12' to the left, 100 feet to the center of track; thence 13th, 10° 15' to the left, 100 feet to the center of track; thence 14th, 9° 25' to the left, 100 feet to the center of track; thence 15th, 11° 04' to the left, 100 feet to the center of track; thence 16th, 9° 11' to the left, 100 feet to the center of track; thence 17th, 10° 06' to the left, 100 feet to the center of track; thence 18th 6° 24' to the left, 100 feet to the center of track; thence 19th, 2° 03' to the left, 100 feet thence 20th, 1° 11' to the left along the tangent to the "Y" curves of said branch road, 1131 feet; thence 21st at right angles S. 9° 15' W., 50 feet to the southerly side of said railroad; thence 22nd, at right angles along the southerly side of said Railroad track, S. 80° 45' E., 50 feet to a point from which a 2" pipe with brass cap bears S. 9° 15' W., 2 feet; thence 23rd at right angles N. 9° 15' E., 150 feet to a 2" pipe with brass cap; thence 24th, at right angles, N. 80° 45' W. parallel with the northerly line of said branch railroad to Lompoc and 50 feet therefrom 675.0 feet to another 2" pipe with brass cap; thence 25th, at right angles N. 9° 15' E., at 1063.6 feet passing through a 2" pipe with brass cap about 20 feet southerly from the southerly side of Santa Ynez River, at 1463.0 feet to center of said river; thence 26th, N. 78° 11' W., 969.3 feet to the point of commencement, which leaving out the Southern Pacific right of way, contains 40 acres, as more fully shown on map entitled "Map of Survey made by F.F.Flournoy of Lompoc Ocean Park near Surf, Santa Barbara Co., Cal., containing 40 acres, owned by the County of Santa Barbara, June, 1913. Scale one inch-100 feet" which map was filed in the office of the County Recorder of said County of Santa Barbara on the 13th day of June, 1913, and pasted in book 7 of maps and surveys at page 26, Santa Barbara County Records, said land being a part of Farm Lot No. 96 of the Subdivisions

Exhibit C & D Ocean Beach Park

Exhibit 1

EXHIBIT D

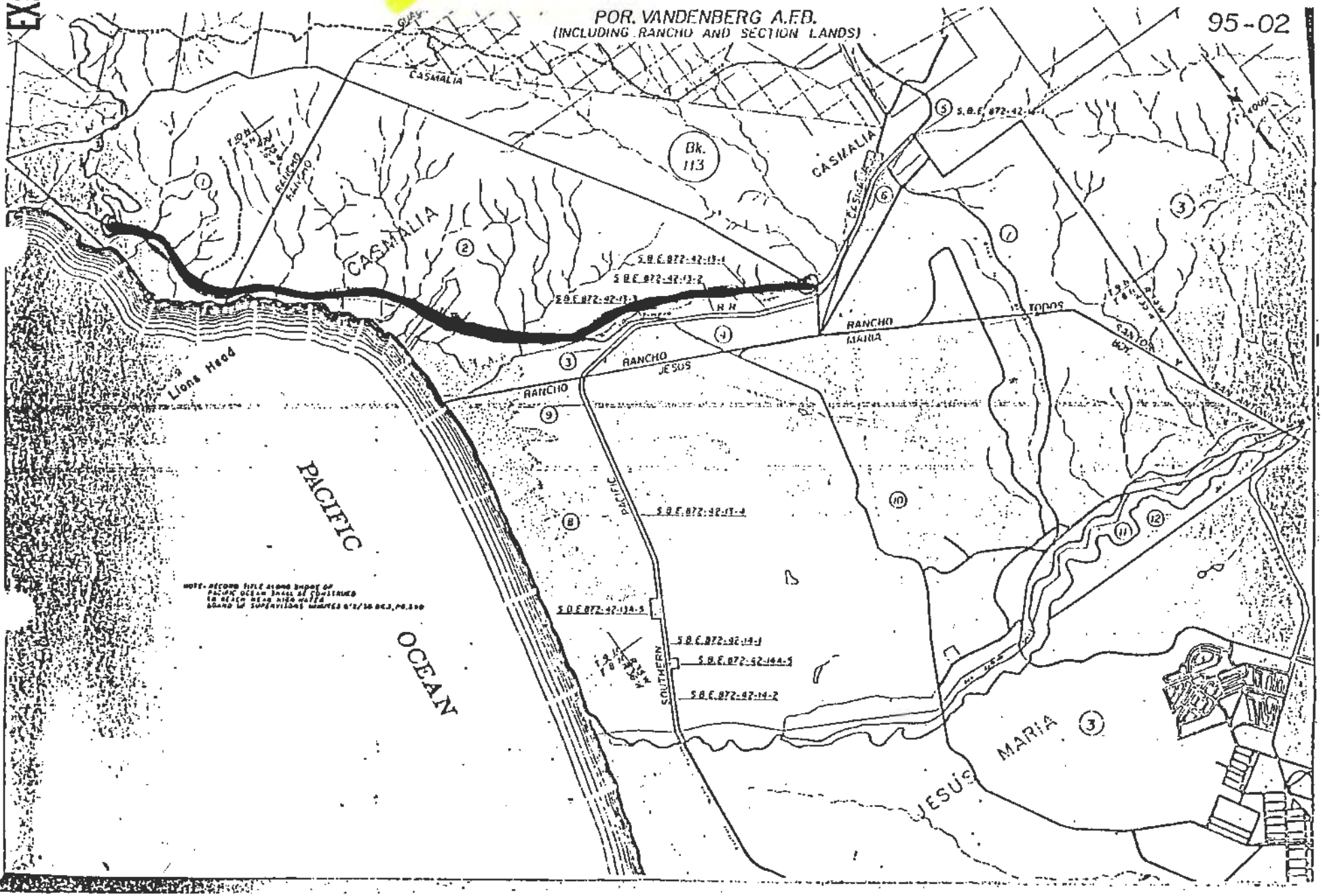
SURF



Ocean Beach Park

EXHIBIT E

PA Sal Exhibit F



PA Sal FOR INFORMATION ONLY.

Expired 7 Feb 1990

A G R E E M E N T

LA-2503

THIS AGREEMENT IS MADE between the

COUNTY OF SANTA BARBARA, California,
hereinafter called "COUNTY"

and the

UNITED STATES OF AMERICA
hereinafter called
"UNITED STATES"

as follows:

WHEREAS, the United States has activated the Vandenberg Air Force Base in Santa Barbara County and has constructed missile installations on said base;

and

WHEREAS, the County has a certain road and road rights of way known as the Point Sal Road, portions of which lie within the military reservation of the Vandenberg Air Force Base;

and

WHEREAS, it is necessary that portions of said Point Sal Road lying within the military reservation be closed to travel by the public, either permanently or intermittently, because of the operation of the military facilities near said road right-of-way in order to protect the public health and safety and also because of military necessity and for security reasons;

and

WHEREAS, because of the compelling military necessity, the United States must acquire control of said portions of Point Sal Road; and

WHEREAS, the parties hereto desire to avoid a condemnation action to condemn said road.

