FINAL
FIVE-YEAR REVIEW FOR OPERABLE UNITS 1 THROUGH 5, MARINE CORPS BASE CAMP PENDLETON, CALIFORNIA

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FIVE-YEAR REVIEW REPORT

OPERABLE UNITS 1 THROUGH 5
MARINE CORPS BASE
CAMP PENDLETON, CALIFORNIA

DEPARTMENT OF THE NAVY
Naval Facilities Engineering Command Southwest
1220 Pacific Highway, San Diego, California 92132-5190

APPROVED BY:

3/26/2014
DATE

JOHN W. BULLARD, BRIGADIER GENERAL
UNITED STATES MARINE CORPS
COMMANDING GENERAL
MARINE CORPS INSTALLATIONS WEST-
MARINE CORPS BASE CAMP PENDLETON

DECLARATION OF ACCEPTANCE

FOR THE

FIVE-YEAR REVIEW

FOR OPERABLE UNITS 1 THROUGH 5
MARINE CORPS BASE
CAMP PENDLETON, CALIFORNIA

Pursuant to the delegation of the authority in Sections 2(d) and 11(g) of Executive Order 12580, and U.S. Department of Defense Instruction 4715.7 of 22 April 1996, the U.S. Department of the Navy is the approval authority for Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews conducted at sites under its jurisdiction, custody, or control.

3/26/2014
Date

JOHN W. BULLARD, BRIGADIER GENERAL
UNITED STATES MARINE CORPS
COMMANDING GENERAL
MARINE CORPS INSTALLATIONS WEST-
MARINE CORPS BASE CAMP PENDLETON

EXECUTIVE SUMMARY

This Five-Year Review has been prepared by the United States Department of the Navy (DON) in support of the Installation Restoration (IR) Program at Marine Corps Base (MCB) Camp Pendleton, California (Base), pursuant to Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9621(c), and the National Contingency Plan (NCP) 40 Code of Federal Regulations (CFR) Part 300.430(f)(4). The IR Program was developed by the Department of Defense (DoD) to remediate contamination at military facilities caused by past use, storage, handling, and disposal of hazardous and other potential toxic substances, as required by Section 121 of CERCLA. Soil and groundwater at MCB Camp Pendleton have been impacted by such substances and are currently being remediated pursuant to the IR Program. The DON is the lead DoD authority responsible for conducting remediation at the Base in conjunction with the United States Environmental Protection Agency (EPA), and with concurrence by the California Regional Water Quality Control Board (RWQCB), San Diego Region, and the State of California Department of Toxic Substances Control (DTSC). All of these agencies comprise the Federal Facilities Agreement (FFA) team.

This report is the third CERCLA Five-Year Review for MCB Camp Pendleton OU3 and presents a comprehensive review of remedies implemented as documented in Records of Decision (RODs) for IR sites belonging to one of the five Operable Units (OUs), as well as other sites not included in an OU. Table ES-1 summarizes the IR sites included in each of the five OUs and other sites not included in an OU. The FFA team members have signed RODs for five OUs: OU-1 (1995), OU-2 (1997), OU-3 (1999), OU-4 (2007), and OU-5 Sites 1A-1, 1H and 6A (2008) and Explanation of Significant Difference (ESD) for IR Site 9 (2004) and IR Site 1A (2007). All OU-1, OU-2 and OU-4 sites have achieved No Further Action (NFA) status. IR Site 7 is the only OU-3 site that requires completion of a Five-Year Review under the CERCLA program. Most of the other sites under OU-3 were considered NFA sites at the time the OU-3 ROD was signed and Sites 1A (OU-3), 1D and 30 (OU-4) 1A-1 and 1H (OU-5) were closed with a RACR within the last five years. A No Further Action ROD has been signed for OU5 Site 1111.

