



Final Programmatic Environmental Assessment

2007 General Plan for the Main Cantonment and the South Base Cantonment at Vandenberg Air Force Base, California

5 May 2008

Report Documentation Page			Form Approved OMB No. 0704-0188		
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 26 SEP 2008		2. REPORT TYPE Environmental Assessment		3. DATES COVERED 00-00-2005 to 00-00-2008	
4. TITLE AND SUBTITLE Final Programmatic Environmental Assessment 2007 General Plan for the Main Cantonment and the South Base Cantonment at Vandenberg Air Force Base, California			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S)			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) United States Air Force,Vandenberg Air Force Base,Lompoc,CA,93437			8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT Final Programmatic Environmental Assessment 2007 General Plan for the Main Cantonment and the South Base Cantonment at Vandenberg Air Force Base, California					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 201	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

**FINDING OF NO SIGNIFICANT IMPACT
AND FINDING OF NO PRACTICABLE ALTERNATIVE**

**2007 General Plan for the Main Cantonment and the South Base Cantonment
at Vandenberg Air Force Base, California**

Pursuant to provisions of the National Environmental Policy Act (NEPA), 42 U.S. Code 4321 *et seq.*, implementing Council on Environmental Quality (CEQ) Regulations, 40 Code of Federal Regulations (CFR) 1500-1508, and 32 CFR Part 989, *Environmental Impact Analysis Process*, the U.S. Air Force (Air Force) conducted an assessment of the potential environmental consequences associated with adopting the Vandenberg Air Force Base (VAFB) 2007 General Plan, and implementing identified military construction (MILCON) and non-appropriated funds (NAF) projects under the 30th Space Wing's (30 SW) Capital Improvements Program (CIP).

The Programmatic Environmental Assessment (PEA), incorporated by reference to this finding, considers all potential impacts of the Proposed Action and No-Action Alternative, both as a solitary action, and cumulatively in conjunction with other projects at VAFB. The PEA analyzes the potential environmental consequences of an identified set of construction projects, representative of future construction projects in the cantonments of VAFB, and provides general environmental protection criteria and guidelines for proposed construction and demolition activities that can be used to avoid adverse environmental impacts. Because the PEA addresses multiple proposed actions within the VAFB cantonments over a 10-year period, supplemental environmental impact analyses would occur for each individual action prior to the commitment of funds or irretrievable resources. The supplemental environmental impact analyses would address environmental requirements and cumulative effects specific to each project, including compliance with the National Historic Preservation Act and the Endangered Species Act. The outcome of the individual environmental impact analyses would result in either a categorical exclusion or a supplemental environmental assessment.

PROPOSED ACTION

The Proposed Action is to adopt the 2007 General Plan, which includes development of 13 identified MILCON and NAF projects under the CIP beginning in 2007 and continuing through a time to be determined, but anticipated not to exceed 10 years. CIP projects are mainly construction projects, although some demolition of facilities would occur in conjunction with some of the projects. Identified CIP projects would only occur within the main cantonment, located on North Base. Project siting is determined in part by the constraint classification of the area selected for project's development. Constraints applicable to the PEA are inherently discussed under their relevant resource.

Only the No-Action Alternative is considered in addition to the Proposed Action. No other viable alternatives to the Proposed Action were identified. Implementation of the No-Action Alternative would result in the 2007 General Plan not being adopted. Projects identified under the

CIP would not be implemented and goals and objectives identified in the 2007 General Plan would not be met.

SUMMARY OF FINDINGS

The analyses of the affected environment and environmental consequences of implementing the Proposed Action presented in the PEA concluded that with implementation of the programmatic environmental protection and monitoring measures as described in Section 2.1.3, no adverse effects should result to Human Health and Safety (Section 4.5), Solid Waste Management (Section 4.6), and Transportation (Section 4.7). In addition, the PEA concluded that Earth Resources, Environmental Justice, Land Use and Aesthetics, and Socioeconomics would not be affected by the Proposed Action.

No cumulative adverse impacts should result from activities associated with the adoption of the 2007 General Plan and development of the 13 identified MILCON and NAF projects, when considered in conjunction with recent past and future projects within the project area (Section 4.9).

Five areas of environmental consequences evaluated in the PEA were determined to have the potential to result in minor impacts to the environment, as described below. Implementing the environmental protection and monitoring measures described in Section 2.1.3 should ensure that no significant impacts occur for any of these resource areas.

Air Quality

Fugitive dust emissions generated from equipment operating on exposed ground and combustive emissions from the equipment would cause adverse air quality impacts. However, no significant impacts are anticipated (see PEA Sections 3.1 and 4.1). Emissions from the Proposed Action would occur over a period of 10 years, and be generated across Santa Barbara County. With the self-imposed emission limits as described in Section 4.1 of the PEA, effects from the Proposed Action would not be considered significant.

Biological Resources

The federally endangered Gaviota tarplant (*Deinandra increscens* ssp. *villosa*) was documented within the footprints of the several CIP project areas. Permanent loss of low quality Gaviota tarplant habitat and permanent loss of a limited number of Gaviota tarplant individuals is anticipated. However, because these locations are isolated from high quality suitable habitat by nature of their location within the highly developed cantonment, and due to the presence of abundant suitable habitat throughout VAFB, loss of individuals within the CIP project areas would not significantly affect the VAFB tarplant populations. In addition, one small area of Arroyo Willow Riparian Forest is present within the footprint of the project area for the proposed new Air Traffic Control Tower.

Cultural Resources

Four of the 13 identified CIP projects are within or near cultural resources. VAFB will implement Section 106 of the National Historic Preservation Act and Air Force Instruction-32-7065. Specifically, the National Register of Historic Places eligibility of cultural resources at these

locations will be evaluated and adverse effects assessed in consultation with the State Historic Preservation Officer and other interested parties.

Hazardous Materials and Hazardous Waste

Hazardous materials, such as petroleum, oil, and lubricants, used for equipment maintenance, along with any hazardous wastes generated during the project would be managed in strict compliance with all applicable statutes and regulations, local support plans, and instructions. This should avert the potential for adverse impacts to the environment. In addition, some of the construction sites of the identified projects included under the Proposed Action would be adjacent to or on top of Installation Restoration Program (IRP) sites, Areas of Interest, and Areas of Concern. Coordination with the 30 SW IRP Office prior to implementation of any project under the Proposed Action should avert the potential for adverse effects to human health and safety.

Water Resources

A National Pollutant Discharge Elimination System (NPDES) Construction General Permit would be required for projects that disturb more than one acre to protect water resources. Implementing all requirements under this permit, including best management practices, should prevent adverse effects as a result of construction and demolition activities.

Because the majority of the South Base cantonment occurs within the 100-year floodplain of the Santa Ynez River, future projects in the South Base cantonment may be located within the floodplain. Future new construction within the South Base cantonment will only occur in such cases as proximity to other mission functions necessitates such siting.

PRACTICABLE ALTERNATIVES

No practicable alternative to the Proposed Action is possible, given the existence of facilities within the South Base cantonment that perform and support mission essential activities.

FINDING OF NO SIGNIFICANT IMPACT

Based upon my review of the facts and analyses contained in the attached PEA, conducted in accordance with the provisions of NEPA, the CEQ Regulations, and 32 CFR Part 989, I conclude that the Proposed Action should not have a significant environmental impact, either by itself or cumulatively with other projects at VAFB. Accordingly, an Environmental Impact Statement is not required. The signing of this Finding of No Significant Impact and Finding of No Practicable Alternative completes the environmental impact analysis process for VAFB's 2007 General Plan. Prior to initiating the 13 proposed projects, VAFB's Environmental Flight will conduct individual environmental impact analyses on each of the projects to determine if a categorical exclusion is suitable or if a supplemental environmental assessment is necessary.

FINDING OF NO PRACTICABLE ALTERNATIVE

Pursuant to Executive Order 11990 and 32 CFR 989.14(g), the authority delegated in SAFO 791.1 and taking the information contained in the attached PEA into consideration, I find that there is no practicable alternative to implementing the Proposed Action in a floodplain. The Proposed

Action, as designed, includes all practicable measures to minimize harm. Before undertaking this action, VAFB officials will complete all relevant regulatory processes, and subsequently abide by all permit conditions and mitigations.

**FINDING OF NO SIGNIFICANT IMPACT and
FINDING OF NO PRACTICABLE ALTERNATIVE
CONCURRENCE PAGE**

**In Conjunction with Final Programmatic Environmental Assessment for the 2007 General
Plan for the Main Cantonment and the South Base Cantonment at Vandenberg Air Force
Base, California**

MAJCOM Approval:



CARLOS R. CRUZ-GONZALEZ
Colonel, USAF
Deputy Director for Installations



26 Sep 08

Final Programmatic Environmental Assessment

2007 General Plan
for the Main Cantonment and
the South Base Cantonment
at Vandenberg Air Force Base, California

Prepared for:

Department of the Air Force
30th Space Wing, Civil Engineer Squadron
Vandenberg Air Force Base, California

5 May 2008

Contents

Table of Contents	i
List of Figures	iii
List of Tables	iii
Acronyms and Abbreviations	v
 Chapter 1. Purpose of and Need for the Proposed Action.....	1-1
1.1 Purpose of and Need for the Proposed Action.....	1-1
1.2 Project Location	1-2
1.3 Scope of the Environmental Assessment	1-2
1.4 Applicable Regulatory Requirements.....	1-6
 Chapter 2. Description of the Proposed Action and Alternatives	2-1
2.1 Proposed Action	2-1
2.1.1 Constraints to Project Planning	2-1
2.1.2 Construction Equipment.....	2-3
2.1.3 Programmatic Environmental Protection and Monitoring Measures	2-3
2.2 No-Action Alternative.....	2-9
 Chapter 3. Affected Environment.....	3-1
3.1 Air Quality.....	3-1
3.1.1 Regional Climate and Meteorology	3-1
3.1.2 Existing Air Quality	3-3
3.2 Biological Resources.....	3-4
3.2.1 Methodology	3-4
3.2.2 Vegetation Types and Wildlife Resources	3-4
3.2.3 Sensitive Vegetation Types and Special Status Species.....	3-10
3.2.4 Waters of the U.S. and Wetlands	3-12
3.3 Cultural Resources.....	3-12
3.3.1 Cultural Resources Studies.....	3-13
3.3.2 Recorded Archaeological Sites	3-18
3.3.3 Isolated Artifacts	3-24
3.3.4 Cold War Related Facilities	3-24
3.4 Hazardous Materials and Hazardous Waste Management.....	3-25
3.4.1 Hazardous Material Management	3-26
3.4.2 Hazardous Waste Management.....	3-26
3.4.3 Installation Restoration Program	3-28
3.5 Human Health and Safety	3-29
3.5.1 Mission-Associated Constraints	3-29
3.5.2 Project Constraints.....	3-31
3.6 Solid Waste Management	3-34
3.6.1 Construction and Demolition Debris	3-36
3.6.2 Pollution Prevention	3-37
3.7 Transportation	3-37
3.8 Water Resources.....	3-38
3.8.1 Potable Water	3-39
3.8.2 Surface Water and Floodplains	3-39
3.8.3 Groundwater	3-41

Chapter 4. Environmental Consequences.....	4-1
4.1 Air Quality	4-1
4.1.1 Proposed Action	4-1
4.1.2 No-Action Alternative	4-4
4.2 Biological Resources.....	4-4
4.2.1 Proposed Action	4-5
No-Action Alternative	4-9
4.3 Cultural Resources.....	4-9
4.3.1 Proposed Action	4-10
No-Action Alternative	4-12
4.4 Hazardous Materials and Hazardous Wastes.....	4-12
4.4.1 Proposed Action	4-12
4.4.2 No-Action Alternative	4-15
4.5 Human Health and Safety	4-15
4.5.1 Proposed Action	4-15
4.5.2 No-Action Alternative	4-16
4.6 Solid Waste Management	4-16
4.6.1 Proposed Action	4-16
4.6.2 No-Action Alternative	4-18
4.7 Transportation.....	4-18
4.7.1 Proposed Action	4-18
4.7.2 No-Action Alternative	4-19
4.8 Water Resources	4-19
4.8.1 Proposed Action	4-19
4.8.2 No-Action Alternative	4-21
4.9 Cumulative Impacts.....	4-21
Chapter 5. Agencies and Persons Contacted	5-1
Chapter 6. List of Preparers.....	6-1
Chapter 7. Distribution List	7-1
Chapter 8. Bibliography	8-1

Appendices

Appendix A: Constraints in the Cantonments

Appendix B: Cultural Resources

Appendix C: Air Quality Analysis

List of Figures

Figure 1-1: Regional map of VAFB and surrounding area.....	1-4
Figure 1-2: Boundaries of VAFB cantonments.	1-5

List of Tables

Table 1.1: Federal and state regulations applicable to the implementation of the Proposed Action or the No-Action Alternative.....	1-7
Table 2.1: Identified CIP projects proposed in the 2007 General Plan for the main cantonment.	2-2
Table 2.2: Generic equipment list for worst-case scenario representative project.	2-3
Table 3.1: Ambient air quality standards.	3-2
Table 3.2: Existing emissions.....	3-3
Table 3.3: VAFB annual emissions (tons) in 2006.....	3-4
Table 3.4: Sensitive plant communities and special status species within the cantonments.....	3-10
Table 3.5: Cultural resources studies within 1.0 mile of the main and South Base cantonments.....	3-15
Table 3.6: Archaeological sites within 0.25 mile of the main and South Base cantonments.	3-17
Table 3.7: Sites within and adjacent to the main and South Base cantonments.	3-19
Table 3.8: Isolated artifacts recorded within 0.25 mile of the main and South Base cantonments.....	3-24
Table 3.9: Table 3.9. Isolated artifacts within the main and South Base cantonments.....	3-25
Table 3.10: IRP sites, AOCs, and AOIs, relevant to the construction of CIP projects, and their current status.....	3-29
Table 3.11: Comparative A-weighted sound levels.	3-33
Table 3.12: Noise levels of heavy construction equipment.....	3-35
Table 4.1: Facility size and disturbed acreages for identified CIP projects.	4-2
Table 4.2: Environmental protection measures for Biological Resources.	4-8
Table 4.3: CIP projects identified in the 2007 General Plan. Projects in bold have the potential to affect cultural resources.	4-11

This page intentionally left blank.

Acronyms and Abbreviations

%	Percent
2007 General Plan	Vandenberg Air Force Base 2007 General Plan
30 CES	30th Civil Engineer Squadron
30 CES/CC	30th Civil Engineer Squadron, Commander
30 CES/CD	30th Civil Engineer Squadron, Deputy Commander
30 CES/CEC	30th Civil Engineer Squadron Contracts Office
30 CES/CECB	30th Civil Engineer Squadron Base Planning Office
30 CES/CEFO	30th Civil Engineer Squadron Fire Operations
30 CES/CEV	30th Civil Engineer Squadron Environmental Flight
30 CES/CEVC	30th Civil Engineer Squadron, Environmental Flight, Compliance Office
30 CES/CEVNC	30th Civil Engineer Squadron Cultural Resources Section
30 CES/CEVV	30th Civil Engineer Squadron, Environmental Flight, Pollution Prevention Office
30 MDOS/SGOAB	30th Medical Operations Squadron Bioenvironmental Engineering Element
30 SW	30th Space Wing
30 SWP	30th Space Wing Plan
30 SW/SE	30th Space Wing Safety
ACM	Asbestos containing material
ACOE	Army Corps of Engineers
Æ	Applied EarthWorks Inc.
AF	Air Force
AFI	Air Force Instruction
AHPA	Archaeological and Historic Preservation Act
AICUZ	Air Installation Compatible Use Zone
AIRFA	American Indian Religious Freedom Act
Air Force	United States Air Force
AMP	Asbestos Management Plan
AOC	Area of Concern
AOI	Area of Interest
APZ	Accident Potential Zone
ARPA	Archaeological Resources Protection Act
AT	Anti-terrorism
Base Landfill	Vandenberg Air Force Base Sanitary Landfill
BCC	Federal Bird Species of Conservation Concern
BMP	Best Management Practice
C&D	Construction and demolition
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
Cal EPA	California Environmental Protection Agency
Cal OSHA	California Occupational Safety and Health Administration
CAP	Collection Accumulation Point
CARB	California Air Resources Board
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CEQ	Council on Environmental Quality

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIP	Capital Improvement Program
CITS	Combat Information Transport System
CIWMB	California Integrated Waste Management Board
cm	Centimeter
CNDDDB	California Natural Diversity Database
CO	Carbon monoxide
Council	Advisory Council on Historic Preservation
CSC	California Species of Special Concern
CWA	Clean Water Act
dB	Decibel
dBA	A-weighted decibel
DOD	Department of Defense
DRMO	Defense Reutilization and Marketing Office
EMS	Environmental Management System
EO	Executive Order
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
EPP	Environmental Protection Plan
ESA	Endangered Species Act
ESBB	El Segundo blue butterfly
FAA	Federal Aviation Administration
FE	Federal endangered species
FEMA	Federal Emergency Management Agency
FFSRA	Federal Facilities Site Remediation Agreement
Fisheries Service	National Marine Fisheries Service
FONPA	Finding of No Practicable Alternative
FONSI	Finding of No Significant Impact
FR	Federal Register
FT	Federally Threatened
FY	Fiscal Year
GIS	Geographic Information System
H ₂ S	Hydrogen sulfide
HazMart	Hazardous Materials Pharmacy
HMMP	Hazardous Materials Management Plan
HP	Horsepower
HWMP	Hazardous Waste Management Plan
IRP	Installation Restoration Program
JTD	Joint Technical Document
kV	kilovolt
Lbs	Pounds
LBP	Lead-based paint
LBPMP	Lead-Based Paint Management Plan
LCZ	Lateral Clear Zone
LEA	Local Enforcement Agency
LEED	Leadership in Energy and Environmental Design
L _{eq1H}	One-hour average sound level
LOS	Level of Service
MBTA	Migratory Bird Treaty Act

MFH	Military family housing
MILCON	Military Construction
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
mm	Millimeter
MSG	Mission Support Group
MSRS	ManTech SRS Technologies, Inc.
N/A	Not Applicable
NAAQS	National Ambient Air Quality Standards
NAF	Non-appropriated Funds
NAGPRA	Native American Graves Protection and Repatriation Act
National Register	National Register of Historic Places
NCA	Noise Control Act
ND	Not Determined
NE	Not Estimated
NEPA	National Environmental Policy Act
NESHAPS	National Emissions Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NO ₂	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
North Base	North Vandenberg Air Force Base
NO _x	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O ₃	Ozone
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
P2	Pollution prevention
Pb	Lead
PCB	Polychlorinated biphenyl
PCDD	Polychlorinated dibenzo dioxins
PCDF	Polychlorinated dibenzo furans
PEA	Programmatic Environmental Assessment
PERP	Portable Equipment Registration Program
PM ₁₀	Particulate matter 10 microns or less in diameter
PM _{2.5}	Particulate matter 2.5 microns or less in diameter
PMEL	Precision Measurement Equipment Lab
POL	Petroleum, oil and lubricant
POW	Prisoner-of-War
PPA	Pollution Prevention Act
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act
RF	Radio Frequency
ROC	Reactive organic compound
RTDS	Reutilization, transfer, donation and sale
RWD	Report of Waste Discharge
RWQCB	Regional Water Quality Control Board
SAIC	Science Applications International Corporation
SAP	Satellite accumulation point
SARA	Superfund Amendments and Reauthorization Act
SBCAPCD	Santa Barbara County Air Pollution Control District

SE	State Endangered (California)
SEL	Sound exposure level
SHPO	State Historic Preservation Office
SO ₂	Sulfur dioxide
SO ₄	Sulfates
South Base	South Vandenberg Air Force Base
SR 246	State Route 246
SRS	SRS Technologies
SRWCB	State Regional Water Control Board
SWFP	Solid Waste Facility Permit
SWMP	Solid Waste Management Plan
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TBD	To Be Determined
TCE	Trichloroethylene
TEU	Test Excavation Unit
THZ	Toxic Hazard Zone
TPH	Total Petroleum Hydrocarbons
TSCA	Toxic Substances Control Act
TTLIC	Total Threshold Limit Concentration
UCSB	University of California Santa Barbara
U.S.	United States
US 1	United States Highway 1
US 101	United States Highway 101
USACERL	United States Army Construction Engineering Research Laboratory
USAF	United States Air Force
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
USGBC	United States Green Building Council
USGS	United States Geological Survey
UST	Underground Storage Tank
UXO	Unexploded Ordnance
VAFB	Vandenberg Air Force Base
V/C	Volume-to-capacity
VOC	Volatile Organic Compound
WDR	Waste Discharge Requirement
WET	Waste Extraction Test
WWII	World War II
µg/m ³	micrograms per cubic meter

Chapter 1. Purpose of and Need for the Proposed Action

This Programmatic Environmental Assessment (PEA) evaluates the potential environmental consequences of adopting the Vandenberg Air Force Base (VAFB) 2007 General Plan (VAFB 2007), hereafter referred to as the 2007 General Plan, and implementing identified military construction (MILCON) and non-appropriated funds (NAF) projects under the 30th Space Wing's (30 SW) Capital Improvements Program (CIP). Identified MILCON and NAF projects are described in the 2007 General Plan. While this PEA specifically addresses potential effects for 13 identified MILCON and NAF projects planned to occur within the main cantonment area, which is located on north VAFB, it also provides a baseline analysis for potential future projects that could be located within either the main or south VAFB cantonment areas.

A programmatic evaluation for identified CIP projects and potential future projects located in VAFB cantonment areas will allow project managers the opportunity to prepare environmentally sound project proposals and, in turn, aid in moving new projects through the approval process in a more efficient manner. Construction/renovations can be planned to: avoid or minimize impacts; incorporate good planning to guide growth in areas where there are no constraints to development; and minimize impacts to the human and natural environment.

Because the PEA addresses multiple proposed actions within the VAFB cantonments over a 10-year period, supplemental environmental impact analyses would occur for each individual action prior to the commitment of funds or irretrievable resources. The supplemental environmental impact analyses would address environmental requirements and cumulative effects specific to each project, including compliance with the National Historic

Preservation Act and the Endangered Species Act. The outcome of the individual environmental impact analyses would result in either a categorical exclusion or a supplemental environmental assessment.

The National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations require lead agencies to evaluate the potential impacts of federal actions on the surrounding environment. The United States Air Force (Air Force or USAF) is the lead agency for NEPA compliance on the proposed project.

This PEA has been prepared in accordance with the NEPA of 1969, as amended (42 United States Code [U.S.C.] 4321 et seq.); as implemented by CEQ regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508); and 32 CFR Part 989.

1.1 Purpose of and Need for the Proposed Action

The CIP is the 30 SW's comprehensive effort to align planning, programming, budgeting, and execution of facility requirements with long-range goals and objectives. The purpose of adopting the 2007 General Plan and developing identified CIP projects is to implement a schedule that assigns priority and allows for proper sequencing of funding and construction according to the funding source for each identified project. The need to implement identified CIP projects is multifold:

- ▶ Consolidate operational and leadership functions to increase efficiency;
- ▶ Comply with anti-terrorism and sustainable design requirements, as well as meet seismic standards;

- ▶ Resolve deficiencies in undersized facilities, such as the Fitness Center and Child Development Center;
- ▶ Provide emergency electric power for launch command and control facilities; and
- ▶ Eliminate deficiencies in meeting Air Force and Federal Aviation Administration (FAA) requirements.

1.2 Project Location

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

VAFB is located on the south-central coast of California, approximately halfway between San Francisco and San Diego (Figure 1-1). VAFB consists of 99,572 acres in western Santa Barbara County (VAFB 2007) and occurs in a transitional ecological region that includes the northern and southern distributional limits for many plant and animal species. The Santa Ynez River and State Highway 246 divide VAFB into two distinct parts – North Base and South Base. The main cantonment on North Base and the South Base cantonment boundaries, as defined in 2007 by the 30th Civil Engineer Squadron Base Planning Office (30 CES/CECB), are depicted in Figure 1-2.

The 13 identified CIP projects proposed for implementation and analyzed within this PEA would occur within the main cantonment area, which is located on North Base. The twelve projects that would include changes to facility boundaries are depicted in Figure A-1 in Appendix A. The remaining identified project is a renovation where all alterations would occur solely within the existing facility; therefore it is not depicted. The total acreage estimated to be affected by identified

MILCON and NAF projects is approximately 56 acres.

1.3 Scope of the Environmental Assessment

Consistent with Title 32 CFR Part 989, and CEQ regulations (40 CFR 1500-1508), the scope of analysis presented in this PEA is defined by the potential range of environmental impacts resulting from implementing the Proposed Action and Alternatives. Pursuant to 40 CFR Part 1501.4(c), resources potentially impacted are considered in greater detail in order to provide sufficient evidence and analysis to determine whether or not to prepare an environmental impact statement.

This PEA identifies, describes, and evaluates the potential environmental effects that could result from the Proposed Action and the No-Action Alternative. No other viable alternatives were identified as the programmatic approach used within this document to evaluate the adoption of the 2007 General Plan and development of identified CIP projects allows for projects to be sited and specifically tailored to eliminate or minimize potential adverse effects. For this reason, the Proposed Action, as described in Chapter 2, incorporates the implementation of *all* 13 identified CIP projects, and does not consider multiple alternatives where some projects would be implemented and others would not. Only the No-Action Alternative is considered in addition to the Proposed Action.

The 2007 General Plan defines floodplains as being a severe constraint to development, meaning development in the affected area is prohibited, except in unique circumstances on a case-by-case basis. Because the majority of the South Base cantonment occurs within the 100-year floodplain of the Santa Ynez River, future projects in the South Base cantonment may be located within the floodplain. No practicable alternative to the Proposed Action is possible, given the existence of facilities within the South Base

cantonment that perform and support mission essential activities. Per 32 CFR Part 989, and Executive Orders (EOs) 11988 and 11990, a Finding of No Significant Impact/Finding of No Practicable Alternative (FONSI/FONPA) must be prepared.

Possible cumulative impacts from other past, present, and planned actions on VAFB are considered and evaluated in this PEA. In addition, the PEA identifies environmental permits relevant to the Proposed Action. As appropriate, it describes in terms of a regional overview or a site-specific description, the affected environment and environmental consequences of the action and identifies



Figure 1-1: Regional map of VAFB and surrounding area.

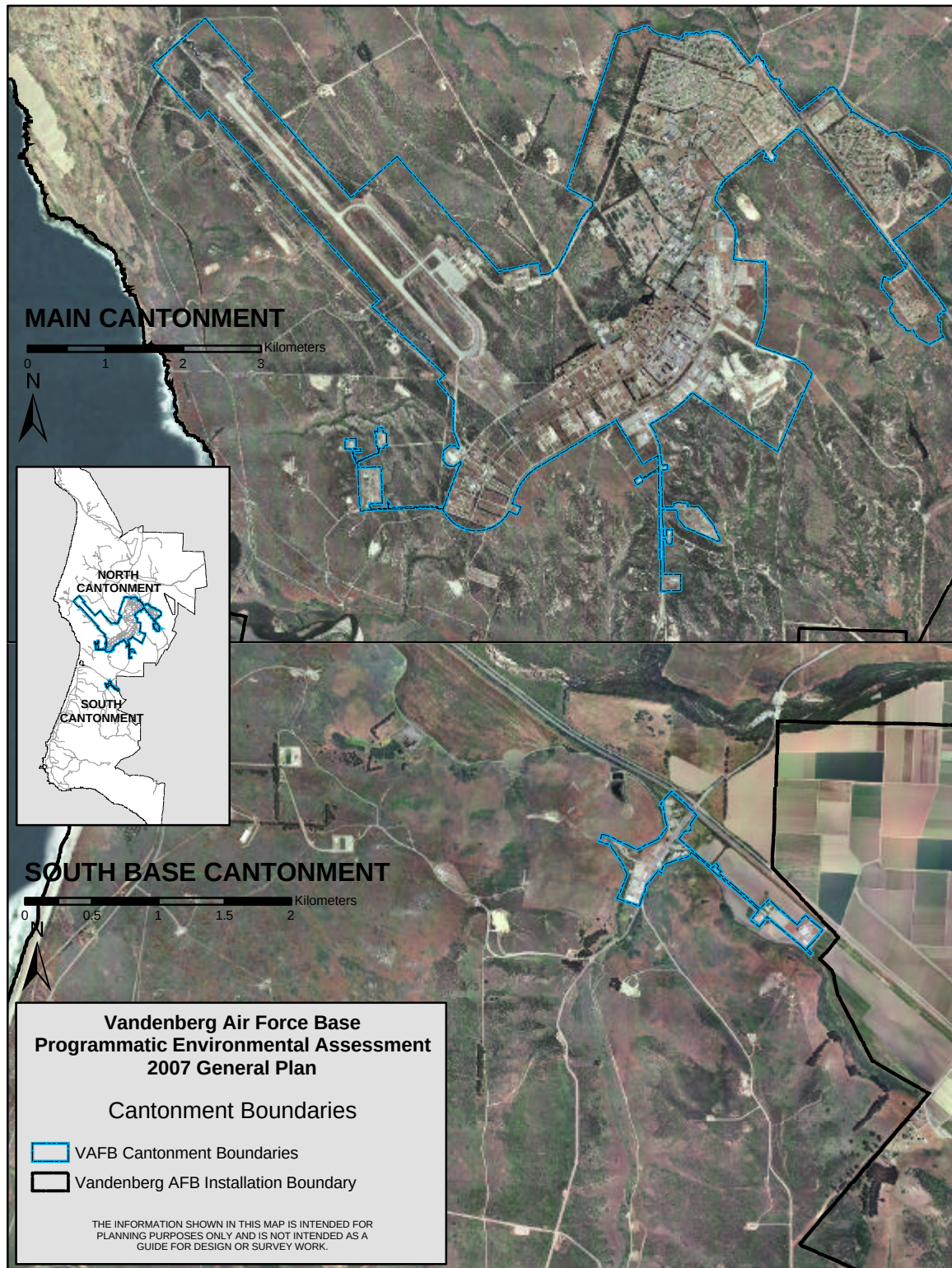


Figure 1-2: Boundaries of VAFB cantonments.

management measures to prevent or minimize environmental impacts.

Finally, this PEA establishes the baseline of environmental issues considered such that all identified and analyzed CIP projects, as well as future projects sited within the main and South Base cantonments, would require limited project-specific analysis when implemented in the future. The Air Force (AF) Form 813, *Request for Environmental Impact Analysis*, would be used to document any new or emerging environmental issues such as threatened and endangered species or air emissions constraints, thus eliminating repetitive discussion, data development and analysis.

The resources analyzed in this PEA include air quality, biological and cultural resources, hazardous materials and hazardous waste, human health and safety, solid waste management, transportation, and water resources.

The following resources were considered but not analyzed in this PEA:

► *Earth Resources.* All construction projects under the Proposed Action would occur within the main or South Base cantonments. These areas have been extensively developed in the past and no adverse effects on geology or soils are anticipated from any of the identified projects. Tsunami or liquefaction hazards in project areas are not anticipated.

► *Environmental Justice.* Per EO 12898, *Environmental Justice*, the potential effects of the Proposed Action on minority communities and low-income communities were considered. Because the Proposed Action and any potential effects would occur within VAFB boundaries, it would not affect low-income or minority populations within the region (Lompoc Valley and Santa Maria Valley).

► *Land Use and Aesthetics.* Land use was considered but not analyzed in this PEA because the Proposed Action would not change land use or affect land use planning outside cantonment boundaries at VAFB.

Any changes to land use within cantonment boundaries would be minimal and would not result in any significant effects. Additionally the Proposed Action would not occur within the coastal zone, and there would be no conversion of prime agricultural land to other uses, and no decrease in its productivity. Finally, the Proposed Action would not conflict with environmental plans or goals, Air Force regulations, permit requirements, or existing uses of the project areas or other properties.

► *Socioeconomics.* Implementing the Proposed Action could result in the creation of some temporary new jobs. However, these potential new jobs would have no effect on the socioeconomic environment of the region (i.e., Lompoc Valley and Santa Maria Valley) because it is likely that contractors would use currently employed personnel to perform projects of small magnitudes, such as those being analyzed. Implementing the No-Action Alternative would neither create nor eliminate jobs from the regional area.

A list of acronyms and abbreviations used in this PEA is included after the Table of Contents.

1.4 Applicable Regulatory Requirements

Federal and state regulatory requirements that would affect the implementation of the Proposed Action and No-Action Alternative are summarized in Table 1.1 below. Compliance with these federal and state regulatory requirements is of primary importance, while compliance with local policy, plans and instructions, such as VAFB-specific plans and Air Force instructions (AFIs) are also discussed under their relevant resources.

Table 1.1: Federal and state regulations applicable to the implementation of the Proposed Action or the No-Action Alternative.

Federal Regulation	Activity or Requirement
American Indian Religious Freedom Act (AIRFA) of 1978 (42 U.S.C. 1996)	The AIRFA states that the policies and procedures of federal agencies must comply with the constitutional clause prohibiting abridgment of religious freedom—including freedom of belief, expression, and exercise—for Native Americans. The AIRFA's policy is to consider Native American access to sites, use and possession of sacred objects, and freedom to worship, and directs federal agencies to revise policies and procedures to correct conflicts with Native American religious cultural rights and practices.
Archaeological and Historic Preservation Act (AHPA) of 1974 (16 U.S.C. 469a et seq.)	Directed toward the preservation of historic and archaeological data that would otherwise be lost as a result of federal construction or other federally-licensed or -assisted activities. The AHPA authorizes the Department of the Interior to undertake recovery, protection, and preservation of archaeological or historic data.
Archaeological Resources Protection Act (ARPA) of 1979 (16 U.S.C. 470aa-mm), Supplemental Regulations of 1984	The ARPA secures protection of archaeological resources and sites on public and Indian lands; requires permitting for any excavation or collection of archaeological material from these lands; provides civil and criminal penalties for violations.
Clean Air Act (CAA) of 1970 (42 U.S.C. 7401 et seq.)	Regulates air emissions from area, stationary, and mobile sources. Authorizes the United States (U.S) Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards to protect public health and the environment.
CAA Amendments of 1990	Establishes new federal non-attainment classifications, emissions control requirements, and compliance dates for areas in non-attainment. The requirements and compliance dates are based on the non-attainment classification.
Clean Water Act (CWA) of 1977 as amended (33 U.S.C. 1251 et seq.)	Prohibits the discharge of pollutants from a point source into navigable waters of the U.S., except in compliance with a National Pollutant Discharge Elimination System (NPDES) (40 CFR Part 122) permit. The navigable Waters of the U.S. are considered to encompass any body of water whose use, degradation, or destruction will affect interstate or foreign commerce. Section 401 of the CWA requires that the discharge of dredged or fill material into water of the U.S. does not violate state water quality standards. Generally, CWA Sec. 404 permits will not be issued until the state has been notified and the Applicant has obtained a certification of state water quality standards. Section 402 of the CWA requires that a NPDES certification be obtained from the applicable Regional Water Quality Control Board (RWQCB) for projects that would disturb one or more acres of land. Section 404 of the CWA establishes a program to regulate the discharge of dredged and fill material into waters of the U.S., including wetlands. Activities in waters of the U.S. that are regulated under this program include fills for development, water resource projects (e.g., dams and levees), infrastructure development (e.g., highways and airports), and conversion of wetlands to uplands for farming and forestry.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. 9601-9675),	The CERCLA, commonly known as Superfund, provided broad federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. It also established prohibitions and requirements concerning closed and abandoned hazardous waste sites; provided for liability of persons responsible for releases of hazardous waste at these sites; and established a trust fund to provide for cleanup when no responsible party could be identified. CERCLA was amended by the Superfund Amendments and Reauthorization Act in October 1986.
Coastal Zone Management Act of 1972 (16 USC 1451-1464)	The CZMA plays a significant role in water quality management. Under the CZMA, a federal action that may affect the coastal zone must be carried out in a manner that is consistent with state coastal zone management programs.
Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.)	Declares the intention of Congress to conserve threatened and endangered species and the ecosystems on which those species depend. The ESA requires federal agencies, in consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (Fisheries Service), to use their authorities in furtherance of its purposes by carrying out programs for the conservation of endangered or threatened species.
Federal Regulation	Activity or Requirement
Section 7 of the ESA (16 U.S.C. 1536)	Contains provisions that require federal agencies to consult with the Secretary of Interior and take necessary actions to ensure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of endangered species and threatened species.

Migratory Bird Treaty Act (MBTA) of 1918 as amended (16 U.S.C. 703-712)	The MBTA implements various treaties and conventions between the United States and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under MBTA, the taking, killing, or possessing of migratory birds is unlawful.
National Environmental Policy Act of 1969 as amended (42 U.S.C. 4321-4347)	Requires federal agencies to analyze the potential environmental impacts of major federal actions and alternatives and to use those analyses as a decision-making tool on whether and how to proceed.
National Historic Preservation Act (NHPA) of 1966 as amended (16 U.S.C. 470 et seq.)	The key federal law establishing the foundation and framework for historic preservation in the U.S. The NHPA 1) authorizes the Secretary of the Interior to expand and maintain a National Register of Historic Places (National Register); 2) establishes an Advisory Council on Historic Preservation (Council) as an independent federal entity; 3) requires federal agencies to take into account the effects of their undertakings on historic properties, and to afford the Council an opportunity to comment upon any undertaking that may affect properties listed, or eligible for listing, in the National Register; and 4) makes the heads of all federal agencies responsible for the preservation of historic properties owned or controlled by them.
Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (25 U.S.C. 3001-3013)	The NAGPRA restores certain rights to Native Americans with respect to the disposition of ancestral human remains and cultural objects; vests ownership of these materials (from federal or tribal lands) with designated Native American groups; requires notification of federal agency head when Native American cultural items are discovered on federal or tribal lands; prohibits trafficking in Native American human remains and cultural items; requires inventory and tribal notification of human remains and associated funerary objects held in existing collections by museums or federal agencies; provides for repatriation of these materials.
Noise Control Act (NCA) of 1972 (42 U.S.C. 4901 et seq.)	This Act establishes a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare. To accomplish this, the Act establishes a means for the coordination of federal research and activities in noise control, authorizes the establishment of federal noise emissions standards for products distributed in commerce, and provides information to the public regarding the noise emission and noise reduction characteristics of such products. The Act authorizes and directs that federal agencies, to the fullest extent consistent with their authority under federal laws administered by them, carry out the programs within their control in such a manner as to further the policy declared in 42 U.S.C. 4901. Each department, agency, or instrumentality of the executive, legislative and judicial branches of the Federal Government having jurisdiction over any property or facility or engaged in any activity resulting, or which may result in, the emission of noise shall comply with federal, state, interstate, and local requirements respecting control and abatement of environmental noise.
Occupational Safety and Health Act of 1970 (29 U.S.C. 659-678)	This Act was established to assure safe and healthful working conditions for working men and women by: authorizing enforcement of the standards developed under the Act; by assisting and encouraging the States in their efforts to assure safe and healthful working conditions; by providing for research, information, education, and training in the field of occupational safety and health; and for other purposes.
Pollution Prevention Act (PPA) of 1990 (42 U.S.C. 13101-13109)	This Act establishes that pollution should be prevented or reduced at the source whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner, whenever feasible; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and that disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner.
Resource Conservation and Recovery Act (RCRA) of 1976 (42 U.S.C. 6901 et seq.)	This Act gives the U.S. EPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous wastes.
Federal Regulation	Activity or Requirement
Superfund Amendments and Reauthorization Act (SARA) (42 U.S.C. 9601-9675)	The SARA amended the CERCLA on October 17, 1986 and made several important changes and additions, such as: stressed the importance of permanent remedies and innovative treatment technologies in clean up; required consideration of standards and requirements found in other state and federal environmental laws and regulations; provided new enforcement authorities and settlement tools; increased state involvement; and increased the focus on human health problems posed by hazardous waste sites. SARA also required U.S. EPA to revise the Hazard Ranking System to ensure that it accurately assessed the relative degree of risk to human health and the environment posed by uncontrolled hazardous waste sites that may be placed on the National Priorities List.

Title II of the Toxic Substances Control Act (TSCA) of 1976 (15 U.S.C. 2601 et seq.)	The primary goal of TSCA is to control chemical hazards through the regulation of listed chemicals in commerce, including manufacture, import, processing, distribution, use, and disposal. TSCA has been amended with Title II to specifically address such substances as asbestos-containing materials.
State Regulation	Activity or Requirement
California Coastal Act of 1976	This Act provides long-term protection of California's 1,100-mile coastline for the benefit of current and future generations. Coastal Act policies constitute the standards used by the Coastal Commission in its coastal development permit decisions and for the review of local coastal programs prepared by local governments and submitted to the Commission for approval. These policies are also used by the Commission to review federal activities that affect the coastal zone.
California Clean Air Act of 1988	This Act develops and implements a program to attain the California Ambient Air Quality Standards for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter less than or equal to 10 microns in diameter, particulate matter less than or equal to 2.5 microns in diameter, lead, sulfates, hydrogen sulfide, and vinyl chloride. 40 CFR Part 51 gives state and local agencies the authority to establish air quality rules and regulations. Rules adopted by the local air pollution control districts and accepted by the Air Resources Board are included in the State Implementation Plan. When approved by the U.S. EPA, these rules become federally enforceable.
Porter-Cologne Water Quality Control Act	Protects all waters of the State for the use and enjoyment of the people of California and declares that the protection of water resources be administered by the regional water quality control boards.
California Integrated Waste Management Act of 1989, California Assembly Bill AB 939	Provides for the proper management and disposal of solid wastes, to include the diversion requirements for construction and demolition debris.

Chapter 2. Description of the Proposed Action and Alternatives

This chapter describes the Proposed Action and the No-Action Alternative. The chapter includes descriptions of anticipated construction equipment needs and programmatic environmental protection and monitoring measures.

2.1 Proposed Action

The Proposed Action is to adopt the 2007 General Plan, which includes development of 13 identified MILCON and NAF projects under the CIP as described in the 2007 General Plan. Identified MILCON and NAF projects are scheduled to occur beginning in 2007 and continuing through a time to be determined (TBD), but anticipated not to exceed 10 years. CIP projects are mainly construction projects, although some demolition of facilities would occur in conjunction with some projects. Identified CIP projects would only occur within the main cantonment, as located on North Base. Potential future projects, not yet identified, could occur within main or South Base cantonments.

Table 2.1 lists the 13 identified MILCON and NAF projects analyzed within this PEA, as well as their anticipated facility size, anticipated total acreage disturbed, and the fiscal year (FY) for which they are planned, if this has been determined. Figure A-1, in Appendix A, shows the specific locations of identified MILCON and NAF projects to occur within the main cantonment and that would have changes other than renovations made internal to the facility.

2.1.1 Constraints to Project Planning

The 2007 General Plan (VAFB 2007) discusses that a key component of the planning process, including planning for

development projects such as those included under the Proposed Action, is to account for constraints to and opportunities for development. Project siting is determined in part by the constraint classification of the area selected for the project's development.

Constraints are grouped into natural, cultural, and environmental resources constraints (e.g. archaeological and historical sites, threatened and endangered species or wetlands present), and operational and safety constraints (e.g. explosive safety zones, or missile flight hazard zones present). They are classified as either none, minimal, moderate, or severe categories with the following meanings (VAFB 2007):

- ▶ None – No constraint to development.
- ▶ Minimal – The constraint is present, but not considered significant, and development in affected areas is permitted.
- ▶ Moderate – Development in affected areas is permitted with conditions.
- ▶ Severe – Development in affected areas is prohibited, except in unique circumstances on a case-by-case basis.

Constraints applicable to this PEA are inherently discussed under their relevant resource, i.e. constraints from threatened and endangered species are addressed within the Biological Resources section, while constraints due to explosive safety zones are addressed within the Human Health and Safety section. The following operational constraints, while not covered within an analyzed resource in this PEA, would also need to be considered during the project siting phase of project planning.

Table 2.1: Identified CIP projects proposed in the 2007 General Plan for the main cantonment.

#	Project Type	Project Number	Project Title	Estimated Facility Size (square meters)	Total Acreage (including AT Buffer)	FY
1	MILCON	XUMU063005	Construct 30 SW Headquarters	1,858	13.6	2010
2	MILCON	XUMU063006	Construct Fitness Center Addition	3,598	1.7	2011
3	MILCON	XUMU003000	Construct Child Development Center	2,173	1.9	2012
4	MILCON	XUMU073000	Construct Western Range Operations Control Center Emergency 10 Megawatt Electric Power Plant	1,498	0.4	TBD
5	MILCON	XUMU993001	Construct Refueling Vehicle Maintenance Shop	325	1.3	TBD
6	MILCON	XUMU033002	Construct Education Center	6,600	4.4	TBD
7	MILCON	XUMU063004	Construct Precision Measurement Equipment Lab	2,725	6.1	TBD
8	MILCON	XUMU053002	Construct 614th Space Operations Group Headquarters	2,360	7.4	TBD
9	MILCON	XUMU053001	Construct Mission Support Group Headquarters	9,290	7.8	TBD
10	MILCON	XUMU063000	Construct Air Traffic Control Tower/Demolish Existing Facility	390	4.7	TBD
11	NAF	XUMU025000	Bowling Center Renovation	N/A	N/A	2007
12	NAF	XUMU083000	FAMCAMP Expansion	N/A	5.1	2009
13	NAF	XUMU098000	Recreational Vehicle Storage/Parking Expansion	N/A	1.2	2010

NOTES:

AT = anti-terrorism
N/A = not applicable

FY = fiscal year
TBD = to be determined

Microwave Line of Sight

Radio frequency (RF) management, including frequency procurement, assignment, control, protection, monitoring, reporting, etc., is a critical function on VAFB. Microwave line-of-site corridors, used for RF management, are considered severe constraints due to the critical mission support role of microwave communications (VAFB 2007). Microwave line-of-site corridors that impinge on main and/or South Base cantonments are depicted in Figures A-5a and A-5b of Appendix A.

► Any future development projects that fall within a line-of-site corridor, or involve the procurement or development of systems involving reception or transmission of RF or microwave energy, or changes to existing RF systems or microwave line-of-site corridors, would require coordination with the frequency planning manager during initial planning phases.

Fire Response Zones

Fire response zones are based on the amount of time it would take for assistance to arrive at an area in the event of a fire. Fire assistance is described one or more fire trucks on scene. Fire response regulations indicate stations should be located within a 5-minute response time radius. Three fire response zones have the following associated constraint levels: a zero to five minute response is no constraint; a five to 10 minute response is a minimal constraint; and a greater than 10 minute response is a moderate constraint. (VAFB 2007)

► Any future development projects that would be located in areas where fire response would exceed 10 minutes, i.e. where a moderate constraint exists, would require coordination through 30th Civil Engineer Squadron Fire Operations (30 CES/CEFO) during initial planning phases.

2.1.2 Construction Equipment

Specific lists of construction equipment would vary for each identified project and were not available at the time this PEA was prepared. Therefore, a generic equipment list was generated for a worst-case scenario representative project that combined the project with the construction of the largest facility, i.e. construction of Mission Support Group (MSG) Headquarters, with the project with the largest area of disturbed acreage, i.e. 30 SW Headquarters. This generic equipment list is provided in Table 2.2. Further, for purposes of analyses completed for this PEA, it was anticipated that any potential future projects included within the scope of the 2007 General Plan and not currently identified or defined, would fall within the limits of this worst-case scenario.

The 30th Civil Engineer Squadron Contracts Office (30 CES/CEC) and contractors, as applicable, would provide a final list of specific equipment for each project to the 30th Civil Engineer Squadron Environmental Flight (30 CES/CEV) upon submission of the individual AF Form 813, *Request for Environmental Impact Analysis*.

2.1.3 Programmatic Environmental Protection and Monitoring Measures

To avoid or minimize potential adverse impacts to resources during activities associated with the implementation of the CIP projects or future projects covered under the 2007 General Plan, programmatic resource protection measures outlined below would be implemented.

Air Quality

► The 30 CES/CEC would submit an AF Form 813, *Request for Environmental Impact Analysis* to 30 CES/CEV, including the project design, specific construction requirements, a detailed equipment list, and an estimate of air emissions prior to the start of construction for any project. The latest available methodology would be used to estimate project air emissions. 30 CES/CEV

would maintain a calendar year and 12-month rolling air inventory.

► Environmental clearances would not be given if the specific project emissions plus the cumulative calendar-year emissions of nitrogen oxides, or reactive organic compounds exceed 548 pounds (lbs)/day or 100 tons/year.

► Before construction begins for any project covered under the Proposed Action, portable equipment meeting the criteria defined in the *Emergency Regulation Order*, effective April 27, 2007 for the California Portable Equipment Registration Program (PERP) would be registered in the program or have a valid Santa Barbara County Air Pollution Control District (SBCAPCD) Permit to Operate.

Table 2.2: Generic equipment list for worst-case scenario representative project.

Equipment Category	Horse Power
Bulldozer	240
Scraper	265
Track Loader	121
Backhoe	77
Compactor (70 Hp)	70
Compactor (32 Hp)	32
Paver	153
Road Grader	137
Skid Steer Loader	78
50 Kw Generator	65
100-ton Crane	270
Forklift	125
Trencher (13 Hp)	13
Trencher (45 Hp)	45
Water Truck	250
Dump Truck ^(a)	25
Asphalt Truck ^(a)	45
Cement Truck ^(a)	45
Delivery Truck ^(a)	45
Foreman's Truck ^(a)	25
Crew Trucks ^(a)	25

NOTE:

(a) For this source, horsepower indicates number of miles for a one-way trip.

▶ Sensitive receptors such as residential units and schools, shall not be located in a manner that would cause significant health risks as a result of toxic pollutants emitted by common commercial uses (i.e., dry cleaners, large gas stations, diesel-powered engines).

▶ Given the requirements of EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, and the increasing concerns with greenhouse gases, which contribute to global climate change, 30 CES/CEV will take into consideration and encourage measures that promote efficiency and conservation through education, programs, and incentives to increase efficiency and conserve energy in development projects on VAFB.

▶ Beginning in fiscal year 2009, Air Force policy requires all vertical, MILCON construction projects, with climate control, to be designed so that they are capable of achieving Leadership in Energy and Environmental Design (LEED) Silver Certification. LEED was created by the United States Green Building Council (USGBC) to assess the green design of facilities. The rating system categories award points for energy reduction measures. 30 CES/CEC will ensure all affected projects meet this Air Force policy.

▶ Idling of heavy-duty diesel trucks during loading and unloading shall be limited to five minutes, with auxiliary power units used whenever possible.

Although significant emissions are not anticipated from any of the projects covered under the Proposed Action, the following SBCAPCD dust control measures would be implemented to further decrease fugitive dust emissions from ground disturbing activities:

▶ Water – preferably reclaimed – would be applied at least twice daily to dirt roads, graded areas, and dirt stockpiles to prevent excessive dust at the staging areas. Watering frequency would be increased whenever the wind speed exceeds 15 miles per hour. Chlorinated water would not be allowed to run into any waterway.

▶ Vehicle speeds would be minimized on exposed earth.

▶ Ground disturbance would be limited to the smallest practical area and to the least amount of time.

▶ Personnel would be designated to monitor project activities to ensure that excessive dust is not generated at demolition sites.

▶ The Storm Water Pollution Prevention Plan – including Best Management Practices to reduce dust emissions - and the contractor's Environmental Protection Plan, which includes dust control compliance measures would be complied with.

▶ If importation, exportation, and stockpiling of fill material are involved, soil stockpiled for more than two days would be covered, kept moist, or treated with soil binders to prevent dust generation. Trucks transporting fill material to and from the site would be tarped from the point of origin.

In addition to the above dust control measures, the following control measures would be implemented to decrease diesel emissions:

▶ When feasible, equipment powered with federally mandated ultra-low sulfur diesel engines would be used.

▶ Engine size in equipment used for the project would be minimized.

▶ The use of equipment would be managed to minimize the number of pieces of equipment operating simultaneously and total operation time for the project.

▶ Engines would be maintained in tune per manufacturer or operator specification.

▶ California Air Resources Board (CARB)-certified low diesel fuel would be used.

▶ If feasible, United States (U.S.) Environmental Protection Agency (EPA) or CARB-certified diesel catalytic converters, diesel oxidation catalysts, and diesel particulate filters would be installed.

- ▶ CARB-developed idling regulations for trucks during loading and unloading would be followed.
- ▶ When feasible, equipment powered by diesel engines retrofitted or re-engined to meet the Air Toxics Control Measures for Off-Road Vehicles would be used.

Biological Resources

Potential adverse impacts to biological resources would be avoided or minimized during construction activities covered under the Proposed Action through implementation of the following construction constraints and monitoring measures:

Central Coast Maritime Chaparral

- ▶ Avoid construction in undisturbed Burton Mesa chaparral.
- ▶ Conduct pre-construction surveys for nesting birds (March – August).
- ▶ Monitor, control, and eradicate invasive non-native species.

Coastal Sage Scrub

- ▶ Avoid construction in undisturbed coastal sage scrub.
- ▶ Conduct pre-construction surveys for nesting birds (March – August).
- ▶ Monitor, control, and/or eradicate invasive non-native species.

Riparian Woodland

- ▶ Avoid construction in riparian woodland.
- ▶ Construction and grading necessary within 100 feet of riparian woodlands should use techniques to minimize impacts, reduce runoff, turbidity, sedimentation, and chemical degradation.
- ▶ Construction periods for projects within 100 feet of riparian woodlands should be based on site-specific surveys to avoid impacts to special status and sensitive species if found in the habitat.
- ▶ Monitor, control, and eradicate invasive non-native species.

Vernal Pools/Seasonal Wetlands

- ▶ Avoid construction in vernal pools/seasonal wetlands.
- ▶ Construction and grading within 100 feet of wetlands should use techniques to minimize impacts, reduce runoff, turbidity, sedimentation, and chemical degradation.
- ▶ Construction periods for projects within 100 feet of wetlands should be based on site-specific surveys to avoid impacts to special status and sensitive species if found in the habitat.
- ▶ Monitor, control, and eradicate invasive non-native species.

Ornamental/Non-native Vegetation

- ▶ Avoid removal of mature trees.
- ▶ Conduct pre-construction surveys for nesting birds and roosting bats.
- ▶ Monitor, control and eradicate invasive non-native species.

Gaviota Tarplant

- ▶ Avoid construction in high quality suitable habitat.
- ▶ Avoid initiating construction in suitable habitat during the blooming period (February 1 – September 30).
- ▶ Minimize habitat loss, degradation, disturbance, or modification.

Vernal Pool Fairy Shrimp

- ▶ Avoid construction in vernal pools/seasonal wetlands.
- ▶ For projects that occur in the vicinity of vernal pools, conduct pre-construction surveys and delineate construction zone to avoid potential adverse effects to vernal pools.

