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Initial Development and Test

Environmental Assessment

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14. ABSTRACT

The Kinetic Energy Interceptor (KEI) Program would be initiated to develop and demonstrate a robust kinetic energy kill capability against ballistic missiles in the boost or early midcourse phases of flight. This EA documents the environmental analysis of implementing the initial phase of the KEI Program, which consists of flight-testing the interceptor booster at Vandenberg Air Force Base, California.

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KINETIC ENERGY INTERCEPTOR INITIAL DEVELOPMENT AND TEST ENVIRONMENTAL ASSESSMENT

AGENCY: Missile Defense Agency

ACTION: Finding of No Significant Impact

BACKGROUND: The Missile Defense Agency (MDA) prepared an Environmental Assessment (EA) to evaluate the potential environmental consequences of implementing the initial phases of the proposed Kinetic Energy Interceptor (KEI) Program at Vandenberg Air Force Base (AFB) in California (CA). The attached EA, which is hereby incorporated by reference, was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, Executive Order 12114 (Environmental Effects Abroad of Major Federal Actions), Council on Environmental Quality (CEQ) Regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508), 32 CFR Part 651 (*Environmental Analysis of Army Actions*), and 32 CFR Part 989 (*Environmental Impact Analysis Process*).

The MDA is responsible for developing, testing, and deploying the Ballistic Missile Defense System (BMDS) to defend the United States and its deployed forces, allies, and friends from ballistic missiles. The KEI Program is needed to develop and demonstrate a high speed hit-to-kill interceptor that can strike medium- to long-range ballistic missiles in the boost or early midcourse phases of flight. Program activities would focus initially on booster development and flight tests. The overall program activities would reduce developmental risks by conducting a series of flight tests.

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES: For the initial phase of the KEI Program, the Proposed Action is to conduct four risk reduction flight tests for the KEI booster at Vandenberg AFB. All four flight tests would be launched over the North Pacific Ocean, allowing spent rocket motors and upper stage components to impact in the Broad Ocean Area (BOA). No target missile intercepts would be attempted during these four tests.

Although three alternative launch sites at Vandenberg AFB are analyzed in the EA, only two of the alternatives—Alternative 1 (Launch Complex 576E [LC-576E]) and Alternative 3 (Launch Facility 06 [LF-06])—are still under consideration for the four KEI flight tests. Alternative 2 (Test Pad 01 [TP-01]) was recently dropped from KEI consideration due to mission conflicts with other US Air Force (USAF) programs. For the first KEI launch, the MDA's preferred alternative launch site is Alternative 1. Decisions for the remaining three flights are pending, but the MDA could select either Alternative 1 or Alternative 3.

In support of the flight tests, missile assembly and integration activities—including flight vehicle/canister integration, test, and checkout activities—would also occur at Vandenberg AFB. Two integration facilities would be used and two candidate launch control centers are also considered. Repairs and modifications to some of the existing buildings and facilities would be needed to meet program requirements. The four flight tests analyzed in the EA would begin during calendar year 2009 and continue through 2014. In addition to the Proposed Action, the EA also analyzes the No Action Alternative, which serves as the baseline against which the Proposed Action is evaluated.

ENVIRONMENTAL EFFECTS: In assessing potential environmental impacts of the Proposed Action at Vandenberg AFB, the MDA identified potential effects to the following resource areas, which are analyzed in this document: air quality, noise, biological resources, cultural resources, coastal zone management, water resources, airspace, health and safety, and hazardous materials and waste management. A review of the analysis is provided below.

Air emissions from the base would be increased by site preparation and construction activities, and new propane boiler operations. Emission levels, however, would not exceed *de minimis* (minimal importance) thresholds for criteria pollutants, be regionally significant, or contribute to a violation of Vandenberg AFB's air operating permits. It is not anticipated that air quality or health-based standards for non-criteria pollutants would be exceeded.

Through application of best management practices, effects from stormwater runoff related to construction activities would be minor. In the event that a release of hazardous material or waste would occur, affected areas would be treated in accordance with applicable Federal, state, and local regulations. Project-related wastewater would be tested and disposed of according to base procedures. Vegetation clearing and maintenance for construction activities and establishing fire breaks would have minimal impacts on wildlife. Efforts would also be made to avoid potential impacts on migratory bird nests.

Most excavation work would be conducted in pre-disturbed or existing paved areas and, thus, the activities are not expected to disturb known archaeological sites. Modifications and use of historic facilities would be minimal and short term. Site preparation activities and other necessary prelaunch activities would be consistent with the Vandenberg AFB General Plan. MDA and Vandenberg AFB would comply with Federal Coastal Zone Consistency regulations and the California Coastal Zone Management Program.

The KEI flight tests represent routine types of activities at Vandenberg AFB. By adhering to established and proven safety standards and procedures, the level of risk to military personnel, contractors, and the general public would be minimal. All four of the KEI launches would utilize existing Restricted Airspace and offshore Warning Areas. The launches would be short-term events, after which joint-use airspace would be released to other users.

Noise from KEI launches would be infrequent, very short in duration, and have little effect on the CA Community Noise Equivalent Level for this area. Because KEI flight trajectories would be to the west, the sonic booms would not impact the mainland or the northern Channel Islands. Based on prior monitoring studies, the rocket launches are expected to have a negligible, short-term impact on seals and sea lions, most sea and shore birds, and other protected species on base. Through consultations, the US Fish and Wildlife Service (USFWS) agreed with MDA's findings that the proposed KEI activities "may affect and are likely to adversely affect" the endangered California least tern and the threatened western snowy plover at the Alternative 1 (LC-576E) launch site, and the endangered Gaviota tarplant at the Alternative 3 (LF-06) launch site. These adverse effects, however, are permitted under existing USFWS Biological Opinions. The proposed launches could also impact the endangered El Segundo blue butterfly, the endangered California brown pelican, and the threatened southern sea otter; however, the USFWS agreed that the launches are not likely to adversely affect these three species.

All program-related hazardous and non-hazardous wastes would be properly disposed of in accordance with applicable regulations. Hazardous material and waste-handling capacities would not be exceeded, and management programs would not have to change.

Because of the potential global effects of launching rockets over the ocean and through the atmosphere, the MDA also considered the environmental effects on the global atmosphere and on marine life in the BOA. Emissions of ozone depleting substances and greenhouse gases would be negligible, but would represent incremental additions to the global atmosphere. Prior studies of sonic booms have shown that brief transient sounds of this type are unlikely to result in significant adverse effects to protected marine mammals and sea turtles in the ocean. In the BOA, the probability for animal injuries from falling rocket debris is considered negligible.

In terms of cumulative impacts, the proposed KEI launches represent a small (6 to 8 percent) increase in the number of launches for a given year at Vandenberg AFB. The launches are short-term, discrete events that would occur at different times and at different locations across the base and within the BOA.

ENVIRONMENTAL MANAGEMENT AND MONITORING ACTIONS: Although the MDA does not expect significant or other major impacts to result from implementation of the Proposed Action, the MDA and the USAF identified some specific environmental management and monitoring actions to minimize the level of impacts that might occur at Vandenberg AFB. These activities include surveying project areas for protected and sensitive species prior to project implementation, briefing contractors and base support personnel on the sensitivity of cultural resources, and coordinating project activities with the base Environmental Office to avoid existing or potentially contaminated sites. Section 4.5 of the EA summarizes these and other measures to be implemented as part of the Proposed Action.

CONCLUSION: An analysis of the Proposed Action concluded that its implementation will not have a significant environmental impact on the human and natural environment, either by itself or cumulatively with other actions. After thoroughly considering the facts herein, the undersigned finds that the Proposed Action is consistent with existing environmental policies and objectives set forth in NEPA and its implementing regulations. Therefore, an Environmental Impact Statement for the Proposed Action is not required.

DEADLINE FOR RECEIPT OF WRITTEN COMMENTS: May 15, 2009

POINT OF CONTACT: Submit written comments or requests for a copy of the Kinetic Energy Interceptor Initial Development and Test EA to the address below. Comments may also be submitted via facsimile at (256) 955-5074, or by e-mail at env.comments@tdytsi.com. The EA and Draft Finding of No Significant Impact are also available on the Internet at: http://www.mda.mil/mdalink/html/enviro.html.

US Army Space and Missile Defense Command/Army Strategic Command
Attention: SMDC-EN-V (David Hasley)
Post Office Box 1500
Huntsville, AL 35807-3801

FINDING OF NO SIGNIFICANT IMPACT
for
KINETIC ENERGY INTERCEPTOR INITIAL DEVELOPMENT AND TEST
ENVIRONMENTAL ASSESSMENT

AGENCY: United States Air Force (USAF)

CONCUR:

_____ _____
STEVEN W. WINTERS, Colonel, USAF Date
Vice Commander, 30th Space Wing
Chairman, Environmental, Safety, and Occupational Health Council
Vandenberg AFB, CA

APPROVED:

_____ _____
CHRIS PUCKETT Date
SES, DAF
Director of Installations and Logistics

AGENCY: Missile Defense Agency (MDA)

APPROVED:

_____ _____
ALBERT D. HEMPHILL II Date
Director for Operations

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ACRONYMS AND ABBREVIATIONS

ACM	Asbestos Containing Materials
AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
AFI	Air Force Instruction
AFOSH	Air Force Occupational Safety and Health
AFSPC	Air Force Space Command
Al_2O_3	Aluminum Oxide
AOC	Area of Concern
AQCR	Air-Quality Control Region
ASEL	A-weighted Sound Exposure Level
BMDS	Ballistic Missile Defense System
BMP	Best Management Practice
BOA	Broad Ocean Area
BTU	British Thermal Unit
BTV	Background Threshold Value
CA	California
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
Cal/EPA	California Environmental Protection Agency
CARB	California Air Resources Board
CCA	California Coastal Act
CCC	California Coastal Commission
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
CH_4	Methane
Cl	Chlorine
ClO	Chlorine Oxide
CNEL	Community Noise Equivalent Level
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CY	Calendar Year
CZMA	Coastal Zone Management Act
dB	Decibel
dBA	A-weighted Decibel
DoD	Department of Defense
DOT	Department of Transportation
EA	Environmental Assessment
EDMS	Emissions and Dispersion Modeling System
ESBB	El Segundo Blue Butterfly
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
FR	Federal Register
ft	Feet

FTK	Flight Test Kinetic-Interceptor
FTS	Flight Termination System
GHG	Greenhouse Gases
GMD	Ground-based Midcourse Defense
H_2	Hydrogen
H_2O	Water
HCl	Hydrogen Chloride
HVAC	Heating, Ventilation, and Air Conditioning
ICBM	Intercontinental Ballistic Missile
in	Inch
INRMP	Integrated Natural Resources Management Plan
IRP	Installation Restoration Program
KEI	Kinetic Energy Interceptor
KV	Kill Vehicle
kW	Kilowatt
lb	Pound
lbm	Pound-Mass
LBP	Lead-Based Paint
LC	Launch Complex
LF	Launch Facility
LOA	Letter of Authorization
LTO	Landing and Take Off
MDA	Missile Defense Agency
mi	Mile
MM	Million
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Area
mph	miles per hour
N_2	Nitrogen
N_2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NAWCWPNS	Naval Air Warfare Center Weapons Division
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
nmi	Nautical Mile
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Airmen
NOTMAR	Notice to Mariners
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O	Oxygen atom
O_2	Molecular Oxygen
O_3	Ozone
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyl
PFMC	Pacific Fishery Management Council
$PM_{2.5}$	Particulate Matter (less than 2.5 microns in diameter)
PM_{10}	Particulate Matter (less than 10 microns in diameter)
ppm	Parts per Million

PRG	Preliminary Remediation Goal
psf	Pounds Per Square Foot
RCC	Range Commanders Council
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
RWQCB	Regional Water Quality Control Board
SBCAPCD	Santa Barbara County Air Pollution Control District
SEL	Sound Exposure Level
SHPO	State Historic Preservation Officer
SLC	Space Launch Complex
SMC Det 12/RPD	Space and Missile Systems Center, Detachment 12/RPD
SMR	State Marine Reserve
SO_2	Sulfur Dioxide
sqft	Square Feet
SRS	SRS Technologies
SW	Space Wing
SWI	Space Wing Instruction
TB	Technical Bulletin
TE	Transporter-Erector
TP	Test Pad
TPH	Total Petroleum Hydrocarbons
tpy	Tons per Year
UCSB	University of California, Santa Barbara
UNFCC	United Nations Framework Convention on Climate Change
US	United States
USAF	US Air Force
USASDC	US Army Strategic Defense Command
USASMDC	US Army Space and Missile Defense Command
USC	US Code
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
USN	US Department of the Navy
VAFB	Vandenberg Air Force Base
VOC	Volatile Organic Compounds
WMO	World Meteorological Organization
$\mu g/m^3$	micrograms per cubic meter

1.0 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

Within the Department of Defense (DoD), the Missile Defense Agency (MDA) is responsible for developing, testing, and fielding an integrated Ballistic Missile Defense System (BMDS). In support of their mission, the MDA proposes to begin implementation of the Kinetic Energy Interceptor (KEI) Program for development and testing of the next generation, multi-use interceptor to combat medium- to long-range ballistic missile threats. The KEI system would use hit-to-kill technologies and a high acceleration rocket booster to engage ballistic missiles in their early phases of flight. For program implementation, the MDA plans to focus initially on KEI booster development and flight tests. Following development and testing, the initial KEI missile interceptors could be fielded in fixed silos and/or as a road mobile system, and later evolve to a sea-based system. The KEI system could also compliment existing Ground-based Midcourse Defense (GMD) systems currently fielded in both Alaska and California (CA).

This Environmental Assessment (EA) documents the results of a study of the potential environmental impacts resulting from implementation of the initial phase of MDA's KEI Program. The EA was prepared in accordance with the National Environmental Policy Act (NEPA, 1969), Executive Order 12114 (Environmental Effects Abroad of Major Federal Actions) (Office of the President, 1979), the President's Council on Environmental Quality (CEQ) Regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508) (CEQ, 2002), 32 CFR Part 651 (*Environmental Analysis of Army Actions*) (US Army, 2002), and 32 CFR Part 989 (*Environmental Impact Analysis Process*) (USAF, 2007).

1.2 BACKGROUND

The MDA is responsible for developing systems to intercept missile threats in all phases of their flight: boost, midcourse, and terminal phases. Boost phase is the powered portion of flight that occurs immediately after launch that allows the missile to rapidly accelerate and gain altitude. Midcourse begins when the rocket motor cuts off and the missile continues on a ballistic trajectory downrange. Warheads and countermeasures may be deployed during the midcourse phase. The final or terminal phase is when the missile warhead re-enters the earth's atmosphere and falls towards the intended target. The sequence for these phases of flight is shown in Figure 1-1. A layered BMDS is needed to defend the United States (US) and its deployed forces, allies, and friends from ballistic missiles of all ranges, from Short Range Ballistic Missiles to Intercontinental Ballistic Missiles (ICBMs).

The common design and performance approach being applied to the KEI Program applies to multiple BMDS elements that address all phases of missile flight. The use of common interfaces for all platforms would also reduce development and life-cycle costs.

1.3 PURPOSE OF THE PROPOSED ACTION

The purpose of the KEI Program is to develop and demonstrate KEI system elements using a common design and performance approach applicable to multiple platforms and across the battle space. The program would focus initially on booster development and flight tests. The overall program activities would reduce developmental risks through a series of verification tests and comprehensive systems engineering.

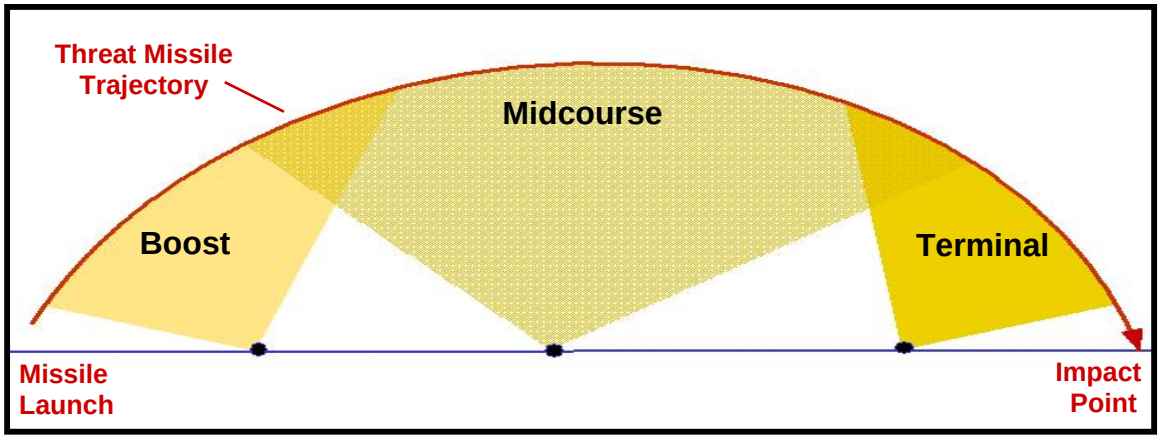

Figure 1-1. Ballistic Missile Phases of Flight

1.4 NEED FOR THE PROPOSED ACTION

A layered BMDS is needed to defend the US and its deployed forces, allies, and friends from ballistic missiles of all ranges and in all phases of flight (refer to Figure 1-1). Current US capabilities only defend against short- and medium-range ballistic missiles in the terminal phase and against intermediate-range missiles and ICBMs in the midcourse phase. The KEI Program is needed to develop and demonstrate a high speed hit-to-kill interceptor that can strike medium- to long-range ballistic missiles in the boost or early midcourse phases of flight. Intercepting missile threats during these early phases can preclude deployment of any countermeasures and prevent the missile warhead from attaining the velocity and trajectory necessary to reach its intended target.

1.5 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

This EA documents the environmental analysis of implementing the initial phase of the KEI Program, which focuses on flight-testing the interceptor booster. Development of the KEI interceptor employs incremental flight-testing. Four flight tests for the KEI booster are planned to occur at Vandenberg Air Force Base (AFB), located approximately 50 miles (mi) northwest of Santa Barbara, CA (refer to Figure 1-2). No target missile intercepts would be attempted during these four tests. In support of these flight tests, missile assembly and integration activities—including flight vehicle/canister integration, test, and checkout activities—would also occur at Vandenberg AFB. Existing buildings and facilities would be used, but repairs and modifications would be needed to meet program requirements. As currently planned, the four flight tests (Flight Test Kinetic-Interceptor [FTK] 01, 02, 03, and 04) would begin during calendar year (CY) 2009 and continue through 2014. No more than one launch would occur in a given year.

The EA analyzes the potential environmental impacts that might result from site modifications and construction, rocket motor transportation, pre-launch preparations, launch activities, and post-launch operations associated with the four KEI flight tests. Although other facilities and activities would support the initial phase of KEI system development, they are not analyzed in this EA because: (1) previous investigations found that these activities do not present an unacceptable environmental risk; and/or (2) the activities would be conducted at existing contractor-owned and operated facilities, where the activities are within the scope and compatibility of current operations, and the facilities are managed within previously established safety levels and in compliance with applicable Federal, state, and local standards. Such KEI

Figure 1-2. Location of Vandenberg AFB, CA

activities include the manufacture, propellant sample testing, and static fire testing of the rocket motors; software development; inert launch vehicle (pathfinder) processing; and other subcomponent development and testing.

The initial KEI flight tests would provide data to support decisions on future program direction. Follow-on phases of the program are anticipated to include further flight tests and intercepts against target missiles; kill vehicle (KV) test and integration; road mobile launcher development; fire control and communications development, testing, and integration; sea-based system development; and eventual fielding of the system. These future actions are expected to require the establishment of several KEI support facilities for long-term operations, which would be established at existing DoD installations. Several candidate installations are being considered, including Hill AFB in Utah and US Army Redstone Arsenal in Alabama. None of these actions, however, would be conducted until further environmental analyses are completed, as necessary, beyond this initial EA. Decisions regarding future KEI program plans would occur later as the KEI Program matures.

Per the CEQ, US Army, and US Air Force (USAF) regulations for implementing NEPA (40 CFR 1502.14[d], 32 CFR 651.34, and 32 CFR 989.8[d], respectively), this EA also analyzes the No Action Alternative, which serves as the baseline against which the Proposed Action is evaluated. Under the No Action Alternative, described in Section 2.2, the KEI Program would not be implemented.

1.6 RELATED ENVIRONMENTAL DOCUMENTATION

The MDA used several existing NEPA documents to prepare this EA. These documents are listed below and cited in the EA where applicable.

- Missile Defense Agency. 2003. *Ground-Based Midcourse Defense (GMD) Extended Test Range Final Environmental Impact Statement*. July.

- Missile Defense Agency. 2007. *Final Ballistic Missile Defense System (BMDS) Programmatic Environmental Impact Statement*. January.

- US Department of the Air Force. 2004. *Final Environmental Assessment for Minuteman III Modification*. December.

- US Department of the Air Force. 2006. *Final Environmental Assessment for the Orbital/Sub-Orbital Program*. July.

1.7 INTERAGENCY COORDINATION AND CONSULTATIONS

Interagency coordination is integral to the preparation of this EA. As part of the analysis process for the KEI Program, the MDA closely coordinated with personnel at Vandenberg AFB to ensure that the project would fully comply with all applicable Federal, state, local, and USAF regulatory requirements. Personnel from the MDA and Vandenberg AFB also consulted with the appropriate regulatory agencies.

In accordance with Section 106 of the National Historic Preservation Act and 36 CFR Part 800, Vandenberg AFB initiated consultations with the California State Historic Preservation Officer (SHPO) in late March 2008. A copy of the letter from the base to the SHPO requesting concurrence with the finding of No Adverse Effect for cultural resources on base is provided in Appendix A. Vandenberg AFB later sent another electronic message to the SHPO's office requesting their concurrence (Carucci, 2008). As of January 2009, no written response has been received from the SHPO. Thus, pursuant to 36 CFR 800.5(c)(1), the MDA and Vandenberg AFB have assumed that the SHPO does not object to the No Adverse Effect determination.

For compliance with Federal Coastal Zone Consistency regulations (15 CFR Part 930) and the California Coastal Zone Management Program, the MDA prepared a Negative Determination. With the assistance of personnel at Vandenberg AFB, the MDA submitted the Negative Determination letter and a draft copy of this EA to the California Coastal Commission (CCC) in April 2008 for their review and concurrence. In a letter dated June 6, 2008, the CCC agreed that the Proposed Action would not adversely affect coastal zone resources and, therefore, concurs with the Negative Determination (refer to Appendix B).

In accordance with Section 7 of the Endangered Species Act, the MDA (with Vandenberg AFB support) prepared a Biological Assessment on Federally listed species and the likely effects of the Proposed Action on the species and their habitats (MDA, 2008). Submitted to the US Fish and Wildlife Service (USFWS) in December 2008, the Biological Assessment addressed KEI-related site preparations and launch activities at Launch Complex 576E (LC-576E) and Launch Facility 06 (LF-06) located on Vandenberg AFB. In a response letter to Vandenberg AFB, dated January 21, 2009, the USFWS determined that initiating new formal consultations was not necessary (refer to Appendix C). Based on the Biological Assessment, prior USFWS Biological Opinions, and other information, the USFWS agreed with MDA's findings on the proposed activities at LC-576E and LF-06, which are further discussed in Section 4.1.1.3 of the EA.

Additionally, the MDA and Vandenberg AFB will apply for or seek to modify applicable permits or licenses in accordance with Federal, state, and local regulations.

1.8 PUBLIC NOTIFICATION AND REVIEW

In accordance with the CEQ, DoD, US Army, and USAF regulations for implementing NEPA, the MDA is soliciting comments on this EA and the enclosed Draft Finding of No Significant Impact (FONSI) from interested and affected parties. A Notice of Availability for the EA and Draft FONSI was published in the following CA newspapers:

- *Lompoc Record*
- *Santa Barbara News-Press*
- *Santa Maria Times*

Copies of the EA and Draft FONSI were placed in local libraries and are available over the Internet at http://www.mda.mil/mdalink/html/enviro.html. Agencies, organizations, and libraries that were sent a copy of the EA/Draft FONSI are listed in Chapter 8.

Following the public review period (as specified in the newspaper notices), the MDA will consider those public and agency comments received to decide whether to: (1) sign the FONSI, which would allow the Proposed Action to proceed; or (2) prepare an Environmental Impact Statement if MDA determines that the Proposed Action is likely to result in significant impacts to the human environment.

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2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

Two actions are analyzed in this EA—the Proposed Action and the No Action Alternative. Within this chapter, Section 2.1 provides a description of the Proposed Action, including the integration and flight-testing of the KEI launch vehicle. Section 2.2 provides a description of the No Action Alternative. Lastly, alternatives to the Proposed Action that were considered and eliminated from further study are discussed in Section 2.3.

2.1 PROPOSED ACTION

2.1.1 LAUNCH VEHICLE DESCRIPTION

The KEI launch vehicle to be flight-tested consists of a 2-stage booster, an avionics section, and the nosecone/shroud. Although not proposed for use on the first four flight tests (FTK-01, 02, 03, and 04) analyzed in this EA, FTK-05 and other future flight tests would likely include a 3rd-stage rocket motor and a Government-provided payload. As previously mentioned, however, these later flight tests would not be conducted until further environmental analyses are completed beyond this initial EA.

The launch vehicle measures approximately 40 feet (ft) in length, 40 inches (in) in diameter, and weighs approximately 23,000 pounds (lb) at launch. A diagram of the launch vehicle is provided in Figure 2-1. Further discussions on key components of the KEI test vehicle are provided in the paragraphs that follow.

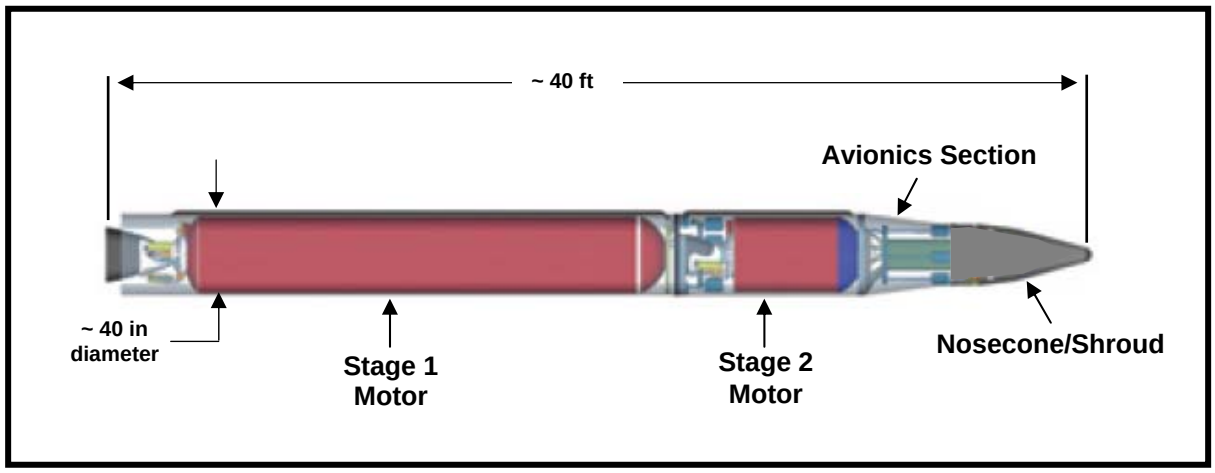

Figure 2-1. KEI Flight Test Vehicle

Solid Propellant Booster

The booster for each of the KEI flight test vehicles would use two newly developed solid propellant rocket motors. Each of the motor casings is made primarily of graphite epoxy composite materials. The main components of the solid propellant material are ammonium perchlorate, aluminum, and hydroxyl-

terminated polybutadiene. Combined, the two rocket motors would contain approximately 20,000 lb of propellant with a Class 1.3 hazard classification.[1]

During boost flight, both the Stage 1 and 2 rocket motors would use an electromechanical Thrust Vector Control system (steering mechanism) to move the nozzle for pitch and yaw control. No hydraulics or liquid/gas injection is used in this system. For the FTK-03 and 04 flights, the Stage-2 motor might also contain an Attitude Control System, consisting of two small solid propellant gas generators, to apply separate thrusters for roll and attitude control.

Small explosive charges are used to separate the stages during flight. Other ordnance carried on the launch vehicle includes motor igniter assemblies, squibs, bolt cutter assemblies, and Flight Termination System (FTS) charge assemblies, which initiate a flight termination action should a launch anomaly occur.

Avionics Section

For the first four FTK flight tests, the avionics section would contain the vehicle avionics package and the guidance navigation processor. This includes a telemetry system with associated power supply and FTS receivers.

Nosecone/Shroud

Located at the top of the launch vehicle is a metallic nosecone or shroud that serves as an aerodynamic protective cover for the KV payload during early flight. None of the four FTK flight tests, however, would carry a KV. FTK-01 would instead carry an inert payload or ballast (steel weights). FTK-02, 03, and 04 would carry a similar inert mass-mockup of the payload.

Batteries

Approximately 12 nickel-cadmium and squib-activated thermal batteries, each weighing from 5 to 25 lb, are carried aboard the launch vehicle (depending on the test vehicle configuration) to provide electrical power to launch vehicle subsystems during flight.

2.1.2 FLIGHT TESTS

The four KEI flight tests would be conducted at Vandenberg AFB, located along the Pacific Coast northwest of Santa Barbara, CA. The base is the headquarters of the 30th Space Wing, which conducts space and missile test launches and operates the Western Range.[2]

Key facilities that may be used in support of the KEI Program at Vandenberg AFB are listed in Table 2-1 and shown on Figure 2-2. All four flight tests would be launched from one or more of the alternative

[1] US Department of Transportation (DOT) regulations (49 CFR 173.56(b)(2)(i)) require the DoD to hazard classify items in accordance with Joint Technical Bulletin (TB) TB-700-2, *Department of Defense Ammunition and Explosives Hazard Classification Procedures*. TB-700-2 sets forth the detailed procedures for hazard classifying ammunition and explosives for transportation and storage in accordance with US DOT regulations, North Atlantic Treaty Organization guidelines, and United Nations recommendations.

[2] The Western Range extends from the CA Coast to the Indian Ocean and consists of a vast array of space and missile tracking and data gathering equipment. Up-range instrumentation sites are located on Vandenberg AFB, Pillar Point Air Force Station, Anderson Peak, and Santa Ynez Peak. Midrange instrumentation is located on the Hawaiian Islands. Western Range instrumentation is supplemented by Point Mugu Naval Air Warfare Center in CA, the Ronald Reagan Ballistic Missile Defense Test Site in the Marshall Islands, and the US Air Force Maui Optical Site in Hawaii.

Table 2-1. List of Facilities Proposed to Support KEI Flight Tests at Vandenberg AFB, CA

Facility/Building	Planned Function	Site Modifications/Construction
Alternative Launch Facilities		
Alternative 1: Launch Complex 576E (LC-576E) (Facility 1611)	Launch Site	Stool Launch: Replace adapter ring on top of the existing Taurus launch stool and install a temporary 6 ft high stand using existing bolt inserts. Canister Launch: Temporarily install an aboveground framework or launcher for mounting the canister. This may require new bolt inserts and/or the permanent installation of new small concrete mounting pads to secure the framework/launcher.
Alternative 2: Test Pad-01 (TP-01) (Facility 1840)	Launch Site	General: Make repairs to the concrete pad and perimeter fence, cut back vegetation within 100 ft of existing pad, restore electrical power at the site, install new electrical grounding points at the pad, and extend fiber optic lines approximately 2.5 mi from Building 1801. Stool Launch: Temporarily install a 20 ft high launch stool and a 6 ft high temporary stand. This would require new bolt inserts to secure the stool and stand. Canister Launch: Temporarily install an aboveground framework or launcher for mounting the canister. This would require new bolt inserts to secure the framework/launcher.
Alternative 3: Launch Complex (LF-06) (Facility 1980)	Launch Site and optional site for Vehicle Canisterization for FTK-02, 03, and 04	Stool Launch: Temporarily install a 20 ft high launch stool and a 6 ft high temporary stand. This would require the permanent installation of new small concrete mounting pads to secure the stool and stand. Canister Launch: Temporarily install an aboveground framework or launcher for mounting the canister. This would require the permanent installation of new small concrete mounting pads to secure the framework/launcher. Canisterization using Silo: Temporarily install structural supports and a base adapter ring in the existing silo shaft to hold canister in place.
Other Support Facilities		
Experimental Payload Facility (Building 6527)	Vehicle Processing and Integration for FTK-01	Erect a temporary enclosure on the exterior of the high bay door.
Atlas Solid Rocket Motor Storage (Building 960)	Vehicle Processing, Integration, and Canisterization for FTK-02, 03, and 04	Replace the heating, ventilation, and air conditioning (HVAC) system; replace boiler; install external propane tank and replace underground propane line (if needed); replace internal electrical system and power transformers; replace exterior lights; replace fire suppression (water sprinkler) system; repair/replacement of high bay and other access doors; repair/replacement of the building roof; remove wall separating bays; resurface interior concrete floor; replace asphalt pavement with concrete outside the high bay doors; expand the asphalt pavement just southeast of the building; construct an anti-terrorism vehicle barrier west of the building; and temporary placement of a test equipment modular unit near the building with utility connections.
Small Ordnance Storage (Building 970)	Small Ordnance Storage for FTK-02, 03, and 04	None
Peacekeeper Launch Support Center (Building 1974)	Candidate Launch Control	None
Remote Launch Control Center (Building 8510)	Candidate Launch Control	None
Office Space (location undetermined)	Administrative and Technical Support	If existing building space is unavailable, two pre-fabricated modular office units would be located in an existing paved area with access to power and telephone.

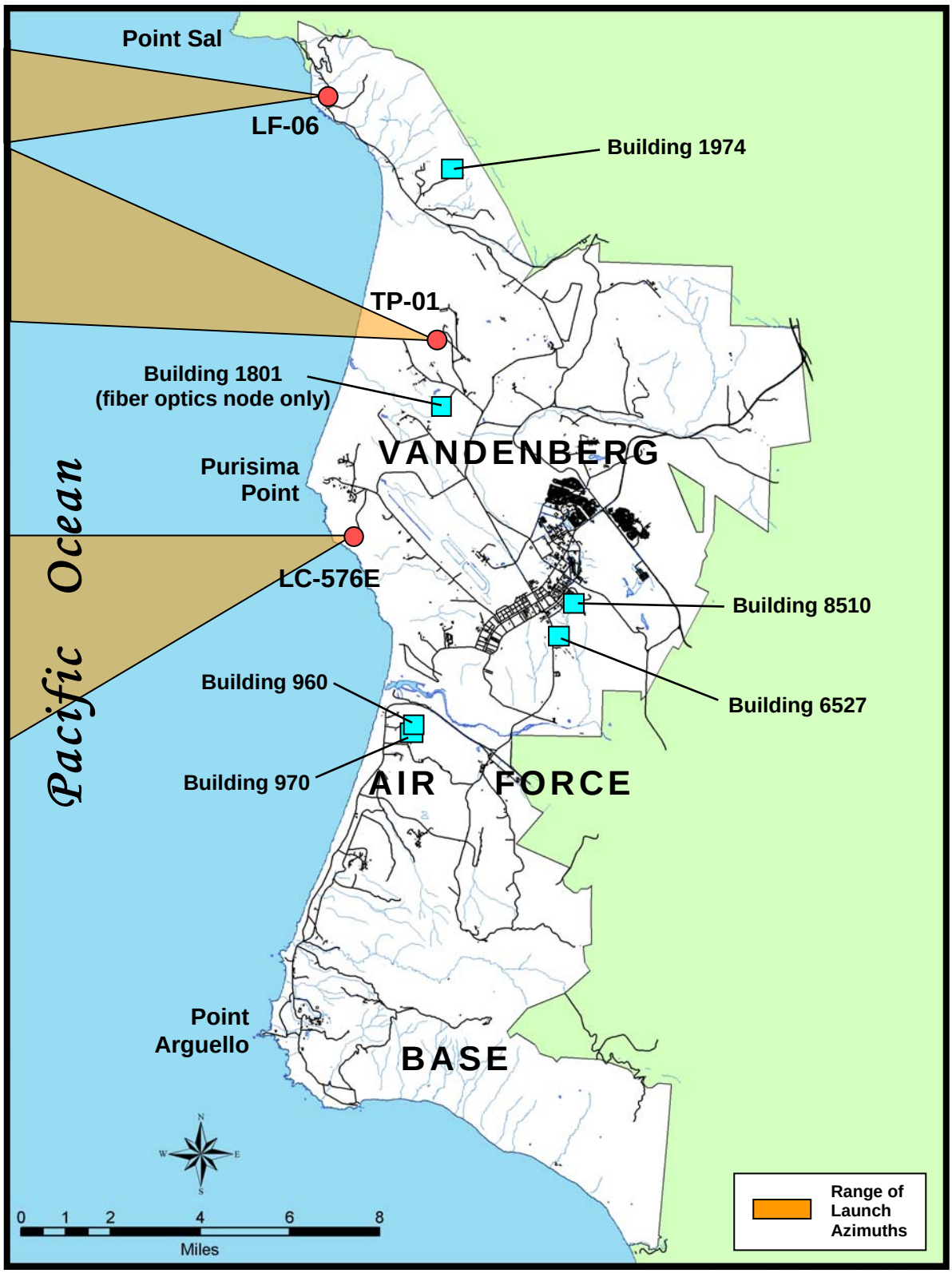

Figure 2-2. Location of Facilities Proposed to Support KEI Flight Tests at Vandenberg AFB, CA

launch sites listed below. The range of possible launch azimuths for each launch site is also shown in Figure 2-2. By using existing launch pads and support facilities, the KEI Program would minimize its effective footprint at Vandenberg AFB and conserve natural resources.

- Alternative 1: LC-576E, which is an existing Taurus launch pad located near Purisima Point
- Alternative 2: TP-01 on North Vandenberg AFB, which is a former Peacekeeper missile test launch site
- Alternative 3: LF-06, which is a former Minuteman missile test silo facility located near the northern tip of Vandenberg AFB.

Depending on mission needs and facility availability, other facilities at Vandenberg AFB could be considered later for KEI vehicle processing, integration, canisterization, and temporary storage, as well as launch control. In such cases, the MDA and Vandenberg AFB would conduct an appropriate NEPA analysis for each additional facility before their use for KEI, initiated through completion of the USAF Form 813 (*Request for Environmental Impact Analysis*).

2.1.2.1 Site Modifications and Construction

Launch Facilities

For FTK-01, the KEI vehicle would be launched off a stool. FTK-02 would be launched either off a stool or from a canister (steel tube). FTK-03 and 04 would only be launched from a canister. All canister launches would be conducted aboveground. As a result, site modifications or construction would depend on the launch site and method used, which could vary for each flight test. The following paragraphs describe site modification/construction requirements for each alternative launch site. Refer to Section 2.1.2.3 for further information on canisterized launch vehicles.