Table ES-1 - IR Sites at MCB Camp Pendleton*

**open sites in green text, closed sites in blue text*

Operable Unit 1 4, 4A, 9, and 24	**Operable Unit 2** 3, 5, 6, 8A, 15, 19, 20, 22, 2B, 28, 31, 43, 44, and 45	**Operable Unit 3** 7, 1E, 2A, 10, 16, 17, 27, 35, 1A, 1B, 1C, 1F, 1I, 2C, 2D, 2F, 2G, 18, 32, 34, 36, 37, 38, 39, 40, 41, and 42
Operable Unit 4 1D, 1E-1, 30	**Operable Unit 5** 1A-1, 1H, 6A, 1115, 12 Area Site 13, 21, 33, 62, 1111 and the 22/23 Area Groundwater Site	**Sites Not Currently Incorporated in an Operable Unit** 150, 1114, 1116, 1117, 1118, 1119, 1120, 1121, and 1122

In accordance with U.S. EPA guidance on completing Five-Year Reviews, this report specifically evaluates the effectiveness of the remedial alternatives implemented by answering the following questions:

- Are the remedies functioning as intended by the ROD?
- Are the exposure assumptions used at the time of remedy selection still valid?
- Has any other information come to light that could call into question the protectiveness of the remedies?

Based on the results of the Five-Year Review process, remedies that have not yet been completed, but are still in the construction phase for IR Sites: 12 Area Site 13, 33, 1115 and 22/23 Area groundwater (OU-5); and 1114, are expected to be protective upon completion and in the interim, exposure pathways that could result in unacceptable risks are being managed.

The remedy for IR Site 7 was found to be protective of both human health and the environment. The methane levels in compliance gas monitoring probe GP-9 have been addressed by the installation of a landfill gas mitigation program.

Discussion of this and other issues are provided as part of the Five-Year Review.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site name: Marine Corps Base Camp Pendleton		
EPA ID: CA2170023533		
Region: 09	**State:** CA	**City/County:** Camp Pendleton, San Diego County

SITE STATUS	
NPL status: ☑ Final ☐ Deleted ☐ Other (specify) _____	
Remediation status (choose all that apply): ☑ Under Construction ☒ Operating ☑ Complete	
Multiple OUs: ☑YES ☐ NO	Construction Complete date: Various dates
Has the site been put into reuse? YES NO ☑	

REVIEW STATUS	
Reviewing Agency: ☑ EPA ☑ State ☐ Tribe ☑ Other Federal Agency Department of the Navy	
Author Name: Adam Hill	
Author Title: Remedial Project Manager	**Author Affiliation:** Naval Facilities Engineering Command Southwest
Review period: March 31, 2009 (date of last Five-Year Review) to March 31, 2014	
Date(s) of inspection: December 19, 2013	

Type of Review: ☑ Statutory
☐ Policy (☑ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action site ☐ NPL State/Tribe-lead
☐ Regional Discretion)

Review number: ☐ 1 (first) ☐ 2 (second) ☑ 3 (third) ☐ Other (specify) _____

Triggering action:
☐ Actual RA Onsite Construction at OU ☐ Actual RA Start at OU #3, IR Site 7
☐ Construction Completion ☑ Previous Five-Year Review Report
☐ Other (specify) _Remedy Complete and final Five-Year Review_____

Triggering action date: March 31, 2009

Due date (five years after triggering action date): March 31, 2014

FIVE-YEAR REVIEW SUMMARY FORM (continued

Issues:

- Four new IR sites have been added to the MCB Camp Pendleton IR Program. The sites are discussed in detail in this document.

Protectiveness Statement(s):

Remedies that have not yet been completed, but are still in the construction phase for IR Sites 12 Area Site 13, 33, 1115, 22/23 Area groundwater and 1114 , are protective in the short term and will be protective in the long term.

The remedy for IR Site 7 was found to be protective of both human health and the environment. Methane levels have been addressed at GP-9 and GP-10 and remain below the 5 percent compliance threshold.