NOW, THEREFORE, in consideration of the foregoing premises, the parties hereto promise, covenant and agree as follows:

1. The County agrees that during the term of this agreement, the United States shall have exclusive use and control of that portion of Point Sal Road and road rights-of-way between a point where the said road intersects the easterly boundary of the military reservation of the Vandenberg Air Force Base (1.7± miles west of Lompoc-Casmalia Road) and the easterly edge of the said Point Sal Road at its intersection with the Point Sal Beach State Park Road.

2. The County agrees that during the term of this agreement the United States shall have the right to regulate and control traffic including the right to close the road entirely to use by the public or use by any persons other than those authorized by the United States, for short periods of time prior to and during missile firings, on that portion of Point Sal Road between a point where the said road intersects the Point Sal Beach State Park Road and the northerly boundary of the military reservation of the Vandenberg Air Force Base.

3. The United States shall have the right of construct, reconstruct, maintain, realign, relocate and use said portions of Point Sal Road described in Paragraph 1 of this agreement.

4. Provided that adequate appropriations are available, the United States shall have the obligation to maintain for vehicular use and in a safe condition said portion of Point Sal Road described in Paragraph 2 of this agreement.

5. The term of this agreement shall be five (5) years commencing February 8, 1980, with an option in the United States to renew the agreement for an additional five (5) years. Said option may be exercised by delivery or mailing of notice of exercising said option to:

Board of Supervisors
County of Santa Barbara
105 East Anapamu Street
Santa Barbara, California 93101

Attn: HOWARD C. MENZEL
Clerk of the Board

on or before thirty (30) days prior to the expiration of the term hereof.

LA-2503

COUNTY OF SANTA BARBARA

Dated: 9-4-79 By: _____
Chairman, Board of Supervisors

ATTEST:

County Clerk

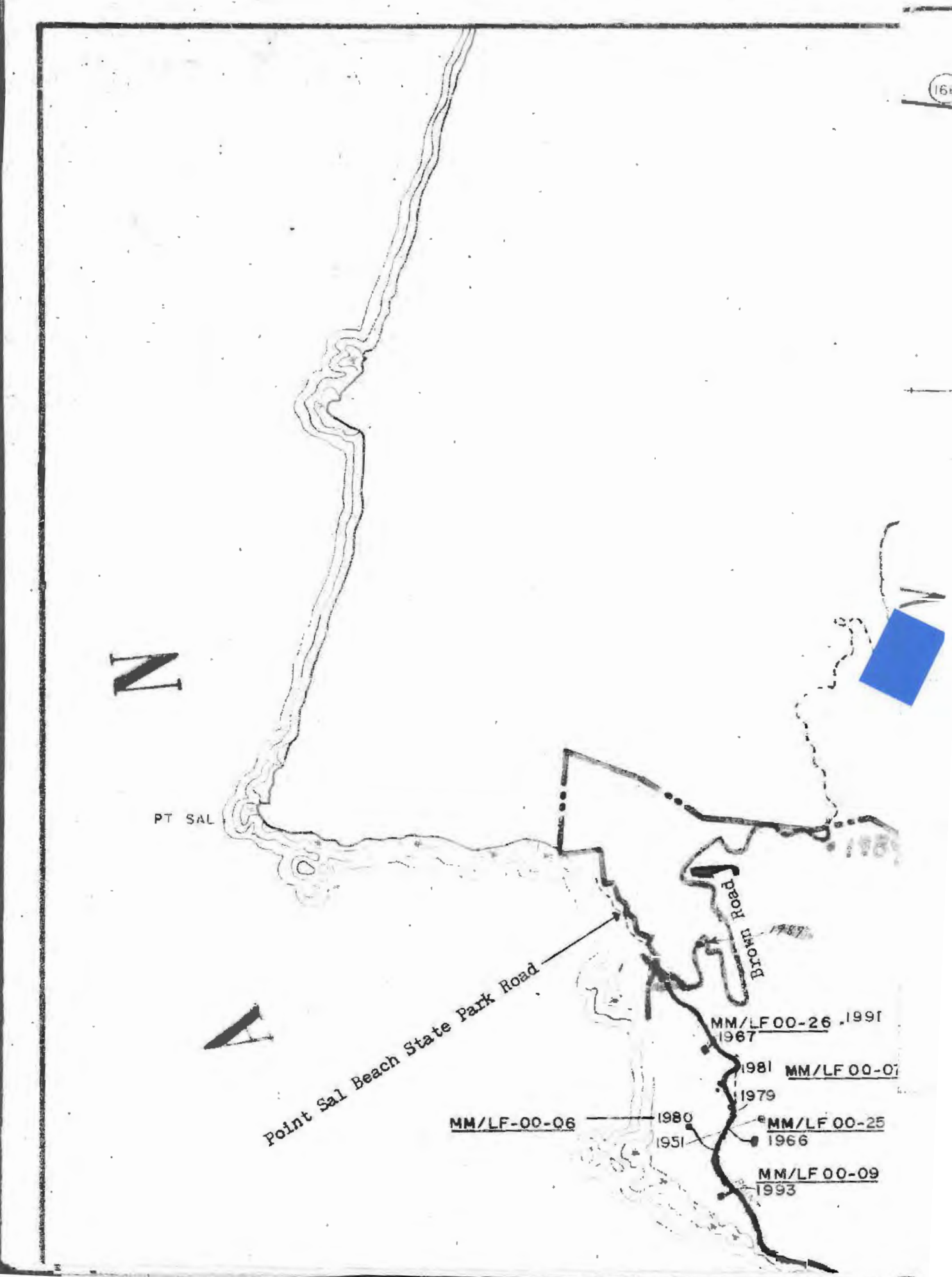
By: _____
Deputy County Clerk

UNITED STATES OF AMERICA

Dated: _____ By: _____
DOUGLAS E. GLASS
Chief, Real Estate Division
U.S. Army Engineer District, Los Angeles

APPROVED AS TO FORM:
GEORGE P. KADING
COUNTY COUNSEL

By: _____
Assistant Co. Counsel


N
PT SAL
Brown Road
Point Sal Beach State Park Road
MM/LF 00-26
1967
1991
1981
MM/LF 00-07
1979
MM/LF-00-06
1980
1951
MM/LF 00-25
1966
MM/LF 00-09
1993

No. SPCVAN-1-93-0006

SUPPLEMENTAL EVACUATION AGREEMENT NO. 1
(Extended Term)

THIS SUPPLEMENTAL AGREEMENT NO. 1, entered into by and between the UNITED STATES OF AMERICA, hereinafter referred to as the GOVERNMENT, and the COUNTY OF SANTA BARBARA, STATE OF CALIFORNIA, hereinafter referred to as the COUNTY, WITNESSETH:

WHEREAS, there exists an evacuation agreement between the parties for the evacuation of County properties Jalama Beach Park, Ocean Beach Park, and Point Sal Road in case of certain government operations for purposes of military necessity, security, and public safety; and

WHEREAS, the agreement dated 1 December 1992, having been automatically renewed annually since that date, expires 1 December 1997; and

WHEREAS, the parties desire to extend the agreement for an additional five years with certain modifications and with the addition of the Surf Train Station Parking Lot.