Alternative 1 (LC-576E). For conducting the stool launches from LC-576E, the existing 20 ft high Taurus vehicle launch stool would be used; however, the current adaptor ring on top of the stool would be replaced with a smaller diameter ring for the KEI vehicle. An approximately 6 ft high stand would be temporarily installed next to the Taurus launch stool to assist in launch preparations, as described in Section 2.1.2.3. The temporary stand would be anchored to the concrete pad using an interface adapter and existing bolt inserts.

In preparation for the canister launches, a supporting framework or tilt-up (hydraulically actuated) launcher would be temporarily installed on the existing pad to hold the canister in place. To secure the framework/launcher, holes would be cut into the existing concrete pad for new anchor bolt inserts and/or small concrete mounting pads would need to be installed within existing paved (asphalt) areas. As an option for conducting the canister launches from LC-576E, the canisterized vehicle could be mounted on top of the existing Taurus vehicle launch stool using an adapter ring, thus eliminating the need for the additional framework/launcher and concrete mounting pads.

As with any launch from LC-576E, pre-established firebreak areas around the launch site would be mowed or disked as necessary.

Alternative 2 (TP-01). To conduct the stool launches at TP-01, an approximate 20 ft high launch stool and a 6 ft high launch stand (the same launch stand as described above for LC-576E) would be temporarily installed near the center of the existing concrete pad. This would require cutting several holes into the existing concrete pad for new anchor bolt inserts.

For the canister launches, a supporting framework or tilt-up (hydraulically actuated) launcher would be temporarily installed near the center of the existing concrete pad to hold the canister in place. To secure the framework/launcher, holes would be cut into the existing concrete pad for new anchor bolt inserts.

Because of the launch pad's disuse for many years, any launches from TP-01 would also require site upgrades and other modifications. The existing concrete pad and perimeter fence would require repairs, electrical power would need to be restored, and new electrical grounding points would need to be installed in or immediately adjacent to the concrete pad. Vegetation within 100 ft of the existing pad (inside and outside the perimeter fence) would need to be cut back and mowed before each launch to re-establish the firebreak. Additionally, fiber optic lines would need to be extended from the nearest connection node at Building 1801 to the TP-01 launch pad (refer to Figure 2-2). This would require excavating a shallow trench (approximate 1 ft deep and 9 in wide) for approximately 2.5 mi along existing roadways. To minimize potential impacts on protected plant species and on any nearby archaeological sites, the fiber optic lines would be trenched within 5 ft of the road shoulder and/or installed within the existing roadway pavement.

Alternative 3 (LF-06). To conduct the stool launches at LF-06, an approximately 20 ft high launch stool and a 6 ft high launch stand (the same launch stand as described above for LC-576E) would be temporarily installed on two new concrete pads. The concrete pads (20 ft square and 6 ft square) would be installed within existing paved (asphalt) areas approximately 90 ft northwest of the existing silo.

In preparation for the canister launches, two options have been proposed to load the KEI launch vehicle into the steel canister: (1) horizontally within Building 960 and (2) vertically using the existing silo shaft at LF-06. At LF-06, this would require placing the empty canister in the existing silo shaft using temporary structural supports and a base adapter ring to hold the canister in place, and then lowering the KEI vehicle into the canister from a Transporter-Erector (TE) or crane. Following completion of the vertical canisterization process, the canisterized vehicle would be removed from the silo shaft for an aboveground launch at one of the candidate launch sites.

To conduct aboveground canister launches at LF-06, a supporting framework or tilt-up (hydraulically actuated) launcher would be temporarily installed on the existing pad to hold the canister in place. To secure the framework/launcher, small concrete mounting pads would need to be installed within the pavement approximately 90 ft northwest of the existing silo.

As with any launch from LF-06, pre-established firebreak areas around the launch site would be mowed or disked as necessary.

As necessary for each alternative launch site, the launch stool and stand or canister framework/launcher would be designed to meet seismic standards specified in Air Force Space Command (AFSPC) Manual 91-710 (*Range Safety User Requirements*) (AFSPC, 2004).

Other Support Facilities

At Building 6527, a temporary enclosure would be erected on the exterior of the high bay door to provide additional floor space for the fully integrated launch vehicle and TE. The temporary enclosure would not be erected until it is needed and it would be removed immediately after final integration testing for FTK-01. Other than security protection system upgrades, no structural modifications or construction would be required.

Built in 1963, Building 960 was used to store solid rocket motors for the Atlas program. In support of the KEI Program, the existing Heating, Ventilation, and Air Conditioning (HVAC) system would need to be replaced. This would include installing a new 1,200,000 British Thermal Unit (BTU) per hour propane powered boiler in the building and placing an approximately 2,000-gallon propane tank outside the building on an existing or new concrete pad. An underground propane fuel line between the building and tank would be replaced by means of trenching through paved and/or gravel areas. Because boilers rated greater than 75,000 BTU per hour are regulated in Santa Barbara County, the new boiler would need to meet Santa Barbara County Air Pollution Control District (SBCAPCD) rules and regulations. Prior to boiler replacement, the MDA would coordinate with the base Environmental Office to ensure that the new boiler complies with all applicable regulatory and permitting requirements.

Other improvements to Building 960 would include replacement of the internal electrical system, exterior lights, and outside power transformers. The new electrical transformer would be either pole or pad mounted off the west end of the building. The existing fire suppression (water sprinkler) system would also be replaced. Because of their deteriorated condition (due to corrosion and other weather damage), the high bay doors, other access doors, and the building roof would need repair or replacement. A wall separating the high bay from the low bay areas would be removed. The concrete floor in the high bay and warehouse areas would require resurfacing. Existing asphalt areas outside both high bay doors (each area measuring approximately 30 ft by 30 ft) would be replaced with concrete. In addition, unpaved portions of the driveway circle just southeast of the building might need to be paved over in order to provide more maneuvering room for large trucks. As necessary, Building 960 would be modified to meet current seismic standards as specified in AFSPC Manual 91-710 (AFSPC, 2004). Modifications and related construction at Building 960 would begin at the earliest in the 4th quarter of CY 2009 and last approximately 10 months.

For added security to operations at Building 960, an anti-terrorism vehicle barrier would be constructed just west of the building. The barrier system would consist of: (1) several manually or electrically operated bollards (retractable metal posts) installed in the main roadway, and (2) approximately 370 ft of steel cable fence installed off the sides of the bollard system. The bollards would be placed in the existing roadway to a depth of 4 or 5 ft with concrete footers and then the disturbed area would be repaved. The steel cable fence, which would run north and south of the bollards, would consist of steel posts and cables for the fence, and a concrete “dead man” block located at each end of a fence run to anchor the cables. North of the bollard system, the cable fence would extend approximately 160 ft off the main roadway into the brush. South of the bollards, the cable fence would run across an unpaved area and side road, and then extend approximately 110 ft into the brush. This would require brush removal and mowing of existing vegetation to form an approximate 20 ft-wide pathway along each fence alignment to allow for equipment access and construction. Excavation for each fence post would be to a depth of about 3 ft, and to a depth of 4 to 5 ft for each “dead man” block.

As part of the KEI vehicle processing activities at Building 960, a test equipment modular unit, measuring up to 12 ft by 60 ft, may be placed temporarily near the existing building for electronic systems test support. The modular unit would be located within an existing paved area and supported on concrete blocks in accordance with applicable seismic standards. Communication lines would be laid between the modular unit and Building 960 via underground trenches and/or aboveground conduits. Depending on location, a pole might be installed near the modular unit to extend the power line. The modular unit would be removed from the site immediately after final integration testing for FTK-04.

As a launch control facility, neither Building 1974 nor Building 8510 would require any structural, mechanical, or exterior modifications. The only requirement would be to place electronic equipment, racks, and cables temporarily inside the building. For small ordnance storage, Building 970 would not require any major modifications.

As part of program operations on base, approximately 1,400 square ft of office space would be needed for administrative and technical support. If existing office space is unavailable on base, then two pre-fabricated modular office units (each measuring approximately 12 ft by 60 ft) would be temporarily located in an existing paved or gravel area with available parking and access to both power and telephone service. For example, the parking/storage lot adjacent to Building 988 (located 0.6 mi west of Building 960) would be a possible location for the modular office units. Prior to selecting an office space or modular unit site, the MDA and Vandenberg AFB would conduct an appropriate NEPA analysis, initiated through completion of the USAF Form 813 (*Request for Environmental Impact Analysis*).

2.1.2.2 Rocket Motor Transportation

Individual KEI motors and upper-stage components would be shipped to Vandenberg AFB by truck over public highways directly from the manufacturer. The Stage-1 rocket motors would come from contractor manufacturing facilities located in Utah, the Stage-2 motors from Maryland. The remaining upper stage components would come from other existing contractor facilities. Trucking contractors would transport each rocket motor in a protective carriage or container. All transportation, handling, and storage of the motors and other ordnance would occur in accordance with DoD, USAF, and US DOT policies and regulations to safeguard the materials from fire or other mishap. The transport of rocket motors to Vandenberg AFB is a routine and frequent operation.

2.1.2.3 Pre-Launch Preparations

As previously described, FTK-01 would be stool launched, FTK-02 would be either stool or canister launched, while both FTK-03 and 04 would be cansister launched. Pre-launch preparations required for the flight tests are described in the following paragraphs.

Stool Launch Requirements

Upon arrival at Vandenberg AFB, the individual motors and components for FTK-01 would be taken to Building 6527 to begin vehicle processing. Within the building, system components would be checked and integrated. Upon completion of processing activities, the fully integrated launch vehicle would be rolled just outside the building, where a single crane would transfer it to an existing TE. Both the crane and TE would operate within existing paved or gravel areas in front of the building. Using the same crane, an umbilical mast would be attached to the vehicle to link power and communication to the vehicle when it sits on the launch pad. The TE and flight test vehicle would then be backed into Building 6527 for final system checks. Processing the flight test vehicle at Building 6527 would occur during the few months preceding the launch. For a stool launch of FTK-02, the motors and components would first be taken to Building 960 or to another existing facility on base for similar vehicle processing.

In addition to launch vehicle solid propellants, ordnance, and batteries, the vehicle processing and integration operations would require use of some hazardous materials, including small quantities of lubricants, paints, sealants, and solvents (less than 5 lb each). Use of hazardous materials would comply with applicable Vandenberg AFB hazardous materials management requirements, and SBCAPCD air quality rules and regulations.

Once vehicle integration is complete, the TE would transport the test vehicle to the selected alternative launch pad several days before launch. At the launch pad, the TE would erect the launch vehicle, placing it on the temporary 6 ft stand. A mobile crane would transfer the launch vehicle from the stand to the launch stool. The crane and TE would operate within existing paved or gravel areas on or adjacent to the pad.

Once on the launch stool, the flight test vehicle would be wrapped in a thermal blanket or cover. One or two electric thermal conditioning units (air conditioners) would supply air inside the cover to maintain avionics and motor temperature. Depending on the launch site, either an existing certified lightning protection system would be used or an umbilical mast-mounted lightning dissipater (connected to new or existing grounding points) would provide the lightning protection. A Launch Equipment Van or Container would be placed outside the launch pad fence in an existing paved or gravel area. Using communication cables that run through aboveground conduits, the van/container would interface between the launch vehicle and base fiber optics. As an option for conducting launches at LF-06, the KEI Program could use the existing underground Launch Equipment Room located next to the silo; thus eliminating the need for the van/container. Electrical power for operations would come from existing commercial power. A portable diesel generator (rated at 250 kilowatt [kW] and 400 horsepower) would be available on-site for emergency power only. The generator would be provided by the launch contractor and permitted by the SBCAPCD or registered under the California Air Resources Board's (CARB) Portable Equipment Registration Program.

Detailed safety procedures would be established to address all phases of operation at the launch pad. This would include delaying or rescheduling some operations in the event of severe weather (including lightning and high winds).

Canister Launch Requirements

Once the motors and other components arrive at Vandenberg AFB, they would be taken to Building 960 to begin booster processing and canisterization. Within the building, booster assembly operations would include checkout of the motor stages, the installation of various subsystems, and testing of individual stages. The stages would be integrated to form the KEI booster stack and flight test vehicle. Following integration, the flight test vehicle would be horizontally loaded into a steel launch canister or transported to LF-06 for vertical canisterization. In addition to solid propellants, ordnance, and batteries, launch vehicle processing, integration, and canisterization operations would require use of some hazardous materials, including small quantities of lubricants, paints, sealants, and solvents (less than 5 lb each per flight test vehicle). Use of hazardous materials would comply with applicable Vandenberg AFB hazardous materials management requirements and SBCAPCD air quality rules and regulations.

Once secured in the canister and final system checks completed, the canisterized launch vehicle (Figure 2-3) would be transferred directly onto an existing TE. In preparation for the flight test, the TE would transport the canisterized launch vehicle to the selected alternative launch pad, where a mobile crane would transfer the canisterized vehicle to an aboveground framework/launcher. The crane and other equipment would operate within existing paved or gravel areas on or adjacent to the pad.

As an option for conducting the canister launches from LC-576E, the canisterized vehicle could be mounted on top of the existing 20 ft high Taurus vehicle launch stool using an adapter ring. A mobile crane would transfer the canisterized vehicle from the TE to the launch stool in preparation for launch.

As described earlier, either an existing certified lightning protection system would be used or a mast-mounted lightning dissipater (connected to new or existing grounding points) would provide the lightning protection. A Launch Equipment Van or Container would be placed outside the launch pad fence in an existing paved or gravel area. Communication cables run through aboveground conduits would link the launch vehicle to the van/container and base fiber optics. As an option for conducting launches at LF-06, the KEI Program could use the existing underground Launch Equipment Room located next to the silo; thus eliminating the need for the van/container. Electrical power for operations would come from

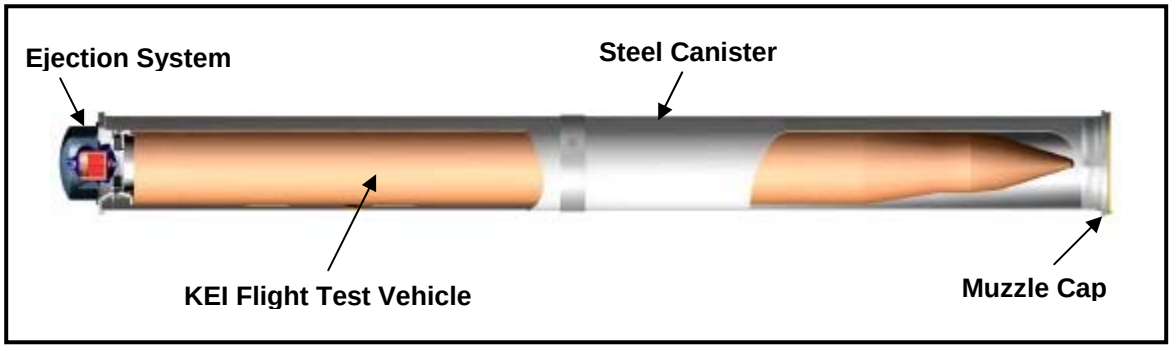

Figure 2-3. Canisterized KEI Flight Test Vehicle

existing commercial power. A portable diesel generator (approximately 250 kW) permitted by the SBCAPCD or registered with the CARB would be placed on-site temporarily for emergency power only.

Detailed safety procedures would be established to address all phases of operation at the launch pad. This would include delaying or rescheduling some operations in the event of severe weather.

2.1.2.4 Launch Activities

Launch operations for both stool and canister launches of the KEI flight test vehicle would be generally the same. The main difference is that stool launches require motor ignition on the stool, while canisterized vehicles would be "cold launched." Under a cold launch, a steam generator ejection system at the base of the canister (refer to Figure 2-3) would create sufficient pressure to eject the launch vehicle from the canister. Steam from the ejection system would come from a small reservoir of water (approximately 10 gallons) heated by the combustion of approximately 67 lb of hazard class 1.3 solid propellant. Following ejection of the vehicle to a minimum height of 60 ft above the canister, the Stage-1 motor would ignite, initiating powered flight downrange.

On the day of launch, the thermal blanket would be removed (for stool launches only), and FTS arming operations and vehicle closeout would occur. Portable cameras would be placed near the launch area to record the launch. Launch control operations using portable equipment would be performed from either Building 1974 or 8510.

Prior to each launch, USAF and MDA personnel would conduct a comprehensive safety analysis to determine specific launch and flight hazards. In the event of severe weather on launch day, the KEI mission would hold until favorable conditions prevail. A standard dispersion computer model, run by installation safety personnel, would be used for both normal and aborted launch scenarios. As part of this analysis, risks to off-base areas and non-participating aircraft, sea vessels, and personnel are determined. The results of this analysis are used to identify the launch hazard area, expended-booster drop zones, and a terminal hazard area for the upper stages and payload assembly. A flight termination boundary along the vehicle flight path is predetermined, should a launch vehicle malfunction or a flight termination action occur. The flight termination boundary defines the limits at which command flight termination would be initiated to contain the vehicle and its debris within predetermined hazard and warning areas, thus minimizing the risk to test support personnel and the general public.

As a normal procedure, commercial and private aircraft and watercraft are notified of all the hazard areas several days prior to launch through a Notice to Airmen (NOTAM) and a Notice to Mariners

(NOTMAR). Prior to each launch, ground roving security forces, radar, helicopters, and other remote sensors may be used to verify that the hazard areas are clear of non-mission-essential aircraft, vessels, and personnel. Recreational areas in the vicinity of the base may be closed for some launches—typically for less than a day—depending on the launch site and launch trajectory used. Commercial train movements through the base are also coordinated and monitored.

The USAF also notifies oilrig companies of an upcoming launch event several days in advance. The notification requests that offshore oilrigs temporarily suspend operations and evacuate or shelter their personnel if rigs are located in the path of the launch vehicle overflight.

Following launch, motor burnout, and stage separation, the spent Stage-1 motor would splash down in the Pacific Ocean approximately 75 to 325 nautical miles (nmi) off the CA Coast. Beyond Stage-1 separation, each of the four FTK flights may differ in terms of upper-stage separations. Individual or combined upper stages would impact much farther out in the mid-Pacific Ocean. For FTK-01, the combined upper stage components and related debris are currently planned to impact north of the Northwestern Hawaiian Islands, outside of the Papahānaumokuākea Marine National Monument.

If a launch vehicle were to head off-course or other problems occur during flight (e.g., complete loss of radar beacon and guidance communications with the base), then the Missile Flight Control Officer would activate the FTS destruct package on the vehicle. The signal to destruct is initiated by receipt of a radio command from the base. The FTS also contains the logic to detect a premature separation of the booster stages and initiate a thrust termination action on its own. Thrust is terminated by initiation of an explosive charge that splits or vents the motor casing(s), which releases pressure. The vehicle's forward thrust would terminate, causing it to fall along a ballistic trajectory into the ocean. If a launch anomaly were to occur at the launch pad or in early flight, then established Vandenberg AFB procedures would be executed immediately to recover unburned solid propellants and other hazardous materials (e.g., batteries) that had fallen on land or within shallow waters. Any recovery from deeper water along the shoreline would be treated on a case-by-case basis. Collected waste materials would be properly disposed of in accordance with applicable regulations.

2.1.2.5 Post-Launch Operations

Following vehicle liftoff from the launch pad, the launch area would be checked for safe access. Post-launch activities would include inspection of the launch facilities and equipment for damage, as well as general cleanup and performance of maintenance and repairs necessary to accommodate the next KEI or other program launch. Other actions would include removal of the temporary stand or the empty canister and any framework/launcher supporting the canister. The empty steel canister would be analyzed for design problems and stored for reuse or disposal per DoD procedures. The expended rocket motors and other flight hardware would not be recovered from the ocean following the flight test.

As is typically done following each launch from LC-576E, the MDA would sample any sediments and rainwater that collected within the shallow concrete trench that surrounds the pad to determine whether contaminants have accumulated at that site. The samples would be tested for total metals, volatile organic compounds (VOCs), semi-volatile organic compounds, reactive sulfide, reactive cyanide, and perchlorate. The post launch samples would be compared to the California Human Health Screening Levels, the US Environmental Protection Agency (USEPA) Region 9 Preliminary Remediation Goals, and the CA hazardous waste characteristics levels (22 California Code of Regulations [CCR] 66261.20 to 66261.50; Cal/EPA, 2005; USEPA, 2007d). If any constituent exceeds one or more of the three screening methods, then the MDA would notify the base Environmental Office to determine whether the sediments or rainwater in the trench would require special handling or disposal. Although no collection trenches exist around the other launch pads, the MDA would conduct similar testing for potential soil contaminant

in the areas immediately adjacent to the TP-01 and LF-06 launch pads prior to and following each KEI launch. The results of such tests would be reported to the base Environmental Office.

2.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the KEI Program for initial development and test would not be implemented. Proposed flight tests at Vandenberg AFB would not be conducted. The base would continue operations and maintenance activities involving other DoD assets and program activities.

By not implementing the Proposed Action, the MDA would not be able to verify hardware/software integration and performance of the KEI booster. Laboratory testing of subsystems and hardware may continue, however, KEI system development would be slowed or postponed. Without the proposed tests, the US would be unable to later field the KEI as a strategically deployable and tactically mobile capability to defeat medium- to long-range ballistic missiles in their boost or early midcourse phases of flight.

2.3 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

Though computer simulations, modeling, and other laboratory tests are typically used during the design and early evaluation of rocket systems, such methods cannot provide all of the information needed to satisfy flight requirements (e.g., verify booster system performance and safe operation). Thus, an alternative relying solely on such methods would not satisfy the purpose and need.

Before selecting Vandenberg AFB for the KEI flight tests, the MDA considered other sites for conducting such tests. In 2003, the MDA, with contractor support, evaluated multiple launch sites and test scenarios for conducting KEI flight tests, including near-term booster tests and longer term intercept engagement tests (Kovacic, Bradford, and Tippie, 2003). Initial studies considered: (1) established ranges (e.g., Wallops Flight Facility, Virginia, and Cape Canaveral Air Force Station at the Eastern Range,[3] Florida); (2) remote or primitive sites (e.g., US Army Kwajalein Atoll in the Marshall Islands and various Aleutian Islands in Alaska); and (3) use of sea-based launch platforms. An initial screening eliminated most locations due to such factors as logistical constraints (i.e., lack of support facilities and test assets), weather-related problems, restricted launch corridors, and constrained intercept engagement geometries and debris patterns. A more detailed evaluation focused on combinations of the remaining launch sites that could eventually support engagement scenarios requiring separate KEI interceptor and target missile locations. Although the booster flight tests analyzed in this EA do not involve target launches or engagement scenarios, it is preferable to conduct long-term development and testing of the KEI system at the same range because KEI facilities, logistical support, and personnel experience would already be established. The five test site combinations that were selected for further evaluation are:

- Vandenberg AFB, in combination with US Naval Operations at San Nicholas Island or San Clemente Island, CA.
- Vandenberg AFB, in combination with a sea-based launch platform.
- Wake Island Airfield and Taongi Atoll (also called Bokak Atoll) of the Marshall Islands.
- Pacific Missile Range Facility, Kauai, Hawaii, in combination with a sea-based launch platform.

[3] The Eastern Range extends from the East Coast of Florida to the Indian Ocean. In addition to the local instrumentation and support at Patrick AFB, Cape Canaveral Air Force Station, and the Kennedy Space Center, it has resources at Argentia, Newfoundland; Jonathan Dickinson Missile Tracking Annex, Florida; Antigua Air Station; and Ascension Auxiliary Air Field.

- Kodiak Launch Complex, Kodiak Island, Alaska, in combination with a sea-based launch platform.

Eleven evaluative criteria were applied to the five test site combinations to determine their risks and ability to satisfy KEI flight test objectives. These criteria are listed below.

1. Engagement Space – Location with available unrestricted airspace that is far enough from and in a position relative to potential target missile launch locations to accommodate representative test scenario engagement geometries and threat-like spaces.

2. Launch Detection – Availability of sensors for detection and flight control to support Command, Control, Battle Management, and Communications.

3. Safety Corridors – Sufficient safety corridors for launch trajectories that avoid civilian populations without engagement geometry constraints.

4. Debris Laydown – Availability of sufficient area downrange for safe deposition and containment of missile debris.

5. KEI Development Beyond Baseline – Ability to support follow-on testing for continued development and expansion of weapon system components.

6. Physical Environments – Prevalence of climatic conditions suitable for launch operations.

7. Logistics/Transportation – The constraints and cost impacts for transporting test assets to launch site and providing on-site logistical support.

8. Site Development/Environmental – The extent of the development of site assembly and support facilities and infrastructure required. Additionally, the constraints, cost, and schedule impacts for satisfying planning and environmental compliance requirements associated with site development.

9. Range Operations and Instrumentation Coverage – Existence/capability of range resources and instrumentation to collect data for evaluation of interceptor missile system performance.

10. Range Safety System Coverage – Existence of range resources to provide safety system health and status monitoring, tracking, and destruct capability during flight test.

11. Target Launch Capability – The availability and capability of target launch sites that provide engagement geometries to support the candidate interceptor launch site.

Following the application of the above criteria, it was determined that the three sites involving Wake Island Airfield, Pacific Missile Range Facility, and Kodiak Launch Complex showed multiple areas of higher risk, sufficient to eliminate them from further consideration for the reasons stated below. A comparison of all the sites by criterion is presented in Table 2-2.

- Wake Island Airfield presented high levels of risks for site development/environmental, primarily due to lack of support facilities. It also presented moderate risks in most other areas, including engagement space and logistics/transportation.

Table 2-2. KEI Test Site Comparison

Sites	Engagement Space/ Geometry	Launch Detection	Safety Corridors	Debris Laydown	KEI Devel. Beyond Baseline	Physical Environments	Logistics/ Transportation	Site Devel./ Environmental	Range Operations/ Instrument Coverage	Range Safety System Coverage	Target Launch Capability
Vandenberg AFB with SNI or SCI	High / Medium	Low	Low	Low	Low	Low	Low / Medium	Low / Medium	Low	Low	Low
Vandenberg AFB with Sea-based	Low	Low	Low	Low	Medium	Low	Medium	Low	Low	Low	Low
Wake I. with Taongi Atoll	Medium	Low	Medium	Medium	Low	Low	Medium	High	Medium	Medium	Medium
PMRF with Sea-based	Medium	Low	Medium	Medium	Medium	Low	Medium	Low	Low	Low	Low
KLC with Sea-based	Medium	Low	Low	Low	Medium	Medium	Medium	Low	Medium	Medium	Medium

Source: Modified from Kovacic, Bradford, and Tippie, 2003

Legend

- Low risk and meets requirements
- Medium risk or reduced objectives
- High risk or does not meet program objectives

- Pacific Missile Range Facility showed moderate risks in several areas, including engagement space, safety corridors, KEI development beyond baseline, and logistics/transportation.

- Kodiak Launch Complex showed moderate risks in most areas, including engagement space, KEI development beyond baseline, logistics/transportation, and target launch capability.

For the KEI flight tests at Vandenberg AFB, the MDA considered other alternative launch pads in addition to Alternatives 1, 2, and 3 (LC-576E, TP-01, and LF-06, respectively). The other launch pads, however, either did not allow for adequate flight safety for the new launch vehicle (Criterion 3 – Safety Corridors) or they required excessive construction and renovations (Criterion 8 – Site Development/ Environmental), such as at Space Launch Complex 4 on South Vandenberg AFB. Additionally, during final preparations of this KEI EA, the USAF determined that Alternative 2 (TP-01) is no longer available for MDA's KEI Program due to recent mission conflicts with other USAF programs. As a result, not all surveys and agency consultations for TP-01 were completed. Although Alternative 2 is no longer a viable alternative for KEI, this EA still describes the analysis of potential environmental impacts completed for Alternative 2.

The transportation of the KEI rocket motors from manufacturers in Utah and Maryland to Vandenberg AFB would be accomplished via contracted truck transport over public roads. Transporting the motors by air was not reasonable because of the high cost of the development and acquisition of handling equipment required to safely protect the motors from high acceleration loads encountered during air transport. Transport by rail was also discounted due to the excessive time normally required for rail and because of security concerns.

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3.0 AFFECTED ENVIRONMENT

This chapter describes the environmental areas that could be affected by the Proposed Action and No Action Alternative at Vandenberg AFB, in addition to key aspects of the global environment. The chapter is organized by location and describes each environmental resource or topical area that could potentially be affected by implementing the Proposed Action. The information and data presented are commensurate with the importance of the potential impacts in order to provide the proper context for evaluating such impacts. Sources of data used and cited in the preparation of this chapter include available literature (such as EAs, EISs, and other environmental studies), installation and facility personnel, and regulatory agencies.

The proposed KEI activities at Vandenberg AFB could impact air quality, noise, biological resources, cultural resources, coastal zone management, water resources, airspace, health and safety, and hazardous materials and waste management (including pollution prevention), and as such, only these environmental resource topics are discussed. Other resource topics were not analyzed further at this location because: (1) the Proposed Action is expected to require limited ground-disturbing activities; therefore, no impacts to soils would be expected; (2) there would be little increase in personnel on base, thus, there are no socioeconomic concerns; (3) given the launch trajectories of the proposed KEI flight tests, the protection provided by range safety regulations and procedures, and the occurrence of launch noise over a wide area of the local community, there would be no disproportionate impacts to minority populations and low-income populations under Executive Order 12898 (Environmental Justice); and (4) the proposed launches represent activities that are consistent with the *Vandenberg Air Force Base General Plan* (VAFB, 2007e) and well within the limits of current base operations. As a result, there would be no adverse effects on land use, utilities, or transportation.

Because of the potential global effects of launching rockets over the ocean and through the earth's atmosphere, this EA also considers the environmental effects on the global environment in accordance with the requirements of Executive Order 12114. Specifically, potential impacts on the global atmosphere and on biological resources in the Broad Ocean Area (BOA) are considered.

The information contained in this Chapter serves as the baseline against which the predicted effects of the Proposed Action can be compared. The potential environmental effects of the Proposed Action and No Action Alternative are discussed in Chapter 4.0.

3.1 VANDENBERG AIR FORCE BASE

Vandenberg AFB is located in Santa Barbara County on the central coast of CA, about 150 mi northwest of Los Angeles. Covering more than 98,000 acres, it is the third largest USAF installation. A primary mission for the base is to conduct and support space and missile launches. Located along the Pacific coast, Vandenberg AFB is the only facility in the US from which unmanned Government and commercial satellites can be launched into polar orbit, and where land-based ICBMs can be launched to verify weapon system performance.

3.1.1 Air Quality

The USEPA, the CARB, and the SBCAPCD, regulate air quality in Santa Barbara County and at Vandenberg AFB. The Clean Air Act (CAA) (42 United States Code (USC) 7401-7671q), as amended, gives USEPA the responsibility to establish the primary and secondary National Ambient Air Quality

Standards (NAAQS) (40 CFR Part 50) that set acceptable concentration levels for seven criteria pollutants: particulate matter less than 10 microns in diameter (PM_{10}), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_x), ozone (O_3), and lead. In addition, the State of California has instituted the California Ambient Air Quality Standards (CAAQS), which includes additional standards for the Federally identified criteria pollutants, as well as, sulfates, hydrogen sulfide, vinyl chloride (chloroethene), and visibility reducing particles. Short-term standards (1-, 8-, and 24-hour periods) have been established for pollutants that contribute to acute health effects, while long-term standards have been established for pollutants that contribute to chronic health effects. The CARB monitors levels of criteria pollutants at representative sites throughout CA. Table 3-1 outlines the NAAQS, CAAQS, and ambient concentrations of the criteria pollutants as measured by monitoring stations at Vandenberg AFB and in nearby Santa Maria. These concentrations are conservative estimates of the air-quality conditions at Vandenberg AFB.

Air-Quality Control Regions (AQCRs) that exceed the NAAQS and CAAQS are designated nonattainment areas and those in accordance with the standards are attainment areas. Vandenberg AFB is in the South Central Coast Intrastate AQCR (AQCR 032) (40 CFR 81.166). Both the USEPA and CARB have designated Santa Barbara County as being in attainment of all Federal and state standards except for the 8-hour O_3 CAAQS and the PM_{10} CAAQS (40 CFR 81.305; SBCAPCD, 2007b). For PM_{10}, the nonattainment is reflected in the locally recorded values shown in Table 3-1. Although the monitoring stations in the vicinity of Vandenberg AFB do not reflect an exceedance for O_3 CAAQS, other monitoring stations within the county have recorded higher levels; hence the nonattainment status for O_3 CAAQS. Because air quality is measured and regulated on a regional level, and O_3 forms in the atmosphere some distance from the location of their precursors' emission, the region of influence (ROI) for the air quality analysis is AQCR 032, Santa Barbara County, and the immediate offshore area.

SBCAPCD maintains a comprehensive inventory of air pollutants released within the county. This inventory accounts for types and amounts of pollutants emitted from a wide variety of sources, including on-road motor vehicles, fuel combustion at industrial facilities, solvent and surface coating usage, consumer product usage, and emissions from natural sources. The emission inventory is used to describe and compare contributions from air pollution sources, evaluate control measures, schedule rule adoptions, forecast future pollution, and prepare clean air plans. Tables 3-2 and 3-3 provide the latest available information on the overall emissions for Santa Barbara County. Emission levels of NO_x and VOC are of particular importance because of their contribution to ground level ozone and smog.

Stationary sources of air emissions on Vandenberg AFB (including both point and area sources) include abrasive blasting operations, boilers, generators, surface coating operations, turbine engines, wastewater treatment plants, storage tanks, aircraft operations, soil remediation, launch vehicle fueling operations, large aircraft starting systems, and solvent usage. On-base mobile sources of air emissions include various aircraft, missile and spacecraft launches, and numerous Government and personal motor vehicles (VAFB, 2005a). Table 3-4 provides information on the overall emissions for Vandenberg AFB in 2006. Notably, the base makes up less than 0.5 percent of the total countywide emissions of all criteria pollutants.

At Vandenberg AFB, wind and other meteorological conditions are critical for the dispersion of emissions. The mean annual wind speed in the area is 7 miles per hour (mph) out of the northwest. The strongest winds occur during the winter and midday, and at ridgelines. Over half of the time, the wind blows at speeds greater than 7 mph. The entire south-central coastal region experiences a persistent subsidence inversion resulting from a Pacific high-pressure region. The average maximum daily inversion height ranges from 1,600 ft during the summer to 2,800 ft during the winter. (USAF, 1998)

Table 3-1. Air Quality Standards and Ambient Air Concentrations at or Near Vandenberg AFB, CA

Pollutant	2004		2005		2006		California Standards[1]	Federal Standards[2]	
	South VAFB	Santa Maria	South VAFB	Santa Maria	South VAFB	Santa Maria		Primary[3]	Secondary[4]
Ozone (ppm)									
1-hour highest[5]	0.09	0.074	0.072	0.063	0.070	0.064	0.09	-	-
1-hour 2nd highest	0.089	0.064	0.067	0.062	0.063	0.063	-	-	-
8-hour highest[6]	0.083	0.064	0.066	0.061	0.063	0.062	0.070	0.075	Same as Primary Standard
8-hour 2nd highest	0.079	0.059	0.061	0.050	0.060	0.058	-	-	-
CO (ppm)									
1-hour highest	0.3	2.4	0.9	1.7	0.3	1.5	20	35	-
1-hour 2nd highest	0.3	1.8	0.9	1.6	0.3	1.5	-	-	-
8-hour highest	0.3	0.9	0.7	0.9	0.3	0.7	9	9	-
8-hour 2nd highest	0.3	0.9	0.6	0.8	0.3	0.7	-	-	-
NO_2 (ppm)									
1-hour highest	0.023	0.05	0.019	0.048	0.016	0.037	0.25	-	-
1-hour 2nd highest	0.023	0.045	0.019	0.045	0.016	0.035	-	-	-
Annual Arithmetic Mean	0.001	0.010	0.010	0.001	0.001	0.008	-	0.053	Same as Primary Standard
SO_2 (ppm)									
1-hour highest	0.009		0.004		0.007		0.25	-	-
1-hour 2nd highest	0.006		0.003		0.005		-	-	-
3-hour highest	0.003	*(no data)*	0.003	*(no data)*	0.005	*(no data)*	-	-	0.50
3-hour 2nd highest	0.003		0.003		0.003		-	-	-
24-hour highest	0.002		0.002		0.002		0.04	0.14	-
24-hour 2nd highest	0.002		0.001		0.002		-	-	-
Annual Arithmetic Mean	0.001		0.001		0.001		-	0.03	-
PM_{10} ($\mu g/m^3$)									
24-hour highest	37	52	41	43	55	54	50	150	Same as Primary Standard
24-hour 2nd highest	37	46	37	38	43	49	-	-	-
Annual Arithmetic Mean	18	24	15	21	18	22	20	50	Same as Primary Standard

Table 3-1. Air Quality Standards and Ambient Air Concentrations at or Near Vandenberg AFB, CA

Pollutant	2004		2005		2006		California Standards[1]	Federal Standards[2]	
	South VAFB	Santa Maria	South VAFB	Santa Maria	South VAFB	Santa Maria		Primary[3]	Secondary[4]
$PM_{2.5}$ ($\mu g/m^3$)									
24-hour highest		17		30		14	-	65 (35)[7]	Same as Primary Standard
24-hour 2nd highest	*(no data)*	13	*(no data)*	18	*(no data)*	13	-	-	-
Annual Arithmetic Mean		7.6		8		7.5	12	15	Same as Primary Standard

Notes:

[1] California standards for ozone, carbon monoxide, sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, and particulate matter are not to be exceeded values.

[2] National averages (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year, with a maximum hourly average concentration above the standard, is equal to or less than one.

[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 from a pollutant.

[5] Not to be exceeded on more than an average of 1 day per year over a 3-year period.

[6] Not to be exceeded by the 3-year average of the annual 4th highest daily maximum 8-hour average.

[7] Although not fully implemented, the USEPA has reduced the $PM_{2.5}$ NAAQS from 65 to 35 $\mu g/m^3$.