The final IR Site 7 landfill cover and associated monitoring systems were found to be isolating waste from the environment; minimizing sediment loading to nearby surface waters; functioning with a minimum amount of maintenance; providing long-term performance; and protecting the public health and safety. The methane will continue to be monitored and the Navy is moving forward with installation of the second phase of the landfill gas extraction system. Site access is controlled and is off limits to any training per Section 2002.1.h of Base Order P3500.1K, Range and Training Regulations Areas Prohibited from Training. LUCs have also been included in the Final PCMMP (NAVFAC, 2008b).

Other Comments:

- None

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FIGURES

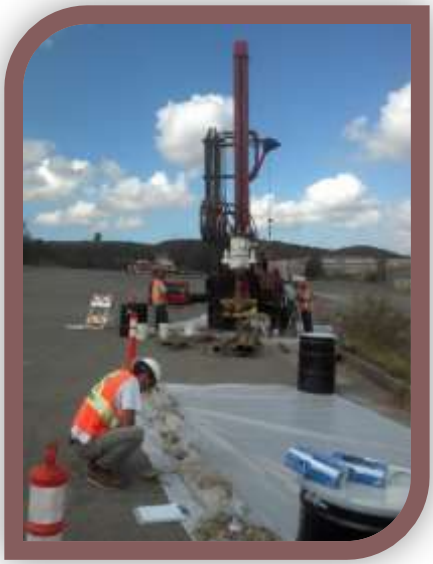
TABLES

ABBREVIATIONS AND ACRONYMS

amsl	above mean sea level
C	area of concern
ARARs	applicable or relevant and appropriate requirements
BAI	Barajas and Associates, Inc.
bgs	below ground surface
BMP	best management practice
CAMU	corrective action management unit
CATEX	Categorical Exclusion
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
cy	cubic yard
DCA	dichloroethane
DCE	dichloroethene
DoD	Department of Defense
DON	U.S. Department of the Navy
DRMO	Defense Reutilization and Marketing Office
DTSC	Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Difference
ET	evapotranspiration
FFA	Federal Facility Agreement
FS	feasibility study
GIS	geographic information system
GP	gas monitoring probe
HASP	health and safety plan
HHRA	human health risk assessment
IAS	Initial Assessment Study
IR	Installation Restoration
LOAEL	lowest-observed-adverse-effect-level
LUC	land use controls
MCB	Marine Corps Base
MCL	maximum contaminant level

MTF	Memo To File
MW	Megawatt
NAVFAC SW	Naval Facilities Engineering Command Southwest
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NEPA	National Environmental Policy Act
NFA	No Further Action
NMOC	non-methane organic compounds
NPL	National Priorities List
O&M	operation and maintenance
OU	Operable Unit
PA/SI	preliminary assessment/site inspection
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PCMMP	Post-Closure Monitoring and Maintenance Plan
PED	Preliminary Environmental Determination
POL	petroleum, oil, and lubricants
ppb	parts per billion
PRG	preliminary remediation goal
PV	photovoltaic
PWC	Public Works Center
RACR	Remedial Action Completion Report
RAO	Remedial Action Objective
RCRA	Resource Compensation and Recovery Act
RG	Remediation goals
RI	remedial investigation
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendment and Reauthorization Act
SI	site inspection
SWDIV	Southwest Division Naval Facilities Engineering Command
TCE	trichloroethene
TPH	total petroleum hydrocarbons
UST	underground storage tank
VOC	volatile organic compound