NOW THEREFORE, in consideration of these premises, the parties hereto do mutually agree that the evacuation agreement be extended and modified in the following particulars:

1. That the agreement be extended one year through 1 December 1998 and shall automatically renew annually on 1 December 1998 and on each subsequent 1 December of the following three years for a total additional term of five years from 1 December 1997.

2. That Part III., paragraph 1., subparagraph a., be modified such that the term "government operations" be defined to include commercial launch-related operations as well as non-commercial launch operations, the government having public safety responsibility for all launch related operations, whether commercial or non-commercial.

3. That the Surf Train Station Parking Lot, owned jointly by the County and the City of Lompoc in fee and located in the vicinity of Ocean Beach County Park, the Parking Lot legally described in Exhibit "F", and outlined in red on Exhibit "G", both of which are attached hereto and incorporated by reference, shall be added to this evacuation agreement in like measure as other County properties named above.

4. That in all other respects the evacuation agreement terms conditions remain in full force and effect.

THE DULY AUTHORIZED GOVERNMENT REPRESENTATIVE SIGNED THIS AGREEMENT THIS 5th DAY OF November, 1997.

THE UNITED STATES OF AMERICA

C. Robert Kehler

C. ROBERT KEHLER
Colonel, USAF
Commander

THE DULY AUTHORIZED COUNTY GOVERNMENT REPRESENTATIVE SIGNED THIS AGREEMENT THIS 2nd DAY OF December, 1997.

THE COUNTY OF SANTA BARBARA, STATE OF CALIFORNIA

Thomas B. Urbanske

Chairman, Board of Supervisors

APPROVED AS TO FORM:

STEPHEN SHANE STARK
COUNTY COUNSEL

By: M Feelbetts
DEPUTY

ATTEST: MICHAEL F. BROWN
CLERK OF THE BOARD

By Joanna Bisbee
Deputy Clerk

APPROVED AS TO FORM:
CHARLES A. MITCHELL, RISK MANAGER

By _____

APPROVED AS TO FORM:
ROBERT GEIS, AUDITOR-CONTROLLER

By Jol Gall CPA

EXHIBIT "F"

Being a portion of the most easterly parcel of land, I.K. Fisher to Southern Pacific Railroad Company Recorded Febuary 27, 1901 in Book 76, at Page 327, of Deeds, County of Santa Barbara, State of California, more particularly described as follows:

Commencing at a T-bar and cap stamped CL (centerline) Sta. 2+44.53, Pt. Arguello, as shown on Sheet 2 of 6, Santa Barbara County Road Map, Route 149, on file at the Santa Barbara County Surveyors Office; Thence northerly along said centerline North 0° 23' 03" East, 38.28 feet to a point which bears South 9° 13' 02" East 1191.81 feet from a U.S.C. and G.S. Survey Monument stamped "Surf 2"; Thence continuing northerly along said centerline, North 0° 23' 03" East 819.46 feet to the beginning of a curve, said point bears South 28° 49' 04" East 407.44 feet from said U.S.C. and G.S. monument; Thence curving to the right with a radius of 1200.00 feet, through an angle of 7° 53' 04", for a distance of 165.13 feet to a point on said curve; Thence radial to the centerline of Route 149, (now called Ocean Avenue), North 81° 43' 53" West 234.41 feet to a point on a curve in the easterly line of said parcel, and the **POINT OF BEGINNING;**

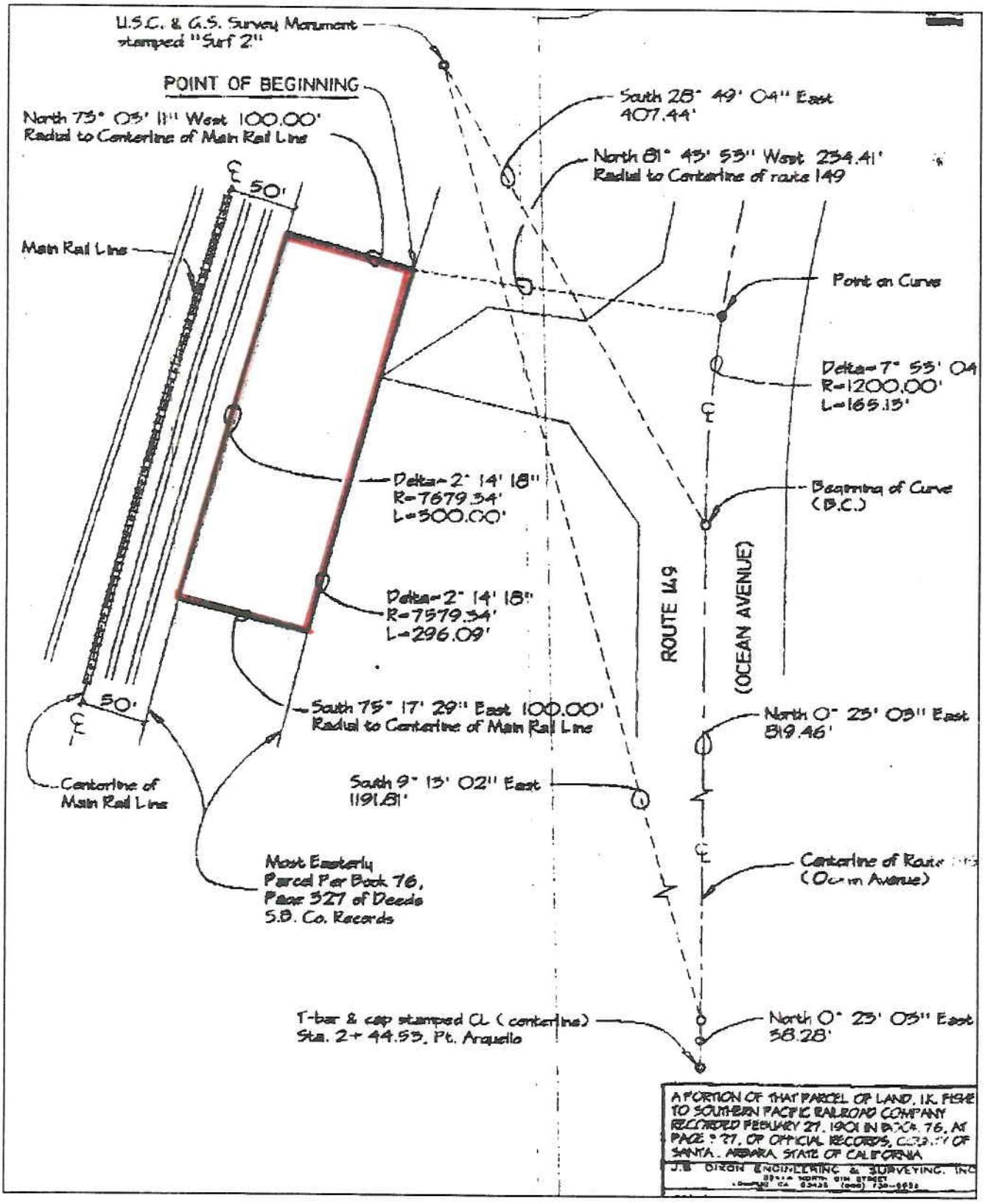
Thence 1; Radial to the centerline of the main rail line, North 73° 03' 11" West, 100.00 feet to a point on a curve in the westerly line of said Parcel, said point being 50.00 feet easterly of the centerline of the main rail line;