Sources: 17 CCR 70200; 40 CFR Part 50; 73 FR 16436-16514; USEPA, 2007a

Table 3-2. 2001 Area and Point Source Emissions for Santa Barbara County, CA (Tons per Year)						
Source	**CO**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
Area Sources	130,199	13,356	16,500	5,249	280	23,919
Point Sources	1,548	1,564	554	289	1,021	835
Total	**131,747**	**14,920**	**17,054**	**5,538**	**1,301**	**24,754**

Source: USEPA, 2007a

Table 3-3. 2002 Ozone Precursor Emissions for Santa Barbara County, CA (Tons per Year)	
NO_x	**VOC**
16,111	43,140

Source: SBCAPCD, 2007a

Table 3-4. 2006 Criteria Air Pollutant Emissions for Vandenberg AFB, CA (Tons per Year)					
CO	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
1,076.0	216.4	11.8	4.1	2.93	140.1

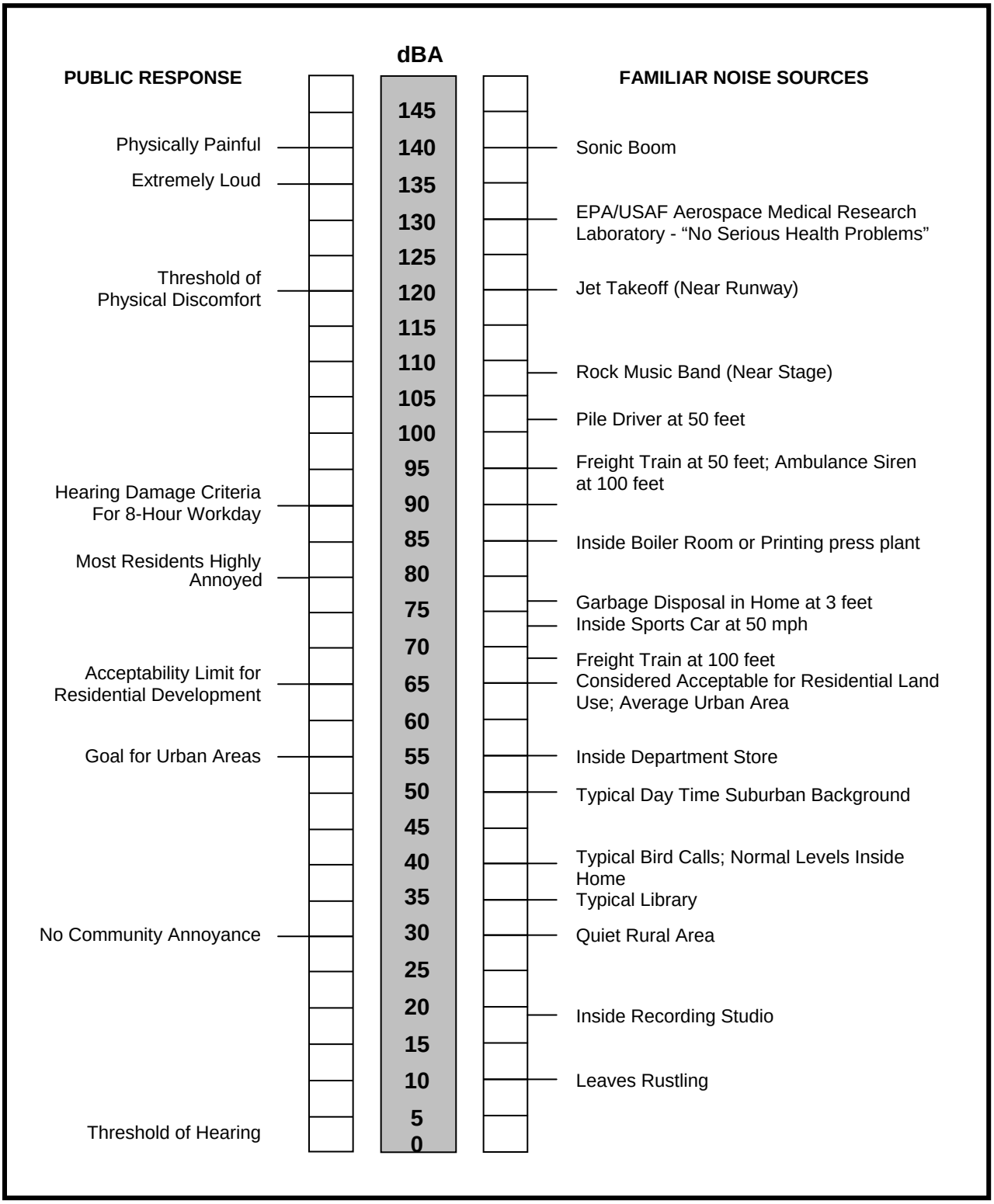
Source: CARB, 2007a; VAFB, 2007c

3.1.2 NOISE

Noise is most often defined as unwanted sound that is heard by people or wildlife and that interferes with normal activities or otherwise diminishes the quality of the environment. Sources of noise may be transient (e.g., a passing train or aircraft), continuous (e.g., heavy traffic or air conditioning equipment), or impulsive (e.g., a sonic boom or a pile driver). Sound waves traveling outward from a source exert a sound pressure measured in decibels (dB).

The human ear is not equally sensitive to all sound wave frequencies. Sound levels adjusted for frequency-dependent amplitude are called "weighted" sound levels. Weighted measurements emphasizing frequencies within human sensitivity are called A-weighted decibels (dBA). Established by the American National Standards Institute, A-weighting significantly reduces the measured pressure level for low-frequency sounds, while slightly increasing the measured pressure level for some high-frequency sounds. In summary, A-weighting is a filter used to relate sound frequencies to human-hearing thresholds. Typical A-weighted sound levels measured for various sources are provided in Figure 3-1.

The greatest sound pressure level recorded during a specific period of time is termed the peak sound pressure level, further qualified as weighted or unweighted (i.e., unfiltered). Peak sound values can be too short and at a frequency missed by the human ear. Sound Exposure Level (SEL), however, is a composite cumulative energy metric of a sound's amplitude and duration, and is qualified as weighted or



Source: Modified from USASDC, 1991

Figure 3-1. Typical Noise Levels of Familiar Noise Sources and Public Responses

unweighted. If the SEL is A-weighted, then it is referred to as ASEL, which is one of the most common metrics used for determining noise exposure effects on humans.

USAF standards require hearing protection whenever a person is exposed to steady-state noise of 85 dBA or more, or impulse noise of 140 dB sound pressure level or more, regardless of duration. Personal noise protection is required when using any noise-hazardous machinery or entering hazardous noise areas.

Air Force Occupational Safety and Health (AFOSH) Standard 48-20 (*Occupational Noise and Hearing Conservation Program*) describes the USAF Hearing Conservation Program procedures used at Vandenberg AFB. Similarly, under 29 CFR 1910.95, employers are required to monitor employees whose exposure to noise could equal or exceed an 8-hour time-weighted average of 85 dBA. For off-base areas, Vandenberg AFB follows state regulations concerning noise, and maintains a Community Noise Equivalent Level (CNEL) of 65 dBA or lower. CNELs represent day-night noise levels averaged over a 24-hour period, with "penalty" decibels added to quieter time periods (i.e., evening and nighttime). As a result, the CNEL is generally unaffected by the short and infrequent rocket launches occurring locally on base.

For noise analysis purposes in this EA, the ROI at Vandenberg AFB is defined as the area within the 85-dB ASEL contours generated by the proposed KEI launches (refer to Figure 4-1). This equates to an area within a few miles of the launch sites.

Noise at Vandenberg AFB is typically produced by automobile and truck traffic, aircraft operations (includes landings, takeoffs, and training approaches and departures for both fixed-wing and rotary-wing aircraft), and Southern Pacific trains passing through the base (an average of 10 trains per day) (VAFB, 2005a). Existing noise levels on Vandenberg AFB are generally low, with higher levels occurring near industrial facilities and transportation routes.

The immediate area surrounding Vandenberg AFB is largely composed of undeveloped and rural land, with some unincorporated residential areas in the Lompoc and Santa Maria valleys, and Northern Santa Barbara County. The Cities of Lompoc and Santa Maria, which make up the two main urban areas in the region, support a small number of industrial areas and small airports. Sound levels measured for the area are typically low, but higher levels occur in the industrial areas and along transportation corridors. The rural areas of the Lompoc and Santa Maria valleys typically have low overall CNELs, normally about 40 to 45 dBA (USAF, 1998). Occasional aircraft flyovers can increase noise levels for a short period of time.

Other less frequent, but more intense, sources of noise in the region are from missile and space launches at Vandenberg AFB. These include Minuteman, GMD, Taurus, and Delta II launches from the North Base area, as well as Minotaur, Atlas V, and Delta IV launches from the South Base area. Depending on the launch vehicle and launch location on the base, resulting noise levels in Lompoc may reach an estimated maximum unweighted sound pressure level of 100 dB, and Santa Maria may reach 95 dB, each for an effective duration of about 20 seconds per launch. Equivalent A-weighted sound levels would be lower. Because launches from Vandenberg AFB occur infrequently, and the launch noise generated from each event is of very short duration, the average (CNEL) noise levels in the nearby areas are not affected. (USAF, 1998, 2000, 2006)

Although rocket launches from Vandenberg AFB often produce sonic booms during the vehicle's ascent, the resulting overpressures are directed out over the ocean in the direction of the launch azimuth and generally do not affect the CA coastline. However, some launches from South Vandenberg can cause sonic booms to occur over portions of the northern Channel Islands (USAF, 1995, 1998, 2000).

3.1.3 BIOLOGICAL RESOURCES

For purposes of analyzing biological resources at Vandenberg AFB, the ROI includes those land areas and near-shore waters within approximately 2 mi of each proposed launch site and associated launch azimuths (refer to Figure 2-2). Biological resources within deeper waters and the BOA are described in Section 3.2.2.

3.1.3.1 Vegetation

Vandenberg AFB supports a wide variety of vegetation organized according to habitat types. These include Bishop pine forest, Tanbark oak forest, coastal live oak woodland, riparian woodland, chaparral, coastal sage scrub, purple sage scrub, coastal dune scrub, coastal bluff scrub, coastal strand, grasslands, coastal bluffs, and rocky headlands. Approximately 85 percent of Vandenberg AFB vegetation is natural, with the balance either invasive vegetation that has replaced natural flora (particularly non-native annual grasslands) or plants associated with developments. Most of the vegetation around the launch facilities, particularly in areas maintained (mowed or disked) to reduce fire hazard, may be characterized as non-native grassland. (USAF, 2006; VAFB, 2005a)

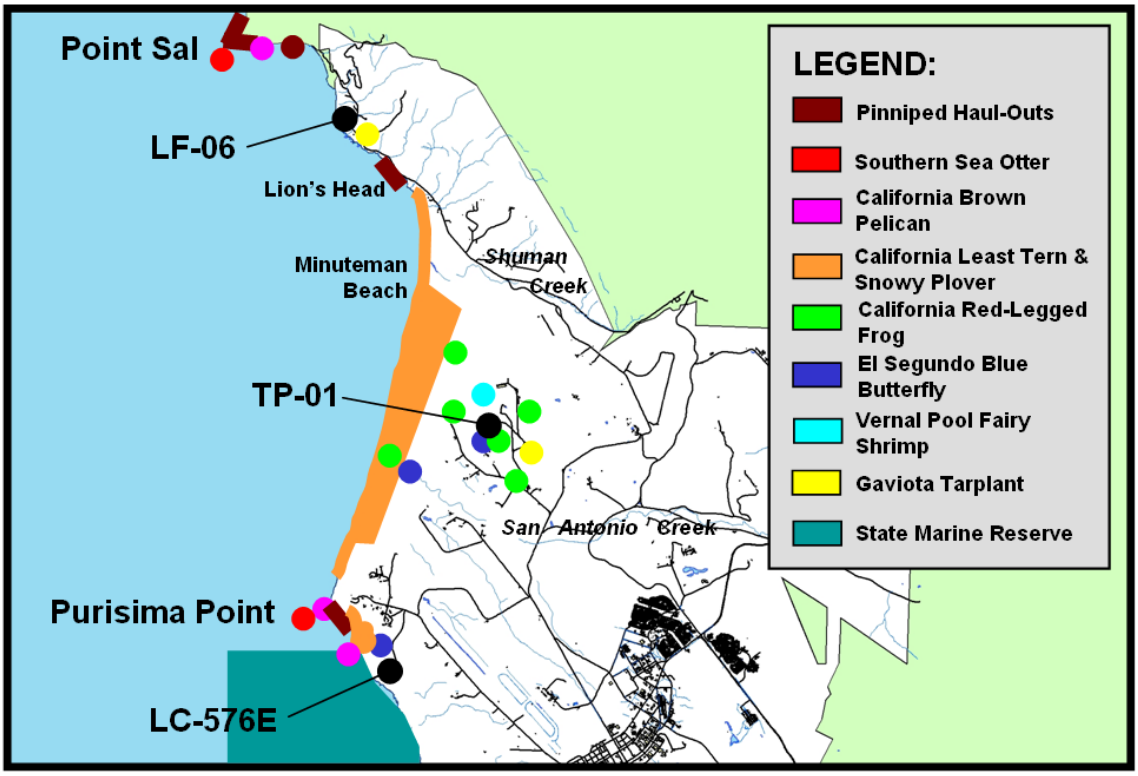
3.1.3.2 Wildlife

The various coastal environments and vegetation types found at Vandenberg AFB provide a wide range of habitats for many resident and migratory animals. While some species are associated with a specific habitat, others may be generalists, occupying multiple habitat communities. Such examples occurring near proposed KEI facilities may include the Western fence lizard, garter snake, brush rabbit, mule deer, Townsend's western big-eared bat, California ground squirrel, and red-tailed hawk (USAF, 2005; USASMDC, 2003; VAFB, 2005a).

Surveys conducted on base have shown a large number of seabirds—including pigeon guillemots, pelagic cormorants, Brandt's cormorants, black oystercatchers, and western gulls—to occur along the coast, particularly around Point Sal, Purisima Point, and other points south. These and other bird species found on base are given additional protections under the Migratory Bird Treaty Act. (Brown, et al., 2001; Robinette and Sydeman, 1999)

Regarding marine mammals, some species of seals and sea lions (pinnipeds) can be found within the ROI using beaches and rocky shores along Vandenberg AFB to rest, molt, and/or breed. Pinnipeds that may be found onshore ("hauled-out") within the ROI include the California sea lion (*Zalophus californianus*) and Pacific harbor seal (*Phoca vitulina richardsi*). None of these species are listed as endangered or threatened, but all receive Federal protection from harassment or injury under the Marine Mammal Protection Act (MMPA).

The Pacific harbor seal is the most common marine mammal inhabiting Vandenberg AFB, occurring year-round within the ROI at several haul-out sites along the base coastline. Purisima Point is a primary haul-out site (refer to Figure 3-2). Lion's Head has also been documented as a haul-out and pupping area for a small number of seals. The highest animal counts at Lion's Head, which average 20 seals, are made between September and January during the post-breeding period. Pupping occurs from March 1 through June 30. Harbor seals are considered particularly sensitive to disturbance during this period, when the risk of mother-offspring separation is greatest. To assess the potential long-term effects of launch noise on pinnipeds, Vandenberg AFB conducts biological monitoring for all launches during the harbor seal pupping season (March 1 to June 30). (74 FR 6236-6244; Roest 1995; USAF, 2006)



Source: CDFG, 2007; MDA, 2008; Tetra Tech, 2007; USAF, 2006; VAFB, 2005a, 2007d

Figure 3-2. Protected Species and Sensitive Habitat Near KEI Launch Areas at Vandenberg AFB, CA

Fewer than 200 California sea lions are found seasonally on Vandenberg AFB. Sea lions may sporadically haul-out to rest when in the area to forage or when transiting the area, but generally spend little time there. They can be found in the area of Point Sal and other points south. (Roest 1995; USAF, 2006)

3.1.3.3 Threatened and Endangered Species

Those threatened and endangered species found in proximity of each proposed KEI launch area are listed in Table 3-5. Although not all inclusive, locations for these species are also shown in Figure 3-2.

3.1.3.3.1 Listed Floral Species

Vandenberg AFB represents an important refuge for threatened and endangered plant species because human activities and invasive species are controlled on the base. The endangered Gaviota tarplant is found at several locations on base, including an area just south of LF-06 (USAF, 2006; VAFB, 2006). Although no Gaviota tarplant was found during a 2007 biological survey around the TP-01 launch pad, previous surveys identified tarplant within 1.6 mi of the site (Tetra Tech, 2007). Mowed and unmowed non-native grassland and ruderal vegetation represent suitable habitat for Gaviota tarplant. The tarplant responds positively to some types of soil disturbance. Light disturbances during the dry season seem to enhance tarplant growth. This is reflected by its distribution along footpaths, livestock trails, and roadsides. More intense disturbance, such as excavation of the soil profile, temporarily enhances seed germination, but also may stimulate growth of competitive exotic species. Overall, the USAF

Table 3-5. Threatened and Endangered Species Near KEI Launch Areas at Vandenberg AFB, CA

Common Name	Scientific Name	Federal Status	CA Status	Species in Proximity of Launch Areas [1]		
				LF-06	TP-01	LC-576E
Plants						
Gaviota tarplant	*Dienandra increscens ssp. villosa*	E	E	X	X	
Invertebrates						
El Segundo blue butterfly	*Euphilotes battoides allyni*	E	-		X	X
Vernal pool fairy shrimp	*Branchinecta lynchi*	T	-		X	
Reptiles/Amphibians						
California red-legged frog	*Rana aurora draytonii*	T	SC		X	
Birds						
California brown pelican	*Pelacanus occidentalis californicus*	E	E	X		X
California least tern	*Sterna antillarum browni*	E	E		X	X
Western snowy plover	*Charadrius alexandrinus nivosus*	T	SC		X	X
Mammals (includes nearshore waters)						
Southern sea otter	*Enhydra lutris nereis*	T	FP	X		X

Notes:
[1] Designated species are known to occur or expected to occur year round or seasonally within approximately 2 mi of each proposed launch site and associated launch azimuths.
E = Endangered FP = Fully Protected
T = Threatened SC = Species of Concern
Source: CDFG, 2007; MDA, 2008; Tetra Tech, 2007; USAF, 2006; VAFB, 2005a, 2007d

permanently removed at least 4.8 acres of Gaviota tarplant on base through mission-critical activities. The USFWS, however, recently concluded that the tarplant population is stable throughout its range (67 FR 67968-68001; USFWS, 2007).

3.1.3.3.2 Listed Faunal Species

As listed in Table 3-5 and shown in Figure 3-2, seven Federally listed wildlife species occur within the ROI at Vandenberg AFB. Discussions on each species are provided in the paragraphs that follow.

Vernal pool fairy shrimp live in ephemeral freshwater habitats, such as natural and man-made vernal pools and swales. The species prefers pools that are relatively short-lived—3 to 7 weeks, depending on the season. None are known to occur in running or marine waters, or in other permanent bodies of water. Fairy shrimp are expected to occur in some of the palustrine wetland areas near TP-01. (Eriksen and Belk, 1999; Tetra Tech, 2007; USAF, 2006)

El Segundo blue butterflies (ESBB) have not been confirmed north of Los Angeles County; however, biologists reported in 2005 to have identified individual butterflies on Vandenberg AFB west of LC-576E and near the mouth of San Antonio Creek (refer to Figure 3-2) (VAFB, 2007d). It is not completely clear whether the butterflies observed were actually the ESBB or morphologically similar species. Recent genetic surveys conducted on blue butterfly specimens captured at Vandenberg AFB showed that five specimen tests were inconclusive as being the ESBB, while a sixth specimen was clearly not the ESBB (Pratt and Stouthamer, 2008). Although the blue butterflies found on base might not genetically be the ESBB, they are similar in appearance to the ESBB and; thus, they are likely to be protected under the

Endangered Species Act due to that similarity or until proven otherwise. ESBBs depend solely on coast buckwheat (*Eriogonum parvifolium*) for much of their lifecycle; thus, their occurrence is dependent upon the distribution of coast buckwheat, which is found at various locations on base. In November 2007, a biological survey conducted at TP-01 found coast buckwheat growing in several areas bordering the launch pad (Tetra Tech, 2007). Surveys conducted at LC-576E in November 2008 also identified coast buckwheat in the vicinity of the launch pad (MDA, 2008). Because the surveys were conducted well after the ESBB flight season, early-June through mid-September (USFWS, 2007), there were no opportunities to verify whether the ESBB or similar blue butterflies actually occur at the sites.

The California red-legged frog prefers freshwater ponds and streams, usually with moderately deep pools, permanent water, and dense aquatic vegetation within and along water edges. Red-legged frogs are common on Vandenberg AFB and are found almost any place where suitable habitat exists. Within the ROI, most occurrences of the red-legged frog are along San Antonio Creek and within the scattered wetlands north of the creek near TP-01 (refer to Figure 3-2). (UCSB, 1995; USAF, 2006; USFWS, 1998, 1999b; VAFB, 2003a, 2004)

Three listed seabirds have been found within the ROI. The endangered California brown pelican roosts mostly along rocky shores, primarily at or near Point Sal, Purisima Point, and other points south; with fewer occurrences at the mouths of Shuman Creek and San Antonio Creek (Collier, et al., 2002; USAF, 2006; VAFB, 2004). Vandenberg AFB provides important nesting and wintering habitat for western snowy plovers. Plover nesting occurs on the coastal dunes of Minuteman Beach and areas further south. Nesting and chick rearing activity generally occurs between March 1 and September 30. California least terns have historically foraged and bred at several coastal locations from San Antonio Creek south. Breeding colonies have varied from year to year in the number of nest attempts and, for some sites, are often not active at all. Since 1978, however, a colony of least terns (ranging from 20 to 80 nesting pairs) has nested annually at Purisima Point within a dunes area located northwest of LC-576E. Least tern nesting generally occurs from April 15 through August 31. (64 FR 68508-68544; Robinette, et al., 2004; Robinette and Sydeman, 1999; USFWS, 1999a; VAFB, 2003a, 2004)

The only listed marine mammal occurring at Vandenberg AFB is the Federally threatened southern sea otter, which can be observed year-round foraging and rafting within a few hundred yards of the shore anywhere kelp beds are present. Resident breeding colonies exist at Purisima Point and along coastline areas further south. Semi-migratory individual otters also have been seen near Point Sal. (USAF, 2006; USFWS, 1999a)

3.1.3.4 Environmentally Sensitive Habitats

In cooperation with the USFWS and the California Department of Fish and Game (CDFG), Vandenberg AFB identified habitats for special protection under its Integrated Natural Resources Management Plan (INRMP) (draft). These and other sensitive habitat areas found within the ROI are summarized in the following paragraphs.

The installation contains a major southern CA coastal dune system. The system is located on North Vandenberg along Minuteman Beach, south to Purisima Point (VAFB, 2005a).

Wetlands on Vandenberg AFB are ecologically important because they provide food, spawning areas, nursing grounds, and habitat for many species. Wetland types on the base include marine, estuarine, riverine, lacustrine, and palustrine. Major wetland areas on base can be found along San Antonio Creek. A number of small tidal wetlands occur along the Minuteman Beach shoreline. Numerous small non-tidal wetlands also exist along lesser stream drainages. Because of its location in the San Antonio Terrace, a peneplain of low relief, TP-01 is within several hundred feet of large wetland areas. A small, potential

wetland area might also exist about 80 ft southeast of the TP-01 pad. The proposed route for the fiber optic lines from TP-01 to Building 1801 passes close to several wetland areas. (Tetra Tech, 2007; VAFB, 2004, 2005a)

Although no USFWS-designated critical habitat areas exist on Vandenberg AFB for the Gaviota tarplant or for other protected plant species, the base has made a commitment to develop and implement protective measures to be specified in its updated INRMP. These measures may include monitoring, surveys, habitat enhancement, and restoration areas (67 FR 67968-68001; USAF, 2006).

For western snowy plovers, the USFWS considered the designation of critical habitat for plover nesting along the beaches and coastal dunes of Vandenberg AFB (refer to Figure 3-2), but determined that such a listing was unnecessary in accordance with 2005-2006 revisions to the Sikes Act.[4] The USFWS determined that appropriate conservation measures were already in place through an earlier Biological Opinion (USFWS, 2005) and the Vandenberg AFB INRMP, and that a conservation benefit to the western snowy plover was provided by the INRMP. Vandenberg AFB has developed a management plan in cooperation with the USFWS for beach closures during the plover nesting season (March 1 through September 30).

To protect and promote the growth of the least tern colony at Purisima Point, Vandenberg AFB has established a comprehensive management program for the area. This program includes monitoring during the breeding season, predator management, and habitat enhancements (Robinette, et al., 2004; USFWS, 1999a).

In 1999, the CA legislature approved, and the governor signed, the Marine Life Protection Act. The Act requires the state to implement a Marine Life Protection Program, which includes a network of Marine Protected Areas (MPAs). MPAs represent discrete geographic marine or estuarine areas set aside primarily to protect or conserve marine life and habitat. In April 2007, the California Fish and Game Commission approved MPAs in the CA Central Coast Region, including the Vandenberg State Marine Reserve (SMR) along the central and south coasts of Vandenberg AFB (refer to Figure 3-2). Effective September 21, 2007, the take[5] of any living marine resource within the SMR is prohibited except for a take incidental to base operations and commercial space launch operations identified as mission critical by the Vandenberg AFB Commander. As part of the Marine Life Protection Program, the CDFG will enter into a Memorandum of Understanding with the base Commander for the mutually beneficial management and administration of the Vandenberg SMR. (CDFG, 2007)

As amended and reauthorized in 2006, Magnuson-Stevens Fishery Conservation and Management Act (Public Law 104-297) requires regional Marine Fisheries Councils to manage fisheries to ensure stability of fish populations with support from the National Marine Fisheries Service (NMFS). Regional Marine Fisheries Councils prepare Fishery Management Plans that identify and protect the habitat essential to maintain healthy fish populations. Commercially important species are preferentially targeted. Threats to habitat from both fishery and non-fishery activities are identified, and actions needed to eliminate them are recommended. In CA, the Pacific Fishery Management Council (PFMC) is responsible for identifying essential fish habitat, which is generally defined as the waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. (PFMC, 2007)

[4] The Sikes Act (Conservation Programs on Military Installations) (16 USC 670) requires the DoD to prepare INRMPs for relevant installations in cooperation with the USFWS and the State fish and wildlife agencies. Revisions to the Act authorize the Secretary of the Interior to exempt DoD land from critical habitat designation where the Secretary finds that the INRMP provides a benefit to the species for which the critical habitat designation is proposed.

[5] Per the Endangered Species Act of 1973 (16 USC 1531 et seq.), "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.

Fishes of commercial importance found just within and downrange from the ROI include coastal pelagic schooling squids and fishes (Pacific sardine and mackerel, northern anchovy, and jack mackerel), groundfish (rockfish, shark, and flatfish), and large, highly migratory pelagic fishes (tuna, marlin, and swordfish). Essential fish habitat identified by the PFMC for these species includes all marine and estuary waters from the coast of CA to the limits of the Exclusive Economic Zone, which extends 200 mi seaward from the coast. Groundfish are the species of commercial importance found within the shallow waters off Vandenberg AFB. More than 82 species of groundfish are identified in the Fishery Management Plan for this region. (PFMC, 2007)

3.1.4 CULTURAL RESOURCES

Cultural resources include prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or any other reason. Cultural resources are limited, nonrenewable resources whose potential for scientific research (or value as a traditional resource) may be easily diminished by actions impacting their integrity.

Numerous laws and regulations require that possible effects to cultural resources be considered during the planning and execution of Federal undertakings. These laws and regulations stipulate a process of compliance and consultation, define the responsibilities of the Federal agency proposing the action, and prescribe the relationship among other involved agencies (e.g., SHPO and the Advisory Council on Historic Preservation). In addition to NEPA, the primary laws that pertain to the treatment of cultural resources during environmental analysis are the National Historic Preservation Act (especially Sections 106 and 110), the Archaeological Resources Protection Act, the Antiquities Act of 1906, the American Indian Religious Freedom Act, and the Native American Graves Protection and Repatriation Act. Depending on the integrity and historical significance of a site or property, it may be listed or eligible for listing on the National Register of Historic Places (NRHP).

The term ROI is synonymous with the "area of potential effect" as defined under cultural resources regulations, 36 CFR 800.16(d). In general, the ROI for cultural resources encompasses areas of planned ground disturbance (e.g., areas of new facility/utility construction) and all buildings or structures requiring modification, renovation, demolition, or abandonment. The ROI for the KEI Proposed Action includes the historic buildings and facilities proposed for use on base, and any construction sites where ground disturbance could occur (e.g., utility corridors and roads). In cases of launch failures, the ROI would include areas of debris clean-up, firefighting, and other required post launch-anomaly activities.

3.1.4.1 Archaeological Sites

Numerous archaeological surveys at Vandenberg AFB have identified more than 2,200 prehistoric and historic cultural sites. Prehistoric sites have included dense shell middens (refuse heaps), stone tools, village sites, stone quarries, and temporary encampments (VAFB, 2005a). Three of the existing facilities that would potentially be used for activities under the Proposed Action (refer to Section 2.1.2) are located adjacent to or on known archaeological sites. These facilities and associated archaeological sites are listed in Table 3-6.

3.1.4.2 Historic Buildings and Structures

As part of the World War II effort, the US Army acquired much of the current base area in 1941. The area, named Camp Cooke, served as a training area for armored and infantry units. In 1950, the base was re-activated in support of the Korean War. In 1957, the USAF took over the northern 65,000 acres of

Table 3-6. Archaeological Sites in Relation to Proposed KEI Facilities at Vandenberg AFB, CA

Facility	Site Characteristics	NRHP Eligibility	Proximity to Facility
TP-01 (Facility 1840)	Prehistoric – Large "chipping station" flakes, tools, and cores	Not Determined	The west end of the TP-01 fenced area overlaps the site. Original construction of TP-01 placed approximately 10-15 ft of fill over part of the site.
Atlas Solid Rocket Motor Storage (Building 960)	Prehistoric – Flaked stone tools and associated lithic debris and ground stone artifacts	Eligible	This large site is located about 350 ft from Building 960.
Small Ordnance Storage (Building 970)	Prehistoric – Flaked stone tools with associated lithic debris and ground stone artifacts	Eligible	Building 970 was constructed inside a portion of this large site.

Source: Carucci, 2007; Lebow and Haslouer, 2005; USAF, 2006

Camp Cooke and renamed it "Cooke AFB." It was later renamed Vandenberg AFB in a ceremony held on October 4, 1958.

Since the late-1950s, the base has been used primarily to develop several types of intermediate and long-range ballistic missiles, and to launch both military and civilian payloads into space. A multi-year survey completed in 1996 identified more than 70 sites, complexes, and facilities that have been determined eligible for the NRHP as historic Cold War-era sites (USAF, 2006). Table 3-7 lists the Cold War sites that could be affected by the Proposed Action.

Table 3-7. Cold War Sites Potentially Affected by KEI Activities at Vandenberg AFB, CA

Facility	NRHP Eligibility	Contributing Elements
LF-06 (Facility 1980)	Eligible	Launch silo, equipment room, support building, and facility environmental shelter
Peacekeeper Launch Support Center (Building 1974)	Eligible	Launch control consoles and equipment

Source: Carucci, 2007; USAF, 2006

Constructed in the early-mid 1960s, both LF-06 and Building 1974 are prior Minuteman ICBM test support facilities. Building 1974 also served as a Peacekeeper ICBM test launch control before the program was deactivated. Currently, LF-06 is used by the MDA for BMDS-related target missile launches, and Building 1974 remains an active launch control center.

3.1.4.3 Native American Traditional Resources

At the time of sustained European contact in the early 1800s, the Vandenberg AFB area was occupied by inhabitants who spoke one of the major languages of the Chumashan branch of the Hokan language family. Several villages were located in the area that is now North Vandenberg AFB. (USAF, 1998)

Today, Chumash-related traditional resources at Vandenberg AFB consist of both Traditional Cultural Properties and "traditional resource areas." Known Traditional Cultural Properties on base include sacred sites, rock art sites, archaeological sites, and ancestral burial locations. The traditional resource areas on base are those locations that modern-day Native Americans access to collect raw materials (e.g., reeds, plants, minerals, and rock resources) or other items of interest. Preservation of this cultural and natural record is important to the living Chumash because of their respect for ancestors, ancestral lands, and traditional resources, as well as the importance of perpetuating Chumash society and traditional ways. (Carucci, 2007; VAFB, 2005a)

Although various traditional resources are known on Vandenberg AFB, none of these sites are within the ROI for proposed KEI activities.

3.1.5 COASTAL ZONE MANAGEMENT

Federal activity in, or affecting, a coastal zone requires preparation of a Coastal Zone Consistency Determination or a Negative Determination, in accordance with the Federal Coastal Zone Management Act (CZMA) of 1972. The California Coastal Zone Management Program was formed through the California Coastal Act (CCA) of 1976. The policies established by the CCA are similar to those for the CZMA. The CCA policies include the protection and expansion of public access and recreation; the protection, enhancement, and restoration of environmentally sensitive areas; protection of agricultural lands; the protection of scenic beauty; the facilitation of energy producing facilities; and the protection of property and life from coastal hazards. The CCC is responsible for reviewing Federally authorized projects for consistency with the California Coastal Zone Management Program. (CCC, 2007)

At Vandenberg AFB, the coastal zone extends seaward out to the 3-nmi state water limit, and inland approximately 0.75 mi at the northern base boundary to approximately 4.5 mi at the southern end of the base (NOAA, 2004; VAFB, 2005a). The ROI for the Proposed Action includes those on- and off-base areas within the coastal zone that could be affected by project-related activities. This would include all of the buildings and facilities proposed for KEI use, with the exception of Buildings 1974, 6527, and 8510 (refer to Figure 2-2). Because of launch-related noise and range safety evacuation procedures, coastal zone areas just north of Vandenberg AFB are also within the ROI.

3.1.6 WATER RESOURCES

The State Water Resources Control Board and the nine Regional Water Quality Control Boards (RWQCBs) administer the Federal Clean Water Act and State water regulations in California. For Vandenberg AFB, the Central Coast RWQCB is the local agency responsible for development and enforcement of water quality objectives and implementation plans.

At Vandenberg AFB, the ROI for water resources includes those surface water features and groundwater that could be adversely affected by KEI facilities or activities (e.g., drainage alteration or water quality degradation).

3.1.6.1 Surface Water

The Santa Ynez River and San Antonio Creek are the two major surface water features on Vandenberg AFB (refer to Figure 3-2). There are also several small streams and tributaries that flow intermittently, mostly in response to rainfall events. Additionally, numerous ponds, wetlands, and other water-holding depressions are found on the base. Rainfall at Vandenberg AFB is relatively light, averaging from 13 to 16 inches per year (VAFB, 2005a).

North and south of LF-06 are intermittent, canyon stream drainages between 800 and 1,200 ft from the launch site. Because of its location in the San Antonio Terrace, a peneplain of low relief, TP-01 is within several hundred feet of large wetland areas. A small, potential wetland area might also exist about 80 ft southeast of the TP-01 pad. The proposed route for the fiber optic lines from TP-01 to Building 1801 passes close to several wetland areas. (Tetra Tech, 2007; VAFB, 2004, 2005a)

There are no surface water features in proximity of LC-576E or the other remaining KEI facilities. None of the KEI facilities and construction areas is located within the 100-year floodplain.

3.1.6.2 Groundwater

Most groundwater on Vandenberg AFB is found in the San Antonio Creek basin, which underlies the northern part of Vandenberg AFB. Smaller, isolated aquifers are found beneath alluvial fans or in perched aquifers at higher elevations. (MDA, 2007b)

At TP-01, perched groundwater at the site has been observed between 10 and 25 ft in depth (VAFB, 2005b). At LC-576E, a thin groundwater zone is present in the unconsolidated sand deposits immediately above bedrock. Depth to groundwater at LC-576E ranges from 20 to 40 ft (VAFB, 2007a). For Building 960, perched groundwater has been identified at no less than 35 ft in depth (VAFB, 2008a). Groundwater has not been a concern at LF-06 or other KEI facilities.

3.1.6.3 Water Quality

The Vandenberg AFB water supply comes primarily from water provided by the CA Central Coast Water Authority and from four wells tapped into the San Antonio Creek groundwater basin. The wells are a supplemental water source used only a few weeks per year. Groundwater quality has decreased slightly in the region due to irrigation. The base water treatment plant, however, treats the water to meet all water quality requirements of the Federal Safe Drinking Water Act and State drinking water standards. Vandenberg AFB monitors the existing water distribution system for various water quality constituents on a routine basis. (MDA, 2007b; USAF, 2005; VAFB, 2005a, 2007a)

3.1.7 AIRSPACE

With the exception of special use airspace, the domestic airspace in the ROI around Vandenberg AFB is considered controlled airspace, consisting of Class A airspace from 18,000 ft above mean sea level up to 60,000 ft, and Class E airspace below 18,000 ft.[6] The Class A and E airspace also includes designated international airspace. (MDA, 2007b)

Airspace designated for Vandenberg AFB and Western Range operations is comprised of four Restricted Airspace areas, each extending to an unlimited altitude immediately above and around Vandenberg AFB; two Restricted Airspace areas over San Nicolas Island 100 mi to the south; and several Warning Areas off the coast of Southern California. The Restricted Airspace is generally closed to civilian and commercial aircraft because of military operations and national security. Warning Areas, which extend from near-shore waters to approximately 110 nmi off the coast, are designated areas for military activities mostly in international airspace. The Warning Areas are active on an intermittent basis and are activated in coordination with the Federal Aviation Administration (FAA). When Warning Areas are activated, the

[6] Controlled airspace is that airspace within which all aircraft operators are subject to certain pilot qualifications, operating rules, and equipment requirements, as specified in 14 CFR Part 91. Controlled airspace is divided into different classes, which vary by altitude, location, and/or operating rules.

flying public is informed through publication of NOTAMs issued by the FAA. Although NOTAMs may be issued to warn of hazardous military operations, such as for missile tests, there are no international agreements to restrict non-participating aircraft from entering international airspace. (MDA, 2007b; USN, 2002; VAFB, 2005a)

3.1.8 HEALTH AND SAFETY

Regarding health and safety at Vandenberg AFB, the ROI is limited to the US transportation network used in shipping rocket motors to the base, existing base facilities supporting the KEI flight tests, off-base areas within launch hazard zones, and areas downrange along the launch vehicle's flight path. The health and safety ROI includes base personnel, contractors, and the general public.

Air Force Policy Directive 91-2 (*Safety Programs*) establishes the USAF's key safety policies and also describes success-oriented feedback and performance metrics to measure policy implementation. More specific safety and safety-related DoD requirements, Air Force Instructions (AFIs), and other requirements and procedures pertaining to explosive safety—including the handling, maintenance, transportation, facility siting, and storage of rocket motors and related ordnance—are listed below:

- DoD 6055.09-STD (*DoD Ammunition and Explosives Safety Standards*)
- AFI 91-202, AFSPC Supplement 1 (*The US Air Force Mishap Prevention Program*)
- Air Force Manual 91-201 (*Explosives Safety Standards*)

Interstate highways are the preferred routes for the transportation of rocket components to the launch facility, although some local and state routes may be used, depending on the destination. The health and safety of travel on US transportation corridors is under the jurisdiction of each State's Highway Patrol and DOT, and the US DOT. The USAF coordinates with each state DOT whenever the transport of hazardous missile/launch vehicle components is planned.