El Segundo Blue Butterfly

- ▶ Avoid construction in documented occupied Central Coast Scrub.
- ▶ For projects that occur in the vicinity of occupied Central Coast Scrub, conduct pre-construction surveys and delineate

construction zone to avoid potential adverse effects to the species.

California Red-legged Frog

- ▶ Avoid construction in riparian woodlands and wetlands.
- ▶ For construction projects within 100 feet of riparian woodlands and wetlands, conduct pre-construction surveys to detect the presence of California red-legged frogs.
- ▶ For construction projects within 100 feet of riparian woodlands and wetlands where California red-legged frogs are detected, establish a monitoring regime to minimize or avoid adverse effects on the species.

Other Special Status Species and Sensitive Habitats

- ▶ For construction projects that occur adjacent to the sensitive resources illustrated in Figure A-2a and A-2b in Appendix A
 - Avoid construction in adjacent suitable habitat during the breeding/blooming times.
 - Minimize habitat loss, degradation, disturbance, or modification.
- ▶ Conduct pre-construction surveys for nesting raptors (January – August).
- ▶ Avoid removal of trees with active raptor nests.
- ▶ Conduct pre-construction surveys for bat roosts.
- ▶ Implement passive exclusion for bats as appropriate.
- ▶ To the extent practicable, avoid removal, thinning, or clearing of known Monarch butterfly roosts.

Cultural Resources

Potential adverse impacts to cultural resources would be avoided or minimized during activities covered under the Proposed Action through implementation of the following measures:

- ▶ Activities under the Proposed Action will comply with all relevant authorities governing

cultural resources, including Section 106 of the National Historic Preservation Act and AFI 32-7065.

- ▶ In the event that previously undocumented cultural resources are discovered during construction activities, procedures established in 36 CFR 800.13 will be followed.

Hazardous Materials and Waste Management

Strict compliance with all applicable federal and state statutes and regulations, as well local support plans and instructions including 30 SW Plan (30 SWP) 32-7086, *Hazardous Materials Management Plan*, 30 SWP 32-7043A, *Hazardous Waste Management Plan*, 30 SWP 32-1052A, *Asbestos Management Plan*, and the 30 SWP 32-1002, *Lead-Based Paint Management Plan* would avert the potential for adverse impacts to the environment as a result of the potential generation of hazardous materials and waste during the Proposed Action.

Implementing the measures presented below would further minimize the potential for adverse impacts for hazardous materials or hazardous waste.

- ▶ Proper disposal of hazardous waste would be accomplished through identification, characterization, sampling, and analysis of wastes generated.
- ▶ All hazardous materials would be properly identified and used in accordance with manufacturer's specifications to avoid accidental exposure to or release of hazardous materials required to operate and maintain construction equipment.
- ▶ All equipment would be properly maintained and free of leaks during operation. All necessary equipment maintenance and repairs would be performed in pre-designated controlled, paved areas to minimize risks from accidental spillage or release.

For demolition of existing facilities associated with proposed CIP construction projects and

future projects, the following measures would also be implemented:

- ▶ In compliance with California Business Plan requirements, contractors would submit a Business Plan or Disclaimer based upon amount of hazardous materials present on site for more than 30 days.
- ▶ Per VAFB requirements, contractors would submit an Environmental Protection Plan to 30 CES/CEV prior to the start of demolition activities.
- ▶ 30 CES/CEC would require demolition contractors to submit a Spill Prevention and Response Plan prior to the start of demolition activities and would obtain concurrence from 30 CES/CEV.
- ▶ As required, to avoid accidental exposure and ensure proper management of hazardous materials presently managed in-place (asbestos containing material, lead-based paint, polychlorinated biphenyls, and dioxins), hazardous materials surveys and abatements would be accomplished prior to demolition. All personnel performing surveys, abatements, and demolition activities would be trained to recognize hazards and protect themselves and others from exposure. Abatement would be completed prior to demolition.
- ▶ As required, an Asbestos Work Plan would be prepared by demolition contractors and approved by 30 CES/CEV, Compliance Office (30 CES/CEVC).
- ▶ As required, all personnel working at abatement sites would wear protective clothing and equipment to protect against hazards that may be encountered.

Because some of the identified projects under the Proposed Action would occur within boundaries of Areas of Interest (AOI) or Installation Restoration Program (IRP) sites, there is the potential for encountering pollutants during implementation of the Proposed Action. Prior to any project activities at AOI or IRP sites, AF Form 332, *Base Civil Engineer Work Request*, and AF Form 103, *Base Civil Engineering Work*

Clearance Request coordination with 30 CES/CEV IRP Office would be required. To avoid adverse effects, construction activities associated with implementation of the Proposed Action would be coordinated with the 30 CES/CEV IRP Office prior to the start of construction so as not to expose workers to contamination.

Human Health and Safety

Potential adverse impacts to human health and safety would be avoided or minimized during activities covered under the Proposed Action through implementation of the following constraints and monitoring measures:

- ▶ Future projects covered under the Proposed Action to occur within the main and South Base cantonments would primarily be sited within areas designated as having no or minimal operational and safety constraints. Specific safety measures would be established prior to implementation of any future projects sited in areas designated as having moderate or severe operational and safety constraints.
- ▶ To provide for the health and safety of workers and visitors who may be exposed to construction and demolition operations included under the Proposed Action, contractors would comply with federal Occupational Safety and Health Administration (OSHA) requirements over the entire project.
- ▶ Contractors would also supply a health and safety plan to VAFB and appoint a formally trained individual to act as safety officer. Additionally, contractors would coordinate with the Explosive Ordnance Disposal (EOD) Flight prior to implementing the Proposed Action to ensure no adverse effects on human health and safety would occur from unexploded ordnance issues.
- ▶ To minimize potential adverse impacts from biological hazards (e.g., snakes and poison oak) and physical hazards (e.g., rocky and slippery surfaces), awareness training

would be incorporated into the worker health and safety protocol.

Solid Waste Management

Solid waste from identified projects and future projects covered under the Proposed Action would be minimized by strict compliance with applicable federal and state statutes and regulations, as well as by following requirements contained in 30 SWP Plan 32-7042, *Solid Waste Management Plan*.

Implementing the measures presented below would further minimize the potential for adverse impacts associated with solid waste.

- ▶ Asphalt and concrete debris resulting from demolition activities would be accepted at the VAFB Sanitary Landfill (Base Landfill) if necessary, and recycled when possible. Access to the landfill requires a Landfill Access Ticket, which would be coordinated through the 30 CES/CEV Pollution Prevention Office (30 CES/CEVV).

- ▶ Hazardous materials surveys and appropriate abatement actions would be completed prior to structural demolition to avoid contamination of inert demolition debris.

- ▶ Solid waste disposal would be minimized by:

- Removing salvageable, reusable, or recyclable materials, items and equipment prior to structural demolition.
- Segregating and separately managing the different types of waste during the demolition process.
- Segregating and processing the different types of demolition debris into sizes, characteristics and specifications identified by local recyclers as acceptable to their authorized processes.
- Segregating and processing the different types of demolition debris into sizes, characteristics and specifications for reuse within other VAFB projects.
- Using segregated demolition debris, such as residual wood, drywall, roofing, and flooring, as feedstock for grinding to

make demolition debris suitable for use as alternate daily cover at the Base Landfill.

In order to meet VAFB's detailed tracking requirements for waste disposal and diversion, the party/unit responsible for diversion, recycling, or disposal must report all materials going off base for these purposes to the 30 CES/CEVV Solid Waste Manager. Additionally, any materials recycled on base by processes other than the Base Landfill, must be reported to the 30 CES/CEVV Solid Waste Manager at least quarterly, with copies of weight tickets and receipts provided.

Compliance with the VAFB Pollution Prevention Management Plan, 30 SWP 32-7080, and implementation of the recommended measures for air quality, as well as hazardous waste and solid waste management would enhance pollution prevention. Contractors would also comply with affirmative procurement requirements as specified in federal and Air Force policies, regulations and plans.

Transportation

Potential adverse impacts to the transportation system would be avoided or minimized during construction activities associated with the Proposed Action through implementation of the following construction constraints and monitoring measures:

- ▶ As required, contractors would supply a traffic control plan that would cover all conditions to be encountered during construction, and which would be implemented to adequately facilitate the movement of traffic.

- ▶ As required, roadway users would be provided with adequate notice of when roadways would experience heavy construction use, so that users could plan for alternate routes when possible.

The following measures would also be implemented to reduce the potential for adverse effects on transportation:

- ▶ Project employees would be encouraged to carpool and eat lunch on site.
- ▶ Truck trips would be scheduled during non-peak traffic hours when possible.

Water Resources

Compliance with National Pollutant Discharge Elimination System (NPDES) Construction General Permit conditions should minimize potential adverse impacts to water resources. Contractors would develop and implement a Storm Water Pollution Prevention Plan (SWPPP) approved by 30 CES/CEV prior to initiation of any construction activities under the Proposed Action. NPDES Construction General Permit Best Management Practices (BMPs) and Discharge To Grade program procedures should minimize the potential for adverse impacts to local water resources.

A Notice of Intent would be submitted to the State Regional Water Control Board (SRWCB). A Notice of Termination would be submitted to the Central Coast Regional Water Quality Control Board (RWQCB) to ensure all permit termination requirements are met. The Notice of Intent and Notice of Termination would be coordinated with 30 CES/CEV and signed by the 30th Civil Engineer Squadron (30 CES) Commander or Deputy Commander (30 CES/CC or 30 CES/CD) prior to submittal.

In addition, implementation of the measures described below should further reduce the potential for adverse effects to water resources:

- ▶ BMPs, including erosion and sediment control, proper spill prevention practices for all stored liquids and construction vehicles, and permanent erosion control, would be implemented to prevent sediment or chemicals from entering stream waters.

- ▶ Approval would be obtained from the 30 CES/CEVC, Water Resources Manager, prior to any release to grade of any water (Discharge to Grade Program).

- ▶ Industrial wastewater (water containing prohibited chemical levels) would be taken to the industrial wastewater treatment ponds.

- ▶ New building water lines and fire suppression systems would require installation of backflow prevention assemblies to prevent cross-contamination of the VAFB drinking water supply.

- ▶ Backflow prevention devices would be required for hoses connected to the VAFB drinking water distribution system (including hydrants).

- ▶ After completion of construction activities, areas with exposed disturbed soil would be stabilized per the NPDES Construction General Permit, as detailed in Section A, Item 7 on page 15 of the Permit.

2.2 No-Action Alternative

Under the No-Action Alternative, the 2007 General Plan would not be adopted. This alternative would entail the continued use of current facilities within the main and South Base cantonments. Projects identified under the CIP would not be implemented and goals and objectives identified in the 2007 General Plan would not be met.

This page intentionally left blank.

Chapter 3. Affected Environment

3.1 Air Quality

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

The Clean Air Act (CAA) required the U.S. EPA to establish ambient ceilings for certain criteria pollutants. Subsequently, the U.S. EPA promulgated regulations that set the National Ambient Air Quality Standards (NAAQS). NAAQS have been established for carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter 10 microns or less in diameter (PM_{10}), particulate matter 2.5 microns or less in diameter ($\text{PM}_{2.5}$), and sulfur dioxide (SO_2). Of these criteria pollutants, only $\text{PM}_{2.5}$ and O_3 are secondary pollutants – i.e., they are not directly emitted, but are formed from the reaction of nitrogen oxides (NO_x) and reactive organic compounds (ROCs). The NAAQS are presented in Table 3.1.

Under the California CAA, California established air quality standards for the state, known as the California Ambient Air Quality Standards (CAAQS). CAAQS are generally more stringent than the NAAQS and there are additional CAAQS for sulfates (SO_4), hydrogen sulfide (H_2S), vinyl chloride, and

visibility-reducing particulate matter. The CAAQS are also presented in Table 3.1.

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

3.1.1 Regional Climate and Meteorology

The climate at VAFB can be characterized as cool and wet from November through April and warm and dry from May through October. The average annual rainfall is approximately 14.7 inches, most of which falls between November and May (unpub. data, 30 SW). Winds are usually light during the nighttime hours, reaching moderate speeds of approximately 12 miles per hour by the afternoon. Winds are most often northwesterly on North Base and north to northeasterly on South Base. The strongest winds are associated with rainy season storms.

VAFB is subject to early morning and afternoon temperature inversions about 96 and 87 percent (%) of the time, respectively. In an inversion, air temperature rises with increasing altitude, which confines the surface air and prevents it from rising (VAFB 2003).

Table 3.1: Ambient air quality standards.

Pollutant	Averaging Time	CAAQS ^(1,3)	NAAQS ^(2,3)	
			Primary ⁽⁴⁾	Secondary ⁽⁵⁾
Ozone	8-hour	0.07 ppm (137 µg/m3)	0.08 ppm (157 µg/m3)	Same as Primary
	1-hour	0.09 ppm (180 µg/m3)	--	
Carbon Monoxide	8-hour	9 ppm (10 mg/m3)	9 ppm (10 mg/m3)	None
	1-hour	20 ppm (23 mg/m3)	35 ppm (40 mg/m3)	
Nitrogen Dioxide*	Annual Arithmetic Mean	0.03 ppm (56 µg/m3))	0.053 ppm (100 µg/m3)	Same as Primary
	1-hour	0.18 ppm (338 µg/m3)	--	
Sulfur Dioxide	Annual Arithmetic Mean	--	0.03 ppm (80 µg/m3)	--
	24-hour	0.04 ppm (105 µg/m3)	0.14 ppm (365 µg/m3)	--
	3-hour	--	--	0.5 ppm (1300 µg/m3)
	1-hour	0.25 ppm (655 µg/m3)	--	--
PM10	Annual Arithmetic Mean	20 µg/m3	--	Same as Primary
	24-hour	50 µg/m3	150 µg/m3	
PM2.5	Annual Arithmetic Mean	12 µg/m3	15 µg/m3	Same as Primary
	24-hour	No State Standard	35 µg/m3	
Sulfates	24-hour	25 µg/m3	No Federal Standards	
Lead	30-day average	1.5 µg/m3	--	--
	Calendar Quarter	--	1.5 µg/m3	Same as Primary
Hydrogen Sulfide	1-hour	0.03 ppm (42 µg/m3)	No Federal Standards	
Vinyl Chloride	24-hour	0.01 ppm (26 µg/m3)	No Federal Standards	
Visibility Reducing Particles	8-hour	Extinction coefficient of 0.23 per kilometer – visibility of ten miles or more due to particles when relative humidity <70%.	No Federal Standards	

NOTES:

*The Nitrogen Dioxide ambient air quality standard was amended on February 22, 2007, to lower the 1-hr standard to 0.18 ppm and establish a new annual standard of 0.03 ppm. These changes become effective after regulatory changes are submitted and approved by the Office of Administrative Law, expected in 2007.

(1) California Standards for ozone, carbon monoxide, sulfur dioxide (1- & 24-hour), nitrogen dioxide, PM₁₀, PM_{2.5}, and visibility reducing particles are not to be exceeded. Sulfate, lead, hydrogen sulfide, and vinyl chloride standards are not to be equaled or exceeded.

(2) National Standards, (other than ozone, particulate matter, and those based upon annual averages or average arithmetic means) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight-hour concentration in a year, averaged over three-years, is equal to or less than the standard. For PM₁₀, the 24-hours standard is attained when 99% of the daily concentrations, averaged over three years, are equal to or less than the standard. For PM_{2.5}, the 24-hours standard is attained when 98% of the daily concentrations, averaged over three years, are equal to or less than the standard.

(3) Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature and pressure of 25 degrees Celsius (OC) and 760-mm Hg, respectively. Most measurements of air quality are to be corrected the reference temperature of 25OC and reference pressure of 760-mm Hg; ppm in this table refers to ppm by volume or micromoles of pollutant per mole of gas.

(4) National Primary Standards: The level of air quality necessary, with an adequate margin of safety to protect the public health.

(5) National Secondary Standards: The level of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

This restricts the vertical dispersion of pollutants and, therefore, increases local pollutant concentrations. Pollutants are "trapped" under an inversion layer until either solar radiation produces enough heat to lift the layer or strong surface winds disperse the pollutants. In general, these conditions occur most frequently during the nighttime and early morning hours.

3.1.2 Existing Air Quality

The U.S. EPA classifies air quality within each air quality control region with regard to its attainment of NAAQS. The CARB does the same for CAAQS. An area with air quality better than state or federal ambient air quality standards for a specific pollutant is designated as attainment for that pollutant. Any area not meeting those standards is classified as non-attainment. Santa Barbara County is in attainment or unclassified for all the ambient air quality standards except for

the state standard for PM₁₀ and the state O₃ standards.

The estimated emissions for Santa Barbara County and VAFB are presented in Tables 3.2 and 3.3. In Table 3.2, the Santa Barbara County emissions are 2000 daily planning emissions taken from the 2004 SBCAPCD Clean Air Plan, while the VAFB emissions are annual emissions taken from the 2001 Comprehensive Emission Inventory Draft Report.

On January 24, 2007, President Bush issued EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*. One of the main requirements established under this EO is the reduction of greenhouse gases through a reduction in energy intensity of 3% per year or 30% by the end of fiscal year 2015.

Table 3.2: Existing emissions.

Source	2000 Emissions			
	Annual (Tons/Year)		Planning Day (Tons/Day)	
	NO _x	ROC	NO _x	ROC
<i>Santa Barbara County</i>				
Stationary Sources	2,096	3,667	5.57	10.05
Area-Wide Sources	350	3,064	0.48	7.94
Mobile Sources	13,803	8,687	37.84	23.84
Natural Sources		28,930		
<i>Outer Continental Shelf Sources</i>	<i>12,175</i>			
Stationary Sources	298	417	0.82	1.14
Mobile Sources	11,876	646	32.55	1.77
Natural Sources		2,004		
Total	29,789	47,415	77.26	44.74
VAFB Annual	1,134	229	ND	ND

ND = Not determined

SOURCE: 2004 Clean Air Plan, Santa Barbara County's plan to attain the state 1-hour ozone standard, December 2004.

Table 3.3: VAFB annual emissions (tons) in 2006.

	CO	NOx	PM10	SOx	ROC
Mobile					
On-Road	402.75	160.71	2.08	NE	46.06
Off-Road	575.78	20.02	2.34	0.91	20.60
Aircraft/Launch Vehicles	97.45	14.69	6.87	1.60	37.19
Permitted Sources	NE	1.35	0.48	0.42	3.30
Exempt Source	NE	19.63	NE	NE	32.96
Total	1,075.98	216.40	11.77	2.93	140.11

NE = Not estimated

SOURCE: VAFB, 30 CES/CEV, unpublished data

3.2 Biological Resources

The scope of the biological analysis includes vegetation and wildlife resources, as well as waters of the U.S. and wetlands.

VAFB is located in a transitional ecological region that lies at the northern and southern distributional limits of many species, and contains diverse biological resources of considerable importance. The base provides habitat for many federal and state listed threatened, endangered, and special concern plant and animal species. Fourteen major habitat types have been described and mapped on the base. The habitat types are fully described and assessed in VAFB's Integrated Natural Resources Management Plan (INRMP). The INRMP is currently in draft form and completion of the document is expected mid-2009. Once the INRMP is finalized, plans and projects will be required to comply with its terms.

3.2.1 Methodology

A literature search, general biological survey, and special status species survey were used to characterize the biological resources within the main and South Base cantonments. Potential occurrence of plant and wildlife species, including special status species was determined based on suitable habitat preferences and on known occurrence based on literature searches and other existing documentation. Sources used to determine potential occurrence include literature and

maps of natural resources present at VAFB (VAFB *In Progress*); California Natural Diversity Database (CNDDB; California Department of Fish and Game [CDFG] 1999, 2001, 2006, 2007); and existing local and regional references (Christopher 1996, 2002; Coulombe and Mahrtdt 1976; Holmgren and Collins 1999; Keil and Holland 1998; Lehman 1994, Pratt 2006). Special status species survey and location maps (ManTech SRS Technologies, Inc. [MSRS] 2007; SRS Technologies [SRS] 2006, 2007) were superimposed over the study area, and intersecting occupied habitat was documented and/or reviewed.

3.2.2 Vegetation Types and Wildlife Resources

Vegetation types that occur within the two cantonments include Non-native Grassland, Central Coast Scrub, Burton Mesa Chaparral, Non-native Woodland, Bishop Pine Forest, Central Coast Arroyo Willow Riparian Forest, Coast Live Oak Woodland, Freshwater Marsh, Vernal Marsh, Vernal Pool, and Seasonal Pool. In addition, non-native invasive species occur extensively within some sections, and ornamental plantings of non-native species and turf grasses are common.

Non-native Grassland

Non-native Grasslands typically occur in areas subjected to prior or continuous disturbance, with non-native grasses and forbs dominating this vegetation type.

Annuals comprise most of the species in areas that receive regular mowing. Common dominant species in mowed Non-native Grasslands include foxtail barley (*Hordeum murinum*), rattail fescue (*Vulpia myuros*), cutleaf plantain (*Plantago coronopus*), and filaree (*Erodium* spp.). Un-mowed Non-native Grasslands are often dominated by bromes (*Bromus* spp.) slender wild oats (*Avena barbata*), Italian ryegrass (*Lolium multiflorum*), and veldt grass (*Ehrharta calycina*). Some Non-native Grassland species are considered highly invasive and pose a threat to intact native habitats. These include veldt grass, jubata grass (*Cortaderia jubata*) and iceplant (*Carpobrotus* spp.).

Native plants adapted to grassland habitats or disturbed areas may also be locally common within Non-native Grassland vegetation type. These species include the federally endangered Gaviota tarplant (*Deinandra increscens villosa*), which is present in many of the mowed and unmowed, unirrigated grassy areas within the main cantonment including highly disturbed areas such as the Base Landfill and road shoulders.

Native wildlife species adapted to grassland habitats are present within the Non-native Grasslands in the main and South Base cantonments. These include species such as the California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), and other small mammals. Predators such as coyotes (*Canis latrans*), red-tailed hawks (*Buteo jamaicensis*), golden eagle (*Aquila chrysaetos*), and great blue heron (*Ardea herodias*) are often attracted to Non-native Grassland areas in the main cantonment by the abundance of small mammals. Non-native Grasslands on the periphery of the main cantonment, such as those maintained around the airfield, provide habitat for American badger (*Taxidea taxus*) as well. The closely mowed grasslands at the airfield are also used annually by wintering Western burrowing owl (*Athene cunicularia*) and mountain plover (*Charadrius montanus*).

Central Coast Scrub

This vegetation type is characterized by shallow-rooted, mesophytic plant species that are often drought-deciduous and summer-dormant. Coyote brush (*Baccharis pilularis*), California sagebrush (*Artemisia californica*), mock heather (*Ericameria ericoides*), and black sage (*Salvia mellifera*) are dominant species in much of the Central Coast Scrub.

Clearings within Central Coast Scrub provide habitat for Gaviota tarplant. In addition, early successional shrubs such as seaciff buckwheat (*Eriogonum parvifolium*), the host plant for the federally endangered El Segundo blue butterfly (*Euphilotes battoides allyni*), ESBB, are present within this vegetation type. Seaciff buckwheat is sparsely distributed within the Central Coast Scrub behind military family housing (MFH). Because it is an early successional species, it is often found along trail edges or adjacent to areas where disturbances have created openings within the scrub.

Some portions of the main cantonment historically occupied by chaparral and scrubland communities subjected to clearing, development or other heavy disturbances, have been allowed to lie fallow. In such areas Central Coast Scrub vegetation may start to recolonize from remnant plants. Such vegetation types typically have widely spaced bushes with intervening areas dominated by non-native annual or perennial grasses. Versatile scrub species such as coyote brush, capable of rapidly re-colonizing areas after a disturbance dominate these sites, along with perennial non-native grasses such as veldt grass, or annual grasses such as slender wild oats or bromes.

Native wildlife species adapted to scrublands are present in Central Coast Scrub within the two cantonments. Reptiles such as Southern Pacific rattlesnake (*Crotalus helleri*), San Diego gopher snake (*Pituophis catenifer annectens*), and Southern alligator lizard (*Elgaria multicarinata*) are common within this vegetation type. Native birds such as goldfinches (*Carduelis* spp.), California thrasher (*Toxostoma redivivum*), bushtit

(*Psaltriparus minimus*), and California towhee (*Pipilo crissalis*) use scrublands for nesting and foraging.

Burton Mesa Chaparral

This vegetation type occurs on well drained sandy substrates and relies on fire for reproduction. Narrowly distributed manzanitas typically dominate Burton Mesa Chaparral. Dominant species within the chaparral in the main cantonment include Purissima manzanita (*Arctostaphylos purissima*), sand mesa manzanita (*Arctostaphylos rudis*), buckbrush (*Ceanothus cuneatus*), Santa Barbara ceanothus (*Ceanothus impressus*), and coast live oak (*Quercus agrifolia*).

Burton Mesa chaparral provides habitat for rare plants such as the Lompoc monkey flower (*Mimulus fremontii*), and the federally endangered Lompoc yerba santa (*Eriodictyon capitatum*). Neither species has been documented within the main cantonment Burton Mesa Chaparral although comprehensive surveys have not been conducted for Lompoc monkey flower. Clearings within Burton Mesa Chaparral also constitute high quality habitat for Gaviota tarplant.

In areas where Burton Mesa Chaparral vegetation has been subjected to disturbance resulting in a patchier distribution of shrub species, non-native grassland species have colonized many of the gaps. Within the main cantonment in the vicinity of the airfield much of the Burton Mesa Chaparral has been heavily colonized by jubata grass. Left unchecked jubata grass forms dense monotypic stands to the exclusion of native species from which it can spread into adjacent intact habitat. Veldt grass, iceplant and non-native annual grasses may also invade disturbed Burton Mesa Chaparral and become a dominant presence.

In contact zones between Central Coast Scrub and Burton Mesa Chaparral the two vegetation types intergrade resulting in a mix of species with dominant species from both vegetation types. Following a disturbance in

Burton Mesa Chaparral, Central Coast Scrub species often colonize the opening, along with Non-native Grassland species. Seacliff buckwheat may occur where Burton Mesa Chaparral and Central Coast Scrub vegetation types intergrade. In areas where Non-native Grassland species become established, Gaviota tarplant may become established as well.

Burton Mesa Chaparral provides habitat for narrowly distributed invertebrates such as the Lompoc blue butterfly (*Philotiella speciosa*) and gopher beetle (*Ceratophyus gopherinus*). A new species of Jerusalem cricket (*Stenopelmatus* sp.) was discovered within the chaparral in the main cantonment during basewide invertebrate surveys conducted in 2004 to 2005 (Pratt 2006). Reptile species such as silvery legless lizard (*Anniella pulchra pulchra*), and coast horned lizard (*Phrynosoma coronatum*) are also common within this vegetation type. Birds such as Bell's sage sparrow (*Amphispiza belli belli*), spotted towhee (*Pipilo maculatus*) and wrentit (*Chamaea fasciata*) use Burton Mesa Chaparral for foraging and nesting. Mammalian species such as shrews (*Sorex ornatus* and *S. trowbridgii*), dusky-footed woodrats (*Neotoma fuscipes*), and brush rabbits (*Sylvilagus bachmani*) also occur in this vegetation type.

In areas of mixed chaparral and scrub vegetation, wildlife adapted to both vegetation types may be found. In areas of mixed chaparral and Non-native Grassland, where the chaparral comprises the bulk of the vegetation, many of the unique wildlife species present in the intact chaparral will persist. In heavily infested areas, where openings in shrubs are dominated by dense growths of non-native grasses and iceplant, species reliant on clearings such as Gaviota tarplant and Lompoc monkey flower may not be able to persist.

Non-native Woodland

Non-native Woodland includes non-native trees planted as ornamentals and windbreaks, as well as growths of non-native

trees which have spread from the original sites of planting to colonize adjacent habitats. Within the two cantonments blue gum eucalyptus (*Eucalyptus globulus*) and Monterey pine (*Pinus radiata*) comprise the bulk of the non-native woodland. These species were widely planted as windbreak and shade trees and have proven adept at spreading into and colonizing adjacent habitats. Small stands of acacia (*Albizia* sp.) have also colonized select sites within the cantonments.

Non-native Woodland species compete with native plants and alter native habitats thereby, posing a threat to many sensitive native plant species and habitats on VAFB. Blue gum eucalyptus and Monterey pines originally planted as part of a windbreak west of California Blvd., have spread into adjacent Burton Mesa Chaparral to the west where they threaten the federally endangered Lompoc yerba santa. Northwest of the MFH area, blue gum eucalyptus and acacia are invading riparian corridors and Monterey pines are invading Central Coast Scrub and Non-native Grassland habitats. The shade and heavy litter layer deposited by these trees make these areas unsuitable for native species such as Gaviota tarplant and seaciff buckwheat which are dependent on open areas.

Non-native Woodlands are used by a variety of wildlife species. Ensatina (*Ensatina eschscholtzii*), arboreal salamander (*Aneides lugubris*), and black bellied slender salamander (*Batrachoseps nigriventris*) inhabit the thick litter below tracts of trees. Raptors such as red-shouldered (*Buteo lineatus*) and red-tailed hawks, and American crow (*Corvus brachyrhynchos*) will use trees for nesting and perching. Birds such as Northern flicker (*Colaptes auratus*), Nuttall's (*Picoides nuttallii*) and hairy woodpeckers (*Picoides villosus*) are common within portions of Non-native Woodland dominated by Monterey pines. Winter migrants such as nuthatches (*Sitta* spp.) and yellow-rumped warbler (*Dendroica coronata*) also use this vegetation type.

Bishop Pine Forest

Bishop pines (*Pinus muricata*) were planted in select areas of Non-native Grassland within the main cantonment. Areas between pines are dominated by Non-native Grassland and are subjected to mowing where gaps between trees are wide enough to admit mowing equipment. Where bishop pine plantings border windbreaks, Monterey pines seeded from the windbreak trees are interspersed with the bishop pines. Grassy openings between the bishop pines provide habitat for various herbaceous plant species including Gaviota tarplant.

The bishop pine plantings provide habitat for common wildlife species such as Anna's hummingbird (*Calypte anna*), and chestnut backed chickadee (*Poecile rufescens*). Western gray squirrel (*Sciurus griseus*) are also abundant within these plantings.

Central Coast Arroyo Willow Riparian Forest

Central Coast Arroyo Willow Riparian Forest is a dense, low, closed-canopy, broad-leaved, winter-deciduous riparian forest dominated by arroyo willow (*Salix lasiolepis*), which can grow as a tree or treelike shrub. Other species such as Pacific wax myrtle (*Myrica californica*) and coast live oak are also associated with riparian corridors. Wild blackberry (*Rubus ursinus*), mugwort (*Artemisia douglasiana*), and stinging nettle (*Urtica dioica*) are common understory components of riparian vegetation types.

Riparian forest provides habitat for common wildlife species such as Pacific treefrog (*Hyla regilla*) and a diverse array of bird species, including Pacific slope flycatcher (*Empidonax difficilis*), Wilson's warbler (*Wilsonia pusilla*), chestnut-backed chickadee, and Cooper's hawk (*Accipiter cooperii*).

Riparian corridors such as those in the South Base cantonment are subject to seasonal pooling and are interspersed with fresh water marsh vegetation. These areas provide habitat and dispersal corridors for the

federally threatened California red-legged frog (*Rana draytonii*).

Coast Live Oak Woodland

Dense Coast Live Oak Woodland is dominated by an overstory of coast live oak. The understory is dominated by species such as poison oak (*Toxicodendron diversilobum*), snowberry (*Symphoricarpos mollis*) and hummingbird sage (*Salvia spathacea*). In more open oak woodland habitats scrub and chaparral species may be intermixed with oaks. Coast live oak trees are also distributed within Non-native Grassland where they may be vestiges remaining from the original native habitat prior to clearing.

Coast Live Oak Woodland provides habitat for a diverse array of native wildlife species. Ensatinas, arboreal salamanders and black-bellied slender salamanders (*Batrachoseps nigriventris*) reside in the litter layer below the trees. Dead branches afford habitat to cavity nesting bird species such as downy woodpecker (*Picoides pubescens*), oak titmouse (*Baeolophus inornatus*), and Western bluebird (*Sialia mexicana*). Species such as Western scrub-jay (*Aphelocoma californica*) and Western gray squirrel also rely on coast live oaks for food and shelter. The dense crowns typically present on coast live oaks also provide nesting sites for raptors such as white-tailed kite (*Elanus leucurus*).

In areas where Central Coast Arroyo Willow Riparian Forest and Coast Live Oak Woodland vegetation types abut, the two vegetation types may intergrade. Dominant species characteristic of both vegetation types occur in these areas. Wildlife species adapted to both riparian and oak woodland vegetation types may be found using these areas. These areas may also provide upland habitat for California red-legged frogs.

Freshwater Marsh

Freshwater Marsh vegetation types are variously dominated by species such as cattail (*Typha* spp.), American bulrush (*Scirpus americanus*), and other rushes (*Juncus* spp.) and sedges (*Carex* spp.).

Freshwater Marsh occurs in perennially moist areas within the main and South Base cantonments. Freshwater Marsh in the South Base cantonment, where surface water is present at least seasonally, provide adult and larval habitat for California red-legged frog.

Freshwater marsh areas, including those within largely developed areas and restricted to drainage ditches, provide breeding habitat for Pacific treefrog, and Western toad (*Bufo boreas*). Common and Western terrestrial garter snakes (*Thamnophis sirtalis* and *T. elegans*) also utilize Freshwater Marsh habitat. Native bird species such as common yellowthroat (*Geothlypis trichas*), song sparrow (*Melospiza melodia*), and fox sparrow (*Passerella iliaca*) are found in association with these wetlands as well.

Vernal Marsh

Vernal Marshes are areas that experience at least seasonally saturated soils but surface water is absent or only briefly present. Areas that experience extended periods of saturation are typically dominated by rushes such as spreading rush (*Juncus patens*), bog rush (*Juncus effusus*), and toad rush (*Juncus bufonius*). Sword-leaved rush (*Juncus ensifolius*), and sickle-leaf rush (*Juncus falcatus*) may dominate where moisture is more ephemeral. Beardless wild rye (*Leymus triticoides*) also is a dominant species in some vernal marsh areas. Gaviota tarplant has been documented within dry vernal marshes.

Vernal Marshes provide habitat for species such as pacific treefrog, Southern alligator lizard (*Elgaria multicarinata*), and garter snakes. Birds such as song sparrows and common yellowthroats are common within Vernal Marshes, and Northern harriers (*Circus cyaneus*) will also use them for foraging. Mule deer (*Odocoileus hemionus*) and feral pig (*Sus scrofa*) may also use Vernal Marshes.

Vernal Pool

Vernal Pools are depressions that fill with water after the onset of fall and winter rains, and dry as the season progresses. In the

cantonments, Vernal Pools are dominated by small rushes such as sword-leaved rush and sickle-leaf rush. In unmowed areas dense growths of non-native grasses such as Italian ryegrass (*Lolium multiflorum*) may become established within drying Vernal pools.

The federally threatened vernal pool fairy shrimp (*Branchinecta lynchi*) inhabits many Vernal Pools within the main cantonment. These shrimp pass the dry summer in a cyst state, with young emerging after the pool is filled by winter rains. As the pool dries adult shrimp die after depositing the next generation of cysts. Gaviota tarplant also grows in Vernal Pool basins after the pools have dried.

Vernal Pools provide habitat for California fairy shrimp (*Linderiella occidentalis*). Amphibians such as Western spadefoot (*Spea hammondi*), Western toad, and Pacific treefrog, use Vernal Pools for breeding. Waterfowl such as mallard (*Anas platyrhynchos*) may also use Vernal Pools, in addition to species such as great blue heron (*Ardea herodias*) and great egret (*Ardea alba*).

Seasonal Pool

Seasonal Pools are areas that fill with water after the onset of fall and winter rains. These pools typically have much shorter hydroperiods than Vernal Pools and may consequently only fill for extended periods in years of high rainfall. Due to their shorter hydroperiods, many of these pools lack hydric vegetation such as rushes, or hydric vegetation is not a dominant component. Dominant species are typically non-native grasses matching those in adjacent upland areas. Seasonal Pools often develop in areas of compacted soil in the footprints of structures that have been removed, roadside ditches or low spots that receive runoff, and drainage ditches that channel runoff from adjacent development.

Some Seasonal Pools within the main cantonment support vernal pool fairy shrimp. Gaviota tarplant may also grow in these areas once water has dried.

In years of high rainfall, Seasonal Pools may support a similar fauna to Vernal Pools.

Other Areas

Developed areas have been subject to heavy modification by human activities. They include areas occupied by structures and infrastructure such as roads and parking lots, as well as irrigated lawns composed of various turf grasses and ornamental plantings. Species capable of coexisting with regular human disturbance will inhabit developed areas. Western fence lizards (*Sceloporus occidentalis*) and southern alligator lizards are commonly found associated with ornamental plantings and gardens in residential areas. Non-native bird species such as European starlings (*Sturnus vulgaris*) will use gaps within bay doors or cavities present within some streetlights for nesting. Native species such as cliff swallows (*Petrochelidon pyrrhonota*), barn swallows (*Hirundo rustica*), and black phoebes (*Sayornis nigricans*) frequently construct mud nests within open outbuildings and under eaves, and house finches (*Carpodacus mexicanus*) will nest in ornamental shrubs and trees as well as in structures, wherever sheltered platforms exist of sufficient size to support a nest. Burrowing mammals such as broad-footed mole (*Scapanus latimanus*), Botta's pocket gopher and California ground squirrel are also common within developed areas.

The South Base cantonment includes portions of agricultural fields. These areas are subject to regular cycles of disking and planting with row crops, which are subsequently colonized on a limited basis by non-native weedy species such as sow thistle (*Sonchus* spp.) and wild radish (*Raphanus sativus*). Birds such as tricolored blackbird (*Agelaius tricolor*), red-winged blackbird (*Agelaius phoeniceus*) and Brewer's blackbird (*Euphagus cyanocephalus*) will frequently forage within disked agricultural fields. Raptors such as Cooper's hawk, and ferruginous hawk (*Buteo regalis*) also use these fields for foraging.

3.2.3 Sensitive Vegetation Types and Special Status Species

Sensitive vegetation types and special status plant and wildlife species that occur within the cantonments are listed in Table 3.4. The table also identifies the presence of these resources within the project areas for the 13 CIP projects proposed in the 2007 General

Plan. Figures A-2a and A-2b depict the presence of sensitive biological resources in the cantonments.

Sensitive vegetation types that occur within the cantonments include Burton Mesa Chaparral, Central Coast Arroyo Willow Riparian Forest, Freshwater Marsh, Vernal Marsh, Vernal Pool, and Seasonal Pool. The occurrence of vegetation types within the

Table 3.4: Sensitive plant communities and special status species within the cantonments.

Description	Coverage/ Status*	CIP Project Occurrence
Burton Mesa Chaparral	403.9 acres	Air Traffic Control Tower Vehicle Maintenance Shop
Central Coast Arroyo Willow Riparian Forest	21.8 acres	Air Traffic Control Tower
Freshwater Marsh	8.4 acres	
Vernal Marsh	31.0 acres	
Vernal Pool	28.6 acres	
Seasonal Pool	62.7 acres	
<i>Deinandra increscens</i> ssp. <i>villosa</i> Gaviota tarplant	FE/SE	Precision Measurement Equipment Lab MSG Headquarters 614th Space Operations Group Headquarters
<i>Eriodictyon capitatum</i> Lompoc yerba santa	FE/SE	
<i>Rana draytonii</i> California red-legged frog	FT/CSC	
<i>Branchinecta lynchi</i> Vernal pool fairy shrimp	FT	
<i>Euphilotes battoides allyni</i> El Segundo Blue Butterfly	FE	
<i>Spea hammondi</i> Western spadefoot	CSC	
<i>Falco columbarius</i> Merlin	CSC	
<i>Athene cunicularia hypugea</i> Western burrowing owl	BCC/CSC	
<i>Buteo regalis</i> Ferruginous hawk	CSC	
<i>Charadrius montanus</i> Mountain plover	BCC/CSC	
<i>Lanius ludovicianus</i> Loggerhead shrike	BCC/CSC	
<i>Amphispiza belli belli</i> Bell's sage sparrow	CSC	
<i>Agelaius tricolor</i> Tricolored blackbird	BCC/CSC	
<i>Carduelis lawrencei</i> Lawrence's goldfinch	BCC	

* FE = Federally Endangered FT = Federally Threatened SE = State Endangered BCC = Federal Bird Species of Conservation Concern CSC = California Species of Concern

cantonments is illustrated in Figures A-2a and A-2b in Appendix A. Specific sensitive biological resources occurring within the project areas for the CIP projects are illustrated in Figures A-3a through A-3d in Appendix A.

As described in Table 3.4, one federally and state endangered plant species, Gaviota tarplant, and one federally threatened wildlife species, vernal pool fairy shrimp, occur within the cantonments. Other special status species with the potential to occur within the cantonments include:

- ▶ The federally threatened California red-legged frog – likely to occur within riparian/wetland habitats of the cantonments.
- ▶ The federally endangered ESBB – field surveys conducted in June through August 2007 (MSRS 2007), documented this species in over four miles of Central Coast Scrub behind MFH. This species also has the potential to occur in other areas where Central Coastal Scrub occurs within the cantonments.
- ▶ The federally and state endangered Lompoc yerba santa (*Eriodictyon capitatum*) – occurs north of 35th Street, approximately 58 feet from the main cantonment boundary.

Brief accounts of these species are included below. No other species listed as either threatened or endangered under the federal and California Endangered Species Act are known to occur.

Several other Federal Bird Species of Conservation Concern and/or California Species of Special Concern occur or have the potential to occur within the cantonments including Western spadefoot, merlin (*Falco columbarius*), Western burrowing owl, Ferruginous hawk (*Buteo regalis*), mountain plover, loggerhead shrike (*Lanius ludovicianus*), Bell's sage sparrow, tricolored blackbird, and Lawrence's goldfinch (*Carduelis lawrencei*).

Gaviota Tarplant

A member of the aster family, this tarplant is a yellow-flowered, gray-green, soft hairy annual that is three to nine decimeters (12 to 35 inches) tall with stems branching near the base. This plant is most often associated with grasses, and on occasion, with coastal shrubs such as *Baccharis* and *Isocoma*.

The U.S. Fish and Wildlife Service (USFWS) listed Gaviota tarplant as federally endangered on March 20, 2000 (65 Federal Register [FR] 14888) and designated critical habitat on November 7, 2002 (67 FR 67967). VAFB was excluded from critical habitat designation under section 4(b)(2) of the federal Endangered Species Act (ESA). As a result, the Proposed Action is not in critical habitat. VAFB conducted basewide surveys for this species in 2005 and 2006. Gaviota tarplant occurs at various locations within the cantonments (SRS 2007).

Lompoc Yerba Santa

Lompoc yerba santa is an evergreen shrub in the waterleaf family. It has smooth, sticky leaves, and branched inflorescences of tubular, lavender flowers. It occurs in chaparral, coastal sage scrub, and closed-cone Bishop pine forest.

The USFWS listed Lompoc yerba santa as federally endangered on March 20, 2000 (65 FR 14888) and designated critical habitat on November 7, 2002 (67 FR 67967). VAFB was excluded from critical habitat designation under section 4(b)(2) of the ESA. As a result, the Proposed Action is not in critical habitat.

VAFB conducted basewide surveys for this species in 2006. Lompoc yerba santa occurs within 58 feet of the main cantonment (SRS 2007).

Vernal Pool Fairy Shrimp

Vernal pool fairy shrimp is a small crustacean that occupies a variety of vernal pool habitats, from small, clear, sandstone rock pools, to large, turbid, alkaline, grassland valley floor pools. The USFWS listed vernal pool fairy shrimp as federally threatened on September

19, 1994 (59 FR 48136), and designated critical habitat on August 6, 2003 (68 FR 46684). Vernal pool fairy shrimp were not known to occur on VAFB at the time of critical habitat designation. However, VAFB would be excluded from this designation under section 4(b)(2) of the ESA. As a result, the Proposed Action is not in critical habitat.

VAFB conducted basewide surveys for this species in 2004, 2005 and 2006. Vernal pool fairy shrimp occur in numerous pools within the main cantonment (SRS 2006).

El Segundo blue butterfly

The ESBB occurs in coastal dune scrub habitat, along coastal bluffs, and in coastal scrub habitats. The adult flight period is generally from mid-June through late August or early September and coincides with the blooming period of its host plant, seacliff buckwheat (Arnold 1978 and 1983; Pratt and Ballmer 1993). Eggs are deposited on buckwheat flowers and buds where the larvae feed until maturation. Upon maturation, larvae burrow into the soil and pupate, usually within the root and debris zone of the host plant (Mattoni 1992, Pratt and Ballmer, pers. obs.). Pupae remain in diapause until at least the following flight season. The number of adult butterflies that emerge in a given year is dependent on environmental conditions. The majority of the pupae may remain in diapause if environmental conditions are not favorable (Pratt and Ballmer 1993).

The ESBB was listed by the USFWS as federally endangered on June 1, 1976 (40 FR 48139). The occurrence of ESBB at VAFB represents a significant extension of the butterfly's geographic range. It was originally thought to be restricted to remnant habitat patches from Playa del Rey to the Palos Verdes Peninsula in Los Angeles County, California (Arnold 1978 and 1981).

VAFB conducted field surveys in June through August 2007 (MSRS 2007). This species was documented in the Central Coast Scrub behind MFH and has the potential to be present in other areas where Central Coastal Scrub occurs within the cantonments.

California red-legged frog

California red-legged frogs require aquatic habitat for breeding but also use a variety of other habitat types including riparian and upland areas. Adults often use dense, shrubby, or emergent vegetation closely associated with deep-water pools with fringes of cattails and dense stands of overhanging vegetation such as willows.

The USFWS listed the California red-legged frog as federally threatened on May 23, 1996 (61 FR 25813), and designated critical habitat on March 13, 2001 (66 FR 14626). VAFB was excluded from this designation under section 4(b)(2) of the ESA. As a result, the Proposed Action is not in critical habitat.

California red-legged frogs occur in nearly all permanent streams and ponds on VAFB and in a number of wetlands throughout the Base. They have the potential to occur within wetlands and riparian areas in the cantonments.

3.2.4 Waters of the U.S. and Wetlands

For the wetland hydrology criterion to be met, a site must be inundated or saturated or exhibit features that show the area was inundated or saturated for the required period of time (i.e., 45 days). A hydric soil is defined as "...a soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophilic vegetation (Environmental Laboratory 1987). While wetlands occur at various locations within the cantonments, only one identified CIP project considered in this PEA (Air Traffic Control Tower) would partially encroach on a portion of Arroyo Willow Riparian Forest (Figure A-3d in Appendix A).

3.3 Cultural Resources

All references made in this section to the VAFB cantonments refer to the areas defined as the main and South Base cantonments (see Figure 1-2 in Chapter 1). The terms

“study area” and “project area” in this section and Section 4.3 of Chapter 4 also refer to the main and South Base cantonments. A summary of the prehistory and ethnohistory as it relates to the cultural setting is provided in Appendix B.

The VAFB cantonments cover about 6,176 acres and function as the central administrative and support center for the base. The cantonments include the airfield, Base Exchange, educational and recreational facilities, all of the housing, and much of the infrastructure of the base. They also include a considerable area that was built up as part of Camp Cooke during World War II (WWII) and the Korean War, but that now is largely devoid of structures.

An archaeological site record and literature search was completed at the 30 CES/CEV Cultural Resources Section (30 CES/CEVNC) at VAFB and at the Central Coast Information Center, University of California Santa Barbara (UCSB). Background research included a review of archaeological literature, archaeological base maps, and cultural resource records. The record search identified archaeological studies within 1.0 mile (Table 3.5) and archaeological resources within 0.25 mile of the project area (Table 3.6).

Maps examined at 30 CES/CEVNC included the VAFB C-1 series (46 map set), the Base Comprehensive Plan Geographic Information System (GIS), and U.S. Geological Survey (USGS) topographic maps. Electronic GIS layers examined include ARCHSITE2000, ISOLATE2000, CULPOLY, CULPTS, CULROADS, AND CULSTORM.

In the mid-1990s, the Tri-Services Cultural Resources Research Center at the U.S. Army Construction Engineering Research Laboratory (USACERL) completed a three-phase inventory and evaluation of Cold War properties on VAFB to assist the installation in its effort to comply with Section 106 of the National Historic Preservation Act (NHPA) (McCullough and Nowlan 1997; Nowlan et al. 1996; Nowlan and McCullough 1997). The

USACERL documents were consulted during the background research.

USACERL looked at all the facilities on the base using the criteria as outlined in National Register Bulletin 22: *Guidelines for Evaluating and Nominating Properties that Have Achieved Significance Within the Last Fifty Years*, and criteria set forth in Air Force guidelines. Bulletin 22 states that properties under fifty years in age can only be considered if they are of exceptional importance or integral parts of districts on or eligible for the National Register of Historic Places (NRHP). Air Force guidelines further state that the facilities must be specifically associated with operational missions. USACERL therefore excluded from consideration such facilities as base exchanges, general administrative buildings, family housing, maintenance shops, sewage treatment plants, and similar facilities (Nowlan et al. 1996:ix). This covers most of the current buildings within the cantonments. Facilities evaluated as eligible are discussed in Section 3.3.4 below.

Family housing units were evaluated in Appendix A of the first USACERL volume. Military family houses on VAFB were constructed after 1958 and thus do not meet the 50-year criteria for significance and, because the Cold War criteria for listing historic properties is focused on front-line weapons systems and support facilities, do not meet the criteria for early listing on the NRHP. In a consultation under Section 106 of the NHPA regarding privatization of family housing, the California State Historic Preservation Office (SHPO) agreed that the Capehart houses on VAFB are not eligible for inclusion on the NRHP. Since the USACERL evaluation, many of the Capehart houses have been demolished and replaced with more modern units.

3.3.1 Cultural Resources Studies

Background research revealed that 111 archaeological studies have been completed within one mile of the VAFB cantonments. Of those, 48 have been at least partially within

the cantonments themselves (Table 3.5). Most previous archaeological studies within the cantonments are small surveys. Others are small portions of larger projects primarily outside the cantonments, such as studies for the Space Transportation System (Glassow 1977; Glassow et al. 1976); the MX missile project (e.g., Bamforth 1979; Chambers Consultants and Planners 1984; Craig 1980; Neff and Snethkamp 1982); fuels management (Schilz et al. 1984); the Base Landfill (Gibson 1992; Jaffke 1990); linear utilities (e.g., Bergin and King 1989; Berry 1990; Crane 1994; Greenwood and Foster 1984; Science Applications International Corporation [SAIC] 1994d; Wilcoxon and Haley 1996); a basewide survey (Carbone and Mason 1998), a basewide survey of historical resources (Palmer 1999, 2000); and a post-wildfire survey (Hodges et al. 2000).

Most substantial archaeological studies focused within the cantonments themselves have been relatively recent and are associated with replacement, expansion, and privatization of MFH. Those studies are detailed by Lebow et al. (2006) and will be only briefly summarized here.

Archaeological studies for replacement of MFH began in the mid 1990s. The initial work included archival research focused on a WWII prisoner-of-war (POW) camp and cemetery, as well as an archaeological survey primarily around the perimeter of the housing complexes. One previously recorded prehistoric site, four previously unknown prehistoric isolated artifacts, and one historical feature were identified. No artifacts or features associated with the WWII POW camp or cemetery were found during the survey, and archival research indicated that all remains in the cemetery were exhumed in 1947 and moved to San Bruno, California (Price et al. 1996a).

As part of their study for housing replacement, Price et al. (1996a) completed subsurface testing at archaeological site CA-SBA-1869 and at three isolated artifacts. Sixteen shovel test pits and a single 1 by 1 meter unit at CA-SBA-1869 yielded three

bifaces, seven cores, one edge-modified piece, and 1,475 flakes. A burned bone was recovered from the surface. The site's integrity was found to be moderately impaired and the site was evaluated as ineligible for the NRHP because it did not contain sufficient data to address important research issues (Price et al. 1996a:21).

Shovel test pits excavated at the three isolated artifacts revealed that one location was truly isolated (now designated VAFB-ISO-169) but two locations were actually archaeological sites (subsequently designated CA-SBA-3487 and -3741). A fourth isolated artifact was a shell pendant fragment found on a manicured lawn and thus was considered out of context. However, subsequent work in the area identified other cultural materials and the location was designated CA-SBA-3748 (Stevens et al. 2005).

Following the initial housing replacement project (Price et al. 1996a), McKim and Price (1997) tested CA-SBA-3487 to evaluate its NRHP eligibility. Twenty-four shovel test pits and three 1 by 1 meter test excavation units yielded 77 flakes, a projectile point fragment, a biface fragment, and two fragments of marine shell. Most cultural materials were found near the surface (above 40 centimeters) in disturbed contexts. Given low artifact density, lack of chronological data, and poor integrity, McKim and Price (1997:5-2) opined that CA-SBA-3487 was not eligible for the NRHP.

Lebow and Haslouer (2005) continued the housing investigations begun by Price et al. (1996a) by testing CA-SBA-3741 to evaluate NRHP eligibility. That effort included excavation of 67 shovel test pits and eight 1 by 1 meter test excavation units that yielded a total of 1,218 flakes, four biface fragments, three cores, one projectile point fragment, six unpatterned flake tools, 10 bones, one marine shell fragment, one fire-altered rock, six pieces of ochre, and four pieces of asphaltum. Radiocarbon analysis revealed that the site was occupied around A.D. 1400. Although the integrity of CA-SBA-3741 had

Table 3.5: Cultural resources studies within 1.0 mile of the main and South Base cantonments.