Thence 2; southerly along said westerly line, and curving to the left with a radius of 7679.34 feet, through an angle of 2° 14' 18", for a distance of 300.00 feet;

Thence 3; Radial to the centerline of the main rail line, South 75° 17' 29" East, 100.00 to a point on a curve in the easterly line of said parcel;

Thence 4; northerly along the easterly line of said parcel and curving to the right, with a radius of 7579.34 feet, through an angle of 2° 14' 18", for a distance of 296.09 feet, to the Point of Beginning, and containing 29804.67 square feet of land

EXHIBIT "G"


U.S.C. & G.S. Survey Monument stamped "Surf 2"
POINT OF BEGINNING
North 75° 05' 11" West 100.00' Radial to Centerline of Main Rail Line
℄ 50'
Main Rail Line
South 28° 49' 04" East 407.44'
North 81° 45' 55" West 234.41' Radial to Centerline of route 149
Point on Curve
Delta=7° 55' 04" R=1200.00' L=165.13'
Delta=2° 14' 18" R=7679.34' L=300.00'
Beginning of Curve (B.C.)
Delta=2° 14' 18" R=7579.34' L=296.09'
ROUTE 149
(OCEAN AVENUE)
50'
South 75° 17' 29" East 100.00' Radial to Centerline of Main Rail Line
North 0° 25' 05" East 519.46'
Centerline of Main Rail Line
South 9° 13' 02" East 1191.81'
Most Easterly Parcel Per Book 76, Page 327 of Deeds S.B. Co. Records
Centerline of Route (Ocean Avenue)
T-bar & cap stamped CL (centerline) Sta. 2+44.55, Pt. Arguello
North 0° 25' 05" East 58.28'
A PORTION OF THAT PARCEL OF LAND, I.K. FISKE TO SOUTHERN PACIFIC RAILROAD COMPANY RECORDED FEBRUARY 27, 1901 IN BOOK 76, AT PAGE 327, OF OFFICIAL RECORDS, COUNTY OF SANTA BARBARA, STATE OF CALIFORNIA
J.B. DIXON ENGINEERING & SURVEYING, INC.

EVACUATION AGREEMENT NO. SPCVAN-1-93-0006

SUPPLEMENTAL AGREEMENT NO. 2

THIS SUPPLEMENTAL AGREEMENT entered into this 13th day of May, 2003, by and between the County Of Santa Barbara, State of California ("County") and Secretary of the Air Force ("Government" or "Air Force"). The Government and the County may be referred to jointly as the "Parties," and each separately may be referred to as a "Party."

RECITALS:

A. On 1 December 1992, the Parties entered into an evacuation agreement for the evacuation of County properties Jalama Beach Park, Ocean Beach Park and Point Sal Road in case of certain government operations for purposes of military necessity, security and public safety.

B. On 05 November 1997, the parties agreed to extend the agreement for one additional year through 01 December 1998 and to automatically renew the agreement for a total additional term of five years from December 1, 1997 and added Surf Station Parking Lot to the agreement.

AGREEMENT:

1. This PERMIT is hereby modified in the following particulars, but no others:

   a. The term of the PERMIT is extended for five (5) years beginning 01 December 2002 through 30 November 2007.

2. All other terms and conditions of the PERMIT shall be and remain the same.

3. This Supplemental Agreement shall be effective immediately.

Project: Evacuation Agreement
No. SPCVAN-1-93-0006:
Supplemental Agreement No. 2
Jalama Beach Park; (WC2044)
Ocean Beach Park; (WC1165)
Point Sal Road; (WC3223)
Surf Train Station Parking Lot,
WC3775)

IN WITNESS WHEREOF, County and Government have executed this Supplemental Agreement No. 2 to Evacuation Agreement No. SPCVAN-1-93-0006, by the respective authorized officers as set forth below to be effective as of the date executed by the Government.

"COUNTY"
COUNTY OF SANTA BARBARA

By: _____
Chair, Board of Supervisors

Date: 2/11/03

ATTEST:
MICHAEL F. BROWN
CLERK OF THE BOARD

By: _____
Deputy

APPROVED:

By: _____
Terri Maus-Nisich, Parks Director

APPROVED AS TO FORM:
STEPHEN SHANE STARK
COUNTY COUNSEL

By: _____

APPROVED:

By: _____
John Forner
Supervising Risk Analyst

APPROVED AS TO FORM:
ROBERT W. GEIS, CPA
AUDITOR-CONTROLLER

By: _____

APPROVED:

By: _____
Ronn Carlentine, SR/WA
Real Property Supervisor

IN WITNESS WHEREOF, I have set my hand by authority of the Secretary of the Air Force as of the day and year first written above.

DEPARTMENT OF THE AIR FORCE

By: _____
Robert M. Worley II
Colonel, USAF
Commander, 30th Space Wing

SUPPLEMENTAL AGREEMENT NO. 3
to
EVACUATION AGREEMENT NO. DACA-09-3-98-0008
Between
THE STATE OF CALIFORNIA
and
THE UNITED STATES OF AMERICA

WITNESSETH:

WHEREAS, The State of California granted to United States of America an evacuation agreement commencing 01 April 1998 and ending 31 March 2003 for an evacuation agreement between the parties for the evacuation of Tract 422 in order to provide for the safety of persons on land in the proximity of Vandenberg Air Force Base in connection with launch operation activities, and

WHEREAS, Supplemental Agreement No. 1 executed on 21 April 2003 to extend the term for a period of years ending 31 March 2009, and

WHEREAS, Supplemental Agreement No. 2 executed on 01 April 2009 to extend the term for a period of years ending 31 March 2014, and

WHEREAS, The parties would like to now extend the agreement for an additional one year with four one year periods.

NOW, THEREFORE, in consideration of these premises, the parties hereto do mutually agree that the evacuation agreement be extended and modified in the following particulars:

1. That the evacuation agreement be extended one year from 01 April 2014 through 31 March 2015 and each option, subject to the availability of funds, shall automatically renew annually on each subsequent 01 April of the following four years for a total additional term of five years to 31 March 2019

All other terms and conditions of the aforesaid evacuation agreement are hereby ratified and, except as modified by this Supplemental Agreement, shall remain in full force and effect.

SUPPLEMENTAL AGREEMENT NO. 3
to
EVACUATION AGREEMENT NO. DACA-09-3-98-0008

THIS SUPPLEMENTAL AGREEMENT is also executed by The Government under the authority of the Secretary of the Air Force this 20 day of Oct, 2017.