The USAF has an excellent safety record of transporting rocket motors. As an example, for ICBM systems, approximately 500,000 road miles have been driven carrying Minuteman and Peacekeeper missiles and motors between bases and launch facilities in the field. During the height of Minuteman ICBM Program operations, from the early 1960s to 1990, over 11,000 missile movements involving over 12,400 individual rocket motors occurred by air, rail, or road. Since 1962, there have been only four accidents associated with these movements—all of them transport truck rollover scenarios involving Minuteman systems. In each of these cases, however, all USAF property was safely recovered and there was no damage to the environment or to human health. Additionally, there were no traffic incidents during a program in which the USAF transported 150 boosters between 1995 and 1997. No accidents or rollovers occurred during the transport of the larger Peacekeeper systems. At FE Warren AFB, Wyoming, for example, the accident rate for USAF vehicles within the ICBM Wing area (about 0.000002 accidents per mile driven) was shown to be nearly identical to the accident rate for the entire state. (Air Force Times, 2008; USAF, 2004, 2006)

Health and safety requirements at Vandenberg AFB include industrial hygiene, which is the joint responsibility of Bio-Environmental Services and the 30 Space Wing (SW) Safety Office. These responsibilities include monitoring worker exposure to workplace chemicals and physical hazards, hearing and respiratory protection, medical monitoring of workers subject to chemical exposures, and oversight of all hazardous or potentially hazardous operations. Ground safety includes both occupational and public safety. Both AFOSH and applicable Occupational Safety and Health Administration (OSHA)

regulations and standards are used to implement safety and health requirements for all workers on base, including military personnel and contractors.

Final responsibility and authority for the safe conduct of ballistic and space vehicle operations lies with the 30 SW Commander. Establishing and managing the overall safety program is the responsibility of the 30 SW Safety Office, which ensures safety during launch operations at Vandenberg AFB.

The AFSPC Manual 91-710 (*Range Safety User Requirements*) establishes range safety policy, and defines requirements and procedures for ballistic and space vehicle operations at Vandenberg AFB (AFSPC, 2004). Over-ocean launches must comply with DoD Instruction 4540.01 (*Use of International Airspace by US Military Aircraft and for Missile/Projectile Firings*).

Prior to conducting rocket launches, all launch operations are evaluated by the 30 SW Safety Office to ensure that populated areas, critical range assets, and civilian property susceptible to damage are outside predicted impact/debris limits. This includes a review of flight trajectories and hazard area dimensions, and review and approval of destruct systems. Criteria used to determine launch debris hazard risks are in accordance with the Range Commanders Council (RCC) Standard 321-07, *Common Risk Criteria Standards for National Test Ranges* (RCC, 2007).

Atmospheric dispersal modeling is also conducted to ensure emission concentrations from each launch do not exceed certain levels outside controlled areas. In accordance with 30 Space Wing Instruction (SWI) 91-106 (*Toxic Hazard Assessments*), if hydrogen chloride (HCl) launch emission cloud concentrations of 10 ppm or higher are predicted to cross the base land boundary, then the launch is held until meteorological conditions improve.

A NOTMAR and a NOTAM are published and circulated in accordance with 30 SWI 91-104 (*Operations Hazard Notice*) to warn personnel within range Warning Areas off the coast (refer to Section 3.1.7), and in other international waters and airspace, to avoid potential impact areas. Resources such as radar, ground roving security forces, and/or helicopter support are used prior to operations to ensure evacuation of non-critical personnel. Nearby access roads may be closed, and nearby recreational areas may be evacuated. Jalama Beach County Park, near the southern tip of the base, is closed on average once a year, while Ocean Beach County Park, between North and South Base, is closed on average three times per year under agreement with Santa Barbara County (USAF, 2006). Also under agreement with the County and the State of California, Point Sal State Beach, at the northern end of the base, is closed on average twice a year (USAF, 2006; VAFB, 2003b). The USAF and Santa Barbara County recently signed a new Memorandum of Agreement that resolved issues regarding public access to Point Sal State Beach through Vandenberg AFB property.

In accordance with 30 SWI 91-105 (*Evacuating or Sheltering of Personnel on Offshore Oil Rigs*), the USAF notifies oilrig companies of an upcoming launch event approximately 10 to 15 days in advance. The USAF's notification, provided through the Department of the Interior's Minerals Management Service, requests that the oilrigs located in the path of the launch vehicle overflight temporarily suspend operations and evacuate or shelter their personnel.

The coordination and monitoring of train traffic passing through the base during hazardous operations is conducted in accordance with 30 SWI 91-103 (*Train Hold Criter*ia). An average of 10 trains pass through the base daily on the Southern Pacific line (VAFB, 2005a).

Vandenberg AFB possesses significant emergency response capabilities that include its own Fire Department, Disaster Control Group, and Security Police Force, in addition to contracted support for handling accidental releases of regulated hypergolic propellants and other hazardous substances.

The Vandenberg AFB Fire Department approves and maintains the business plans and hazardous material inventories prescribed by the CA Health and Safety Code. The plans and inventories are developed by the organizations conducting business on the base. Additionally, the base Fire Department conducts on-site facility inspections, as required, to identify potentially-hazardous conditions that could lead to an accidental release. During launch operations, Fire Department response elements are pre-positioned to expedite response in the event of a launch anomaly. (USAF, 2006)

3.1.9 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

For the analysis of hazardous materials and waste management at Vandenberg AFB, the ROI is defined as those KEI support facilities that: (1) handle and transport hazardous materials; (2) collect, store (on a short-term basis), and ship hazardous waste; and (3) are in proximity to existing Installation Restoration Program (IRP) sites or other contamination.

Hazardous materials and waste management activities at USAF installations are governed by specific environmental regulations. For the purposes of the following discussion, the term "hazardous materials or hazardous waste" refers to those substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC Section 9601 et seq., as amended. In general, this includes substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to the public health, welfare, or the environment when released. Regulated under the Resource Conservation and Recovery Act (RCRA), 42 USC Section 6901 et seq., hazardous waste is further defined in 40 CFR 261.3 as any solid waste that possesses any of the hazardous characteristics of toxicity, ignitability, corrosiveness, or reactivity.

AFI 32-7042 (*Solid and Hazardous Waste Compliance*) and AFI 32-7086 (AFSPC Supplement 1) (*Hazardous Materials Management*) specify requirements for the development of procedures to manage hazardous materials and waste. In accordance with AFI 32-4002 (*Hazardous Materials Emergency Response Program*), each USAF installation must also develop a hazardous materials emergency response plan and procedures. These plans and procedures also incorporate appropriate Federal, state, local, and USAF requirements regarding the management of hazardous materials and hazardous waste, including pollution prevention.

On Vandenberg AFB, Air Force organizations are required to manage hazardous materials through the base's HazMart Pharmacy. The HazMart is the single point of control and accountability for the requisitioning, receipt, distribution, issue, and reissue of hazardous materials. Hazardous materials obtained from off base suppliers are also coordinated through Vandenberg AFB's HazMart Pharmacy. Hazardous materials are inventoried and tracked using Environmental Management System software. These procedures are in accordance with the base *Hazardous Materials Management Plan* (30 SW Plan 32-7086).

The prevention, control, and handling of any spills of hazardous materials are covered under Vandenberg's *Spill Prevention, Control and Countermeasures Plan* (30 SW 32-4002-C) and *Hazardous Materials Emergency Response Plan* (30 SW Plan 32-4002-A). These plans ensure that adequate and appropriate guidance, policies, and protocols regarding hazardous material spill prevention, spill incidents, and associated emergency response are available to all installation personnel.

For hazardous waste, the base *Hazardous Waste Management Plan* (30 SW Plan 32-7043-A) describes the procedures for packaging, handling, transporting, and disposing of such wastes. If not reused or recycled, hazardous wastes are transported off base for appropriate treatment and disposal. Industrial wastewaters (including rain and wash water collected from launch pad catchments) are monitored and

properly disposed of in accordance with the Vandenberg AFB *Wastewater Management Plan* (30 SW Plan 32-7041-A). All hazardous wastes are managed in accordance with RCRA requirements and with CA Hazardous Waste Control Laws. The transportation of hazardous materials and waste outside the base boundaries is governed by the US DOT regulations within 49 CFR 100-199.

As for IRP-related issues at proposed KEI facilities on Vandenberg AFB (refer to Section 2.1.2), the LC-576E property is designated as Site 33 in the base IRP. Various investigations indicate the presence of metals, solvents, and fuel in the soil and groundwater, most likely the result of prior Atlas F missions in the 1960s. For example, antimony, thallium, and nickel were detected above the background threshold value in the soil. No petroleum hydrocarbons, aromatic volatile compounds, or halogenated volatile compounds were detected in the soil samples. There is no spill or release history for this facility in current records. Vandenberg AFB is coordinating with the California Environmental Protection Agency (Cal/EPA) to develop corrective actions for the site. (VAFB, 2007a)

The property surrounding Building 6527 is designated as Area of Concern (AOC) 213. Analysis of soil borings at the site indicate trace concentrations of trichloroethylene, cis-1,2-dichloroethylene, and methylene chloride in collected samples. Two soil borings contained total petroleum hydrocarbons (TPH) at concentrations above the CA RWQCB action level of 100 milligrams per kilogram. Elevated concentrations of metals (e.g., antimony, selenium, and vanadium) relative to the background threshold values were also detected across the site. There is no spill or release history for this facility in current records. In a letter dated January 11, 2007, the RWQCB and the CA Department of Toxic Substances Control reviewed the base recommendation for AOC 213 that includes the area surrounding Building 6527. The State concurred with the recommendation to remove TPH impacted soil near two of the soil boring sites. (VAFB, 2007a)

Both Buildings 960 and 970 are located within AOC 219. In 1992, a 1,500-gallon diesel fuel underground storage tank next to Building 960 was removed from the site; however, petroleum hydrocarbon contamination was later found in the surrounding soil. Following removal of the contaminated soil, the tank site was closed by the RWQCB in 1999 (VAFB, 2008a). In 2007, additional soil and groundwater sampling was conducted around Buildings 960 and 970 to determine the nature and extent of any other contamination problems (VAFB, 2008a). No explosives or perchlorates were detected in the soil samples. Although soil analyses around Building 960 detected various metals (barium, lead, nickel, selenium, vanadium, and zinc) above their respective background threshold value (BTV), levels present were below their USEPA Region 9 residential soil Preliminary Remediation Goals (PRGs). At the now-empty flammable materials storage shed next to Building 960, lead levels in the soil were found to be 25 times greater than the BTV. Concentrations of TPH at this site also exceeded the RWQCB action level. At the newer septic system leach field located northeast of Building 960, preliminary groundwater analysis showed elevated concentrations of trichloroethylene and bromodichloromethane that exceeded their PRGs. Slightly higher levels of trichloroethylene were also found at a sump/pit outside the north edge of Building 960. Vandenberg AFB is in the process of coordinating the sampling results with the State of California to determine the need for additional studies and whether remedial actions might be required.

Older buildings proposed for KEI activities may contain hazardous materials used in their construction, such as asbestos-containing materials (ACM) and lead-based paint (LBP). For example LBP might have been used in Buildings 960, 1974, and 6527. An asbestos survey of Building 6527 in 1992 indicated that asbestos containing tiles, fitting insulation, and vent piping were located in the administrative office area, attic, and building exterior. Since the time of the survey, some of the ACM in Building 6527 have been removed, but some quantity of non-friable asbestos remains (VAFB, 2007a). At Building 960, asbestos was identified in the exterior transite siding, floor tile and mastic, and in the pipe insulation (VAFB, 2002). At Vandenberg AFB, LBP and ACM are managed in accordance with 30 SW Plan 32-1002

(*Lead-Based Paint Management Plan*), 30 SW Plan 32-1052-A (*Asbestos Management Plan*), 32-1052-B (*Asbestos Operating Plan*), and other applicable Federal, state, local, and USAF requirements.

3.2 GLOBAL ENVIRONMENT

3.2.1 GLOBAL ATMOSPHERE

3.2.1.1 Stratospheric Ozone Layer

The stratosphere, which extends from 32,800 ft to approximately 164,000 ft in altitude, contains the Earth's ozone layer (NOAA, 2007a). The ozone layer plays a vital role in absorbing harmful ultraviolet radiation from the sun. Over the last 20 years, the concentration of ozone in the stratosphere has been threatened by anthropogenic (human-made) gases released into the atmosphere—primarily chlorine related substances. Such materials include chlorofluorocarbons (CFCs), which have been widely used in electronics and refrigeration systems, and the lesser-used Halons, which are extremely effective fire extinguishing agents. Once released, the motions of the atmosphere mix the gases worldwide until they reach the stratosphere, where ultraviolet radiation releases their chlorine and bromine components. Atomic chlorine (Cl) reacts directly with O_3 to form chlorine oxide (ClO) and molecular oxygen (O_2) (refer to equation 1). The ClO in turn can react with a free oxygen atom (O) to form more O_2 and a free Cl atom that is ready to attach to more O_3 molecules (refer to equation 2). A single Cl atom can destroy as many as 100,000 O_3 molecules during its residence in the stratosphere (Levi, 1988). This combination of reactions occurs throughout the stratosphere, and can be directly linked to global ozone depletion (Hemond, 1994).

Equation 1: $Cl + O_3 \rightarrow ClO + O_2$
Equation 2: $ClO + O \rightarrow Cl + O_2$

Through global compliance with the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer and amendments, the worldwide production of CFCs and other ozone-depleting substances has been drastically reduced, and banned in many countries. A continuation of these compliance efforts is expected to allow for a slow recovery of the ozone layer (WMO, 2006).

3.2.1.2 Greenhouse Gases and Global Warming

Greenhouse gases (GHG) are components of the atmosphere that contribute to the greenhouse effect and global warming. Some GHG occur naturally in the atmosphere, while others result from human activities such as the burning of fossil fuels. Federal agencies, states, and local communities address global warming by preparing GHG inventories and adopting policies that will result in a decrease of GHG emissions. According to the Kyoto Protocol and the California Climate Action Registry, there are six GHGs: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (CARB, 2007b; UNFCC, 2007). Although the direct GHG (CO_2, CH_4, and N_2O) occur naturally in the atmosphere, human activities have changed GHG atmospheric concentrations. From the pre-industrial era (i.e., ending about 1750) to 2004, concentrations of CO_2 have increased globally by 35 percent. Within the US, fuel combustion accounted for 94 percent of all CO_2 emissions released in 2005. On a global scale, fossil fuel combustion added approximately 30 x 10^9 tons of CO_2 to the atmosphere in 2004, of which the US accounted for about 22 percent (USEPA, 2007b).

Since 1900, the Earth's average surface air temperature has increased by about 1.2° to 1.4° F. The warmest global average temperatures on record have all occurred within the past 15 years, with the warmest two years being 1998 and 2005 (USEPA, 2007c). With this in mind, the MDA and the USAF

are poised to support climate-changing initiatives globally, while preserving military operations, sustainability, and readiness by working, where possible, to reduce GHG emissions (AFCEE, 2007).

3.2.2 BIOLOGICAL RESOURCES IN THE BROAD OCEAN AREA

The affected environment of the BOA is described in the following subsections in terms of its biological diversity, threatened and endangered species, and other protected marine mammal species. For purposes of this analysis, the ROI is focused primarily on the launch corridors over the Pacific Ocean, where motor drop zones and other debris impacts might occur (refer to Section 2.1.2.4).

3.2.2.1 Biological Diversity

Although the oceans have traditionally been considered to be much less biodiverse than the land environments, an incredible variety of living things reside in the ocean (Columbia University, 2007). Marine life ranges from microscopic one-celled organisms to the world's largest animal, the blue whale. Marine plants and plant-like organisms can live only in the sunlit surface waters of the ocean, the photic zone, which extends to only about 650 ft below the surface (NOAA, 2007b). Beyond the photic zone, the light is insufficient to support plants and plant-like organisms. Animals, however, live throughout the ocean from the surface to the greatest depths.

The average ocean depth within much of the ROI is over 10,000 ft. Marine biological communities in the deep ocean waters can be divided into two broad categories: pelagic and benthic. Pelagic communities live in the water column and have little or no association with the bottom, while benthic communities live within, upon, or are otherwise associated with the bottom.

The organisms living in pelagic communities may be drifters (plankton) or swimmers (nekton). The plankton includes larvae of benthic species, so a pelagic species in one ecosystem may be a benthic species in another. The plankton consists of plant-like organisms (phytoplankton) and animals (zooplankton) that drift with the ocean currents, with little ability to move through the water on their own. The nekton consists of animals that can swim freely in the ocean, such as fish, squids, sea turtles, and marine mammals. Benthic communities are made up of marine organisms that live on or near the sea floor, such as bottom dwelling fish, shrimps, worms, snails, and starfish.

3.2.2.2 Threatened, Endangered, and Other Protected Species

The BOA contains a number of threatened, endangered, and other protected species, including whales and small cetaceans, pinnipeds, and sea turtles. These are listed in Table 3-8 for North Pacific Ocean areas within the ROI. Many of these species can be found near the West Coast of the US, but are sometimes seasonal in occurrence because of unique migration patterns. Some species, particularly the larger cetaceans, can occur hundreds or thousands of miles from land.

Table 3-8. Protected Marine Mammal and Sea Turtle Species Occurring in the Broad Ocean Area of the North Pacific Ocean

Common Name	Scientific Name	Federal Status
Pinnipeds		
Northern fur seal	*Callorhinus ursinus*	MMPA
Guadalupe fur seal	*Arctocephalus townsendi*	T
California sea lion	*Zalophus californianus*	MMPA
Pacific harbor seal	*Phoca vitulina richardsi*	MMPA
Northern elephant seal	*Mirounga angustirostris*	MMPA
Steller sea lion	*Eumetopias jubatus*	E
Hawaiian monk seal	*Monachus schauinslandi*	E
Small Cetaceans		
Harbor porpoise	*Phocoena phocoena*	MMPA
Dall's porpoise	*Phocoenoides dalli*	MMPA
Bottlenose dolphin	*Tursiops truncatus*	MMPA
Common dolphin	*Delphinus delphis*	MMPA
Spinner dolphin	*Stenella longirostris*	MMPA
Striped dolphin	*Stenella coeruleoalba*	MMPA
Northern right whale dolphin	*Lissodelphis borealis*	MMPA
Risso's dolphin	*Grampus griseus*	MMPA
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	MMPA
Pantropical spotted dolphin	*Stenella attenuata*	MMPA
Rough-toothed dolphin	*Steno bredanensis*	MMPA
Fraser's dolphin	*Lagenodelphis hosei*	MMPA
Short-finned pilot whale	*Globicephala macrorhynchus*	MMPA
Killer whale	*Orcinus orca*	MMPA
False killer whale	*Pseudorca crassidens*	MMPA
Pygmy killer whale	*Feresa attenuata*	MMPA
Dwarf sperm whale	*Kogia sima*	MMPA
Pygmy sperm whale	*Kogia breviceps*	MMPA
Melon-headed whale	*Peponocephala electra*	MMPA
Beaked Whales		
Cuvier's beaked whale	*Ziphius cavirostris*	MMPA
Longman's beaked whale	*Indopacetus pacificus*	MMPA
Blainsville's beaked whale	*Mesoplodon densirostris*	MMPA
Large Odontocetes and Baleen Whales		
Sperm whale	*Physeter macrocephalus*	E
Gray whale	*Eschrichtius robustus*	MMPA
Humpback whale	*Megaptera novaeangliae*	E
North Pacific right whale	*Eubalaena japonica*	E
Sei whale	*Balaenoptera borealis*	E
Blue whale	*Balaenoptera musculus*	E
Fin whale	*Balaenoptera physalus*	E
Bryde's whale	*Balaenoptera edeni*	MMPA
Minke whale	*Balaenoptera acutorostrata*	MMPA

Table 3-8. Protected Marine Mammal and Sea Turtle Species Occurring within the North Pacific Over-Ocean Flight Corridor

Common Name	Scientific Name	Federal Status
Sea Turtles		
Green sea turtle	*Chelonia mydas*	E, T
Hawksbill sea turtle	*Eretmochelys imbricata*	E
Loggerhead sea turtle	*Caretta caretta*	T
Olive ridley sea turtle	*Lepidochelys oliveacea*	T
Leatherback sea turtle	*Dermochelys coriacea*	E

Notes:

MMPA = Protected under the Marine Mammal Protection Act

E = Endangered

T = Threatened

Source: NOAA, 2008; USAF, 2006

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter presents the potential environmental consequences of the Proposed Action and No Action Alternative, described in Chapter 2.0 of this EA, when compared to the affected environment described in Chapter 3.0. The amount of detail presented in each section of the analysis is proportional to the potential for impact. Both *direct* and *indirect* impacts[7] are addressed where applicable. In addition, *cumulative* effects that might occur are identified later in Section 4.3. A comparison of environmental consequences of the Proposed Action, Alternatives within the Proposed Action, and the No Action Alternative is provided in Section 4.4. Appropriate environmental management and monitoring actions and requirements are also included in this chapter, where necessary, and summarized in Section 4.5. A list of all agencies, organizations, and persons consulted as part of this analysis is provided in Chapter 6.0.

4.1 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

The following sections describe the potential environmental consequences of implementing the Proposed Action at Vandenberg AFB and within the global environment.

Various management controls and engineering systems are in place at Vandenberg AFB to manage and implement environmental and safety requirements. Required by Federal, state, DoD, and agency-specific regulations, these measures are implemented through normal operating procedures. To help ensure that procedures are followed, base personnel and contractors receive periodic training on applicable environmental and safety requirements. In addition, environmental audits by both internal offices and external agencies are conducted at the base to verify compliance.

4.1.1 VANDENBERG AIR FORCE BASE

For Vandenberg AFB, the analysis discussions presented under each resource topic are broken out into three key phases of operations: (1) site modifications/construction, rocket motor transportation, and pre-launch preparations; (2) launch activities; and (3) post-launch operations. The discussions focus on those activities, facilities, and test areas that could result in potential environmental impact. This includes analysis of the three alternative launch sites identified in Chapter 2.0 and listed below:

- Alternative 1: LC-576E
- Alternative 2: TP-01
- Alternative 3: LF-06

As described in Section 2.3, Alternative 2 (TP-01) is no longer available for MDA's KEI Program due to recent mission conflicts with other USAF programs. As a result, not all surveys and agency consultations for TP-01 were completed. Although Alternative 2 is no longer a viable alternative for KEI, this section of the EA still describes the analysis of potential environmental impacts completed for Alternative 2.

4.1.1.1 Air Quality

Short-term minor adverse effects to air quality would be expected with the implementation of the Proposed Action. The total direct and indirect emissions, however, would not exceed *de minimis*

[7] *Direct* impacts are caused by the action and occur at the same time and place. *Indirect* impacts occur later in time or are farther removed in distance, but are still reasonably foreseeable.

(minimal importance) thresholds, be regionally significant, or contribute to a violation of Vandenberg AFB's air operating permits.

The general conformity rules require Federal agencies to determine whether their action(s) would increase emissions of criteria pollutants above preset threshold levels (40 CFR 93.153). These *de minimis* rates vary depending on the severity of the nonattainment and geographic location. Because Santa Barbara County is an attainment area for all NAAQS, the general conformity rules do not apply (40 CFR 93; SBCAPCD Rule 702). For the purposes of this EA, however, these threshold levels were used to determine whether implementation of the Proposed Action would be significant under NEPA. The *de minimis* levels of 100 tons per year (tpy) for all criteria pollutants were used for comparison purposes.

The total direct and indirect emissions associated with the Proposed Action were estimated and would not exceed *de minimis* levels (Table 4-1). Because AQCR 032 and Santa Barbara County are an attainment area, there are no existing emission budgets. Due to the limited size and scope of the Proposed Action, it is not anticipated that the estimated emission would make up 10 percent or more of regional emissions for any criteria pollutant and be regionally significant. Detailed methodologies for estimating the air emissions are described in Appendix D.

Table 4-1. Estimated Emissions of Criteria Pollutants for the Proposed Action (Tons per Year)

Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Site Modifications/Construction	0.397	0.445	0.093	0.001	0.025	0.024
Pre-Launch Preparations and Rocket Motor Transportation	0.749	0.949	0.101	0.002	0.042	0.040
Flight Activities[1]	2.236	0.015	0.001	0.002	0.311	0.217
Post-Launch Operations	0.068	0.011	0.056	0.000	0.001	0.000
Total	**3.450**	**1.420**	**0.250**	**0.004**	**0.380**	**0.283**
De Minimis Thresholds	100	100	100	100	100	100
Exceeds *De Minimis* Threshold	**No**	**No**	**No**	**No**	**No**	**No**

[1] PM_{10} and $PM_{2.5}$ emissions from launch vehicle exhaust are assumed to be 10.3 and 7.2 percent total aluminum oxide (Al_2O_3), respectively (USAF, 2004).

4.1.1.1.1 Site Modifications/Construction, Rocket Motor Transportation, and Pre-Launch Preparations

Site modifications and related construction requirements would be minor and limited to just a few facilities. Modifications to existing facilities would not include grading or open burning. Excavation would be required for trenching fiber optic and utility lines, placement of a power pole, installation of a barrier, and repaving. Release of fugitive dust from these activities would be minimal. For the site modifications/construction, pre-launch preparations, and local rocket motor transportation emissions shown in Table 4-1, all of the sources listed below were estimated for direct and indirect emissions of criteria pollutants. Detailed methodologies for estimating the air emissions are provided in Appendix D.

- Combustive emissions from equipment used for facility modifications/construction
- Painting/corrosion control efforts from refurbishing/constructing at facilities

- Emissions from delivery of equipment, supplies, and services
- Employee commuting during construction and pre-launch activities
- Emissions from transporting KEI motors, components, and equipment to Vandenberg AFB
- Emissions from transporting the KEI launch vehicle and equipment to the launch site
- Use of solvent/paints/adhesives during vehicle integration
- New boiler emissions from facilities used for vehicle integration and processing

Proper tuning and preventive maintenance of construction and other support vehicles would minimize engine exhaust emissions. In addition, preparations for the KEI flights would be conducted in compliance with all applicable SBCAPCD rules and regulations, including those that cover the use of organic solvents (Rule 317), architectural coatings (Rule 323), surface coating of metal parts and products (Rule 330), surface coating of aircraft or aerospace parts and products (Rule 337), or adhesives and sealants (Rule 353) (SBCAPCD, 2007c). No hazardous liquid propellants, such as hydrazine, would be used as part of the Proposed Action; thus, there would be no losses or leaks of potential air pollutants associated with these types of materials.

At Building 960, the existing HVAC system, which has not been in operation for several years, would be replaced with a new and more efficient heating and cooling system. This would include the installation of a new 1,200,000 BTU per hour propane boiler. The new boiler would need to comply with SBCAPCD Rule 360 (Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers), which regulates boilers greater than or equal to 75,000 BTU per hour, up to and including 2,000,000 BTU per hour. The new boiler would also need to be on the South Coast Air Quality Management District's approved boiler list or it must be certified by the SBCAPCD prior to installation. Because the new boiler would be rated less than 2,000,000 BTU per hour, an Authority to Construct permit would not be required, and neither SBCAPCD Rule 361 (Small Boilers, Steam Generators, and Process Heaters) nor Rule 342 (Control of Oxides of Nitrogen [NO_x] from Boilers, Steam Generators and Process Heaters) would apply (SBCAPCD, 2007c). Prior to purchasing and installing the new boiler, the MDA would coordinate with the base Environmental Office to ensure that the boiler complies with all applicable regulatory and permitting requirements. The boiler is the only component of the new HVAC system that is expected to generate air emissions.

At each launch site, an emergency power portable generator provided by the launch contractor would be permitted by the SBCAPCD or registered under the CARB Portable Equipment Registration Program.

During the facility modification/construction phase, ACM and possibly LBP would be encountered. The release of asbestos fiber emissions into the ambient air are regulated in accordance with Section 112 of the CAA, which established the National Emissions Standards for Hazardous Air Pollutants. These standards address demolition or renovation of buildings with ACM. LBP would be controlled using in-place management or removal procedures. Only trained and qualified personnel would abate ACM and LBP subject to disturbance. Actions requiring the control and removal of LBP or ACM would be conducted in accordance with 30 SW Plan 32-1002 (for LBP), with 30 SW Plans 32-1052-A and -B (for ACM), and with other applicable Federal, state, and local regulations.

4.1.1.1.2 Launch Activities

Under the Proposed Action, only four flight tests would occur, with no more than one launch occurring in a given year. In the hours before launch, remote sensors and helicopters (when available) may be used to verify that the hazard areas would be clear of non-mission-essential aircraft, vessels, and personnel. All direct and indirect emissions of criteria pollutants for the helicopter exhaust emissions and from the KEI flight test vehicles were estimated (Table 4-1). In addition to criteria pollutants, the products of

combustion from the KEI booster would also include other common products of combustion including aluminum oxide, hydrogen chloride, hydrogen, nitrogen, carbon dioxide, and water. Table 4-2 provides a comprehensive breakdown of the KEI booster emissions for one launch. Detailed methodologies for estimating air emissions during launch are provided in Appendix D.

Table 4-2. Exhaust Emissions for a Single KEI Flight Test Vehicle[1]

Pollutant	1st Stage (tons)	2nd Stage (tons)	Total (tons)
Aluminum Oxide (solid) (Al_2O_3)	2.94	0.08	3.02
Carbon Monoxide (CO)	1.81	0.42	2.23
Carbon Dioxide (CO_2)	0.20	0.02	0.22
Hydrogen Chloride (HCl)	1.74	0.28	2.02
Water (H_2O)	0.61	0.15	0.76
Hydrogen (H_2)	0.18	0.59	0.77
Nitrogen (N_2)	0.69	0.14	0.83
Other miscellaneous	0.02	0.12	0.14
Total	**8.20**	**1.80**	**10.00**

[1] KEI booster emissions were developed from fuel chemistry and molar fractional analysis of the solid rocket propellant and emissions obtained for the first two stages of a Peacekeeper ICBM booster (SMC Det 12/RPD, 2005, 2006).

During boost flight, the rocket emissions from all stages would be rapidly dispersed over a large geographic area and by prevailing winds. Because the launches would be short-term, discrete events, the time between launches allows the dispersion of the emission products. The emissions per launch at Vandenberg AFB would be the same for each launch vehicle, but the atmospheric concentrations would differ depending on local meteorological conditions at the time of launch, such as temperature profiles, atmospheric stability, wind speeds, and the presence or absence of inversions. It is not anticipated that air quality standards or health-based standards for non-criteria pollutants would be exceeded.

4.1.1.1.3 Post-Launch Operations

In the hours and days following the launch, a general safety check and cleanup of the launch site would occur. All direct and indirect emissions of criteria pollutants for workers commuting, the removal of equipment from the launch sites, and general refurbishment of launch facilities were estimated (Table 4-1). Detailed methodologies for estimating air emissions for post-launch activities are provided in Appendix D. Post-launch refurbishment activities would comply with all applicable SBCAPCD rules and regulations, including Rule 323 (architectural coatings) for VOCs found in paints (SBCAPCD, 2007c). No new air emission permits would be required for these operations. With the exception of minor, localized increases in particulate matter from the brushing of blast residues from the launch stool, no adverse effects on air quality are expected. Therefore, there should be no significant impacts to air quality.

4.1.1.2 Noise

4.1.1.2.1 Site Modifications/Construction, Rocket Motor Transportation, and Pre-Launch Preparations

Noise exposures from proposed modification and construction activities on base (refer to Table 2-2) are expected to be minimal and short term. Most of the construction-related noise would occur at Building 960 and at the KEI launch sites. The use of heavy construction equipment, power tools, and other machinery (e.g., tractors/backhoes, dump trucks, jack hammers, and power saws) would generate noise levels ranging from 50 to 95 dB (unweighted) at 164 ft (USAF, 2005).

The noise generated during pre-launch preparations would come primarily from the use of trucks, cranes, and other load handling equipment. The noise would essentially be confined to the immediate area surrounding the activities.

For all of these actions, noise exposure levels would need to comply with USAF Hearing Conservation Program requirements (as described in Section 3.1.2) and other applicable occupational health and safety regulations. Because most of the activities would take place on base, the public in the surrounding communities would not detect an increase in noise levels.

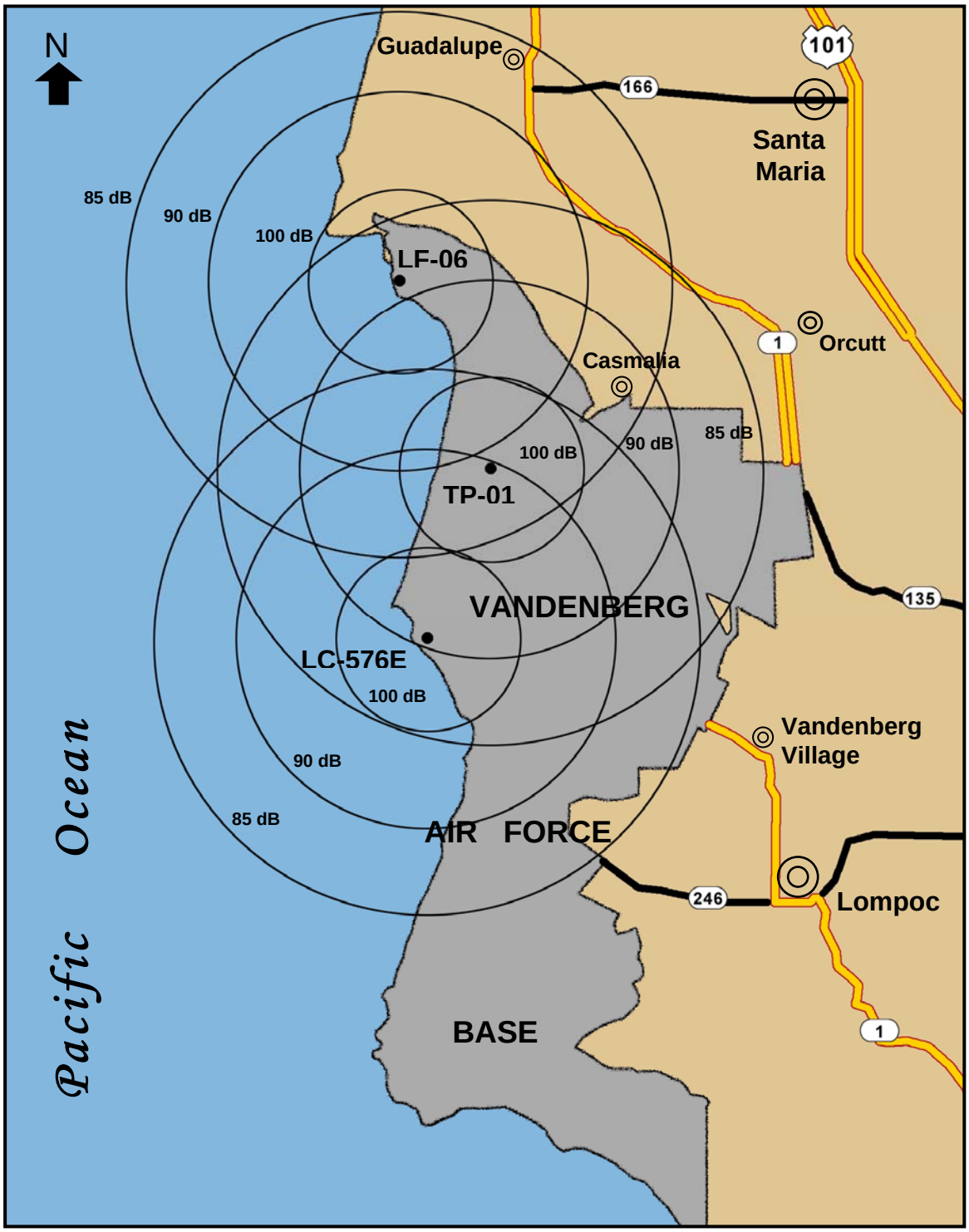
4.1.1.2.2 Launch Activities

Noise levels generated by each KEI flight test would vary, depending on launch location, launch vehicle configuration, launch trajectory, and weather conditions. Figure 4-1 depicts the predicted maximum noise-level contours for each proposed KEI launch site (LF-06, TP-01, and LC-576E). The modeling results depicted in the figure represents a maximum predicted scenario that does not account for variations in weather or terrain.

As shown in Figure 4-1, the ASEL generated can range from 100 dB and higher in the vicinity of each launch site, to around 85 dB nearly 7.5 mi away. Launch noise levels would extend furthest off base from the LF-06 launch site, and extend the least amount off base from the LC-576E pad. The City of Guadalupe, for example, may experience a maximum ASEL of around 87 dB for launches from LF-06. Launch noise levels from this site would be very similar to those produced from prior Minuteman ICBM flight tests and MDA target launches at LF-06 and other nearby LFs (USAF, 2006). For the small community of Casmalia, KEI launches from TP-01 would result in even higher noise levels—up to approximately 93 dB ASEL. Such noise levels, however, would be less than those from prior Peacekeeper ICBM flight tests conducted at LF-02, located a few miles west of Casmalia, and less than the proposed USAF Orbital/Sub-Orbital Program launches analyzed for TP-01 (USAF, 2006). Similarly for LC-576E, expected KEI launch noise levels would be several dB lower than that of current Taurus vehicle launches from the same site.[8]

While these noise exposure levels can be characterized as very loud in some areas, they would occur infrequently, are very short in duration (about 20 seconds of intense sound per launch), and have little effect on the CNEL in these areas. Personnel working near the area at the time of launch would be required to wear adequate hearing protection in accordance with USAF Hearing Conservation Program requirements. In addition, public access areas near the launch sites would be restricted at the time of launch to ensure public safety and minimize unnecessary exposures. If helicopters are used to verify that

[8] Based on expected KEI launch noise levels (Plotkin, 2007), when compared with data for Peacekeeper ICBM and Athena launch vehicles (USAF, 2006). Taurus launch vehicles use the same 1st-stage motors (i.e., SR-118 and Castor 120 motors) as used on Peacekeeper and Athena launch vehicles, respectively.