Reference (listed chronologically)	Within Cantonments	VAFB Reference Number	UCSB Reference Number
Glassow et al. (1976)	X	VAFB-1976-01	V-58
Glassow (1977)	X	VAFB-1977-01	V-5
Bamforth (1979)	X		V-1
HDR Science (1979)			V-2
Spanne (1979a)		VAFB-1979-02	
Spanne (1979b)	X	VAFB-1979-04	V-13
Spanne (1979c)	X	VAFB-1979-05	V-12
Spanne (1980)			
Craig (1980)	X	VAFB-1980-13	
Duncan (1980)			V-4
Stone and Haley (1981)	X	VAFB-1981-06	
WESTEC Services, Inc. (1981)	X	VAFB-1981-04	V-16
Greenwood and Foster (1981)		VAFB-1981-09	V-26
WESTEC Services, Inc. (1982a)		VAFB-1982-02	
WESTEC Services, Inc. (1982b)		VAFB-1982-03	
HDR Sciences (1982)			V-8
Neff and Snethkamp (1982)	X	VAFB-1982-05	V-9
WESTEC Services, Inc. (1982c)		VAFB-1982-10	V-17
Colten (1983)			E-272
WESTEC Services, Inc. (1983)	X	VAFB-1983-02	
Schilz et al. (1984)	X	VAFB-1984-02	V-20
WESTEC Services, Inc. (1984)	X		V-24
O'Halloran (1984)			V-280
Erlandson (1984)	X	VAFB-1984-11	
Greenwood and Foster (1984)	X	VAFB-1984-12	
Greenwood (1984)		VAFB-1984-18	
Gibson (1984a)		VAFB-1984-21	
Gibson (1984b)	X	VAFB-1984-22	
Chambers Consultants and Planners (1984)	X	VAFB-1984-26	
Peterson et al. (1984)		VAFB-1984-31	
Rudolph (1984)		VAFB-1984-32	V-30
Gibson (1985a)		VAFB-1985-01	
Gibson (1985b)		VAFB-1985-02	
Schilz (1985)		VAFB-1985-03	
Dames & Moore (1985)		VAFB-1985-05	V-36
Foster and Greenwood (1985)		VAFB-1985-12	
Foster (1985a)		VAFB-1985-19	
King et al. (1985)		VAFB-1985-25	V-35
Foster (1985b)		VAFB-1985-28	V-190
Gibson (1986a)		VAFB-1986-08	
U.S. Army Corps of Engineers (1986)	X	VAFB-1986-12	
Gibson (1986b)		VAFB-1986-13	
Gibson (1986c)		VAFB-1986-14	
Gibson (1987a)		VAFB-1987-08	
Gibson (1987b)		VAFB-1987-09	
Marmor (1988)		VAFB-1988-07	
Rudolph (1988)		VAFB-1988-08	V-201
Waldron (1988)			V-256
Berry (1988)		VAFB-1988-11	
Day-Moiarty et al. (1988)	X	VAFB-1988-12	
Environmental Solutions, Inc. (1988)		VAFB-1988-19	

Reference (listed chronologically)	Within Cantonments	VAFB Reference Number	UCSB Reference Number
Bergin and King (1989)	X	VAFB-1989-12	V-115
Snethkamp et al. (1989)			E-845a
Snethkamp et al. (1990)			E-845b
Jaffke (1990a)	X	VAFB-1990-04	V-122
Jaffke (1990b)	X	VAFB-1990-07	
Osland (1990)	X	VAFB-1990-11	
Berry (1990)	X	VAFB-1990-20	V-128
State Water Resources (1991a)			E-845c
State Water Resources (1991b)			E-845d
Berry (1991)		VAFB-1991-03	
Woodman et al (1991)		VAFB-1991-06	
Peter and Dondero (1991)		VAFB-1991-07	E-1232
Tetra Tech (1991)		VAFB-1991-08	
Snethkamp and Munns (1991)		VAFB-1991-09	
Earth Technology Corporation (1991)		VAFB-1991-12	
Gibson (1992)	X	VAFB-1992-03	E-1376
Berry (1992)		VAFB-1992-05	
Tetra Tech (1993)		VAFB-1993-01	V-195
Osland (1993)			V-248
Berry (1994)		VAFB-1994-01	
SAIC (1994a)	X	VAFB-1994-03	
SAIC (1994b)		VAFB-1994-04	E-1708
SAIC (1994c)	X	VAFB-1994-05	E-1705
SAIC (1994d)	X	VAFB-1994-06	V-209
Bowser (1994)		VAFB-1994-07	
SAIC (1994e)		VAFB-1994-12	
Crane (1994)	X	VAFB-1994-15	
SAIC (1994f)		VAFB-1994-16	
SAIC (1994g)		VAFB-1994-17b	
Schneider (1994)		VAFB-1994-18	E-1691
SAIC (1994h)	X		E-1707
Cagle (1995)	X	VAFB-1995-05	
Crane (1995)	X	VAFB-1995-07	
Eisentraut (1995)		VAFB-1995-11	V-153
SAIC (1995)		VAFB-1995-19	
Minas (1996)	X	VAFB-1996-01	V-154
Price et al. (1996a)	X	VAFB-1996-03	V-146
Wilcoxon and Haley (1996)	X	VAFB-1996-07	V-164
Price et al. (1996b)		VAFB-1996-08	
Clark (1997)		VAFB-1997-01	V-159
McKim and Price (1997)	X	VAFB-1997-19	V-179
Gerber (1998)	X	VAFB-1998-01	
Carbone and Mason (1998)	X	VAFB-1998-03	
Palmer (1999)	X	VAFB-1999-09	
Curt (2000)			V-273
Hodges et al. (2000)	X	VAFB-2000-04	V-276
Palmer (2000)	X	VAFB-2000-15	
Gibson and Parsons (2002)		VAFB-2002-02	V-332
Munns and Lebow (2003)			E-3006
Mirro and Lebow (2003)		VAFB-2003-02	V-326
Owen and Lebow (2003a)		VAFB-2003-06	
Owen and Lebow (2003b)		VAFB-2003-08	

Reference (listed chronologically)	Within Cantonments	VAFB Reference Number	UCSB Reference Number
Linder (2004)			V-346
Lebow and Haslouer (2005)	X	VAFB-2005-01	
Munns (2005)			V-361
Stevens (2005)			V-360
Stevens et. al. (2005)	X		
Price et al. (2006)			E-3569
Lebow and Peterson (2007)	X		
Peterson and Lebow (2007)	X		

Table 3.6: Archaeological sites within 0.25 mile of the main and South Base cantonments.

CA-SBA-0776	CA-SBA-1868	CA-SBA-3080	CA-SBA-3180	CA-SBA-3270
CA-SBA-0778	CA-SBA-1869	CA-SBA-3081	CA-SBA-3182	CA-SBA-3272
CA-SBA-0923	CA-SBA-2086	CA-SBA-3082	CA-SBA-3183	CA-SBA-3376
CA-SBA-0924	CA-SBA-2333	CA-SBA-3083	CA-SBA-3184	CA-SBA-3406
CA-SBA-0925	CA-SBA-2346	CA-SBA-3084	CA-SBA-3186	CA-SBA-3414
CA-SBA-0926	CA-SBA-2554	CA-SBA-3085	CA-SBA-3187	CA-SBA-3487
CA-SBA-0927H	CA-SBA-2569	CA-SBA-3086	CA-SBA-3188	CA-SBA-3559H
CA-SBA-0964	CA-SBA-2570/2571	CA-SBA-3093	CA-SBA-3192	CA-SBA-3580
CA-SBA-1022	CA-SBA-2572	CA-SBA-3112	CA-SBA-3193	CA-SBA-3581
CA-SBA-1047	CA-SBA-2876	CA-SBA-3124	CA-SBA-3194	CA-SBA-3582
CA-SBA-1048	CA-SBA-2879	CA-SBA-3165	CA-SBA-3196	CA-SBA-3583
CA-SBA-1049	CA-SBA-2882	CA-SBA-3166	CA-SBA-3203	CA-SBA-3584
CA-SBA-1064	CA-SBA-2888	CA-SBA-3168	CA-SBA-3205	CA-SBA-3741
CA-SBA-1065	CA-SBA-2889	CA-SBA-3169	CA-SBA-3213	CA-SBA-3747
CA-SBA-1066	CA-SBA-3071	CA-SBA-3170	CA-SBA-3214	CA-SBA-3748
CA-SBA-1068	CA-SBA-3073	CA-SBA-3171	CA-SBA-3248	CA-SBA-3560H
CA-SBA-1142	CA-SBA-3074	CA-SBA-3172	CA-SBA-3258	CA-SBA-3561H
CA-SBA-1147	CA-SBA-3075	CA-SBA-3175	CA-SBA-3261	CA-SBA-3562H
CA-SBA-1759	CA-SBA-3076	CA-SBA-3176	CA-SBA-3262	CA-SBA-3575H
CA-SBA-1760	CA-SBA-3077	CA-SBA-3177	CA-SBA-3263	CA-SBA-3858
CA-SBA-1779	CA-SBA-3078	CA-SBA-3178	CA-SBA-3265H	CA-SBA-3859H
CA-SBA-1867	CA-SBA-3079	CA-SBA-3179	CA-SBA-3269H	

clearly been affected by construction of family housing and associated infrastructure, roughly 55 percent of the site area was considered intact. Because data from the site could be used to address questions important to understanding prehistory, Lebow and Haslouer (2005:9.2–9.3) opined that CA-SBA-3741 was eligible for the NRHP.

Stevens et al. (2005) documented archaeological investigation of a 470-acre area for an expansion of MFH. Background research and the survey revealed that five

sites and six isolated artifacts were present. Absence/presence testing at 11 locations revealed that two of the isolated artifacts were actually archaeological sites. Six sites (CA-SBA-2569H, -2570, -2571, -2572, -3747, and -3748) were found to be completely or partially within the expansion study area. More intensive testing found that CA-SBA-2570, -2571, and -2572 were actually a single site that was subsequently designated CA-SBA-2570/2571. Because they were near the expansion project's Area of Potential Effects, NRHP eligibility testing

was completed at CA-SBA-2570/2571, -2569H, and -3748.

NRHP eligibility testing at CA-SBA-2569H included excavation of 19 shovel test pits and a single 1 by 1 meter test excavation unit, which yielded a modest collection of 287 historical artifacts. The site appeared to represent a single episode of trash disposal and thus provides little useful contextual information; Stevens et al. (2005) opined that CA-SBA-2569H was not eligible for the NRHP.

At CA-SBA-2570/2571, NRHP eligibility testing yielded a much more substantial assemblage of prehistoric and historical artifacts. Excavations included nine test excavation units, six manually excavated trenches, and 78 shovel test pits. Prehistoric materials recovered included nine flaked stone tools, 1,522 flakes, and one battered stone. A diverse assemblage of historical artifacts reflecting life at a line camp (Fern Springs Camp) associated with the Marshall Ranch also was recovered. Chronological data for the prehistoric component suggest an Early or Middle Period occupation. The historical component was established circa 1900 and was abandoned after 1937. Stevens et al. (2005) opined that both the historical and prehistoric components have the potential to increase understanding of important research issues and, ultimately, local and regional history and prehistory. Consequently, the site was considered eligible for the NRHP.

The third site evaluated for NRHP eligibility by Stevens et al. (2005) was CA-SBA-3748. Located adjacent to the existing MFH, this site was initially recorded as the shell pendant fragment noted above. An initial six shovel test pits yielded three flakes, qualifying the location as a site which was then tested to evaluate NRHP eligibility. A small collection of 16 flakes was recovered from the site; 13 of these were found in redeposited sediments related to construction of the existing housing. With only three flakes recovered from equivocally intact deposits, the density of cultural materials is too low to allow

interpretations of prehistoric behavior. Given low integrity and the very low data potential, Stevens et al. (2005) opined that CA-SBA-3748 is not eligible for the NRHP.

The most recent survey effort in the cantonments was performed between January and October 2007, specifically for the cantonments General Plan study (Lebow and Peterson 2007). The survey covered 3,383 acres not covered by any previous surveys. Two new sites, CA-SBA-3858 (a prehistoric lithic scatter) and CA-SBA-3859 (four WWII era ditch headers), were recorded along with two additional historic features for previously recorded site CA-SBA-3575H. Six new prehistoric isolated artifacts and one isolated feature were also recorded.

On June 6, 2007, Robert Peterson also surveyed a very small area near the South Gate for a security gates upgrade project that is still ongoing (Peterson and Lebow 2007). No new cultural resources were recorded during that survey.

3.3.2 Recorded Archaeological Sites

Background research identified 109 previously recorded sites within 0.25 mile of the cantonments, as listed in Table 3.6. Twenty-eight recorded sites are within or immediately adjacent to the cantonment study area (Table 3.7), and each is summarized below.

CA-BA-0923

Spanne recorded the site in 1972 as a light to moderate density scatter of debitage, on a hilltop at the mouth of Lompoc Canyon. Seven shovel test pits were excavated on the site in 1980 in association with the Space Transportation System 69 kilovolt (kV) transmission line project. Six of these yielded a total of nine flakes and one shell fragment. The site is located on the slope immediately west of the South Base cantonment boundary. The site has not been formally evaluated for NRHP eligibility.

Table 3.7: Sites within and adjacent to the main and South Base cantonments.

CA-SBA-0923	CA-SBA-2888	CA-SBA-3561H
CA-SBA-0925	CA-SBA-3165	CA-SBA-3562H
CA-SBA-927H	CA-SBA-3168	CA-SBA-3575H
CA-SBA-1049	CA-SBA-3169	CA-SBA-3741
CA-SBA-1779	CA-SBA-3170	CA-SBA-3747
CA-SBA-1869	CA-SBA-3182	CA-SBA-3748
CA-SBA-2086	CA-SBA-3270	CA-SBA-3858
CA-SBA-2554	CA-SBA-3487	CA-SBA-3859H
CA-SBA-2569	CA-SBA-3559H	
CA-SBA-2876	CA-SBA-3560H	

CA-SBA-0925

Spanne recorded this site in 1972, and was rerecorded and expanded by T. Jaffke in 1990. It is described as a trace to moderate density lithic scatter, with numerous groundstone artifacts. The site is located on the slope immediately west of Building 874, on the west edge of the South Base cantonment. Artifacts noted on the site included two manos, two choppers, a groundstone mortar or bowl lip fragment, a few retouched flakes, bifaces of Monterey chert, and some fire altered rock fragments. The site has not been evaluated for eligibility to the NRHP.

CA-SBA-0927H

Spanne originally recorded this site in 1972 as a scatter of historic refuse and concrete foundations. Palmer (2000) identified it as the site of the dairy barn, outbuildings and residence of the Colli family. The dairy operated from 1922 to 1944. The property originally belonged to George H. Long, who moved to this ranch in 1888 (Palmer 2000:56-57). The extant remains consist of three loci constituting the residential area, the dairy barn area and a pasture, corral and eucalyptus windrow. The residential area is located about 100 meters from the east end of the South Base cantonment and includes a Monterey cypress windrow and three foundation pads. Palmer considered the site as potentially eligible, as it has the remains of

the dairy barn, which represents one of the few traces of the Swiss-Italian dairy industry in the Lompoc Valley.

CA-SBA-1049

Spanne recorded the site in 1972. It was described as a high density of unmodified and blocky fragments of chert. It is identified as a prehistoric quarry, and four hammerstones were noted on the surface. Spanne noted a good chert source on the site. It is located at the end of a large point sticking into Oak Canyon within the main cantonment. It has not been evaluated for NRHP eligibility.

CA-SBA-1779 (Winn Camp)

The Winn Camp is a freight hauler's campsite located in what was then a "U" shaped grove of eucalyptus trees at the northwest edge of the terminus of old Cross Road. Spanne recorded it in 1982 during preparations for extending the VAFB runway for Shuttle operations. The site contained a considerable number of glass, ceramic and metal fragments, machine, wagon, and truck parts and other refuse dating from the late 1890s to the 1950s. Spanne notes that the Winn brothers, who hauled freight to and from the railroad station at Tangair, about two miles northwest, originally established the site. Much of the site was graded away for extension of the runway and there is little left today. The site is partially within the main cantonment immediately northeast of the

runway. It has not been evaluated for NRHP eligibility.

CA-SBA-1869

CA-SBA-1869 is a low-density scatter of lithic artifacts just north of West Housing. It is within the study area but outside of the existing MFH. The site was originally recorded in 1984 as a sparse scatter of Monterey chert flakes covering about 70 by 75 meters. At that time, approximately 20 secondary and tertiary flakes were observed on the surface. Flakes extended below the surface for at least 60 centimeters, as indicated by excavation of one shovel probe and archaeological monitoring of excavation for a buried communication cable (Foster 1985a). During the studies for the MFH Replacement Project in 1996 (Price et al. 1996a) the site was tested. Excavation of 16 shovel test pits and a single 1 by 1 meter unit yielded three bifaces, seven cores, one edge-modified piece, and 1,475 flakes. A single burned bone was recovered from the surface. This effort determined that the site lies just north of the single-lane road that marks the edge of West Housing. Following testing, the site was evaluated as not eligible for the NRHP because it lacks chronological data.

CA-SBA-2086

R. Weaver of the U.S. Army Corps of Engineers (ACOE) originally recorded this site in 1986. It is a segment of roadway which may represent the highly modified remains of the historic trail between Tangair Station and Short Camp. The roadway is about 24 feet wide and has been chip sealed over about 18 feet of its width. The Short camp is located at the head of Juan Pedro Canyon, north of the present airfield, and was a camp site named for the Short family, who once resided there. The route runs east to west, cuts diagonally across the airfield area, and appears to intersect with the Winn Camp (CA-SBA-1779). About 1,336 meters of roadway were recorded. It cuts through the main cantonment on the north side of the airstrip, close to the proposed new control tower. The

site has not been evaluated for NRHP eligibility.

CA-SBA-2554

The site has apparently been completely destroyed by the Base Landfill. There is no site record on file at 30 CES/CEVNC, and it is mentioned only in one report. It was apparently recorded by Spanne in the late 1990s from memory, but was first noted during a hunting trip in the 1960s. There is no additional information on it. As it has been completely destroyed it is not recommended eligible for inclusion on the NRHP.

CA-SBA-2569/H

This site was first recorded in 1992 as a diffuse scatter of historical glass, ceramic, and metal with some faunal material. It was evaluated by Applied EarthWorks Inc. (Æ) through subsurface testing for the MFH expansion project in 2004 (Stevens et al. 2005). Six of 19 shovel tests yielded historical debris and three had prehistoric debris. One 1 by 1 meter test excavation unit (TEU) was also excavated. The testing yielded mainly flat metal and nails but also had ceramics, bottle fragments a cartridge casing, and a tumbler rim. The original site boundary was modified slightly due to the testing results. Æ opined that the site was not eligible for inclusion on the NRHP.

CA-SBA-2876

Recorded during the basewide survey (Carbone and Mason 1998), this site is described as "several thousand possible red Franciscan chert flakes/shatter." It lies adjacent to and just north of 35th Street; it is within the study area but outside the actual main cantonment. An inspection in 1998 pointed out that the site recorders failed to recognize that the site coincides precisely with an area of extensive earthwork where heavy equipment scraped cherty bedrock. It appeared during that inspection that the "site" was created by the equipment (Lebow and Ryan 1998:Appendix A). The site has not been formally evaluated for eligibility.

CA-SBA-2888

CA-SBA-2888 was recorded in 1995 as a highly disturbed, low-density scatter of lithic artifacts in the Air Force obstacle training course west of West Housing. As such, it is within the study area but outside the actual main cantonment. Artifacts observed included one Monterey chert projectile point, two chert cores, and three chert flakes. A test was conducted near the site to determine whether it extended into a possible expansion of the MFH and found that it did not (Stevens et al. 2005). No other studies have been completed at the site and its eligibility for the NRHP has not been evaluated.

CA-SBA-3165

E. Freitze, of Chambers Group, recorded the site in 1995. It is located at the head of Pine Canyon and is immediately outside the main cantonment boundary. The site was recorded as a low density lithic scatter about 40 x 145 meters in size. It contained 11 secondary, three primary, and one tertiary flakes along with a small number of decortication flakes, a tested chert chunk, and some shatter. It has not been evaluated for NRHP status.

CA-SBA-3168

The site is a small lithic scatter consisting of about 26 primary and secondary flakes, a biface fragment, and a tested cobble. It was recorded by J. Sharp, of Chambers Group, in 1995 and is noted to be mostly on a man-made berm from a firebreak. It is noted to have been almost completely disturbed by construction of the firebreak. A small section of intact site is noted adjacent to the eastern cut of the firebreak. The site has not been evaluated for NRHP eligibility.

CA-SBA-3169

E. Freitze, of Chambers Group, recorded this site in May of 1995, and is described as a chipping station. Three secondary flakes, three pieces of shatter, one modified flake, one hammerstone, and a decortication flake, were noted on the site in an area about

10 x 50 meters in size. It is located within the main cantonment south of the Base Landfill. It has not been formally evaluated for NRHP eligibility.

CA-SBA-3170

The Chambers Group recorded this site in May of 1995, and it is identified as a chipping station. It is small, only 3 x 8 meters in size but contains four cores, a decortication flake, two primary and 11 secondary flakes, and one tertiary flake. The material is noted to be in two concentrations associated with a large nodule or small boulder of chert. It is within the main cantonment, south of the Base Landfill. The site has not been evaluated for NRHP eligibility.

CA-SBA-3182

The site is located immediately southwest of the Base Landfill, and was recorded in 1995, by J. Sharp, of Chambers Group. It is very small, only 4 x 8 meters in size, and contains only one chert tertiary flake, one chert edge-notched tool, and two quartzite hammerstones. Chert outcrops are noted within the site. It has not been evaluated for eligibility to the NRHP.

CA-SBA-3270

This site was discovered in 1995 during the VAFB basewide survey (Carbone and Mason 1998). It is described as a sparse lithic scatter that includes two black Monterey chert flake fragments, one gray Monterey chert flake, one mudstone flake, more than 10 Monterey chert nodules of all colors, and more than five small pieces of Monterey chert shatter. It lies partially within the study area but just outside the main cantonment, east of East Housing.

CA-SBA-3487

Originally recorded as an isolated marine shell fragment (Price et al. 1996a), subsequent absence/presence testing yielded additional cultural material and the location was considered a site. It was subsequently tested to evaluate NRHP eligibility as part of a

MFH undertaking. That effort revealed that the site is a highly disturbed low-density scatter of lithic artifacts with a few fragments of marine shell. No chronological data from intact deposits were recovered, so the site was recommended ineligible for the NRHP in 1997 (McKim and Price 1997). It lies in East Housing, within the main cantonment.

CA-SBA-3559H

CA-SBA-3559H is the location of a former POW camp and cemetery established on 9 October 1944 (Palmer 2000). It lies entirely within the main cantonment study area and partially within the main cantonment itself at the eastern edge of West Housing. All 10 bodies in the cemetery were exhumed on 26 November 1947 and moved to the Golden Gate National Cemetery in San Bruno, California. The wooden markers were removed at the same time. Price et al. (1996a) found no evidence of the POW cemetery during their survey for the MFH Replacement Project and testing at CA-SBA-3741, which is roughly in the same area, yielded no evidence to suggest a cemetery (Lebow and Haslouer 2005). However, Palmer (2000:186) found a low-density scatter of concrete and milled lumber in an area that had been bladed. Based on surface evidence and the fact that the burials had been removed, Palmer (2000:186) opined that the site is not eligible for the NRHP.

CA-SBA-3560H

CA-SBA-3560H was recorded by Palmer in 1999 and is a 1,400-foot segment of a concrete mortar drainage ditch on the north side of Wyoming Avenue. It is entirely within the main cantonment study area and mostly within the main cantonment itself. The ditch was constructed between 1944 and 1946 (Palmer 1999, 2000:187). According to the site record, the ditch was altered in the spring of 1999, and very little remains of the original ditch. Palmer (2000:187) opines that the site is not NRHP eligible due to the lack of integrity.

CA-SBA-3561H

This site includes three segments of rough concrete mortar ditches and ditch features built by POWs during the Camp Cooke era. The segments are evident along Nebraska, New Mexico, and Guam avenues and include two headers and a drain. Palmer (2000:28) suggests that this site is not eligible for the NRHP.

CA-SBA-3562H

Included in this site are three segments of finished concrete mortar ditches and headers at Washington/Nevada, Washington/California, and Alaska/Community. Again, Palmer (2000:28) suggests this site is not NRHP eligible.

CA-SBA-3575H

This site includes segments of ditches and headers constructed of mortar and rock quarried from Lions Head. These are located in the vicinity of 15th–20th streets, between California Boulevard and Nevada Avenue. Palmer (2000:193) argues that these segments are eligible for the NRHP due to their craftsmanship, their use of Lions Head rock, and their association with POW workers. Two additional ditch segments were recorded during the 2007 cantonment survey (Lebow and Peterson 2007).

CA-SBA-3741

CA-SBA-3741 was initially recorded as an isolated artifact during a survey for the MFH Replacement Project. However, absence/presence testing at the location yielded 20 flakes and indicated that the location qualified as a site (Price et al. 1996a). It lies both inside and outside West Housing and is entirely within the main cantonment. In 2004, the site was tested as part of the MFH Replacement Project, an effort that included 67 shovel test pits and eight test excavation units. This effort yielded lithic debitage, flaked stone tools, fire-altered rock, vertebrate faunal remains, invertebrate faunal remains, asphaltum, and ochre. Radiocarbon analysis indicates that the site was occupied around

A.D. 1040, corresponding to the late Middle Period. Although much of the site had been disturbed by construction of West Housing, substantial archaeological deposits remain intact, both inside and outside the existing development. Based on the excavation results, Lebow and Haslouer (2005) recommended that the site was eligible for the NRHP.

CA-SBA-3747

CA-SBA-3747 was originally recorded in 2004 as an isolated flake but subsequent testing yielded six additional flakes. Flakes were found to a depth of 70 centimeters (cm) in the testing. A total of seven chert flakes over an area of 30 x 150 meters were found and six of these were from buried context. The site is located just to the east of East housing on the north edge of the main cantonment. The site has not been evaluated for NRHP eligibility and its southern boundary is not well defined.

CA-SBA-3748

This site was previously recorded as an isolated abalone pendant found in the lawn of an existing house at the western edge of West Housing (Price et al. 1996a). Limited subsurface probing nearby for the MFH Expansion Project (Stevens et al. 2005) found cultural materials and the isolated artifact was designated archaeological site CA-SBA-3748. Subsequent excavation of 33 shovel test pits and two 1 by 1 meter test excavation units (a total volume of 7.22 cubic meters) within and adjacent to the existing housing complex yielded a small collection of 16 flakes. Most (13) of these were found in fill that had been imported to elevate the existing housing development. The integrity of the remaining three flakes was unclear. Given the low artifact density and the poor integrity, Stevens et al. (2005) opined that CA-SBA-3748 is not eligible for the NRHP.

CA-SBA-3858

CA-SBA-3858 is a sparse scatter of marine shell and flaked stone in an open area on the east side of Nebraska Avenue approximately

150 meters northwest of the base headquarters building entrance. The site encompasses approximately 26 meters north-south and 24 meters east-west. Cultural material noted on the surface consists of less than 10 very small fragments of marine shell. A considerable amount of natural chert gravel is evident in the area, but some flakes appear to be present. Because the area has been repeatedly mowed, however, it is difficult to distinguish prehistoric cultural material from mower-created lithic debris. The area may have been graded or plowed in the past. The site was first noted by 30 CES/CEVNC personnel but was not formally recorded. AEs inspection of the site during their survey of the main and South Base cantonments did not locate any new material (Lebow and Peterson 2007). Its significance has not been evaluated.

CA-SBA-3859

CA-SBA-3859 consists of four discontinuous sections of historic brick and stone masonry probably constructed by German POWs between 1944 and 1946. Each section is designated a feature. One of the features is a Y-shaped section of ditch and the other three are culvert headers. All are located in the main cantonment area and were discovered during the recent survey of the main and South Base cantonments (Lebow and Peterson 2007).

Feature 1 is at the north end of Cocheo Park. It is a Y-shaped brick-lined water channel 1.2–1.9 feet wide and about 1.2 feet deep. Feature 2 is a rock and masonry ditch header at the intersection of Kansas and Nebraska avenues, on the west side of Nebraska. Feature 3 is a brick ditch header on the east side of Utah Avenue, across from the Scout and Centaur dormitories. Feature 4 is a fire-brick ditch header on the east side of Utah Avenue, across from the Discovery and Peacekeeper dormitories. The site and its individual features have not been evaluated for NRHP significance.

3.3.3 Isolated Artifacts

Background research identified 70 isolated artifacts recorded within 0.25 mile of the VAFB cantonments (Table 3.8). The 29 isolated artifacts recorded within the main and South Base cantonments are described in Table 3.9. Two of those artifacts (VAFB-ISO-170 and -171) are now designated as sites CA-SBA-3748 and -3741, respectively, following testing associated with the MFH projects. Both of those sites are described above.

3.3.4 Cold War Related Facilities

Three individual facilities within the main cantonment were evaluated by USACERL as eligible for the NRHP. One of these is Building 7000, the Western Range Control Center. This is considered eligible as part of the proposed Western Range Landbased Instrumentation Support Systems Historic District. Buildings 8195 and 7403 are also considered eligible for their contribution to the Minuteman and Peacekeeper missile programs. These two buildings house Missile Procedures Trainers, which are vital in training missile crews in operation of Minuteman and Peacekeeper intercontinental ballistic missile systems.

All of these facilities are considered NRHP-eligible based on their function, and their

integrity is judged in these terms rather than physical condition. They are regularly changed and upgraded to match satellite and missile system changes and upgrades. Treatment of these buildings is specified in the VAFB Integrated Cultural Resources Management Plan Volume 8: Management of Cold War Resources (Moratto and Price 2005), and the Historic Preservation Plan for the Management and Treatment of Cold War Properties at VAFB, California (see Appendix B). They are covered under a Programmatic Agreement between the base and the California SHPO covering the treatment of Exceptionally Important Cold War Historic Properties. This agreement was signed by SHPO on 17 June, 2002 (also in Appendix B).

One consideration in dealing with Cold War eligible properties is the possibility that the NRHP eligibility of facilities might change in the future as previously classified information is released. It may be possible that such new information will reveal important programs or events that might change the evaluation of various facilities. When previously classified intelligence, covert histories, or other data concerning sites or properties at VAFB become known, they will be considered for their content and their bearing on the existing list of NRHP-eligible properties.

Table 3.8: Isolated artifacts recorded within 0.25 mile of the main and South Base cantonments.

VAFB-ISO-118	VAFB-ISO-301	VAFB-ISO-437	VAFB-ISO-539	VAFB-ISO-741
VAFB-ISO-119	VAFB-ISO-302	VAFB-ISO-438	VAFB-ISO-540	VAFB-ISO-742
VAFB-ISO-129	VAFB-ISO-303	VAFB-ISO-439	VAFB-ISO-577	VAFB-ISO-755
VAFB-ISO-169	VAFB-ISO-347	VAFB-ISO-440	VAFB-ISO-579	VAFB-ISO-767
VAFB-ISO-170	VAFB-ISO-348	VAFB-ISO-441	VAFB-ISO-580	VAFB-ISO-769
VAFB-ISO-171	VAFB-ISO-349	VAFB-ISO-449	VAFB-ISO-581	VAFB-ISO-770
VAFB-ISO-173	VAFB-ISO-350	VAFB-ISO-450	VAFB-ISO-582	VAFB-ISO-878
VAFB-ISO-199	VAFB-ISO-351	VAFB-ISO-473	VAFB-ISO-585	VAFB-ISO-951
VAFB-ISO-200	VAFB-ISO-352	VAFB-ISO-475	VAFB-ISO-588	VAFB-ISO-952
VAFB-ISO-220	VAFB-ISO-353	VAFB-ISO-510	VAFB-ISO-595	VAFB-ISO-953
VAFB-ISO-228	VAFB-ISO-354	VAFB-ISO-512	VAFB-ISO-708	VAFB-ISO-954
VAFB-ISO-230	VAFB-ISO-378	VAFB-ISO-523	VAFB-ISO-709	VAFB-ISO-955
VAFB-ISO-235	VAFB-ISO-379	VAFB-ISO-524	VAFB-ISO-739	VAFB-ISO-956
VAFB-ISO-236	VAFB-ISO-380	VAFB-ISO-538	VAFB-ISO-740	VAFB-ISO-957

Table 3.9: Table 3.9. Isolated artifacts within the main and South Base cantonments.

VAFB Number	Isolate Description
VAFB-ISO-129	Dark brown Monterey chert bifacial thinning flake
VAFB-ISO-169	One Monterey chert medial biface fragment. It measures 31 x 18 millimeter (mm)
VAFB-ISO-170	An abalone pendant measuring 77 x 67 x 7 mm; rectangular in shape with ground edges; conical hole near one edge. This became a site
VAFB-ISO-171	A Monterey chert tertiary flake. This became a site.
VAFB-ISO-228	One black banded Monterey chert flake approximately 4.5 x 4.5 x 1.0 cm
VAFB-ISO-230	One piece of brown and tan banded Monterey chert shatter (3.7 x 5.9 x 1.2 cm)
VAFB-ISO-235	One chert flake tool
VAFB-ISO-236	One probable chert flake
VAFB-ISO-347	Possible hammerstone, tan sandstone
VAFB-ISO-348	Large flake, banded gray-tan-cream Monterey chert
VAFB-ISO-349	Possible small retouch flake (gray chert)
VAFB-ISO-350	Bifacial, edge-ground mano, light gray sandstone
VAFB-ISO-351	Hammerstone with one battered edge (pinkish-tan quartzite)
VAFB-ISO-352	Bifacial, edge-ground mano and/or hammerstone with two battered ends (light gray sandstone)
VAFB-ISO-378	Chert flakes
VAFB-ISO-379	One complete Haliotis shell
VAFB-ISO-438	Isolate?
VAFB-ISO-439	Isolates?
VAFB-ISO-440	Isolates?
VAFB-ISO-510	One brown and white banded Monterey chert flake; one black and white mottled Monterey chert shatter
VAFB-ISO-740	Secondary flake
VAFB-ISO-742	Core fragment
VAFB-ISO-951	Primary chert flake, Cortex near the platform. Less than five shell fragments also found within 10 meters.
VAFB-ISO-952	Mid-stage biface reduction flake,
VAFB-ISO-953	Two early- to mid-stage biface reduction flakes.
VAFB-ISO-954	Late-stage biface reduction flake.
VAFB-ISO-955	Two isolated Monterey chert flakes. Both appear to be early-stage biface reduction flakes and both have some cortex.
VAFB-ISO-956	Mid- to late-stage biface reduction flake.
VAFB-ISO-957	Concrete and brick sewer head located about 20 feet southwest of 22nd Street between Alabama and Arizona avenues.

3.4 Hazardous Materials and Hazardous Waste Management

Hazardous materials and wastes are those substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA - 42 U.S.C 9601-9675), Toxic Substances Control Act (TSCA - 15 U.S.C. 2601-2671), the Solid Waste Disposal Act as amended by the Resources Conservation and Recovery Act (RCRA -

42 U.S.C. 6901-6992), and Title 22 of the California Code of Regulations (CCR). In addition, federal and state OSHA regulations govern protection of personnel in the workplace. In general, the definitions within these citations include substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health (to workers), welfare, or the environment, when released into the environment.

3.4.1 Hazardous Material Management

VAFB uses approximately 5,000 hazardous materials items to accomplish mission and mission support activities, with the hazard potential of the materials ranging across the spectrum of toxicity. Organizations using hazardous materials on VAFB must comply with California Business Plan requirements. Management of hazardous materials used on VAFB follows procedures found in 30 SWP 32-7086, *Hazardous Materials Management Plan* (HMMP). The base operates using a Hazardous Materials Pharmacy (HazMart) concept, wherein the HazMart maintains inventories of hazardous materials, whether purchased by the Air Force or its contractors. Before releasing hazardous materials to the user, HazMart staff ensures a copy of the Material Safety Data Sheet is available and verifies that the material is suitable for use on VAFB. By providing handling and use information, VAFB controls the potential misuse of hazardous materials, maintains an accounting of the types of hazardous materials used on the base, and accomplishes use and emissions reports as required by federal, state and local environmental regulations.

In addition to VAFB requirements, contractors operating on VAFB are subject to all federal, state and local hazardous materials regulations, and are subject to inspection by a variety of federal, state and local regulatory agencies.

Hazardous materials potentially used during construction projects and associated demolition activities include petroleum, oils and lubricants (POLs) in equipment and vehicles, solvents for paint abatement or equipment cleaning, and compressed gases for welding or cutting equipment.

3.4.2 Hazardous Waste Management

Management of hazardous waste at VAFB complies with the RCRA Subtitle C (40 CFR Part 240-299) and with California Hazardous Waste Control Laws as administered by the California Environmental Protection Agency (Cal EPA) Department of Toxic Substances

Control, under CCR Title 22, Division 4.5. These regulations require that hazardous wastes be handled, stored, transported, disposed of, or recycled according to defined procedures. The VAFB *Hazardous Waste Management Plan* (HWMP; 30 SWP 32-7043A) outlines the procedures to be followed for hazardous waste management on VAFB.

Contractors generating hazardous wastes in support of a government contract are required to follow federal, state and local laws and regulations, and use the VAFB Generator Identification Number to account for hazardous wastes generated. Because of the amount of hazardous waste generated per month under its Generator Identification Number, VAFB is classified as a large quantity, fully regulated generator, required to comply with all laws regulating the generation, storage, transportation, and disposal of hazardous waste. VAFB employs a “cradle to grave” waste management approach. Generally, hazardous waste follows the 90-day accumulation rules as allowed by regulation, or is stored up to 270 days at authorized “satellite accumulation” points (SAPs). SAPs are located at the point of generation, and wastes may be stored until 55 gallons of hazardous waste, or one quart of extremely or acutely hazardous waste is accumulated. When the SAP limit is reached, the waste is transferred in a properly labeled Department of Transportation approved container from its point of origin to the Consolidated Collection Accumulation Point (CAP) at Building 6830, or to a permitted off-site treatment storage or disposal facility. Appendix 4 of the VAFB HWMP provides detailed procedures for hazardous waste accumulation.

Construction/demolition contractors would use the VAFB Generator Identification Number, and would have to comply with the VAFB HWMP. A base contractor operates the Consolidated CAP for the Air Force and is responsible for receiving waste, inspecting waste containers for proper storage and labeling, and preparing Department of Defense (DOD) Form 1348-1A, issue/turn-in documentation, required to fund

disposal of hazardous waste. Hazardous waste is then removed from VAFB under hazardous waste manifest and shipped off-site for final disposal.

Hazardous wastes would most likely have the potential to be encountered by workers during demolition activities and could include asbestos containing material (ACM); lead-based paint (LBP); polychlorinated biphenyl (PCB) oils, coatings and electrical devices; smoke detectors; and universal wastes such as fluorescent lamps, other electronic wastes; batteries; and mercury-filled thermostats and switches.

Asbestos Abatement Management

The U.S. EPA and OSHA define ACM as any material or product that contains greater than one percent asbestos. The California Occupational Safety and Health Administration (Cal OSHA) defines asbestos-containing construction material as any manufactured construction material that contains more than 0.1% asbestos (CCR Title 8, Section 1529, Article 4). AFI 32-1052, *Facilities Asbestos Management*, establishes requirements and assigns responsibilities to incorporate facility asbestos management principles and practices into all Air Force asbestos programs. The AFI ensures compliance with the U.S. EPA National Emission Standards for Hazardous Air Pollutants (40 CFR 61.140) and the OSHA Asbestos Construction Standards (29 CFR 1926.58). The VAFB *Asbestos Management Plan* (30 SWP 32-1052A), and the *Asbestos Operating Plan* (30 SWP 32-1052B) are VAFB's primary documents for implementing the objectives of facility asbestos management, and ensure the base complies with applicable federal, state, and local regulations. Procedures for asbestos management are outlined in the VAFB Asbestos Management Plan (AMP).

Notification of demolition of load-bearing structures must be made to the SBCAPCD no later than 10 working days prior to the start of the project even if there is no asbestos present in the facility. A copy of the

notification must be sent to and approved by the 30 CES/CEVC Asbestos Program Manager before submitting to the SBCAPCD. All projects must be approved by 30 CES/CEVC prior to the start of work. Conditions for project approval include requirements for training, building surveys, and project management. Persons contracted to perform asbestos abatement, building surveys, and project management must be certified in accordance with Section 341.15, Article 2.6, Chapter 3.2, of Title 8 CCR.

All demolition projects must incorporate an asbestos survey into the design process. Demolition work cannot occur without a facility survey. Many facilities on VAFB have asbestos survey information on file in the 30 CES/CEVC offices. If additional surveys are required, the surveys must be conducted by a state certified asbestos consultant or an asbestos site surveillance technician. Sampling and surveys are conducted in accordance with 40 CFR Part 763. Detailed demolition contract requirements would include building-specific asbestos abatement specifications; completion of an up-to-date asbestos survey for each specific facility, including maps, drawings, or sketches indicating the exact location of the ACM; and a requirement to obtain demolition permits. Contract provisions would also include the requirement to notify the SBCAPCD and all other regulatory agencies of any revisions in the project design. The 30 CES/CEVC Asbestos Program Officer is contacted to schedule pre-abatement and post-abatement inspections.

Lead-Based Paint Management

The U.S. EPA and Cal EPA test for and regulate wastes exhibiting the characteristic of toxicity in different manners. Both agencies test metal-bearing wastes for toxicity based on the potential for leaching of metals. The U.S. EPA uses the Toxicity Characteristic Leaching Procedure, and sets the Threshold Limit Value, also named Maximum Concentration of Contaminant for the Toxicity Characteristic, for lead leachate at 5.0

milligrams per liter (mg/L). Cal EPA regulates wastes for toxicity using the Waste Extraction Test (WET) to determine the amount of extractable substance in a waste. Appendix II of Title 22 of the CCR, Division 4.5, Chapter 11, describes how and when the WET procedures are used. For lead and lead compounds the Total Threshold Limit Concentration (TTL) is 1,000 milligrams per kilogram (mg/kg) and the Soluble Threshold Limit Concentration is 5.0 mg/L. Based upon the determination of metals toxicity, the California Health and Safety Code Section 25141.5(b) (3) may allow the disposal of wastes, which are hazardous *only* due to exceeding applicable TTLs for inorganic constituents, to be disposed of in a Class I, II or III non-hazardous waste disposal unit provided certain conditions are met.

Many of the buildings on VAFB constructed before 1978, and especially those constructed before 1960, contain quantities of LBP. The VAFB *Lead-Based Paint Management Plan* (30 SWP 32-1002) provides specific direction in LBP management. The Lead-Based Paint Management Plan (LBPMP) contains strategies to identify, evaluate, and eliminate lead, pursuant to LBP standards; protect facility occupants and workers from LBP hazards; and properly dispose of lead-containing waste.

Demolition projects on VAFB include LBP surveys and sampling, as required. These surveys include risk assessment to define the source and extent of lead exposure hazards and review of data from LBP testing and bulk or x-ray fluorescence testing for non-priority buildings.

Polychlorinated Biphenyls and Dioxins

PCBs are occasionally found in oils, coatings, transformers, older fluorescent lighting ballasts, and electrical devices or appliances with PCB capacitors. PCB production in the U.S. ceased in 1997. PCBs are regulated under the TSCA (40 CFR 761; Title 22 of the CCR) and the U.S. EPA "PCB Final Ruling" (50 FR 29172 [July 17, 1985]).

Dioxins, like PCBs belong to a family of toxic chemicals that share similar chemical structure and a common mechanism of toxic action. This family includes seven of the polychlorinated dibenzo dioxins (PCDDs), ten of the polychlorinated dibenzo furans (PCDFs), and twelve of the PCBs. PCDDs and PCDFs are not commercial chemicals but are trace level unintentional byproducts of most forms of combustion (U.S. EPA, *Persistent Bioaccumulative and Toxic Chemical Program*). During the demolition of buildings, dioxins are likely to be encountered in areas where PCBs may have been used, where structures may have been involved in fires, or where deposition of soot may have occurred as the result of combustion. Materials contaminated by or containing any level of PCBs, dioxins, and or furans, cannot be accepted for recycling or disposal at the Base Landfill.

3.4.3 Installation Restoration Program

The federal IRP was implemented at DOD facilities to identify, characterize, and restore hazardous substance release sites. There are currently 136 IRP sites throughout VAFB grouped into six Operable Units based on similarity of their characteristics. The IRP sites are remediated through the Federal Facilities Site Remediation Agreement (FFSRA), a working agreement between the USAF, the Central Coast RWQCB, and the Department of Toxic Substances Control. In addition to IRP sites, there are identified Areas of Concern (AOCs), where potential hazardous material releases are suspected; and AOIs, defined as areas with the potential for use and/or presence of a hazardous substance. Various contaminants could be present at these sites including trichloroethylene (TCE), PCBs, volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH), asbestos, and other hazardous contaminants.

A number of AOCs, AOIs, and IRP sites occur within the main and South Base cantonments. Construction and demolition activities associated with the Proposed Action may encounter contaminated soils or sites

managed under the IRP program. Figures A-4a and A-4b in Appendix A depict these sites within the main and South Base cantonments, respectively. Table 3.10 lists sites presently known to occur within or adjacent to the 13 identified project areas included under the Proposed Action and provides their current status. AOIs-339, -524, -525, and -510, and IRP Site-24 have an open status and have projects that fall within their actual boundaries. Many of the AOIs have not yet been surveyed or are presently under investigation, thus actual extent and type of contamination is unknown at this time.

3.5 Human Health and Safety

The affected environment for Human Health and Safety includes those areas within the main and South Base cantonments where safety constraints associated with past and present VAFB mission and operations are in

effect. It also includes the regulatory environment for health and safety issues established to minimize or eliminate potential risk to the general public and personnel involved in the identified projects included under the Proposed Action.

3.5.1 Mission-Associated Constraints

Hazards associated with some past and present mission activities and operations on VAFB can constrain locations where projects can be sited in order to ensure the health and safety of workers. Safety constraints were developed to address hazards that could be associated with the development and use of some areas of VAFB, including areas within main and South Base cantonments. As discussed in Chapter 2, Section 2.1.1, constraints can be classified as none, minimal, moderate, or severe, and relevant operational and safety constraints are further discussed below.

Table 3.10: IRP sites, AOCs, and AOIs, relevant to the construction of CIP projects, and their current status.

Site	Location	Description	Status/Comments
AOI-339*	Child Development Center		Open
AOI-510*	30 SW Headquarters	Transformers	Open
AOI-524*	30 SW Headquarters	Transformers	Open
AOI-525*	30 SW Headquarters		Open
AOI-528	30 SW Headquarters	1,128 gallon underground storage tank (UST)	Open
AOC-067*	30 SW Headquarters	UST	Closed
AOI-549	MSG Headquarters		Open
IRP-24*	MSG Headquarters	Deep groundwater contamination plume; monitoring wells on site	Pollutants: TCE Open
IRP-32	Vehicle Maintenance Shop	Fuel Tank Farm	Pollutants: petroleum, hydrocarbons Open
AOI-580	FAMCAMP Expansion		Open
AOI-581	FAMCAMP Expansion	Transformer	Open
AOC-247	RV Storage Expansion		Open
AOC-248	RV Storage Expansion		Open
AOC-249	RV Storage Expansion		Open

NOTES:

* Indicates projects fall within site boundary.

Toxic Hazard Zones

Toxic hazard zones (THZ) are downwind areas that extend from launch site operations that involve the transfer or loading of liquid propellants, or maintenance of their systems. These zones can extend 20,000 or more feet from a spill site. THZ are computed for launch operations and applicable zones are determined. THZs also include estimates of the risk of personnel exposure to excessive levels of toxic vapors. (VAFB 2007)

THZ are categorized into three zones. Zone 1 has an airborne exposure level that poses no hazard to the general population but may affect sensitive individuals. Zone 2 is based on a lower exposure limit that may cause short-term symptoms, but which most individuals could endure without irreversible or serious health effects. Zone 3 consists of an airborne exposure level based on the National Institute for Occupational Safety and Health Immediate Danger to Life or Health values. Zone 1 is classified as a moderate constraint, while Zones 2 and 3 are severe constraints. (VAFB 2007)

At the time of production of this Final Draft PEA, the GIS layer for THZs was under development and not available for inclusion in Figures A-5a and A-5b in Appendix A. None of the identified projects included under the Proposed Action are located in a THZ. The THZ does not impinge on the South Base cantonment.

Missile Flight Hazard Zones

Flight analyses are performed prior to launches to assess potential hazards associated with launch operations and possible launch destruct debris fall-out. Two missile flight safety areas are calculated: the flight hazard area and the flight caution area. These areas must be evacuated prior to any launch. These flight areas are only considered hazardous during actual launch operations and personnel can be allowed back into the areas after launches are complete. When restrictions for these areas are in effect, the flight hazard area is

classified as a severe constraint, while the flight caution area is classified as a moderate constraint.

The flight caution area is the only missile flight hazard zone that impinges on a cantonment. It impinges on the main cantonment, at the north-westernmost point near the VAFB airfield runway and is depicted in Figure A-5a, in Appendix A. None of the identified projects included within the Proposed Action fall within these zones.

Electromagnetic Radiation Hazards

RF transmitters on base can present radiation hazards to people and cause detonation of electro-explosive devices. The size of the hazard areas associated with RF transmitters vary depending on transmitter power and antenna reception. The effects of RF radiation on humans depend on the frequency of the incident radiation field, the polarization of the field, the size and shape of the person, and their ability to dissipate absorbed energy. RF radiation hazard areas are classified as severe constraints. (VAFB 2007) Electromagnetic radiation hazards areas are depicted in Figure A-5b of Appendix A. The RF hazard area does not impinge on either the main or South Base cantonments, and none of the identified projects included within the Proposed Action fall within RF hazard areas.

Airfield Clear Zones and Accident Potential Zones

Clear zones and two accident potential zones are in place at both ends of the VAFB airfield runway. Clear zones, where accident potential is so high that land use restrictions prohibit reasonable use of land, are considered severe constraints. In addition to the clear zones at both ends of the runway, there is also a lateral clear zone (LCZ) that extends 1,000 feet from both sides of the centerline along the length of the runway. The LCZs lateral limits coincide with the limits of the primary surface while its ends coincide with the runway ends. The ground surface within the LCZ must be graded to

requirements and kept clear of fixed or mobile objects, excepting necessary navigational aids and meteorological equipment. (VAFB 2007)

Accident potential zones (APZ) I and II are less critical than clear zones, but still possess significant potential for accidents. They are considered moderate constraints. Acceptable uses of APZ I include industrial or manufacturing, communication and utilities transportation, wholesale trade, open space, recreation, and agricultural use, but not uses that concentrate people in small areas. Structures are to be located toward outer edges of this zone when possible. APZ II is less critical than APZ I, but still possesses the potential for accidents. Acceptable uses for this area include low business services and commercial retail trade uses of low intensity or scale of operation, but not high density operations. (VAFB 2007)

The clear zones and APZs are depicted in Figure A-5a of Appendix A and impinge on the main cantonment area only. None of the identified projects included within the Proposed Action fall within these zones.

Air Installation Compatible Use Zone (AICUZ) Noise Zones

The Air Force, recognizing that air operations can be incompatible with certain land uses, developed the AICUZ program. The AICUZ program provides land use recommendations by combining factors of accident hazards, noise, and obstacle clearances. Noise contours for VAFB operations have been developed and are identified as minimal to severe constraints depending on the associated decibel (dB) level. A 60 to 70 dB level is a minimal constraint, a 70 to 80 dB level is a moderate constraint, while a level greater than 80 dB is a severe constraint. (VAFB 2007)

The AICUZ noise zones are depicted in Figure A-5a in Appendix A. None of the identified projects included under the Proposed Action fall within the moderate or severe constraint areas.

Explosive Safety Zones

Space launch complexes and ballistic missile launch facilities, when prepared for launches, pose potential explosive hazards requiring personnel to be cleared from these areas for safety reasons. Additionally, numerous buildings on base contain missile components or high-energy rocket propellants that pose explosive hazards. AFIs establish safety criteria for operations involving explosives and set policies for the separation of various activities from potential explosive areas. Separation distances can vary from 75 to 5,000 feet and are prescribed for inhabited buildings, public traffic routes, and storage facilities containing POLs. Explosive safety zone are considered severe constraints. (VAFB 2007) Explosive safety zones impinge on the main cantonment only and are depicted in Figure A-5a in Appendix A.

Potential Unexploded Ordnance Zones

Many areas on VAFB were used as ordnance training ranges and have the potential to contain unexploded ordnance (UXO). Special precautions need to be taken in known areas of VAFB that were used as practice ranges for artillery firing, referred to as EOD Zones. Since ordnance can be found almost anywhere on base, the EOD Flight must coordinate on all ground disturbing projects. According to EOD guidance, if ordnance is found on-site, it should not be disturbed. Workers in the vicinity must be alerted to the danger and directed away from it, and the EOD Flight must be contacted.

3.5.2 Project Constraints

In addition to meeting mission-associated constraints described above, all construction and demolition activities, and facility operations and maintenance on VAFB are subject to the requirements of the federal OSHA regulations. Relevant health and safety requirements include industrial hygiene and ground safety. Industrial hygiene is the joint responsibility of the 30 SW Safety Office (30 SW/SE), 30th Medical Operations Squadron Bioenvironmental Engineering

Element Bioenvironmental Engineering (30 MDOS/SGOAB), and contractors safety departments. Responsibilities include monitoring of exposure to workplace chemicals and physical hazards, hearing and respiratory protection, medical monitoring of workers subject to chemical exposures, and oversight of all hazardous or potentially hazardous operations. Ground safety is the responsibility of 30 SW/SE and includes protection from hazardous situations and hazardous materials.

The Proposed Action would involve activities where workers could be exposed to conditions that may adversely impact their health and safety:

- ▶ Hazardous materials, primarily POLs, would be used for operating heavy equipment under the Proposed Action. The potential exists for unexpected releases of these POLs, which would generate hazardous waste.
- ▶ As required, ACM, LBP, PCBs and dioxins would be abated prior to any demolition activities. Therefore, these hazardous materials would not pose a health and safety issue to workers. The handling of these hazardous materials is discussed in detail in Section 3.4 of this PEA.
- ▶ Contractors would transport hazardous material used in or resulting from the Proposed Action. Permitted hazardous waste haulers would transport hazardous waste.

Because of the above conditions, the potential exists for persons participating in the activities to become exposed to hazardous materials and hazardous waste. In addition to these more obvious risks to human health and safety, the following more mundane physical features, which have the potential to be present in the vicinity of construction or demolition sites, also have the potential to adversely impact the health and safety of the site workers:

- ▶ Physical hazards including traffic in the roads, holes and ditches, uneven terrain, sharp or protruding objects, slippery soils or mud, and unstable ground.

- ▶ Biological hazards such as animals (insects, spiders, and snakes), and disease vectors (ticks and rodents).

Project Noise

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

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

The amplitude of sound is described in a unit called the decibel. Because the human ear covers a broad range of encountered sound pressures, decibels are measured on a quasi-logarithmic scale. The dB scale simplifies this range of sound pressures to a scale of zero to

140 dB and allows the measurement of sound to be more easily understood.

There are many methods for quantifying noise, depending on the potential impacts in question and on the type of noise. One useful noise measurement in determining the effects of noise is the one-hour average sound level, abbreviated L_{eq1H} . The L_{eq1H} can be thought of in terms of *equivalent* sound; that is, if a L_{eq1H} is 45.3 dB, this is what would be measured if a sound measurement device were placed in a sound field of 45.3 dB for one hour. The L_{eq1H} is usually A-weighted unless specified otherwise. A-weighting is a standard filter used in acoustics that approximates human hearing and in some cases is the most appropriate weighting filter when investigating the impacts of noise on wildlife as well as humans. Examples of A-weighted noise levels for various common noise sources are shown in Table 3.11.