UNITED STATES OF AMERICA

MICHAEL S. HOUGH, Colonel, USAF
Commander, 30th Space Wing

IN WITNESS WHEREOF, I have hereunto set my hand by authority of the State of California this 29th day of August, 2017.

STATE OF CALIFORNIA

DRodriguez

DANITA RODRIGUEZ, Superintendent
Channel Coast District
California State Parks
California Department of Parks and Recreation
1933 Cliff Drive, Suite 27
Santa Barbara, CA 93109

SUPPLEMENTAL AGREEMENT NO. 3
to
EVACUATION AGREEMENT NO. DACA-09-3-98-0009
Between
THE STATE OF CALIFORNIA
and
THE UNITED STATES OF AMERICA

WITNESSETH:

WHEREAS, The State of California granted to United States of America an evacuation agreement commencing 01 April 1998 and ending 31 March 2003 for an evacuation agreement between the parties for the evacuation of Tract 432 in order to provide for the safety of persons on land in the proximity of Vandenberg Air Force Base in connection with launch operation activities, and

WHEREAS, Supplemental Agreement No. 1 executed on 21 April 2003 to extend the term for a period of years ending 31 March 2009, and

WHEREAS, Supplemental Agreement No. 2 executed on 01 April 2009 to extend the term for a period of years ending 31 March 2014, and

WHEREAS, The parties would like to now extend the agreement for an additional one year with four one year periods.

NOW, THEREFORE, in consideration of these premises, the parties hereto do mutually agree that the evacuation agreement be extended and modified in the following particulars:

1. That the evacuation agreement be extended one year from 01 April 2014 through 31 March 2015 and each option, subject to the availability of funds, shall automatically renew annually on each subsequent 01 April of the following four years for a total additional term of five years to 31 March 2019

All other terms and conditions of the aforesaid evacuation agreement are hereby ratified and, except as modified by this Supplemental Agreement, shall remain in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand by authority of the State of California this 29th day of August, 2017.

STATE OF CALIFORNIA

DRodriguez

DANITA RODRIGUEZ, Superintendent
Channel Coast District
California State Parks
California Department of Parks and Recreation
1933 Cliff Drive, Suite 27
Santa Barbara, CA 93109

SUPPLEMENTAL AGREEMENT NO. 3
to
EVACUATION AGREEMENT NO. DACA-09-3-98-0009

THIS SUPPLEMENTAL AGREEMENT is also executed by The Government under the authority of the Secretary of the Air Force this 20 day of Oct, 2017.

UNITED STATES OF AMERICA

MICHAEL S. HOUGH, Colonel, USAF
Commander, 30th Space Wing

SUPPLEMENTAL AGREEMENT NO. 4

THIS SUPPLEMENTAL AGREEMENT entered into this ____ day of _____, **2020,** by and between THE County of Santa Barbara, State of California ("County") and Secretary of the Air Force ("Government" or "Air Force") The Government and the County may be referred to jointly as the "Parties," and each separately may be referred to as a "Party."

RECITALS

A. On 1 December 1992, the Parties entered into an evacuation agreement for the evacuation of County properties Jalama Beach Park, Ocean Beach Park, Surf Station Parking and Brown/Point Sal Road in case of certain government operations for purposes of military necessity, security and public safety.

B. On 05 November 1997, the Parties agreed to extend the Agreement for one additional year through 01 December 1998 and to automatically renew the Agreement for a total additional term of five years from December 1, 1997 and added Surf Station Parking Lot to the Agreement.

C. On 13 May 2003, the Parties agreed to extend the agreement for five years through 30 November 2007.

D. On 18 November 2008 the Parties agreed to extend the agreement for an additional total term of five years through 30 November 2012.

AGREEMENT

1. The Agreement is hereby modified in the following particulars, but no others:

   a. The term of the Permit is extended for an additional twenty (20) years, beginning 1 December 2012 to and including 30 November 2032.

2. All other terms and conditions of the agreement shall be and remain the same.

3. This Supplemental Agreement shall be effective immediately.

IN WITNESS WHEREOF, I have set my hand by authority of the Secretary of the Air Force as of the day and year first written above.

DEPARTMENT OF THE AIR FORCE

BY: _____

ROBERT E. MORIARTY, P.E
Director
Installations Directorate
Air Force Civil Engineer Center

IN WITNESS WHEREOF, Government and County have executed this Supplemental Agreement No. 4 to Evacuation Agreement SPCVAN-1-93-0006, by the respective authorized officers as set forth below to be effective as of the date executed by Government.

COUNTY:

COUNTY OF SANTA BARBARA

ATTEST:
MONA MIYASATO
CLERK OF THE BOARD

By: _____
Deputy Clerk

By: _____
Gregg Hart, Chair
Board of Supervisors

Dated: _____

APPROVED AS TO FORM:
MICHAEL C GHIZZONI
COUNTY COUNSEL

By: _____
Scott Greenwood
Deputy County Counse

APPROVED AS TO ACCOUNTING FORM:
BETSY M. SCHAFFER, CPA
AUDITOR-CONTROLLER

By: _____
Deputy

APPROVED:

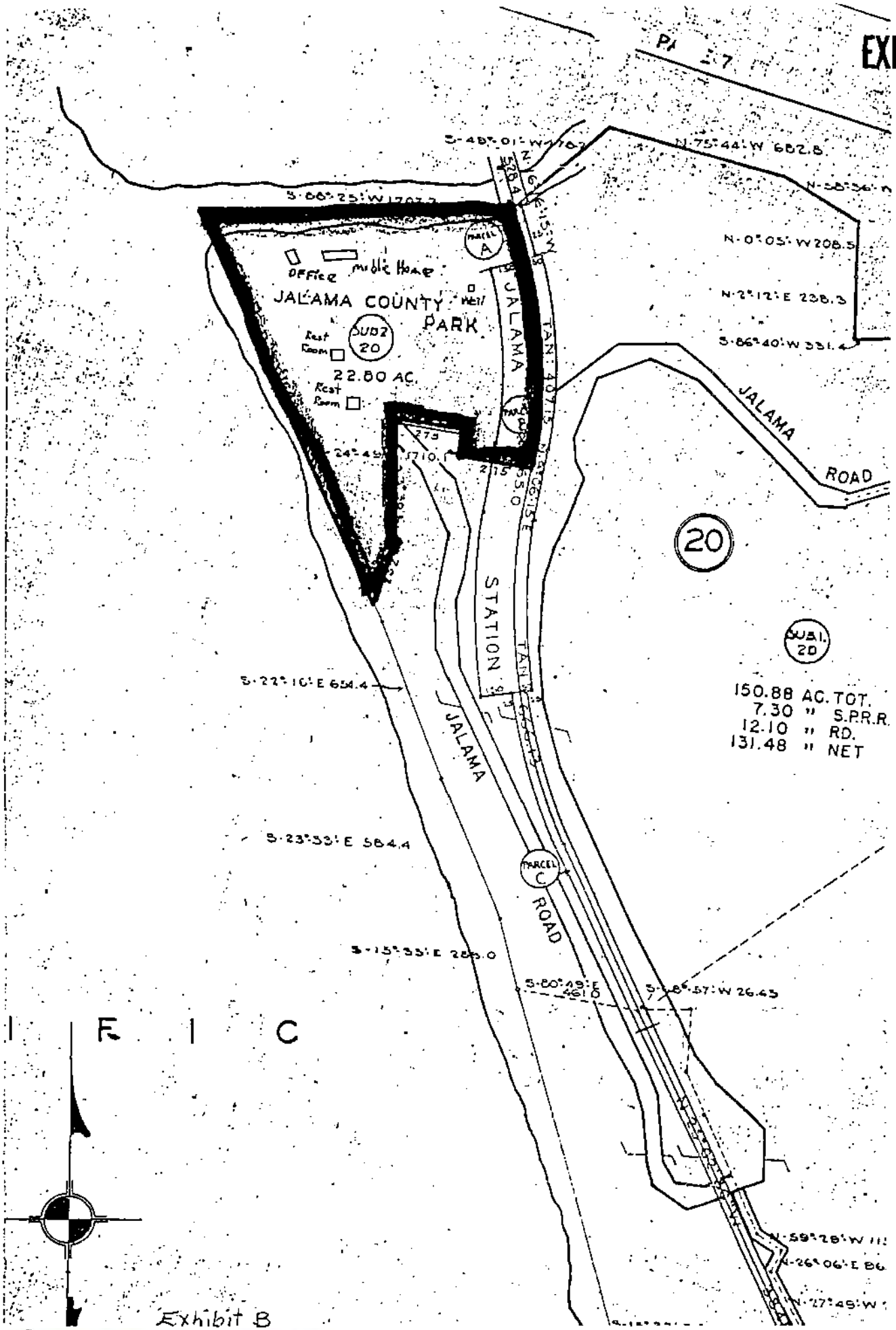
By: _____
Carlo Achdjian
Real Property Manager

APPROVED:

By: _____
Ray Aromatorio, ARM, AIC
Risk Manager


Approx. location of Jalama Beach Park
Approx. location of Jalama Beach Park
Jalama Beach

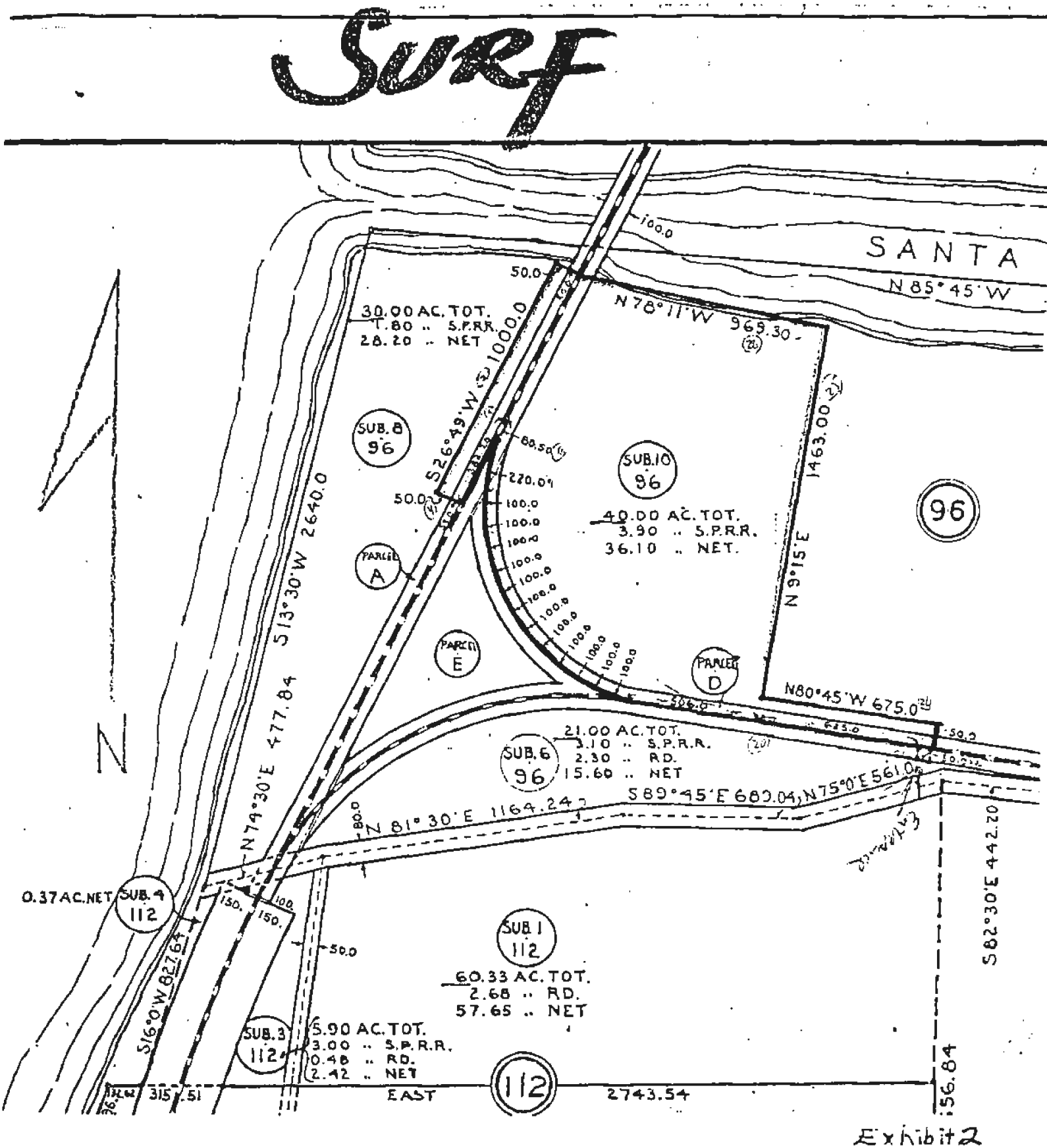
EXHIBIT B



Jalama Beach Park


Approx. location of Ocean Beach Park
Approx. location of Surf Station Parking Lot
Approx. location of Ocean Beach Park
Approx. location of Surf Station Parking Lot