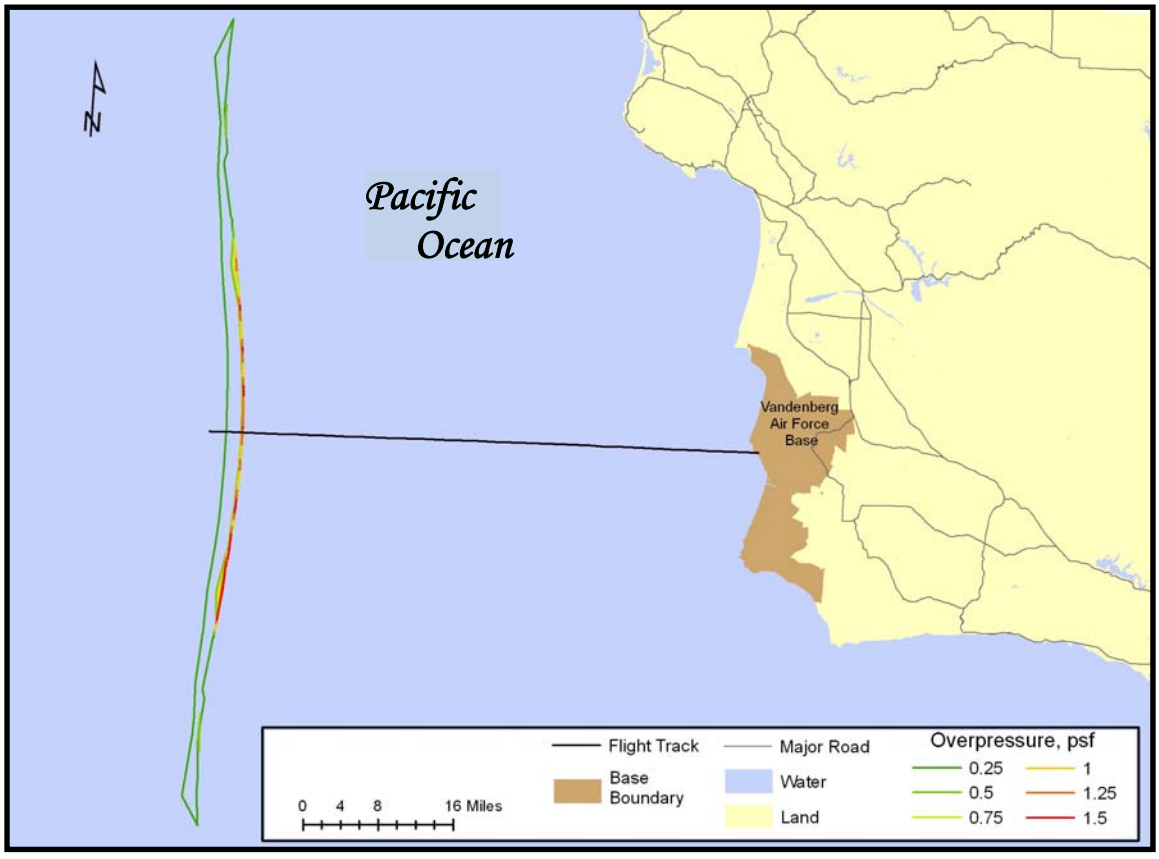


Source: Noise contour data computed by Plotkin, 2007 and based on average noise levels for bearings from 0 to 180 degrees.

Figure 4-1. Predicted A-Weighted Sound Exposure Levels for KEI Booster Launches from Vandenberg AFB, CA

beach areas and near offshore waters are clear of non-participants, they would generally limit their flights to the areas around the base, thus limiting the noise effects on local communities.

The sonic boom generated by KEI launch vehicles would typically be at its maximum level at approximately 45 nmi off the CA Coast (refer to Figure 4-2). Resulting overpressures at the ocean surface are not expected to exceed 1.5 pounds per square foot (psf) (Plotkin, 2007). Such overpressures are likely to be lower than those produced by larger vehicles (e.g., Peacekeeper and Taurus), and considerably less than the 7.2 psf expected from the much larger Atlas V system (USAF, 2000, 2006). Because KEI flight trajectories would be in a westerly direction, the resulting sonic boom would not be audible on any coastal areas, including the Channel Islands. Typically, the sonic boom would last only a few milliseconds.



Source: Modified from Plotkin, 2007

Figure 4-2. Predicted Sonic Boom Footprint for a KEI Launch from Vandenberg AFB, CA

Based on this analysis, the action of conducting four KEI launches from Vandenberg AFB over a 4 to 5-year period would have no significant impact on ambient noise levels. The potential for launch noise and sonic boom impacts on protected wildlife species is discussed in Sections 4.1.1.3 and 4.1.2.2.

4.1.1.2.3 Post-Launch Operations

Noise levels generated during post-launch operations would be similar to those generated during pre-launch preparations, but for a shorter duration. Thus, no impacts to ambient noise levels are expected.

4.1.1.3 Biological Resources

4.1.1.3.1 Site Modifications/Construction, Rocket Motor Transportation, and Pre-Launch Preparations

At Vandenberg AFB, noise from the movement of trucks and other load-handling equipment would have minimal affects on wildlife. These activities would be relatively short-term and intermittent, and the vehicles and other equipment would normally remain on paved or gravel areas. During some of the construction phases at Building 960 and at the launch pads, however, equipment and heavy machinery would generate relatively continuous noise, ranging from 50 to 95 dB (unweighted) at 164 ft (USAF, 2005). Although the activities and noise levels might cause some species of birds and mammals to leave the immediate area, the activities are not expected to have a noticeable affect on local wildlife populations.

For the use of either LC-576E or LF-06, pre-established firebreak areas around each launch site would be mowed or disked, as necessary, with minimal affects on local wildlife. Through consultations, the USFWS agreed with MDA's conclusions that the firebreak maintenance at LF-06 "may affect and is likely to adversely affect" Federally endangered Gaviota tarplant due to mowing (see Appendix C). The effects of firebreak mowing and disking, however, are permitted by an existing biological opinion issued earlier by the USFWS for LF-06 and other launch sites at Vandenberg AFB (USFWS, 2006).

At TP-01, the vegetation is overgrown after years of disuse, necessitating heavy brush removal and mowing around the launch pad, including inside and outside security fence areas within 100 ft of the existing pad. In the long term, periodic mowing or other vegetation management would be necessary to maintain the firebreak for launches. The installation of the fiber optic lines to TP-01 would also require vegetation disturbance for trenching, but mostly in pre-disturbed areas within 5 ft of the road shoulder. A recent field survey of the TP-01 pad perimeter identified the presence of coast buckwheat—the federally endangered ESBB's host plant—in several areas bordering the existing pad, and a small, potential wetland area approximately 80 ft southeast of the pad (Tetra Tech, 2007). Coast buckwheat, Gaviota tarplant, and other protected species might also occur along the 2.5 mi route for the fiber optic lines. Prior to implementing vegetation removal or other disturbance, biologists would survey the impact areas. Surveys would include observations for the ESBB (early-June through mid-September) or similar blue butterflies, and for nesting migratory bird species. Depending on the survey results, a Biological Assessment might need to be prepared, unless the actions are discussed and the resulting take is authorized within the limits allowed by the Programmatic Biological Assessment currently in preparation by Vandenberg AFB and the USFWS. No areas of coast buckwheat would be affected by pre-launch preparations at LC-576E. Vandenberg AFB would work with the USFWS to minimize impacts, as necessary. Mitigation measures could include avoiding vegetation removal or other disturbance in the potential wetland area near TP-01, and trenching the new fiber optic lines within the existing roadway pavement to avoid impacts on Gaviota tarplant or other species.

At Building 960, most of the facility modifications and related construction would occur within existing paved, gravel, or mowed areas. Construction of the anti-terrorism barrier, however, would require brush removal and mowing to form pathways along the new cable fence alignments for equipment access and construction. The total area of vegetation disturbance would be about 0.12 acres. In May 2008, a survey of the proposed fence alignments identified various plant species, with iceplant and veldt grass being the

dominant vegetation (Tetra Tech, 2008). There was no coast buckwheat (the ESBB's host plant) in the survey area and no other threatened or endangered species of vegetation or wildlife were observed. Prior to construction of the anti-terrorism barrier, the area of disturbance would be surveyed for nesting birds. If nests of bird species protected under the Migratory Bird Treaty Act were found within vegetation that would be removed during construction, efforts would be made to avoid clearing of vegetation until the eggs are hatched and the young are fledged. Depending on the construction schedule, however, a take permit for the nests could become necessary.

On Vandenberg AFB, buildings and structures are sometimes used as nesting and roosting sites for various bird species, including several species protected under the Migratory Bird Treaty Act (e.g., barn swallows, white-throated swifts, and great-horned owls). A few bat species have also been found to roost in some of the buildings (USAF, 2005). To avoid impacts to these species, Building 960 would be surveyed several months prior to project implementation before start of the nesting season. Methods to discourage roosting and the initiation of nests, such as the installation of netting or the removal of nesting materials, would be implemented prior to building repairs and modifications. Existing migratory bird nests, however, would not be removed or destroyed unless determined by a qualified biologist to be inactive.

Overall, it is expected that these activities would not have a significant effect on local vegetation and wildlife, because: (1) noise exposures from these activities generally would be short term and localized around existing facilities and along roadways; (2) limited areas would be disturbed, which would occur primarily around existing facilities; and (3) affected areas would be surveyed for protected and other sensitive species prior to project implementation. For these same reasons, the proposed activities are not expected to have a significant impact on threatened or endangered species or other sensitive habitats.

4.1.1.3.2 Launch Activities

Potential issues associated with KEI launch operations at Vandenberg AFB include wildlife responses to helicopter overflights (if conducted), wildlife responses and potential injury from excessive launch noise, and the release of potentially harmful chemicals in the form of exhaust emissions. The release of unburned propellant from a possible launch failure or termination is also considered. The potential effects of these actions on the biological resources at Vandenberg AFB are described in the paragraphs that follow.

Vegetation

Ground-level heat and emissions generated by the rocket plume during initial launch have the potential to scorch nearby vegetation and cause foliar spotting. At LC-576E, however, the paved launch pad area is large enough that no vegetation adjacent to the pad would be burned. Additionally, the plume effects from the stool-launched KEI booster would be less than that of the larger Taurus vehicle launched from this same site. Similarly, LF-06 has a large firebreak around the pad area, and a new 100 ft wide firebreak would be re-established at TP-01. These firebreaks would sufficiently buffer surrounding vegetation from the impact of nominal launches (both stool and canister launches). Such launch effects on vegetation caused by larger rocket systems have been shown to be temporary and not of sufficient intensity to cause long-term damage to vegetation (NASA, 2002; USAF, 2000). During KEI launch operations, emergency firefighting personnel and equipment would be on standby status as a protective measure in case of brush fires.

Wildlife

Helicopter Overflights. When available, base helicopters might be flown over the ROI on the day of

launch and possibly the day before to ensure launch hazard areas are clear of unauthorized personnel. Helicopter overflights have the potential to disturb marine mammals and birds, causing potential loss of eggs when birds fly from nests; separation of pinniped mothers from their offspring; and abandonment of favored resting, feeding, or breeding areas.

Under the terms of the MMPA, as amended, short-term behavioral effects on marine mammals must be considered. According to the MMPA for military readiness activities (as defined in section 319 of Public Law 108-136), "harassment" means any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild (Level A Harassment); or disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns to the extent that they are abandoned or significantly altered (Level B Harrassment). Proposed KEI and other system launches at Vandenberg AFB have the potential to harass marine mammals. To address this issue, base personnel consulted the NMFS to obtain a programmatic "take" permit to allow Level B Harassment on four pinniped species, including the California sea lion and Pacific harbor seal. A 5-year take permit was originally issued to Vandenberg AFB in 1997, and was later re-issued in February 2004 and again in February 2009. Under the permit, the NMFS is allowed to issue annual Letters of Authorization (LOAs) to Vandenberg AFB for these harassments, which are classified as a small number of "takes" incidental to space vehicle and test flight activities. This allows the base to expose pinnipeds, including breeding harbor seals, to missile and rocket launches, and aircraft flight tests. The programmatic take permit and LOAs also authorize incidental harassment of pinnipeds from helicopter overflights. (74 FR 6236-6244; USAF, 1997)

Prior observations of helicopter overflights in launch hazard areas have shown them to be a greater source of disturbance than the rocket launches (Bowles, 2000). Under the current NMFS permit and LOA, helicopters and other aircraft are required to maintain a minimum slant range of 1,000 ft from recognized seal haul-outs and rookeries (refer to Figure 3-2), including Point Sal and Lion's Head year round, and Purisima Point from October through February only (74 FR 6236-6244; VAFB, 2007b). These requirements can be modified only in emergencies, such as during search-and-rescue and firefighting operations. When helicopter flight restrictions are observed, there are negligible impacts on marine mammals and other wildlife.

Launch Noise. As described in Section 4.1.1.2.2, the expected launch noise generated by the proposed KEI flight tests would not be any louder than other vehicles launched or proposed for launch from LF-06, TP-01, or LC-576E. When compared to Taurus launches at LC-576E, the KEI booster would generate slightly lower launch noise levels. Prior monitoring of four Taurus launches at the Spur Road pinniped haul-out site—located 0.31 mi from the LC-576E launch pad—resulted in ASEL measurements ranging from 123.5 to 128.9 dB, with an average of 126.6 dB (69 FR 5720-5728). At the same distance of 0.31 mi, the proposed KEI launches are expected to generate ASEL levels between 120 to 125 dB (Plotkin, 2007).

The noise generated by launches from Vandenberg AFB may result in the incidental harassment of pinnipeds. The noise and visual disturbances from space lift vehicle and missile launches may cause the animals to move towards or enter the water. Field surveys have shown that the louder the launch noise, the longer it took for seals to begin returning to the haul-out site and for the numbers to return to pre-launch levels. Seals may begin to return to the haul-out site within 2 to 55 minutes of the launch disturbance, and the haul-out site has usually returned to pre-launch levels within 45 to 120 minutes. No evidence of injury, mortality, or abnormal behavior has been observed for Pacific harbor seals following a launch. Additionally, research has shown that population levels at the pinniped haul-out sites have remained constant in recent years. (69 FR 5720-5728; SRS, 2000, 2001a)

To minimize potential long-term effects of launch noise on pinnipeds, the programmatic take permit requires several measures, including: (1) schedule missions, whenever possible, to avoid launches during the harbor seal pupping season (March 1 through June 30), unless constrained by factors including, but not limited to, human safety, national security, or for a space vehicle launch trajectory necessary to meet mission objectives; (2) conduct biological monitoring for all launches during the harbor seal pupping season in accordance with permit procedures, and report the results to the NMFS; and (3) conduct both acoustic and biological monitoring for all new space and missile launch vehicles during at least the first launch (including an existing vehicle from a new launch site), whether it occurs within the pupping season or not (74 FR 6236-6244). The proposed KEI launches would be conducted in accordance with the measures specified in the programmatic take permit.

The marine mammal programmatic take permit covers a forecast of up to 30 space and missile launches per year at Vandenberg AFB (74 FR 6236-6244). The addition of one KEI launch per year would not cause the forecast limit to be exceeded (refer to Section 4.3.1 for further discussions on this issue).

As for other non-listed species at Vandenberg AFB, any terrestrial mammals or birds in proximity to a launch might suffer startle responses and flee the area for some period of time. These effects would be temporary, however, and are not expected to have a significant effect on local populations.

Because of the programmatic take permit measures already in place, and considering that the KEI launches would represent brief events, would occur infrequently (no more than four times over a 4 to 5-year period), and are unlikely to occur from the same launch site each time, no significant impacts to pinnipeds or to other non-listed wildlife species on base are expected to occur as a result of launch noise.

Launch Emissions and Plume Effects. The atmospheric deposition of launch emissions has the potential to acidify surface waters. The types and quantities of emissions products released from the KEI booster are listed in Table 4-2. The principal combustion product of concern is HCl gas, which forms hydrochloric acid when combined with water.

The acidification of surface waters in some of the small drainages and wetland areas close to some of the launch sites could present harmful conditions for aquatic wildlife and some protected species. The bedrock and, by inference, the soils at Vandenberg AFB do not contain large amounts of acid-neutralizing minerals. However, the proximity of the proposed launch sites to the ocean, combined with the prevailing onshore winds, causes the deposition of acid-neutralizing sea salt. The alkalinity derived from sea salt should neutralize the acid falling on soil, thus eliminating the potential for acid runoff. Surface water monitoring conducted for larger launch systems on Vandenberg's South Base has not shown long-term acidification of surface waters (USAF, 2000). Because the KEI launch vehicle is smaller and produces fewer exhaust emissions, the potential for adverse effects is minimal.

Launch Failure or Early Flight Termination. In the unlikely event of a failure during launch, or an early termination of flight, the KEI launch vehicle would most likely fall into the ocean reasonably intact, along with some scattered debris. Pieces of unburned solid propellant, which is composed of ammonium perchlorate, aluminum, and other materials, could be widely dispersed. Of particular concern is the ammonium perchlorate in the solid propellant resin binding-agent. Once the propellant enters the water, the ammonium perchlorate could slowly leach out and create toxic conditions for plants and animals. In freshwater at 68° F, it is likely to take over a year for the perchlorate contained in solid propellant to leach out into the water. Lower water temperatures and more saline waters would likely slow the leaching of perchlorate from the solid propellant into the water. Over this time, the perchlorate would be diluted in the water by wave action and currents and, thus, would not reach significant concentrations. (MDA, 2007a)

A lesser hazard may also exist from small amounts of battery electrolyte carried on each KEI launch vehicle. The risks from electrolytes are far smaller than for propellants because of smaller quantities, lower toxicity, and the use of more rugged containment systems for batteries (NASA, 2002).

The probability for an aborted KEI launch to occur is very low. Historically, launch records indicate a 4 percent failure rate for similar Minuteman and Peacekeeper ICBM launch vehicles (SMC Det 12/RPD, 2006). If an early abort were to occur, then base actions would be taken immediately for the recovery and cleanup of unburned propellants, and any other hazardous materials that had fallen on the beach, off the beach within 6 ft of water, or in any of the nearby freshwater creeks and wetland areas. Recovery from deeper coastal waters would occur on a case-by-case basis. Any solid propellants remaining in the offshore waters would be subject to constant wave action and currents. The water circulation would, in particular, help to prevent localized build-up of perchlorate concentrations, which has proven to be a slow process. As a result, no significant impacts on biological resources would be expected.

Threatened and Endangered Species

Those threatened and endangered species that could be potentially affected by KEI launches at Vandenberg AFB are listed in Table 3-5 by launch site. Although other listed species occur on Vandenberg AFB, their remoteness from the launch sites makes it unlikely that they would be adversely affected. In accordance with Section 7 of the Endangered Species Act, the MDA (with Vandenberg AFB support) prepared a Biological Assessment on Federally listed species and the likely effects of the Proposed Action on the species and their habitats (MDA, 2008). Submitted to the USFWS in December 2008, the Biological Assessment addressed KEI-related site preparations and launch activities at LC-576E and LF-06. In a response letter to Vandenberg AFB, dated January 21, 2009, the USFWS determined that initiating new formal consultations was not necessary (refer to Appendix C). Based on the Biological Assessment, prior USFWS Biological Opinions, and other information, the USFWS agreed with MDA's findings on the proposed activities at LC-576E and LF-06. Because Alternative 2 is no longer a viable alternative for KEI, TP-01 was not included in the Biological Assessment or in the consultations with USFWS.

The only listed plant species that could be potentially affected is the Federally endangered Gaviota tarplant, which is widely found just south of LF-06 and is expected to occur in the vicinity of TP-01. There is a small risk for some tarplants to be affected by the solid rocket motor emissions, particularly HCl deposition, which can form hydrochloric acid when dissolved into fog droplets or rainwater and be deposited directly onto plants. Through consultations, the USFWS agreed with MDA's conclusions that the launches "may affect and are likely to adversely affect" Gaviota tarplant due to acid deposition (see Appendix C). Such effects, however, have been shown to be temporary and not of sufficient intensity to cause long-term damage to vegetation (NASA, 2002; USAF, 2000).

During the flight season of the ESBB (early-June through mid-September), any ESBB individuals in proximity to a KEI launch at TP-01 or LC-576E could be harmed or killed by the blast effects of the rocket motor. It is expected, however, that very few if any ESBB would be traveling across the large, open firebreak and launch pad areas during the brief launch events. The butterflies are more likely to stay within vegetated areas containing their host plant (coast buckwheat). Therefore, risks to ESBB populations from KEI launches would be minimal. Through consultations, the USFWS agreed with MDA's conclusions that the KEI Program and launches "may affect, but are not likely to adversely affect" ESBB (see Appendix C). Per the USFWS's response letter, MDA will survey the launch pad blast zone for ESBB individuals prior to each launch that is scheduled during the butterfly flight season. If ESBB are observed in the project area, the MDA and Vandenberg AFB will reinitiate consultations with the USFWS to reanalyze the launch effects.

It is possible that vernal pool fairy shrimp might occur in some of the wetland areas near TP-01. During launch, acidic exhaust products from the rocket motor could potentially cause a slight increase in water pH, affecting fairy shrimp survival. As described earlier, however, the constant deposition of wind-blown sea salt should eliminate the potential for water acidification. Because of this and the brief life span of the fairy shrimp, risks to the population are minimal.

The Federally threatened California red-legged frog is commonly found in freshwater ponds and streams around the base, occurring within several hundred feet of the TP-01 launch site. At such distances, the frogs could be exposed to high launch noise levels (up to 140 dB ASEL in some cases [Plotkin, 2007]) and acidic exhaust products from the rocket motor. It is expected, however, that during a launch, the red-legged frogs would dive underwater, where they would be less susceptible to acoustic effects because the sound levels would be attenuated to some degree. Also, the constant deposition of wind-blown sea salt should eliminate the potential for water acidification. Giving support to these conclusions, previous monitoring studies conducted at the wastewater ponds for an Athena 2 launch from South Vandenberg showed no reduction in the number of red-legged frogs, no change in water pH levels, and no change in the acid neutralizing capacity of the water (USFWS, 1999b). Although the KEI launches would potentially disturb red-legged frogs, the Biological Opinions issued earlier by the USFWS already authorize the incidental harassment of an unspecified number of the frogs as a result of rocket launches (USFWS, 1998, 1999b).

The sights and sounds of KEI launches and helicopter overflights (if conducted) could affect some of the threatened and endangered bird species found at Vandenberg AFB. Endangered California brown pelicans roost at several shoreline locations around Point Sal, just over 2 mi from LF-06, and at Purisima Point, within 1.5 mi of LC-576E. At the latter distance, launch of a KEI vehicle would expose the brown pelicans to ASEL levels around 108 dB (Plotkin, 2007). Such sound levels and sight of the launch vehicle may cause brown pelicans roosting in the vicinity to take flight. However, monitoring studies conducted for a 2001 Atlas IIAS launch showed no evidence of injury, mortality, or abnormal behavior in brown pelicans (SRS, 2001b). Also, for an earlier Delta II mission, no differences in brown pelican roosting patterns were observed in the days prior to launch when compared to after the launch (SRS, 2001a). It is expected that security helicopter overflights (if conducted) would have little or no effect as well. The USFWS identified in their 1999 Biological Opinion for the Taurus Program at LC-576E that implementing the launch program was not expected to result in the injury or death of any brown pelicans (USFWS, 1999a). In addition, through recent consultations, the USFWS agreed with MDA's conclusions that the launch-related activities "may affect, but are not likely to adversely affect" California brown pelicans (see Appendix C).

On the coastal dunes along Minuteman Beach, western snowy plovers forage year round and nest from early March through September within 1.5 mi of the TP-01 launch site. At this distance, the plovers would be subject to brief launch noise with ASEL levels up to 108 dB as the launch vehicle passes over on a westerly trajectory (Plotkin, 2007). Although less abundant, snowy plovers also occur along the coastal dunes at Purisma Point, approximately 0.5 mi west of LC-576E. Because of the closer distance, plovers in this area would experience higher noise levels (up to 118 dB ASEL) for KEI launches from this site (Plotkin, 2007). Such noise levels, however, would be less than that for Taurus launches. Launch noise and the flash of the rocket plume could startle plovers (especially at night), causing them to flee the area and their nests. However, observations of flocks of snowy plovers during an Atlas IIAS launch from South Vandenberg in 2001 showed no interruption of activities, or any evidence of abnormal behavior or injury (SRS, 2001b). In addition, the sights and sounds of KEI launches would be substantially less than that of much larger launch vehicles (e.g., Delta II launches from Space Launch Complex [SLC] 2W near Purisima Point). Through recent consultations, the USFWS agreed with MDA's conclusions that the KEI launches "may affect and are likely to adversely affect" western snowy plovers if the launches are conducted during the nesting season (see Appendix C). The KEI Program launches, however, would

comply with the existing biological opinion issued earlier by the USFWS that allows the incidental take of up to 10 western snowy plovers nests, 30 chicks or eggs, and 7 flushes of nesting adult birds (without signs of nest abandonment, death, or injury) per CY from the indirect effects of launches (USFWS, 1999a).

In some years, a few nesting pairs of California least terns can be found along the southern end of Minuteman Beach, from San Antonio Creek south. During their nesting season (generally from April 15 to August 31), these shorebirds could also be affected by KEI launches from TP-01. As with nesting snowy plovers, least terns in this area could be startled by the brief launch noise (up to 108 dB ASEL in some areas) and the flash of the rocket plume as the vehicle passes over. For the least tern colony at Purisima Point, the effects of KEI launches from LC-576E would be the same as previously described for western snowy plovers. The least tern colony could be exposed to launch noise levels of up to 118 dB ASEL. Such noise levels, however, would be less than that for Taurus launches. During KEI launches from either TP-01 or LC-576E, least terns are not expected to abandon nests, as has previously occurred during earlier Delta II launches from the SLC-2W pad (USFWS, 1998). The reasons for this are: (1) the KEI launch vehicle is much smaller and would generate lower noise levels for a shorter duration when compared to a Delta II; (2) only four KEI launches are proposed over a 4 to 5-year period and all four launches are not expected to occur from the same launch pad; and (3) any KEI launches conducted from the TP-01 launch site would be located further away from least tern habitat. Through recent consultations, the USFWS agreed with MDA's conclusions that the KEI launches "may affect and are likely to adversely affect" California least terns if the launches are conducted during the nesting season (see Appendix C). The KEI Program launches, however, would comply with the existing biological opinion issued earlier by the USFWS that allows the incidental take of up to 10 least tern nests, 20 chicks or eggs, and 5 flushes of nesting adult birds (without signs of nest abandonment, death, or injury) per CY from the indirect effects of launches (USFWS, 1999a).

To minimize the potential for impacts on both California least terns and western snowy plovers, the MDA would adopt the terms of the USFWS's earlier Biological Opinions for KEI program use of the TP-01 and LC-576E launch sites, which specify the following actions:

- Avoid night and low-light launches to the extent possible (USFWS, 1998).
- Conduct no more than three launches (total) per CY from LC-576E, including both KEI and Taurus launches (USFWS, 1999a).
- Of the three launches allowed at LC-576E per year, conduct no more than two launches annually between April 15 and July 31, which corresponds to the least tern nesting season and the core of the snowy plover nesting season (USFWS, 1999a).

Because helicopters and other aircraft can also disturb California least terns and western snowy plovers, Vandenberg AFB implemented requirements for all aircraft to maintain a slant range of not less than 1,900 ft from nesting areas (from March 1 through September 30), and a year-round minimum 500 ft slant range from all identified snowy plover habitat areas on base (VAFB, 2007b). Just as described earlier for pinniped haul-outs and rookeries, these requirements can be modified only for emergency purposes. By observing these aircraft restrictions, it is expected that no adverse effects would occur to these listed bird species.

As previously described, southern sea otter colonies are found in the offshore waters at Purisima Point, about 1.5 mi away from LC-576E. Semi-migratory individuals are also seen near Point Sal, just over 2 mi from LF-06. At these distances, the animals could be exposed to surface launch noise levels of up to 108 dB ASEL. Such events might cause the animals to suffer startle responses and retreat underwater

temporarily. At such sound pressure levels, however, it is unlikely that the animals would experience adverse effects, particularly when submerged. Monitoring of sea otters for an earlier Delta II launch showed no evidence of injury, mortality, mother-pup separation, or other abnormal behavior, even when exposed to launch noise ASEL levels of approximately 115 dB (SRS, 2001a). Any helicopter overflights close to the otters could also startle the animals, but again, the effects would be temporary. Because rocket launches and helicopter overflights (if conducted) can potentially disturb southern sea otters, the USFWS has, in their earlier Biological Opinions, authorized the incidental harassment of an unspecified number of the animals (USFWS, 1998). In addition, through recent consultations, the USFWS agreed with MDA's conclusions that the launch-related activities "may affect, but are not likely to adversely affect" sea otters (see Appendix C).

To minimize potential long-term impacts on Federally threatened and endangered species at Vandenberg AFB, monitoring requirements would be conducted for KEI launches in accordance with USFWS's recent response letter provided in Appendix C, and the existing USFWS Biological Opinions and monitoring plan that are listed below, by launch site:

- **LF-06 and TP-01 Launch Sites**
  - *Biological Opinion for the Theater Missile Targets Program, Vandenberg Air Force Base, Santa Barbara County, California* (USFWS, 1998)
  - *Final Threatened/Endangered Species Monitoring Plan for the Theater Ballistic Missile Targets Program* (VAFB, 1999)
  - *Biological Opinion for the Clearance of Firebreaks and Access Roads, Vandenberg Air Force Base, Santa Barbara County, California* (USFWS, 2006)

- **LC-576E Launch Site**
  - *Biological and Conference Opinion for the Delta II Launch Program at Space Launch Complex 2, and Taurus Launch Program at 576-E, Vandenberg Air Force Base, Santa Barbara County, California* (USFWS, 1999a)

In summary, the proposed KEI launches and operations may cause short-term effects on some Federal and state threatened or endangered species; however, these actions are not likely to adversely affect the long-term well-being, reproduction rates, or survival of any of these species. The measures and monitoring requirements already in place at Vandenberg AFB would be incorporated into KEI launch operations to minimize potential impacts on listed species.

Environmentally Sensitive Habitats

KEI launches conducted from the TP-01 would fly west over the coastal dune system, but are not expected to have any adverse effects on the dunes. Should a launch anomaly result in any debris impacting in the dunes, appropriate methods of recovery would be used to minimize surface disturbance (e.g., limited use of vehicles and heavy equipment within the dunes).

Known habitat areas for the Gaviota tarplant and other protected plant species would not be adversely affected by normal launch operations from any of the proposed launch sites. However, in the rare case of a launch anomaly, should any debris impact near or within habitat areas, the base biologists would assist in recovery operations by surveying the impact area to avoid or minimize damage to protected plant species. Emergency firefighting personnel and equipment would also be on standby status as a protective measure in case of brush fires.

Western snowy plover habitat is located along Minuteman Beach, about 1.5 mi west of the TP-01 launch site. At this distance, portions of the habitat area would be subject to brief noise levels up to 108 dB ASEL, but otherwise would not be adversely affected by launch vehicle overflights. In the unlikely event that launch debris would fall within sensitive habitat areas, particularly during the nesting season, the base biologists would assist in recovery operations by surveying the impact area in order to avoid or minimize damage to nesting sites. Just as described for potential debris impacts within the coastal dunes, appropriate methods of recovery would be used that minimize surface disturbance.

Though a few California least terns may also occur along the southern end of Minuteman Beach, they are most prominent at the least tern colony immediately south of Purisima Point. Located about 0.5 mi from LC-576E, this nesting area would experience launch noise levels up to 118 dB ASEL, but would not be subject to any other disturbance. Also, as described earlier, any helicopters used to survey launch hazard areas must maintain minimum slant ranges during flights near least tern and snowy plover habitat areas (VAFB, 2007b). As a result, proposed KEI launch operations are unlikely to cause long-term adverse effects on either the least tern or snowy plover habitat areas.

Launches from LC-576E would travel directly over the northern end of the Vandenberg SMR, resulting in noise levels ranging up to 118 dB ASEL over the near shore reserve waters. Such brief noise levels, however, are not expected to cause behavioral changes in the wildlife found in these waters. Also, during a nominal flight, no launch debris would be expected to impact within the area.

As described in Sections 4.1.1.3.2 and 4.1.1.6.2, rocket launch emissions would not impact the water quality of local surface waters. If a launch anomaly were to occur, actions at Vandenberg AFB would be taken immediately for the recovery and cleanup of unburned propellants, and any other hazardous materials that had fallen on the ground or in any of the wetlands and shoreline areas. Recovery operations in deeper coastal waters, however, would be treated on a case-by-case basis. As a result, no significant impacts to wetlands, the Vandenberg SMR, or to local essential fish habitat areas would occur.

4.1.1.3.3 Post-Launch Operations

The intermittent movement of trucks, cranes, and any clean-up/maintenance equipment would not produce substantial levels of noise, and vehicles would normally remain on paved or gravel areas. Thus, the limited actions associated with post-launch operations would have no adverse effects on local vegetation or wildlife, including threatened and endangered species, and other environmentally sensitive habitats.

4.1.1.4 Cultural Resources

In support of the proposed KEI Program, Vandenberg AFB initiated consultations with the California SHPO in accordance with Section 106 of the National Historic Preservation Act and 36 CFR Part 800. In a letter to the SHPO dated March 25, 2008 (refer to Appendix A), Vandenberg AFB requested concurrence with their finding of No Adverse Effect for cultural resources on base. Vandenberg AFB later sent another message electronically to the SHPO's office requesting their concurrence (Carucci, 2008). As of January 2009, no written response has been received from the SHPO. Thus, pursuant to 36 CFR 800.5(c)(1), the MDA and Vandenberg AFB have assumed that the SHPO does not object to the No Adverse Effect determination. A discussion of the potential effects on archaeological and historical resources, and the mitigation measures to be implemented as part of the KEI Program, are provided in the following subsections.

4.1.1.4.1 Site Modifications/Construction, Rocket Motor Transportation, and Pre-Launch Preparations

Archaeological Sites

The KEI-related site modifications proposed at Vandenberg AFB would require excavation and ground disturbance for trenching utility lines, placement of a power pole, installation of a barrier, and repaving. Most of the excavation work would be conducted in pre-disturbed areas. To minimize potential impacts on any nearby archaeological sites, the fiber optic extension to TP-01 would be trenched within 5 ft of the road shoulder and/or installed within the existing roadway pavement. The proposed anti-terrorism vehicle barrier at Building 960 is sufficiently distant (approximately 200 ft) from the nearest archaeological site, that no construction-related impacts are expected. For those buildings and facilities selected for KEI operations that are in the vicinity of known archaeological sites, site modifications and related construction activities would be tailored to ensure that the archaeological resource areas are avoided.

If KEI-related excavation work was to occur within 200 ft of a known archaeological site, boundary testing would be required to ensure that portions of the site are not inadvertently disturbed. Any archaeological site or potential site where tested boundaries are within 100 ft of the project would require monitoring by an archaeologist and/or Native American specialist during earth disturbing activities. In the unlikely event that previously undocumented sites are discovered during the execution of the proposed action, work would be temporarily suspended within 100 ft of the discovered item and the base archaeologist would be notified immediately. Work would not resume until after the site had been secured and properly evaluated.

The MDA would be responsible for implementation of any required avoidance of archaeological sites or other mitigation measures assigned to the project as a condition of approval for the activity by Vandenberg AFB and the California SHPO. These measures may include, but are not limited to, having an archaeologist and/or Native American specialist present during site preparation activities, flagging or fencing to protect cultural resources, archaeological testing, data recovery, and report preparation. The base Environmental Office would brief contractors and base support personnel on the sensitivity of cultural resources, applicable Federal regulations, and the mitigation measures that might be required if sites are inadvertently damaged or destroyed.

Unauthorized artifact collection by KEI personnel has the potential to adversely affect nearby archaeological sites. Workers would not be notified of the location of nearby sites unless the sites are to be specifically avoided by KEI activities. Thus, no impacts to archaeological sites are expected.

The KEI launch vehicle integration and launch site preparations represent routine types of activities at the base. In some situations, transportation activities could potentially harm subsurface resources when moving launch vehicle components and equipment to and from the launch pad and other facilities. However, transport vehicles, cranes, and other load-handling equipment would remain on paved or gravel areas (no off-road travel), which would reduce the potential for disturbing archaeological sites.

Both the LF-06 and LC-576E launch sites are active facilities with vegetation maintenance programs in place. TP-01, however, has had little maintenance in years and suffers from vegetation overgrowth. Heavy vegetation inside and immediately outside the perimeter fence would require removal to minimize fire hazards from launches and for security purposes. Vandenberg AFB currently employs both mowers and disk harrows for clearing and vegetation maintenance, depending on how heavy and invasive the vegetation is. Disk harrows would not be used, however, for clearing and maintenance in the vicinity of known archaeological sites at TP-01.

Historic Buildings and Structures

Two facilities that would potentially be used for the KEI flight tests have been determined to be eligible for listing on the NRHP for their Cold War, ICBM Program historic context: LF-06 and Building 1974. Although the buildings and facilities would be used in support of the new KEI program, the types of activities proposed to occur would be similar to that of the Minuteman and deactivated Peacekeeper ICBM support programs.

As an existing launch control center, Building 1974 would not require any structural, mechanical, or exterior modifications. If used in support of the KEI flight tests, electronic equipment, racks, and cables would be brought into the building and operated temporarily.

If LF-06 were to be used for the proposed stool launches, a launch stool and launch stand would be temporarily installed on two new concrete pads. The new concrete pads (20 ft square and 6 ft square) would be installed within existing paved (asphalt) areas approximately 90 ft northwest of the existing silo.

In preparation for the canister launches, the KEI launch vehicle could be canisterized vertically using the existing silo shaft at LF-06. This would require placing the empty canister in the existing silo shaft using temporary structural supports and a base adapter ring to hold the canister in place, and then lowering the KEI vehicle into the canister from a TE or crane. Following completion of the vertical canisterization process, the canisterized vehicle would be removed from the silo shaft for an aboveground launch at one of the three candidate launch sites. The temporary structural supports would also be removed from the silo. To conduct the canister launches from LF-06, a supporting framework or tilt-up launcher would be temporarily installed on the existing pad to hold the canister in place. To secure the framework/launcher, small concrete mounting pads would be installed within the pavement approximately 90 ft northwest of the existing silo.

Use of the LF-06 underground Launch Equipment Room would not require any permanent modifications to the facility. Electronic equipment, racks, and cables would be temporarily installed in support of each launch and then removed.

Although LF-06 is eligible for listing as a historic site, documentation on the historical significance of LF-06 and other Minuteman LFs at Vandenberg AFB is available at the base Environmental Office. In addition, other similar Minuteman LFs and associated documentation exists elsewhere at the USAF Minuteman Wings (e.g., F.E. Warren AFB in Wyoming and Malmstrom AFB in Montana).

Overall, use of Building 1974 and LF-06 for the proposed KEI flight tests would not result in significant impacts to historic properties at Vandenberg AFB because: (1) Building 1974 would not require any modifications; (2) modifications to LF-06 would be minimal and mostly temporary; and (3) the availability of LF-06 documentation and the existence of other similar Minuteman LFs.