Another useful acoustical metric for describing sound events is the A-weighted sound exposure level (SEL). The A-weighted SEL is the total sound energy in a sound event *if that event could be compressed into one (1) second*. In essence, SEL is an average sound level that is condensed into one second. This provides a time-normalized metric and allows for analysis of events with different durations. As an example, an F-16 aircraft overflight (85% full power, altitude 210

feet, speed of 443 knots) was measured to have an A-weighted SEL of 113.1 dB (Berry et al. 1991).

The “peak sound level” is the greatest instantaneous sound level reached during a sound event. Peak levels also have various frequency weightings applied to them. Peak levels, though useful in some cases, can often be misleading. It can occur that a single peak in a complex waveform can be substantially greater than the majority of a sound event. Therefore, peak levels should always be presented along with one or more of the metrics described above to better describe the sound event. An unweighted peak sound level is simply the peak sound level with no frequency weighting applied.

Existing noise levels on VAFB are generally quite low due to the large areas of undeveloped landscape and relatively sparse noise sources. Background noise levels are primarily driven by wind noise; however, louder noise levels can be found near industrial facilities and transportation routes. Rocket launches and aircraft over flights create louder intermittent noise levels. On VAFB, general ambient L_{eq1H} measurements have been found to range from around 35 to 60 dB (Thorson et al. 2001). Most activities associated with the Proposed Action would generate relatively continuous noise. Noise

Table 3.11: Comparative A-weighted sound levels.

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

levels of typical heavy construction equipment, as would be used under the Proposed Action are presented in Table 3.12.

3.6 Solid Waste Management

In 1989, the California Integrated Waste Management Act (Assembly Bill 939) mandated a 50% reduction in the quantity of solid waste disposed of in California landfills. The 50% reduction was to be accomplished by January 1, 2000, and was measured against a 1990 baseline. In 1994, the Air Force mandated similar waste diversion requirements, using a 1992 baseline. The most recent solid waste diversion requirements applicable to this PEA were enacted through California Senate Bill 1374, *Solid Waste: Construction and Demolition Waste Materials: Diversion Requirements Model Ordinance*. On March 1, 2004, the California Integrated Waste Management Board (CIWMB) promulgated a model ordinance for local agencies to follow for implementing a 50 to 75% diversion of construction and demolition (C&D) debris waste materials from landfills. Currently, the local enforcement agency, the Santa Barbara County Environmental Health Services Division, has not promulgated its final model ordinance. A locally adopted diversion ordinance would affect requirements and operations at the Base Landfill because the Federal Facilities Compliance Act waived sovereign immunity with respect to California solid waste programs, and VAFB is within the Santa Barbara County waste shed.

30 CES/CEV will require a minimum 85% diversion rate by weight over all for C&D materials generated by these efforts. Inert materials are highly recyclable with proper pre-planning for segregation and on-site management. Steel, non-chemically treated wood, concrete, waste soil, and asphalt generated as a result of the demolition actions would be expected to have a diversion rate higher than 85%. Typically,

such materials are 100% divertible with proper planning and practices. VAFB policy is that C&D materials will be managed on VAFB to the maximum extent possible. Efforts to minimize capacity consumption of off-base Santa Barbara County recyclers will be incorporated into all project planning.

The Base Landfill is 172 acres; while the RCRA Subtitle D disposal footprint is 46 acres (that part of the facility that has received or is receiving wastes and that has not been closed in accordance with 40 CFR Part 258). The Base Landfill does not charge a tipping fee to authorized base organizations, base contractors, and residents of MFH and dormitories. A part of the Lompoc waste shed, the Federal Correction Institute and U.S. Penitentiary, use the Base Landfill for disposal of their wastes and are charged \$32.50 per ton for solid waste disposal. Commercial space operations with leased facilities on VAFB do not have access to the Base Landfill, and make their own arrangements for solid waste management.

Through a 30 SW contract, a commercial contractor collects refuse and recyclables generated on base and operates the Base Landfill. Operational oversight of the contractor is provided by the 30 CES Operations Flight, with environmental oversight provided by the 30 CES/CEV. The contract includes pre-arranged collection routes for both recycled material and refuse in the base industrial and MFH areas. The contractor provides all personnel, equipment, tools, materials, supervision, and other items and services necessary to meet contract requirements. Collected refuse is disposed of in the Base Landfill. Recyclable materials are prohibited from landfill disposal and are taken to off-base recovery facilities. Special projects are authorized to use the Base Landfill if their contract with the Air Force so stipulates. Project contractors make arrangements to use the Base Landfill but are required to segregate and transport their solid wastes to designated disposal areas within the landfill.

Table 3.12: Noise levels of heavy construction equipment.

Equipment Item	Maximum Noise Level (dBA) at 15 meters (50 feet)
All other equipment > 5 HP	85
Auger Drill Rig	85
Backhoe	80
Bar Bender	80
Boring Jack Power Unit	80
Chain Saw	85
Compactor (ground)	80
Compressor (air)	80
Concrete Batch Plant	83
Concrete Mixer Truck	85
Concrete Pump	82
Crane (mobile or stationary)	85
Dozer	85
Dump Truck	84
Excavator	85
Flat Bed Truck	84
Front End Loader	80
Generator (25 KVA or less)	70
Generator (more than 25 KVA)	82
Gradall	85
Grader	85
Horizontal Boring Hydraulic Jack	80
In situ Soil Sampling Rig	84
Jackhammer	85
Paver	85
Pickup Truck	55
Pneumatic Tools	85
Pumps	77
Rock Drill	85
Scraper	85
Slurry Plant	78
Slurry Trenching Machine	82
Soil Mix Drill Rig	80
Tractor	84
Vacuum Excavator (vac-truck)	85
Vacuum Street Sweeper	80
Vibratory Concrete Mixer	80
Welder	73

SOURCE: Commonwealth of Massachusetts, Section 721.560 Construction Noise Control - <http://www.nonoise.org/resource/construc/bigdig.htm>

Due to the detailed tracking requirements for waste disposal and diversion levied by the state of California, VAFB is required to track all materials going off base for diversion, recycling, or disposal. VAFB must report on the weight (in tons), the type of material, and the destination. Additionally, any materials

recycled on base by processes other than the Base Landfill, must be reported to the 30 CES/CEVV Solid Waste Manager at least quarterly, with copies of weight tickets and receipts provided. The party/unit responsible for the diversion, disposal, or recycling is

responsible for reporting the information to the Solid Waste Manager.

The Base Landfill is classified as a Class III Sanitary Landfill, pursuant to Solid Waste Facility Permit (SWFP) #42-AA-0012 issued on August 19, 2005, by the CIWMB; and enforced by Santa Barbara County Environmental Health Services, the local enforcement agency (LEA). The landfill is also subject to requirements found in RWQCB Waste Discharge Requirement (WDR) Order No. R3-2004-151, dated November 19, 2004; and Monitoring and Reporting Program No. R3-2004-151, dated November 19, 2004. In June 2006, VAFB submitted a Joint Technical Document (JTD) amendment, #42-AA-0012, which was accepted by the LEA. The LEA concluded that the JTD did not require any change to the August 2005 SWFP.

Pursuant to requirements of the existing permits and other federal and state regulations, the Base Landfill has groundwater monitoring wells, a landfill gas monitoring procedure, and leachate and run-on/run-off control systems.

The Base Landfill has several designated disposal areas: The active face of the landfill; a non-friable asbestos disposal area; an animal cemetery, and a wood yard. SWFP #42-AA-0012 allows disposal of 400 tons/day, and a traffic volume of 99 vehicles per day. Under WDR No. R3-2004-0151 section, *Waste Type & Classification (paragraph 18)*, of the 400 tons of waste per day: 374 tons are allotted for general non-hazardous waste, 18 tons for separated or commingled recyclables, and eight tons for miscellaneous non-hazardous waste as allowed in Section 14 of the permit. Section 14 items include: non-friable asbestos; small animal carcasses; separated C&D debris; wood or green wastes to be chipped for recycling or alternate daily cover; waste tires to be hauled off-site for recycling or incineration; and properly treated medical waste as defined in the California Health and Safety Code, Chapter 8, Section 117600, et seq. (medical wastes are not accepted and are managed under separate contract). The Base Landfill

is prohibited from accepting: liquid wastes, including grease; sewage sludge and septic tank pumping; burning waste; hot ashes; untreated medical waste; non-hazardous waste requiring special handling; designated waste; hazardous waste; radioactive waste; and treated wood waste.

As stated in the VAFB June 2006 *Application for Solid Waste Facility Permit/Waste Discharge Requirements*, the current permitted capacity is 2,464,000 cubic yards with a remaining site capacity of 2,179,447 cubic yards (Dec-04, data). Based upon a waste to cover ratio of 4:1, an in-place waste density of 1,000 pounds per cubic yard, and historical disposal tonnage, the closure date for the landfill is estimated to be 2089. Although permitted for a peak daily tonnage of 400 tons, the average daily tonnage is approximately 35 tons per operating day. The four most recent Quarterly Reports (July 06-June 07) show daily disposal tonnages of 26, 28, 29 and 36 tons/day. The recent increase is attributable to a large project for the demolition of MFH.

3.6.1 Construction and Demolition Debris

VAFB C&D projects generally originate from 30 CES program management and planning requirements. Projects for new construction range from multi-story administrative buildings to space launch complexes. Demolition projects range from removal of WWII wooden structures to MFH replacement, to demolition of obsolete launch complexes and facilities. The debris from these projects includes, but is not limited to, concrete, asphalt, wood waste, dry wall material, and glass. There are different processes established for handling and disposing of C&D debris.

Debris from new construction is typically uncontaminated and is reused or recycled whenever feasible. Material segregation and storage are also less of a problem with new construction than with demolition. Debris from demolition projects is sometimes less amenable to reuse or recycle because, based on facility age, the structure may be painted

with LBP, contain ACM, and have treated woods in structural and finishing materials. This debris may have to be managed as hazardous waste. In addition, the federal government has specific rules that apply to the transfer of government property to local jurisdictions or commercial enterprises. Demolition projects must also overcome cost differentials wherein it may be less expensive to demolish a structure than to deconstruct or dismantle it. Cost differentials between tipping fees and costs associated with reuse or recycling also influence disposal decisions.

VAFB has a resident Defense Reutilization and Marketing Office (DRMO) to accomplish reutilization, transfer, donation, and sale (RTDS) of excess property. The first three elements of this process (reutilization, transfer and donation) are internal to the federal government or to government-approved entities such as state or local government agencies. The final step (sale) makes property available to commercial enterprises and the general public.

3.6.2 Pollution Prevention

Both the State of California and the Air Force have mandated a reduction in the quantity of solid waste disposed of in landfills. The Pollution Prevention Act (PPA) of 1990 refocused the national approach to environmental protection toward pollution prevention (P2). Implementation of the Air Force Environmental Management System (EMS) will carry P2 a step further toward mission sustainability principles. The P2 program at VAFB, including the 30 SWP 32-7080 *Pollution Prevention Management Plan* (PPMP), is evolving to promote EMS and provide a policy aimed at achieving 30 SW EMS objectives and targets, through documented practices, procedures, and operational requirements. VAFB will continue to implement EMS and its associated P2 program elements by following the P2 hierarchy:

- ▶ Reduce (source reduction to prevent the creation of wastes);

- ▶ Reuse (keep item or material for its intended purpose);

- ▶ Recycle (use item or material for some other beneficial purpose);

- ▶ Disposal (in an environmentally compliant manner, only as a last resort).

The VAFB Materials Diversion Center, located in Building 11510, allows for the recycling of furniture, tools, and other materials. These items are diverted back for VAFB use, thus recycling items that would otherwise be scraped. Base units and personnel can obtain materials from the Materials Diversion Center free of charge.

3.7 Transportation

VAFB is located approximately five miles west of the City of Lompoc. Two main highways connect VAFB and metropolitan areas in the region (Figure 1-1). U.S. Highway 1 (US 1), a north-south highway, traverses VAFB and provides access to Santa Maria to the northeast, and Santa Barbara to the southeast when used in conjunction with U.S. Highway 101 (US 101). State Route 246 (SR 246), an east-west highway, provides access to Lompoc to the east, and Santa Barbara to the southeast when used in conjunction with US 101. Vehicles enter VAFB from these two roads through several gates.

North Base and its cantonment area are primarily accessible from four gates; Santa Maria Gate, Solvang Gate, Lompoc Gate, and Utah Gate. US 1 services the Santa Maria Gate, the main gate, which provides access to the northern side of the main cantonment area, and the Lompoc Gate. The Utah Gate is immediately northwest of the Santa Maria Gate and is mainly used by MFH traffic. SR 246, which is known in Lompoc as Ocean Avenue, services the Solvang Gate.

Directly across SR 246 from the Solvang Gate is the South Gate, the primary access for South Base. Further west, at the terminus of SR 246, is the Coast Gate, which is closed to

the public but is occasionally opened for South Base operational activities.

On VAFB, roads are categorized as highways, primary, local (secondary roads), and patrol (VAFB 2007). Primary roads serve large volumes of traffic, are divided, and provide limited access to adjacent land uses. They act as the main circulation routes into and through the cantonment areas and connect to local streets (VAFB 2004). Local streets provide for traffic movement between primary roads and access roads and provide access to community facilities, parking lots, and housing and service areas. They make up the majority of the road network in the cantonment area and have frequent traffic stops and low speeds (VAFB 2004). Patrol roads are remote roads that are paved or unpaved and are used for security patrol and monitoring of infrastructure (VAFB 2004).

Existing roadway conditions are evaluated based on roadway capacity and traffic volume. The capacity, which reflects the ability of the network to serve the traffic demand of a roadway, depends on the roadway width, number of lanes, intersection control, and other physical factors. A road's ability to accommodate different volumes of traffic is generally expressed in terms of Level of Service (LOS). The LOS scales ranges from A to F, with each level defined by a range of traffic volume to roadway capacity (V/C). LOS A, B, and C are considered good operating conditions with minor to tolerable delays experienced by motorists. LOS D represents below-average conditions. LOS E reflects a roadway at maximum capacity, and LOS F represents traffic congestion.

All primary roads on VAFB operate at a LOS between A and C (VAFB 1994b). Local (secondary) roads operate at a LOS between A and B (VAFB 1994b). Informal traffic studies indicate gates operate at LOS A to C range (VAFB 2005). A traffic volume study performed in 2000 took counts at 22 key intersections in the cantonment area. LOS was determined for current conditions and future conditions (2010). The study concluded that most intersections would

operate at or better than an LOS C under future conditions (VAFB 2007).

Given that identified CIP projects would entail worker commuting and construction truck traffic off-base, for the purposes of this PEA, the affected environment as it relates to transportation would consist of: local major highways/roads off-base connecting to Santa Maria and Lompoc, including US 1 and SR 246; those primary and local roadways on VAFB that service project areas; and routes between project areas and the Base Landfill for projects that include demolition activities.

On North Base, the primary roads serve as the principle circulation routes into and through the main cantonment area and include: California Boulevard, 13th Street, Utah Avenue, Nebraska Avenue and Washington Avenue (VAFB 2004). On South Base the primary roads include Arguello Road, Bear Creek Road and Coast Road (VAFB 1994a). Only Arguello Road services the cantonment area on South Base, and would therefore be considered as occurring within the affected environment. Figure A-1 in Appendix A depicts identified CIP projects and shows the locations of the primary roadways on the main cantonment.

3.8 Water Resources

In California, the State Water Resources Control Board (SWRCB) and the RWQCB administer the Clean Water Act (CWA) and state water regulations. The CWA defines the standards for water quality and mandates that treated water discharged to surface water or to the ocean are subject to the requirements of a NPDES Construction General Permit. The RWQCB is responsible for management of the NPDES permit process for California. The Central Coast RWQCB is the local agency responsible for the VAFB area. The NPDES Construction General Permit for construction activities ensures that water discharged from a site meets water quality standards at the point of discharge.

The California Porter-Cologne Water Quality Act provides a framework for establishing beneficial uses of water resources and the development of local water quality objectives to protect these beneficial uses. State regulations require a WDR for permitting discharge. A Report of Waste Discharge (RWD) (similar to an NPDES permit application) is required for actions that will involve discharge of waste to surface and/or groundwater. The California Porter-Cologne Water Quality Act implements the NPDES program for the state.

The general storm water rainy season at VAFB is from 1 October to 15 April. This timeframe has the greatest potential of construction site pollutant runoff. The average annual rainfall is approximately 14.7 inches (unpublished data, 30 SW).

Water resources for this PEA are defined as the potable water supply, groundwater, surface water and floodplains that could be affected by development within the main and South Base cantonments.

3.8.1 Potable Water

The potable water supply for VAFB was historically obtained solely from groundwater sources. Since 1997, VAFB has received potable water from the State Water Project, which does not draw from local aquifers. VAFB can purchase up to 1.46 billion gallons of water per year from the State Water Project. In 2001, the total potable drinking water consumption at VAFB was 328.6 million gallons. (SpaceX 2003)

3.8.2 Surface Water and Floodplains

The major freshwater resources of the VAFB region include six streams, comprising two major and four minor drainages. The major drainages are San Antonio Creek and the Santa Ynez River. The minor drainages include Shuman, Bear, Cañada Honda, and Jalama Creeks. Aquifers capable of yielding large quantities of water usable for water supply are generally restricted to the deeper portions of the Santa Ynez River and San Antonio Creek (VAFB 1998).

Watersheds are subject to on-base construction and agricultural runoff. San Antonio Creek, Santa Ynez River, and Shuman Creek also receive off-base agricultural runoff resulting in elevated dissolved solids, phosphates, and nitrates. Surface water is not directly used as a potable water supply at VAFB. Ambient water quality sampling is performed by the Air Force.

It is anticipated that VAFB will be covered under the NPDES General Permit for Storm Water Discharges for Small Separate Storm Sewer Systems (Small MS4 General Permit) in the near future (per. comm. T. Wiskowski, 30 CES/CEVC). 30 SWP 32-7041-C, *Storm Water Management Plan*, contains BMPs for six minimum control measures, two of which are construction related.

Freshwater resources on VAFB can be divided into four geographic areas: north, north-central, south-central, and south areas. Of these four areas, only resources within north-central and south-central areas are anticipated to have a potential to be affected by activities associated with the Proposed Action. Therefore, for the purposes of this PEA, the affected environment includes only north-central and south-central areas, and north and south areas are not further described or analyzed within this PEA.

North-Central Area

The north-central area contains the main cantonment and is heavily influenced by human activity. The north-central area includes the San Antonio Creek drainage, the Santa Ynez River drainage north of the river, and some permanent and seasonal wetlands, ponds and streams (Figure A-6a in Appendix A). The surface topography ranges from active sand dunes along the coast, to older, fixed dunes in the interior sections of San Antonio Terrace, north of San Antonio Creek, to the peneplain represented by Burton Mesa, which extends from San Antonio Valley to the Santa Ynez River Valley. The soil is generally sandy and highly permeable. The drainage divide between the

San Antonio Creek basin and the Santa Ynez River basin occurs in the southern portion of Burton Mesa. The Santa Ynez lagoon covers 58 acres in the southwest corner of this area.

San Antonio Creek drains an area of approximately 154 square miles, and flows westward to discharge into a lagoon impounded behind the coastal dunes on north VAFB. The upper reaches of San Antonio Creek (i.e. upstream of Barka Slough) have intermittent flows, generally as runoff from the winter rains from November through April. The lower reaches of San Antonio Creek (i.e. downstream of Barka Slough) are perennial and are fed by surfacing groundwater in Barka Slough. In the lower San Antonio Creek basin, water from the creek flows west-northwest to the sea. Marshlands are located along part of its course. The creek ends in a small lagoon in the sand dunes, which breaks through to the Pacific Ocean only during large storms. The Santa Ynez River flows westward to discharge into the Pacific Ocean. The river watershed has a total drainage area of about 900 square miles of which less than 5% is within VAFB (VAFB 2003). Flow in the Santa Ynez River varies seasonally in response to precipitation and runoff. From June through November, the river flow is typically less than seven cubic feet per second, including effluent from the Lompoc Regional Wastewater Treatment Plant, about five miles upstream from the 13th Street Bridge. The flow of the Santa Ynez River has been regulated since 1920 by Gibraltar Reservoir and since 1930 by Jameson Lake. Additional flow regulation has existed since 1952 from Lake Cachuma. Water is diverted out of the Santa Ynez basin from these three reservoirs for municipal use in the Santa Barbara area. In addition, water is pumped from wells along the river for irrigation (URS 1987).

High discharge and flooding may occur in the Santa Ynez River and San Antonio Creeks from November through April, and there may be very little or no discharge occurring in the drier months. The presence of high levels of total dissolved solids, sulfates, chlorides, and iron causes poor water quality in San Antonio

Creek and the Santa Ynez River (VAFB 2001).

In the cantonment area, the storm water system diverts storm water runoff to low-lying areas as surface flow via streets, concrete-lined gutters, earthen ditches, and natural drainage systems. The main cantonment storm water drainage is predominantly concrete lined channels and subsurface piping, which generally divert the water to several natural drainages that discharge into either the Santa Ynez River or San Antonio Creek.

South-Central Area

The south-central area includes the southern part of the Santa Ynez River drainage, Bear Creek, Cañada Honda, and several small, seasonal stream drainages (Figure A-6b in Appendix A). This area includes what is known as the Lompoc Terrace, which extends south from the Santa Ynez River Valley to Cañada Honda Creek. It is a gently rounded, north trending, low ridge extending from an elevation of approximately 450 feet down to the Santa Ynez River floodplain. Dunes extend only a short distance inland from the coast along this terrace. South of the Lompoc Terrace and Cañada Honda Creek are the western Santa Ynez Mountains, which includes a number of small seasonal streams. The topography in this area is complex and is dissected by major canyons. The soils in the south-central area tend to be well-drained sandy loams or clay loams.

Bear Creek is an intermittent annual creek that originates approximately 3.4 miles southeast of its discharge into the Pacific Ocean. A seasonal pond occurs near the discharge of the creek, east of Coast Road and south of Bear Creek Road. Jurisdictional wetlands are adjacent to the creek. Cañada Honda Creek is a seasonal flowing creek with a watershed that is approximately 12 square miles in area. It originates in the Santa Ynez Mountains, near the eastern boundary of south VAFB and flows westward discharging into the Pacific Ocean.

Smaller streams and westerly hillsides often have a natural berm area, generally along the railroad tracks and the Pacific Ocean. These berms provide a natural barrier for water to settle and slow down its flow prior to being infiltrated and continuing their generally westward flow. Some smaller streams flow directly into the Pacific Ocean. Many of these streams on south VAFB are highly vegetated and have seasonal flows.

The 100-year floodplain for the Santa Ynez River basin was defined by the Federal Emergency Management Agency (FEMA) and is depicted in Figures A-6a and A-6b of Appendix A. The South Base cantonment boundary falls within the 100-year floodplain, as discussed in Chapter 1, Section 1.3.

3.8.3 Groundwater

VAFB includes parts of two major groundwater basins, and at least two subbasins. Most of the northern third of the base is within the San Antonio Creek Basin, while most of the southern two-thirds of the base are within the Santa Ynez River Basin and associated Lompoc Terrace and Cañada Honda subbasins.

The main groundwater basin on the northern portion of VAFB is the San Antonio Creek Basin. This basin coincides with the San Antonio Creek drainage basin. The San Antonio Creek Basin is approximately 25 miles long, extending from four miles east of the town of Los Alamos, west to the Pacific Ocean, and is a maximum of one mile wide. Water-bearing units in the San Antonio Creek Basin are comprised of unconsolidated clay, silt, sand, and gravel. These unconsolidated sediments are up to 4,000 feet thick and overlie consolidated Tertiary rocks, which are generally not water bearing.

Across the eastern two-thirds of the San Antonio Creek Basin, largely east of VAFB, groundwater flows toward San Antonio Creek, and then west toward the Pacific Ocean. Approximately two miles west of the VAFB boundary, a naturally occurring consolidated rock barrier causes the groundwater to rise to the surface where it forms the Barka Slough,

and discharges to San Antonio Creek. Because of this nearly continual discharge of groundwater, San Antonio Creek west of Barka Slough runs year-round, whereas all other drainages in the valley are ephemeral (Muir 1964). West of Barka Slough, across San Antonio Terrace and Burton Mesa, the unconsolidated water-bearing units are only on the order of tens to a few hundred feet thick, comprised of dune sands, recent alluvium, and the Orcutt Sand. The flow direction in this area is controlled by bedrock topography, which is obscured by the overlying unconsolidated sediments, but is believed to mimic surface topography (SAIC 1990). Groundwater flow direction is therefore likely to be generally toward San Antonio Creek.

The Santa Ynez River Basin is approximately 70 miles long, and a maximum of 15 miles wide. It extends west from about half a mile east of the Santa Barbara County line to the coast. The Santa Ynez Mountains and Lompoc Terrace bound the basin to the south and the San Raphael Mountains, the lower Purisima Hills, and Burton Mesa bound it to the north. The Lompoc Plain represents the westernmost reach of the Santa Ynez River Basin. The most productive water-bearing zones of the entire Santa Ynez River Basin underlie this alluvial plain. VAFB lies along the coast and traverses the westernmost three to four miles of the Lompoc Plain, where it is bounded to the south by the Lompoc Terrace and to the north by Burton Mesa (SAIC 1990). Groundwater in the Lompoc Plain area is divided into two main bodies: a shallow, unconfined body, and a deep, confined body. These two groundwater bodies are generally not hydrologically connected, but do appear to be connected in a few restricted areas. Where the comparison can be made, the hydraulic head of the shallow body is generally one to 10 feet higher than that of the deep body. Groundwater flow direction in the shallow body is irregular and poorly defined, and changes over time in response to seasonal changes (Upson and Thomasson 1951).

The most significant water-bearing zones on VAFB, south of the Santa Ynez River Basin, are within the Lompoc Terrace subbasin. The drainage divide between Cañada Honda Creek and the Santa Ynez River bound this subbasin to the south, the Santa Ynez River to the north, the Pacific Ocean to the west, and the La Salle Canyon to the east. The water-bearing units of this subbasin have accumulated in a structural depression caused by faulting along its southern margin, and either faulting or folding along its northern margin (SAIC 1990). The basin is regarded as a subbasin because it is likely hydrologically connected with the Santa Ynez River Basin to the east, and possibly with the Pacific Ocean to the west (Evenson and Miller 1963). Groundwater in the Lompoc Terrace subbasin generally flows northeast to the Lompoc Plain or northwest to the ocean. Recharge to the subbasin is from infiltration of local precipitation, and from percolation of surface runoff (Evenson and Miller 1963). Immediately south of the Lompoc Terrace subbasin is the Cañada Honda subbasin. The subbasin is relatively small and is bounded to the north and south by the

drainage divides to the Cañada Honda Creek.

Groundwater quality in the region meets all National Primary Drinking Water Regulation standards (VAFB 1989). Continued overdraft of the groundwater basins could lead to degradation in the water table levels and a compaction of the basins. A slight decrease in water quality has been occurring in the region due to the use of water for irrigation. As this water flows through the soil back to the basin, it entrains salts and leads to a buildup of salts in the groundwater (VAFB 1989). Groundwater monitoring is conducted for basins that are used for drinking water. Water in the San Antonio Valley Creek groundwater basin exceeds drinking water standards for total dissolved solids, manganese, and iron. The Lompoc Terrace groundwater contains constituents that exceed maximum contaminant levels for total dissolved solids. Groundwater is used about one to three weeks per year, while maintenance is being performed on the state water line. However, groundwater is treated prior to its usage as potable water.

Chapter 4. Environmental Consequences

This chapter presents the results of the analysis of potential environmental effects of implementing the Proposed Action and the No-Action Alternative as described in Chapter 2.

Constraints to project planning, as discussed in Chapter 2, are covered under their relevant resource, i.e. constraints from threatened and endangered species are addressed within the Biological Resources section. In addition to the constraints discussed in the following sections of this Chapter, microwave line-of-site and fire response zones would need to be considered during the project siting phase of project planning, as discussed in Chapter 2.

4.1 Air Quality

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

In non-attainment or maintenance areas, federal agencies are required to prepare a conformity determination to prevent federal actions from causing an exceedance of a national ambient air quality standard. To reduce the time and resources federal agencies expend in preparing conformity determinations, U.S. EPA developed de minimis levels that serve as thresholds for focusing on those actions likely to have the most significant impacts. U.S. EPA deemed that emission levels below the de minimis levels were not significant.

As of June 15, 2005, Santa Barbara is in attainment of all federal air quality standards, and federal agencies are no longer required to prepare conformity determinations. However, VAFB believes the threshold levels used in conformity determinations are still relevant for use as thresholds for determining if air quality impacts would be significant. The rationale used by U.S. EPA to develop the thresholds for nonattainment areas is no less applicable for areas in attainment. Although VAFB is no longer required to observe the significance levels required in conformity determinations, voluntary use of them provides a conservative approach to determining air quality impacts.

Maintenance areas have de minimis levels of 100 tons/year for NO_x. The VOC limits are 50 tons/year for areas inside an ozone transport region and 100 tons/year outside that region. Using a 365-day year, these de minimis levels equate to significance levels of 548 lbs/day of NO_x and 274 or 548 lbs/day for VOCs for areas inside and outside of an ozone transport region, respectively. VAFB will apply the 100 tons/year or 548 lbs/day VOC significance threshold. If Santa Barbara County becomes part of an Ozone Transport Region under the CAA, VAFB will reassess its VOC significance threshold. These are the levels, 100 tons/year or 548 lbs/day of NO_x, or VOC, VAFB will use for determining whether or not air quality impacts are significant.

4.1.1 Proposed Action

Construction activities for MILCON and NAF projects to be implemented under the CIP and as identified in the 2007 General Plan would occur intermittently over approximately 10 years. Fugitive dust emissions generated from equipment operating on exposed ground and combusive emissions from the equipment would cause adverse air quality

impacts. The largest adverse impacts would occur when vehicles disturb the soil on-site; smaller impacts would occur during the transport of construction debris and material handling.

Painting of new buildings and facilities would also contribute to air emissions. One of the key ingredients contributing to ozone formation are solvents commonly found in many architectural coatings, including house paints, lacquers, sealers, maintenance coatings, primers, stains, and enamels. These coatings generate VOC emissions from the evaporation of solvents they contain. Painting structures with architectural coatings and related equipment cleanup activities release ROC and toxic air contaminant (e.g., benzene, toluene and xylene) emissions. Emissions can be reduced by selecting lower VOC paint available. In addition, the SBCAPCD is limiting the ROC content in solvents used to clean application equipment to 25 grams per liter.

Because equipment lists and usages were not available for identified CIP projects, a complete detailed air emissions calculation could not be prepared. In its place, and to consider the worst-case scenario, the project representing the largest construction

operation (Table 4.1, new MSG Headquarters) was combined with the project with the largest area of disturbance (Table 4.1, new 30 SW Headquarters) to derive the largest anticipated list of construction equipment and length of construction. The list of equipment was compiled based on equipment typically used during construction projects. A detailed air emission inventory of this worst-case scenario representative project was prepared and can be found in Appendix C.

A general list of construction equipment anticipated for this worst-case representative project is included in Appendix C, Table C.-1, while the emission factors used to estimate the emissions are found in Table C-2. For purposes of this analysis, it was estimated that an average of 1.36 acres per day would be disturbed. It was further estimated that on a reasonable worst-case day, 4.08 acres would be disturbed. With a disturbance of eight-hours per day, the reasonable worst-case day fugitive dust emissions would be 73.78 pounds of PM₁₀ per day. These emissions would not be expected to cause an exceedance of any ambient air quality standard and therefore there would be no significant impacts from PM₁₀.

Table 4.1: Facility size and disturbed acreages for identified CIP projects.

Identified CIP Project*	Facility Size (square meters)	Total acreage (including AT buffer)
30 SW Headquarters	1,858	13.6
614th Space Operations Group Headquarters	2,360	7.4
Air Traffic Control Tower	390	4.7
Child Development Center	2,173	1.9
Education Center	6,600	4.4
FAMCAMP Expansion	NA	5.1
Fitness Center Addition	NA	1.7
MSG Headquarters	9,290	7.8
Precision Measurement Equipment Lab (PMEL)	2,725	6.1
RV Storage/Parking Expansion	NA	1.2
Refueling Vehicle Maintenance Shop	325	1.3
WROCC Emergency 10 Megawatt Electric Power Plant	NA	0.4

NOTES:

* Does not include Bowling Center Renovation, which consists solely of interior modifications to the current facility.

The methodology and assumptions used to estimate the emissions are presented in Appendix C. The estimated daily and total emissions for construction of the worst-case representative project can be found in Tables C-3 and C-4, respectively. The daily emissions were estimated to be 91.05 pounds of CO, 156.05 pounds of NO_x, 82.22 pounds of PM₁₀, 14.52 pounds of ROC, and less than one pound of SO_x. The total project emissions for construction of the new 30 SW Headquarters were estimated to be 57.18 tons of CO, 28.01 tons of NO_x, 2.14 tons of PM₁₀, 7.77 tons of ROC, and 1.66 tons SO_x. Emissions for the planned CIP projects within the main cantonment would not exceed the significance thresholds of 548 lbs/day or 100 tons/year. Therefore, no adverse impacts to the region's air quality would occur.

To prevent significant impacts from construction activities, 30 CES/CEC would submit an AF Form 813, *Request for Environmental Impact Analysis* to 30 CES/CEV, along with a detailed equipment list for each of the projects at the time of their implementation and estimate the air emissions based upon the methodology detailed in Appendix C. 30 CES/CEV would maintain a calendar year and 12-month rolling air inventory. When the cumulative calendar year emissions of NO_x, or ROC reach but not exceed 100 tons/year that request would receive clearance, but no further environmental clearances for projects would be given until the following calendar year. At no time would environmental clearances be given if the specific project emissions plus the cumulative calendar-year emissions of NO_x, or ROC exceed 100 tons/year.

Emissions from the construction projects under the Proposed Action would occur intermittently over a period of ten years. With the temporal distribution of emissions and the 100 tons/year of NO_x, or ROC significance thresholds, emissions from the Proposed Action would not cause an exceedance of any ambient air quality standard. Since no ambient air quality standards would be

exceeded, impacts of the Proposed Action would not be considered significant.

Before construction can begin for any project covered under the Proposed Action, portable equipment meeting the criteria defined in the *Emergency Regulation Order* effective April 27, 2007 for the California PERP would be registered in the program or have a valid SBCAPCD Permit to Operate.

Although significant emissions would not occur from the Proposed Action, the following SBCAPCD dust control measures would be implemented to further decrease fugitive dust emissions from ground disturbing activities:

- ▶ Water – preferably reclaimed – would be applied at least twice daily to dirt roads, graded areas, and dirt stockpiles to prevent excessive dust at the staging areas. Watering frequency would be increased whenever the wind speed exceeds 15 miles per hour. Chlorinated water would not be allowed to run into any waterway.
- ▶ Vehicle speeds would be minimized on exposed earth.
- ▶ Ground disturbance would be limited to the smallest, practical area and to the least amount of time.
- ▶ Personnel would be designated to monitor project activities to ensure that excessive dust is not generated at demolition sites.
- ▶ The SWPPP – including BMPs to reduce dust emissions - and the contractor's Environmental Protection Plan (EPP), which includes dust control compliance measures would be complied with.
- ▶ If importation, exportation, and stockpiling of fill material are involved, soil stockpiled for more than two days would be covered, kept moist, or treated with soil binders to prevent dust generation. Trucks transporting fill material to and from the site would be tarped from the point of origin.

In addition to the above dust control measures, the following control measures would be implemented to decrease diesel emissions:

- ▶ When feasible, equipment powered with federally mandated ultra-low sulfur diesel engines would be used.
- ▶ Engine size in equipment used for the project would be minimized.
- ▶ The use of equipment would be managed to minimize the number of pieces of equipment operating simultaneously and total operation time for the project.
- ▶ Engines would be maintained in tune per manufacturer or operator specification.
- ▶ CARB-certified low diesel fuel would be used.
- ▶ If feasible, U.S. EPA or CARB-certified diesel catalytic converters, diesel oxidation catalysts, and diesel particulate filters would be installed.
- ▶ CARB-developed idling regulations for trucks during loading and unloading would be followed.
- ▶ When feasible, equipment powered by diesel engines retrofitted or re-engined to meet the Air Toxics Control Measures for Off-Road Vehicles would be used.

VAFB ensures compliance with EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, through the incorporation of energy reduction measures in the design process for all projects. These energy reduction measures also help the Air Force policy that all the design of all vertical MILCON construction projects be capable of achieving LEED Silver Certification.

4.1.2 No-Action Alternative

Under the No-Action Alternative, the 2007 General Plan would not be adopted and identified projects for the VAFB cantonments, as proposed under the CIP in the 2007 General Plan, would not be implemented. Air quality would not be affected under this alternative.

4.2 Biological Resources

Federal agencies are required by Section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.), to assess the effect of any project on federally listed threatened and endangered species. Under Section 7, consultation with the USFWS and the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (Fisheries Service) is required for federal projects if such actions could directly or indirectly affect listed species or destroy or adversely modify critical habitat. Prior to initiating the 13 CIP projects, VAFB's Environmental Flight will assess potential impacts upon federally listed threatened and endangered species on a project by project basis. If it is determined that formal Section 7 consultation is required for the projects, the Environmental Flight will initiate consultation with the USFWS before any resources are committed. In addition to federally listed species, it is also Air Force policy to consider listed and special status species recognized by state agencies when evaluating impacts of a project. Impacts to biological resources would occur if special status species (endangered, threatened, rare, or candidate) or their habitats as designated by federal and state agencies would be affected directly or indirectly by project-related activities. In addition, impacts to biological resources are considered adverse if substantial loss, reduction, degradation, disturbance, or fragmentation would occur in native species habitats or in their populations. These impacts can be short- or long-term impacts, for example, short-term or temporary impacts from noise and dust during construction, and long-term impacts from the loss of vegetation and thereby loss of the capacity of habitats to support wildlife populations. The VAFB INRMP, currently in draft, addresses management of protected species and habitats. Once finalized, projects and plans will comply with the terms of the INRMP.

Impacts to jurisdictional waters of the U.S. and wetlands are considered significant if the project would result in net loss of wetland

area or habitat value, either through direct or indirect impacts to wetland vegetation, loss of habitat for wildlife, degradation of water quality, or alterations in hydrological functions. Projects resulting in a discharge of dredged or fill material within jurisdictional waters of the U.S., including wetlands, require a permit from the U.S. ACOE.

4.2.1 Proposed Action

The Proposed Action to adopt the 2007 General Plan and implement the 13 CIP projects described therein would proceed by avoiding the constraints described in this section and implementing the measures detailed below and included in Section 2.1.3 of Chapter 2. Temporary, short-term effects on wildlife species, permanent loss of low quality Gaviota tarplant habitat, permanent loss of a small amount of Burton Mesa Chaparral, permanent loss of a small amount of Arroyo Willow Riparian Forest, and permanent loss of a limited number of Gaviota tarplant individuals, are anticipated with the construction of some of the CIP projects.

The primary measure for the protection of sensitive biological resources is avoidance. Development occurring under the Proposed Action should avoid sensitive biological resources. Table 4.2 lists specific measures designed to minimize the potential for adverse effects to biological resources.

Botanical Resources

Potential impacts from construction activities to plant communities and plant species include:

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

- ▶ Soil erosion in wetlands or open water adjacent to the project site.

Native vegetation types and special status habitats have been altered or destroyed in much of the cantonments as a result of past development. Construction associated with CIP projects would occur in areas that have been previously disturbed as a result of past development or landscaping practices. Most proposed CIP projects would be sited in open space areas dominated by non-native grassland/ruderal communities. The site proposed for the proposed new Air Traffic Control Tower infringes on a narrow riparian corridor (Figure A-3d in Appendix A). This is discussed later in this section under Waters of the U.S. and Wetlands. In addition, the footprints for the proposed Vehicle Maintenance Shop and WROCC Emergency Power Plant infringe on the edges of existing Burton Mesa Chaparral (Figure A-3c in Appendix A), a sensitive vegetation type. Surveys at these two project sites should be conducted prior to construction to determine if adverse effects are avoidable or can be minimized. Lastly, Gaviota tarplant occurs at several locations within the non-native grassland (see the Special Status Plant Species section below).

Special Status Plant Species

Gaviota tarplant has been documented within the project areas for the Precision Measurement Equipment Lab, the MSG Headquarters, and the 614th Space Operations Group Headquarters (Figures A-3a and A-3b in Appendix A). Non-native grasslands and ruderal community, both of which are suitable habitat for Gaviota tarplant, dominate the sites where these projects are proposed. Construction of these CIP projects would result in the permanent loss of all vegetation within the project area. Any individuals of Gaviota tarplant present would be permanently lost, and the seed bank within the area would also be lost. Gaviota tarplant frequently grows in low quality habitats such as along disturbed road shoulders and within unpaved access roads (USFWS 2006). Gaviota tarplant within the cantonments

occurs in low quality non-native grasslands and ruderal vegetation types that are subject to continuous disturbance as a result of mowing, road maintenance and other operational activities. These plants tend to occur in areas where they are isolated from high quality suitable habitat by nature of their location within the highly developed cantonments. Due to the presence of abundant suitable habitat throughout VAFB, loss of individuals within the CIP project areas would not significantly affect VAFB tarplant populations.

Table 4.2: Environmental protection measures for Biological Resources.

Resource	Measure
Central Coast Maritime Chaparral	▶ Avoid construction in undisturbed Burton Mesa chaparral ▶ Conduct pre-construction surveys for nesting birds (March – August) ▶ Monitor, control, and eradicate invasive non-native species
Coastal Sage Scrub	▶ Avoid construction in undisturbed coastal sage scrub ▶ Conduct pre-construction surveys for nesting birds (March – August) ▶ Monitor, control, and eradicate invasive non-native species
Riparian Woodland	▶ Avoid construction in riparian woodland ▶ Construction and grading necessary within 100 feet of riparian woodlands should use techniques to minimize impacts, reduce runoff, turbidity, sedimentation, and chemical degradation ▶ Construction period for projects within 100 feet of riparian woodlands should be based on site-specific surveys to avoid impacts to special status and sensitive species if found in the habitat ▶ Monitor, control, and eradicate invasive non-native species
Vernal Pools/Seasonal Wetlands	▶ Avoid construction in vernal pools/seasonal wetlands ▶ Construction and grading within 100 feet of wetlands should use techniques to minimize impacts, reduce runoff, turbidity, sedimentation, and chemical degradation ▶ Construction period for projects within 100 feet of wetlands should be based on site-specific surveys to avoid impacts to special status and sensitive species if found in the habitat ▶ Monitor, control, and eradicate invasive non-native species
Ornamental/Non-native Vegetation	▶ Avoid removal of mature trees ▶ Conduct pre-construction surveys for nesting birds and roosting bats ▶ Monitor, control and eradicate invasive non-native species
Gaviota Tarplant	▶ Avoid construction in high quality suitable habitat ▶ Avoid initiating construction in suitable habitat during the blooming period (February 1 – September 30) ▶ Minimize habitat loss, degradation, disturbance, or modification
Vernal Pool Fairy Shrimp	▶ Avoid construction in vernal pools/seasonal wetlands ▶ For projects that occur in the vicinity of vernal pools, conduct pre-construction surveys and delineate construction zone to avoid potential adverse effects to vernal pools
El Segundo Blue Butterfly	▶ Avoid construction in documented occupied Central Coast Scrub ▶ For projects that occur in the vicinity of occupied Central Coast Scrub, conduct pre-construction surveys and delineate construction zone to avoid potential adverse effects to the species
California Red-legged Frog	▶ Avoid construction in riparian woodlands and wetlands ▶ For construction projects within 100 feet of riparian woodlands and wetlands, conduct pre-construction surveys to detect the presence of California red-legged frogs ▶ For construction projects within 100 feet of riparian woodlands and wetlands where California red-legged frogs are detected, establish a monitoring regime to minimize or avoid adverse effects on the species
Other Special Status Species and Sensitive Habitats	▶ For construction projects that occur adjacent to sensitive resources illustrated in Figures A-2a and A-2b in Appendix A: - o Avoid construction in adjacent suitable habitat during the breeding/blooming times - o Minimize habitat loss, degradation, disturbance, or modification ▶ Conduct pre-construction surveys for nesting raptors (Jan – August) ▶ Avoid removal of trees with active raptor nests ▶ Conduct pre-construction surveys for bat roosts ▶ Implement passive exclusion for bats as appropriate ▶ To the extent practicable, avoid removal, thinning, or clearing of known Monarch butterfly roosts

Wildlife Resources

The potential impacts to wildlife species associated with the construction activities included under the Proposed Action include:

- ▶ Short-term (temporary) and long-term (permanent) loss of habitat from construction

related activities such as access, and excavation.

- ▶ Loss of individuals within the work area due to excavation, crushing or burial.
- ▶ Loss of individuals in habitats adjacent to work areas due to soil erosion.

- ▶ Abandonment of breeding and/or roosting sites due to project related noise and associated disturbance.
- ▶ Disruption of foraging or roosting activities due to project related noise and associated disturbance.
- ▶ Soil erosion in wetlands or open water adjacent to the project site.

Wildlife present in the vicinity of construction projects could be disturbed by construction noise and activities. The removal of vegetation would cause the loss of habitat for some species, which would have to seek alternate cover, adding to the disturbance. These disturbances would be considered short-term and temporary and would not result in adverse impacts to populations with the vicinity of project areas.

Construction for identified CIP projects would occur intermittently over a 10-year period and could encompass the breeding season for wildlife species, including birds, for some of the projects. The Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. 703-712), provides federal protection to native avian species, their nests, eggs, and unfledged young. Construction activities associated with proposed projects would result in short-term noise disturbances, which may temporarily disrupt foraging and roosting activities of individual birds. In addition, if the construction occurs during the breeding season for avian species, it has the potential to disrupt breeding activities including courtship, incubation and brooding.

Avian surveys immediately preceding the initiation of construction activities scheduled to occur between March and August would identify the presence of any nests. Monitoring during construction would identify any potential disturbance so measures could be implemented to avoid adverse effects.

Special Status Wildlife Species

Vernal pool fairy shrimp occur in vernal pools within the main cantonment. No vernal pools occur in the vicinity or within the project area

for the proposed 13 CIP projects, therefore vernal pool fairy shrimp would not be affected.

California red-legged frogs have the potential to occur within riparian and wetland areas. The footprint for the proposed new Air Traffic Control Tower would infringe on a narrow corridor of Arroyo Willow Riparian Forest. This area should be surveyed prior to the initiation of construction activities to determine its suitability for California red-legged frogs and appropriate protection measures implemented if necessary.

Waters of the U.S. and Wetlands

Waters of the U.S. and wetlands occur in the cantonments. Waters of the U.S. include intermittent creeks and drainages that in the cantonments are typically associated with riparian woodlands. Wetlands include vernal pools and seasonal wetlands. Wetlands are represented in Figures A-2a and A-2b in Appendix A. Development within these areas would be restricted to avoid adverse effects on these sensitive habitats.

The footprint of the proposed new Air Traffic Control Tower would infringe on a small portion of a narrow riparian corridor dominated by arrow willows. Disturbances to this vegetation would be minimized during project implementation and pre-construction surveys would be completed to flag and delineate the area to minimize the disturbances from construction activities.

No-Action Alternative

Under the No-Action Alternative, the 2007 General Plan would not be adopted and construction associated with the identified CIP projects would not occur. Under this alternative, no impacts to biological resources would occur.

4.3 Cultural Resources

Cultural resources would be adversely affected if the Proposed Action would cause loss of the value or characteristics that qualify

them for listing on the NRHP, or if the Proposed Action substantially alters the natural environment or access to it in such a way that traditional cultural or religious activities are restricted. Criteria used to evaluate the significance of cultural resources and to assess potential adverse project effects are set forth in the NHPA of 1966, as amended. Associated implementing regulations include 36 CFR 60 and 800. All projects initiated under the General Plan shall be subject to compliance with Section 106 of the NHPA and AFI-32-7065. In the event that previously undocumented cultural resources are discovered during construction activities, procedures established in 36 CFR 800.13 will be followed.

The 2007 General Plan is intended to facilitate planning for future projects in the VAFB cantonments. As such, it is designed to interface with projects presently in the planning stages as well as those which have not yet been proposed. The latter can, of course, only be discussed in very general terms, but the 2007 General Plan provides information that can be used to identify potential cultural resource constraints on projects not yet in the system.

4.3.1 Proposed Action

This analysis provides a planning tool for future cantonment projects by identifying those areas where cultural resources constraints exist. The recommended actions at any given location might include no further work, additional documentary research or photography, or testing and data recovery.

All of the main and South Base cantonments have been inventoried for cultural resources. Within the 6,176 acres there are 28 known prehistoric and historic sites. Of these sites, three (CA-SBA-927H, -3575 and -3741) have been recommended as eligible for the NRHP, and the latter has been determined so through SHPO consultation. Eight sites, CA-SBA-1869, -2569, -3487, -3559, -3560, -3561, -3562, and -3748, were recommended as not eligible, and the last has been determined so through consultation with

SHPO. Seventeen others (CA-SBA-923, -925, -1049, -1779, -2086, -2554, -2876, -2888, -3165, -3168, -3169, -3170, -3182, -3270, -3747, -3858, and -3859) have not been evaluated relative to the NRHP at this time. Also, three facilities have been evaluated as NRHP eligible for their direct contribution to the Cold War operations. These are Building 7000 (the Western Range Control Center) and two buildings (7403 and 8195) containing Missile Trainers.

Ten MILCON projects and three NAF projects are currently planned to occur within the main cantonment (VAFB 2007). Four projects in the planning stages are within or near cultural resources. Table 4.3 lists all CIP projects and identifies the four that have the potential to affect cultural resources. Construction of one of these, the MSG Headquarters, will be restricted to the north side of Nebraska Avenue to avoid affecting CA-SBA-3561H.

Three upcoming projects, 614th Space Operations Group Headquarters, the Education Center, and the FAMCAMP Expansion, all have the potential to affect cultural resources. For these three proposed facilities, VAFB will implement Section 106 of the NHPA and AFI-32-7065. Specifically, the NRHP eligibility of cultural resources at each of these locations will be evaluated and adverse effects assessed in consultation with the SHPO and other interested parties.

The following sections discuss the cultural resources consequences of these four proposed CIP projects. No cultural resources constraints were identified for the remaining identified CIP projects within the main cantonment.

614th Space Operations Group Headquarters

This project is located on the south side of Nebraska Avenue between Oregon Avenue and the Headquarters building. It involves construction of a 2,360 square meter building and associated support areas. Recently recorded site CA-SBA-3858 is located within the footprint of the building and the security buffer on its north side. The site is a very

Table 4.3: CIP projects identified in the 2007 General Plan. Projects in bold have the potential to affect cultural resources.

Project Number	Title	FY
XUMU063005	30 SW Headquarters	2010
XUMU063006	Fitness Center Addition	2011
XUMU003000	Child Development Center	2012
XUMU073000	WROCC Emergency Electric Power Plant	TBD
XUMU993001	Refueling Vehicle Maintenance Shop	TBD
XUMU033002	Education Center	TBD
XUMU063004	Precision Measurement Equipment Lab	TBD
XUMU053002	614 th Space Operations Group Headquarters	TBD
XUMU053001	MSG Headquarters	TBD
XUMU063000	Air Traffic Control Tower	TBD
XUMU025000	Bowling Center Renovation	2007
XUMU083000	FAMCAMP Expansion	2009
XUMU098000	RV Storage/Parking Expansion	2010

sparse scatter of shell and lithic debris exposed on the surface. At this time the NRHP eligibility of the site has not been determined. Consequently, prior to construction, VAFB will follow Section 106 of the NHPA and AFI 32-7065. Specifically, the Air Force will evaluate the site's NRHP eligibility and assess adverse effects.

One of the ditch features of site CA-SBA-3562 is located immediately across Herado Avenue from the south side of the project area. The feature is a finished concrete and mortar ditch, probably constructed by POW labor during WWII. However, all construction activities will be restricted to the north side of Herado Avenue and thus the site will not be affected.

Mission Support Group Headquarters

The proposed project is on the east side of California Avenue immediately south of Building 11777. It will provide a modern facility for Support Group operations. One segment of site CA-SBA-3561H is approximately 30 meters south of the security buffer around the proposed building. Palmer (2000) recommended the site as not eligible. The feature runs along the east side of New Mexico Avenue, south of its intersection with

Nebraska Avenue. German POWs likely constructed the rough concrete and mortar ditch during WWII. All construction activities will be limited to the north side of Nebraska Avenue. Consequently, the site will not be affected.

Education Center

This proposed CIP project will be located on the north side of Utah Avenue immediately southeast of the SESTO Auditorium parking lot. It will provide modern educational facilities in a central location. Included in this project is demolition of the existing SESTO Auditorium, which was previously determined ineligible for the NRHP through SHPO consultation.

Features 3 and 4 of recently recorded site CA-SBA-3859 are on the north side of Utah Avenue, within the footprint of the proposed Education Center. Both of the features are brick and mortar ditch headers, probably dating to the Camp Cook period. They will likely be destroyed by construction of the proposed Education Center.

The NRHP eligibility of CA-SBA-3859 has not yet been determined. Consequently, prior to construction, VAFB will follow Section 106 of the NHPA and AFI 32-7065. Specifically, the

Air Force will evaluate the site's NRHP eligibility and assess adverse effects.

FAMCAMP Expansion

Plans are being developed to expand the FAMCAMP area, mainly to the northwest of the present facility. One of the ditch features of CA-SBA-3575 is located at the southwest corner of the present facility. The feature is a stone and mortar ditch along 15th Street and Santa Barbara Avenue. Palmer (2000:193) argues that this site is eligible for the NRHP, but no formal determination through consultation with the SHPO has been reached. If the FAMCAMP expands to CA-SBA-3575, VAFB will follow Section 106 of the NHPA and AFI 32-7065 and formally evaluate the site's NRHP eligibility, and assess adverse effects.

No-Action Alternative

Under the No-Action Alternative, the 2007 General Plan would not be adopted and construction associated with the identified CIP projects would not occur. Under this alternative, no impacts to cultural resources would occur.

4.4 Hazardous Materials and Hazardous Wastes

Potential impacts resulting from hazardous materials and hazardous waste are evaluated using federal, state, and local regulatory requirements, contract specifications, and base operating constraints, as outlined in Chapter 3, Section 3.4. Hazardous materials management requirements are found in federal and state U.S. EPA and OSHA regulations, contract specifications and the VAFB HMMP (30 SWP 32-7086). Hazardous waste management requirements are found in federal, state and local regulations, contract specifications and the VAFB HWMP (30 SWP 32-7043A). Non-compliance with applicable regulatory requirements, human exposure to hazardous materials and wastes, or

environmental release above permitted limits, would be considered adverse impacts.