EXHIBIT D



Ocean Beach Park

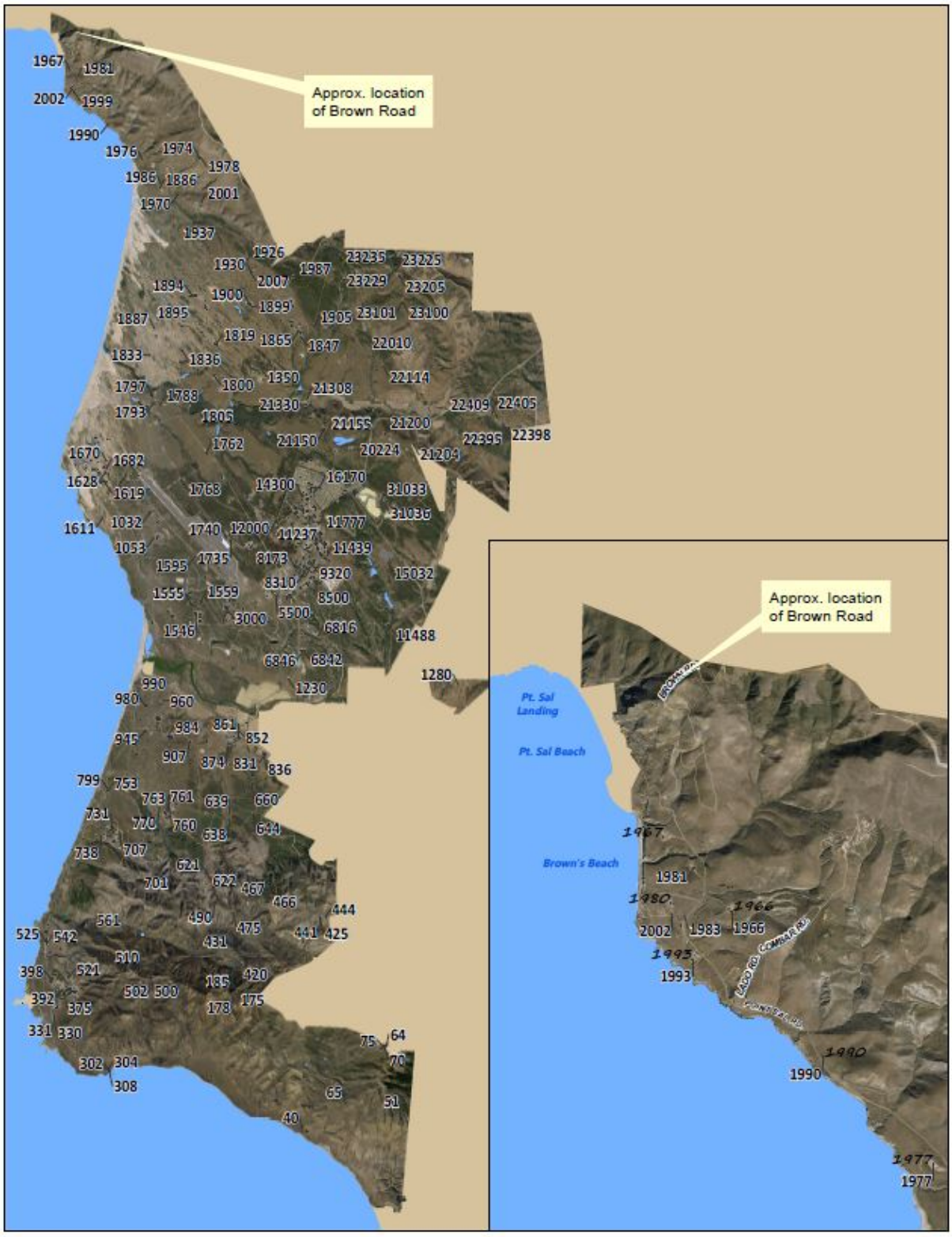
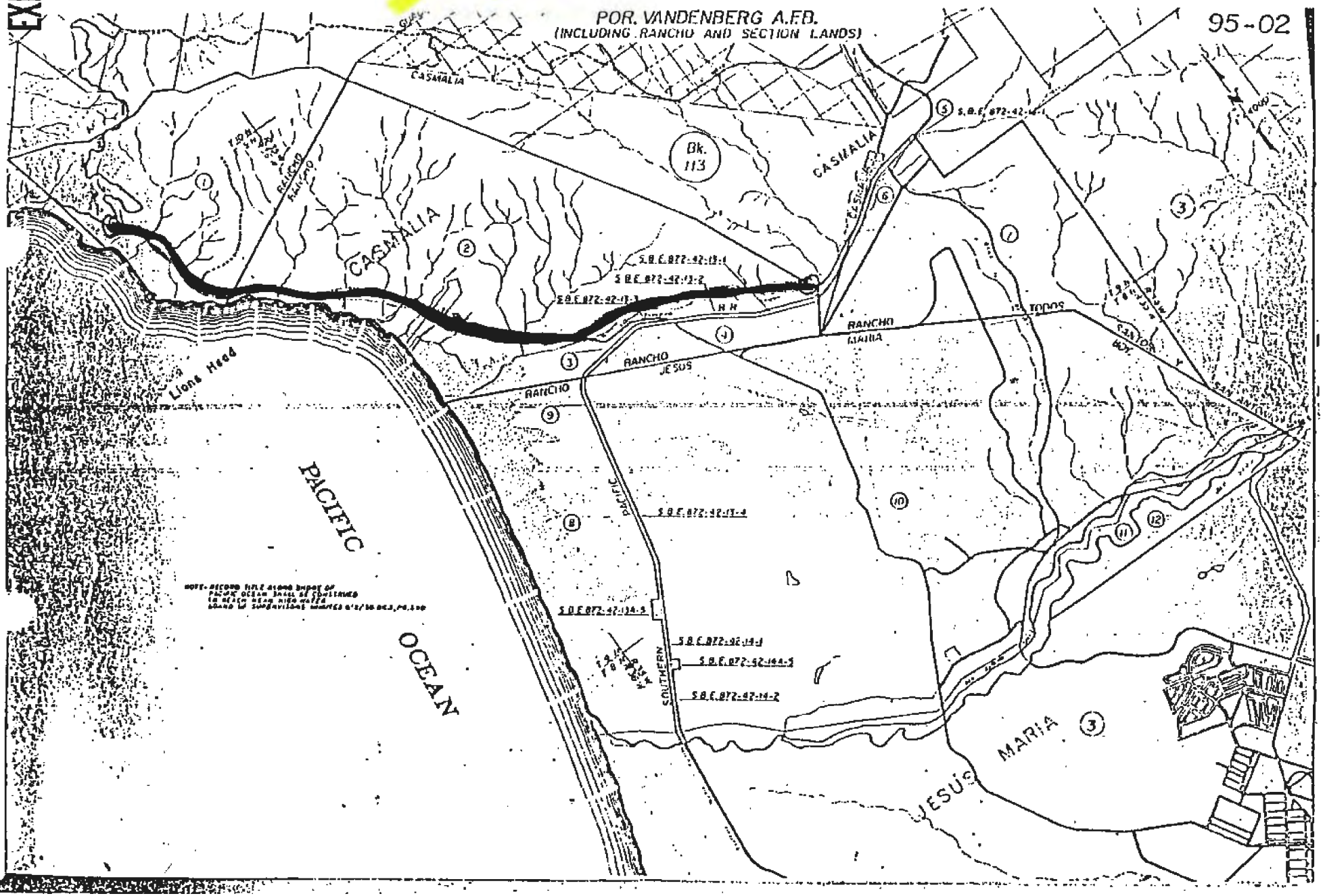

Approx. location of Brown Road
Approx. location of Brown Road
Pt. Sal Landing
Pt. Sal Beach
Brown's Beach