4.1.1.4.2 Launch Activities

No additional ground disturbance or facility modification would occur during flight activities. Thus, no impacts to archaeological sites or historic buildings are expected from nominal flight activities.

Falling debris from a flight termination or other launch anomaly, however, could strike areas on the ground where surface or subsurface archaeological deposits, or other cultural resources, are located. This could result in soil contamination, fire, and/or resource damage, which would all require a reparation effort. Firefighting activities could damage subsurface historic and prehistoric archaeological sites as well. In the unlikely event that a mishap occurs, post-mishap recommendations would include post-event

surveying, mapping, photography, and site recordation to determine and record the extent of the damage. These efforts would be coordinated with applicable range representatives and the California SHPO to develop the most appropriate mitigation measures based on the nature of the mishap and the cultural resources involved. Any debris falling offshore would not pose a threat to cultural resources on base.

4.1.1.4.3 Post-Launch Operations

Following each launch, the launch stand and launch stool, or the launch canister supporting framework/ launcher, would be removed from LF-06. At Building 1974, the electronic equipment, racks, and cables would be removed from the building immediately after final integration testing for FTK-04.

Because of the limited activities associated with post-launch operations, no additional ground disturbance or facility modification would occur. KEI and base personnel would be on site during cleanup and site maintenance, creating potential risk of unauthorized artifact collection. Personnel, however, would be reminded of the sensitivity of cultural resources and the issues of inadvertently damaging or destroying such resources. Thus, no impacts to archaeological sites or historic buildings are expected to occur.

4.1.1.5 Coastal Zone Management

Most of the proposed KEI activities at Vandenberg AFB would take place within the CA Coastal Zone. This would include activities at all three KEI launch sites (LF-06, TP-01, and LC-576E) and Buildings 960 and 970. Although these buildings and facilities would be used in support of the new KEI program, the types of activities proposed to occur would be similar to that of their current and/or prior usage.

As discussed in other sections of Chapter 4.0, the KEI actions that are proposed to occur within the coastal zone would not result in significant impacts to sensitive biological or cultural resources, nor would such actions have lasting effects on the scenic beauty along the coast. During KEI launches at LC-576E, Ocean Beach County Park, between North and South Vandenberg, would be closed for public safety purposes. Under agreement with Santa Barbara County, the base can close the county beach during launch operations; the beach is closed on average three times per year (USAF, 2006). Similarly at LF-06, the base would need to close Point Sal State Beach for any KEI launches at this location. Under agreement with Santa Barbara County and the State of California, the base can close the state beach during launches, which occurs on average twice a year (USAF, 2006; VAFB, 2003b). The USAF and Santa Barbara County recently signed a new Memorandum of Agreement that resolved issues regarding public access to Point Sal State Beach through Vandenberg AFB property (VAFB, 2008b). There will be no additional restrictions to public access at Point Sal State Beach or for any other public beaches on Vandenberg AFB beyond what is already agreed to in the Agreement with the County.

By conducting four KEI launches over a 4 to 5-year period, a minor increase in temporary beach closures would be expected. The maximum annual number of beach closures would be determined by the number of operations and the number of times these operations might be rescheduled due to, but not limited to, equipment, weather, or vehicle conditions. Because only one KEI program launch would be expected to occur in a given year, the increase in beach closures would be minimal and would not have a major effect on local recreation.

Under the Proposed Action, the MDA and USAF would comply with Federal Coastal Zone Consistency regulations (15 CFR Part 930) and the California Coastal Zone Management Program. Because the proposed KEI activities would not have a significant impact on physical and natural resources, require implementation of new restrictions to beach access or other recreational areas, or adversely affect the visual qualities of the coastline, the MDA prepared a Negative Determination in accordance with the Federal and state regulations. With the assistance of personnel at Vandenberg AFB, the MDA submitted

the Negative Determination letter and a draft copy of this EA to the CCC in April 2008 for their review and concurrence. In a letter dated June 6, 2008, the CCC agreed that the Proposed Action would not adversely affect coastal zone resources and, therefore, concurs with the Negative Determination (refer to Appendix B).

4.1.1.6 Water Resources

4.1.1.6.1 Site Modifications/Construction, Rocket Motor Transportation, and Pre-Launch Preparations

All KEI facilities and activities, as outlined in Section 2.1.2, would not be located within or affect floodplain areas. Because all KEI-related construction activities would result in less than 1 acre of total soil disturbance, a stormwater permit under the state's National Pollutant Discharge Elimination System (NPDES) General Permit for Construction is not required.

Excavations for small concrete pads and/or asphalt pavement at the LF-06 and LC-567E launch sites, and at Building 960, would be minimal and conducted primarily within existing paved areas. Construction of the anti-terrorism barrier at Building 960 would also require several small areas of excavation for bollards, fence post footers, and concrete "dead man" blocks. The construction contractor would apply state-approved best management practices (BMPs) for soil erosion control, and for the collection and disposal of waste concrete and wastewater from concrete truck washout. No concrete wastes or wastewater would be allowed to enter drainages or surface waters.

For the firebreak around TP-01, vegetation removal would be accomplished using cutting and mowing methods; no scraping or other soil disturbance would occur. As described in Section 4.1.1.3.1, a recent field survey of the TP-01 pad perimeter identified a small, potential wetland area approximately 80 ft southeast of the pad. Prior to any vegetation removal, biologists would survey the surrounding area, which would include the delineation of any wetlands. Depending on the survey results, mitigation measures to be implemented at the site might include avoiding vegetation removal or other disturbance in the potential wetland area.

During construction of the 2.5 mi long fiber optic cable trench to TP-01, ground-disturbing activities could result in short-term adverse water quality impacts to nearby wetlands and groundwater. Potential impacts could include increased siltation and turbidity levels from stormwater runoff, as well as contamination from accidental spills of fuel, anti-freeze, and oil from construction equipment. However, the shallow trench (approximate 1 ft deep and 9 in wide) would be located in previously disturbed areas of soil (within or adjacent to existing roadways) outside of wetland areas or other surface waters. To minimize potential impacts, the construction contractor would be required to prepare a hazardous material Spill Prevention and Response Plan and obtain concurrence from the base Environmental Office. The plan would include the implementation of BMPs, such as daily inspections of construction vehicles and equipment for fluid leaks, secondary containment provisions for equipment fueling sites, and proper handling and disposal of vehicle wastes. After the completion of each leg of trenching and cable installation, the construction contractor would also implement appropriate soil erosion controls, such as the spreading of soil binders and hydro-seeding with a seed mixture approved by the base Environmental Office.

During replacement of the old HVAC system, boiler, and associated steam/water lines at Building 960, any remaining water in the closed loop water system would be collected, tested for contaminants, and disposed of, as necessary, in accordance with the base *Wastewater Management Plan* (30 SW Plan 32-7041-A).

The base *Hazardous Materials Emergency Response Plan* (30 SW Plan 32-4002-A) would provide resources and guidelines for use in the control, cleanup, and emergency response for spills of hazardous material or waste during facility modifications/construction and pre-launch activities. In the event that a release of hazardous material or waste would occur, affected areas would be treated in accordance with applicable Federal, state, and local regulations. Therefore, the risk of accidental spills would be minimal.

Because the KEI rocket motors would use only solid propellants (and no liquid fuels), there is no potential for accidental releases of propellant during motor transportation or other related ground operations.

As a result, no significant impacts to groundwater or surface waters are expected to occur during site modifications/construction, rocket motor transportation, and pre-launch preparations.

4.1.1.6.2 Launch Activities

During a nominal KEI launch, rocket emissions would not impact surface waters or groundwater except for the potential for a short-term, minor decrease in pH from hydrogen chloride emissions, particularly in wetlands near the TP-01 launch pad. In general, IRP studies at Vandenberg AFB have not shown long-term concerns for contamination to groundwater from repeated launches of similar solid-propellant systems (USAF, 2006).

There is a remote possibility that an early flight termination could result in propellant release and other missile debris over inland water bodies or drainages. However, the probability for direct impact to an individual water body or stream is extremely low. In addition, an accident response team would be available immediately to negate or minimize adverse effects and dispose of the recovered fuel in accordance with hazardous waste management procedures.

Therefore, no significant impacts to water resources are expected to occur during launch activities.

4.1.1.6.3 Post-Launch Operations

Following each canister launch, it is possible that some of the approximately 10 gallons of water from the steam generator ejection system might remain in the canister. Prior to removing the canister from the launch pad, any residual water would be collected, tested for contaminants, and disposed of, as necessary, in accordance with the base Wastewater Management Plan (30 SW Plan 32-7041-A).

Post-launch activities would not require pad wash down. However, as is typically done following each launch from LC-576E, the MDA would sample any sediments and rainwater that collected within the shallow concrete trench that surrounds the pad to determine whether contaminants have accumulated at that site. The samples would be tested for total metals, volatile organic compounds, semi-volatile organic compounds, reactive sulfide, reactive cyanide, and perchlorate. The post launch samples would be compared to the California Human Health Screening Levels, the USEPA Region 9 Preliminary Remediation Goals, and the CA hazardous waste characteristics levels (22 CCR 66261.20 to 66261.50; Cal/EPA, 2005; USEPA, 2007d). If any constituent exceeds one or more of the three screening methods, the MDA would notify the base Environmental Office to determine whether the sediments or rainwater in the trench would require special handling or disposal. Any wastewater disposal would be conducted in accordance with the base Wastewater Management Plan (30 SW Plan 32-7041-A). As a result, no adverse impacts to water resources are expected.

4.1.1.7 Airspace

4.1.1.7.1 Site Modifications/Construction, Rocket Motor Transportation, and Pre-Launch Preparations

KEI rocket motors would be shipped to Vandenberg AFB using ground transportation only. Use of air transportation for other KEI equipment and components to Vandenberg AFB would be minimal. All air transportation would be performed in accordance with existing airspace use requirements and USAF standard operating procedures; therefore, no significant impacts on airspace would be expected.

4.1.1.7.2 Launch Activities

All KEI Program-related helicopter flights and launches from Vandenberg AFB would use existing Restricted Airspace and offshore Warning Areas. Prior to each launch, Vandenberg AFB would coordinate with the FAA to issue a NOTAM for pilots to avoid launch hazard areas. The launches would be short-term events, after which joint-use airspace would be released to other users. No significant impacts to airspace are expected because there would be no expansion or other changes to currently controlled airspace, and only four launches are planned over a 4 to 5-year period.

4.1.1.7.3 Post-Launch Operations

No aircraft are planned for use during KEI post-launch operations; therefore, no impacts on airspace are expected.

4.1.1.8 Health and Safety

4.1.1.8.1 Site Modifications/Construction, Rocket Motor Transportation, and Pre-Launch Preparations

For the proposed facility modifications and construction activities at Vandenberg AFB, all program personnel would be required to comply with applicable AFOSH and OSHA regulations and standards. This would include the use of appropriate personal protective equipment for workers at Building 960 because of the potential for exposure to ACM, LBP, and/or soil contaminants.

The KEI launch vehicle integration and launch site preparations represent routine types of activities at the base. All applicable Federal, state, and local health and safety requirements, such as OSHA regulations within 29 CFR, would be followed, as well as all appropriate DoD and USAF regulations. The handling of large rocket motors and other vehicle ordnance is a hazardous operation that requires special care and training of personnel. By adhering to the established and proven safety standards and procedures identified in Section 3.1.8 of this EA, the level of risk to military personnel, contractors, and the general public would be minimal.

The systems to be used for transportation of the KEI rocket motors and related ordnance to Vandenberg AFB would provide environmental protection and physical security to the components. Heavily constructed trailers and/or containers would be used to safely transport the motors. All transportation and handling requirements for the rocket motors and other ordnance would be accomplished in accordance with DoD, USAF, and DOT policies and regulations to safeguard the materials from fire or other mishap. As described in Section 3.1.8, accident rates for ongoing operations involving rocket motor transportation have been historically very low.

To avoid potential non-ionizing radiation impacts, pre-launch ground tests of the telemetry and tracking systems used on the KEI vehicle would comply with AFOSH Standard 48-9 (*Radio Frequency Radiation Safety Program*) for limiting human exposure to radio frequency electromagnetic fields.

Consequently, no significant impacts to health and safety are expected.

4.1.1.8.2 Launch Activities

Adherence to the policies and procedures identified in Section 3.1.8 protects the health and safety of on-site personnel. During launches, public safety and health are ensured through the establishment of Launch Hazard Areas, impact debris corridors, beach and access road closures, and the coordination and monitoring of train traffic passing through the base, in addition to the NOTMARs and NOTAMs published for mariners and pilots. In support of each mission, a safety analysis would be conducted prior to launch activities to identify and evaluate potential hazards and reduce the associated risks to a level acceptable to Range Safety. For each rocket launch from Vandenberg AFB, the allowable public risk limit for launch-related debris is extremely low, as the following RCC Standard 321-07 criteria (RCC, 2007) show:

- Individuals within the general public must not be exposed to a probability of casualty greater than 1 in 1,000,000 for any single mission. Collective risk for the general public (i.e., the combined risk to all individuals exposed to the hazard) must not exceed a casualty expectation of 1 in 10,000 for any single mission.

- Non-mission ships will be restricted from near-shore hazard areas, where the probability of impact of debris capable of causing a casualty exceeds 1 in 10,000 for non-mission ships. For each launch, a NOTMAR would be published for mariners to avoid launch hazard areas.

- Non-mission aircraft in near-shore areas will be restricted from hazard volumes of airspace, where the cumulative probability of impact of debris capable of causing a casualty on an aircraft exceeds 1 in 10,000,000 for all non-mission aircraft. For each launch, a NOTAM would be published for pilots to avoid launch hazard areas.

For comparison purposes, the 2005 average annual probability of fatality in the US from non-transportation accidental (unintentional) injuries was 1 in 4,274 (National Safety Council, 2009). This included falls, fire and burns, drowning, electrical shock, and poisoning. Thus, the risk of fatality to the public from KEI launches at Vandenberg AFB would be significantly less than the risk from non-transportation related accidents.

As a result, no significant impacts to health and safety are expected.

4.1.1.8.3 Post-Launch Operations

Post-launch maintenance and repairs at a launch pad are routine operations at Vandenberg AFB. All applicable Federal, state, and local health and safety requirements, such as OSHA regulations, would be followed, as well as all appropriate DoD and USAF regulations. This would include the use of appropriate personal protective equipment for workers involved in the general cleanup of launch facilities and related equipment. By adhering to the established safety standards and procedures identified in Section 3.1.8, the level of risk to military personnel, contractors, and the general public would be minimal. Consequently, no significant impacts to health and safety are expected.

4.1.1.9 Hazardous Materials and Waste Management

4.1.1.9.1 Site Modifications/Construction, Rocket Motor Transportation, and Pre-Launch Preparations

Site modifications proposed for the LC-576E launch site would not damage or interfere with existing IRP treatment and monitoring systems. Because Building 960 and 970 are within AOC 219, the MDA would coordinate proposed site modification and construction plans with the base IRP Office so as not to disturb potential soil or groundwater contamination at the site. If contaminated areas were to be disturbed, such as during the installation of underground utilities, power poles, barriers, or new pavement, the base IRP Office would implement appropriate safeguards and remediation procedures.

Modifications and related demolition activities to some buildings and facilities—primarily Building 960—might require surveys for ACM and LBP if such information is not already available. Any removal of hazardous materials from the buildings and facilities would require containerizing and proper disposal in accordance with Vandenberg AFB's *Hazardous Waste Management Plan* (30 SW Plan 32-7043-A). Other non-hazardous construction and demolition debris would be managed in accordance with the disposal and recycling requirements specified in the base *Solid Waste Management Plan* (30 SW 32-7042).

Prior to replacement of the HVAC system at Building 960, any R-22 hydrochlorofluorocarbon refrigerant (a Class II ozone depleting substance) remaining in the old system would be recovered for proper disposal or reuse in accordance with AFI 32-7086 (AFSPC Supplement 1).

During site modifications/construction activities, potential impacts could occur from the accidental release of fuel, anti-freeze, and oil from construction equipment. To minimize potential impacts, the construction contractor would be required to prepare a hazardous material Spill Prevention and Response Plan and obtain concurrence from the base Environmental Office. The plan would include the implementation of BMPs, such as daily inspections of construction vehicles and equipment for fluid leaks, secondary containment provisions for equipment fueling sites, and proper handling and disposal of vehicle wastes.

The KEI launch vehicle integration and launch site preparations represent routine types of activities at the base. During pre-launch preparations, small quantities of lubricants, paints, sealants, and solvents (less than 5 lb per flight test vehicle) would be used. All hazardous materials and associated wastes would be responsibly managed in accordance with the well-established policies and procedures identified in Section 3.1.9. As an example, key elements in the management of hazardous liquids would include material compatibility, security, leak detection and monitoring, spill control, personnel training, and specific spill-prevention mechanisms. Whenever possible, KEI operations at Vandenberg AFB would use environmentally-preferred and/or recyclable materials.

All hazardous and non-hazardous wastes would be properly disposed of in accordance with applicable Federal, state, local, DoD, and USAF regulations. Hazardous material and waste-handling capacities would not be exceeded, and management programs would not have to change.

4.1.1.9.2 Launch Activities

Flight activities would not normally release hazardous materials or generate hazardous waste. In general, IRP studies at Vandenberg AFB have not shown any long-term concerns for contamination to soils and groundwater from repeated launches of similar solid-propellant systems (USAF, 2006).

If an early launch abort were to occur, base actions would be taken immediately to recover unburned solid propellants and any other hazardous materials that had fallen on the beach, off the beach within 6 ft of water, or in any of the nearby freshwater creeks. Recovery from deeper water along the shoreline would be treated on a case-by-case basis. Collected waste materials would be properly disposed of in accordance with applicable regulations. Consequently, no adverse impacts from the management of hazardous materials and waste are expected.

4.1.1.9.3 Post-Launch Operations

Post-launch maintenance and repairs at a launch pad are routine operations at Vandenberg AFB. During this process, all hazardous materials would be responsibly managed in accordance with the well-established policies and procedures identified in Section 3.1.9. Hazardous and non-hazardous wastes would be properly disposed of in accordance with applicable Federal, state, local, DoD, and USAF regulations. Hazardous material and waste-handling capacities would not be exceeded, and management programs would not have to change.

As is typically done following each launch from LC-576E, the MDA would sample any sediments and rainwater that collected within the shallow concrete trench that surrounds the pad to determine whether contaminants have accumulated at that site. As described in Section 4.1.1.6.3, the samples would be tested and compared to the California Human Health Screening Levels, the USEPA Region 9 Preliminary Remediation Goals, and the CA hazardous waste characteristics levels (22 CCR 66261.20 to 66261.50; Cal/EPA, 2005; USEPA, 2007d). If any constituent exceeds one or more of the three screening methods, then the MDA would notify the base Environmental Office to determine whether the sediments or rainwater in the trench would require special handling or disposal. Although no collection trenches exist around the other launch pads, the MDA would conduct similar testing for potential soil contaminates in the areas immediately adjacent to the TP-01 and LF-06 launch pads prior to and following each KEI launch. The results of such tests would be reported to the base Environmental Office.

As a result, no adverse impacts from the management of hazardous materials and waste are expected.

4.1.2 GLOBAL ENVIRONMENT

4.1.2.1 Global Atmosphere

4.1.2.1.1 Stratospheric Ozone Layer

As described in Section 3.2.1.1, chlorine is a chemical of primary concern with respect to ozone depletion in the stratosphere. Exhaust emissions from the KEI rocket motors contain both free Cl and chlorine compounds, produced primarily as HCl at the rocket engine nozzle. Each of the four KEI flight tests would release approximately 2 tons of HCl and 37 lb of Cl (refer to Table 4-2). The Cl and HCl would have a long enough tropospheric lifetime to eventually mix with the stratosphere, even when released at ground level.

The global release of emissions from rocket launches, however, is small enough that it is not listed as a significant source of ozone depleting substances by the World Meteorological Organization (WMO, 2006). It is also estimated that the emission loads of chlorine (as HCl and free Cl) from BMDS and other rocket launches worldwide, as projected from 2004 to 2014, would account for only 0.5 percent of the industrial Cl load from the US over the 10-year period (MDA, 2007a).

In summary, rocket emissions from the four proposed KEI flight tests would not have a significant impact on stratospheric ozone depletion; however, any emission of ozone-depleting substances represents an incremental increase that could have incremental effects on the global atmosphere.

4.1.2.1.2 Greenhouse Gases and Global Warming

Under the Proposed Action, all KEI activities combined would release approximately 841 tons of CO_2 per year, most of which (approximately 708 tons) would come from new boiler operations at Vandenberg AFB. Detailed emission calculations of GHGs from all program modifications/construction and for pre-launch preparations (including local rocket motor transportation), launch, and post-launch activities for a single launch are provided in Appendix D.

Carbon dioxide is the only GHG identified in the Kyoto Protocol or the California Climate Action Registry that would be emitted during KEI launches (refer to Table 4-2). Because of the propellant used, launch of one KEI booster would release only 0.22 tons of CO_2. For comparison, the CO_2 emissions from all USAF launch vehicles (i.e., Atlas, Delta, Titan, Minuteman, etc.) in CY 2005 represents the emissions of 130 passenger cars operated that year (DeSain and Brady, 2007).

The amount of CO_2 released by all KEI activities represents less than 0.0001 percent of the anthropogenic emissions for this gas released on a global scale annually (USEPA, 2007b). Although this limited amount of emissions would not contribute significantly to global warming, any emission of GHG represents an incremental increase that could have incremental effects on the global atmosphere.

4.1.2.2 Biological Resources in the Broad Ocean Area

The proposed KEI launches would not have a discernible or measurable impact on benthic or planktonic organisms, because of their abundance, their wide distribution, and the protective influence of the mass of the ocean around them. However, the potential exists for impacts to larger vertebrates in the nekton, particularly those that must come to the surface to breathe (e.g., marine mammals and sea turtles). Potential impacts on these protected species have been considered in this analysis and include the effects of acoustic stimuli produced by launches (sonic booms), and non-acoustic effects (splash-down of launch vehicle stages and release of propellants or other contaminants into the water). These issues are further discussed in the following sections.

4.1.2.2.1 Sonic Boom Overpressures

The propagation of sonic booms underwater could affect the behavior and hearing sensitivity in marine mammals (primarily cetaceans), sea turtles, and other fauna. If the sounds were to be strong enough, they might cause animals to quickly react, briefly altering their normal behavior. Such behavioral reactions might include cessation of resting, feeding, or social interactions; changes in surfacing, respiration, or diving cycles; and avoidance reactions, such as vacating an area. (Kastak, et al., 1999; Richardson, et al., 1995)

The modeling results for the KEI flight tests show that sonic boom overpressures at the ocean surface are typically near their maximum level at a distance of about 45 nmi off the CA Coast (refer to Figure 4-2). The surface footprint of the sonic boom can extend outward many miles on each side of the flight path, but it quickly dissipates with increasing distance downrange. At the ocean surface, peak overpressures were estimated to be about 1.5 psf or 131 dB in air, based on typical atmospheric wind conditions. The duration of these overpressures would last less than 200 milliseconds. The propagation of the sonic boom

underwater is estimated to be 1.23 psf or 155.4 dB (referenced to 1 microPascal)[9] at a depth of 3 ft. With increasing depth, the overpressure would dissipate. (Plotkin, 2007)

Noise level thresholds for impact to marine life in general, and to marine mammals and sea turtles in particular, are currently the subjects of scientific studies. Because different species have varying sensitivities to different sound frequencies and sound levels, and that species may be found at different locations and depths in the ocean, it is difficult to generalize sound impacts to marine mammals and sea turtles from rocket launches. However, previous studies have shown that brief transient sounds, such as sonic booms, are unlikely to result in significant adverse effects to marine mammals or sea turtles underwater (USAF, 2006; USN, 2002). In addition, the sonic boom overpressures resulting from the KEI flight tests would be significantly lower than for other larger vehicles launched from Vandenberg AFB (e.g., Altas V system).

Thus, the sonic booms overpressures generated by the KEI flight tests are not expected to result in significant impacts to marine mammals and sea turtles because: (1) the overpressures would be relatively low, very short in duration (lasting only a fraction of a second) and occur no more than four times over a 4 to 5-year period; and (2) the probability for marine mammals or sea turtles to be within the sonic boom footprint out in the BOA is reasonably low.

4.1.2.2.2 Direct Contact and Shock/Sound Wave from the Splashdown of Vehicle Components

As described in Section 2.1.2.4, the KEI spent motors and upper stages would impact in the BOA, well away from coastal areas. For FTK-01, the combined upper stage components and related debris are currently planned to impact north of the Northwestern Hawaiian Islands, outside of the Papahānaumokuākea Marine National Monument. All of the main KEI vehicle components are expected to impact in deep ocean waters averaging 10,000 ft or more in depth.

At the velocity of their normal descent, non-orbital rocket bodies and spent rocket motors have been estimated to impact in the ocean at speeds of approximately 195 to 230 ft per second (Tooley, et al., 2004). For the KEI launch vehicle, the expended rocket motors and stages—each weighing up to 1,500 lb—would have considerable kinetic force. Upon impact, this transfer of energy to the ocean water would cause a shock wave (low-frequency acoustic pulse) similar to that produced by explosives.

As for the risk of injury to marine mammals and sea turtles in the BOA, analyses conducted at the Point Mugu Sea Range off the coast of Southern CA (USN, 2002) have determined that there is a very low probability for marine mammals to be killed by falling boosters, targets, or other missile debris, or from the resulting shock wave of a missile impacting the water. These studies showed the cumulative number of animals expected to be injured or killed ranged from 0.0006 for US territorial waters to 0.0016 for non-territorial waters, for all related missile operations conducted over 1 year. The probability calculations were based on the densities of marine mammals in the ocean areas where activities are conducted, the number of activities, and the area of influence of the activity (NAWCWPNS Point Mugu, 1998). Similar impact results were identified by the US Navy for annual missile exercises conducted in the open ocean off Hawaii (USN, 2008). The risk levels are low enough that the probability for marine mammal injuries from falling debris can be considered negligible. Because sea turtles have been shown to occur generally in smaller numbers when compared to marine mammals, the resulting probabilities for impacts on sea turtles would be even less.

[9] Underwater sound levels are normalized to 1 microPascal at 3.3 ft (1 meter) away from the source, a standard used in underwater sound measurement.

Thus, no long-term adverse impacts on protected marine mammals and sea turtles are expected to occur, because: (1) the likelihood for an animal to be located within the shock/sound wave impact zone is extremely low; (2) impact sites for each flight likely would not occur in the same areas; and (3) KEI flight tests would occur only four times over a 4 to 5-year period.

4.1.2.2.3 Contamination of Seawater

By the time the spent rocket motors impact in the ocean, all of the solid propellants in them would be consumed. The residual aluminum oxide and burnt hydrocarbon coating the inside of the motor casings would not present any toxicity concerns. Although the nickel-cadmium batteries carried onboard the launch vehicle would be spent (discharged) by the time they impact in the ocean, small quantities of electrolyte material would remain in the batteries. The battery materials could mix with the seawater causing localized contamination. The release of such contaminants could potentially harm marine life that comes in contact with, or ingests, toxic levels of these solutions.

Previous studies of missile tests concluded that the release of hazardous materials carried onboard rocket systems would not be significant (USN, 2008). Materials would be rapidly diluted in the seawater and, except for the immediate vicinity of the debris, would not be found at concentrations identified as producing adverse effects. Ocean depths in the ROI reach thousands of feet and, consequently, any impacts from hazardous materials are expected to be minimal. The area affected by the dissolution of hazardous materials onboard would be relatively small because of the size of the rocket components and the minimal amount of residual materials they contain. Such components would immediately sink to the ocean bottom, out of reach of marine mammals, sea turtles, and most other marine life. Although it is possible for deep-ocean, benthic species to be adversely affected by any remaining contaminants, such impacts would be very localized, occurring within a short distance to rocket debris deposited on the ocean floor. Consequently, no significant impacts to biological resources are expected from the contamination of seawater.

4.1.2.2.4 Failed or Terminated Launch

In the unlikely event of a system failure during launch, or an early termination of flight, the launch vehicle would fall to the ocean intact or as debris scattered over a large area. It is expected that the falling debris would not have a significant impact on biological resources because of the large ocean area and the very low probability of striking a marine mammal or sea turtle.

Initiating flight termination after launch would split or vent the solid propellant motor casing, releasing pressure. Pieces of unburned propellant, which is composed of ammonium perchlorate, aluminum, and other materials, could be dispersed over an ocean area of up to several square miles. Of particular concern is the ammonium perchlorate, which can slowly leach out of the solid propellant resin binding-agent once the propellant enters the water. However, as described in Section 4.1.1.3.2, it is unlikely that perchlorate concentrations would accumulate to a level of concern. The overall concentration and toxicity of dissolved solid propellant from the unexpended rocket motors, or portions of them, is expected to be negligible and without any substantial effect. Any pieces of propellant expelled from a destroyed or exploded rocket motor would sink hundreds or thousands of feet to the ocean floor. At such depths, the material would be beyond the reach of most marine life.

4.2 ENVIRONMENTAL CONSEQUENCES OF THE NO ACTION ALTERNATIVE

Under the No Action Alternative, the KEI system integration and flight tests would not be implemented at Vandenberg AFB. As a result, there would be no KEI-related environmental impacts from facility modifications, construction, or launch activities. Vandenberg AFB and the MDA would continue

ongoing operations, including support for current BMDS-related programs, with environmental conditions expected to remain unchanged from that described for the Affected Environment in Chapter 3.0 of the EA.

4.3 CUMULATIVE EFFECTS

Cumulative effects are considered those resulting from the incremental effects of an action when considering past, present, and reasonably foreseeable future actions, regardless of the agencies or parties involved. In other words, cumulative effects can result from individually minor, but collectively potentially significant, impacts occurring over the duration of the Proposed Action and within the same geographical area.

The following sections describe the potential for cumulative impacts to occur at Vandenberg AFB and within the global environment as a result of implementing the proposed KEI system integration and flight tests.

4.3.1 VANDENBERG AIR FORCE BASE

The proposed KEI launches would be conducted in a manner similar to that of other launch systems in use at Vandenberg AFB. The expected launch rate forecast for Vandenberg AFB is presented in Table 4-3 for CY 2009 and 2010. Beyond CY 2010, the launch rate forecast is expected to be similar through completion of the KEI flight tests. Under the Proposed Action, only four KEI flight tests would be conducted, with no more than one launch occurring in a given year. Thus, the proposed KEI program represents a 6 to 8 percent increase in the number of launches per year at Vandenberg AFB.

Table 4-3. Launch Rate Forecast for Vandenberg AFB, CA

Launch System	Calendar Year	
	2009	2010
Atlas V	1	1
Delta II	4	3
Delta IV	0	1
Falcon	0	0
Taurus	2	0
Minotaur	3	1
Minuteman	4	3
BMDS Programs	3	4
Pegasus	0	0
Current Launch Rate Totals	**17**	**13**

Source: Edwards, 2009

In addition to the launch programs, the demolition of numerous older buildings and structures on base is planned over the next several years, as described and analyzed in the *Final Programmatic Environmental Assessment for Demolition and Abandonment of Atlas and Titan Facilities, Vandenberg Air Force Base, California* (USAF, 2005). Other MDA construction projects proposed within the coming years may include the construction of a new small target missile launch pad just south of LF-06 (MDA, 2007c).

The potential for cumulative impacts to occur at Vandenberg AFB is discussed in the following paragraphs for each affected resource.

Air Quality. Under the Proposed Action, minor temporary increase in air emissions would occur, primarily from site modifications/construction, pre-launch, and launch activities. Additionally, other projects and activities would occur at Vandenberg AFB and within the region, resulting in some measurable amounts of air pollutants. The State of California and Santa Barbara County take into account the effects of all past, present, and reasonably foreseeable activities during the development of their County Clean Air Plan and State Implementation Plan of the CAA. Estimated emissions generated by the Proposed Action would be below *de minimis* levels and conform completely to these plans. Therefore, implementation of the Proposed Action would not contribute to adverse cumulative air quality impacts.

In addition, KEI and other rocket launches represent short-term, discrete events that would occur at different times and at different locations across Vandenberg AFB. The emissions would not accumulate because winds quickly and effectively disperse them between launches. The proposed KEI test vehicle would generate fewer emissions than the larger spacelift systems (e.g., Atlas, Delta, and Taurus) in use at the base. Consequently, no significant cumulative impacts to air quality are anticipated.

Noise. The KEI and other launch programs would be conducted from multiple locations across the base. The KEI launch vehicles would generate lower noise levels per launch, when compared to the larger spacelift systems in use (e.g., Atlas, Delta, and Taurus). Also, despite the increase in number of launch events, the noise generated by each KEI launch would be very brief, launches would occur only four times over a 4 to 5-year period, and they would not have a perceptible impact on cumulative noise metrics, such as the CNEL. Thus, implementation of the KEI flight tests at Vandenberg AFB is not expected to result in any significant cumulative impacts on noise.

Biological Resources. Facility modifications and construction-related activities for the KEI, and for other construction and demolition projects on base, would occur at different locations and at different times over a period of a few years, and would be generally short-term. Limited areas of vegetation and wildlife would be affected; however, mitigating actions developed through consultations with the USFWS would be implemented for those projects affecting rare and other protected species.

The proposed increase in the number of launches would result in an increase in launch noise and rocket emissions released. However, the KEI and other rocket launches represent short-term, discrete events that would occur at different times and at different locations across the base. Through coordination and consultations with the USFWS and the NMFS, the USAF implemented various plans and measures to limit the extent and frequency of potential impacts on protected and sensitive species. In addition, monitoring of certain species during launches is conducted on a regular basis to ensure that no long-term or cumulative impacts occur. To address the short-term disturbance of threatened and endangered species from launches, the USFWS authorized the incidental harassment of certain terrestrial and freshwater species. For the harassment of marine mammals, the NMFS recently granted Vandenberg AFB authorization to take four species of pinnipeds by Level B harassment incidental to launching up to 30 space and missile vehicles per year, and from aircraft and helicopter operations, for the period of February 7, 2009 through February 7, 2014 (74 FR 6236-6244). As discussed earlier and shown in Table 4-3, the addition of one KEI launch in any given year would not cause the take permit launch forecast limit to be exceeded.

Although the KEI actions would result in an increase in the number of short-term impact events at the range, no long-term significant cumulative effects on biological resources are anticipated. Consequently,

no cumulative adverse effects on threatened and endangered species or sensitive habitats are expected to occur.

Cultural Resources. Vandenberg AFB has an Integrated Cultural Resources Management Plan already in place for the long-term protection and management of cultural resources that are found on the base. Also, per Federal and state regulations, and agreements with the California SHPO, Vandenberg AFB personnel regularly coordinate and consult with the SHPO and Native American specialists prior to implementing new projects where historical, archaeological, or traditional resources could be affected. As part of normal procedures, workers are informed of the sensitivity of cultural resources and the mitigation measures that might be required if sites are inadvertently damaged or destroyed, and security forces regularly patrol the base to help prevent potential vandalism and looting of such resources. Because of the requirements and procedures already in place, and the limited potential for proposed KEI construction activities and launch operations to affect cultural resources on base, implementation of the KEI activities at Vandenberg AFB is not expected to result in any significant cumulative impacts on these resources.

Coastal Zone Management. Vandenberg AFB contains over 35 mi of coastline consisting of a variety of natural communities, resources, and recreation areas. The base has taken many steps to protect and maintain coastal resources in collaboration with Federal, state, and local agencies. This includes funding for research of marine mammals on base, enforcing the limited access regulations to key wildlife areas on base, and minimizing the closure of public beaches.

As previously discussed, the launch rate forecast for Vandenberg AFB over the next few years is expected to range from 16 to 22 launches per year. Depending on the launch site and flight trajectory, each launch may require the closure of public beach areas. For example, Ocean Beach County Park has been closed for launches on average three times per year, while Point Sal State Beach has been closed twice a year (USAF, 2006, VAFB, 2003b). Although the number of beach closures could increase slightly from the addition of KEI and other new launch programs on base, the increase in closures would be minimal, short term, and have no major effect on local recreation.

Vandenberg AFB personnel regularly consult with the CCC prior to implementing new projects that might affect the policies of the CCA. As a result, implementation of the KEI activities at Vandenberg AFB is not expected to result in any significant cumulative impacts on Coastal Zone Management.

Water Resources. The proposed KEI program activities, when combined with other planned base activities, would not have any adverse effects on water resources. No other future programs have been identified that, when combined with the proposed activities, would contribute to cumulative water resources impacts. All construction and operations would be conducted in accordance with Federal and state water resource regulations.

Airspace. As previously discussed, the launch rate forecast for Vandenberg AFB is expected to range from 16 to 22 launches per year. With each launch, Vandenberg AFB would activate Warning Areas and close coastal airspace for brief periods. Because the KEI program would only conduct four additional launches over a 4 to 5-year period, no significant cumulative impact to airspace usage is expected.

Health and Safety. On Vandenberg AFB, all projects must comply with applicable standards, policies, and procedures for health and safety. All rocket launches and other hazardous operations are closely reviewed and analyzed to ensure that there are no unacceptable risks to the public, military personnel, and contractors. Because implementation of the KEI actions would also comply with these same requirements, no significant cumulative impacts to health and safety are expected to occur.

Hazardous Materials and Waste Management. The cumulative generation of solid waste from KEI-related facility modifications and construction activities, in addition to other planned construction and demolition projects on base, has the potential to exceed the permitted disposal tonnage on base. Coordination of implementation schedules for these projects, and appropriate tracking of disposal tonnage, would ensure that permitted disposal amounts at the base landfill are not exceeded.

In addition, implementing the KEI Program would not introduce new hazardous materials and wastes, and only a small increase in wastes would be expected from the four proposed launches. Therefore, no significant cumulative impacts from the management of hazardous materials and waste are anticipated.

4.3.2 GLOBAL ENVIRONMENT

Global Atmosphere. On a global basis, the four KEI flight tests would release negligible quantities of HCl and Cl emissions. Solid rocket motors make a relatively small contribution to stratospheric ozone losses, which are dominated by the release of CFCs and Halons. As for effects on global warming, the overall KEI program would release a small quantity of CO_2 compared to anthropogenic releases worldwide. This limited amount of emissions would not contribute significantly to cumulative global warming or stratospheric ozone depletion; however, any emissions of ozone-depleting substances and GHG represent an incremental increase that could have incremental effects on the global atmosphere.

Biological Resources in the BOA. Potential cumulative impacts on marine life in the BOA could occur from the additional KEI launches, over and above projected launches identified in Table 4-3. Although sonic booms could affect the behavior of marine mammals and sea turtles in the BOA, the noise levels are very short in duration and the resulting underwater peak pressures caused by the KEI launch vehicles would be relatively low when compared against the other larger vehicles. There would be a slight increase in the risk for launch vehicle debris to strike marine life in the BOA. However, the probability for such an occurrence is very low, considering the minimal number of launches proposed, the relatively low population distribution of animals in the BOA, and the small size of the ocean areas affected by each launch. Thus, no significant cumulative impacts to marine life are anticipated.