4.4.1 Proposed Action

The contractor would be subject to hazardous materials and waste management regulations as required by federal, state and local laws and regulations, and would follow procedures as outlined in the VAFB HMMP (30 SWP 32-7086) and VAFB HWMP (30 SWP 32-7043A). Compliance with all applicable federal, state and local regulations, rules and requirements, and applicable VAFB plans, would govern all actions associated with implementing the Proposed Action, and would minimize the potential for adverse effects.

Implementing the Proposed Action would require the use of hazardous materials. As described in Chapter 3, Section 3.4, these hazardous materials are commonly used for construction projects and associated demolition, and would be the same types as currently used and managed on VAFB. Because identified projects included under the Proposed Action would be spread over a 10-year period and would only use up to 17 workers per project (worst-case scenario estimate) at any one time, there would not be a significant increase in the amounts of hazardous materials present on VAFB. Thus, no significant adverse impacts are anticipated.

Potential adverse effects could result from accidental releases of POLs from vehicle and equipment leaks. All hazardous wastes would be properly managed and disposed of in accordance with applicable federal, state and local hazardous waste regulations, and the VAFB HWMP (30 SWP 32-7043A). All hazardous wastes would be managed either during release response and clean-up, or during abatement removal actions.

Implementing the measures presented below would further minimize the potential for adverse impacts for hazardous materials or hazardous waste.

- ▶ All hazardous materials would be properly identified and used in accordance with

manufacturer's specifications to avoid accidental exposure to or release of hazardous materials required to operate and maintain construction equipment.

- ▶ Proper disposal of hazardous waste would be accomplished through identification, characterization, sampling and analysis of wastes generated.
- ▶ All equipment would be properly maintained and free of leaks during operation. All necessary equipment maintenance and repairs would be performed in pre-designated controlled, paved areas to minimize risks from accidental spillage or release.

For demolition of existing facilities associated with proposed CIP construction projects, the following measures would also be implemented:

- ▶ In compliance with California Business Plan requirements, contractors would submit a Business Plan or Disclaimer based upon amount of hazardous materials present on site for more than 30 days.
- ▶ Per VAFB requirements, contractors would submit an EPP to 30 CES/CEV prior to the start of demolition activities.
- ▶ 30 CES/CEC would require demolition contractors to submit a Spill Prevention and Response Plan prior to the start of demolition activities and would obtain concurrence from 30 CES/CEV.

Asbestos Abatement Management

In addition to the regulations described above for hazardous materials and waste management, the evaluation of potential impacts associated with the presence of ACM also includes disposal requirements, particularly as applied to the disposal of non-friable asbestos in the Base Landfill. The VAFB AMP (30 SWP 32-1052A) and local SBCAPCD rules, as applicable to National Emissions Standards for Hazardous Air Pollutants (NESHAPS) for asbestos, would also be criteria for assessing asbestos survey, abatement, management, and disposal actions. Non-compliance with applicable

regulatory requirements, human exposure to ACM, or environmental release above permitted limits, would be considered adverse impacts.

An Asbestos Work Plan would be prepared by the contractor for any demolition activities and approved by 30 CES/CEVC. In addition, all ACM would be abated prior to demolition. Personal protective clothing and equipment are necessary to protect workers against asbestos hazards that may be encountered at abatement sites. Friable asbestos waste generated by the demolition contractor would be disposed of following VAFB hazardous waste management procedures, wherein the contractor obtains the appropriate container or portable disposal unit and provides 30 CES/CEVC 48-hour notice to approve the manifest to a certified landfill. Friable asbestos that has been sampled, analyzed, and characterized as hazardous waste would have paperwork processed through the Consolidated CAP and disposed of by a VAFB-approved contractor. Non-friable asbestos may be disposed of at the Base Landfill, provided contract specifications allow it, and the contractor follows requirements and procedures as found in the VAFB *Solid Waste Management Plan* (SWMP; 30 SWP 32-7042). Implementing these measures should ensure no adverse effects result from ACM.

Lead-Based Paint Management

In addition to the regulations described above for hazardous materials and waste management, the evaluation of potential impacts as a result of LBP containing materials also includes the VAFB LBPMP (30 SWP 32-1002) and applicable local SBCAPCD rules. These regulations, rules, and the VAFB LBPMP (30 SWP 32-1002) would also be criteria for assessing LBP survey, abatement, management and disposal actions. Non-compliance with applicable regulatory requirements, human exposure to LBP containing materials, or environmental release above permitted limits, would be considered adverse impacts.

The contractor for any demolition activities would sample all buildings proposed for demolition for lead content. Personnel performing demolition activities would be trained to recognize hazards and protect themselves and others from lead exposure. LBP abatement would be accomplished prior to structural demolition. Proper segregation of demolition debris would be used to avoid unnecessary contamination due to LBP. Wastes that are hazardous due to metals (lead) toxicity would be processed following VAFB HWMP (30 SWP 32-7043A) procedures for eventual offsite disposal. Wastes that may contain LBP, have been analyzed, and are determined to be non-hazardous, may be disposed of in the Base Landfill, provided VAFB SWMP (30 SWP 32-7042), federal and state regulatory conditions have been met. Implementing these measures should ensure no adverse effects result from LBP containing materials.

Polychlorinated Biphenyls and Dioxins

The regulations described above for hazardous materials and waste management are used to evaluate potential impacts as a result of PCB and dioxin containing materials. These regulations, rules, and VAFB plans would also be criteria for assessing PCB and dioxin survey, abatement, management, and disposal actions. Non-compliance with applicable regulatory requirements, human exposure to PCB and dioxin containing materials, or environmental release above permitted limits, would be considered adverse impacts.

Any building proposed for demolition would be surveyed for PCBs in oils, coatings and electrical devices. Devices or wastes containing PCBs would be managed in accordance with the VAFB HWMP (30 SWP 32-7043A), federal, state and local environmental regulations. Should any transformer be removed, the removal action would be coordinated with the 30 CES Utilities Electrical Shop to account for removal, and to verify PCB presence or content in the removed transformer. Implementing these measures should ensure

no adverse effects result from PCB and dioxin containing materials.

Installation Restoration Program

Potential IRP impacts are evaluated using DOD and Air Force guidance, and the FFSRA, as negotiated between VAFB and the regulatory agencies with oversight of VAFB IRP activities. Non-compliance with the FFSRA and applicable regulatory requirements, human exposure to contaminants, or environmental release above permitted limits, would be considered adverse impacts.

- ▶ Prior to any project activities at AOI or IRP sites, AF Form 332, *Base Civil Engineer Work Request*, and AF Form 103, *Base Civil Engineering Work Clearance Request* coordination with 30 CES/CEV IRP Office would be required.

- ▶ Because some of the identified projects would occur within boundaries of some AOIs or IRP Site-24, there is the potential for encountering pollutants during implementation of the Proposed Action. In addition, many of the AOIs and AOCs have not undergone surveys or investigations, or results are not yet available. Therefore, the potential for contact with contaminants considered a risk to human health is unknown at this time. To avoid adverse effects and exposure of workers to contamination, coordination with the 30 CES/CEV IRP Office would be required prior to the start of any construction activities under the Proposed Action.

Additionally, the MSG Headquarters project site is situated adjacent to a deep TCE groundwater contamination plume at IRP Site-24, as well as some of the associated groundwater monitoring wells. The location of this project site could impact treatment alternatives for the groundwater plume. Therefore, coordination with the 30 CES/CEV IRP Office regarding activities at IRP Site-24 would be required prior to any activity occurring at this site.

4.4.2 No-Action Alternative

Under the No-Action Alternative, the 2007 General Plan would not be adopted and identified projects for the VAFB cantonments, as proposed under the CIP in the 2007 General Plan, would not be implemented. No adverse effects resulting from hazardous materials or the generation of hazardous waste would occur. If demolition to be conducted under the Proposed Action did not occur, hazardous materials currently “managed in-place” would remain, and abatements of ACM, LBP, PCBs, and dioxins would not occur. Building deterioration over time could lead to potential releases of these materials into the environment, resulting in adverse effects on human health and safety, and the environment.

4.5 Human Health and Safety

4.5.1 Proposed Action

Mission-Associated Constraints

Mission-associated constraints are in place to ensure the safety of personnel on VAFB. Siting future projects within areas identified as having no or minimal operational and safety constraints would not result in adverse impacts. Siting projects in areas identified as having moderate or severe operational and safety constraints could result in adverse impacts unless appropriate conditions were met.

None of the identified projects included under the Proposed Action would be located at sites identified as having moderate or severe operational or safety constraints and project workers would not be exposed to the safety hazards associated with those areas. Additionally, future projects covered under the Proposed Action to occur within the main and South Base cantonments would primarily be sited within areas designated as having no or minimal operational and safety constraints. Specific safety measures would be established prior to implementation of any future projects sited in areas designated as

having moderate or severe operational and safety constraints.

Special precautions need to be taken in certain areas of VAFB that were used as practice ranges for artillery firing, referred to as areas of potential UXO. Coordination with the EOD Flight prior to implementing the Proposed Action would ensure that no adverse effects on human health and safety occur.

Project Constraints

The contractor would comply with OSHA regulations, and other recognized standards and applicable Air Force regulations or instructions. Restricted public access to the construction sites would be provided through use of signs and fencing. The contractor must also provide for the health and safety of workers and all subcontractors who may be exposed to their operations or services. The contractor must submit a health and safety plan to the base and appoint a formally trained individual to act as safety officer. The appointed individual would be the point of contact on all problems involving job site safety. During performance of work, the contractor must comply with all provisions and procedures prescribed for the control and safety of personnel and visitors to the job site. Therefore, human health and safety would not be adversely impacted by general construction hazards.

Biological hazards, including vegetation (i.e., poison oak and stinging nettle), animals (i.e., insects, spiders, and snakes), and disease vectors (i.e., ticks, rodents), exist at and near the proposed project sites, and have the potential to adversely impact the health and safety of construction personnel. Adherence to federal OSHA regulations would minimize the exposure of workers to these hazards.

According to regulations of the federal OSHA, employees should not be subjected to sound exceeding a L_{eq1H} of 90 dB for an eight-hour period. This sound level increases by five dB with each halving of time (e.g., four-hour period at 95 dB). Exposure up to a L_{eq1H} of 115 dB is permitted for a maximum of only 15

minutes during an 8-hour workday and no exposure above 115 dB is permitted. For this analysis, OSHA standards are used as the “not to exceed” criteria as they are the most appropriate standards available.

The Proposed Action would temporarily increase the ambient noise levels within the project area and in neighboring areas during project implementation activities. Relatively continuous noise would be generated by construction equipment. These continuous noise levels are generated from equipment that has source levels (at one meter) ranging from approximately 72.7 to 112.7 dB. As a sound source gets further away, the sound level decreases. This is called the attenuation rate. The rates are highly dependent on the terrain over which the sound is passing and the characteristics of the medium in which it is propagating. The rate used in these estimates was a decrease in level of 4.5 dB per doubling of distance. This average rate has been shown to be an accurate estimate from field data on grassy surfaces (Harris 1998). At 50 meters these levels range from 47.3 to 87.3 dB. Adverse effects as a result of noise are expected to be minimal and less than significant.

4.5.2 No-Action Alternative

Under the No-Action Alternative, the 2007 General Plan would not be adopted and identified projects for the VAFB cantonment, as proposed under the CIP in the 2007 General Plan, would not be implemented. Health and safety would not be affected under this alternative.

4.6 Solid Waste Management

Solid waste impacts are evaluated using federal, state, and local regulatory requirements, permit conditions, contract specifications, VAFB SWMP (30 SWP 32-7042), and operating constraints as outlined in Chapter 3, Section 3.6. Adverse impacts would occur from non-compliance with applicable regulatory requirements or an

increase in the amount of waste disposed beyond available base waste management capacities, which would result in disposal in other Santa Barbara County landfills. Disposal amounts in the Base Landfill that would cause the base to drop below its currently mandated 50% diversion rate would also be considered an adverse impact.

4.6.1 Proposed Action

C&D Debris

Solid waste generated during construction projects would include packaging from materials (cardboard and plastic), scrap rebar, wood, pipes, and wiring, and miscellaneous waste generated by onsite construction workers. Contractors would be responsible for the disposal and/or recycling of all waste generated during the scope of the project.

All soil excavated during construction activities would be used as backfill, and any excess materials would be spread throughout the site. Asphalt and concrete would be accepted at the Base Landfill if necessary and recycled when possible. Access to the landfill requires a Landfill Access Ticket, which would be coordinated through 30 CES/CEVV.

Construction debris, along with green waste, used tires and other recyclable materials, would be segregated and diverted for reclamation. All green waste would be disposed of at the Base Landfill. Any wastes resulting from the implementation of the Proposed Action that are not authorized to be disposed of in the Base Landfill would be segregated and taken off base for recycling or disposal.

In order to meet VAFB’s detailed tracking requirements for waste disposal and diversion, the party/unit responsible for diversion, recycling, or disposal must report all materials going off base for these purposes to the 30 CES/CEVV Solid Waste Manager. Additionally, any materials recycled on base by processes other than the Base Landfill, must be reported to the 30 CES/CEVV Solid Waste Manager at least

quarterly, with copies of weight tickets and receipts provided.

For any demolition that would occur under the Proposed Action, generation of demolition debris and materials and items removed from the buildings during deconstruction have the potential of adversely affecting waste volumes at the Base Landfill, particularly for acceptance of non-friable asbestos and demolition debris that could not be reused, recycled or placed as engineered fill. The demolition contractor would meet the applicable state or local diversion requirements in effect at the time of actual disposal. In addition, although the Base Landfill is permitted for a peak daily tonnage of approximately 400 tons, the demolition contractor would limit daily landfill disposal so the Base Landfill could continue to operate nearer its current daily average disposal tonnage of 35 tons/day. Useable items and material removed during deconstruction would directly impact the RTDS process of the local DRMO, and could indirectly impact regional Defense Logistic Agency RTDS centers. Recyclable solid wastes not managed by base processes would impact local and regional recycling facilities.

The evaluation of potential P2 impacts includes solid waste diversion requirements, particularly as applied to demolition debris. Non-compliance with applicable regulatory requirements or disposal of quantities of solid waste that would cause the proposed project not to meet mandate diversion rates would be considered an adverse impact. The placement of certain items and installed equipment removed from facilities into the DRMO RTDS process would increase the amounts of materials handled above normal operations. Debris would be segregated to facilitate subsequent P2 options. P2 options would be exercised in the following order: reuse of materials, recycling of materials and then regulatory compliant disposal.

Compliance with all applicable federal, state and local regulations, rules and requirements, and applicable VAFB plans would govern all actions associated with implementing the

Proposed Action and minimize the potential for adverse effects. Implementing the measures presented below would ensure no significant adverse impacts for solid waste would occur.

- ▶ Hazardous materials surveys and appropriate abatement actions would be completed prior to structural demolition to avoid contamination of inert demolition debris.

- ▶ Prior to structural demolition, salvageable, reusable, or recyclable materials, items and equipment would be removed to reduce the amount of solid waste disposal.

- ▶ Segregating and separately managing the different types of waste during the deconstruction and demolition processes would reduce the amount of solid waste disposal.

- ▶ Segregating and processing the different types of demolition debris into sizes, characteristics, and specifications identified by local recyclers as acceptable to their authorized processes would reduce solid waste disposal.

- ▶ Segregating and processing the different types of demolition debris into sizes, characteristics, and specifications for reuse within other VAFB projects.

- ▶ Using segregated demolition debris, such as residual wood, drywall, roofing, and flooring, as feedstock for grinding to make demolition debris suitable for use as alternate daily cover at the Base Landfill would minimize the amount of solid waste disposal.

Because projects associated with the Proposed Action would be implemented over a 10-year period, the addition of the solid wastes associated with identified projects would result only in small increases in the amount of solid waste generated by VAFB. The amount of solid waste generated would not affect the daily maximum waste that the Base Landfill can accept. The Proposed Action would have no adverse impacts on the environment.

Pollution Prevention

Construction operations associated with the Proposed Action would create pollution in the air and water and would generate hazardous and solid waste. Compliance with applicable regulatory requirements, as well as the VAFB PPMP, and implementation of the recommended measures for air quality (Section 4.1), and hazardous waste (Section 4.4) and solid waste management (see above) would enhance pollution prevention.

Contractors on VAFB must comply with affirmative procurement requirements as specified in federal regulations, and Air Force policies and plans, including Section 6002, Federal Procurement, of the RCRA; EO 12873, Federal Acquisition, Recycling, Waste Prevention; EO 13149, Greening the Government; EO 13101, Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition; AFI 32-7080, Compliance Assurance and Pollution Prevention; 30 SWP 32-7042, SWMP; and 30 SWP 32-7080, Pollution Prevention Management Plan.

The contractor shall use specified materials with recycled and recovered content as the minimum standard, which shall be considered when evaluating recycled or reused materials as part of the contractor's affirmative procurement program. The contractor shall also consider other green materials and products not listed, but commonly used in industry outside of the Government as a means of further reducing hazardous materials, hazardous waste and solid waste. The contractor shall make sure these materials and products meet the requirements of their contract specifications.

In addition, EO 13101 requires the use of products which have reduced toxicity and hazardous characteristics or reduced embodied energy in its manufacturing. The U.S. EPA provides comprehensive on-line pollution prevention training in the World Wide Web (www.epa.gov/).

Compliance with the regulations, guidelines, and measures described above would result in no adverse impacts to the environment.

4.6.2 No-Action Alternative

Under the No-Action Alternative, the 2007 General Plan would not be adopted and identified projects for the VAFB cantonments, as proposed under the CIP in the 2007 General Plan, would not be implemented. Solid waste levels and management would not be affected under this alternative.

4.7 Transportation

For the purposes of this PEA, impacts to the transportation system at VAFB would be considered significant if:

- ▶ A primary roadway could no longer service the traffic demands of that roadway;
- ▶ The project access to a primary road or local road would require a driveway that would create an unsafe situation or a new traffic signal or major revisions to an existing traffic signal; or
- ▶ The project adds traffic to a roadway that has limiting design features or receives use that would be incompatible with substantial increases in traffic, which would become potential safety problems with the addition of project or cumulative traffic. Limiting design features include, but are not limited to narrow width, roadside ditches, sharp curves, poor sight distance, and inadequate pavement structure. Some examples of a roadway receiving incompatible use are large number of heavy trucks on rural roads used by farm equipment, livestock, horseback riding, or on residential roads with heavy pedestrian or recreational use.

4.7.1 Proposed Action

Given that the 13 identified CIP projects would be implemented over a 10-year period and that the worst-case scenario representative was estimated to utilize 17 personnel (see Appendix C), personnel

commuting using US 1 and SR 246 and their entrance onto VAFB would be unlikely to affect existing off-base roadway conditions. The small number of additional personnel and the good LOS rating at the base gates makes it unlikely that activities under the Proposed Action would result in any significant impacts.

Increased truck activity on VAFB from the Proposed Action has the potential to decrease the LOS on affected primary and local roads. Because projects would be implemented over a 10-year period and only small numbers of personnel and associated project traffic would occur, the good LOS ratings for these roads make it unlikely that any significant impacts would occur. Additionally, none of the projects under the Proposed Action would occur on the roadways themselves, therefore no adverse effects such as temporary closures of roads or lanes are anticipated.

Although significant impacts from the Proposed Action are not anticipated given the temporary nature of the construction on any given roadway and the good LOS levels of primary roads on VAFB, the following measures would reduce the potential for adverse effects on the transportation system:

- ▶ Contractors would supply a traffic control plan that would cover all conditions to be encountered during construction, and which would be implemented to adequately facilitate the movement of traffic.
- ▶ Roadway users would be provided with adequate notice of when roadways would experience heavy construction use, so that users could plan for alternate routes when possible.

The following measures would also be implemented to reduce the potential for adverse effects on transportation:

- ▶ Project employees would be encouraged to carpool and eat lunch on site.
- ▶ Truck trips would be scheduled during non-peak traffic hours when possible.

4.7.2 No-Action Alternative

Under the No-Action Alternative, the 2007 General Plan would not be adopted and identified projects for the VAFB cantonments, as proposed under the CIP in the 2007 General Plan, would not be implemented. The transportation system at VAFB would not be changed.

4.8 Water Resources

Adverse impacts to water resources would occur if the Proposed Action: 1) caused substantial flooding or erosion; 2) caused VAFB to exceed their available supply of potable water; 3) adversely affected surface water quality to the creeks or rivers; or 4) adversely affected groundwater or water quality to localized water resources.

4.8.1 Proposed Action

Each project of one acre or more under the Proposed Action would require a NPDES Construction General Permit as required by Section 402 of the CWA because the total disturbed area would be greater than one acre. Further:

- ▶ Contractors would develop and implement a SWPPP to maintain compliance with the NPDES Construction General Permit. The contractor's SWPPP would be approved by 30 CES/CEV prior to initiation of any construction activities under the Proposed Action.
- ▶ Contractors would implement all NPDES Construction General Permit conditions, BMPs, and Discharge To Grade program procedures to minimize the potential for adverse impacts to local water resources.
- ▶ A Notice of Intent would be submitted to the SRWCB. A Notice of Termination would be submitted to the Central Coast RWQCB to ensure all permit termination requirements are met. The Notice of Intent and Notice of Termination would be coordinated with 30 CES/CEV and signed by the 30 CES/CC or 30 CES/CD prior to submittal.

► After completion of construction activities, areas with exposed disturbed soil would be stabilized per the NPDES Construction General Permit, as detailed in Section A, Item 7 on page 15 of the permit.

A CWA Section 401 Water Quality Certification from the Central Coast RWQCB and CWA Section 404 Permit from the U.S. ACOE would not be required under the Proposed Action because no direct impacts to water bodies or wetlands would occur. There are no direct discharges from the Proposed Action into any of the CWA Section 303 (d) listed water bodies, San Antonio Creek, and Santa Ynez River on VAFB.

Implementing the measures presented below to reduce impacts from new construction, regardless of project size, would ensure no significant adverse impacts to water resources would occur.

► BMPs would be implemented to prevent sediment or chemicals from entering into storm water. Storm drains should be protected from sediment migration. BMPs would include erosion and sediment control, vehicle tracking controls, proper spill prevention practices for all stored liquids and construction vehicles and post-construction BMPs.

► 30 CES/CEVC, Water Resources Manager approval is required prior to any release to grade or the storm water system of potable water, process wastewater, storm water, or ground water on VAFB, under the Discharge to Grade Program.

► Industrial wastewater (water containing prohibited chemical levels) would be taken to the industrial wastewater treatment ponds.

► New building water lines and fire suppression systems require installation of backflow prevention assemblies to prevent cross-contamination of the VAFB drinking water supply.

► Backflow prevention devices are required for hoses connected to the VAFB drinking water distribution system (including hydrants).

Potable Water

Given the small number of personnel associated with the projects to be implemented under the Proposed Action, and the 10-year period over which the projects would be implemented, it is not anticipated that there would be a significant effect to the amount of potable water needed at VAFB. Nor are water usage rates after completion of construction expected to significantly increase. Personnel utilizing newly constructed facilities would mainly be composed of personnel previously located at other on-base facilities and would not constitute a large number of additional base personnel. Projects associated with the Proposed Action are not anticipated to cause VAFB to exceed the available supply of potable water.

Surface Water and Floodplains

The Proposed Action includes renovation of one building and demolition of another. Demolition materials can contain materials that could increase the potential for pollutants such as ACM, PCBs, mercury-fill thermostats and switches, and LBP. Proper management of materials and wastes during the abatement phase for ACM, PCBs, mercury-fill thermostats and switches, and LBP (as described in Sections 3.4 and 4.4 of this PEA) would reduce or eliminate the potential for contaminated runoff. However, material may need to be temporarily stored while transportation is being arranged for its final disposal.

The processes of demolition and segregation of materials have the greatest potential for exposing pollutants at project sites. Thus, these actions would pose the greatest threat to water resources during the rainy season. There are a variety of BMPs that would be implemented, as required by the NPDES permit, to properly manage materials while on-site, especially during the rainy season.

North-Central Area

Potential runoff from construction activities associated with the 13 CIP projects described

under the Proposed Action would not reach San Antonio Creek because the sections of the main cantonment where those projects would be sited do not drain towards this waterway.

The Santa Ynez River would also not be affected because of the distance between the main cantonment and the river, and the presence of agricultural lands between the main cantonment and the Santa Ynez River, which provides a natural system to capture any runoff.

Permanent and/or seasonal wetlands occur throughout the San Antonio Terrace geographical area, near the Santa Ynez River drainage area, and within and adjacent to the main cantonment. None of the CIP projects under the Proposed Action are in the vicinity of these resources.

South-Central Area

The topography of the area and distance would prevent any potential runoff from activities at the South Base cantonment from reaching Bear Creek, Canada Honda Creek or the Pacific Ocean (see Figure A-6b in Appendix A).

SR 246 (West Ocean Avenue) and agricultural lands separate the South Base cantonment from the Santa Ynez River riparian corridor and the river itself. Activities under the Proposed Action are unlikely to result in runoff that would adversely affect the Santa Ynez River.

The South Base cantonment lies within the 100-year floodplain for the Santa Ynez River. There is no practicable alternative for future construction activities to occur under the Proposed Action given the existence of facilities within the South Base cantonment that perform and support mission essential activities. Construction activities associated with the Proposed Action would not be expected to alter the floodplain.

Groundwater

The VAFB water supply primarily comes from water purchased from the California

Department of Water Resources State Water Project. Four wells located in the San Antonio Creek-Barka Slough area are used to supplement the VAFB state water during annual maintenance periods. The greatest threat to groundwater is contamination from hazardous material or waste releases that could infiltrate an aquifer. The only local ground drinking water sources are the water wells located near Barka Slough, which are approximately 3.1 miles from the main cantonment. By implementing the protective measures as described in Section 4.4, Hazardous Materials and Hazardous Waste, the potential for releases to surface and subsurface waters is drastically reduced.

The VAFB water supply system capacity is 7.5 million gallons per day. Therefore, watering areas for dust control would not significantly affect the VAFB water supply system.

4.8.2 No-Action Alternative

Under the No-Action Alternative, the 2007 General Plan would not be adopted and identified projects for the VAFB cantonments, as proposed under the CIP in the 2007 General Plan, would not be implemented. Water resources on VAFB would not be affected.

4.9 Cumulative Impacts

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

As discussed in Chapter 1, this PEA incorporates a programmatic evaluation for identified CIP projects and potential future projects located in VAFB cantonments. The previous sections of Chapter 4 in this PEA

provide analyses of potential effects on resources from multiple projects planned to occur over a 10-year period. In this regard, this PEA inherently addresses cumulative effects to resources within the main and South Base cantonments.

In addition to the MILCON and NAF projects analyzed in this PEA, VAFB has an on-going operations and maintenance (O&M) program for Base facilities (also known as sustainment). O&M includes activities such as corrosion control, landscaping, paving, roofing, etc. There are over 300 O&M projects planned for FY07 to FY12 (VAFB 2007). Given that these projects are spread throughout the Base and the small scale of their operations, no significant cumulative impacts are anticipated with these activities.

Current projects at VAFB for which NEPA analysis, including cumulative impacts analysis, was completed include: demolition and abandonment of Atlas and Titan facilities and installation of fiber optic lines associated with the Combat Information Transport System (CITS) upgrade. Future projects for which NEPA analysis is currently underway include: security and safety upgrades at entry control facilities, and San Antonio Creek restoration.

Air quality impacts were considered in conjunction with on-going and future projects planned at VAFB. The cumulative emissions from projects included under the Proposed Action and past, present, and future projects would not exceed the significance thresholds of 548 lbs/day or 100 tons/year because any project that would cause an exceedance would be postponed until the following calendar year. Therefore, no significant cumulative impacts to the region's air quality would occur.

Adverse effects to biological and cultural resources should be minimized with the implementation of measures described in Section 2.1.3 of this PEA, identified in the environmental assessments completed for other projects, to be incorporated in environmental assessments currently under development for future projects, and identified

and established by VAFB for O&M projects. With these measures in place, no significant cumulative impacts are anticipated.

No impacts to earth resources are anticipated from the Proposed Action, from the demolition and abandonment of Atlas and Titan facilities, from the CITS upgrade, or from O&M projects. Environmental assessments under development for future projects would identify any potential adverse effects to earth resources and describe measures to avoid or minimize these adverse effects. No cumulative impacts are anticipated.

When considered in conjunction with other past, present, and future projects on VAFB, the Proposed Action was found to have no cumulative impacts on Environmental Justice, as activities covered under this PEA would be confined to the cantonments of VAFB and not affect minority communities.

Any hazardous materials/wastes encountered or generated during the Proposed Action would be managed in strict compliance with all applicable statutes and regulations, as well as local support plans and instructions including 30 SWP 32-7086, *Hazardous Materials Management Plan*, and 30 SWP 32-7043A, *Hazardous Waste Management Plan*, *Asbestos Management Plan*, and the 30 SWP 32-1002, *Lead-Based Paint Management Plan* to avert the potential for adverse impacts. Implementing the measures described in Section 2.1.3 of this PEA, identified in the environmental assessments completed for other projects, to be incorporated in environmental assessments currently under development for future projects, and identified and established by VAFB for O&M projects, should avoid or minimize any potential adverse effects. No significant cumulative impacts are anticipated.

Given contractors' requirement to comply with OSHA, Cal-OSHA, and all other applicable federal, state, and local regulations, no adverse impacts and therefore no cumulative impacts to Human Health and Safety are anticipated.

No cumulative impacts are anticipated in regards to land use as none of the projects considered within this PEA would change land use outside the cantonments or result in adverse effects. Additionally, projects covered under the Proposed Action would not occur within the coastal zone, and would not result in the conversion of prime agricultural land to other uses.

No adverse impacts to socioeconomics and therefore no cumulative impacts are expected from projects included under the Proposed Action, given that small numbers of personnel utilized for projects and the short-term nature of the activities (17 personnel for 12 months).

High levels of solid waste are not anticipated to occur under the implementation of the Proposed Action. Construction debris would be segregated and diverted for reclamation and solid waste would also be minimized by reuse and recycling. Contractors would also be required to appropriately dispose of all solid waste either at the Base Landfill as appropriate, or off of VAFB property. With these measures in place no significant cumulative effects are anticipated.

Activities covered under the Proposed Action would be unlikely to impact the transportation system or roadway conditions on VAFB given their good LOS ratings. Additionally, none of the projects under the Proposed Action would occur on roadways themselves, therefore there are no adverse effects such as temporary closures of roads or lanes

anticipated. No cumulative impacts are anticipated.

All activities under the Proposed Action would be subject to all requirements contained in the NPDES Construction General Permit. Implementation of measures described in Section 2.1.3 of this PEA, identified in the environmental assessments completed for other projects, to be incorporated in environmental assessments currently under development for future projects, and identified and established by VAFB for O&M projects, should avoid or minimize any potential adverse effects. No significant cumulative impacts to water resources are anticipated.

To ensure that no significant cumulative impacts result from VAFB projects occurring concurrently or non-currently, VAFB includes environmental contract specifications and mitigation/protective measures as necessary in all projects. Actions are taken during the planning process to ensure adverse impacts are minimized or avoided all together as projects are reviewed under NEPA. Prior projects are also considered to ensure no levels of acceptable impacts are exceeded.

With these practices in place, and given that all VAFB projects are designed and implemented to be in full compliance with applicable statutes and regulations, and environmental protection measures are developed in coordination with appropriate regulatory agencies, the described projects included under the Proposed Action, in conjunction with other foreseeable projects at VAFB, would not result in significant cumulative impacts.

This page intentionally left blank.

Chapter 5. Agencies and Persons Contacted

Amena Atta, 30 CES/CEV Installation Restoration Program, VAFB

Rhys Evan, 30 CES/CEV Natural Resources, VAFB

Luanne Lum, 30 CES/CEV Natural Resources, VAFB

Patrick Maloy, 30 CES/CEV Pollution Prevention, VAFB

Craig Nathe, 30 CES/CEV Installation Restoration Program, VAFB

Laura Ornelaz, 30 SW/JA Environmental Law, VAFB

Chris Ryan, 30 CES/CEV Cultural Resources, VAFB

Dina Ryan, 30 CES/CEVP Environmental Planning, VAFB

Dave Savinsky, 30 CES/CEV Compliance, VAFB

Sarah Wagner, 30 CES/CEC Base Planning, VAFB

Tara Wiskowski, 30 CES/CEV Compliance, VAFB

This page intentionally left blank.

Chapter 6. List of Preparers

- Abela, Alice. Wildlife Biologist, ManTech SRS Technologies, Inc.
B.S. 2003, Biology, California Polytechnic State University, San Luis Obispo
Years of Experience: 5
- Ball, Morgan. Wildlife Biologist, ManTech SRS Technologies, Inc.
B.S. 2001, Evolution/Ecology, University of California, Santa Barbara
Years of Experience: 10
- Fillmore, Leslie. Environmental Engineer, ManTech SRS Technologies, Inc.
B.S. 1994. Biology, University of North Carolina at Chapel Hill
Years of Experience: 11
- LaBonte, John, Wildlife Biologist, ManTech SRS Technologies Inc.
PhD, 2008, Department of Ecology, Evolution, and Marine Biology, University of California, Santa Barbara
B.S. 1997, Ecology, Behavior and Evolution, University of California, Santa Barbara
Years of Experience: 11
- Lebow, Clayton, Vice President/Senior Archaeologist, Applied EarthWorks, Inc.
B.S. 1977 Forest Engineering, Oregon State University, Corvallis
M.A. 1983 Archaeology, Cultural Anthropology & Geography, Oregon State University, Corvallis
Years of Experience: 29
- Nieto, Paloma. Senior Research Biologist, ManTech SRS Technologies, Inc.
B.S. 1997, Ecology & Wildlife Biology, California Polytechnic State University, San Luis Obispo
M.S. 1999, Biological Sciences, California Polytechnic State University, San Luis Obispo
Years of Experience: 13
- Peterson Jr., Robert, Staff Archaeologist, Applied Earthworks, Inc.
B.S. 1974 Sociology with Archaeology emphasis, Montana State University, Bozeman
M.A. 1977 Anthropology, University of Wyoming, Laramie
Years Experience: 30
- Sipos, John. Senior Environmental Engineer, ManTech SRS Technologies, Inc.
B.A. 1965 Geography, Johns Hopkins University
M.A. 1974 Geography, Syracuse University
Years of Experience: 16

This page left intentionally blank.

Chapter 7. Distribution List

California Coastal Commission, Federal Consistency Review, San Francisco, CA
California Native Plant Society, Los Osos, CA
California Regional Water Quality Control Board, Central Coast Region, San Luis Obispo, CA
Environmental Defense Center, Santa Barbara, CA
La Purisima Audubon Society, Lompoc, CA
Santa Barbara County Air Pollution Control District, Project Review, Santa Barbara, CA
Santa Barbara Museum of Natural History, Santa Barbara, CA
Santa Ynez Band of Chumash Indians, Office of the Tribal Chairman, Santa Ynez, CA
U.S. Fish and Wildlife Service, Ventura Field Office, Ventura, CA
University of California, Museum of Systematics & Ecology, Santa Barbara, CA
Lompoc Public Library, Lompoc, CA
Santa Barbara Public Library, Santa Barbara, CA
Santa Maria Public Library, Santa Maria, CA
University of California, Library, Santa Barbara, CA
Vandenberg AFB Library, Vandenberg AFB, CA

This page intentionally left blank.

Chapter 8. Bibliography

- Arnold, R.A. 1978. Status of six endangered California butterflies, 1977. California Dept. of Fish & Game, Nongame Wildlife Investigations #1-1, Study V, Job 2.20. Sacramento, CA. 95 pp.
- Arnold, R.A. 1981. A review of endangered species legislation in the USA and preliminary research on 6 endangered California butterflies. Beih. Veroff. Naturschutz. Landschaftspflege Bad.-Württ. 21: 79-96.
- Arnold, R.A. 1983. Ecological studies of six endangered butterflies (Lepidoptera: Lycaenidae): island biogeography, patch dynamics, and the design of habitat preserves. Univ. of Calif. Publ. in Entomology. 99:1-161.
- Bamforth, D.B. 1979. *Prehistoric Cultural Resources within Four Proposed Hypergolic Propellant Storage Areas on Vandenberg Air Force Base*. Social Process Research Institute, Office of Public Archaeology University of California, Santa Barbara.
- Bergin, K.A., and C.D. King. 1989. *The Survey and Inventory of Archaeological Properties for the Backbone Fiber-Optic Transmission System Project, Vandenberg Air Force Base, Santa Barbara County, California*. Environmental Solutions, Inc., Irvine, California. Prepared for Department of the Air Force, Headquarters Space Systems Division, Department of Environmental Planning, El Segundo, California.
- Berry, B.F., R.C. Payne, and A.L. Harris. 1991. Noise levels of USAF aircraft in Exercise "Luce Belle". National Physics Laboratory Report RSA (EXT) 16. 22pp.
- Berry, S.H. 1988. *Santa Ynez Waterline Surface Survey, Raw Waterline Placement Project, Santa Ynez River, County of Santa Barbara*. On file, California Historical Resources Information System, Central Coast Information Center, University of California, Santa Barbara.
- Berry, S.H. 1990. *Power Line to A/D/E Substations Surface Survey, Vandenberg Air Force Base, Santa Barbara County, California*. Prepared for Civil Engineer Squadron, Engineering and Contracts Branch, Vandenberg Air Force Base, California.
- Berry, S.H. 1991. *A-6 Power Line Surface Survey, Vandenberg Air Force Base, Santa Barbara County, California*. On file, California Historical Resources Information System, Central Coast Information Center, University of California, Santa Barbara.
- Berry, S.H. 1992 *Water Line Replacement, Santa Ynez Ridge Road, Archaeological Inventory Report, Vandenberg Air Force Base, Santa Barbara County, California*. 30 CES/CEVPC report. On file, 30 CES/CEVPC, Vandenberg Air Force Base, California. (VAFB-1992-05)
- Berry, S.H. 1994. *San Antonio 14-Inch Water Line Archaeological Survey and Testing Report*. 730 CES, Environmental Flight, Vandenberg Air Force Base, California. Prepared for the California Office of Historic Preservation.
- Bowser, B. 1994. *Archaeological Survey Report, AN/TPQ-18 Radar Facility Site, Vandenberg Air Force Base, Santa Barbara County, California*. SAIC Report Prepared for 730 CES/CEVA, Vandenberg AFB, CA. On file, 30 CES/CEVPC, Vandenberg Air Force Base, California. (VAFB-1994-07)

- Cagle, C. 1995. *Archaeological Survey Report for the Repair of the 13th Street Waterline (XUMU 89-0082)*. Science Applications International Corporation, Santa Barbara, California. Submitted to the Department of the Air Force, Vandenberg Air Force Base, California.
- Carbone, L.A., and R.D. Mason. 1998. *Phase I, II, and III Archaeological Surveys for Cultural Resources Inventory, Vandenberg Air Force Base, Santa Barbara County, California*. Science Applications International Corporation and Chambers Group, Inc., Santa Barbara, California. Submitted to U.S. Department of the Interior, National Park Service, Western Region Interagency Archeological Services Branch, San Francisco.
- CDFG (California Department of Fish and Game). 1999. Special Status Plants, Animals and Natural Communities of Santa Barbara County. California Natural Diversity Data Base.
- CDFG. 2001. Special Plants and Animals: Casmalia USGS Quadrangle. California Natural Diversity Database.
- CDFG. 2006. Special Animals. Department of Fish and Game Wildlife and Habitat Analysis Branch. California Natural Diversity Database. Retrieved from the World Wide Web: <http://www.dfg.ca.gov/whdab/pdfs/spanimals.pdf>.
- CDFG. 2007. Special Vascular Plants, Bryophytes, and Lichens List. Department of Fish and Game Wildlife and Habitat Analysis Branch. California Natural Diversity Database. Retrieved from the World Wide Web: <http://www.dfg.ca.gov/whdab/pdfs/SPPlants.pdf>.
- Chambers Consultants and Planners. 1984. *Archaeological Investigations on the San Antonio Terrace, Vandenberg Air Force Base, California, in Connection with MX Facilities Construction*. Chambers Consultants and Planners, Stanton, California. Submitted to U.S. Army Corps of Engineers, Los Angeles District, Contract No. DAC09-81-C-0048.
- Christopher, S.V. 1996. Reptiles and amphibians of Vandenberg AFB, Santa Barbara County, California. Museum of Systematics and Ecology, Report No. 4, University of California, Santa Barbara, in cooperation with the National Biological Service, San Simeon.
- Christopher, S.V. 2002. Sensitive amphibian inventory at Vandenberg Air Force Base, Santa Barbara County, California. Summary of preliminary results and site maps. Appendix A Field survey data January 1995 through March 2002.
- Clark, M.E. 1997. *Archaeological Surveys around Septic Systems at Various Facilities, Vandenberg Air Force Base, Santa Barbara County, California*. Tetra Tech, Inc., Santa Barbara, California, and Applied EarthWorks, Inc., Fresno, California. Submitted to 30 CES/CEV, Vandenberg Air Force Base, California, USAF Contract No. F04684-95-C-0045.
- Colten, R.H. 1983. *Archaeological Sensitivity for the Proposed Union Oil Company Santa Maria Basin Pipeline, Santa Barbara County, California*. Submitted to Robert Dundas Association, Oxnard, California.
- Coulombe, H.N., and C.R. Mahrtdt. 1976. Ecological Assessment of Vandenberg Air Force Base, California. Vol II: Biological inventory, 1974/75. Prepared for Headquarters Space and Missile Systems Org., Air Force Systems Command, Los Angeles Air Force Station, California.
- Craig, S. 1980. Cultural Resource Impact Evaluation and Mitigation Planning for the MX Missile System Vandenberg Air Force Base, California. Submitted to U.S. Air Force Ballistic Missile Office, Norton AFB, California. On file with 30 CES/CEVPC, Vandenberg Air Force Base, California.

- Crane, B.D. 1994. *The Survey and Inventory of Historical Properties for the RSA Fiber-Optic Transmission system, North Vandenberg Air Force Base, Santa Barbara County, California*. Parsons Engineering Science, Fairfax, Virginia.
- Crane, B.D. 1995. *The Survey and Inventory of Historical Properties for the RSA Fiber-Optic Transmission System, North Vandenberg Air Force Base, Santa Barbara County, California*. Parsons Engineering Science, Fairfax, Virginia.
- Curt, D. 2000. *Cultural Resources Assessment for Pacific Bell Wireless Facility, County of Santa Barbara, California*. On file, California Historical Resources Information System, Central Coast Information Center, University of California, Santa Barbara.
- Dames & Moore. 1985. Environmental Assessment, Northwest Lompoc, Jesus Maria Development Project, Vandenberg Air Force Base, Santa Barbara County, California. Dames & Moore, Santa Barbara, California. Submitted to 30th Civil Engineer Squadron, Environmental Flight (30 CES/CEV), Vandenberg Air Force Base, California.
- Day-Moriarty, Sandra, Kathleen Ann Bergin, Jerry D. Moore, David D. Ferraro, and Jeffry A. Parsons. 1988. Survey, Testing, and Evaluation of Fourteen Sites for the STS Power Plant, Natural Gas Pipeline Project, Santa Barbara County, California. Harmsworth Associates Report submitted to Martin Marietta Corporation. On file, 30 CES/CEVPC, Vandenberg Air Force Base, California. (VAFB-1988-12)
- Duncan, F. 1980. *Cultural Resources Technical Report Supplement on the El Rancho Road Gate House Project, Vandenberg Air Force Base, California*. On file, California Historical Resources Information System, Central Coast Information Center, University of California, Santa Barbara.
- Earth Technology Corporation. 1991. *Peacekeeper Rail Garrison Mitigation Program San Antonio Terrace, Vandenberg Air Force Base, California, Cultural Resources Survey for Proposed Groundwater Well Installation*. Earth Technology Corporation, Colton, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California.
- Eisentraut, P. 1995. *Cultural Resources Investigation for Proposed Improvements to 18 Septic Tank Systems, Vandenberg Air Force Base, Santa Barbara County, California*. Dames & Moore, Santa Barbara, California. Prepared for 30th Space Wing, Environmental Management Office, Vandenberg Air Force Base, California.
- Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.
- Environmental Solutions, Inc. 1988. Archaeological Resources Inventory and No Effects Determination for Proposed Phase III Geotechnical Testing, Proposed Space Launch Complex 7, Vandenberg Air Force Base, Santa Barbara County, California. Environmental Solutions, Inc., Irvine, California. Prepared for United States Air Force El Segundo CA. (VAFB-1988-19).
- Erlandson, J. M. 1984. *A Summary of Phase I Cultural Resource Investigations Conducted in Support of the Proposed Union Oil/Santa Maria Basin Pipeline*. Social Process Research Institute, University of California, Santa Barbara. Submitted to HDR Systems, Santa Barbara, California (VAFB-1984-11).
- Evenson, R.E., and G.A. Miller. 1963. Geology and Groundwater Features of Point Arguello Naval Missile Facility, Santa Barbara County, California. U.S.G.S. Water Supply Paper 1619-F.

- Foster, J.M. 1985a. *Archaeological Investigations: Vandenberg Air Force Base Communication Line #1976, Santa Barbara County, California*. Greenwood and Associates, Pacific Palisades, California. Submitted to U.S. Department of the Interior, National Park Service, Interagency Services Division, San Francisco, in partial fulfillment of Purchase Order No. PX-8000-6-0080.
- Foster, J.M. 1985b. *Archaeological Investigation: Onshore Portion of Point Pedernales Pipeline Project, Santa Barbara County, California*. Greenwood and Associates, Pacific Palisades, California. Prepared for Dames & Moore, Santa Barbara, California.
- Foster, J.M., and R.S. Greenwood. 1985. *Archaeological Investigation: Northwest Lompoc/Jesus Maria Project, Union Oil Company of California, Vandenberg Air Force Base*. Greenwood and Associates, Pacific Palisades, California. Prepared for Dames & Moore, Santa Barbara, California.
- Gerber, J. 1998. *Archaeological Survey Report, Concrete/Asphalt Rubble Processing Facility Alternative 3 (Withdrawn), Vandenberg Air Force Base, California*. Lockheed Martin Services Group, Lompoc, California. Prepared for Tetra Tech, Inc., Santa Barbara, California. Submitted to 30 CES/CEV, Vandenberg Air Force Base, California.
- Gibson, R.O. 1984a. Results of Archaeological Surface Survey on Three Parcels of Land Totaling 234 Acres on Vandenberg Air Force Base. Robert O. Gibson, Archaeologist, Paso Robles, California. Submitted to URS Corporation, Santa Barbara, California (VAFB-1984-21).
- Gibson, R.O. 1984b. Results of Archaeological Surface Survey for the Papi Runway Landing Lights, VAFB, CA. R. O. Gibson. VTN. Submitted to Ralph M. Parsons Company. (VAFB-1984-22)
- Gibson, R.O. 1985a. Results of Archaeological Surface survey for the Communications Line Between Buildings 1610 and 1862, Northern Vandenberg Air Force Base, CA. Harmsworth Associates Report submitted to Martin Marietta Corporation (VAFB-1985-01).
- Gibson, R.O. 1985b. Installation of the Communications Cable between Building 865 and Building 660 and Extension of the Fence at Building 660 Facility Area, Vandenberg Air Force Base, CA. Harmsworth Associates Report submitted to Martin Marietta Corporation (VAFB-1985-02).
- Gibson, R.O. 1986a. *Archaeological Surface Survey for a Portion of the MPS36 Electrical Power Line Project, Vandenberg Air Force Base, CA*. Letter report to Harmsworth Associates, Laguna Hills, California. On file, 30th Civil Engineer Squadron, Environmental Flight, Cultural Resources Section, Vandenberg Air Force Base, California.
- Gibson, R.O. 1986b. *Additional Comments on Fiber Optics Monitoring at SBA-1867, SBA-1868, and SBA-1869*. Robert O. Gibson, Paso Robles, California. Submitted to Harmsworth Associates, Laguna Hills, California.
- Gibson, R.O. 1986c. *Results of Archaeological Surface Survey for a Fence Improvement Project near Highway 246, Vandenberg Air Force Base, California*. On file, 30 CES/CEVPC, Vandenberg Air Force Base, California. (VAFB-1986-14)
- Gibson, R.O. 1987a. *Results of Archaeological Surface Survey for Two Fence Improvement Projects on Vandenberg Air Force Base, California*. Robert O. Gibson, Archaeological Consultant, Paso Robles, California. Prepared for Vandenberg Air Force Base Range Management, Santa Barbara County, California.

- Gibson, R.O. 1987b. *Results of Archaeological Surface Survey for a Fence Improvement Project and Two Pasture Management Projects, Vandenberg Air Force Base, California*. On file, 30th Civil Engineer Squadron, Environmental Flight, Cultural Resources Section, Vandenberg Air Force Base, California.
- Gibson, R.O. 1992. *Results of Cultural Resources Inventory for VAFB Landfill Permit Renewal Project, Vandenberg Air Force Base, Santa Barbara County, CA*. Prepared for Engineering Science, Inc.
- Gibson, R.O., and J.A. Parsons. 2002. *Results of Presence/Absence Testing for Cultural Resources at SBA-912, SBA-1040, SBA-1131, SBA-1146, SBA-1889, SBA-2880, and SBA-2953, Vandenberg Air Force Base, Santa Barbara County, CA*. Gibson's Archaeological Consulting, Paso Robles, California. Prepared for Nuevo Energy Company, Orcutt, California.
- Glassow, M.A. 1977. *An Intensive Archaeological Survey of Five Areas on Vandenberg Air Force Base, Santa Barbara County, California*. Anthropology Department, University of California, Santa Barbara. Submitted to U.S. Department of the Interior, National Park Service, Western Region Interagency Archeological Services Branch, San Francisco, Contract No. CX8880-7-0005.
- Glassow, M.A., L.W. Spanne, and J. Quilter. 1976. *Evaluation of Archaeological Sites on Vandenberg Air Force Base, Santa Barbara County, California*. Department of Anthropology, University of California, Santa Barbara. Submitted to the U.S. Department of the Interior, National Park Service, Office of Archeology, San Francisco, Contract No. CX800040020.
- Greenwood, R.S. 1984. *Letter Report on an Archaeological Survey of a Union Oil Pipeline Corridor as Requested by Dames and Moore of Santa Barbara*. Greenwood and Associates, Pacific Palisades, California. Submitted to Dames and Moore, Santa Barbara, California.
- Greenwood, R.S., and J.M. Foster. 1981. *Range Improvement Project, Vandenberg Air Force Base, Santa Barbara County, California*. 2 vols. Greenwood and Associates, Pacific Palisades, California. Prepared for Vandenberg Air Force Base, Civil Engineering Squadron, Environmental Planning Branch, Santa Barbara County, California. Submitted to U.S. Department of the Interior, National Park Service, Western Region Interagency Archeological Services Branch, San Francisco, in partial fulfillment of Purchase Order PX8000-1-0421.
- Greenwood, R.S., and J.M. Foster. 1984. *Replacement Cable Project and Fibre Optic Cable Project, Vandenberg Air Force Base, Santa Barbara County, California*. Greenwood and Associates, Pacific Palisades, California. Submitted to the U.S. Air Force, Space and Missiles Center, Vandenberg Air Force Base, California.
- Harris, C.M. 1998. *Handbook of Acoustical Measurements and Noise Control*, Third Edition.
- HDR Sciences. 1979. *Cultural Resources Impact Evaluation and Mitigation Planning for the MX Missile System, Vandenberg Air Force Base*. HDR Sciences, Santa Barbara, California. Prepared for the U.S. Air Force Ballistic Missile Office, Norton Air Force Base, California.
- HDR Sciences. 1982. *Summary of HDR Archaeological Testing and Mitigation Excavation Programs in the San Antonio Terrace Dunes, Vandenberg Air Force Base*. HDR Sciences, Santa Barbara, California. Prepared for the U.S. Air Force Ballistic Missile Office, Norton Air Force Base, California.

- Hodges, C.M., C.G. Lebow, and R.L. McKim. 2000. *Archaeological Survey of the Azalea and Halloween Wildfire Areas on North Vandenberg Air Force Base, Santa Barbara County, California*. Applied EarthWorks, Inc., Fresno, California, for Tetra Tech, Inc., Santa Barbara, California. Submitted to 30 CES/CEV, Vandenberg Air Force Base, California, USAF Contract No. F04684-95-C-0045.
- Holmgren, M.A., and P.W. Collins. 1999. Final report on the distribution and habitat associations of six bird species of special concern at Vandenberg Air Force Base, Santa Barbara County, California. Prepared for Vandenberg Air Force Base, 30CES/CEVPN, Natural Resources, Vandenberg Air Force Base, California. Santa Barbara Museum of Natural History Monographs No. 1, Studies in Biodiversity No. 1. 204 pp.
- Jaffke, T.D. 1990a. *Archaeological Survey Report for a Proposed Landfill Expansion on VAFB*. 30 CES/CEVPC internal report (VAFB-1990-04) On file, Central Coast Information Center, California Historical Resources Information System, University of California, Santa Barbara.
- Jaffke, T.D. 1990b. *Archaeology Survey Report, Waterline Replacement on South Vandenberg Air Force Base, California*. 30 CES/CEVPC internal report. On file, California Historical Resources Information System, Central Coast Information Center, University of California, Santa Barbara. (VAFB-1990-07)
- Keil, D.J., and V.L. Holland. 1998. Documented Flora of Vandenberg Air Force Base Santa Barbara County, California. California Polytechnic State University, San Luis Obispo.
- King, C.D., R.O. Gibson, J. Hunter, M.K. Martin, L. Roberts, and L.R. Wilcoxon. 1985. Cultural Resources. In Union Oil Project/Exxon Project Shamrock and Central Santa Maria Basin Area Study EIS/EIR, Technical Appendix G. Arthur D. Little, Inc., Santa Barbara, California. Prepared for County of Santa Barbara U.S. Minerals Management Service, California State Lands Commission, and California Office of Offshore Development.
- Lebow, C.G., and L. Haslouer. 2005. *National Register of Historic Places Eligibility Evaluation at CA-SBA-3741 in Support of Military Family Housing Phase 8 on Vandenberg Air Force Base, Santa Barbara County, California*. Applied EarthWorks, Inc., Lompoc, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California, Contract No. T0900DF415.
- Lebow, C.G. and R.R. Peterson. 2007. *Archaeological Survey for the Vandenberg Air Force Base General Plan, Santa Barbara County, California*. Applied EarthWorks, Lompoc, California. Submitted to 30 CES/CEVNC, Vandenberg Air Force Base, California.
- Lebow, C.G., and C. Ryan. 1998. *Cultural Resources Condition on Vandenberg Air Force Base, Fiscal Year 1998: Zones 6 and 7*. Applied EarthWorks, Inc., Fresno, California, for Tetra Tech, Inc., Santa Barbara, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California.
- Lebow, C.G., N.E. Stevens, B.A. Price, R.L. McKim, W.M. Nettles, L.G. Haslouer, M.H. Imwalle, and J.M. Fancher. 2006. *Archaeological Investigations Supporting Consultation with the State Historic Preservation Officer for the Privatization of Military Family Housing on Vandenberg Air Force Base, Santa Barbara County, California*. Applied EarthWorks, Inc., Lompoc, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California.
- Lehman, P.E. 1994. The birds of Santa Barbara County, California. Vertebrate Museum, University of California, Santa Barbara. 337 pp.