EXHIBIT E

Pt Sal Exhibit E

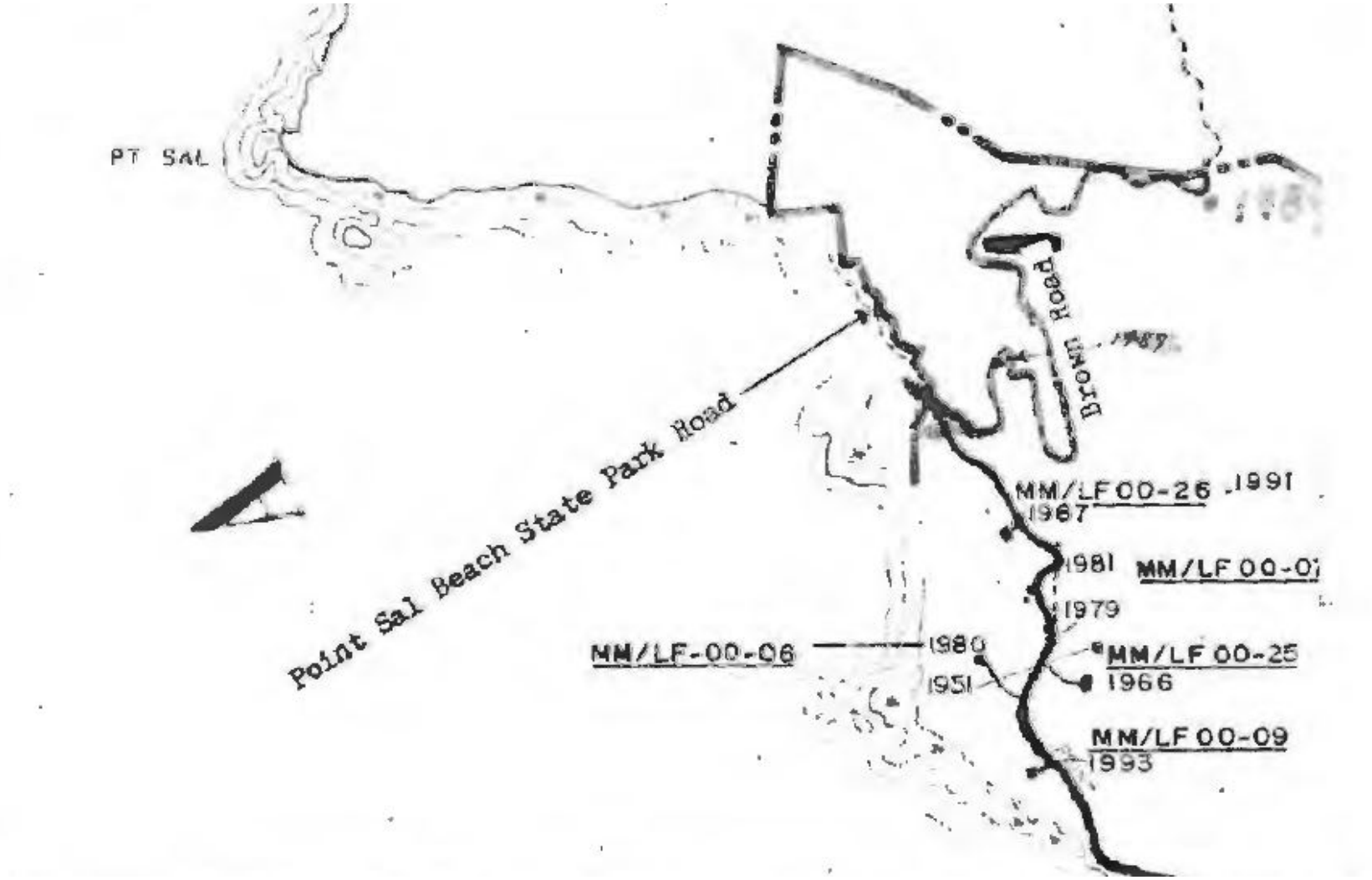


FOR INFORMATION ONLY.

Pt Sal


Approx. location of Pt. Sal Park
Approx. location of Pt. Sal Park
Pt. Sal Landing
Pt. Sal Beach
Brown's Beach

Brown Road on North Base
To
Point Sal State Beach



APPENDIX N

NOTICE OF AVAILABILITY FOR PUBLIC REVIEW, PROOF OF DELIVERY/PUBLICATION, COMMENTS RECEIVED ON FINAL DRAFT, AND RESPONSES

DEPARTMENT OF THE AIR FORCE
UNITED STATES SPACE FORCE
SPACE LAUNCH DELTA 30

25 Oct 21

MEMORANDUM FOR ALL INTERESTED GOVERNMENT AGENCIES, PUBLIC OFFICIALS, ORGANIZATIONS, AND INDIVIDUAL PARTIES

FROM: 30 CES/CEI
1028 Iceland Avenue
Vandenberg SFB CA 93437-6010

SUBJECT: Final Draft Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) Pre-launch and Launch Operations of ABL Space Systems RS1 at Launch Complex 576-E, Vandenberg Space Force Base, California.

1. Attached as public and agency notification, to comply with the National Environmental Policy Act of 1969, and the President's Council on Environmental Quality's implementing regulations, is the Final Draft EA and FONSI for Pre-launch and Launch Operations of ABL Space Systems RS1 at Launch Complex 576-E, Vandenberg Space Force Base, California.

2. This Final Draft EA is available at: the Lompoc, Santa Maria, and Santa Barbara Public Libraries, and the VSFB Library. The Proposed Action is to operate the ABL Space Systems (ABL) RS1 launch vehicle at Launch Complex 576-E (LC 576-E) on Vandenberg Space Force Base, California and the associated infrastructure improvements needed to LC 576-E for the launch program. Resources analyzed in the attached Final Draft EA include air quality, sound (airborne), biological resources, water resources, cultural resources, Department of Transportation Act Section 4(f) properties, recreation, transportation, human health and safety, hazardous materials and waste management, solid waste management, and Coastal Zone management. This Final Draft EA concludes that there will be no significant environmental impacts resulting from the Proposed Action.

3. The public comment period for this Final Draft EA/FONSI will be from 27 October 2021 through 26 November 2021. Comments may be sent to Space Launch Delta 30, Installation Management Flight Environmental Assets, 1028 Iceland Avenue, Building 11146, Vandenberg Space Force Base, California 93437, attention of Ms. Samantha Kaisersatt, emailed to samantha.kaisersatt@spaceforce.mil, or faxed to (805) 606-6137. If you have any questions, please contact Ms. Samantha Kaisersatt at (805) 605-8684.

10/25/2021

X Beatrice L Kephart
Beatrice L Kephart
Signed by: KEPHART.BEATRICE.LINDA.1166122291

BEATRICE L. KEPHART
Chief, Installation Management Flight

Attachment:
Final Draft EA and FONSI for Pre-launch and Launch Operations of ABL Space Systems RS1 at Launch Complex 576-E, Vandenberg Space Force Base, California.