4.4 COMPARISON OF ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

Table 4-4 provides a comparison of the potential environmental consequences of the Proposed Action, Alternatives within the Proposed Action, and the No Action Alternative for those locations and resources affected.

4.5 SUMMARY OF ENVIRONMENTAL MANAGEMENT AND MONITORING ACTIONS

Throughout this EA, various environmental management controls and monitoring systems are described. Required by Federal, state, DoD, and USAF environmental and safety regulations, these measures are implemented through normal operating procedures.

Although no significant or other major impacts are expected to result from implementation of the Proposed Action, some specific environmental management and monitoring actions have been identified to minimize the level of impacts that might occur at Vandenberg AFB. These actions are summarized in the following discussions and include the relevant sections of the EA where they are further described.

Table 4-4. Comparison of Potential Environmental Consequences

Locations and Resources Affected	Proposed Action			No Action Alternative
	Alternative 1 (LF-576E Launch Site)	Alternative 2 (TP-01 Launch Site)	Alternative 3 (LF-06 Launch Site)	
Vandenberg Air Force Base, CA				
Air Quality	ALL ALTERNATIVES: The proposed facility modifications and construction are not expected to have an adverse effect on local or regional air quality. The new boiler at Building 960 would need to comply with applicable regulatory and permitting requirements. Any activities involving the removal of ACM or LBP would comply with all applicable Federal, state, and local regulations. The KEI vehicle launches represent short-term, discrete events. In boost flight, the rocket emissions from each stage would be rapidly dispersed over a large geographic area and by prevailing winds. The total direct and indirect emissions associated with the Proposed Action were estimated to include release of 0.250 tons per year of VOCs and 0.663 tons per year of total particulate matter. Emission levels would not exceed *de minimis* (minimal importance) thresholds, be regionally significant, or contribute to a violation of Vandenberg AFB's air operating permits. It is not anticipated that air quality standards or health-based standards for non-criteria pollutants would be exceeded.			The proposed KEI activities would not be implemented; therefore, project related impacts to air quality would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.1 of the EA.
Noise	ALL ALTERNATIVES: Because most KEI-related activities would take place on base, the public in the surrounding communities would not detect an increase in noise levels except during launches. KEI launches would generate noise levels exceeding 115 dB ASEL in the immediate vicinity of each launch site, to about 85 dB ASEL nearly 7.5 mi away. Outside the base boundary, some local communities could experience launch noise levels up to approximately 93 dB ASEL. While these noise exposure levels can be characterized as very loud, they would occur infrequently, be very short in duration (about 20 seconds of intense sound per launch), and have little effect on the CNEL for these areas. The launch noise generated by the KEI vehicle would be less than that of larger vehicles used on North Vandenberg (e.g., Delta II and Taurus). Sonic booms generated by KEI launch vehicles during flight would typically be at their maximum level at approximately 45 nmi off the coast. Surface overpressures are not expected to exceed 1.5 psf. Because KEI flight trajectories would be in a westerly direction, the sonic booms would not impact the mainland or the northern Channel Islands.			The proposed KEI activities would not be implemented; therefore, project related impacts to the noise environment would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.2 of the EA.
Biological Resources	ALL ALTERNATIVES: Because migratory birds and bats roost or nest in some buildings on base, surveys of Building 960 would be conducted several months prior to project start and before the nesting season. Rocket launch emissions and ground-level heat from the rocket plume are expected to have minimal effects on nearby vegetation, wildlife, and surface water habitats. Exposure to short-term noise from launches and helicopter overflights (if conducted) could cause startle effects in protected bird species, pinnipeds, and other wildlife. However, on the basis of prior monitoring studies conducted on base, biologists determined that rocket launch activities have negligible, short-term impact on marine mammals, most sea and shore birds, and other protected species.			The proposed KEI activities would not be implemented; therefore, project related impacts to biological resources would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.3 of the EA.

Table 4-4. Comparison of Potential Environmental Consequences

Locations and Resources Affected	Proposed Action			No Action Alternative
	Alternative 1 (LF-576E Launch Site)	**Alternative 2 (TP-01 Launch Site)**	**Alternative 3 (LF-06 Launch Site)**	
Biological Resources (cont'd)	The noise and flash of the rocket plume from KEI launches could startle endangered California least terns and threatened western snowy plovers nesting in the dune and shore areas of the base. The KEI Program launches, however, would comply with the existing biological opinion issued earlier by the USFWS that allows the incidental take of these two species. Although the KEI launches could also impact the endangered ESBB, the endangered California brown pelican, and the threatened southern sea otter, the USFWS agreed that the launches "may affect, but are not likely to adversely affect" these three species. As a condition of their findings, the USFWS specified that pre-launch surveys for ESBB individuals be conducted within the project area.	Prior to implementing vegetation removal or other disturbance at TP-01, and along the fiber optic route to TP-01, biologists would survey the impact areas. Depending on the survey results, a Biological Assessment might need to be prepared, unless the actions are discussed and the resulting take is authorized within the limits allowed by the Programmatic Biological Assessment currently in preparation by Vandenberg AFB and the USFWS. Vandenberg AFB would work with the USFWS to minimize impacts, as necessary. Mitigation measures could include avoiding vegetation removal or other disturbance in the potential wetland area near TP-01, and trenching the new fiber optic lines within the existing roadway pavement to avoid impacts on Gaviota tarplant or other protected plant species.	Mowing the firebreak around LF-06 has the potential to impact endangered Gaviota tarplant growing in the area. These effects, however, are permitted by an existing biological opinion issued by the USFWS. Although the KEI launches could impact the endangered California brown pelican and the threatened southern sea otter, the USFWS agreed that the launches "may affect, but are not likely to adversely affect" these two species.	
Cultural Resources	ALL ALTERNATIVES: Most excavation work would be conducted in pre-disturbed or existing paved areas and, thus, the activities are not expected to disturb known archaeological sites. For those facilities selected for KEI operations that are in the vicinity of known archaeological sites, site modifications and related construction activities would be tailored to ensure that the archaeological resource areas are avoided. Building 1974 is eligible for listing on the NRHP for its Cold War, ICBM historic context. Building 1974, however, would be used for similar purposes and would not require any structural or mechanical modifications. As a result, there would be no significant impacts to historic or other cultural resources.			The proposed KEI activities would not be implemented; therefore, project related impacts to cultural resources would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.4 of the EA.
	There are no unique issues regarding use of LF-576E as a KEI launch site.	Vegetation removal and maintenance at TP-01 would use methods that minimize soil disturbance in the vicinity of known archaeological sites; thus, no	Although LF-06 is eligible for listing on the NRHP for its Cold War, ICBM historic context, modifications to the launch site for similar launch applications	

Table 4-4. Comparison of Potential Environmental Consequences				
Locations and Resources Affected	**Proposed Action**			**No Action Alternative**
	Alternative 1 (LF-576E Launch Site)	**Alternative 2 (TP-01 Launch Site)**	**Alternative 3 (LF-06 Launch Site)**	
Cultural Resources (cont'd)		significant impacts are expected.	would be minimal. As a result, there would be no significant impacts to the site.	
Coastal Zone Management	ALL ALTERNATIVES: The USAF and Santa Barbara County recently signed a new Memorandum of Agreement that resolved issues regarding public access to Point Sal State Beach through Vandenberg AFB property. There will be no additional restrictions to public access at Point Sal State Beach or for any other public beaches on Vandenberg AFB beyond what is already agreed to in the Agreement with the County. By conducting only four KEI launches over a 4 to 5-year period, the increase in beach closures would be minimal and not have a major effect on local recreation. In addition, the proposed KEI activities would not have a significant impact on physical and natural resources or adversely affect the visual qualities of the coastline. Under the Proposed Action, the MDA and USAF would comply with Federal Coastal Zone Consistency regulations and the California Coastal Zone Management Program. Through consultations, the CCC agreed that the Proposed Action would not adversely affect coastal zone resources.			The proposed KEI activities would not be implemented; therefore, project related impacts to coastal zone management would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.5 of the EA.
Water Resources	ALL ALTERNATIVES: Through application of BMPs, minimal stormwater runoff problems are expected to occur from construction activities. In the event that a release of hazardous material or waste would occur, affected areas would be treated in accordance with applicable Federal, state, and local regulations. Any project-related wastewater would be tested and disposed of according to base procedures. Although nominal launches could result in a short-term, minor decrease in pH in surface waters, no long-term adverse effects to surface waters or groundwater would occur. Therefore, no significant impacts to water resources are expected to occur.			The proposed KEI activities would not be implemented; therefore, project related impacts to water resources would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.6 of the EA.
Airspace	ALL ALTERNATIVES: All KEI launches from Vandenberg AFB would utilize existing Restricted Airspace and offshore Warning Areas. The launches would be short-term events, after which joint-use airspace would be released to other users. No significant impacts to airspace are expected because there would be no changes to current controlled airspace and only four launches are planned over a 4 to 5-year period.			The proposed KEI activities would not be implemented; therefore, project related impacts to airspace would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.7 of the EA.
Health and Safety	ALL ALTERNATIVES: For the proposed facility modifications and construction activities at Vandenberg AFB, all program personnel would be required to comply with applicable AFOSH and OSHA regulations and			The proposed KEI activities would not be implemented;

Table 4-4. Comparison of Potential Environmental Consequences

Locations and Resources Affected	Proposed Action			No Action Alternative
	Alternative 1 (LF-576E Launch Site)	Alternative 2 (TP-01 Launch Site)	Alternative 3 (LF-06 Launch Site)	
Heath and Safety (cont'd)	standards. This would include the use of appropriate personal protective equipment for workers at Building 960 because of the potential for exposure to ACM, LBP, and/or soil contaminants. The KEI launch vehicle integration and flight tests represent routine types of activities at Vandenberg AFB. Allowable public risk limits for launch-related debris would be extremely low; individuals within the general public would not be exposed to a probability of casualty greater than 1 in 1,000,000 for any single mission. Accident rates for ongoing operations involving solid rocket motor transportation over public roads have also been historically very low (e.g., 0.000002 accidents per mile driven). By adhering to established and proven safety standards and procedures, the level of risk to all personnel would be minimal.			therefore, project related impacts to health and safety would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.8 of the EA.
Hazardous Materials and Waste Management	ALL ALTERNATIVES: The MDA and their contractors would coordinate proposed site modification/ construction plans with the base IRP Office so as not to disturb potential soil or groundwater contamination at Buildings 960 and 970. If contaminated areas were to be disturbed, such as during the installation of underground utilities, power poles, barriers, or new pavement, the base IRP Office would implement appropriate safeguards and remediation procedures. Any removal of ACM and LBP from the buildings and facilities would require containerizing and proper disposal at the base landfill or at other permitted facilities located off base. Minimal quantities of hazardous materials would be used during KEI vehicle integration (less than 20 lb per test vehicle). All hazardous and non-hazardous wastes would be properly disposed of in accordance with applicable regulations. Hazardous material and waste-handling capacities would not be exceeded, and management programs would not have to change.			The proposed KEI activities would not be implemented; therefore, project related impacts on hazardous materials and waste management would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.1.9 of the EA.
Global Environment				
Global Atmosphere	ALL ALTERNATIVES: Each KEI flight test would release approximately 2 tons of HCl and 37 lb of free Cl into the atmosphere. However, solid rocket motors make a relatively small contribution to global ozone losses compared to other sources. It is estimated that the emission loads of chlorine (as HCl and Cl) from BMDS and other rocket launches worldwide, as projected from 2004 to 2014, would account for only 0.5 percent of the industrial Cl load from the US over the 10-year period. The GHG emissions from all KEI program activities (841 tons of CO_2 per year) represents less than 0.0001 percent of the anthropogenic emissions for this gas released on a global scale annually. As a result, the KEI flight tests would not contribute significantly to ozone layer depletion or to global warming.			The proposed KEI activities would not be implemented; therefore, project related impacts on the stratospheric ozone layer and on global warming would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.2.1 of the EA.
Biological Resources in the BOA	ALL ALTERNATIVES: The underwater propagation of KEI sonic booms would generate overpressures estimated at 1.23 psf or 155.4 dB (referenced to 1 microPascal) at a depth of 3 feet. Previous studies, however, show that brief transient sounds of this level underwater are unlikely to result in significant adverse effects to protected marine mammals and sea turtles. In the BOA, the probability for animal injuries from falling rocket			The proposed KEI activities would not be implemented; therefore, project related impacts on biological resources

Table 4-4. Comparison of Potential Environmental Consequences				
Locations and Resources Affected	**Proposed Action**			**No Action Alternative**
	Alternative 1 (LF-576E Launch Site)	**Alternative 2 (TP-01 Launch Site)**	**Alternative 3 (LF-06 Launch Site)**	
Biological Resources in the BOA (cont'd)	debris can be considered negligible. Studies show that the cumulative number of animals expected to be injured or killed from missile tests ranged from 0.0006 to 0.0016 over a 1-year period. Following the impact of rocket debris in the BOA, small quantities of propellant residues and battery electrolytes could be released from the KEI components, but such releases would be rapidly diluted in the seawater. The spent rocket motors and upper stage components would sink thousands of feet to the ocean bottom, out of reach of most marine life.			in the BOA would not occur. Conditions are not expected to change from that described for the Affected Environment in Section 3.2.2 of the EA.

1. If other buildings or facilities at Vandenberg AFB are later considered for KEI operations, then the MDA and Vandenberg AFB would conduct an appropriate NEPA analysis for each additional building/facility prior to use for KEI, initiated through completion of the USAF Form 813 (Request for Environmental Impact Analysis). (Section 2.1.2)

2. Construction equipment and other support equipment would be tuned and maintained to minimize engine exhaust emissions. (Section 4.1.1.1.1)

3. At Building 960, the new propane boiler would need to comply with SBCAPCD Rule 360. The new boiler would also need to be on the South Coast Air Quality Management District's approved boiler list or it must be certified by the SBCAPCD prior to installation. Prior to purchasing and installing the new boiler, the MDA would coordinate with the base Environmental Office to ensure that the boiler complies with all applicable regulatory and permitting requirements. (Section 4.1.1.1.1)

4. The use of emergency power portable generators for launches would require that they be permitted by the SBCAPCD or registered under the CARB Portable Equipment Registration Program. (Section 4.1.1.1.1)

5. During building/facility modifications, only trained and qualified personnel would abate ACM and LBP subject to disturbance. (Section 4.1.1.1.1)

6. Prior to implementing any vegetation removal or other disturbance at TP-01, and along the fiber optic route to TP-01, biologists would survey the impact areas. Depending on the survey results, a Biological Assessment might need to be prepared, unless the actions are discussed and the resulting take is authorized within the limits allowed by the Programmatic Biological Assessment currently in preparation by Vandenberg AFB and the USFWS. Vandenberg AFB would work with the USFWS to minimize impacts, as necessary. (Section 4.1.1.3.1)

7. Prior to initiating construction of the anti-terrorism barrier at Building 960, a qualified biologist would survey the affected vegetation areas for nesting birds. If nests of migratory bird species were found within vegetation that would be removed during construction, efforts would be made to avoid clearing of vegetation until the eggs are hatched and the young are fledged. Depending on the construction schedule, however, a take permit for the nests could become necessary. (Section 4.1.1.3.1)

8. Before building modifications and repairs would occur at Building 960, a qualified biologist would survey the building several months prior to project implementation to ensure that active bird nests are not present. If necessary, methods to discourage roosting and the initiation of nests, such as the installation of netting or the removal of nesting materials, would be implemented prior to building repairs and modifications. Existing migratory bird nests, however, would not be removed or destroyed unless determined by a qualified biologist to be inactive. (Section 4.1.1.3.1)

9. To minimize potential impacts on marine mammal species (pinnipeds), particularly from launch noise, KEI launch operations would comply with all acoustical and biological monitoring requirements, and other measures, identified in the NMFS programmatic take permit and current LOA. This would include:

a. Scheduling missions, whenever possible, to avoid launches during the harbor seal pupping season (March 1 through June 30), unless constrained by factors including, but not limited to, human safety, national security, or for a space vehicle launch trajectory necessary to meet mission objectives;

b. Conduct biological monitoring for all launches during the harbor seal pupping season in accordance with permit procedures, and report the results to the NMFS;

c. Conduct both acoustic and biological monitoring for all new space and missile launch vehicles during at least the first launch (including an existing vehicle from a new launch site), whether it occurs within the harbor seal pupping season or not. (Section 4.1.1.3.2)

11. The MDA will survey the launch pad blast zone for ESBB individuals prior to each launch that is scheduled during the butterfly flight season. If ESBB are observed in the project area, the MDA and Vandenberg AFB will reinitiate consultations with the USFWS to reanalyze the launch effects. (Section 4.1.1.3.2)

12. To minimize potential long-term impacts on Federally threatened and endangered species at Vandenberg AFB, the MDA would adopt the terms of the USFWS's earlier Biological Opinions for KEI program use of the LF-06, TP-01, and LC-576E launch sites. Specific to minimizing potential impacts on both California least terns and western snowy plovers during use of TP-01 and LC-576E, this would include the following actions:

    a. Avoid night and low-light launches to the extent possible;

    b. Conduct no more than three launches (total) per CY from LC-576E, including both KEI and Taurus launches;

    c. Of the three launches allowed at LC-576E per year, conduct no more than two launches annually between April 15 and July 31, which corresponds to the least tern nesting season and the core of the snowy plover nesting season. (Section 4.1.1.3.2)

13. Any KEI-related excavation work that would occur within 200 ft of a known archaeological site would require boundary testing to ensure that portions of the site are not inadvertently disturbed. Any archaeological site or potential site where tested boundaries are within 100 ft of the project would require monitoring by an archaeologist and/or Native American specialist during earth-disturbing activities. In the unlikely event that previously undocumented sites are discovered during the execution of the proposed action, work would be temporarily suspended within 100 ft of the discovered item and the base archaeologist would be notified immediately. Work would not resume until after the site had been secured and properly evaluated. The MDA would be responsible for implementation of any required avoidance of archaeological sites, or other mitigation measures, assigned to the project as a condition of approval for the activity by Vandenberg AFB and the California SHPO. (Section 4.1.1.4.1)

14. The base Environmental Office would brief KEI contractors and base support personnel on the sensitivity of cultural resources, applicable Federal regulations, and the mitigation measures that might be required if archaeological or other cultural sites are inadvertently damaged or destroyed. (Section 4.1.1.4.1)

15. Workers would not be notified of the location of nearby archaeological sites unless the sites are to be specifically avoided by KEI activities. (Section 4.1.1.4.1)

16. To avoid potential impacts to archaeological sites in the vicinity of TP-01, disk harrows would not be used for vegetation clearing and maintenance. (Section 4.1.1.4.1)

17. To minimize potential impacts on any nearby archaeological sites, the fiber optic extension to TP-01 would be trenched within 5 ft of the road shoulder and/or installed within the existing roadway pavement. (Section 4.1.1.4.1)

18. In the unlikely event that a flight termination or other launch anomaly were to impact land, response efforts would be coordinated with applicable range representatives and the California SHPO to develop the most appropriate mitigation measures based on the nature of the mishap and the cultural resources involved. (Section 4.1.1.4.2)

19. The construction contractor would apply state approved BMPs for soil erosion control, and for the collection and disposal of waste concrete and wastewater from concrete truck washout. No concrete wastes or wastewater would be allowed to enter drainages or surface waters. (Section 4.1.1.6.1)

20. Prior to any vegetation removal for the firebreak around TP-01, biologists would survey the surrounding area, which would include the delineation of any wetlands. Depending on the survey results, mitigation measures to be implemented at the site might include avoiding vegetation removal or other disturbance in the potential wetland area. (Section 4.1.1.6.1)

21. The construction contractor would be required to prepare a hazardous material Spill Prevention and Response Plan and obtain concurrence from the base Environmental Office. (Sections 4.1.1.6.1 and 4.1.1.9.1)

22. During replacement of the old HVAC system, boiler, and associated steam/water lines at Building 960, any remaining water in the closed loop water system would be collected, tested for contaminants, and treated, as necessary, in accordance with base procedures. (Section 4.1.1.6.1)

23. Following each canister launch and prior to removing the canister from the launch pad, any residual water from the steam generator ejection system would be recovered from the canister, tested for contaminants, and disposed of, as necessary, in accordance with base procedures. (Section 4.1.1.6.3)

24. At LC-576E, the MDA would sample any sediments and rainwater that collected within the shallow concrete trench that surrounds the pad to determine whether contaminants have accumulated at that site. The post launch samples would be compared to the California Human Health Screening Levels, the USEPA Region 9 Preliminary Remediation Goals, and the CA hazardous waste characteristics levels. If any constituent exceeds one or more of the three screening methods, then the MDA would notify the base Environmental Office to determine whether the sediments or rainwater in the trench would require special handling or disposal. (Sections 4.1.1.6.3 and 4.1.1.9.3)

25. During building/facility modifications and construction, particularly at Building 960, workers would use appropriate personal protective equipment because of the potential for exposure to ACM, LBP, and/or soil contaminants. (Section 4.1.1.8.1)

26. During post-launch operations for the cleanup of launch facilities and related equipment, workers would use appropriate personal protective equipment. (Section 4.1.1.8.3)

27. Because Building 960 and 970 are within AOC 219, the MDA would coordinate proposed site modification and construction plans with the base IRP Office so as not to disturb potential soil or groundwater contamination at the site. If contaminated areas were to be disturbed, such as during the installation of underground utilities, power poles, barriers, or new pavement, the base IRP Office would implement appropriate safeguards and remediation procedures. (Section 4.1.1.9.1)

28. Prior to replacement of the HVAC system at Building 960, any R-22 hydrochlorofluorocarbon refrigerant (a Class II ozone depleting substance) remaining in the old system would be recovered for proper disposal or reuse. (Section 4.1.1.9.1)

29. Modifications and related demolition activities at some buildings and facilities—primarily Building 960—might require surveys for ACM and LBP if such information is not already available. Any removal of hazardous materials from the buildings and facilities would require containerizing and proper disposal in accordance with base procedures. (Section 4.1.1.9.1)

30. Whenever possible, KEI operations at Vandenberg AFB would use environmentally-preferred and/or recyclable materials. (Section 4.1.1.9.1)

31. The MDA would conduct testing for potential soil contaminates in the areas immediately adjacent to the TP-01 and LF-06 launch pads prior to and following each KEI launch. The results of such tests would be reported to the base Environmental Office. (Section 4.1.1.9.3)

32. The cumulative generation of solid waste from KEI-related facility modifications and construction activities, in addition to other planned construction and demolition projects on base, has the potential to exceed the permitted disposal tonnage on base. Coordination of implementation schedules for these projects, and appropriate tracking of disposal tonnages, would ensure that permitted disposal amounts at the base landfill are not exceeded. (Section 4.3.1)

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Rickie D. Moon, Senior Systems Engineer, Teledyne Solutions, Inc.
MS, Environmental Management, Samford University
BS, Chemistry and Mathematics, Samford University
Years of Experience: 24

Susan B. Pearsall, Principal Technologist, Teledyne Solutions, Inc.
MS, Biological Sciences, University of Alabama in Huntsville
BS, Zoology, Auburn University
Years of Experience: 13

Kenneth J. Plotkin, Chief Scientist, Wyle Laboratories, Inc.
PhD, Aerospace Engineering, Cornell University
MEng, Aerospace Engineering, Cornell University
BS, Aerospace Engineering, Polytechnic Institute of Brooklyn
Years of Experience: 41

Erica D. Zamensky, Environmental Analyst, Teledyne Solutions, Inc.
MA, Outdoor Recreation/Natural Resource Planning, University of New Mexico
BS, English, Radford University
Years of Experience: 14

8.0 DISTRIBUTION LIST

The following is a list of agencies, organizations, and libraries that were sent a copy of the Kinetic Energy Interceptor Initial Development and Test EA and Draft FONSI.

Federal Agencies

National Marine Fisheries Service, Pacific Islands Regional Office, Honolulu, HI
National Marine Fisheries Service, Southwest Regional Office, Long Beach, CA
National Oceanic and Atmospheric Administration, Northwestern Hawaiian Islands Marine National Monument Office, Honolulu, HI
US Environmental Protection Agency, Region IX, San Francisco, CA
US Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, HI
US Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura, CA

State and Local Agencies

California Coastal Commission, San Francisco, CA
California Department of Fish and Game, Santa Barbara, CA
California Department of Parks and Recreation, Office of Historic Preservation, Sacramento, CA
California Regional Water Quality Control Board, Central Coast Region, San Luis Obispo, CA
Santa Barbara County Air Pollution Control District, Santa Barbara, CA
University of California, Santa Barbara, Dept. of Ecology, Evolution, and Marine Biology, Santa Barbara, CA

Native American Tribes

Santa Ynez Band of Chumash Indians, Tribal Elders Council, Santa Ynez, CA

Organizations

California Native Plant Society, Los Osos, CA
Environmental Defense Center, Santa Barbara, CA
La Purisima Audubon Society, Lompoc, CA
Sierra Club, Santa Barbara, CA

Libraries

Davidson Library, University of California, Santa Barbara, CA
Lompoc Public Library, Lompoc, CA
Santa Barbara Public Library, Santa Barbara, CA
Santa Maria Public Library, Santa Maria, CA

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APPENDIX A

STATE HISTORIC PRESERVATION OFFICER CORRESPONDENCE

(Note: Sensitive information on resources described in this correspondence is intentionally blacked out.)

DEPARTMENT OF THE AIR FORCE
30TH SPACE WING (AFSPC)

MAR 2 5 2008

Richard N. Cote
30 CES/CD
1172 Iceland Ave
Vandenberg AFB CA 93437-6012

Mr. Milford Wayne Donaldson
State Historic Preservation Officer
Department of Parks and Recreation
Office of Historic Preservation
P.O. Box 942896
Sacramento CA 94296-0001

Dear Mr. Donaldson

In accordance with Section 106 of the National Historic Preservation Act (NHPA) and 36 CFR Part 800, the Department of the Air Force, Vandenberg Air Force Base (VAFB), requests concurrence from the California State Historic Preservation Officer (SHPO) with our finding of No Adverse Effect (NAE) for the "Kinetic Energy Interceptor" program (KEI). This undertaking involves a number of related activities that together support a component part of the National Missile Defense (NMD) program at VAFB. Specifically, this NMD program will process and launch three KEI test missiles. Our NAE finding is based in part on the avoidance of known historic properties, and is also conditioned upon the monitoring of ground disturbance near known archaeological deposits. Several facilities are associated with the KEI undertaking, the majority of which are located on North VAFB (Atch 1). This letter combines our discussion of the Area of Potential Effect (APE) for the undertaking with our finding of No Adverse Effect.

Project Background

The President of the United States has directed the Department of Defense to deploy components of a National Missile Defense system in North America. The President's orders required the installation of four operational Ground Based Interceptor (GBI) defensive missiles at VAFB, which can be launched against a long-range ballistic missile attack on the United States. The existing GBI is designed to intercept hostile missiles in the midcourse phase of their flights, while the KEI weapon (this consultation) would intercept ballistic missiles in the boost, ascent, or midcourse phases. The KEI is not nuclear or explosive; its destructive power derives from its mass and its kinetic potential. The KEI is being developed in transportable format for deployment on land, on surface ships, and on submarines. The completed and proven system will consist of the Interceptor Component, the Mobile Launcher Component, and a Command, Control, Battle Management, and Communications Component. Attachment 2 is a general fact sheet that describes the KEI system.

The four GBI defensive missiles mentioned above have been installed at VAFB, and test launches supporting that program continue. Other NMD program components, including the KEI, are being designed and developed simultaneously. Facilities being used for development and testing of the various NMD components and the launch silos that contain the GBI defensive missiles now on alert at the base are not new construction. Only limited new construction has been needed to support the NMD program at VAFB, and this support has generally involved the expansion of existing asphalt paving, limited trenching for new utility lines, and construction of a data and communications complex for control of the GBI and test missiles while in flight.

Development of the NMD program has required VAFB to consult with the SHPO on four previous occasions; this letter is the fifth. Previous consultations included: 1) "IDT Construction Project" in June 2003 (No Historic Properties Affected, SHPO# USAF030613A), 2) "Ground Based Interceptor" in July through November 2003 (Adverse Effect with mitigation, SHPO# USAF030613A), 3) "Reuse of Minuteman Silo LF-24 and the Construction of a Second RIDT" in April 2007 (No Adverse Effect, SHPO# USAF070423A), and 4) "Small Target Missile Launch Site" in May 2007 (No Historic Properties Affected, SHPO# USAF070510A). Copies of these consultation letters are included for reference (Atch 3).

800.11(a)(1) – Description of the Area of Potential Effects

The KEI undertaking involves the possible use of three launch facilities and six support facilities (Atch 4). For the latter, the APE is the footprint of the building plus any external work areas. For the three launch sites, the APE is the entire developed area plus a vegetation clear zone around each site. These delineations ensure that all staging, reconstruction, and vegetation clearing activities will be contained within each separate APE. Also, a new fiber optic cable may be needed to connect Launch Facility 1840 with Building 1801. The cable would be placed in a narrow trench excavated into existing roads or road shoulders. The linear APE would be about 12 meters wide by 4 kilometers long, centered on the roads. Attachment 5 lists the KEI facilities proposed for reuse, their functions, associated APEs, and potential impacts to historic properties.

In total, the APE for this undertaking involves three potential launch facilities and six support facilities (office space for the KEI program will be identified in the future, but this is not expected to involve any historic properties). All direct impacts from the KEI undertaking will be contained within the building footprints of support facilities 1974, 1801, 8510, 6527, and 970. The APE for Facility 960 is larger than the building footprint because new utility connections, a trailer, and repairs to exterior asphalt and concrete are needed. The APEs for Facilities 1980, 1840, and 1611 include the developed areas of the launch facilities, plus a 100-foot wide (30 m) vegetation clear zone needed for fire control. The launch facilities require limited concrete repair, perimeter fence repair, and addition of new mounting hardware to tie down, support, access, and securely mount the stool-launched or canister-launched KEI missiles.

Of all the facilities proposed for reuse, only Launch Facility 06 (LF-06) and Missile Alert Facility 01A (MAF-01A) are eligible for the National Register of Historic Places (NRHP). In addition, the trenching for the utility connection between Facility 1840 and 1801 is an activity that could damage historic properties because archaeological deposits are located in the vicinity. These actions are discussed in detail in the pages that follow.

800.11(e)(1) – Description of the Undertaking

The undertaking described here is for the development and testing of the KEI, it does not include deployment of KEI defensive missiles at Vandenberg. The proposed project is the initial phase of the KEI Program, which consists of missile assembly and integration, and flight-testing of the interceptor booster. Three test flights for the KEI booster are planned to occur at VAFB, and all tests would be conducted over the North Pacific Ocean. Spent boosters and upper stage components from the KEI missiles would impact in the Broad Ocean Area. These tests of the KEI missile would not attempt to intercept and destroy simulated hostile targets.

Three launch facilities were proposed for reuse by the KEI undertaking. All of them may require clearing of ground vegetation within about 30 meters of the existing security fences, and the fences may need to be repaired or replaced. Although these activities have the potential to impact archaeological deposits, analysis using archaeological survey and site records, and the VAFB Geographic Information System (GIS) confirms that brush clearing and fence repairs will not damage any undisturbed soils. [redacted]

Three different types of launches may be accomplished as part of the KEI undertaking. In the first, planners intend to launch from a metal support "stool" at an open site. This requires placing the KEI vehicle on an upright, raised metal launch ring mounted on the launch stool that is secured to the concrete foundations at the ground surface. An existing stool launcher is in place at Launch Complex 576-E, but new stools could be installed on the existing concrete surfaces at either of the other two proposed launch sites. The stool launch likely would be followed by a canister launch, with the containerized KEI launching from within a protective metal tube that is secured to an existing ground-level launch site such as TP-01 or Launch Complex 576-E. A third type of test will launch the containerized KEI missile from within an existing underground silo. For this test, the KEI program proposes to reuse a Minuteman silo, LF-06, which is an NRHP-eligible Cold War site.

In support of the flight tests, processing of the KEI missiles also would occur at VAFB in Facilities 6527 and 960. These activities would involve assembling or "stacking" the KEI stages, inserting the assembled KEI into its protective metal canister, integration and testing of missile and canister systems, transport to the launch site, and installation at the launch site. A third processing facility, 970, is located near Facility 960 and would be used only for the storage of explosives. No modifications are needed to reuse Facility 970. All of these processing activities are commonly required by any established missile launch program at VAFB, and temporary reuse of these facilities for the KEI undertaking will not materially alter or affect them.

Along with the processing facilities and launch sites that were selected, three launch control centers also were identified, and each of the three KEI launches may use a different combination of processing facility, launch facility, and launch control center. Controlling the launches from either Facility 1974 or 8510 would require no permanent changes, only temporary electronic control panels would be needed to update them for the KEI program. Facility 6527 is also proposed as a Launch Control Center. Originally used to process experimental payloads, this facility would be outfitted with temporary electronic control panels to enable the KEI test launches. For all three facilities, none of the required changes would be permanent, and only Facility 1974 (MAF-01A) is eligible for the NRHP.

The KEI undertaking will have little physical impact at VAFB. The existing launch sites require only minor alterations to support the program, and launch control can be accomplished from existing facilities that are temporarily upgraded. The KEI missiles will be processed in existing facilities, which require limited concrete and asphalt repairs, upgraded doors and roofs, and updated utility systems. The need for new utility lines is minimal, except for a 4 kilometer-long segment that will connect TP-01 with the nearest communications node at Facility 1801.

800.11(e)(2) – Identification of Historic Properties

The dates of construction for the facilities proposed for reuse by the KEI program (Atch 5) range from 1959 to 1982, a span of 23 years from the middle part of the Cold War. The Cold War historic status of each of these facilities was evaluated in the 1990s when a basewide survey of Cold War-era construction was accomplished. The evaluation was conducted by personnel of the US Army Corps of Engineers Research Laboratory (CERL), who completed a three-phase study that examined all housing, structures, and other facilities dating to the Cold War. The final reports provided by CERL included summary recommendations listing which Cold War facilities met the criteria for NRHP eligibility and which did not. Based on the CERL evaluations, VAFB developed a Historic Preservation Plan (HPP) for the management of Cold War-era historic properties and wrote a Programmatic Agreement (PA) to implement the management practices. After negotiations with the SHPO, the PA and HPP were signed and executed in July 2002. Copies of these agreement documents are included here for your reference (Atch 7).

As noted in the discussions above, two KEI facilities were determined eligible for the NRHP. The eligible facilities are LF-06 and MAF-01A; the other seven facilities proposed for reuse by the KEI project are not eligible, as established by the PA. LF-06 is an underground silo that was constructed in 1961. It was used to launch Minuteman (MM) Intercontinental Ballistic Missiles during testing and training missions. MAF-01A is a Missile Alert Facility that was used by training crews to control MM launches. Completed in 1962, the MAF occupies a portion of Facility 1974, which is a one-story concrete block structure at ground level and an underground "Launch Control Capsule" from which personnel triggered the missile launches. The topside facility also contains the Peacekeeper Launch Control Center (PLCC), which was used during Peacekeeper test launches. During operations, the PLCC and the MAF had no connections or interactions, and either facility could be reused on a temporary basis by the KEI project.

The project APEs are all located in areas of VAFB that were thoroughly surveyed for archaeological sites. Survey records and the VAFB GIS were used to analyze all of the separate

APEs. [redacted]

The area of concern on North VAFB is the 40-foot wide, 2.5-mile long (12 meters by 4 kilometers) corridor needed to install the utility cable between TP-01 and the connection node in Facility 1801. Direct physical impacts will be minimal, however, because the cable will be laid in a narrow trench within the wider APE. The trench will be 12 inches (30 centimeters) wide or less and will be excavated in existing roads or in the disturbed road shoulders. The cable will be placed about 12 inches deep, within or just below the road base. This cable corridor falls within the "San Antonio Terrace Archaeological District," which was thoroughly surveyed and studied. In 1988, a PA was negotiated and signed establishing the district, and a HPP was written to guide treatment of the NRHP-eligible district elements within it (Atch 8). At the time the district was proposed, 134 prehistoric archaeological sites were known and were determined NRHP-eligible through consultation and negotiation of the PA (see SHPO# USAF871231A).

800.11(e)(3) – Description of the Affected Historic Properties

Affected historic properties related to this undertaking are limited to two Cold War facilities and two APEs having prehistoric archaeological concerns. The Cold War facilities are both located on North VAFB; one is a MM launch silo with a moveable above-ground shelter that can be positioned over the silo (Facility 1980; LF-06), and the other is a Missile Alert Facility or launch control center that was used for MM testing and training launches (Facility 1974; MAF-01A). Schematic diagrams, descriptive summaries, and photographs of these Cold War historic properties are included in Attachment 9.

On South VAFB, Facility 960 was constructed in 1963 and was originally used as the Ordnance Assembly Building (OAB) for Space Launch Complex 5 (SLC-5), which is located about six miles to the south. The 6,750 square foot structure is in the center of an octagonal safety fence enclosure, with Facility 970 situated just inside the security fence near its southern apex. Facility 970 was constructed in 1968 and measures about 340 square feet in area. It was used to store certain explosive materials a safe distance away from the main OAB. [redacted]

Included in Attachment 10 is the archaeological site record for [redacted] which indicates that the site was first described as a "shell midden" and was thought to be "largely destroyed" in 1950. Later survey documents describe it as a "moderate to high density scatter of Monterey chert flakes and bifaces" and noted that heavy wind erosion of the sandy soils likely occurred in the past. These documents are included for reference because [redacted] will involve repetitive access to the area, and unauthorized surface collection has been a problem in the past according to the site record. Other historic era impacts to [redacted] include paved and unpaved roads that traverse the site, and a small concrete-lined reservoir built into the site.

The proposed 4-kilometer route from TP-01 to Facility 1801 for placement of a new utility cable is illustrated in Attachment 11. The cable trench route passes through or near nine known

and mapped prehistoric archaeological sites. Seven of them (CA-SBA-1155, 1687, 1181, 1173, 1177, 998, and 1777) are listed in the HPP for the San Antonio Historic District (Atch 8). The other two (CA-SBA-2233 and 3649) were added to the VAFB site records after the PA and HPP documents were first drafted. As discussed above, impacts to the known archaeological deposits in the APE corridor for the utility cable trench will be avoided because the narrow (30 cm wide, 30 cm deep) trench will be excavated within the existing roads or the disturbed and built-up road shoulders. None of these archaeological sites will be adversely affected.