- Linder, M. 2004. *Archaeological Monitoring for the Nuevo Energy Project at Beach Road*. Applied Earthworks, Inc., Lompoc, California. Prepared for Nuevo Energy Company, Orcutt, California. Submitted to 30th Civil Engineer Squadron, Environmental Flight, Cultural Resource Section, Vandenberg Air Force Base, California.
- Marmor, J. 1988. *Results of Archaeological Monitoring of Geotechnical Exploration at the Proposed Space Launch Complex 7 (SLC 7) Project Area, Vandenberg Air Force Base*. U.S. Forest Service, Los Padres National Forest. Submitted to Richard Weaver, U.S. Corps of Engineers, Sacramento District.
- Mattoni, R.H.T. 1992. The endangered El Segundo blue butterfly. *Journal of Research Lepidoptera* vol. 29. 277-304pp.
- McCullough, R. and P. Nowlan. 1997. *Cold War Properties Evaluation—Phase III, Inventory and Evaluation of Atlas, Titan, Bomarc, and Blue Scout Junior Launch Facilities at Vandenberg Air Force Base, California, for the United States Air Force*. Tri-Services Cultural Resources Research Center, U.S. Army Construction Engineering Research Laboratories, Champaign, Illinois.
- McKim, R.L., and B.A. Price. 1997. *NRHP Eligibility Testing at CA-SBA-3487 (CA-SBA-ISO-608), Military Family Housing Project, Vandenberg Air Force Base, California*. Applied EarthWorks, Inc., Fresno, California, for Tetra Tech, Inc., Santa Barbara, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California, USAF Contract No. F04684-95-C-0045.
- Minas, K.R. 1996. *Survey of Borrow Area on Vandenberg Air Force Base*. On file, 30th Civil Engineer Squadron, Environmental Flight, Cultural Resource Section, Vandenberg Air Force Base, California.
- Mirro, M.J., and C.G. Lebow. 2003. *Archaeological Survey of the Harris Wildfire Burn Area on North Vandenberg Air Force Base, Santa Barbara County, California*. Applied EarthWorks, Inc., Lompoc, California. Submitted to 30 CES/CEV, Vandenberg Air Force Base, California, USAF Contract No. T0900DF415.
- Moratto, M.J., and B.A. Price (eds). 2005. *Vandenberg Air Force Base Integrated Cultural Resources Management Plan*, vol. 5. Applied EarthWorks, Inc., Fresno, California. Submitted to U.S. Air Force, 30 CES/CEVPC, Vandenberg Air Force Base, California.
- MSRS (ManTech SRS Technologies, Inc.). 2007. *El Segundo Blue Butterfly (Euphilotes battoides allyni) : Flight Season Surveys and Management Recommendations*, Vandenberg Air Force Base, California. Prepared for 30th Space Wing Environmental Flight. October 2007. 107 pp.
- Muir, K.S. 1964. *Geology and Groundwater of San Antonio Creek Valley, Santa Barbara, California*. U.S.G.S. Water Supply Paper.
- Munns, A. 2005. *Cultural Resources Monitoring for IRP site 15 Monitoring Well Installation, Vandenberg Air Force Base, California*. Applied Earthworks, Lompoc, California. Submitted to Earth Tech, Sacramento, California.
- Munns, A.M., and C.G. Lebow. 2003. *Cultural Resource Investigation for the Nuevo Energy Company Waterline, Santa Barbara County, California*. Applied EarthWorks, Inc., Lompoc, California. Submitted to Nuevo Energy Company, Orcutt, California.

- Neff, H., and P. Snethkamp. 1982. *Final Report, Vandenberg Air Force Base, California, 1982 Fuels Management Program, Cultural Resources Survey/Evaluation*. Office of Public Archaeology, Social Process Research Institute, University of California, Santa Barbara. Submitted to U.S. Department of the Interior, National Park Service, Interagency Archeological Services Division, San Francisco, in partial fulfillment of Contract No. DX 800-2-0024.
- Nowlan, P., S. Ellsworth, R. McCullough, M. Metzinger, J. Gorski, and A. Bonhert. 1996. *Cold War Properties Evaluation—Phase I, Inventory and Evaluation of Launch Complexes and Related Structures at Vandenberg Air Force Base, California, for the United States Air Force*. Tri-Services Cultural Resources Research Center, U.S. Army Construction Engineering Research Laboratories, Champaign, Illinois.
- Nowlan, P. and R. McCullough. 1997. *Cold War Properties Evaluation—Phase II, Inventory and Evaluation of Minuteman, MX Peacekeeper, and Space Tracking Facilities at Vandenberg Air Force Base, California, for the United States Air Force*. Tri-Services Cultural Resources Research Center, U.S. Army Construction Engineering Research Laboratories, Champaign, Illinois.
- Osland, K. 1993. *An Archaeological Survey, Test Report, and Eligibility Report for an Electrical Power System Upgrade, Vandenberg Air Force Base, CA*. 730 CES/CEVA, Vandenberg Air Force Base, California. Prepared for 730 CES/CEC Vandenberg Air Force Base, California.
- O'Halloran, S. 1984. *Phase I Archaeological Survey of a Proposed Union Oil Pipeline and Processing Facility in Northern Santa Barbara County*. Office of Public Archaeology, Social Process Research Institute, University of California, Santa Barbara.
- Osland, K. 1990. *Inventory Report for the Weather Information Networks System, Vandenberg Air Force Base, California*. 30 CES/CEVP, Vandenberg Air Force Base, California. (VAFB-1990-11)
- Owen, V.A., and C.G. Lebow. 2003a. *Archaeological Survey for the Nuevo Energy Company Power Line, Santa Barbara County, CA*. Applied Earthworks, Inc., Lompoc, California. Submitted to Nuevo Energy Company, Orcutt, California.
- Owen, V.A., and C.G. Lebow. 2003b. *Archaeological Survey for the Proposed Wind Farm South Vandenberg Air Force Base, Santa Barbara County, California*. Applied EarthWorks, Inc., Lompoc, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California.
- Palmer, K. 1999. *Central Coast Continuum—From Ranchos to Rockets: A Contextual Historic Overview of Vandenberg Air Force Base, Santa Barbara County, California*. Prepared by Palmer Archaeology and Architecture Associates, Santa Barbara, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California.
- Palmer, K. 2000. *Vandenberg Air Force Base Cultural Resources Historic Sites Management Notebook*. Prepared by Palmer Archaeology and Architecture Associates, Santa Barbara, California, for BTG, Inc., Santa Maria, California. Submitted to 30th Civil Engineer Squadron, Environmental Flight, Cultural Resources Section (30 CES/CEVPC), Vandenberg Air Force Base, California.

- Peter, K.J., and S. Dondero. 1991. Site Summaries and Technical Appendices. In *Western Chumash Prehistory: Resource Use and Settlement in the Santa Ynez River Valley*, edited by Craig F. Woodman, James L. Rudolph, and Teresa P. Rudolph. Science Applications International Corporation, Santa Barbara. Prepared for Unocal Corporation. Submitted to U.S. Army Corps of Engineers, Los Angeles District.
- Peterson, R.R., and C.G. Lebow. 2007. Archaeological Investigations for Security Upgrades at Seven Entry Control Gates at Vandenberg Air Force Base, Santa Barbara County, California. Applied Earthworks, Inc. Lompoc California. Submitted to 30 CES/CEVNC Vandenberg Air Force Base, California.
- Peterson Jr., R., J.D. Moore and R. Colton. 1984. Phase I Archaeological Survey of a proposed powerline right of way and two lane alternate routes, Lompoc, California. Office of Public Archaeology, Social Process Research Institute, University of California Santa Barbara.
- Pratt, Gordon F. 2006. Terrestrial Arthropods of Vandenberg Air Force Base, Lompoc, California 2004-2005 Draft. 106pp.
- Pratt, G. F. & G. R. Ballmer. 1993. Correlations of diapause intensities of *Euphilotes* spp. and *Philotiella speciosa* (Lepidoptera:Lycaenidae) with host bloom period and elevation. Ann. Ent. Soc. 86: 265-272.
- Price, B.A., R.H. Colten, T.W. Canaday, M.E. Clark, C. Ryan, T.P. Fulton, M.H. Imwalle, and C.K. Roper. 2006. *Final Report of Archaeological Investigations, Mission Hills and Santa Ynez Extension, Coastal Branch Aqueduct, Phase II*, with contributions by Douglas R. Harro, Kurt T. Katsura, and Rebecca L. McKim. Applied EarthWorks, Inc., Fresno, California. Submitted to Central Coast Water Authority, Buellton, California.
- Price, B.A., R.L. McKim, and M.H. Imwalle. 1996a. *Cultural Resource Investigations for the Military Family Housing Project, Vandenberg Air Force Base, Santa Barbara, California*. Applied EarthWorks, Inc., for INFOTEC Research, Inc., Fresno, California. Prepared for Halliburton, Inc. Submitted to Brown and Root Environmental, Gaithersburg, Maryland.
- Price, B.A., R.L. McKim, and M.H. Imwalle. 1996b. *Cultural Resource Investigations for the Combat Arms Training and Maintenance Facility, Vandenberg Air Force Base, Santa Barbara County, California*. Applied Earthworks, Inc., Fresno, California. Submitted to Brown and Root Environmental, Gaithersburg, Maryland.
- Rudolph, J.L. 1984. *Phase I Archaeological Survey, Arkley 23X-20*. Social Process Research Institute, Office of Public Archaeology. Letter report to Union Oil Company of California.
- Rudolph, J.L. 1988. *Phase I Archaeological Survey for Proposed Fence Lines in Santa Lucia Canyon and San Antonio Valley, Vandenberg Air Force Base*. URS Corporation, Santa Barbara, California. Submitted to 30th Civil Engineer Squadron, Environmental Flight (30 CES/CEV), Vandenberg Air Force Base, Santa Barbara County, California.
- SAIC (Science Applications International Corporation). 1990. Site Characterization Stage 1, Final Report. Installation Restoration Program, Vandenberg AFB, California.
- SAIC. 1994a. *Archaeological Survey Report: Chemical Test and Analysis Laboratory, Vandenberg Air Force Base, Santa Barbara, California*. Science Applications International Corporation, Santa Barbara, California. Prepared for Environmental Management, 730 CES/CEVA, Vandenberg Air Force Base, California.

- SAIC. 1994b. *Archaeological Survey Report, Proposed Fire Fighting Training Area, Vandenberg Air Force Base, Santa Barbara County, California*. Science Applications International Corporation, Santa Barbara, California. Prepared for Environmental Management, Vandenberg Air Force Base, California.
- SAIC. 1994c. *Archaeological Survey Report: Capehart Military Family Housing Multipurpose Trail, Vandenberg Air Force Base, Santa Barbara, California*. Prepared by Science Applications International Corporation, Santa Barbara, California. Prepared for Environmental Management, Vandenberg Air Force Base, California.
- SAIC. 1994d. *Archaeological Survey Report: 12-kV Electrical Upgrade Project, Vandenberg Air Force Base, Santa Barbara County, California*. Science Applications International Corporation, Santa Barbara, California. Prepared for Environmental Management Office, Vandenberg Air Force Base, California.
- SAIC. 1994e. *Archaeological Survey Report, 8-Inch Watering Curley/Lompoc-Casmalia Roads, Vandenberg Air Force Base*. Science Applications International Corporation, Santa Barbara, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California.
- SAIC. 1994f. *Archaeological Survey Report, Cultural Resources Survey of the Santa Ynez Extension and Mission Hills Extension, Santa Barbara County, California*. Science Applications International Corporation, Santa Barbara, California. Prepared for Central Coast Water Authority, Santa Barbara, California.
- SAIC. 1994g. *Addendum to Archaeological Extended Survey Report for the Santa Ynez Extension and Mission Hills Extension, Santa Barbara County, California: Local Facilities of the Coastal Aqueduct, Phase II*. Science Applications International Corporation, Santa Barbara, California. Prepared for Central Coast Water Authority, Santa Barbara, California.
- SAIC. 1994h. *Archaeological Survey Report: Natural Gas Pipeline Upgrade, Vandenberg Air Force Base, Santa Barbara County*. Science Applications International Corporation, Santa Barbara, California. Prepared for Environmental Management Office, 30 SW/ET, Vandenberg Air Force Base, California.
- SAIC. 1995. *Historical Eligibility Evaluation of the Vandenberg Tracking Station, Vandenberg Air Force Base*. Science Applications International Corporation, Santa Barbara, California. Prepared for ITT Federal Services Corporation, Vandenberg Air Force Base, California.
- Schilz, A.J. 1985. *Archaeological Survey, Testing, and Evaluation: STS Power Plant No. 6 Natural Gas Pipeline, Vandenberg Air Force Base, Santa Barbara County, California*. WESTEC Services, Inc., San Diego, California. Submitted to U.S. Department of the Interior, National Park Service, Western Region Interagency Archeological Services Branch, San Francisco. Purchase Order No. PX 8000-5-0087 (VAFB-1985-03).
- Schilz, A.J., J. Thesken, and T. Jacques. 1984. *Final Report: Vandenberg Air Force Base, California, 1983 Fuels Management Project, Phase II Cultural Resource Survey-Evaluation*. WESTEC Services, Inc., San Diego, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California, Contract No. CX 8000-3-0030.
- Schneider, J.S. 1994. *Final Historic Properties Treatment Plan for the Santa Ynez Extension and Mission Hills Extension, Santa Barbara County, California*. Science Applications International Corporation, Santa Barbara, California. Submitted to the Central Coast Water Authority, Santa Barbara, California, and U.S. Army Corps of Engineers, Los Angeles District.

- Snethkamp, P.E. and A. Munns. 1991. Results of Phase 1 Archaeological Survey in Conjunction with SLC-3 East Modification Project, South Vandenberg Air Force Base, Santa Barbara County, California. Dames and Moore Report Prepared for Versar, Inc. On file, Central Coast Information Center, California Historical Resources Information System, University of California, Santa Barbara (VAFB-1991-09).
- Snethkamp, P.E., L. Michaels, and J. Costello. 1989. *Draft: Phase I Cultural Resources Survey for the Proposed California Coastal Aqueduct between Devils Den, Kern County, and Mission Hills, Santa Barbara County*, volume I. On file, California Historical Resources Information System, Central Coast Information Center, University of California, Santa Barbara.
- Snethkamp, P.E., L. Michaels, and J. Costello. 1990. *Draft: Phase I Cultural Resources Survey for the Proposed California Coastal Aqueduct between Devils Den, Kern County, and Mission Hills, Santa Barbara County*, vol. II. On file, California Historical Resources Information System, Central Coast Information Center, University of California, Santa Barbara.
- SpaceX. 2003. Final Environmental Assessment for the Falcon Launch Vehicle Program. Prepared for Space Exploration Technologies Corporation. Prepared by Tetra Tech, Inc. 18 July 2003.
- Spanne, L.W. 1979a. *Archaeological Survey of Station Set Location V-27, Vandenberg Air Force Base, California*. VTN Consolidation, Inc., Irvine, California. Submitted to The Ralph M. Parson Company, Pasadena, California (VAFB-1979-04).
- Spanne, L.W. 1979b. *Archaeological Survey of Station Set Location V-88, Vandenberg Air Force Base, California*. VTN Consolidated, Inc., Irvine, California. Prepared for The Ralph M. Parsons Company, Pasadena, California (VAFB-1979-05).
- Spanne, L.W. 1979c. Archaeological Survey of Vandenberg Air Force Base Station Set Location V-88, Space Transportation System. VTN Incorporated May 14, 1979. Report on file at 30 CES/CEVNC, Vandenberg AFB, CA (VAFB-1979-05).
- SRS (SRS Technologies). 2006. Special-status Crustacean Surveys at Vandenberg Air Force Base, Santa Barbara County, California, November 2004-April 2006. 23 October. 20 pp.
- SRS. 2007. Survey Results for Three Federally Endangered Plants on Vandenberg Air Force Base, California. Prepared for 30th Space Wing Environmental Flight. 30 January. 43 pp.
- State Water Resources. 1991a. *Final: State Water Project, Coastal Branch, Phase II and Mission Hills Extension*, volume I. On file, California Historical Resources Information System, Central Coast Information Center, University of California, Santa Barbara.
- State Water Resources. 1991b. *Final: State Water Project, Coastal Branch, Phase II and Mission Hills Extension*, volume II. On file, California Historical Resources Information System, Central Coast Information Center, University of California, Santa Barbara.
- Stevens, N. 2005. *Plains Exploration and Production—Cultural Resources Monitoring of Wall Beach Anomaly Excavations*. Applied EarthWorks, Inc., Lompoc, California. Prepared for Plains Exploration and Production, Orcutt, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California.

- Stevens, N.E., C.G. Lebow, W.M. Nettles, L.G. Haslouer, and J.M. Fancher. 2005. Archaeological Investigations in Support of the Military Family Housing Expansion Project, Vandenberg Air Force Base, Santa Barbara County, California. Applied EarthWorks, Inc., Lompoc, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California.
- Stone, D.F. and B.D. Haley. 1981. Cultural Resources Evaluation of the Vandenberg Air Force Base Security Clear Zones, Santa Barbara County, California. 2 vols. Office of Public Archaeology, University of California, Santa Barbara. Submitted to the Heritage Conservation and Recreation Service, Interagency Archeological Services, San Francisco, Contract No. A52016(81). (VAFB-1981-06)
- Tetra Tech, Inc. 1991. Cultural Resource Investigations for the Peacekeeper Program San Antonio Terrace, Vandenberg Air Force Base, California. Tetra Tech, Inc., San Bernardino, California. Prepared for United States Air Force AFRCE-BMS, Norton Air Force Base, California.
- Tetra Tech, Inc. 1993. Phase I Cultural Resources Survey For the Earth Observing System (EOS) Payload Processing Facility (PPF) Vandenberg Air Force Base, California. Tetra Tech, Inc., Pasadena, California. Prepared for National Aeronautics and Space Administration, Kennedy Space Center, Florida.
- Thorson, P.H. J.K. Francine, E.A. Berg, L.E. Fillmore, and D.A. Eidson. 2001. Acoustic Measurement of the 21 September 2000 Titan II G-13 Launch and Quantitative Analysis of Behavioral Responses for Selected Pinnipeds on Vandenberg Air Force Base, CA. SRS Technologies technical report submitted to the United States Air Force and the National Marine Fisheries Service. 29pp.
- Upson, J.E., and H.G. Thomasson Jr. 1951. Geology and Water Resources of the Santa Ynez River Basin, Santa Barbara County, California. U.S. Government Printing Office, Washington D.C.
- URS (URS Corporation). 1986. San Miguel Project and Northern Santa Maria Basin Area Study – Final Environmental Impact Statement, Environmental Impact Report. Prepared for County of San Luis Obispo, Minerals Management Service, State Lands Commission, County of Santa Barbara, California Coastal Commission, and California Office of Offshore Development. October 1986.
- URS. 1987. Potential Exploration, Development, and Production of Oil and Gas Resources, Vandenberg AFB, California. Environmental Impact Analysis Process, Draft Mineral Resource Management Plan.
- U.S. Army Corps of Engineers. 1986. *Cultural Resources Survey, Proposed Airport Control Tower (P.N. 84014), Vandenberg Air Force Base, California*. U.S. Army Corps of Engineers, Sacramento, California.
- USFWS (U.S. Fish and Wildlife Service). 2006. Biological Opinion for the Clearance of Firebreaks and Access Roads, Vandenberg Air Force Base, Santa Barbara County.
- VAFB (Vandenberg Air Force Base). *In Progress*. Preliminary Draft Integrated Natural Resources Management Plan, Vandenberg Air Force Base, California.
- VAFB. 1989. Draft Environmental Impact Statement Construction and Operation of Space Launch Complex 7, Vandenberg Air Force Base, California, Volume I, July.
- VAFB. 1994a. Final Environmental Assessment for the 12-kV Electrical System Upgrade at Vandenberg Air Force Base, California. Prepared by SAIC. April 1994.

- VAFB. 1994b. Final Environmental Assessment for the Natural Gas Pipeline System Upgrade at Vandenberg Air Force Base, California. Prepared by SAIC. July 1994.
- VAFB. 1998. Final environmental assessment for installation of Tranquillion Mountain fiber-optic cable system, Vandenberg Air Force Base, California.
- VAFB. 2001. Final Environmental Assessment Power Line Modifications and Encapsulated Payload Transport, Vandenberg Air Force Base, California.
- VAFB. 2003. Final Draft Integrated Natural Resources Management Plan, Vandenberg Air Force Base, California. Prepared for: 30 CES/CEV, Vandenberg Air Force Base, California. Prepared by: SRS Technologies, Lompoc, California.
- VAFB. 2004. Vandenberg Air Force Base 2004 General Plan
- VAFB. 2005. Final Programmatic Environmental Assessment – Demolition and Abandonment of Atlas and Titan Facilities, Vandenberg Air Force Base, California. 13 September 2005.
- VAFB. 2007. Vandenberg Air Force Base 2007 General Plan.
- Waldron, W. 1988. *Caltrans Proposes to Widen and Rehabilitate the Pavement on Highway 1 from Vandenberg Road to Constellation Road*. Prepared for California Department of Transportation.
- WESTEC Service, Inc. 1981. *Environmental Resources Survey, Union Oil Company of California Geophysical Evaluation, Vandenberg Air Force Base, Santa Barbara County, California*. WESTEC Services, Inc., Santa Ana, California. Submitted to Union Oil Company of California, Ventura.
- WESTEC Service, Inc. 1982a. *Environmental Assessment, Union Oil Company of California Oil Exploration Project, Vandenberg Air Force Base, California*. WESTEC Services, Inc., San Diego, California. Submitted to Union Oil Company of California, Ventura.
- WESTEC Service, Inc. 1982b. *Environmental Assessment, Union Oil Company of California, Oil Exploration Project (Jesus Maria Arkley No. 19-1), Vandenberg Air Force Base, California*. WESTEC Services, Inc., Ventura, California. Submitted to Union Oil Company, Ventura, California.
- WESTEC Service, Inc. 1982c. *Union Oil Company of California Seismic Test Monitoring Program, Vandenberg Air Force Base, Santa Barbara County, California*. WESTEC Services, Inc., Santa Ana, California. Submitted to Union Oil Company of California, Ventura.
- WESTEC Service, Inc. 1983. *Environmental Assessment, Conoco, Inc. Oil Exploration Project, Vandenberg Air Force Base, California*. WESTEC Services, Inc., Tustin, California. Submitted to Conoco, Inc., Ventura, California.
- WESTEC Service, Inc. 1984. *Union Oil Company of California Geophysical Evaluation, Vandenberg Air Force Base, Santa Barbara County, California*. WESTEC Services, Inc., Tustin, California.
- Wilcoxon, L.R., and B.D. Haley. 1996. *A Phase 1 Cultural Resource Evaluation for a Proposed Fiber-Optic Cable Alignment on Vandenberg Air Force Base, Santa Barbara, California*. Wilcoxon Associates. Prepared for Resource Applications, Inc., Falls Church, Virginia.
- Woodman, C.F., J.L. Rudolph, and T.P. Rudolph (editors). 1991. *Western Chumash Prehistory: Resource Use and Settlement in the Santa Ynez River Valley*. Science Applications International Corporation, Santa Barbara, California. Prepared for Unocal Corporation. Submitted to U.S. Army Corps of Engineers, Los Angeles District.

This page intentionally left blank.

APPENDIX A

Constraints in the Cantonments

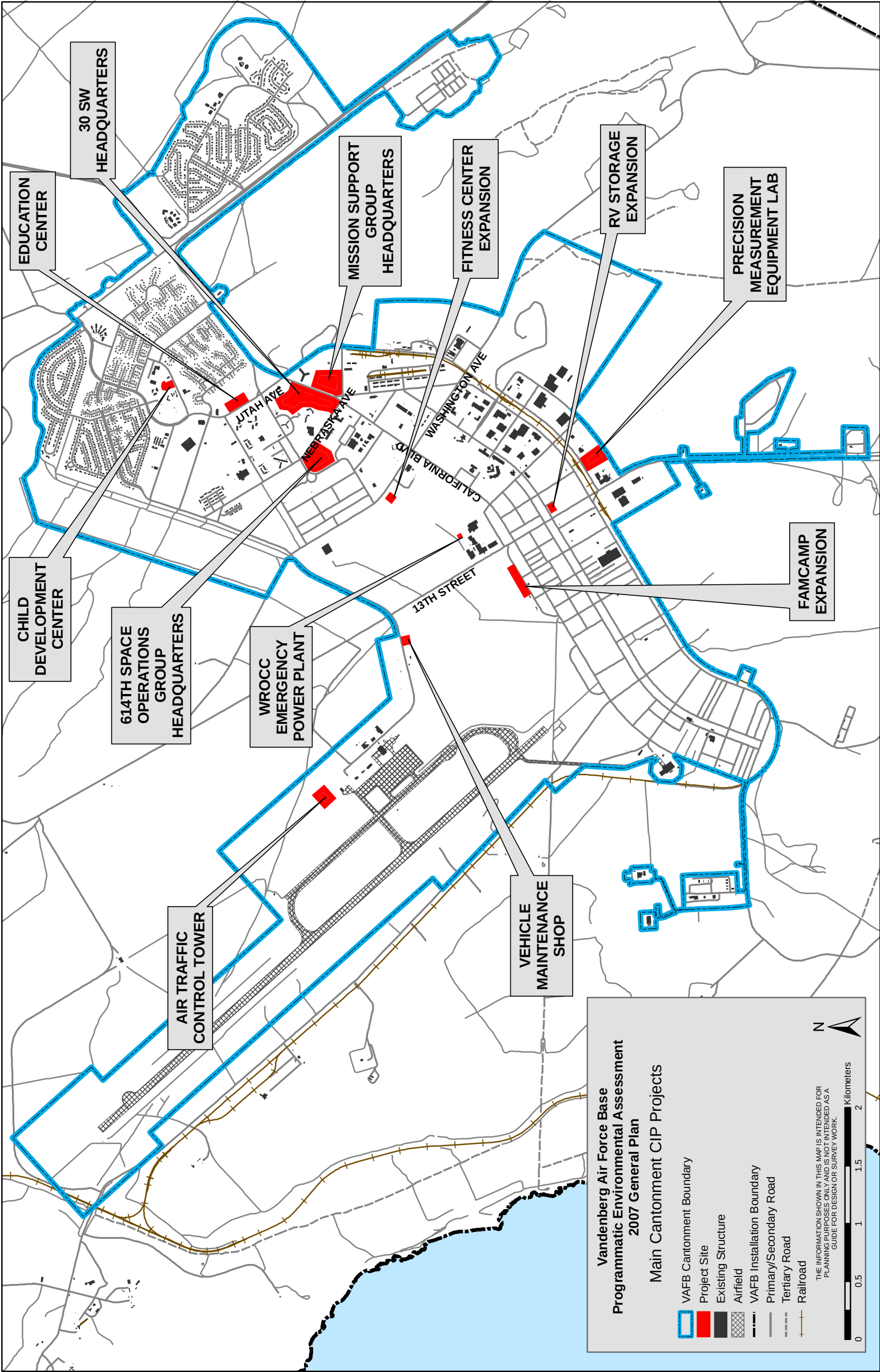


Figure A-1: Main cantonment boundaries and CIP projects under the Proposed Action.

[This page intentionally left blank.]

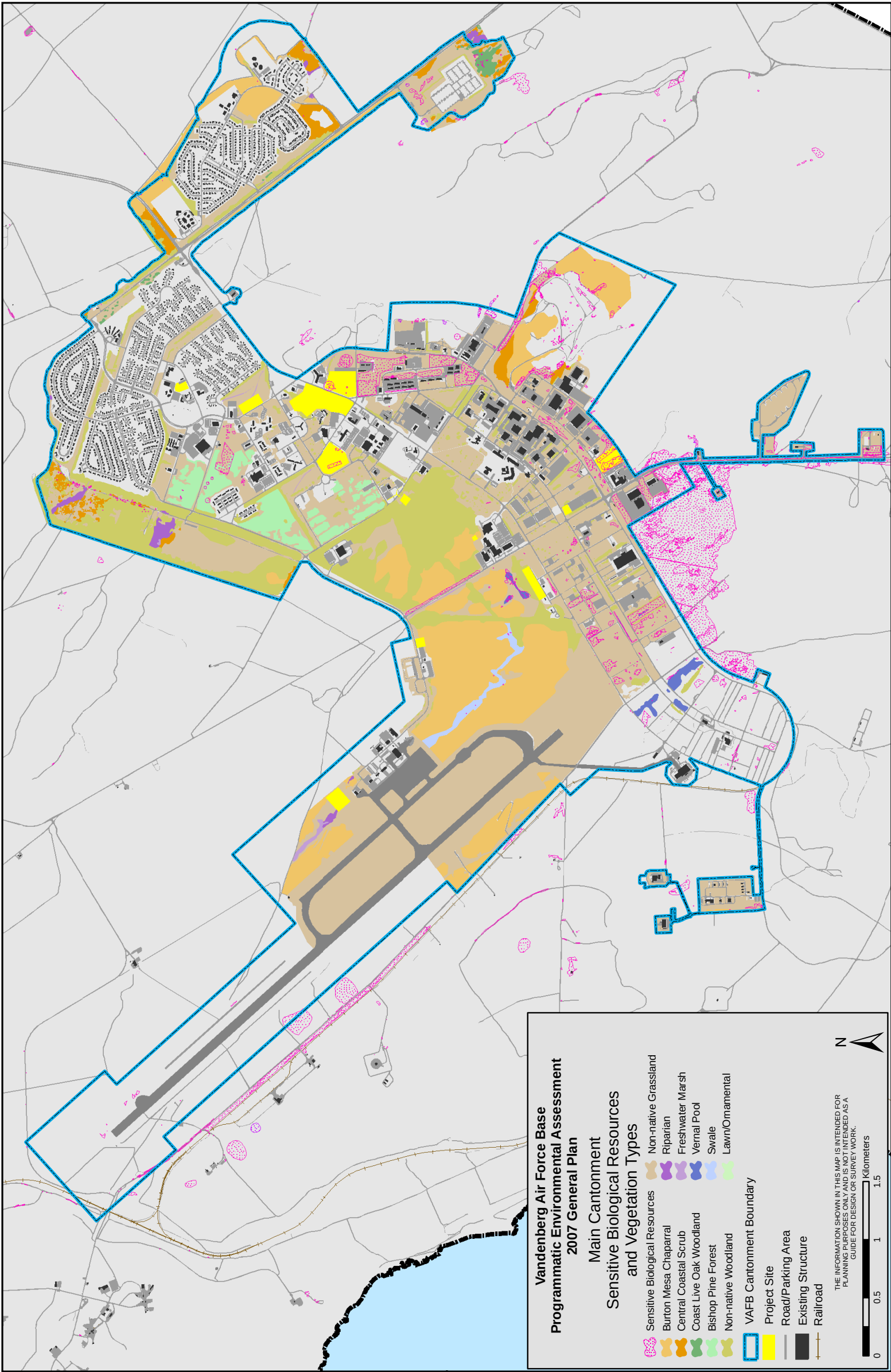


Figure A-2a: Main cantonment vegetation types.

[This page intentionally left blank.]

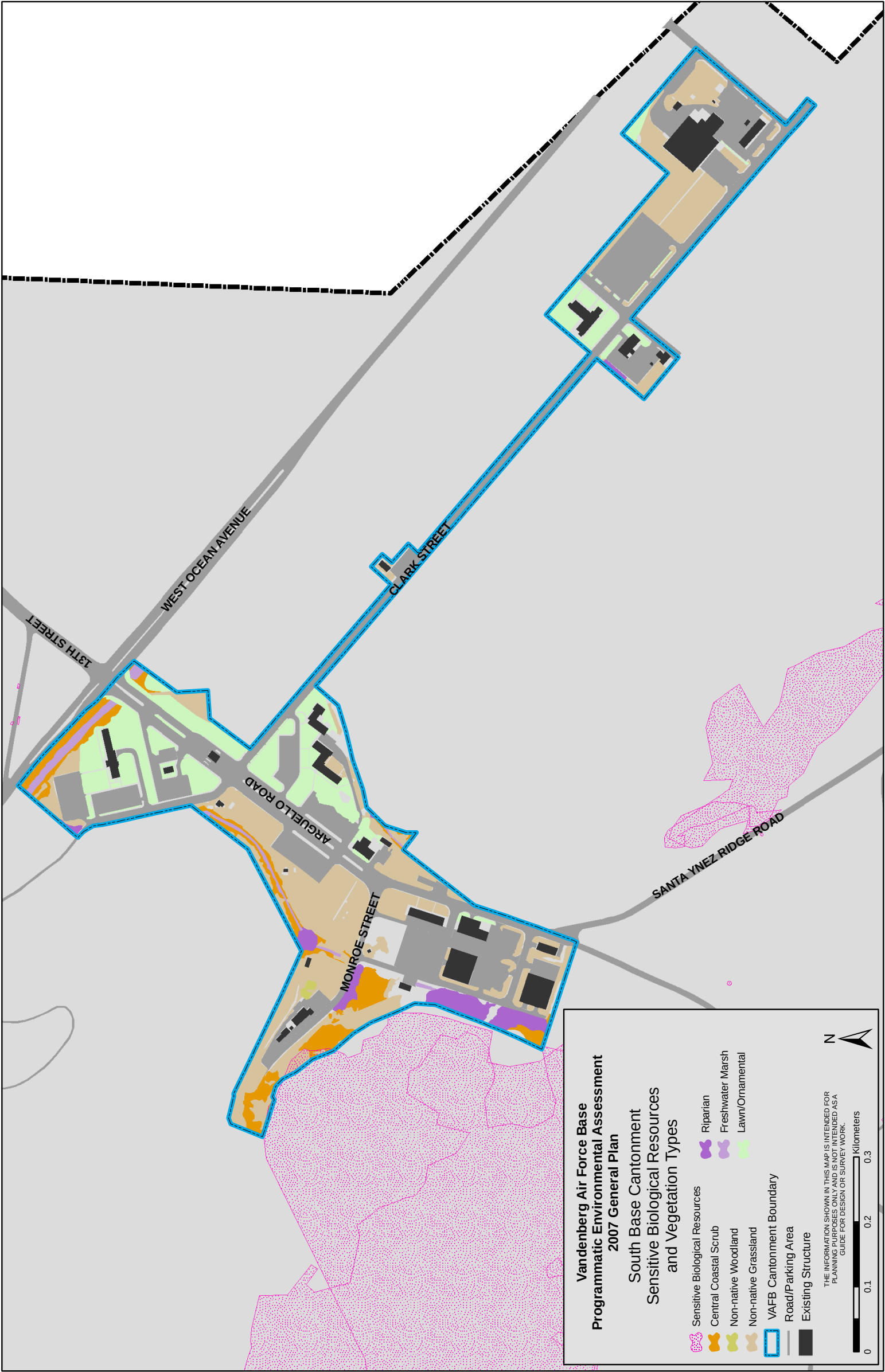
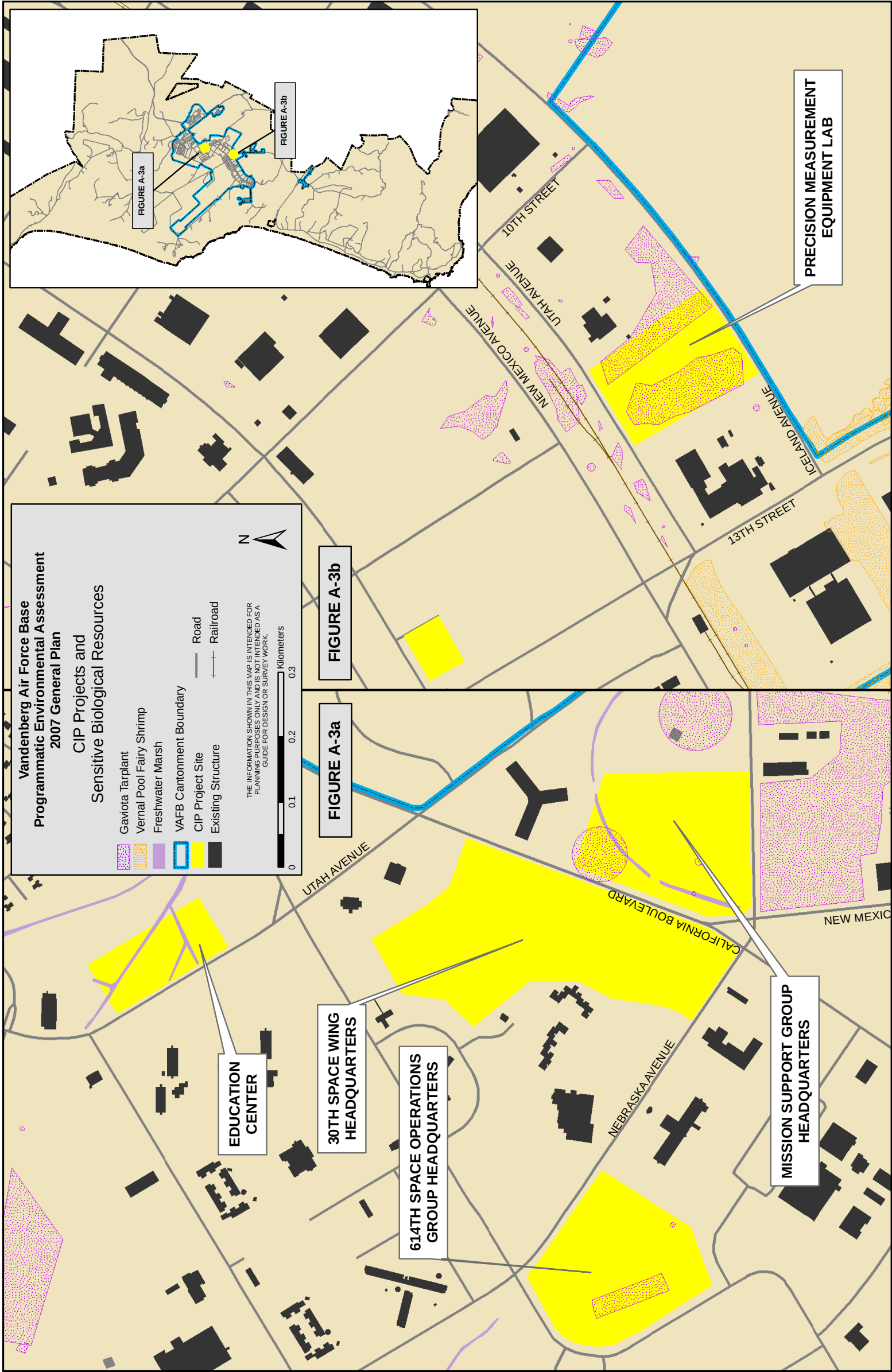


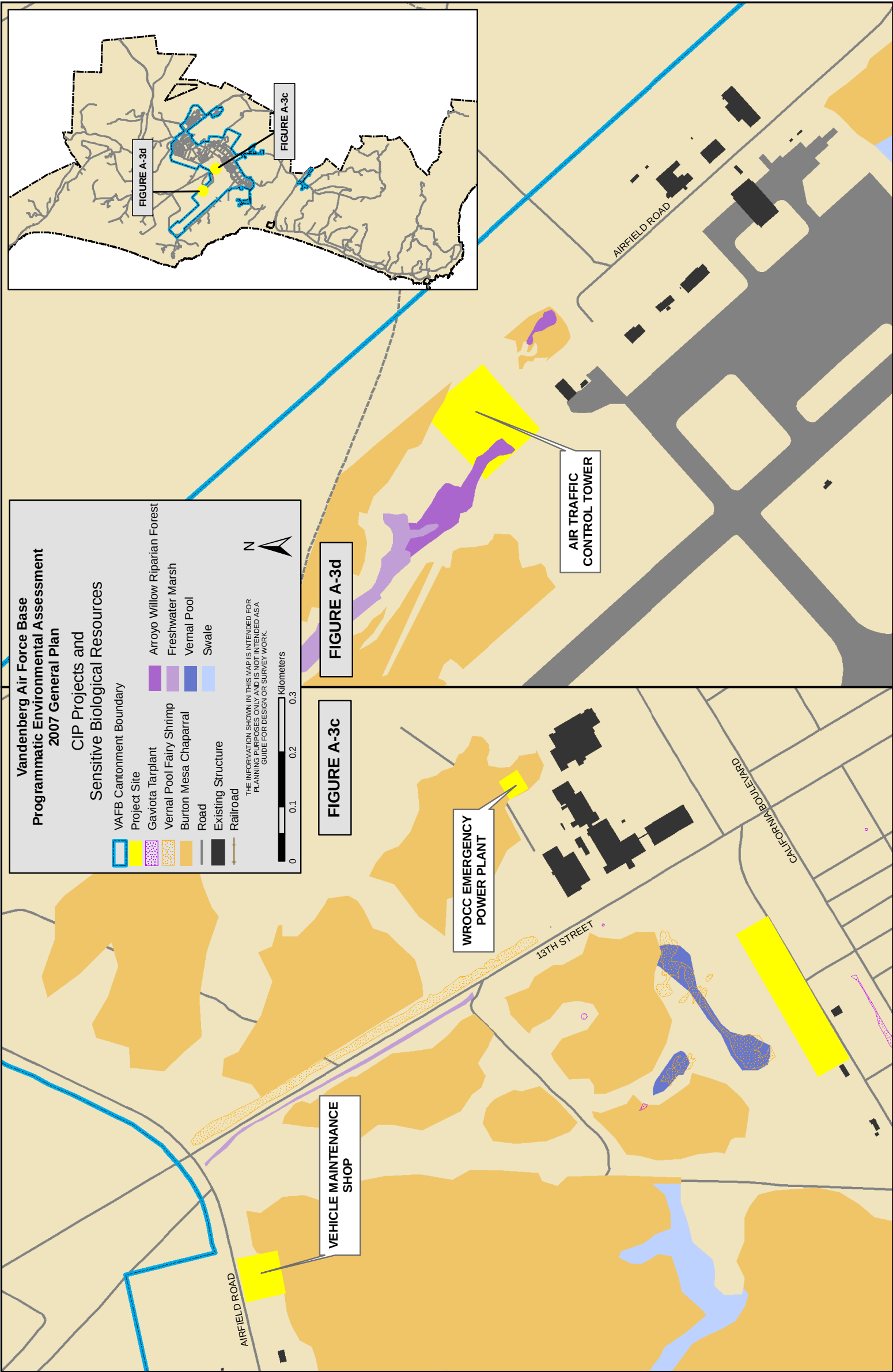
Figure A-2b: South Base cantonment vegetation types.

[This page intentionally left blank.]



Figures A-3a and A-3b: Sensitive biological resources within project areas for identified CIP projects.

[This page intentionally left blank.]



Figures A-3c and A-3d: Sensitive biological resources within project areas for identified CIP projects.

[This page intentionally left blank.]

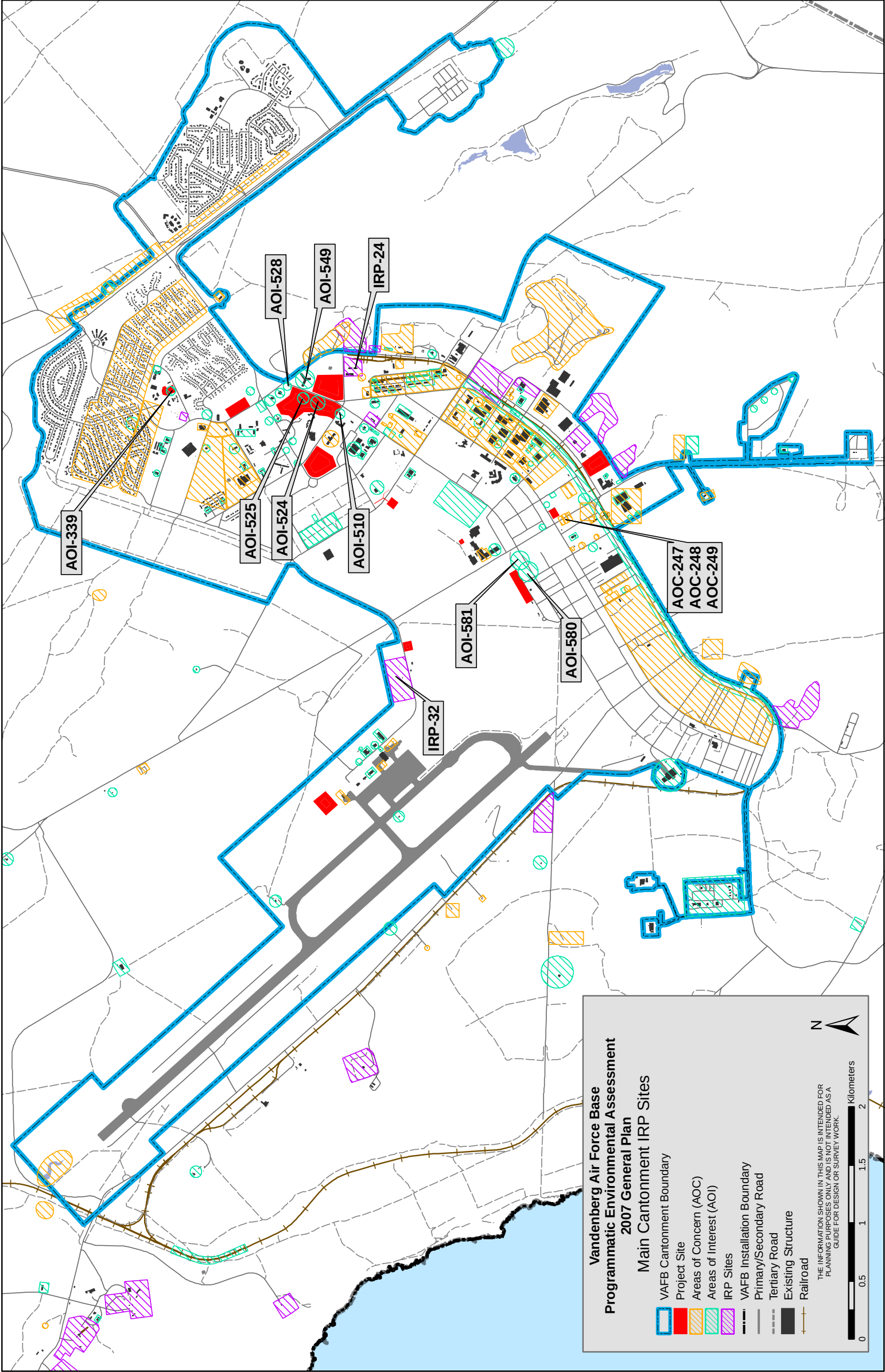


Figure A-4a: IRP sites within the main cantonment.

[This page intentionally left blank.]

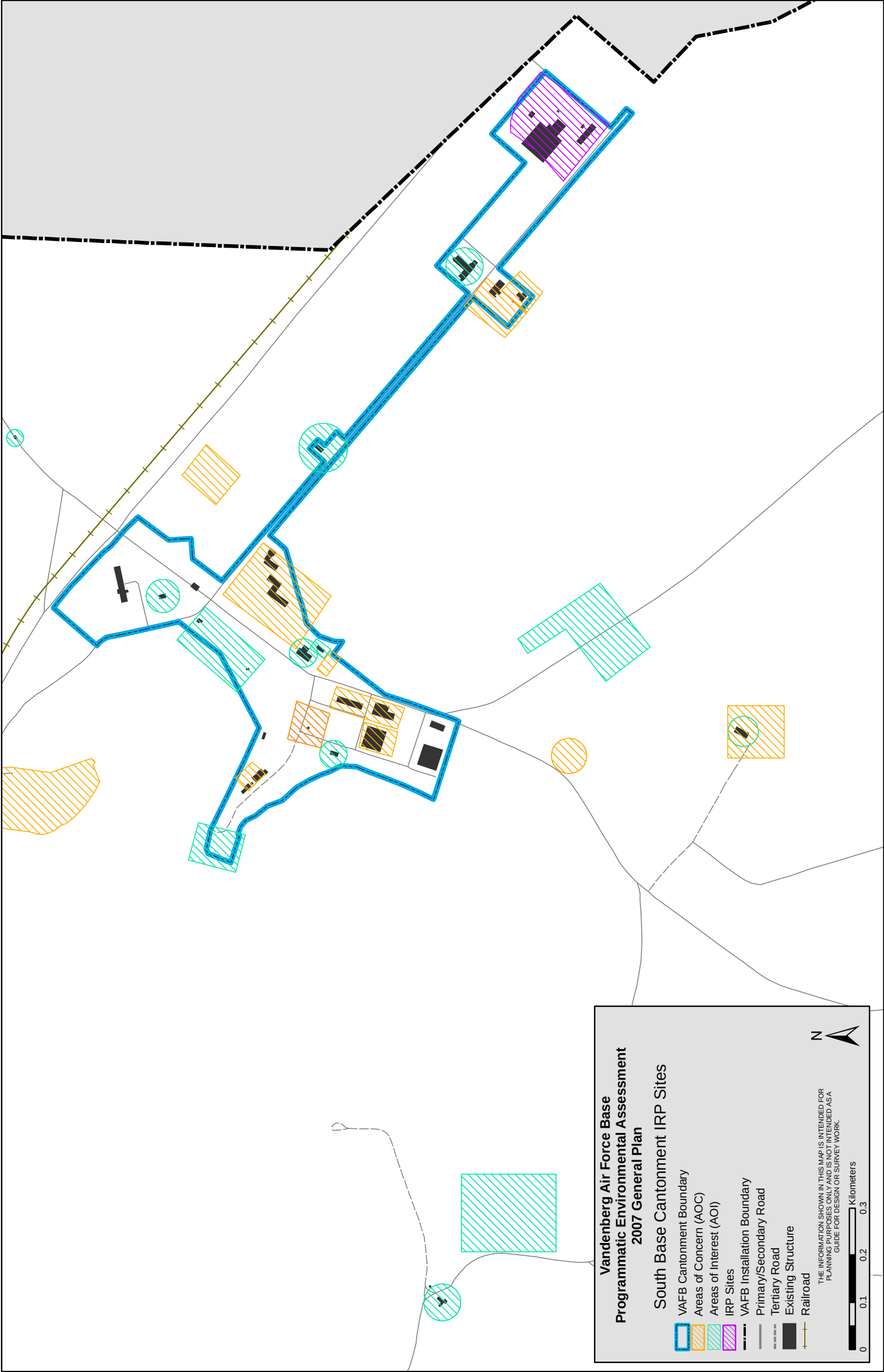


Figure A-4b: IRP sites within the South Base cantonment.

[This page intentionally left blank.]

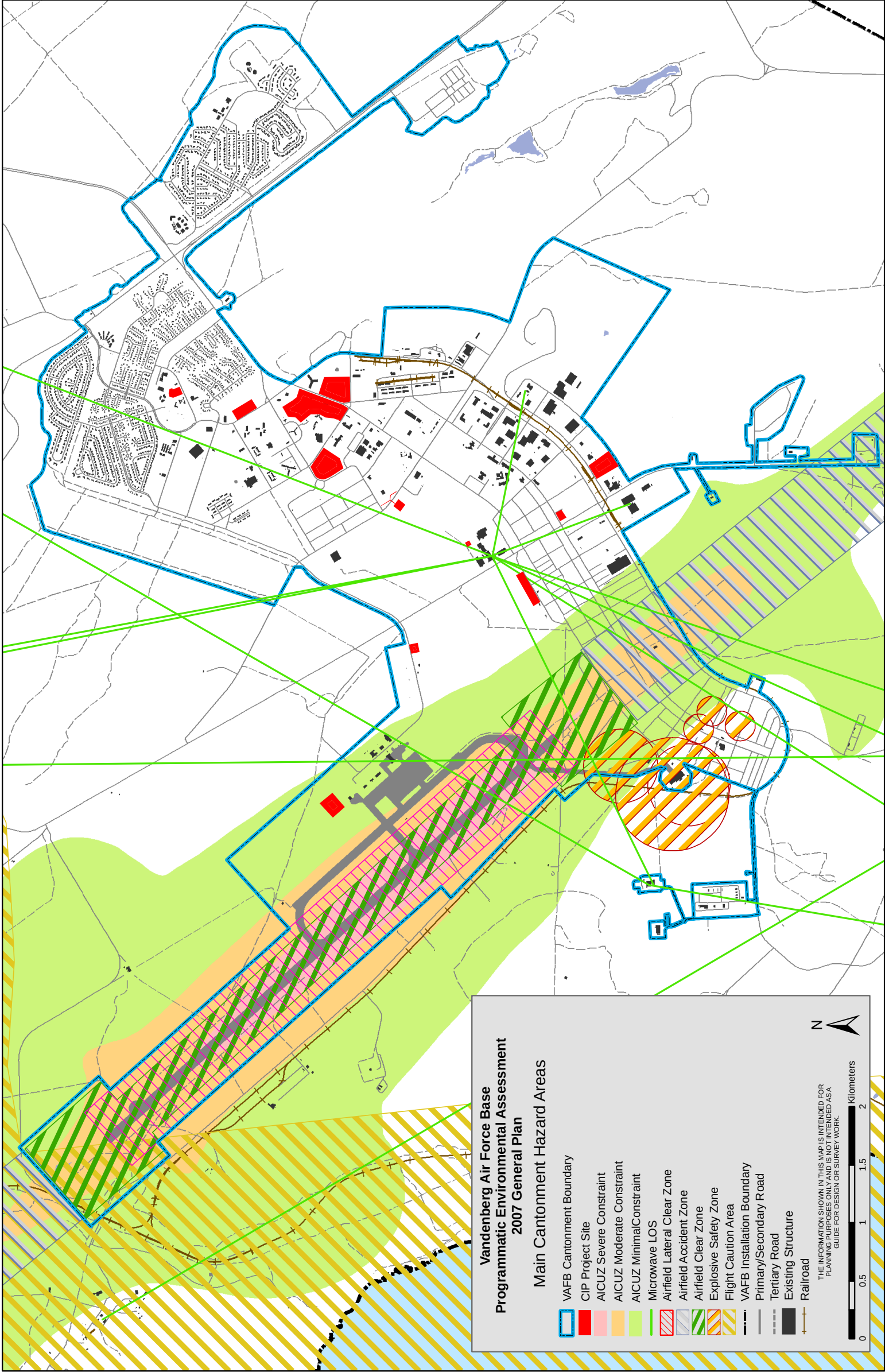


Figure A-5a: Main cantonment mission related constraints.

[This page intentionally left blank.]

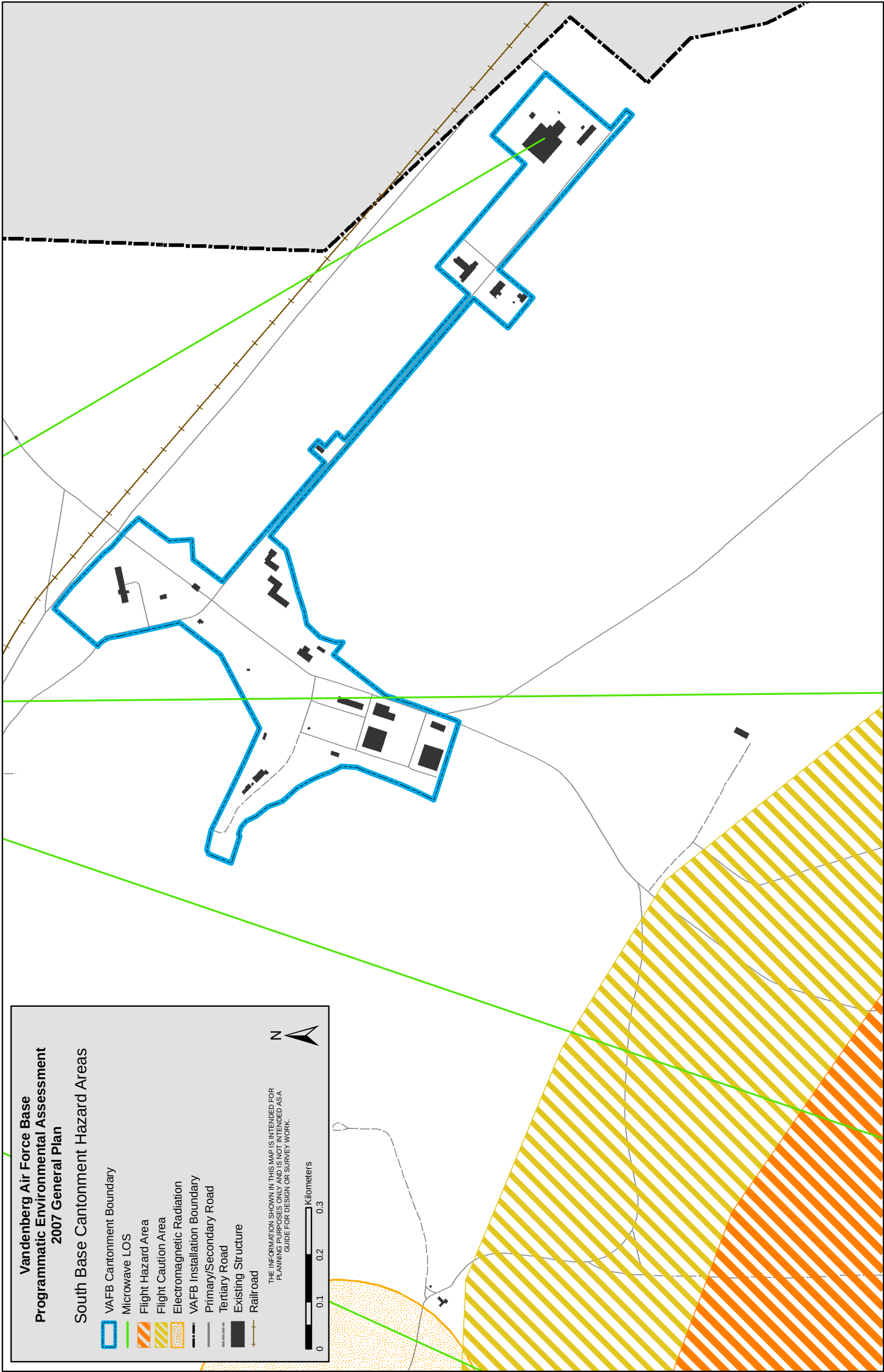


Figure A-5b: South Base cantonment mission-associated constraints.

[This page intentionally left blank.]

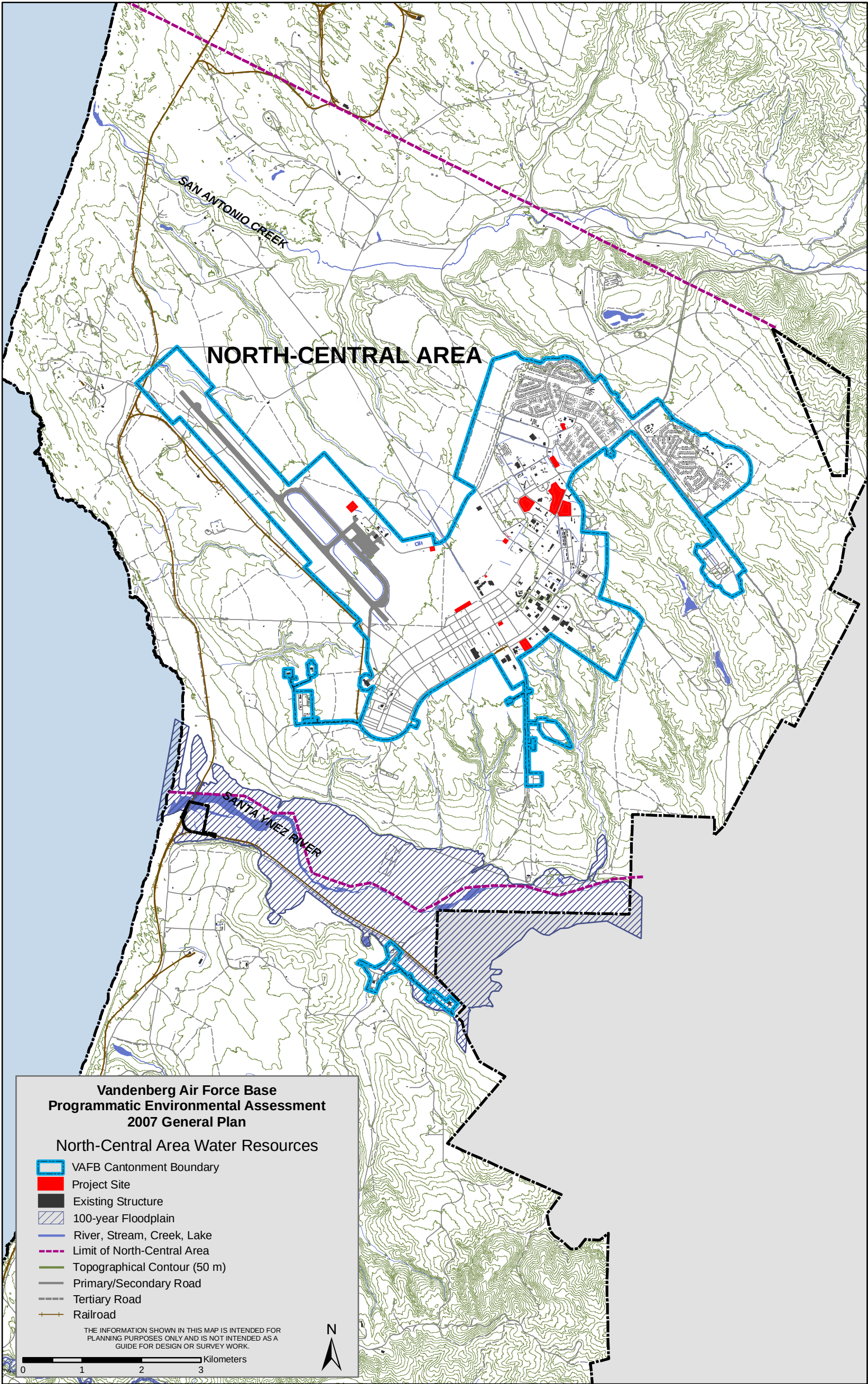


Figure A-6a: Water resources in the north-central area of VAFB.

[This page intentionally left blank.]

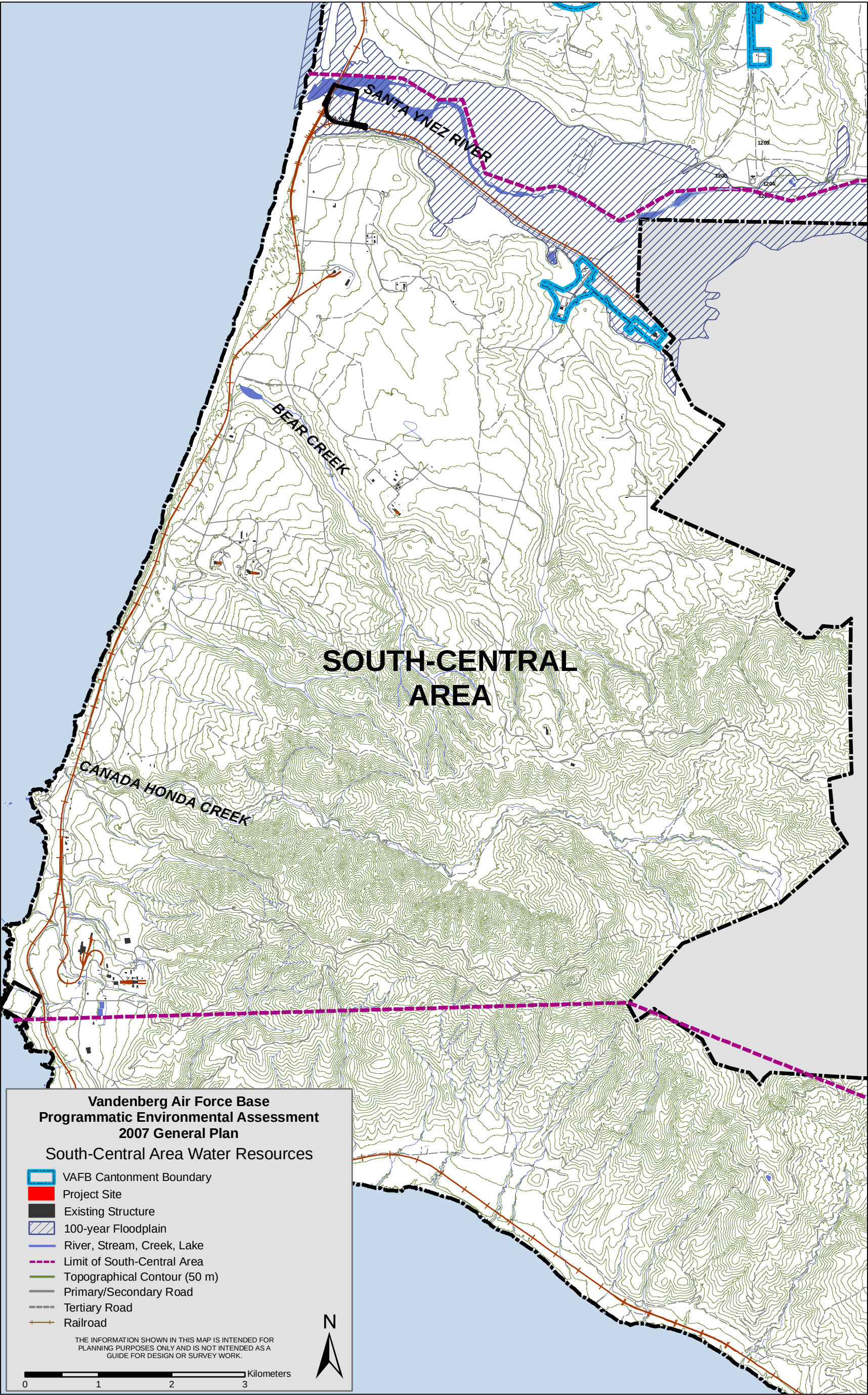


Figure A-6b: Water resources in the south-central area of VAFB.

[This page intentionally left blank.]

APPENDIX B

Cultural Resources

Appendix B – Cultural Resources

The following synthesis, modified from Lebow and Moratto (2005), provides a general overview of the prehistory and ethnohistory of the Vandenberg AFB region (i.e., Santa Barbara and San Luis Obispo counties). The historical synthesis, primarily derived from Palmer (1999), is more specific to Vandenberg AFB.

Prehistory

The prehistory of California's central coast spans the entire Holocene and may extend back to late Pleistocene times. In the Santa Barbara Channel region, a fluted Clovis point found on the surface of a coastal site suggests use of the area possibly as early as 11,000–12,000 years ago (Erlandson et al. 1987), while a site on San Miguel Island has yielded a radiocarbon date of 10,300 B.P. (Erlandson 1991). Recent calibrations suggest that terminal Pleistocene radiocarbon dates are about 2,000 years too recent (Fiedel 1999:95) and thus these early sites may be even older. In San Luis Obispo County, excavations at CA-SLO-2 in Diablo Canyon revealed an occupation older than 9,000 years (Greenwood 1972; Moratto 1984) and investigations at CA-SLO-1797 indicate initial occupations as early as 10,300 B.P. (Fitzgerald 2000). Occupations on Vandenberg AFB occurred by at least 9,000 years ago, based on radiocarbon dates from CA-SBA-931 (Glassow 1990, 1996) and CA-SBA-246 (Lebow et al. 2001) near the mouth of the Santa Ynez River, and from CA-SBA-530 at the mouth of Honda Canyon (Lebow et al. 2002).

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

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

Early scholars associated sites of this age with inland knolls and terraces (e.g., Rogers 1929), but subsequent investigations revealed that coastal environments were also used (e.g., Glassow et al. 1988). Well-developed middens at many sites suggest a more sedentary and stable settlement

system (Breschini et al. 1983). Glassow (1990, 1996) infers that occupants of Vandenberg AFB during this time were sedentary and had begun using a collector-type (i.e., logistically mobile) land-use strategy. Burial practices suggest that society was primarily egalitarian (Glassow 1996).

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

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

Confidence in the reconstructions of early human occupation on the Central California Coast needs to be tempered to some degree by the consideration of changes in coastline configuration over this period. Various studies (Inman 1983; Kinlan et al. 2005; Porcasi et al. 1999) suggest that sea levels were rising at a fluctuating rate during the Early Holocene from a low stand at the height of the last glaciation around 15,000–23,000 years ago. This, combined with the variations in offshore bathymetry, means that at different points in time the coastline was varying distances from where it is today. Morgan et al. (1991) note that due to the shallow sloping sea floor at the mouth of the Santa Ynez River the shoreline was probably some 5.5 kilometers west of its present position around 10,000 years ago. Off the more steeply sloping shore at the mouth of Honda Canyon, however, the distance was more like 2 kilometers around the same time (Lebow et al. 2002:3-30). This realization has significant archaeological implications. One is that a whole range of archaeological evidence dating to the Early Holocene is offshore, where it is not available for study. Another realization is that sites that are today in nearshore environments were not as close to the coastline some 4,000–10,000 years ago. The shoreline in this part of the California coast appears to have reached essentially its present configuration about 3,000–4,000 years ago.

Cultural complexity appears to have increased around 3,000–2,500 B.P. Based on mortuary data from the Santa Barbara area; King (1981, 1990) suggests a substantial change in social organization and political complexity about 3,000 years ago. According to King, high-status positions became hereditary and individuals began to accumulate wealth and control exchange systems. Arnold (1991, 1992) proposes that this evolutionary step in socioeconomic complexity occurred around 700–800 years ago. In their studies on Vandenberg AFB, Lebow et al. (2006) found changes in the archaeological data supporting King's (1981, 1990) chronology of culture change.

The period between 2,500 and 800 years ago is marked by increased cultural complexity and technological innovation. Fishing and sea mammal hunting became increasingly important, corresponding to development of the *tomol* (a plank canoe), single-piece shell fishhooks, and

harpoons (Glassow 1996; King 1990). The bow and arrow also was introduced during this period (Glenn 1990, 1991). Sites in San Luis Obispo County suggest that use of terrestrial mammals remained high. Proportions of imported obsidian continued to increase during this period (Jones et al. 1994).

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

On Vandenberg AFB and in the Santa Barbara Channel region, population densities reached peak levels between 700 years ago and historic contact (Glassow 1990, 1996). Higher numbers of *Olivella* shell beads reflect increased exchange between the Channel Islands, the Santa Barbara mainland, and Vandenberg AFB. Increased subsistence diversity is apparent. Although shellfish continued to be a dietary staple in the Vandenberg area, the use of fish and birds increased, proportions of secondary species in shellfish assemblages increased (Glassow 1990), and dietary expansion is evident (Lebow and Harro 1998). Correspondingly, the range and diversity of site types increased as a greater range of habitats and resources was used (Glassow 1990; Lebow and Harro 1998; Woodman et al. 1991). In San Luis Obispo County, the settlement system appears to have changed substantially after 700 B.P. as residential bases along the coast were abandoned in favor of habitation sites farther inland. Coastal sites were used to obtain resources during short-term occupations (Breschini and Haversat 1988; Greenwood 1972; Jones et al. 1994; Jones and Waugh 1995). In addition, proportions of imported obsidian decreased substantially during this period (Jones et al. 1994).

Ethnohistory

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

Accounts of early explorers in the Santa Barbara Channel area indicate that the Chumash people lived in large, densely populated villages with well-built structures (e.g., Bolton 1927, 1930; Engelhardt 1933; Fages 1937; Moriarity and Keistman 1968; Simpson 1939; Teggart 1911; Wagner 1929). With a total Chumash-speaking population estimated at 18,500 (Cook 1976) and employing a maritime economy, the Chumash had a culture that “was as elaborate as that of any hunter-gatherer society on earth” (Moratto 1984:118). Leadership was hereditary and chiefs exercised control over more than one village, reflecting a simple chiefdom social organization. The Chumash engaged in craft specialization and maintained exchange systems (Arnold 1992; Johnson 1988).

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

villages are identified by King (1984:Figure 1) on Vandenberg AFB, along with another five villages in the general vicinity.

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

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

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

History

Vandenberg AFB history is divided into the Mission, Rancho, Anglo-Mexican, Americanization, Regional Culture, and Suburban periods (Palmer 1999). The Mission Period began with the early Spanish explorers and continued until 1820. Established in 1787, Mission La Purísima encompassed the area between Gaviota and Guadalupe. Farming and ranching were the primary economic activities at the mission, which was responsible for supplying the Santa Barbara Presidio with food supplies. The mission had 4,000 head of sheep by 1800; by 1812 they numbered 12,000 and by 1821 the count peaked at 23,546. Missionaries had the Chumash weave wool blankets for the Santa Barbara Presidio. Approximately 14,000 sheep remained when the mission closed in 1835. In addition to sheep, wheat, barley, corn, peas, and beans were grown at Mission La Purísima. Agricultural activities primarily occurred along the major streams such as San Antonio Creek and the Santa Ynez River (Palmer 1999:2).

The Rancho Period of Vandenberg AFB history began in 1820 and continued until 1845 (Palmer 1999). Following secularization in 1834, the Alta California government granted former mission

lands to Mexican citizens as ranchos. The Vandenberg AFB cantonment area lies within Rancho Jesus Maria, which originally encompassed 42,184 acres and was granted to Lucas, Antonio, and Jose Olivera in 1837. Rancho Jesus Maria included lands from just south of Shuman Canyon (northern boundary) to the Santa Ynez River (southern boundary), and from the Pacific Ocean to a few kilometers east of San Antonio Terrace and Burton Mesa on the east (Tetra Tech 1988). Lucas Olivera is thought to have constructed an adobe at the site of the Marshallia Ranch in 1837. By 1839, Antonio and Jose Olivera had sold their part of the land grant to José Valenzuela, who, in 1847, sold a one-third share to Don Pedro Carrillo and a one-third share to Lewis T. Burton. Cattle ranching was the primary economic activity during the Rancho Period; in the 1840s cattle were so abundant that only the hides had any value (Palmer 1999).

The Bear Flag Revolt and the Mexican War marked the beginning of the Anglo-Mexican Period (1845–1880). Cattle ranching continued to flourish during the early part of this period, with as many as 500,000 cattle in Santa Barbara County during the 1850s. However, severe droughts during the 1860s decimated cattle herds, and less than 5,000 cattle remained in the entire county. The combination of drought and change in government from Mexico to the United States caused substantial changes in land ownership. By 1851 non-Mexicans owned approximately 42 percent of the land grants; by 1864, after a few years of drought, 90 percent of the southern California ranchos were mortgaged. The various shares in Rancho Jesus Maria changed hands, with Lewis Burton increasing his holdings. His son, Ben Burton, inherited all of Rancho Jesus Maria upon his father's death in 1879. Sheep ranching and grain farming replaced the old rancho system during this period. Dairy farming became an important economic activity during this time, particularly as Swiss-Italians immigrated into the area. Early roads were established during the 1860s and 1870s to obtain supplies that were surfed in at Point Sal. Farming remained a limited activity, due in part to the difficulty of shipping to markets. The Lompoc Temperance Colony established Lompoc during this period (Palmer 1999).

Increased population densities characterize the Americanization Period (1880–1915). The railroad reached the area in the late 1890s and provided a more efficient means of shipping and receiving goods and supplies, which in turn increased economic activity. Ranching continued and agriculture increased, particularly with development of steam-powered threshers. Row crops became increasingly common, and sugar beets were one of the most economically important commodities. Union Sugar Company had a substantial influence on economic growth in the region. Oil exploration began in earnest during this period. Union Oil began to purchase Rancho Jesus Maria property in 1903; they ultimately obtained subsurface rights to 120,000 acres in the area. Ben Burton leased the former Rancho Jesus Maria for grazing and farming during the early part of the Americanization Period. However, by 1900 the rancho was divided into four parcels and sold. These four parcels were further subdivided by 1906. Edwin Marshall formed the Jesus Maria Rancho Corporation in December of 1906; by the 1920s the Marshall Ranch encompassed 52,000 acres and prospered by raising cattle and beets. Its headquarters were constructed between 1906 and 1933 at the location of the Olivera adobe. An elaborate system of line camps and other facilities supported the ranch operations. Marshall also introduced eucalyptus trees as a potential source of commercial firewood.

Ranching and farming continued on the Marshall Ranch during the early part of The Period of Regional Culture (1915–1945). At various times, the Marshall Ranch experimented with game birds, chickens, turkeys, and purebred bulls. Grain was raised on coastal terraces, and Union Sugar purchased farm land in the San Antonio Valley from Marshall for agricultural purposes. In 1933, the Marshall family moved to the Olivera adobe and expanded and modernized the building. A wood-framed guest house was added in 1935, and a dude ranch operation began. The facility became known as the Marshallia Ranch and catered to Hollywood personalities. Visitors could arrive by airplane at an air strip in front of the house, and they could enjoy ranching activities,

horseback riding, or tennis. The ranch was sold to Frank Long upon the death of Edwin Marshall in 1937. Cattle ranching and guest operations continued until the start of World War II, when the property was condemned for Camp Cooke. However, the Army allowed the Marshallia Ranch to stay open to serve Army officers. All ranching, farming, and dairy farming in the Vandenberg AFB area was substantially reduced when Camp Cooke was established in 1941. This Army training facility was built on approximately 90,000 acres along the coast, and included the area of Rancho Jesus Maria. Camp Cooke was deactivated at the end of World War II (Palmer 1999).

The Suburban Period (1945–1965) began with the end of World War II. After Camp Cooke was deactivated, the Army continued the historic tradition and leased much of the area for ranching and farming. Oil drilling reached its peak during this period. Union Oil drilled a number of wells on the San Antonio Terrace, and the Jesus Maria No. 4 produced commercial quantities of oil. Most of the Suburban Period is characterized by military use of the area. Camp Cooke was reactivated in 1950 for training during the Korean War. It was put into caretaker status from 1953 to 1956. The cantonment area became so overgrown that sheep were used to manage the vegetation and reduce the fire hazard. In November of 1956, the Army transferred 64,000 acres of North Camp Cooke to the Air Force, and it was renamed the Cooke Air Force Base (Palmer 1999). In 1958 the base had its first missile launch, the Thor, and was renamed Vandenberg AFB. The southern section of the current base was transferred to the Air Force from Army and Navy control in 1964 (Vandenberg AFB 1992). Post-transfer use of both North and South Base has related primarily to the construction and operation of missile launch and support facilities. Specific activities include management of the launch, testing, and evaluation of ballistic missile and space systems for the DOD, and operation of the Western Range (Science Applications International Corporation [SAIC] 1995; Vandenberg AFB 1992).

Bibliography

Arnold, Jeanne E.

- 1991 Transformation of a Regional Economy: Sociopolitical Evolution and the Production of Valuables in Southern California. *American Antiquity* 56:953–962.
- 1992 Complex Hunter-Gatherer-Fishers of Prehistoric California: Chiefs, Specialists, and Maritime Adaptations of the Channel Islands. *American Antiquity* 57:60–84.

Basgall, Mark E.

- 1987 Resource Intensification among Hunter-Gatherers: Acorn Economies in Prehistoric California. *Research in Economic Anthropology* 9:21–52.

Blackburn, Thomas C.

- 1975 *December's Child: A Book of Chumash Oral Narratives*. University of California Press, Berkeley.

Bolton, Herbert E.

- 1927 *Fray Juan Crespi, Missionary Explorer on the Pacific Coast, 1769–1774*. University of California Press, Berkeley.
- 1930 *Anza's California Expeditions*. 5 vols. University of California Press, Berkeley.

Breschini, Gary S., and Trudy Haversat

- 1988 Archaeological Excavations at CA-SLO-7 and CA-SLO-8, Diablo Canyon, San Luis Obispo County, California. *Coyote Press Archives of California Prehistory* 28. Coyote Press, Salinas, California.

Breschini, Gary S., Trudy Haversat, and R. Paul Hampson

- 1983 *A Cultural Resources Overview of the Coast and Coast-Valley Study Areas*. Coyote Press, Salinas, California.

Cook, Sherburne F.

- 1976 *The Population of California Indians, 1769–1770*. University of California Press, Berkeley.

Engelhardt, (Father) Zephyrin

- 1933 *Mission San Luis Obispo in the Valley of the Bears*. Mission Santa Barbara, Santa Barbara, California.

Erlandson, Jon M.

- 1991 Early Maritime Adaptations on the Northern Channel Islands. In *Hunters and Gatherers of Early Holocene Coastal California*, edited by Jon M. Erlandson and Roger H. Colten, pp. 101–111. *Perspectives in California Archaeology*, vol. 1. Institute of Archaeology, University of California, Los Angeles.
- 1994 *Early Hunter-Gatherers of the California Coast*. Plenum, New York.
- 1997 The Middle Holocene along the California Coast. In *Archaeology of the California Coast during the Middle Holocene*, edited by Jon M. Erlandson and Michael A. Glassow, pp. 1–10. *Perspectives in California Archaeology*, vol. 4. Institute of Archaeology, University of California, Los Angeles.

Erlandson, Jon M., and Kevin Bartoy

- 1995 Cabrillo, the Chumash, and Old World Diseases. *Journal of California and Great Basin Anthropology* 17:153–173.

- 1996 Protohistoric California: Paradise or Pandemic? *Proceedings of the Society for California Archaeology* 9:304–309.
- Erlandson, Jon M., Theodore G. Cooley, and Richard Carrico
- 1987 A Fluted Projectile Point Fragment from the Southern California Coast: Chronology and Context at CA-SBA-1951. *Journal of California and Great Basin Anthropology* 9:120–128.
- Fages, Pedro
- 1937 A Historical, Political, and Natural Description of California, translated by Herbert I. Priestly. University of California Press, Berkeley.
- Fiedel, Stuart J.
- 1999 Older Than We Thought: Implications of Corrected Dates for Paleoindians. *American Antiquity* 64:95–115.
- Fitzgerald, Richard T.
- 2000 Cross Creek: An Early Holocene/Millingstone Site. California State Water Project, Coast Branch Series, Paper Number 12. San Luis Obispo County Archaeological Society, San Luis Obispo, California.
- Glassow, Michael A.
- 1996 Purisimeño Chumash Prehistory: Maritime Adaptations along the Southern California Coast. *Case Studies in Archaeology*. Jeffrey Quilter, series editor. Harcourt Brace College Publishers, San Diego.
- 1997 Middle Holocene Cultural Development in the Central Santa Barbara Channel Region. In *Archaeology of the California Coast during the Middle Holocene*, edited by Jon M. Erlandson and Michael A. Glassow, pp. 73–90. *Perspectives in California Archaeology*, vol. 4. Institute of Archaeology, University of California, Los Angeles.
- Glassow, Michael A. (editor)
- 1990 Archaeological Investigations on Vandenberg Air Force Base in Connection with the Development of Space Transportation System Facilities, with contributions by Jeanne E. Arnold, G. A. Batchelder, Richard T. Fitzgerald, Brian K. Glenn, D. A. Guthrie, Donald L. Johnson, and Phillip L. Walker. Department of Anthropology, University of California, Santa Barbara. Submitted to U.S. Department of the Interior, National Park Service, Western Region Interagency Archeological Services Branch, San Francisco, Contract No. CX-8099-2-0004.
- Glassow, Michael A., and Larry R. Wilcoxon
- 1988 Coastal Adaptations near Point Conception, California, with Particular Regard to Shellfish Exploitation. *American Antiquity* 53:36–51.
- Glassow, Michael A., Larry R. Wilcoxon, and Jon M. Erlandson
- 1988 Cultural and Environmental Change during the Early Period of Santa Barbara Channel Prehistory. In *The Archaeology of Prehistoric Coastlines*, edited by Geoff N. Bailey and John E. Parkinson, pp. 64–77. Cambridge University Press, Cambridge.
- Glenn, Brian K.
- 1990 Typological Analysis of Projectile Points. In *Archaeological Investigations on Vandenberg Air Force Base in Connection with the Development of Space Transportation System Facilities*, vol. 2, edited by Michael A. Glassow, pp. A4-1–A4-45. Department of Anthropology, University of California, Santa Barbara. Submitted to U.S. Department of the Interior, National Park Service, Western Region Interagency Archeological Services Branch, San Francisco, Contract No. CX 8099-2-0004.

- 1991 Typological Analysis of Projectile Points Recovered from Excavation on Vandenberg Air Force Base, Santa Barbara County, California. Master's thesis, University of California, Santa Barbara.

Grant, Campbell

- 1978a Chumash: Introduction. In *California*, edited by Robert F. Heizer, pp. 505–508. *Handbook of North American Indians*, vol. 8, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.
- 1978b Eastern Coastal Chumash. In *California*, edited by Robert F. Heizer, pp. 509–519. *Handbook of North American Indians*, vol. 8, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.
- 1978c Interior Chumash. In *California*, edited by Robert F. Heizer, pp. 530–534. *Handbook of North American Indians*, vol. 8, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.
- 1978d Island Chumash. In *California*, edited by Robert F. Heizer, pp. 524–529. *Handbook of North American Indians*, vol. 8, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Greenwood, Roberta S.

- 1972 9000 Years of Prehistory at Diablo Canyon, San Luis Obispo County, California. San Luis Obispo County Archaeological Society Occasional Paper No. 7.
- 1978 Obispeño and Purisimeño Chumash. In *California*, edited by Robert F. Heizer, pp. 520–523. *Handbook of North American Indians*, vol. 8, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Hudson, Travis, and Thomas C. Blackburn

- 1982 Food Procurement and Transportation. *The Material Culture of the Chumash Interaction Sphere*, vol. 1. Ballena Press Anthropological Papers No. 25. Ballena Press/Santa Barbara Museum of Natural History Cooperative Publication, Los Altos and Santa Barbara, California.
- 1985 Clothing, Ornamentation, and Grooming. *The Material Culture of the Chumash Interaction Sphere*, vol. 3. Ballena Press Anthropological Papers No. 28. Menlo Park, California.
- 1986 Ceremonial Paraphernalia, Games, and Amusement. *The Material Culture of the Chumash Interaction Sphere*, vol. 4. Ballena Press Anthropological Papers No. 30. Menlo Park, California.

Hudson, Travis, Thomas C. Blackburn, Rosario Curletti, and Janice Timbrook (editors)

- 1977 *The Eye of the Flute: Chumash Traditional History and Ritual*, as told by Fernando Librado Kitsepawit to John P. Harrington. Santa Barbara Museum of Natural History, Santa Barbara, California.

Hudson, Travis, and Ernest Underhay

- 1978 *Crystals in the Sky: An Intellectual Odyssey Involving Chumash Astronomy, Cosmology, and Rock Art*. Ballena Press Anthropological Papers 10. Socorro, New Mexico.

Inman, D.L.

1983. Application of Coastal Dynamics to the Reconstruction of Paleocoastlines in the Vicinity of La Jolla, California. *Quaternary Coastlines and Marine Archaeology*, ed. P. Masters and N. Flemming. Academic Press, New York. pp1-49.

Johnson, John R.

- 1988 Chumash Social Organization: An Ethnohistoric Perspective. Ph.D. dissertation, Department of Anthropology, University of California, Santa Barbara.

Jones, Terry L., M. Kathleen Davis, Glenn Farris, Steven D. Grantham, Teresa W. Fung, and Betty Rivers

- 1994 Towards a Prehistory of Morro Bay: Phase II Archaeological Investigations for the Highway 41 Widening Project, San Luis Obispo County, California. Submitted to the California Department of Transportation, Environmental Branch, San Luis Obispo.

Jones, Terry L., and Georgie Waugh

- 1995 Central California Coastal Prehistory: A View from Little Pico Creek. Perspectives in California Archaeology, vol. 3, Jeanne M. Arnold, senior series editor. Institute of Archaeology, University of California, Los Angeles.

Kennett, Douglas J.

- 1998 Behavioral Ecology and the Evolution of Hunter-Gatherer Societies on the Northern Channel Islands, California. Ph.D. dissertation, Department of Anthropology, University of California, Santa Barbara.

King, Chester D.

- 1981 The Evolution of Chumash Society: A Comparative Study of Artifacts Used in Social System Maintenance in the Santa Barbara Channel Region before A.D. 1804. Ph.D. dissertation, Department of Anthropology, University of California, Davis.
- 1984 Ethnohistoric Background. In Archaeological Investigations on the San Antonio Terrace, Vandenberg Air Force Base, California, in Connection with MX Facilities Construction, pp. I-1–I-54. Chambers Consultants and Planners, Stanton, California. Submitted to U.S. Army Corps of Engineers, Los Angeles District, Contract No. DAC09-81-C-0048.
- 1990 Evolution of Chumash Society: A Comparative Study of Artifacts Used for Social System Maintenance in the Santa Barbara Channel Region before A.D. 1804. The Evolution of North American Indians, edited by David Hurst Thomas. Garland, New York.

Kinlan, Brian P., Michael H. Graham, and Jon M. Earlandson

- 2005. Late Quaternary Changes in the Size and Shape of the California Channel Islands: Implications for marine Subsidies to Terrestrial Communities. Retrieved on 18 June 2007 from the World Wide Web: <http://phycology.mlml.calstate.edu/PDFs/Kinlan05.pdf>.

Landberg, Leif

- 1965 The Chumash Indians of Southern California. Southwest Museum Papers No. 19. Los Angeles.

Lebow, Clayton G., and Douglas R. Harro

- 1998 Plant Processing on the San Antonio Terrace: Archaeological Investigations at CA-SBA-2767. Applied EarthWorks, Inc., Fresno, California. Submitted to Central Coast Water Authority, Buellton, California.

Lebow, Clayton G., Douglas R. Harro, Rebecca L. McKim, and Carole Denardo

- 2001 Archaeological Excavations at CA-SBA-246, An Early Holocene Site on Vandenberg Air Force Base, Santa Barbara County, California. Applied EarthWorks, Inc., Fresno, California, for Tetra Tech, Inc., Santa Barbara, California. Submitted to 30 CES/CEV, Vandenberg Air Force Base, California, USAF Contract No. F04684-95-C-0045.

- 2002 Archaeological Excavations at the Honda Beach Site (CA-SBA-530), Vandenberg Air Force Base, Santa Barbara County, California. Applied EarthWorks, Inc., Fresno, California, for Tetra Tech, Inc., Santa Barbara, California. Submitted to Headquarters 311th Human Systems Wing (AFMC), Brooks Air Force Base, Texas, Contract No. F41684-00-D-8029.
- Lebow, Clayton G., and Michael J. Moratto
- 2005 Management of Prehistoric Archaeological Resources. Vandenberg Air Force Base Integrated Cultural Resources Management Plan, vol. 5, edited by Michael J. Moratto and Barry A. Price. Applied EarthWorks, Inc., Fresno, California. Submitted to U.S. Air Force, 30 CES/CEVPC, Vandenberg Air Force Base, California.
- Lebow, Clayton G. and Robert R. Peterson, Jr.
- 2007 Archaeological Survey of the Vandenberg Air Force Base Cantonment Area, Santa Barbara County, California. Applied EarthWorks, Inc., Lompoc, California. Submitted to the 30 CES/CEVNC, Vandenberg Air Force Base, California.
- Lebow, Clayton G., Nathan E. Stevens, Barry A. Price, Rebecca L. McKim, Wendy M. Nettles, Leeann G. Haslouer, Michael H. Imwalle, and Jason M. Fancher
- 2006 Archaeological Investigations Supporting Consultation with the State Historic Preservation Officer for the Privatization of Military Family Housing on Vandenberg Air Force Base, Santa Barbara County, California. Applied EarthWorks, Inc., Lompoc, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California.
- Moratto, Michael J.
- 1984 California Archaeology. Academic Press, New York and London.
- Morgan, Anthony, Thomas Mulroy, Rosemary Thompson, Michael Dungan, Melissa Mooney, Elizabeth Dunlap, John Storrer, and James L. Rudolph
- 1991 Environmental Setting. In Western Chumash Prehistory: Resource Use and Settlement in the Santa Ynez River Valley, edited by Craig F. Woodman, James L. Rudolph, and Teresa P. Rudolph, pp. 35–64. Science Applications International Corporation, Santa Barbara, California. Prepared for Unocal Corporation. Submitted to U.S. Army Corps of Engineers, Los Angeles District.
- Moriarity, James R., and M. Keistman (translators)
- 1968 Cabrillo's Log 1542–1543: A Voyage of Discovery (a Summary by Juan Paez). Western Explorer 5(2–3):1–20. Cabrillo Historical Association, San Diego, California.
- Palmer, Kevin (Lex)
- 1999 Central Coast Continuum—From Ranchos to Rockets: A Contextual Historic Overview of Vandenberg Air Force Base, Santa Barbara County, California. Prepared by Palmer Archaeology and Architecture Associates, Santa Barbara, California. Submitted to 30 CES/CEVPC, Vandenberg Air Force Base, California.
- Porcasi, Paul, Judith F. Porcasi, and Collin O'Neill
1999. Early Holocene Coastlines of the California Bight: The Channel Islands as First Visited by Humans. *Pacific Coast Archaeological quarterly*. (35)2&3.
- Preston, William
- 1996 Serpent in Eden: Dispersal of Foreign Diseases into Pre-Mission California. *Journal of California and Great Basin Anthropology* 18:2–37.
- Raab, L. Mark, Katherine Bradford, Judith F. Porcasi, and William J. Howard
- 1995 Return to Little Harbor, Santa Catalina Island, California: A Critique of the Marine Paleotemperature Model. *American Antiquity* 60:287–308.

Raab, L. Mark, and Daniel O. Larson

- 1997 Medieval Climatic Anomaly and Punctuated Cultural Evolution in Coastal Southern California. *American Antiquity* 62:319–336.

Rogers, David Banks

- 1929 Prehistoric Man of the Santa Barbara Coast, California. Santa Barbara Museum of Natural History Special Publications No. 1. Santa Barbara, California.

Rudolph, Teresa P.

- 1991 Settlement Organization in the Lower Santa Ynez River Valley: 9000 B.P. to Contact. In *Western Chumash Prehistory: Resource Use and Settlement in the Santa Ynez River Valley*, edited by Craig F. Woodman, James L. Rudolph, and Teresa P. Rudolph, pp. 307–338. Science Applications International Corporation, Santa Barbara, California. Prepared for Unocal Corporation. Submitted to U.S. Army Corps of Engineers, Los Angeles District.

Science Applications International Corporation (SAIC)

- 1995 Historical Eligibility Evaluation of the Vandenberg Tracking Station, Vandenberg Air Force Base. Science Applications International Corporation, Santa Barbara, California. Prepared for ITT Federal Services Corporation, Vandenberg Air Force Base, California.

Simpson, Lesley B.

- 1939 California in 1792: The Expedition of Longinos Martinez. Huntington Library, San Marino, California.

Teggart, Frederick J. (editor)

- 1911 The Portolá Expedition of 1769–1770: Diary of Miguel Costansó. *Publications of the Academy of Pacific Coast History* 2(4):164–327. Berkeley, California.

Tetra Tech, Inc.

- 1988 Historic Preservation Plan, San Antonio Terrace National Register District, Vandenberg Air Force Base, California. Tetra Tech, Inc., San Bernardino, California. Prepared for United States Air Force AFRCE-BMS, Norton Air Force Base, California.

Vandenberg Air Force Base

- 1992 Land Management Plan for Vandenberg Air Force Base, California, for Plan Period 1992 to 1997. Natural Resources and Comprehensive Planning Division, Vandenberg Air Force Base, California.

Wagner, Henry R.

- 1929 Spanish Voyages to the Northwest Coast in the Sixteenth Century. California Historical Society, San Francisco.

Wallace, William J.

- 1978 Post-Pleistocene Archeology, 9000 to 2000 B.C. In *California*, edited by Robert F. Heizer, pp. 25–36. *Handbook of North American Indians*, vol. 8, William C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Warren, Claude N.

- 1967 The San Dieguito Complex: A Review and Hypothesis. *American Antiquity* 32:168–185.

Woodman, Craig F., Chantal Cagle, Philip de Barros, and Teresa P. Rudolph

- 1995 Final Report, Archaeological Survey and Evaluation of the Honda Beach Site, SBA-530. Science Applications International Corporation and Chambers Group, Inc., Santa Barbara, California. Submitted to U.S. Department of the Interior, National Park Service, Western Region Interagency Archeological Services Branch, San Francisco, Contract No. 1443 CX 8000-92-010.

APPENDIX -1

PROGRAMMATIC AGREEMENT BETWEEN

VANDENBERG AIR FORCE BASE, CALIFORNIA

AND THE

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

REGARDING THE MANAGEMENT OF

**EXCEPTIONALLY IMPORTANT COLD WAR HISTORIC PROPERTIES
UNDER THE JURISDICTION OF VANDENBERG AIR FORCE BASE,
CALIFORNIA**

WHEREAS, Vandenberg Air Force Base (VAFB) maintains properties located at VAFB and its remote installations that contributed to exceptionally important military and civilian programs during the Cold War (hereinafter, "Cold War properties"); and

WHEREAS, VAFB developed a systematic methodology for identifying and evaluating VAFB property types that could qualify as Cold War properties of exceptional significance and used this methodology to complete a three-phase Cold War Properties Inventory and Evaluation Report (hereinafter, "Report") that identifies, evaluates and documents VAFB-administered Cold War properties and concludes that certain of these properties (hereinafter collectively, "historic properties") are exceptionally significant and qualify for inclusion in the National Register of Historic Places (hereinafter, "NRHP"); and

WHEREAS, VAFB has determined that its mission, programs, and other ongoing management activities (hereinafter, "Undertakings") may have an effect on historic properties and on SLC-10, a National Historic Landmark (hereinafter, the "NHL"), and has consulted with the California State Historic Preservation Officer (hereinafter, "SHPO") pursuant to § 800.6(a) of 36 CFR Part 800, regulations implementing Section 106 of the National Historic Preservation Act (16 U.S.C. 470f) (hereinafter, "NHPA") and Section 110(f) of the NHPA (16 U.S.C. 470h-2(f)), and has notified the Advisory Council on Historic Preservation (the "Council") pursuant to 36 CFR § 800.6(a)(1)(i)(C), and intends to execute this Programmatic Agreement (hereinafter, "PA") pursuant to 36 CFR § 800.6(b)(1) because the Council has declined to participate in the consultation pursuant to 36 CFR § 800.6(a)(1)(iii-iv); and

WHEREAS, pursuant to 36 CFR § 800.10(c), VAFB has notified the Secretary of the Interior (hereinafter, "Secretary") through the National Park Service (hereinafter, "NPS") that Undertakings covered by this PA may have an adverse effect on the NHL, has invited the Secretary to participate in the consultation, has requested the NPS to execute this PA on behalf of the Secretary, and herewith acknowledges that, following the consultation cited herein, the NPS has declined VAFB's request to execute this PA; and

WHEREAS, VAFB has developed a *Historic Preservation Plan for the Management and Treatment of Cold War Properties at Vandenberg Air Force Base, California* (Attachment 1) (hereinafter, "HPP") that includes in Appendix A a list of historic properties covered by this PA at the time of its execution; upon execution of this PA, the HPP will be used by VAFB to manage historic properties, to take into account the effects of Undertakings on historic properties, and to re-evaluate Cold War properties previously determined NRHP eligible or ineligible as the passage of time, changing perceptions of significance, or incomplete prior evaluations may require;

NOW, THEREFORE, VAFB and the SHPO agree that the Undertakings covered by this PA shall be administered in accordance with the following stipulations to take into account the effect of the Undertakings on historic properties and to satisfy VAFB's Section 106 responsibilities for these Undertakings during the term of this PA.

STIPULATIONS

VAFB will ensure that the following stipulations are carried out:

I. Applicability

This PA applies exclusively to the Undertakings defined and described herein.

II. Implementing the HPP

Upon execution of this PA, VAFB will implement the HPP, Attachment 1, in lieu of compliance with 36 CFR §§ 800.3 through 800.6.

III. Reviewing Implementation of the HPP

1. No later than one year after execution of this PA, and by the anniversary date of such execution each year thereafter, until the signatories to this PA agree in writing that its terms have been fulfilled, VAFB will prepare and provide the SHPO with a written report that includes, but is not necessarily limited to, the following items:

- a. A narrative that indicates how many actions were undertaken and that describes and discusses how and with what results, the HPP was applied to such actions;
 - b. An assessment of the effectiveness of this PA and of the HPP in assisting VAFB to advance with greater efficiency both its mission and its obligation under applicable law to preserve and protect historic properties;
 - c. A discussion of any problems or unexpected issues encountered during the year;
 - d. Any changes that VAFB believes should be made to this PA, to its manner of implementation, or to the HPP.
2. The SHPO shall have 45 days from the date of receipt to provide VAFB with comments on the annual report. VAFB shall take any comments received into account when considering possible modifications to this PA or to the HPP. Absent SHPO comments within the time frame stipulated herein, VAFB may assume that no comments will be forthcoming, except that VAFB will honor any SHPO request for a reasonable extension of the review period provided that such request is received by VAFB within the review period.
 3. At the request of the SHPO, VAFB shall hold a consultation meeting to facilitate review and comment on the annual report, or to resolve questions, issues or adverse comments that have been raised by the SHPO or by a member of the public.

IV. Professional Standards

1. All work required by this PA and the HPP that addresses the identification, evaluation, treatment and documentation of historic properties shall be carried out by or under the direct supervision of a person or persons meeting at a minimum the Secretary of Interior's Professional Qualifications Standards (48 FR 44738-39) (PQS) in the appropriate disciplines. However, nothing in this stipulation may be interpreted to preclude VAFB or any agent or contractor thereof from using the properly supervised services of persons who do not meet the PQS.
2. All documentation required by this PA and the HPP that addresses the identification, evaluation, and treatment of historic or potentially historic properties shall be responsive to contemporary professional standards, to the Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716-40), National Park Service Bulletin 38, as well as to standards and guidelines established by the SHPO.

V. Resolving Objections

1. Should the SHPO object in writing to VAFB regarding the manner in which the terms of this PA or the provisions of the HPP are carried out, or to any documentation prepared in accordance with and subject to the terms of this PA, the signatories shall consult to address the objection. VAFB shall determine a reasonable time frame for this

consultation. If resolution is reached within this time frame, VAFB may proceed with its action in accordance with the terms of the resolution. If after initiating such consultation, VAFB determines that the objection cannot be resolved through consultation, VAFB shall forward all documentation relevant to the objection to the Council, including VAFB's proposed response to the objection, with the expectation that the Council will within thirty (30) days after receipt of such documentation:

(a) Advise VAFB that the Council concurs in its proposed response to the objection, whereupon VAFB will respond to the objection accordingly. Thereafter, VAFB may proceed with its action in a manner consistent with its proposed response; or

(b) Provide VAFB with recommendations, which VAFB will take into account in reaching a final decision regarding its response to the objection. Upon reaching its final decision, VAFB will notify the SHPO and the Council of its final decision, and may thereafter proceed with its action; or

(c) Notify VAFB that the objection will be referred for comment pursuant to 36 CFR 800.7(a)(4), and proceed to refer the objection and comment. In this event, VAFB shall ensure that its agency head is prepared to take the resulting comment into account in accordance with 36 CFR 800.7(c)(4) and Section 110(l) of the NHPA. Thereafter, VAFB shall notify the objecting party and the Council of its final decision regarding the objection, and may thereafter proceed with its action.

2. Should the Council not exercise one of the above options within 30 days after receipt of all pertinent documentation, VAFB may assume the Council's concurrence in its proposed response to the objection, advise the SHPO of that response and proceed with its action in a manner consistent with that response.

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

4. At any time during implementation of the stipulations in this PA should an objection pertaining to such implementation be raised by a member of the public, VAFB shall notify the SHPO about the objection and take the objection into account, consulting with the objector and, should the objector so request, with the SHPO to resolve the objection.

5. Disputes pertaining to the NRHP eligibility of properties covered by this PA shall be addressed through consultation between VAFB and the SHPO. If such consultation fails to resolve the dispute within a time frame deemed reasonable by VAFB, the dispute will be addressed by VAFB in accordance with 36 CFR § 800.4(c)(2).

VI. Amending the PA and the HPP

1. If either signatory believes that this PA should be amended, that signatory may at any time propose amendments, whereupon the signatories will consult to consider the amendment pursuant to 36 CFR § 800.6(c)(7) and 800.6(c)(8). This PA may be amended only upon the written concurrence of VAFB and the SHPO.

2. If either signatory believes that the HPP should be revised, that signatory may at any time propose revisions, whereupon the signatories will consult to consider the revisions. The HPP will be promptly revised by VAFB if VAFB and the SHPO agree upon the proposed revisions. The signatories agree that any such revision shall not necessarily require either concurrent or subsequent amendment of this PA.

VII. Terminating the PA

1. This PA may be terminated by VAFB or the SHPO. If this PA is not amended as provided for in Stipulation VI.1., above, or if VAFB or the SHPO proposes termination of this PA for other reasons, the signatory proposing termination shall in writing notify the other signatory, explain the reasons for proposing termination, and consult with the other signatory for no more than 30 days to seek alternatives to termination.

2. Should such consultation fail, the signatory proposing termination may terminate this PA by promptly notifying the other signatory in writing.

3. Should this PA be terminated, then beginning with the date of termination VAFB shall do the following:

a. promptly consult with the SHPO to develop a new PA pursuant to 36 CFR Part 800.

b. ensure that until a new PA is executed for the actions covered by this PA, that each such individual action is reviewed in accordance with 36 CFR § 800.4 - 800.6.

VIII. Duration of the PA

This PA shall take effect when it has been executed by VAFB and the SHPO. It shall remain in effect for a period of 10 years from the date of last signature and will automatically become null and void at the end of this ten year period unless it is terminated prior to that time or unless it is extended by written agreement of VAFB and the SHPO. Not later than 6 months prior to the expiration date of this PA, VAFB will notify the SHPO of the PA's pending expiration and, following such expiration, VAFB will re-initiate review of the Undertakings in accordance with 36 CFR Part 800.

IX. Anti-Deficiency Act

1. All requirements set forth in this PA requiring the expenditure of VAFB funds are expressly subject to the availability of appropriations and the requirements of the Anti-Deficiency Act (31.U.S.C. Section 1341). No obligation undertaken by VAFB under the terms of this PA shall require or be interpreted to require a commitment to expend funds not appropriated for a particular purpose.

2. If VAFB cannot perform any obligation set forth in this PA because of the unavailability of funds, VAFB and the SHPO intend that the remainder of the PA be executed. Any obligation under this PA that cannot be performed because of the unavailability of funds must be renegotiated between VAFB and the SHPO.

Execution of this PA by VAFB and the SHPO, its transmittal by VAFB to the Council in accordance with 36 CFR § 800.6(b)(1)(iv), and implementation of its terms shall evidence, pursuant to 36 CFR § 800.6(c), that this PA is an agreement with the Council for purposes of Section 110(l) of the NHPA, and shall further evidence that VAFB has afforded the Council an opportunity to comment on the Undertakings and their effects on historic properties, that VAFB has taken into account the effects of the Undertakings on historic properties, and that VAFB has satisfied its responsibilities under Sections 106 and 110(f) of the NHPA and applicable implementing regulations for all aspects of the Undertakings.

30 CES/CEV, VANDENBERG AIR FORCE BASE

By: _____ [signed] _____ Date: [19 Jul 02] _____

Name: SCOTT W. WESTFALL, Lt Col, USAF

Title: Commander, Environmental Flight

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

By: _____ [signed] _____ Date: [6/17/02]

Name: Dr. Knox Mellon

Title: State Historic Preservation Officer

ATTACHMENT 1

Historic Preservation Plan for the Management and Treatment of Cold War Properties at Vandenberg Air Force Base, California

FOREWORD

Vandenberg Air Force Base (VAFB), California maintains numerous Cold War properties at VAFB and its remote installations (hereinafter “properties”). These properties often require modifications to meet changing mission requirements. The Tri-Services Cultural Resources Research Center (TSCRRC) at the United States Army Construction Engineering Research Laboratories (USACERL) in Champaign, Illinois has completed a three-phase inventory and evaluation of VAFB’s Cold War properties to assist VAFB in complying with Section 106 of the National Historic Preservation Act (NHPA). During Phase I, TSCRRC developed a standard methodology for identifying and evaluating VAFB properties that qualify as exceptionally important Cold War properties. This standard methodology was subsequently applied during Phases II and III. The essential purpose of this Historic Preservation Plan (HPP) is to apply the findings of the three-phase TSCRRC study, and establish a process for appropriately preserving and using VAFB’s Cold War properties consistent with VAFB’s mission, programs, and planning processes.

INTRODUCTION

This HPP is organized into eight sections. Section One provides a brief historic context of VAFB, describing its unique role in supporting numerous Cold War ballistic missile and space programs. Section Two establishes procedures for identifying and evaluating VAFB’s exceptionally important Cold War properties. Section Three lists the properties identified as being eligible for the National Register of Historic Places (NRHP) in the three-phase, three volume TSCRRC study prepared at USACERL. The studies identify 13 site areas, weapon systems, or districts (with a total of 61 Numbered facilities and 23 unnumbered elements) as eligible for the NRHP (see Appendix A). Section Four establishes procedures for managing and treating VAFB’s exceptionally important Cold War properties. Section Five reiterates and summarizes the management and treatment procedures to be applied to the various types of Cold War properties at VAFB. Section Six discusses discontinuous historic districts having non-VAFB contributing elements. Section Seven discusses the determination of eligibility and the future mitigation of impacts to sites that are identical or nearly identical to scores of other sites. Section Eight briefly considers the problem of secret and classified information and the effect that the declassification of Cold War-era records will have on VAFB’s Cold War properties.