800.11(e)(4) – Effects of the Proposed Undertaking

Seven of the nine facilities proposed for reuse (1840, 1611, 1801, 8510, 6527, 960, and 970) are not NRHP-eligible and their reuse will have no effect on historic structures. The other two facilities, 1980 (LF-06) and 1974 (MAF-01A), are eligible for the NRHP based on Cold War criteria but their reuse does not constitute an Adverse Effect. The modifications necessary to utilize these facilities are summarized in Attachment 5, and aside from minor repairs to LF-06, only temporary changes and upgrades are needed to reuse both of them. In sum, both facilities will be asked to perform the same functions for which they were originally designed and built, but in support of a new testing program, and this proposed reuse will have no adverse effects.

For the purposes of this consultation, we assume NRHP eligibility for the nine prehistoric archaeological sites located along the route of the proposed utility cable connecting TP-01 and Facility 1801. We also assume NRHP eligibility for sites [redacted] The assumption of eligibility is a management decision that eliminates the need for extensive field testing of the sites and it pertains to this consultation only.

The assumption of eligibility also addresses a confusing issue related to the NRHP-eligible sites listed in the HPP for the San Antonio Terrace Archaeological District. In the concurrence letter (Atch 8) regarding the district, the SHPO agreed that "***intact*** archaeological properties on the San Antonio Terrace are eligible for inclusion in the National Register of Historic Places as an Archaeological District, under 36 CFR 60.4(d)…" (emphasis added). However, the HPP does not clarify the meaning of intact nor does it define the criteria that were used to determine which sites were identified as damaged. Since the agreement documents are unclear on this point, we wish to be cautious and assume that all of the prehistoric sites in the APE corridor for the cable trench are NRHP-eligible elements of the historic district, for the purposes of this consultation.

Project engineers have stated that the KEI undertaking will have no adverse effects on archaeological resources. Through planning and project design, a number of zero-impact options were identified. [redacted] All necessary utility connections and the placement of single power poles at cable terminations will be sited to avoid impacts to historic properties. The four kilometer-long communications cable connecting TP-01 with Facility 1801 will be placed in a relatively narrow, shallow trench within existing roads or in the built-up road shoulders. In addition, all earth disturbing activities within 30 meters of known archaeological sites will be monitored by qualified personnel to ensure that unanticipated finds are promptly recognized, reported, and treated according to 36 CFR Part 800.

800.11(e)(5) – Why the Criteria of Adverse Effect are Inapplicable

Based on the analysis in this letter, we believe that the reuse of the two NRHP-eligible Cold War-era facilities (LF-06 and MAF-01A) by the KEI undertaking will have No Adverse Effect. Further, we believe that no known archaeological sites will be adversely affected by the proposed undertaking. We offer the following specific reasons why the Criteria of Adverse Effect are inapplicable:

a. The two NRHP-eligible Cold War properties (LF-06 and MAF-01A) will be reused on a temporary basis and will require only temporary upgrades. Also, these two facilities will be used to perform the same tasks for which they were originally designed and built.

b. We have assumed eligibility for all the known prehistoric archaeological sites located within or adjacent to a project APE, but this undertaking, as proposed, will not damage any sites.

c. A major component of the project, a four-kilometer long corridor needed to place a utility cable, will be accomplished with a 30-centimeter wide, 30-centimeter deep trench within the wider APE corridor. The trench will be excavated into existing roadways and road shoulders and will not impact any undisturbed soils.

d. Vegetation clearing will use low-impact methods near known archaeological sites, and all ground disturbing activities will be monitored by qualified personnel.

e. Unanticipated discoveries made during this undertaking shall be evaluated by the monitor(s), and actions specified in 36 CFR 800.13 and Air Force guidance shall be followed.

f. Indirect impacts from the undertaking are unlikely. Construction crews are well supervised and all personnel are subjected to security checks and briefings about environmental hazards, resource protection, and other legal constraints. KEI personnel involved in the reuse of Facility 970 will be cautioned about artifact collecting and other illegal activities.

800.11(e)(6) – Views of the Public / Consulting Parties

VAFB maintains a Nation-to-Nation relationship with the Santa Ynez Band of Chumash Indians, a federally recognized tribe and the one having the closest historic ties to identified villages on base. VAFB Cultural Resources staff meets with the Chumash at least quarterly to discuss projects and other issues of interest. Native American views of the National Missile Defense program were sought on several occasions. The Chumash, represented by the Tribal Elders Council, were briefed about the overall plans related to the installation of the NMD components at VAFB. The Elders acknowledged the importance of the developing missile defense capability for the Air Force and the nation and voiced no specific negative comments.

Additionally, an Environmental Assessment (EA) that details aspects of the KEI testing and development program is being prepared and soon will be released for public review. In the past, for similar EAs related to the NMD program, no comments critical of the management of VAFB historic properties were received.

Summary

VAFB requests agreement from SHPO on the multiple component APEs for the KEI undertaking, as described in this consultation. Further, we assume that the nine archaeological sites within the four kilometer cable trench APE, the two archaeological sites adjacent to LF-06, and the single archaeological site underlying Facility 970 are NRHP-eligible, for the purposes of this consultation. We also note that planning for the KEI project has incorporated avoidance of known historic properties, and field management of the undertaking will include monitoring of ground-disturbing activities within 30 meters of known archaeological site boundaries. Any unanticipated discoveries made during construction will be managed according to law.

Based on the preceding, VAFB requests SHPO concur with our finding of No Adverse Effect for the Kinetic Energy Interceptor undertaking at VAFB. Your receipt of this letter and concurrence with our finding constitutes satisfactory evidence that we have complied with Section 106 of the NHPA. If you do not concur with our finding, we understand that further consultation will be necessary. If you have questions, please contact Dr. James Carucci by phone (805-606-2860) or email (James.Carucci@Vandenberg.AF.MIL) or phone Mr. Tom deVenoge (805-605-8684).

Sincerely

RICHARD N. COTE, P.E.
Deputy Base Civil Engineer

Attachments:
1. General Project Location
2. KEI Fact Sheet
3. Previous NMD Consultations
4. Map of Facility Locations
5. Summary of APEs and Impacts
6. Proposed Launch Sites
7. Cold War PA and HPP
8. San Antonio PA and HPP
9. Descriptions of Cold War Facilities
10. Site CA-SBA-246
11. TP-01 to Facility 1801 APE

cc:
HQ AFSPC/A7CV w/o Atch
30 CES/CC/CEV/CEVNC w/o Atch

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APPENDIX B

CALIFORNIA COASTAL COMMISSION RESPONSE

STATE OF CALIFORNIA – THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, GOVERNOR

CALIFORNIA COASTAL COMMISSION
45 FREMONT, SUITE 2000
SAN FRANCISCO, CA 94105- 2219
VOICE AND TDD (415) 904- 5200
FAX (415) 904- 5400

June 6, 2008

Beatrice Kephart
Chief, Environmental Flight
30th Space Wing (AFSPC)
30 CES/CEV
ATTN: Andrew Edwards
1028 Iceland Avenue
Vandenberg AFB, CA 93427-6010

Subject: Negative Determination ND-021-08 (Kenetic Energy Interceptor Program, Vandenberg Air Force Base, Santa Barbara Co.)

Dear Ms. Kephart:

The Coastal Commission staff has reviewed the above-referenced negative determination. The Air Force proposes to implement the initial phase of the Kenetic Energy Interceptor (KEI) program, which consists of missile assembly and integration, and flight testing of the KEI interceptor booster at Vandenberg Air Force Base (VAFB). Three risk reduction flight tests for the KEI booster would be conducted over the Pacific Ocean but actual target interceptions are not included as a part of these test flights. Following launch of the test flights, the first stage booster would splash down in the Pacific Ocean approximately 75 to 325 nautical miles off the California coast. Upper stages would impact the ocean north of the Northwestern Hawaiian Islands and outside of the Papahānaumokuākea Marine National Monument. The three test flights would be launched in a westward direction from one or more of three existing VAFB launch sites: Launch Complex 576E, Test Pad-01, and Launch Facility 06. Missile assembly and integration activities would occur at existing buildings and facilities on VAFB, and only minor construction and modifications to those facilities would occur under the proposed project. In addition, if Test Pad-01 is used, approximately 2.5 miles of fiber optic cable line would need to be extended to the launch pad from the nearest connection node at Building 1801. The cable would be installed in trench within five feet of the existing roadway shoulder or down the middle of the roadway. The Air Force states that the three flight tests would occur between 2009 and 2012.

KEI launches would generate lower noise levels when compared to Peacekeeper, Taurus, and Atlas V rocket launches that currently occur at VAFB. Sonic booms would typically reach their maximum level approximately 45 miles off the coastline, and would not be audible on any coastal areas, including the Channel Islands. The Air Force states that no evidence of injury, mortality, or abnormal behavior has been observed for Pacific harbor seals following launches at VAFB, and that population levels at the pinniped haul-out sites have remained constant in recent years. The Air Force will implement standard scheduling and monitoring measures included in

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the programmatic take permit issued by the National Marine Fisheries Service to minimize potential adverse effects on pinnipeds. The Air Force will also adopt the terms of the U.S. Fish and Wildlife Service's Biological Opinion previously issued for launch activities at Test Pad-01 and Launch Complex 576E to minimize potential impacts to California least terns and western snowy plovers, including limits on annual launches at Launch Complex 576C and avoiding night and low-light launches to the extent possible.

To protect public safety in the event of a launch and/or early flight malfunction, Ocean Beach County Park is closed on average three times per year and Point Sal State Beach on average twice a year due to ongoing launch activities at Launch Complex 576-E and Launch Facility 06, respectively. The Air Force reports that total rocket launches for all existing spacelift systems at VAFB are currently expected to total 13 in 2008 and 16 in 2009, and concludes that three proposed KEI launches over a four-year period would result in only a minor increase in temporary beach closures at Ocean Beach County Park and/or Point Sal State Beach. The Air Force is currently negotiating with the County of Santa Barbara to resolve public access issues regarding the ability of the public to reach Point Sal State Beach through VAFB property. While the Coastal Commission has not been a party to those negotiations, Commission staff has communicated to both the County and the Air Force that any proposal to implement changes to existing and long-standing public access to Point Sal State Beach would be subject to the Commission's federal consistency review authority.

In conclusion, the Coastal Commission staff **agrees** with the Air Force's determination that the proposed Kenetic Energy Interceptor program at Vandenberg Air Force base will not adversely affect coastal zone resources. We therefore **concur** with your negative determination made pursuant to 15 CFR 930.35 of the NOAA implementing regulations. Please contact Larry Simon at (415) 904-5288 should you have any questions regarding this matter.

Sincerely,

PETER M. DOUGLAS
Executive Director

cc: CCC – South Central Coast District
California Department of Water Resources
Governor's Washington, D.C., Office
Santa Barbara County Supervisor Joni Gray

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APPENDIX C

US FISH AND WILDLIFE SERVICE RESPONSE

United States Department of the Interior

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

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
2009-F-0107

January 21, 2009

Beatrice L. Kephart
30 CES/CEV
1028 Iceland Avenue
Vandenberg Air Force Base, California 93437-6010

Subject: Kinetic Energy Interceptor Program Launches from Facilities 06 and 576-E on Vandenberg Air Force Base, Santa Barbara County, California

Dear Ms. Kephart:

We are responding to your correspondence regarding the U.S. Air Force's (Air Force) proposed Kinetic Energy Interceptor (KEI) launches from Launch Facility 06 (LF-06) and Space Launch Complex 576-E (576-E) on Vandenberg Air Force Base (VAFB) and the effects of these activities on the federally endangered California least tern (*Sterna antillarum browni*) and Gaviota tarplant (*Deinandra increscens* spp. *villosa*), and the federally threatened western snowy plover (*Charadrius alexandrinus nivosus*). We received your request for formal consultation, dated December 3, 2008, in our office on December 5, 2008. Your December 3, 2008, letter also requested our concurrence that the KEI launches are not likely to adversely affect federally endangered California brown pelicans (*Pelecanus occidentalis*), southern sea otters (*Enhydra lutris nereis*), or El Segundo blue butterflies (*Euphilotes battoides allyni*)(ESBB). 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.).

The proposed action consists of implementing the initial phase of the KEI program, which includes flight-testing the interceptor booster at LF-06 and 576-E. Modifications to the existing facilities at LF-06 and 576-E would be necessary to meet KEI program requirements. Preparation for launches at both sites would require firebreak maintenance using a mower or disker. The launches would also require minor additions to paved areas at pre-existing launch facilities. The additions include concrete pads, launch stools, and other structural framework. Four flight tests for the KEI booster are planned to occur from VAFB. Flight tests are expected to begin in September 2009 and continue at least through 2012, with no more than one launch occurring in a given year. The KEI booster is smaller than other vehicles launched from these sites and generates a lower decibel level as well.

After reviewing the proposed project, we do not believe initiating a new formal consultation is necessary for the KEI launches. We reached this conclusion using information provided in the

December 2008 biological assessment prepared by ManTech SRS Technologies, Inc., for the Department of Defense Missile Defense Agency, previous biological opinions 1-8-98-F-25R and 1-8-06-F-43, and information in our files.

You determined that the KEI project may affect, but is not likely to adversely affect, southern sea otters or California brown pelicans and requested our concurrence with these findings. Previous biological opinions and SRS monitoring reports describe the effects of VAFB launch events on sea otters and brown pelicans. These documents acknowledge that both species may display a startle response seemingly caused by high-decibel noise or visual stimuli (e.g., light flash, exhaust plume, aircraft overflights) present during a launch. The noise appears to cause only a temporary effect, as both species typically return to normal behavior and habitat usage shortly after the launch noise subsides. Based on the lack of documented effects on southern sea otters and brown pelicans during previous monitoring of launch operations at VAFB, we concur that the proposed KEI launches from LF-06 and 576-E on VAFB may affect, but are not likely to adversely affect, southern sea otters or brown pelicans.

You also requested our concurrence that the KEI program may affect, but is not likely to adversely affect, ESBB. Potential impacts to ESBB as identified in the biological assessment for this project include direct effects (ground-level heat and emissions from the launch blast) and indirect effects (destruction of seacliff buckwheat (*Eriogonum parvifolium*), the host plant for ESBB). The closest verified ESBB observation is 259 meters from 576-E, and the closest seacliff buckwheat plant is approximately 30 meters from the site across a paved area. We agree that it is unlikely that ESBB would fly through the blast zone during the 6- to 8-second launch period; however, to confirm this assumption, you would conduct pre-launch surveys to determine if ESBB individuals occur within the project area. If ESBB are observed in the blast zone, you would then reinitiate consultation with our office to reanalyze the effects of the proposed project on ESBB. Therefore, we concur that the KEI program may affect, but is not likely to adversely affect, ESBB.

You determined that the KEI project launches may affect, and are likely to adversely affect, western snowy plovers and California least terns. Your conclusions are conditional, based on whether or not your project activities occur during the nesting season. We agree that avoiding launches from 576-E between March 1 and September 30 would likely eliminate many of the potential disturbances to nesting California least terns. In their biological assessment, SRS indicated that decibel levels from the proposed KEI launches are expected to be lower than those emitted during the launches described in the documents listed above. In addition, the proposed project adds only one launch per year, from 2009 through 2012, to the launch activities already occurring on VAFB. Thus, given the parameters established in biological opinion 1-8-98-F-25R, we do not feel that the information provided on the KEI project warrants re-initiation of formal consultation for western snowy plovers and California least terns.

You determined that the project launches and firebreak maintenance may affect, and are likely to adversely affect, Gaviota tarplant. Gaviota tarplant is known to exist within the firebreak for LF-06; however, the information you provided with your December 3, 2008, request does not reveal any additional or compounding effects of the KEI launches or firebreak mowing and disking that were not already considered and evaluated in biological opinion 1-8-06-F-43. We continue to recommend that the Air Force:

1. Conduct work in areas known to contain Gaviota tarplant between October and January to avoid the germination and blooming seasons;

2. Replace topsoil containing Gaviota tarplant where possible; and

3. Flag and avoid areas that contain Gaviota tarplant.

We appreciate the opportunity to provide comments on the proposed project and look forward to continue working with you to avoid and/or minimize potential adverse effects on federally listed species. If you have any questions regarding this letter, please contact David Simmons of my staff at (805) 644-1766, extension 368.

Sincerely,

Roger P. Root
Assistant Field Supervisor

APPENDIX D

AIR EMISSIONS METHODOLOGY AND CALCULATIONS

D.1 METHODOLOGY

All KEI-related direct and indirect emissions of criteria pollutants for site modifications/construction, pre-launch preparations (including local rocket motor transportation), launch, and post-launch activities were estimated. Detailed methodologies and emission calculations for each phase of activities are contained herein.

D.1.1 Construction Equipment Emissions

Pollutant emissions resulting from activities associated with site modifications and construction at the launch sites and support buildings were estimated. Site modifications and construction would involve the use of various non-road equipment, portable generators, and trucks. Pieces of equipment often used for such activities include, but are not limited to, backhoes, loaders, excavators, air compressors, cranes, graders, rollers, and heavy trucks. Emissions from the site modification and construction activities were estimated based on the projected construction activity schedule, the number of vehicles/pieces of equipment, and vehicle/equipment utilization rates (Table D-1). Emission factors for heavy-duty diesel equipment were obtained from CARB's Off-road Mobile Source Emission Factors (CARB, 2007b). The following formula was used to calculate hourly emissions from non-road engine sources, including cranes, backhoes, and the like:

E = n x EF

where

E = emission in pounds (lb)/day
n = hours/day of equipment operation
EF = off-road mobile source emission factor in lb/hour

D.1.2 On-road Vehicle Operations

The emissions due to construction worker commutes, employee vehicle, and delivery/service trucks used were included in the analysis. Emission factors for motor vehicles were taken from the CARB's On-Road Emission Factors (CARB, 2007a). A sample calculation for the annual emission rate for NO_x from an on-road vehicle is presented below:

Additional employees	=	50
Number of trips/day	=	2
Number of days/year	=	80
Average vehicle commute distance	=	35 miles
On-road emission factor	=	0.001 lb/mile
Annual emission level	=	50 x 2 x 80 x 35 x 0.001/2000 lb/ton
	=	0.14 ton/year

D.1.3 Emissions from Paints, Architectural Coatings, and Adhesives

Emission factors relating emissions to total square footage (sqft) were used to estimate VOC emissions from architectural coating activities, primarily painting, and from launch vehicle assembly activities. VOC content was obtained from SBCAPCD Rules 323 (*Architectural Coatings*) and 353 (*Adhesives and Sealants*) (SBCAPCD, 1999, 2001). The following formula was used to calculate emissions from such activities:

Table D-1. Construction Emissions

Construction Equipment Use

Equipment Type	Units	Days	Hours/Day	Hours
Air Compressors	1	30	4	120
Cranes	1	30	7	210
Generator Sets	1	30	7	210
Tractors/Loaders/Backhoes	1	30	7	210

Construction Equipment Emission Factors (lb/hour)

Equipment	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Air Compressors	0.3782	0.7980	0.1232	0.0007	0.0563	0.0563	63.6
Cranes	0.6011	1.6100	0.1778	0.0014	0.0715	0.0715	7.2
Generator Sets	0.3461	0.6980	0.1075	0.0007	0.0430	0.0430	128.7
Tractors/Loaders/Backhoes	0.4063	0.7746	0.1204	0.0008	0.0599	0.0599	61.0

Construction Equipment Emissions (tons)

Equipment	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Air Compressors	0.0227	0.0479	0.0074	0.0000	0.0034	0.0034	3.8
Cranes	0.0631	0.1691	0.0187	0.0001	0.0075	0.0075	13.5
Generator Sets	0.0363	0.0733	0.0113	0.0001	0.0045	0.0045	6.4
Tractors/Loaders/Backhoes	0.0427	0.0813	0.0126	0.0001	0.0063	0.0063	7.0
Total Equipment Emissions	0.1648	0.3716	0.0500	0.0003	0.0217	0.0217	30.7

Painting

VOC Content	1.25	lb/gallon
Coverage	400	sqft/gallon
Emission Factor	0.003125	lb/sqft

Building/Facility	Surface Area [sqft]	VOC [lb]	VOC [tons]
TP-01 (Facility 1840)	1000	3.125	0.001563
Building 6527	5000	15.625	0.007813
Building 960	5000	15.625	0.007813
Building 970	100	0.3125	0.000156
Total	11100	34.6875	0.017344

Transportation of Concrete

Volume of Concrete (Cubic Yards)	80.7
Truck Capacity (Cubic Yards)	10
Number of Deliveries	8
Number of Trips	2
Miles Per Trip	30
Total Miles	484.4

	Pad 1	Pad 2
Length	20	6
Width	20	6
Depth	5	5
Volume	74.1	6.7

Pollutant (pounds/mile)	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Emission Factor (lbs/mile)	0.0136	0.0446	0.0035	0.0000	0.0022	0.0019	4.2
Total Emissions (lbs)	6.60	21.60	1.70	0.02	1.04	0.92	2045.2
Total Emissions (tons)	0.0033	0.0108	0.0009	0.0000	0.0005	0.0005	1.0

Delivery of Equipment, Supplies, and Services

Number of Deliveries	2
Number of Trips	2
Miles/Trip	30
Days of Construction	30
Total Miles	3600

Pollutant (lb/mile)	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Emission Factor (lb/mile)	0.0219	0.0237	0.0030	0.0000	0.0009	0.0007	2.7
Total Emissions (lb)	79.02	85.37	10.77	0.09	3.08	2.66	9790.0
Total Emissions (tons)	0.0395	0.0427	0.0054	0.0000	0.0015	0.0013	4.9

Table D-1. Construction Emissions (continued)

Worker Commutes

Number of Workers	20
Number of Trips	2
Miles/Trip	30
Days of Construction	30
Total Miles	36000

Pollutant (lb/mile)	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Emission Factor (lb/mile)	0.0105	0.0011	0.0011	0.0000	0.0001	0.0001	1.1
Total Emissions (lb)	379.74	39.70	38.85	0.39	3.06	1.91	39583.2
Total Emissions (tons)	0.1899	0.0199	0.0194	0.0002	0.0015	0.0010	**19.8**

Construction Emissions Roll-Up (tons)

Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Construction Equipment	0.1648	0.3716	0.0500	0.0003	0.0217	0.0217	30.7
Painting	0.0000	0.0000	0.0173	0.0000	0.0000	0.0000	0.0
Transportation of Concrete	0.0033	0.0108	0.0009	0.0000	0.0005	0.0005	1.0
Delivery of Equipment,	0.0395	0.0427	0.0054	0.0000	0.0015	0.0013	4.9
Worker Commutes	0.1899	0.0199	0.0194	0.0002	0.0015	0.0010	19.8
Total Construction Emissions	**0.3975**	**0.4449**	**0.0930**	**0.0006**	**0.0253**	**0.0244**	**56.5**

Sources: CARB, 2007a, 2007b; SBCAPCD, 2001

E = [(F x G) / 1000] x H

where

E = emissions of VOCs from architectural coatings
F = lb of VOC emissions/gallon
G = total area to be coated in sqft
H = paint or coating coverage in sqft/gallon

A sample calculation for architectural coating VOC emissions during construction/renovation of an example facility is provided below:

E = 0.83 [lb/gallon] x 100,000 [sqft] / 400 [sqft/gallon] / 2,000 [lb/ton]
= 0.104 tons

D.1.4 Emissions from Helicopter Operations

Emission factors relating emissions to total helicopter operations on the day of the launch were estimated. Emission factors were taken from the Emissions and Dispersion Modeling System (EDMS) v. 5.0.2 (FAA, 2007). Although the exact type of aircraft to make the safety sweeps is not specified at this time, the UH-1N helicopter was used for the emission calculations. These activities and their associated emissions are extremely limited and no substantial change is expected regardless of what aircraft is used. The following formula was used to calculate emissions from the helicopters:

E = EF x N

where

E = Helicopter emissions
EF = Emission per operation (landing and take-off [LTO] or 90 minute flight)
N = Number of Operations

A sample calculation for helicopter emissions from 20 flights is provided below:

E = 1.30 [lb/operation] x 20 [operations] / 2000 [lb/ton]
= 0.0130 tons of emissions

D.1.5 Emissions from the KEI Booster

Emissions from the KEI booster were developed from fuel chemistry and molar fractional analysis of the solid rocket propellant used in the first two stages of a Peacekeeper ICBM booster (SMC Det 12/RPD, 2005, 2006). The following formula was used to calculate emissions from the launch vehicle:

E = %M x T
where
E = KEI booster emissions
%M = Percentage in the products of combustion
T = Total mass of propellant

A sample calculation for CO_2 from the launch vehicle is provided below:

E_{CO2} = 2.44 [%CO_2] x 16400 [lb of propellant] / 2000 [lb/ton]
= 0.2 tons CO_2

D.1.6 Boiler Emissions

The emissions from new boiler heating at Building 960 were included in the analysis. Emission factors were obtained from USEPA's AP-42, Section 1.5 (Liquefied Petroleum Gas Combustion) (USEPA, 1996). It was conservatively assume that $PM_{2.5} = PM_{10}$, and that the sulfur concentration for commercial propane = 15 grams/100 cubic ft. A sample calculation for the annual emission rate for CO from a propane boiler is presented below:

Maximum Heat Input = 1.2 (million [MM] BTU/hour)
Hours Operated = 8640 [hours/year]
Emission factor = 1.9 [lbs CO/1000 gallons]

Annual emission level = 1.2 [MMBTU/hour] x 8640 [hours/year] x 1.9 [lbs CO/1000 gallons] / [91.5 MMBTU/gallon] / 2000 [lbs/ton]
= 0.108 ton/year

D.2 EMISSION ESTIMATIONS

D.2.1 Site Modifications/Construction, Rocket Motor Transportation, and Pre-Launch Preparations

All direct and indirect emissions of criteria pollutants for the site modifications/construction and pre-launch preparations (including local rocket motor transportation) were estimated (Table D-2). Air emissions for pre-launch activities would include:

- Combustive emissions from equipment used for facility modifications/construction
- Painting/corrosion control efforts from refurbishing/constructing at facilities

Table D-2. Pre-launch Emissions for a Single Launch

Delivery of Equipment, Supplies and Services to VAFB

Number of Deliveries	1
Number of Trips	2
Miles/Trip	30
Days of Assembly	90
Total Miles	5400

Pollutant (lb/mile)	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Emission Factor (lb/mile)	0.0219	0.0237	0.0030	0.0000	0.0009	0.0007	2.7
Total Emissions (lb)	118.53	128.05	16.16	0.14	4.62	3.99	14684.9
Total Emissions (tons)	0.0593	0.0640	0.0081	0.0001	0.0023	0.0020	7.3

Delivery of Equipment, Supplies, and Services to the Launch Site

Number of Deliveries	1
Number of Trips	2
Miles/Trip	5
Days of Delivery to Launch Site	2
Total Miles	20

Pollutant (lb/mile)	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Emission Factor (lb/mile)	0.0219	0.0237	0.0030	0.0000	0.0009	0.0007	2.7
Total Emissions (lb)	0.44	0.47	0.06	0.00	0.02	0.01	54.4
Total Emissions (tons)	0.0002	0.0002	0.0000	0.0000	0.0000	0.0000	0.0

Use of Adhesives During Assembly

VOC Content	3.5	lb/gallon
Coverage	150	sqft/gallon
Emission Factor	0.07	lb/sqft

Activities	Area [sqft]	VOC [lb]	VOC [tons]
Assembly	200	4.7	0.0023
Total	200	4.7	0.0023

Crane Use at Launch Site

Equipment Type	Units	Days	Hours/Day	Hours
Crane	1	10	4	40

Pollutant	CO	NO_x	VOC	SOx	PM_{10}	$PM_{2.5}$	CO_2
Emission Factor	0.6011	1.6100	0.1778	0.0014	0.0715	0.0715	128.7
Total Emissions (tons)	0.0120	0.0322	0.0036	0.0000	0.0014	0.0014	2.6

Boiler Emissions

Maximum Heat Input	1.2	MMBTU/hr
Hours of Operation (50% of the time)	8640	hours/yr

Pollutant	CO	NO_x	VOC	SOx	PM_{10}	$PM_{2.5}$	CO_2
Emission Factor (lb/10^3 gal)	1.9	14	0.5	0.015	0.6	0.6	12500
Total Emissions (tons)	0.108	0.793	0.028	0.001	0.034	0.034	708.2

Worker Commutes

Number of Workers	20
Number of Trips	2
Miles/Trip	30
Days of Pre-launch Days	90
Total Miles	108000

Pollutant (lb/mile)	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Emission Factor (lb/mile)	0.0105	0.0011	0.0011	0.0000	0.0001	0.0001	1.1
Total Emissions (lb)	1139.23	119.11	116.55	1.16	9.19	5.72	118749
Total Emissions (tons)	0.5696	0.0596	0.0583	0.0006	0.0046	0.0029	59.4

Table D-2. Pre-launch Emissions for a Single Launch (continued)

Pre-launch Emission Roll-Up (tons)

Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Delivery of Equipment, Supplies, and Services to VAFB	0.0593	0.0640	0.0081	0.0001	0.0023	0.0020	7.3
Delivery of Equipment, Supplies, and Services to the Launch Site	0.0002	0.0002	0.0000	0.0000	0.0000	0.0000	0.0
Use of Adhesives During Assembly	0.0000	0.0000	0.0023	0.0000	0.0000	0.0000	0.0
Crane Use at Launch Site	0.0120	0.0322	0.0036	0.0000	0.0014	0.0014	2.6
Worker Commutes	0.5696	0.0596	0.0583	0.0006	0.0046	0.0029	59.4
Boiler Emissions	0.1076	0.7932	0.0283	0.0008	0.0340	0.0340	708.2
Total Pre-launch Emissions	**0.7488**	**0.9492**	**0.1006**	**0.0015**	**0.0423**	**0.0403**	**777.5**

Sources: CARB, 2007a, 2007b; SBCAPCD 1999

- Emissions from delivery of equipment, supplies and services
- Employee commuting during construction and pre-launch activities
- Emissions from transporting KEI motors, components, and equipment to Vandenberg AFB
- Emissions from transporting the KEI launch vehicle and equipment to the launch site
- Use of solvent/paints/adhesives during vehicle integration
- New boiler emissions from facilities used for vehicle integration and processing

D.2.2 Launch Activities

Under the Proposed Action, four KEI flight tests would occur, with no more than one launch occurring in any given year. In the hours before the launch, helicopters (as well as other remote sensors) could be used to verify that the hazard areas are clear of non-mission-essential aircraft, vessels, and personnel. All direct and indirect emissions of criteria pollutants for the helicopter exhaust emissions and from the KEI test flight vehicles were estimated (Table D-3). In addition to criteria pollutants, the products of combustion from the KEI test flight vehicle would also include other common products of combustion including aluminum oxide, hydrogen chloride, hydrogen, nitrogen, carbon dioxide, and water. The KEI booster generally uses the same type of solid propellant as used in the first two stages of a Peacekeeper booster (SR-118 and SR-119). Emissions from the KEI booster were developed from fuel chemistry and molar fractional analysis of the solid rocket propellant used in the first two stages of a Peacekeeper ICBM booster (SMC Det 12/RPD, 2005, 2006). Table D-3 also provides a comprehensive breakdown of the flight test vehicle emissions from a single launch.

D.2.3 Post-Launch Operations

In the hours and days following each launch, a general safety check and cleanup of the launch site would occur. All direct and indirect emissions of criteria pollutants for worker commutes, the removal of equipment from the launch sites, and general refurbishment of launch facilities were estimated (Table D-4).

D.2.4 Overall Project Emissions

All direct and indirect emissions of criteria pollutants were estimated for the initial site modifications/ construction; and for pre-launch preparations (including local rocket motor transportation), launch, and post-launch activities for a single launch (Table D-5).

Table D-3. Flight Activity Emissions for a Single Launch

Helicopter Emissions

Number of Flights	2					
	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
LTO Emission Factors (lb/operation)	1.120	7.350	0.24	1.72	0.146	0.146
LTO Emission (tons)	0.0011	0.0073	0.0002	0.0017	0.0001	0.0001
Flight Emission Factors (lb/operation)	2.97	7.59	0.33	0.00	0.000	0.000
Flight Emissions (tons)	0.00297	0.00759	0.00033	0	0	0
Total (tons)	**0.0041**	**0.0149**	**0.0006**	**0.0017**	**0.0001**	**0.0001**

Launch Emissions

Number of Launches	1					
Avg SR118 Prop Mass (lbm)	16400					
Avg SR119 Prop Mass (lbm)	3600					
	Molar Mass (grams)	SR118 (%M)	SR118 (lb)	SR119 (%M)	SR119 (lb)	Total (tons)
Aluminum Oxide (solid) (Al_2O_3)	101.96	35.89%	5886.0	4.32%	155.664	3.0208
Carbon Monoxide (CO)	28.01	22.13%	3629.3	23.21%	835.488	2.2324
Carbon Dioxide (CO_2)	44.01	2.44%	400.2	1.05%	37.692	0.2189
Hydrogen Chloride (HCl)	36.46	21.21%	3478.4	15.74%	566.748	2.0226
Water (H_2O)	18.02	7.45%	1221.8	8.30%	298.656	0.7602
Hydrogen (H_2)	2.02	2.23%	365.7	32.63%	1174.608	0.7702
Nitrogen (N_2)	28.01	8.38%	1374.3	7.99%	287.784	0.8311
Other Misc		0.27%	44.3	6.76%	243.36	0.1438
Total		100.00%	16400.0	100.00%	3600	10.0000

Total Flight Activity Emissions (tons)

Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
Helicopter Emissions	0.0041	0.0149	0.0006	0.0017	0.0001	0.0001
Launch Emissions	2.2324	0.0000	0.0000	0.0000	0.3111	0.2172
Total Emissions	**2.2365**	**0.0149**	**0.0006**	**0.0017**	**0.3113**	**0.2173**

Sources: FAA 2007; SMC Det 12/RPD, 2005, 2006

Note: Launch PM_{10} and $PM_{2.5}$ emissions are assumed to be 10.3 and 7.2 percent total aluminum oxide (Al_2O_3), respectively.

Table D-4. Post-launch Emissions for a Single Launch

Removal of Equipment

Number of Removals	2
Number of Trips	2
Miles/Trip	10
Days of Breakdown	10
Total Miles	400

Pollutant (lb/mile)	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Emission Factor (lb/mile)	0.0219	0.0237	0.0030	0.0000	0.0009	0.0007	2.7
Total Emissions (lb)	8.78	9.49	1.20	0.01	0.34	0.30	1087.8
Total Emissions (tons)	0.0044	0.0047	0.0006	0.0000	0.0002	0.0001	0.5

Worker Commutes

Number of Workers	20
Number of Trips	2
Miles/Trip	30
Days of Breakdown	10
Total Miles	12000

Pollutant (lb/mile)	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Emission Factor (lb/mile)	0.0105	0.0011	0.0011	0.0000	0.0001	0.0001	1.1
Total Emissions (lb)	126.58	13.23	12.95	0.13	1.02	0.64	13194.4
Total Emissions (tons)	0.0633	0.0066	0.0065	0.0001	0.0005	0.0003	6.6

Painting

VOC Content	1.25	lb/gallon
Coverage	400	sqft/gallon
Emission Factor	0.003125	lb/sqft

Building/Facility	Surface Area [sqft]	VOC [lb]	VOC [tons]
Launch Facility	5000	15.625	0.0078125
Total	5000	15.625	0.0488281

Total Post-launch Emissions (tons)

Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Removal of Equipment	0.0044	0.0047	0.0006	0.0000	0.0002	0.0001	0.5
Worker Commutes	0.0633	0.0066	0.0065	0.0001	0.0005	0.0003	6.6
Painting	0.0000	0.0000	0.0488	0.0000	0.0000	0.0000	0.0
Total Post-launch Emissions	0.0677	0.0114	0.0559	0.0001	0.0007	0.0005	7.1

Sources: CARB, 2007a; SBCAPCD, 2001

Table D-5. Roll-up of All Direct and Indirect Emissions Associated with the Proposed Action for a Single Launch

Total Construction Emissions (tons)

Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Construction Equipment	0.1648	0.3716	0.0500	0.0003	0.0217	0.0217	30.7
Painting	0.0000	0.0000	0.0173	0.0000	0.0000	0.0000	0.0
Delivery of Equipment and Supplies	0.0395	0.0427	0.0054	0.0000	0.0015	0.0013	4.9
Worker Commutes	0.1899	0.0199	0.0194	0.0002	0.0015	0.0010	19.8
Total Construction Emissions	0.3975	0.4449	0.0930	0.0006	0.0253	0.0244	56.5

Total Prelaunch Emissions (tons)

Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Delivery of Equipment and Supplies to VAFB	0.0593	0.0640	0.0081	0.0001	0.0023	0.0020	7.3
Delivery of Equipment and Supplies to Launch Site	0.0002	0.0002	0.0000	0.0000	0.0000	0.0000	0.0
Use of Adhesives During Assembly	0.0000	0.0000	0.0023	0.0000	0.0000	0.0000	0.0
Crane Use at Launch Site	0.0120	0.0322	0.0036	0.0000	0.0014	0.0014	2.6
Worker Commutes	0.5696	0.0596	0.0583	0.0006	0.0046	0.0029	59.4
Boiler Emissions	0.1076	0.7932	0.0283	0.0008	0.0340	0.0340	708.2
Total Prelaunch Emissions	0.7488	0.9492	0.1006	0.0015	0.0423	0.0403	777.5

Total Launch Emissions for Single Launch (tons)

Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Helicopter Emissions	0.0041	0.0149	0.0006	0.0017	0.0001	0.0001	0.0
Launch Emissions	*2.2324*	0.0000	0.0000	0.0000	0.3111	0.2172	0.2
Total Launch Emissions	2.2365	0.0149	0.0006	0.0017	0.3113	0.2173	0.2

Total Postlaunch Emissions (tons)

Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Removal of Equipment	0.0044	0.0047	0.0006	0.0000	0.0002	0.0001	0.5
Worker Commutes	0.0633	0.0066	0.0065	0.0001	0.0005	0.0003	6.6
Painting	0.0000	0.0000	0.0488	0.0000	0.0000	0.0000	0.0
Total Postlaunch Emissions	0.0677	0.0114	0.0559	0.0001	0.0007	0.0005	7.1

Emissions for Entire Action

Number of Launches	1						
Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Construction	0.397	0.445	0.093	0.001	0.025	0.024	56.5
Prelaunch	0.749	0.949	0.101	0.002	0.042	0.040	777.5
Launch	2.236	0.015	0.001	0.002	0.311	0.217	0.2
Post-launch	0.068	0.011	0.056	0.000	0.001	0.000	7.1
TOTAL EMISSIONS	**3.450**	**1.420**	**0.250**	**0.004**	**0.380**	**0.283**	**841.3**

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