1. HISTORIC CONTEXT¹

VAFB is located on the Pacific Coast of California about 130 miles northwest of Los Angeles. Originally known as Camp Cooke, VAFB was a World War II and Korean War Army training facility. In 1956, the Air Force chose Camp Cooke as the site for a new missile base and subsequently renamed the installation Vandenberg Air Force Base. The Air Force established VAFB as an operational base for missiles and their supporting ground equipment, complementing Cape Canaveral, the Air Force's missile research and development test site. VAFB was also a training base for missile combat and maintenance crews. All of the United States' operational intercontinental ballistic missiles have been flight tested at VAFB, and thousands of personnel, including crews from the British Royal Air Force, received operational missile weapon system combat and maintenance training at the base. In addition to its ballistic missile programs, VAFB also played an important role in America's Cold War military and civilian space programs. VAFB is the only safe polar orbit launch site in the United States. Since most surveillance and reconnaissance spy satellites require a polar orbit, VAFB has launched many of America's critically important military satellites. Also, many important scientific and application satellites have been launched from VAFB launch complexes. Today, VAFB continues to serve as a critically important ballistic missile testing installation and satellite launch site.

2. IDENTIFICATION SYSTEM

Under 36 CFR Section 60.4(g) and National Register Bulletin (NRB) 22: Guidelines for Evaluating and Nominating Properties that Have Achieved Significance within the Last Fifty Years, properties that have achieved significance within the last fifty years may be listed on the NRHP only if they are of exceptional importance or if they are integral parts of districts that are eligible for listing in the NRHP, according to the National Register Criteria for Evaluation. Such properties must also retain sufficient integrity to convey their significance.

2.1 Identifying and Evaluating Exceptionally Important Cold War Properties at

VAFB

All VAFB's Cold War properties are less than fifty years of age; therefore, they must possess exceptional importance to be eligible for NRHP listing. The first step to identify exceptionally important Cold War properties is to identify an installation's Cold War programs that are considered exceptionally important. Then, per Air Force

¹ Each volume of the three-phase TSCRRC study includes an extensive discussion of VAFB's historic context. See for example, *Cold War Properties Evaluation - Phase 1: Inventory and Evaluation of Launch Complexes and Related Facilities at Vandenberg Air Force Base, California* (February 1996).

guidelines,² identify those properties that are specifically associated with operational missions. Air Force guidelines exclude properties such as base exchanges, general administrative buildings, family housing, maintenance shops, and sewage treatment plants. VAFB's exceptionally important Cold War programs are the various ballistic missile testing and training programs (e.g. Thor, Atlas, Titan, Minuteman, and Peacekeeper) that provided the United States with an operational nuclear missile force and the necessary support personnel. VAFB has supported other exceptionally important programs including American military and civilian space programs. The military space program provided critical information to military and political leaders during the Cold War. Since the National Aeronautics and Space Administration (NASA) was established in 1958, the civilian space program has supported the military space program by sharing critical scientific information and technology. The civilian space program has also greatly expanded our knowledge of science and the universe. This knowledge is of significant value to the military.

After identifying VAFB's exceptionally important Cold War programs and their associated properties, a distinction must be made between direct and indirect association or contribution of these properties to the operational missions. Some properties *directly* supported operational missions, while other properties supported operational missions in a secondary or complementary capacity. An example is the distinction between a VAFB Minuteman launch silo and a Minuteman maintenance facility. The Minuteman maintenance facility was used primarily for mating missile components. Although this function was certainly important, it is considered secondary or complementary. The silo, on the other hand, directly supported Minuteman missions as the primary staging ground for various Minuteman weapon systems testing programs. A Minuteman silo, because of its direct contribution to operational missions, better illustrates and offers a better understanding of the Minuteman program than does a maintenance facility. Properties directly supporting VAFB's operational missions of exceptionally important Cold War programs are themselves exceptionally important, and therefore qualify for listing in the NRHP.

2.2. Evaluating Integrity of Cold War Properties

Integrity is defined by NRB 15 as:

“[T]he authenticity of a property's historic identity, evidenced by the survival of physical characteristics that existed during the property's historic...period. If a property retains the physical characteristics it possessed in the past then it has the capacity to convey association with historical patterns or persons, architectural or engineering design and technology, or information about a culture or people.”

² See *Interim Guidance Treatment of Cold War Historic Properties for U.S. Air Force Installations* (June 1993) written by Dr. Paul Green.

NRB 15 states that integrity, as applied to historic properties, has seven aspects: location, design, setting, materials, workmanship, feeling, and association. To be regarded as retaining sufficient integrity to be considered eligible for listing on the NRHP a historic structure must normally demonstrate integrity in at least two of these qualities. Retention of integrity does not necessarily mean that a property must be in an unchanged state. This is particularly true when the significance of a property derives from its function rather than its physical design, as is often the case with historic Cold War properties. Most Cold War military programs, and certainly the ballistic missile and space programs, were characterized by constantly changing and advancing technology. Consequently, the properties that supported these programs often underwent numerous modifications reflecting those technological advances. Many of the exceptionally important Cold War properties at VAFB have experienced numerous physical changes and modifications. However, a significant percentage of these properties qualify for NRHP listing based on their historic function rather than their architectural or engineering design. In these cases, integrity of function becomes more important than integrity of the original design. As long as such properties retain an ability to convey a sense of their historic function, then the properties retain their integrity, regardless of modifications or changes. A classic example would be the launch complex that has been constantly modified over the years to accommodate new generations of space vehicles. It obviously would not retain integrity of original design, but if it retained an ability to convey a sense of its historic function as a launch site, it would continue to retain its integrity of function and would meet the NRHP integrity requirement.³

Integrity of function would not apply to facilities that are found eligible for the NRHP based on their exceptionally important architectural or engineering design. In such cases, integrity of design would take precedence.

3. INVENTORY

TSCRRC conducted the inventory and evaluation of Cold War resources at VAFB in three phases. This multi-phase study resulted in three volumes, prepared by USACERL. The first volume, *Cold War Properties Evaluation - Phase I: Inventory and Evaluation of Launch Complexes and Related Facilities at Vandenberg Air Force Base, California*, was completed in February 1996. The second volume, *Cold War Properties Evaluation - Phase II: Inventory and Evaluation of Minuteman, MX Peacekeeper, and Space Tracking Facilities at Vandenberg Air Force Base, California*, was completed in June 1997. The third and final volume, *Cold War Properties Evaluation - Phase III: Inventory and Evaluation of Atlas, Titan, Bomarc, and Blue Scout Junior Launch Facilities at Vandenberg Air Force Base, California*, was completed in October 1997.

³ In presenting this argument, the Advisory Council on Historic Preservation (ACHP), in its 1991 publication Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities, specifically refers to the many active NASA and U.S. Air Force launch complexes that have been continually modified over time to support new generations of rockets. See also the discussion of “integrity of function” found in the Center for Air Force History report, Coming in from the Cold. Military Heritage in the Cold War. Report on the Department of Defense Legacy Cold War Project (Washington, DC: Department of Defense Legacy Resource Management Program, June 1994), 18-19.

Appendix A is a complete listing of properties deemed eligible for the NRHP in all three phases of TSCRRC's inventory and evaluation.

3.1 Phase I

In Phase One, facilities deemed eligible for the NRHP qualified in one of two ways: as sites with contributing elements, or as a district with contributing elements.

3.1.1 Sites: Space Launch Complexes and GERTS

Several VAFB sites possess exceptional importance for their *direct* contribution to operational missions of exceptionally important military or civilian Cold War programs. These sites are Space Launch Complexes (SLCs) 2, 3, 5 and 10 (the latter is an already existing National Historic Landmark) and the General Electric Radio Tracking Station (GERTS). Each of these sites contains individual structures and facilities, not all of which are considered contributing elements of those sites. The contributing elements are limited to the primary launching facilities and support systems.

3.1.2 District: Western Range Landbased Instrumentation Support Systems Historic District

The proposed discontinuous Western Range Landbased Instrumentation Support Systems Historic District (WRLISSHD) encompasses the historic Air Force Western Range landbased instrumentation support facilities located at VAFB, and VAFB remote (or "satellite") installations that *directly* supported operational missions of exceptionally important Cold War space programs and exceptionally important Cold War ballistic missile programs *during their critical design, development, and testing phases*. The contributing elements of the proposed WRLISSHD located at VAFB are: the Western Range Control Center (Facility 7000) on North Vandenberg; and the control center (Facility 75) and two telemetry structures (Facilities 81 and 86) of the Vandenberg Telemetry Receiving Site, the LA-24 Tracking Telescope (Facility 181), the AN/TPQ-18 Radar Facility (Facility 907), and the AN/FPS-16 Radar Facility (Facility 178), on South VAFB. Contributing elements of the WRLISSHD located at VAFB remote installations are: the AN/FPQ-6 Radar Facility (Facility 18) and two telemetry structures (Facilities 22 and 40) at Pillar Point Air Force Station, California; the Deployment Mapping Instrument (DMI) telescope (Facility 3) at the Anderson Peak Optical Site, Big Sur, California; and the Recording Optical Tracking Instrument (ROTI, Facility 21) at the Santa Ynez Peak Optical Tracking Site, California.

3.2 Phase II

In Phase Two, properties deemed eligible for NRHP listing qualified in one of three ways: as individual buildings, as sites with contributing elements, or as a district with contributing elements.

3.2.1 Individual Buildings: Minuteman and Peacekeeper Missile Alert Facilities and Missile Procedure Trainers

Four Minuteman Missile Alert Facilities (MAF-DO, -EO, -01A, -01B), a Minuteman Launch Support Center (LSC), a Peacekeeper Missile Alert Facility (MAF-01E), and two buildings housing Missile Procedure Trainers (Facilities 8195 and 7403) qualify for NRHP listing as individual buildings that directly supported operational missions of the exceptionally important Minuteman and Peacekeeper ICBM programs.

3.2.2 Sites: Minuteman and Peacekeeper Launch Facilities and the Vandenberg Tracking Station

Seven Minuteman Launch Facilities (LF-03, -06, -04, -07, -09, -10, -26) and three Peacekeeper Launch Facilities (LF-02, -05, -08) qualify for NRHP listing as sites based on their *direct* contributions to operational missions of the exceptionally important Minuteman and Peacekeeper ICBM programs. The Vandenberg Tracking Station (VTS) qualifies for NRHP listing based on its historic function as a satellite tracking and control site that directly supported operational missions of exceptionally important U.S. military space programs. Each of these sites is comprised of a number of individual structures and facilities, not all of which are considered contributing elements of those sites. The contributing elements of the LFs are the launch silos, the Launcher Equipment Rooms (LERs), and the Launch Support Buildings (LSBs). The contributing elements of the VTS are the UHF Building and 60' Telemetry Tracking and Control Antenna (Facility 23201) and the VHF Antenna Building and Antenna Support Structure (Facility 23235).

3.2.3 District: Rail Garrison Historic District

In an evaluation completed in 1994, Dames & Moore, Inc.⁴ found fourteen rail garrison facilities eligible for the NRHP as contributing elements of a Rail Garrison Historic District. TSCRRC agreed with the designation of a Rail Garrison Historic District (RGHD), but found only seven facilities eligible for NRHP listing as contributing elements of this district. The seven contributing elements are Facilities 1819, 1886, 1862, 1894, 1900, the Test Loop, and the Rail Spur.

3.3 Phase III

In the Phase Three report of the evaluation of Cold War properties at VAFB, one property qualified for NRHP listing as a site with contributing elements.

3.3.1 Site: Titan II Launch Complex 395-C

The Titan II Launch Complex qualified for listing in the NRHP as a site based upon its *direct* contribution to operational missions of the exceptionally important Titan II ICBM program. This site is composed of a number of contributing elements consisting of: the access portal, launch control center, blast lock structure, cableway, silo, oxidizer hardstand, fuel hardstand, cooling tower pit, and the air intake and air exhaust vents.

⁴ Dames & Moore, Inc. (Weitze, Karen J.), National Register of Historic Places Evaluation: Peacekeeper Rail Garrison Complex, Vandenberg Air Force Base, Austin, TX, April 1994.

4. MANAGEMENT AND TREATMENT OF HISTORIC COLD WAR PROPERTIES AT VAFB IDENTIFIED IN TSCRRRC'S THREE-PHASE INVENTORY AND EVALUATION

This section provides guidance for managing and treating VAFB's historic Cold War properties. Management procedures specified in this PA will be followed until they are superseded by Air Force Guidance that specifically addresses the management of Cold War Historic Resources located on active highly technical and scientific facilities.

The appropriate management and treatment measures for VAFB's historic Cold War properties are dictated by the nature of their significance. In all cases, for all eligible properties, preventative maintenance (e.g., painting, caulking, roof repair), repairs or upgrades to utilities or service infrastructure (e.g., phone, power, plumbing, HVAC, parking areas, fencing), and the upgrade of control components that do not affect the historic character or appearance of a facility, site, or weapon system (e.g., communication panel upgrades, power management system upgrades) are considered normal, necessary evolutionary changes and will not require SHPO consultation.

Below, the specific management and treatment measures for historic Cold War properties are discussed. The properties are categorized as Individual Facilities, Sites, or Historic Districts. They are also divided into specific categories corresponding to the nature of their significance.

4.1 Individual Facilities

4.1.1 Individual Facilities Significant for their Historic Function

The individual facilities significant for their historic function are MAF-DO, MAF-EO, MAF-01A, MAF-01B⁵, MAF-01E, the LSC, and facilities 8195 and 7403. The LSC and the MAFs are significant for their historic function as Minuteman or Peacekeeper launch control facilities. Facilities 8195 and 7403 are significant because of their function as missile combat training facilities. Undertakings that do not alter the ability of these facilities to convey a sense of their historic function will have no adverse effect and will not require VAFB to conduct Section 106 consultations or to take any other actions.

4.1.2 Individual Facilities Significant for their Distinctive Physical Characteristics

There are no individual facilities in this category.

⁵ Late in 1996 and early in 1997, VAFB decommissioned Minuteman II Alert Facility MAF-01B and Minuteman II Launch Facility LF-07. This was done according to Section 106 guidelines, in consultation with the SHPO. Mitigation for the action of decommissioning was identified and agreed upon by SHPO and VAFB.

4.2 Sites

4.2.1 *Sites Significant for their Historic Function*

Sites significant for their historic function are SLC-2, LF-03, LF-04, LF-06, LF-07⁶, LF-09, LF-10, LF-26, 395-C, and the VTS (SLC-3 is also significant based on its historic function, but it is a special case which is discussed separately below). The significance of the SLCs lies in their historic function as launch complexes that supported the United States space program. The significance of the LFs lies in their historic function as launch complexes that supported the Minuteman program during the critical design, development, and testing phases. The significance of 395-C lies in its historic function as a launch complex for the Titan II ICBM. The significance of the VTS lies in its historic function as a satellite tracking and control facility.

Each site is comprised of a number of contributing elements that together convey a sense of that site's historic function. Undertakings that do not alter the ability of these contributing elements to convey a sense of the site's historic function, including preventive maintenance, will have no adverse effect on the site and will not require VAFB to conduct Section 106 consultations or to take any other actions.

Undertakings that modify contributing elements of these historic sites are sometimes necessary to accommodate new missiles or space launch vehicles or mission requirements. Normally, such modifications do not compromise the functional integrity of these sites as launch complexes (or, in the case of the VTS, as a satellite tracking and control facility). Since the sites are eligible for NRHP listing based on their historic function, normal evolutionary modifications that do not affect the ability of the contributing elements to convey a sense of the site's historic function will not require VAFB to complete the statutory Section 106 process.

All upgrades and modifications of the launch complexes and the VTS are routinely recorded by Air Force launch personnel, and personnel of the cultural resources section. Descriptive project plans, engineering documents, and photographs of these modifications are filed at the launch facility in question. These historical documents record the physical evolution of the launch complex and are invaluable when maintenance problems are encountered or when a facility is upgraded further.

When substantial upgrades or modifications are made to a site that is significant for its historic function, a packet of descriptive information will be archived at 30 CES/CEVPC at VAFB. The documentation packet will normally contain photographic prints, design plans, and narrative documents describing the project. The prints will be color, 5" x 7", from 35 mm negatives. Digital camera images, and video film (magnetic tape media) may also be used to record "before and after" images of the affected facility.

⁶ See footnote 5, above.

Undertakings that adversely affect the ability of the contributing elements to convey a sense of a site's historic function will require VAFB to complete the statutory Section 106 process. This would be required if, for example, an eligible launch complex is demolished, or one or more contributing elements of the site are removed or completely replaced. Section 106 consultation would also be necessary if the launch complex is altered to accommodate entirely new space vehicles or weapon systems or, in the case of the VTS, if the site is altered to perform a function wholly unrelated to its present satellite tracking and control function.

At SLC-3, the entire launch complex was thoroughly documented in 1993. This study, Historic American Engineering Record (HAER) recordation No. CA-133-1 was mitigation for the adverse effects of the Atlas II program at SLC-3 East and was required by a three-party Programmatic Agreement (PA). In 1999, development of the Evolved Expendable Launch Vehicle (EELV) program at SLC-3 West required a follow-on PA between VAFB and SHPO. The new PA clarifies the scope of the original 1993 HAER effort, and qualifies that study as mitigation for the adverse effects of the 1999 EELV program. Since the entire site has been recorded to HAER standards, only the complete demolition of SLC-3 will require a statutory Section 106 consultation in the future.

4.2.2 Sites Significant for their Distinctive Physical Characteristics and their Historic Function

Sites in this category qualify for listing in the NRHP based on their historic function and their exceptionally important architectural or engineering design. For the purposes of Section 106 consultation concerning the mitigation of impacts, engineering design and architecture take precedence over historic function. Sites in this category are: SLC-5, GERTS, Peacekeeper Launch Facilities LF-02, LF-05, and LF-08, and SLC-10.

Undertakings compromising the physical integrity of contributing elements of these sites have an adverse effect on the sites, and will require VAFB to complete the statutory Section 106 process. Preventive maintenance, normal repairs and upgrades, as defined above, do not require Section 106 consultation.

SLC-10 is significant for both its distinctive physical characteristics and its historic function. In addition, SLC-10 was designated a National Historic Landmark as part of the 1986 "Man In Space" thematic study conducted by the National Park Service (NPS). All undertakings affecting SLC-10 will follow the guidelines and procedures outlined in the NHPA and in 36 CFR 800, or in a PA that specifically addresses SLC-10.

4.3 Historic Districts

4.3.1 Western Range Landbased Instrumentation Support Systems Historic District

The WRLISSHD is composed of a number of sites (both on VAFB, and also at three remote locations in other parts of California) that are significant based on their historic function. Each site is comprised of a number of contributing elements that together convey a sense of that site's historic function. Preventative maintenance,

repairs, and normal upgrades that do not modify a site's contributing elements will not require VAFB to complete the standard Section 106 process.

Undertakings that modify contributing elements of the historic sites in the WRLISSHD, but do not compromise the functional integrity of these sites (e.g., as a telemetry site or as an optical site), still constitute incremental and cumulative changes. While these evolutionary upgrades are common at highly technical and scientific installations, some documentation to preserve a record of these changes is necessary. In such cases, VAFB will prepare a documentation packet consisting of photographic prints, design plans, and a description of the undertaking. Normally, color, 5" x 7" photographic prints from 35-mm film negatives will be produced. Digital camera images, and video film (magnetic tape media) may also be used to record "before and after" images of the affected facility. This packet will be archived at 30 CES/CEVPC at VAFB.

Undertakings that adversely affect the ability of a site's contributing elements to convey a sense of the site's historic function will require VAFB to complete the statutory Section 106 process. This would occur, for example, when contributing elements are completely removed or replaced, when an entire site is demolished, or when a site is altered to perform a function wholly unrelated to its historic function.

4.3.2 Rail Garrison Historic District

The Rail Garrison Historic District is composed of a number of facilities that are significant based on their historic function and their exceptionally important architectural or engineering design. For the purposes of Section 106 consultation concerning the mitigation of impacts, significance of the engineering and architecture takes precedence over significance based on historic function.

Undertakings compromising the physical integrity of any of these facilities will require VAFB to complete the statutory Section 106 process. Preventive maintenance, normal repairs, and upgrades to these facilities will have no adverse effect and will not require VAFB to conduct Section 106 consultations or to take any other actions.

5. SUMMARY OF MANAGEMENT AND TREATMENT PROCEDURES

Section 106 consultations will be initiated by VAFB when undertakings are proposed that will change the physical layout and/or design of the contributing elements of the GERTS, LF-02, LF-05, LF-08, SLC-5, and the contributing elements of the Rail Garrison Historic District. For these properties, undertakings that do not change the physical layout or design of the contributing elements have no adverse effect and will not require VAFB to complete a Section 106 consultation.

The remaining historically significant Cold War resources at VAFB are eligible for the NRHP because of their direct support of exceptionally important Cold War programs. The majority of these properties are dynamic, active technical facilities that are significant for their function, not for their physical design. Only undertakings that compromise the ability of these properties to convey a sense of their historic function have an adverse effect and will require VAFB to complete the standard Section 106 process. Upgrades

and other necessary modifications to these properties that do not compromise their ability to convey a sense of their historic function will be considered to have no adverse effect. Unless contributing elements are removed or completely replaced, such modifications will not require formal Section 106 consultations, although VAFB will record and document these modifications as outlined in Sections 4.2.1 and 4.3.1.

In all cases, for all the eligible VAFB Cold War properties, decommissioning or abandonment will require formal Section 106 consultation. Demolition of an entire site or of one or more contributing elements will require Section 106 consultation, as will new construction within a site that is not compatible with the original structure or existing site elements. Also, a change in the function, purpose, or use of an eligible site will require formal Section 106 consultation.

SLC-10 is listed in the National Register as a National Historic Landmark. VAFB will initiate consultations with the SHPO, the Council, and the NPS for any proposed undertakings that would affect the contributing elements of SLC-10.

6. VAFB INTENTIONS CONCERNING PROPOSED AND POTENTIAL DISCONTIGUOUS HISTORIC DISTRICTS CONTAINING NON-VAFB CONTRIBUTING ELEMENTS

The TSCRRC study of VAFB Cold War properties proposes the establishment of one NRHP eligible discontinuous historic district, and mentions the potential eligibility of a second discontinuous historic district. The proposed eligible district is the Western Range Landbased Instrumentation Support Systems Historic District, or WRLISSHD. It is discussed in summary fashion in volume 1 of TSCRRC's evaluation of VAFB Cold War properties.⁷ The potential district is the Satellite Control Historic District (SCHD). If proposed and found eligible, the SCHD would include the two eligible VTS facilities (23201 and 23235), the Satellite Control Center at Onizuka Air Force Base (OAFB), and the network of remote satellite tracking stations located in the Pacific and elsewhere. Details of the potential SCHD are summarized in volume 2 of the TSCRRC study.⁸

The scope of the TSCRRC study of VAFB Cold War properties did not include the remote landbased tracking and control stations. Consequently, the study volumes offer little detail about the proposed and potential discontinuous districts. Although other cultural resource studies have previously evaluated the five non-VAFB contributing elements of the WRLISSHD (located at Pillar Point, Santa Ynez Peak, and Anderson Peak), presently VAFB does not have the resources to reevaluate these WRLISSHD sites or to inventory and evaluate NRHP eligible elements of the potential SCHD.

In sum, VAFB will assume that the contributing elements of the discontinuous WRLISSHD are eligible for the National Register, and will manage them in accord with

⁷ *Cold War Properties Evaluation - Phase I: Inventory and Evaluation of Launch Complexes and Related Facilities at Vandenberg Air Force Base, California* (February 1996), pages 59-61.

⁸ *Cold War Properties Evaluation - Phase II: Inventory and Evaluation of Minuteman, MX Peacekeeper, and Space Tracking Facilities at Vandenberg Air Force Base, California* (June 1997), pages 267-281. Note that VAFB does not directly control the remote sites that have satellite tracking stations.

this PA and HPP. Significant historical documentation, construction plans, and other data related to potential contributing elements of the discontinuous SCHD will be collected and retained for possible evaluation and use in the future.

7. FINDING OF NRHP ELIGIBILITY vs. FUTURE MITIGATION: VAFB INTENTIONS CONCERNING MITIGATION OF SIMILAR COLD

WAR-ERA MILITARY FACILITIES

The determination of eligibility (or *potential* eligibility) is a critical step in the process of Cultural Resource Management (CRM). Significance (and therefore NRHP eligibility) is normally determined separately from issues of preservation. However, in the case of the Air Force and its legacy of Cold War weapons systems, great numbers of similar missile silos, launch facilities, and control centers remain throughout the western and Midwestern United States. Both logic, and the continuing decline in CRM funding argue that new methods are needed to manage these similar “cookie-cutter” sites.

Regardless of how scores (or hundreds) of similar Cold War sites should be managed, the formal determination of eligibility is important for two reasons. First, definitive national guidance (from the Air Force or the Department of Defense) relevant to the management of Cold War resources is still wanting. Second, no easily accessible nationwide database is yet available listing all known Cold War resources. Lacking such a nationwide database, the determination of potential NRHP eligibility is currently the only way available to acknowledge the existence of historic Cold War properties.

A number of similar Minuteman and Peacekeeper facilities at VAFB are deemed eligible for NRHP listing. While this determination of eligibility is important for future management of these resources, it should not be construed as giving equal mitigatory protection to all the historic properties in question. Current resources in the Cold War CRM program at VAFB will not allow identical, repetitive mitigation to be applied to similar NRHP eligible sites. In sum, when a future Air Force undertaking affects one of a block of similar “cookie-cutter” historic properties (e.g., Minuteman silos or launch facilities), the entire suite of sites will be considered in the mitigation effort. Further, if it is determined that similar silos or launch facilities have been documented and/or preserved elsewhere, then it is possible the undertaking at VAFB may be allowed to proceed with no local mitigation or documentation (although the normal statutory Section 106 consultation with the SHPO would be necessary).

8. DECLASSIFICATION OF COLD WAR-ERA MILITARY RECORDS AND INTELLIGENCE, AND ITS EFFECT ON NATIONAL REGISTER-ELIGIBLE PROPERTIES AT VAFB

While the system to declassify national security records was cited as “hopelessly clogged” in 1994,⁹ the declassification of important Cold War documents continues, and a

⁹Center for Air Force History, Coming in from the Cold. Military Heritage in the Cold War. Report on the Department of Defense Legacy Cold War Project (Washington, DC: Department of Defense Legacy Resource Management Program, June 1994), 29.

reconsideration of the methods normally used may succeed in speeding up the process. Still, it is expected that important military, national security, and intelligence documents from the Cold War will remain to be examined and declassified until well into the next millennium. One must assume that the data contained in at least a tiny percentage of these millions of pages will have some relevance to Vandenberg AFB.

When previously classified intelligence, covert histories, or other data concerning sites or properties at VAFB become known, they will be considered for their content and their bearing on the existing list of NRHP-eligible properties. If important data become available concerning a site or facility not previously considered to be eligible, then the cultural resources staff at 30 CES/CEVPC will reevaluate the property, using the same methods and criteria originally developed and applied by TSCRRC. When new information indicates that a property previously thought ineligible may be eligible, VAFB will notify the SHPO. The normal Section 106 consultation process, between VAFB and the SHPO, will determine if the property will be added to the list of NRHP eligible properties protected under this Programmatic Agreement.

Although it is possible that newly declassified information will precipitate the removal of a property from the list of NRHP-eligibles, this situation is thought to be highly unlikely. If, however, information is received which causes VAFB to reevaluate a property, and if the property appears to be ineligible given the new information, and if the property in question is in the Area of Potential Effect of an Air Force undertaking, then VAFB will initiate formal Section 106 consultation proceedings with the SHPO.

APPENDIX A

**SUMMARY LIST OF PROPERTIES DEEMED ELIGIBLE FOR THE NRHP
AT
VANDENBERG AIR FORCE BASE, CALIFORNIA**

PHASE I PROPERTIES IDENTIFIED BY USACERL

Contributing Elements of Space Launch Complex 2

The following facilities are eligible for the NRHP under **Cold War Criterion A** as a result of SLC-2's historic function as a launch complex that directly supported operational missions of exceptionally important Cold War programs.

SLC-2 West

Facility 1622	Blockhouse
Facility 1623	Mobile Service Tower
Facility 1662	Tank Farm
Facility 1623A	Trailer Shelter
Facility 1623B	Trailer Shelter
	Electric Cableway
	Fixed Umbilical Tower
	Flame Bucket / Flame Trench
	Fuel Propellant Transfer Unit
	Fuel Propellant Transfer Unit Pond
	Fuel Tank Revetment
	LOX Tank Revetment
	Oxidizer Propellant Transfer Unit
	Water Valve Pit

Contributing Elements of Space Launch Complex 3

The following facilities are eligible for the NRHP under **Cold War Criterion A** as a result of SLC-3's historic function as a launch complex that directly supported operational missions of exceptionally important Cold War programs. Note: In 1993, SLC-3 was documented according to HABS/HAER standards.

SLC-3 East

Facility 751	Launch and Service Facility
	Retention Basin and Deluge Channel
	Mobile Service Tower and Umbilical Mast

SLC-3 West

Facility 770	Launch and Service Facility
	Mobile Service Tower and Umbilical Mast
	Retention Basin and Deluge Channel

SLC 3 (Shared Facilities)

Facility 763	Launch Operations Facility
Facility 766	Launch Vehicle Support Facility

Contributing Elements of Space Launch Complex 5

The following facilities are eligible for the NRHP under **Cold War Criterion A** as a result of SLC-5's historic function as a launch complex that directly supported operational missions of exceptionally important Cold War programs. These facilities are also eligible under **Cold War Criterion D** as a result of SLC-5's distinctive launch technology that, along with these facilities, has remained relatively unchanged since the early 1960s.

Facility 578	Cosmodyne Shelter
Facility 579	Motor Building
Facility 580	Terminal Building / Launch Shelter
Facility 582	Launcher Support Building
Facility 589	Blockhouse

Contributing Elements of Space Launch Complex 10

The following facilities at SLC-10 are eligible for listing as contributing elements to a National Historic Landmark (NHL) under **NHL Criterion 1** due to their direct contribution to operational missions of the Air Force's Thor training program, the nation's military space program, and the Air Force Program 437. SLC-10 also qualifies as a NHL under **NHL Criterion 4** as the best surviving example of a launch complex built in the 1950s at the beginning of the American effort to explore space.

SLC-10 East

Facility 1651	East Pad Shelter
Facility 1664	Storage and Maintenance Facility

SLC-10 West

Facility 1657	Office and Administration Facility
Facility 1658	Shelter/ Electrical Equipment Building
Facility 1659	Storage and Maintenance Facility
Facility 1663	Storage and Maintenance Facility

SLC-10 (Shared Facilities)

Facility 1654	Blockhouse
---------------	------------

Contributing Elements of the GERTS

The following facilities are eligible for the NRHP under **Cold War Criterion A** resulting from the GERTS historic function as a missile command guidance system that directly supported operational missions of exceptionally important Atlas space programs and Atlas and Titan ICBM programs during their critical design, development, and testing phases. The GERTS facility is also eligible for the NRHP under **Cold War Criterion D** for its distinctive technological characteristics as the only surviving example of the MOD-3 command guidance system.

Facility 470	Rate Receiver Station
Facility 480	Rate Receiver Station
Facility 488	Range Operations Building

Contributing Elements of the Proposed Western Range Landbased Instrumentation Support Systems Historic District (WRLISSHD)

The following facilities are eligible for the NRHP under **Cold War Criterion A** and the last part **Cold War Criterion D** as contributing elements of a district that provided direct support to the numerous ballistic missile and space missions originating at VAFB throughout the Cold War era.

Contributing Elements of the Proposed WRLISSHD Located at VAFB:

Facility 7000 Western Range Control Center, North VAFB

Vandenberg Telemetry Receiving Site, South VAFB

Facility 81	Ten Meter Antenna
Facility 86	GKR-7 Autotrack Antenna
Facility 75	Vandenberg Telemetry Receiving Site Control Center

Optical Systems

Facility 181	LA-24 Optical Tracking Radar, South VAFB
--------------	--

Radar Systems

Facility 907	TPQ-18 Radar Facility, South VAFB
Facility 178	FPS 16-1 Radar Facility, South VAFB

Contributing Elements of the Proposed WRLISSHD at Satellite Installations:

Pillar Point Air Force Station, California

Facility 18	AN/FPQ-6 Radar Facility
Facility 22	Telemetry Antenna
Facility 40	Telemetry Antenna

Santa Ynez Peak, California

Facility 21	Recording Optical Tracking Instrument (ROTI)
-------------	--

Anderson Peak Optical Site at Big Sur, California

Facility 3	Deployment Mapping Instrument Telescope (DMI)
------------	---

PHASE II PROPERTIES IDENTIFIED BY USACERL

Minuteman Facilities

The following facilities are eligible for the NRHP under **Cold War Criterion A** for their function as facilities providing direct support to the exceptionally important ICBM program. *Note: LF-07 and MAF 01B were decommissioned in March 1997, with mitigation, per Section 106 consultation with SHPO.

Launch Facilities

Facility 1972	LF-03
Facility 1980	LF-06
Facility 1976	LF-04
Facility 1981	LF-07*
Facility 1993	LF-09
Facility 1963	LF-10
Facility 1967	LF-26

Missile Alert Facilities

Facility 1450	MAF-DO
Facility 1565	MAF-EO
Facility 1974	MAF-O1A
Facility 1978	MAF-O1B*

Launch Support Center (LSC) for LF-03 and LF-06

Missile Procedures Trainers

Facility 8195
Facility 7403

Peacekeeper Facilities

The following facilities are eligible for the NRHP under **Cold War Criterion A** for their function as facilities providing direct support to the exceptionally important MX and Peacekeeper ICBM program, and **Cold War Criterion D** for the unique architectural and engineering characteristics associated with the 'cold launch' concept.

Launch Facilities

Facility 1971:	LF-02
Facility 1977:	LF-05
Facility 1986:	LF-08

The following facility is eligible for the NRHP under **Cold War Criterion A** for its function as a facility that provided direct support to the exceptionally important MX Peacekeeper ICBM program.

Missile Alert Facilities

Facility 1987: MAF-O1E

Peacekeeper Rail Garrison Complex

The following facilities are eligible for the NRHP as contributing elements to a proposed Rail Garrison Historic District under **Cold War Criterion A** for their association with critical Cold War nuclear strategic planning, and under **Cold War Criterion D** as facilities that together represent a unique ICBM basing concept.

Facility 1819	Missile Assembly Building
Facility 1886	Rail Transfer Facility
Facility 1862	Rail Garrison Launch Site
Facility 1894	Test Igloo
Facility 1900	Integration Refurbishment Facility
	Test Loop
	Rail Spur

Vandenberg Tracking Station

The following facilities are eligible for the NRHP under **Cold War Criterion A** for their function as facilities providing direct support to the numerous ballistic missile and space missions originating at VAFB throughout the Cold War era, and **Cold War Criterion D** as contributing elements to a potential satellite control historic district that would include the network of remote tracking stations and the Satellite Control Center at Onizuka AFB.

Facility 23201	UHF Building and 60' Telemetry Tracking and Control Antenna
Facility 23235	VHF Antenna Building and Antenna Support Structure.

PHASE III PROPERTIES IDENTIFIED BY USACERL

Titan II Facilities

The following facilities are eligible for the NRHP under **Cold War Criterion A** for their function as facilities providing direct support to the exceptionally important Titan II ICBM program.

Complex 395-C

1 FACILITY 1050:

Access Portal
Launch Control Center
Blast Lock Structure
Cableway
Silo
Oxidizer Hardstand
Fuel Hardstand
Cooling Tower Pit
Air Intake and Air Exhaust Vents

APPENDIX C

Air Quality Analysis

Appendix C Air Quality Analysis

Detailed engineering analyses for identified Capital Improvement Program (CIP) projects described in the 2007 Vandenberg Air Force Base (VAFB) General Plan (2007 General Plan – VAFB 2007 *In progress*) have not been completed; thus equipment usages have not been generated for any of these projects. Documentation from previously planned and/or executed VAFB construction projects was reviewed to develop a generic equipment list and usages for a worst-case scenario project, representative of identified CIP projects addressed in this Programmatic Environmental Assessment. This worst-case scenario representative project combined the CIP project with the construction of the largest facility with the project with the largest area of disturbed acreage. Procedures and equations used to calculate air emissions for this worst-case scenario are detailed below.

Technical Assumptions and Emission Calculation

Proposed Action

Under the CIP, the 2007 General Plan proposes the construction of a number of new facilities over a 10-year period starting in fiscal year 2007. For the purposes of this air quality analysis, a worst-case scenario representative project, hereafter representative project, was developed that combines the CIP project with the construction of the largest facility with the project with largest area of disturbance to estimate air emissions that would represent the annual worst-case scenario throughout the 10-year period. The construction of the Mission Support Group Headquarters is the CIP project with the construction of the largest facility at 9,290 square meters while the 30th Space Wing Headquarters is the CIP project with the largest area of disturbance at 13.6 acres.

Equipment usages from prior construction projects were reviewed to estimate equipment usages for this representative project. Table C-1 presents equipment usages for the estimated reasonable daily worst-case scenario, including equipment size and load factors. Table C-2 shows the emissions factors used in this analysis, and Tables C-3 and C-4 show the reasonable estimated worst-case daily and total project emissions. Because implementation of selected construction projects in the representative project would start in 2010, emissions were estimated using 2010 emission factors.

Projects proposed under the Proposed Action would be similar in nature, i.e. involve similar construction activities. After a detailed engineering study is prepared for the construction of each facility, the 30th Civil Engineer Contracts (30 CES/CEC) would submit an Air Force Form 813, *Request for Environmental Impact Analysis* (AF Form 813) to the 30th Space Wing Environmental Flight (30 CES/CEV) at the time of each project's implementation. The AF Form 813 would include the project design, specific construction requirements, a detailed equipment list, and an estimate of air emissions based upon the methodology detailed in this appendix. The 30 CES/CEV would maintain a calendar year and 12-month rolling air inventory. When the cumulative calendar year emissions of nitrogen oxide (NO_x), or reactive organic compound (ROC) reach but not exceed 548 pounds per day (lbs/day) or 100 tons/year, that request would receive clearance, but no further

environmental clearances for projects would be given until the following calendar year. At no time will environmental clearances be given if specific project emissions plus cumulative calendar year emissions of NO_x, or ROC exceed 548 lbs/day or 100 tons/year.

Sources of air emissions from projects included under the Proposed Action would include combustive and fugitive emissions. Combustive emission would come from construction equipment, employee commuting, and trucks. Fugitive emissions would come from construction equipment disturbing the sites.

Combustive Emissions

Actual daily combustive and vehicular emissions for each project under the Proposed Action would be calculated at the time of implementation based on the information submitted in the AF Form 813.

For combustive emissions from construction equipment, the daily emissions for the representative project were calculated by multiplying the equipment horsepower, the load factor, the emission factor, the number of equipment and the hours of operation for a day. Project emissions were calculated by multiplying the equipment horsepower, the load factor, the emission factor, the number of equipment, and the hours of operation during the project. As shown in Table C-1, the default horsepower and load factors from URBEMIS 2007 (Jones & Stokes Associates 2007) were used. Emission factors for the construction equipment, also from URBEMIS 2007 (Jones & Stokes Associates 2007), are shown in Table C-2. In the future, if better emission factors and load factors become available, new data would be used to provide more accurate emissions calculations.

Vehicular emissions from employees commuting and truck trips for the representative project were estimated by multiplying the total number of trips per day, the distance traveled, and the emission factor. Project emissions were calculated by multiplying number of trips per day by the distance traveled by the numbers of days in the project by the emission factor. It was assumed the average, one-way employee commute is 25 miles, while for the trucks delivering materials, an average one-way trip of 45 miles was assumed. Emission factors for commuting employees and trucks hauling materials were obtained from California Air Resources Board's EMFAC 2007 (v2.3) BURDEN model run by the South Coast Air Quality Management District. The emission factors for employee commuting and construction trucks are shown in Table C-2.

Fugitive Dust

Equipment operating on construction sites would disturb soil and create fugitive dust. Maps included with the AF Form 813 would be used to estimate the area disturbed by construction equipment. This area would be multiplied by the hours of operation by the emission factor of 3.49 pounds of particulate matter 10 microns or less in diameter (PM₁₀) per acre per hour to estimate the daily emissions (Santa Barbara County Air Pollution Control District [SBCAPCD]). The 3.49 pounds per acre per hour includes site watering to achieve a 50% reduction in PM₁₀. The project PM₁₀ emissions would be estimated by multiplying daily emissions by the number of days the site would be disturbed.

Table C-1. Estimated daily equipment usage for representative project.

Equipment Category	Horse Power	Load Factor	# of Pieces of Equipment	Hrs/Day	Total Hrs
Site Grading					
Bulldozer	240	0.59	1	8.00	80
Scraper	265	0.66	2	8.00	80
Track Loader	121	0.59	1	8.00	80
Backhoe	77	0.47	1	8.00	80
Water Truck	250	0.47	1	5.00	50
Dump Truck ^(a)	25	2.00	4	NA	40
Foreman's Truck ^(a)	25	2.00	2	NA	20
Crew Trucks ^(a)	25	2.00	16	NA	160
Road, Parking Lot and Utility Construction					
Compactor (70 Hp)	70	0.53	1	6.00	120
Compactor (32 Hp)	32	0.53	1	6.00	120
Paver	153	0.59	1	6.00	120
Road Grader	137	0.58	1	6.00	120
Skid Steer Loader	78	0.52	1	6.00	120
Water Truck	250	0.47	1	4.00	80
50 Kw Generator	65	0.74	1	4.00	80
Asphalt Truck ^(a)	45	2.00	6	NA	180
Foreman's Truck ^(a)	25	2.00	2	NA	40
Crew Trucks ^(a)	25	2.00	16	NA	320
Facility Construction					
100-ton Crane	270	0.43	1	3.00	660
Backhoe	77	0.47	4	5.00	1,100
Forklift	125	0.48	4	8.00	1,760
Scraper	265	0.66	1	7.00	1,540
Skid Steer Loader	78	0.52	1	6.00	1,320
Trencher (13 Hp)	13	0.70	1	7.00	1,540
Trencher (45 Hp)	45	0.70	1	7.00	1,540
Cement Truck ^(a)	45	2.00	6	NA	1,980
Delivery Truck ^(a)	45	2.00	4	NA	1,320
Dump Truck ^(a)	25	2.00	2	NA	440
Foreman's Truck ^(a)	25	2.00	2	NA	440
Crew Trucks ^(a)	25	2.00	32	NA	7,040
Fugitive Dust ^(b)					
Average Day					
Site Grading	1.36				72
Road & Parking Lot Construction	0.34				152
Facility Construction	0.03				1,752
Worst-Case Day					
Site Grading	4.08				8
Road & Parking Lot Construction	1.02				8
Facility Construction	0.09				8

NOTES:

(a) For this source, Horsepower indicates number of miles for a one-way trip, # of Pieces of Equipment indicates the number of one-way trips per day, and Total Hours indicates the total number of one-way trips.

(b) For this source, Horsepower indicates number of acres disturbed in one day and Total Hours indicates the number of hours of disturbance.

Table C-2. Construction equipment emission factors for representative project.

Equipment Category	Emission Factor (gm/hp-hr)					Ref.	Category
	CO	NO _x	PM ₁₀	ROG	SO _x		
Site Grading							
Bulldozer Cat D7R	0.735	2.822	0.095	0.258	0.004	(1)	Tractors/Loaders/Backhoe
Scraper Cat 611	1.440	4.852	0.197	0.512	0.005	(1)	Scrapers
Track Loader Cat 953C	2.191	3.426	0.312	0.550	0.004	(1)	Tractors/Loaders/Backhoe
Backhoe Cat 416D	3.658	3.211	0.322	1.296	0.004	(1)	Tractors/Loaders/Backhoe
Water Truck Ford F750	0.837	3.144	0.112	0.319	0.004	(1)	Off-Highway Truck
Dump Truck 10 yd ^{3(a)}	0.011955	0.038221	0.001831	0.003042	0.000041	(2)	Heavy Heavy Duty Diesel Truck ^(a)
Foreman's Truck ^(a)	0.008263	0.000918	0.000087	0.000914	0.000011	(2)	Passenger Vehicles ^(a)
Crew Trucks ^(a)	0.008263	0.000918	0.000087	0.000914	0.000011	(2)	Passenger Vehicles ^(a)
Road, Parking Lot and Utility Construction							
Asphalt Truck	0.011955	0.038221	0.001831	0.003042	0.000041	-2	Heavy Heavy Duty Diesel Truck ^(a)
Compactor Cat CB-214D	1.314	2.504	0.129	0.391	0.004	(1)	Rollers
Compactor Cat CB-434C	3.885	3.375	0.358	1.557	0.004	(1)	Rollers
Paver Cat BG-240C	2.188	4.406	0.248	0.563	0.004	(1)	Pavers
Road Grader Cat 120H	2.527	4.290	0.393	0.719	0.004	(1)	Graders
Skid Steer Loader 262B	3.658	3.211	0.322	1.296	0.004	(1)	Tractors/Loaders/Backhoes
Water Truck Ford F750	0.837	3.144	0.112	0.319	0.004	(1)	Off-Highway Truck
50 Kw Generator	3.965	4.207	0.387	1.515	0.005	(1)	Generator Sets
Foreman's Truck ^(a)	0.008263	0.000918	0.000087	0.000914	0.000011	(2)	Passenger Vehicles ^(a)
Crew Trucks ^(a)	0.008263	0.000918	0.000087	0.000914	0.000011	(2)	Passenger Vehicles ^(a)
Facility Construction							
100-ton Crane	0.755	2.698	0.102	0.271	0.003	(1)	Cranes
Backhoe Cat 416D	3.658	3.211	0.322	1.296	0.004	(1)	Tractors/Loaders/Backhoe
Cement Truck ^(a)	0.011955	0.038221	0.001831	0.003042	0.000041	(2)	Heavy Heavy Duty Diesel Truck ^(a)
Delivery Truck ^(a)	0.011955	0.038221	0.001831	0.003042	0.000041	(2)	Heavy Heavy Duty Diesel Truck ^(a)
Forklift Grandsal 544D	2.342	3.700	0.344	0.616	0.004	(1)	Forklifts
Scraper Cat 611	1.440	4.852	0.197	0.512	0.005	(1)	Scrapers
Skid Steer Loader 262B	3.658	3.211	0.322	1.296	0.004	(1)	Tractors/Loaders/Backhoes
Trencher Ditchwitch 1230	2.605	3.110	0.117	0.497	0.007	(1)	Trenchers
Trencher Ditchwitch 3700	5.657	4.692	0.525	2.381	0.006	(1)	Trenchers
Dump Truck 10 yd ³	0.011955	0.038221	0.001831	0.003042	0.000041	(2)	Heavy Heavy Duty Diesel Truck ^(a)
Foreman's Truck ^(a)	0.008263	0.000918	0.000087	0.000914	0.000011	(2)	Passenger Vehicles ^(a)
Crew Trucks ^(a)	0.008263	0.000918	0.000087	0.000914	0.000011	(2)	Passenger Vehicles ^(a)
Fugitive Dust							
			3.490			(3)	SBCAPCD Form 24 ^(b)
REFERENCES:							
(1) URBEMIS 2007 Version 9.2, Appendix I - Construction Equipment Emission Factors, Year 2010							
(2) EMFAC 2007 Version 2.3 On-Road Emission Factors, Year 2010							
(3) SBCAPCD Form 24 Construction Equipment Emission Factors							
NOTES:							
(a) Emission factor from SCAQMD CEQA On-Road Vehicles are in lbs/mile							
(b) Emission factor is controlled in units of lbs/acre-hr with PM ₁₀ fraction 0.64 and Control Efficiency of 50%.							

Table C-3. Estimated daily emissions for representative project.

Emission Source	Daily Emissions (Lbs)				
	CO	NO _x	PM ₁₀	ROC	SO _x
Site Grading					
Bulldozer Cat D7R	1.836	7.048	0.237	0.644	0.010
Scraper Cat 611	8.884	29.934	1.215	3.159	0.031
Track Loader Cat 953C	2.759	4.314	0.393	0.692	0.005
Backhoe Cat 416D	2.310	2.028	0.203	0.137	0.003
Water Truck Ford F750	1.084	4.072	0.145	0.069	0.005
Dump Truck 10 yd ^{3(a)}	2.391	7.644	0.366	0.608	0.008
Foreman's Truck ^(a)	0.826	0.092	0.009	0.091	0.001
Crew Trucks ^(a)	6.610	0.735	0.070	0.731	0.009
Fugitive Dust Worst-Case Day			56.957		
Total	26.699	55.865	59.595	6.132	0.072
Road, Parking Lot and Utility Construction					
Asphalt Truck ^(a)	6.455	20.639	0.989	1.642	0.022
Compactor Cat CB-214D	0.295	0.562	0.029	0.015	0.001
Compactor Cat CB-434C	1.907	1.656	0.176	0.128	0.002
Paver Cat BG-240C	2.613	5.261	0.296	0.112	0.005
Road Grader Cat 120H	2.633	4.470	0.410	0.125	0.004
Skid Steer Loader 262B	1.944	1.706	0.171	0.115	0.002
Water Truck Ford F750	0.867	3.258	0.116	0.055	0.004
50 Kw Generator	1.682	1.784	0.164	0.643	0.002
Foreman's Truck ^(a)	0.826	0.092	0.009	0.091	0.001
Crew Trucks ^(a)	6.610	0.735	0.070	0.731	0.009
Fugitive Dust Worst-Case Day			14.239		
Total	25.832	40.163	16.668	3.657	0.052
Facility Construction					
100-ton Crane	0.580	2.072	0.078	0.035	0.002
Backhoe Cat 416D	5.775	5.069	0.508	0.341	0.006
Cement Truck ^(a)	6.455	20.639	0.989	1.642	0.022
Delivery Truck ^(a)	4.304	13.760	0.659	1.095	0.015
Forklift Grandsal 544D	9.913	15.661	1.456	0.435	0.017
Scraper Cat 611	3.887	13.096	0.532	0.231	0.013
Skid Steer Loader 262B	1.944	1.706	0.171	0.115	0.002
Trencher Ditchwitch 1230	0.363	0.434	0.016	0.012	0.001
Trencher Ditchwitch 3700	2.730	2.265	0.253	0.192	0.003
Dump Truck 10 yd ^{3(a)}	1.195	3.822	0.183	0.304	0.004
Foreman's Truck ^(a)	0.826	0.092	0.009	0.091	0.001
Crew Trucks ^(a)	13.220	1.469	0.139	1.462	0.017
Fugitive Dust Worst-Case Day			2.589		
Total	51.193	80.084	7.583	5.956	0.105
Daily Project Total	103.724	176.112	83.845	15.745	0.228

Table C-4. Estimated project emissions for representative project.

Emission Source	Project Emissions (Lbs)				
	CO	NO _x	PM ₁₀	ROC	SO _x
Site Grading					
Bulldozer Cat D7R	18.356	70.475	2.372	6.443	0.100
Scraper Cat 611	88.838	299.335	12.154	31.587	0.308
Track Loader Cat 953C	27.587	43.136	3.928	6.925	0.050
Backhoe Cat 416D	23.100	3.384	2.033	8.184	11.458
Water Truck Ford F750	10.841	6.796	1.451	4.132	23.500
Dump Truck 10 yd ^{3(a)}	95.636	305.768	14.645	24.333	0.330
Foreman's Truck ^(a)	16.526	1.836	0.174	1.828	0.022
Crew Trucks ^(a)	1,057.633	117.522	11.133	116.991	1.379
Fugitive Dust			341.741		
Total (Lbs)	1,338.516	848.253	389.632	200.422	37.147
Total (Tons)	0.669	0.424	0.195	0.100	0.019
Road, Parking Lot and Utility Construction					
Asphalt Truck ^(a)	774.655	2,476.722	118.624	197.094	2.677
Compactor Cat CB-214D	5.896	1.875	0.579	1.754	8.141
Compactor Cat CB-434C	38.131	5.528	3.514	15.282	17.808
Paver Cat BG-240C	52.252	17.560	5.922	13.445	43.330
Road Grader Cat 120H	52.663	14.920	8.190	14.984	37.812
Skid Steer Loader 262B	38.874	5.695	3.422	13.773	19.282
Water Truck Ford F750	17.345	10.873	2.321	6.611	37.600
50 Kw Generator	33.636	35.689	3.283	12.852	0.042
Foreman's Truck ^(a)	33.051	3.673	0.348	3.656	0.043
Crew Trucks ^(a)	2,115.267	235.044	22.267	233.981	2.757
Fugitive Dust			180.363		
Total (Lbs)	3,161.768	2,807.579	348.833	513.431	169.492
Total (Tons)	1.581	1.404	0.174	0.257	0.085
Facility Construction					
100-ton Crane	127.541	76.062	17.231	45.780	229.878
Backhoe Cat 416D	1,270.478	186.117	111.835	450.120	630.168
Cement Truck ^(a)	8,521.210	27,243.943	1,304.866	2,168.031	29.446
Delivery Truck ^(a)	3,787.205	12,108.419	579.940	963.569	13.087
Forklift Grandsal 544D	2,180.910	575.011	320.339	573.630	1,689.600
Scraper Cat 611	855.067	480.819	116.978	304.024	1,346.730
Skid Steer Loader 262B	427.609	62.642	37.641	151.498	212.098
Trencher Ditchwitch 1230	79.907	15.921	3.589	15.245	97.397
Trencher Ditchwitch 3700	600.663	83.143	55.745	252.816	288.981
Dump Truck 10 yd ^{3(a)}	526.001	1,681.725	80.547	133.829	1.818
Foreman's Truck ^(a)	363.561	40.398	3.827	40.216	0.474
Crew Trucks ^(a)	93,071.729	10,341.929	979.743	10,295.183	121.313
Fugitive Dust			188.993		
Total (Lbs)	111,811.880	52,896.130	3,801.274	15,393.941	4,660.989
Total (Tons)	55.906	26.448	1.901	7.697	2.330
Project Total (Lbs)					
Project Total (Lbs)	116,312.164	56,551.962	4,539.738	16,107.794	4,867.628
Project Total (Tons)	58.156	28.276	2.270	8.054	2.434

References

- Jones & Stokes Associates. 2007. Software User's Guide: URBEMIS2007 for Windows Version 9.2. Emissions Estimation for Land Use Development Projects. November.
- Santa Barbara County Air Pollution Control District. 2004. Clear Air Plan. Santa Barbara.
- Vandenberg Air Force Base. 2007 *In progress*. Vandenberg Air Force Base 2007 General Plan. 65% Submission.