SECTION 1: INTRODUCTION



The United States Department of the Navy (DON) is conducting environmental restoration activities at Marine Corps Base (MCB) Camp Pendleton as part of the Installation Restoration (IR) Program. The IR Program was established by the Department of Defense (DoD) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 to identify, evaluate, and control the spread of contaminants from historical waste sites at military installations. MCB Camp Pendleton was placed on the National Priorities List (NPL) in 1989 (U.S. Environmental Protection Agency [EPA] No. CA2170023533) because groundwater and soils at various locations had become impacted with organic and inorganic constituents primarily as a result of past waste disposal practices related to vehicle maintenance and domestic and light commercial activities. The DON, acting on behalf of and in conjunction with the Base, has been conducting and implementing the IR Program at MCB Camp Pendleton since the early 1980s. The DON's cleanup efforts are being conducted in conjunction with the EPA, Region 9, the State of California Regional Water Quality Control Board (RWQCB), San Diego Region, and the State of California Environmental Protection Agency's Department of Toxic Substances Control (DTSC) through a Federal Facility Agreement (FFA) signed in 1990 (EPA, 1990).

The DON is preparing this Five-Year Review report pursuant to Section 121(e) of CERCLA, 42 U.S.C. 9621(e), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300.430(f)(4). This review was conducted from September through December 2013 and this report presents the results of this review. Analysis for the Five-Year Review was conducted by the Naval Facilities Engineering Command Southwest (NAVFAC SW). This document was reviewed and finalized for compliance with DON Policy for Conducting Five-Year Reviews Under the Installation Restoration Program (DON, 2004a), DON Environmental Restoration Program Manual (DON, 2006), and EPA Comprehensive Five-Year Review Guidance (EPA, 2001).

This report is a comprehensive Five-Year Review for MCB Camp Pendleton that presents the results of a review of remedies implemented at MCB Camp Pendleton as documented in Records of Decision (RODs) and Explanations of Significant Difference (ESDs) for IR sites belonging to one of the five Operable Units (OUs), as well as other sites not included in an OU. The IR sites included in OUs 1 through 5 and additional sites not incorporated into an OU are summarized in Table 1-1. Appendix A of the document contains a table providing more detailed descriptions and remedial status of all of the IR sites and other investigative areas within MCB Camp Pendleton.

Table 1-1: Summary of IR Sites at MCB Camp Pendleton

OU-1	
No Open IR Sites	**Closed IR Sites** 4, 4A, 9, and 24
OU-2	
No Open IR Sites	**Closed IR Sites** 3, 5, 6, 8A, 19, 20, 22, 2B, 28, 31, 43, 44, and 45
OU-3	
Open IR Sites 7	**Closed IR Sites** 10, 16, 17, 18, 27, 32, 34, 35, 36, 37, 38, 39, 40, 41, 42, 1A, 1B, 1C, 1E, 1F, 1I, 2A, 2C, 2D, 2F, and 2G
OU-4	
No Open IR Sites	**Closed IR Sites** 1D, 1E-1, and 30
OU-5	
Open IR Sites 1115, 12 Area Site 13, 21, 33, 62, and the 22/23 Area Groundwater Site	**Closed IR Sites** 1A-1, 1H, 6A soil, and 1111
Sites Not in OUs	
Open IR Sites 150, 1114, 1116, 1117, 1118, 1119, 1120, 1121, and 1122	**No Closed IR Sites**

The OUs and specific IR sites that are the focus of this Five-Year Review are summarized below:

- **Operable Unit 1**
- **Operable Unit 2**
- **Operable Unit 3**
  - Site 7
- **Operable Unit 4**
- **Operable Unit 5**
  - Site 33
  - 22/23 area groundwater
  - Site 1115
  - 12 Area Site 13
  - Site 62
  - Site 21
- **Sites Not Incorporated in an OU**
  - Site 150
  - Site 1114
  - Site 1116
  - Site 1117
  - Site 1118
  - Site 1119
  - Site 1120
  - Site 1121
  - Site 1122

1.1 Purpose

Consistent with Executive Order 12580, the Secretary of Defense is responsible for ensuring that Five-Year Reviews are conducted at all qualifying DoD cleanup sites. According to the Policy for Conducting Five-Year Reviews Under the Installation Restoration Program (DON, 2004a), a statutory Five-Year Review is required when both the following conditions are met:

- Remedial actions at a site are completed, and hazardous substances, pollutants, or contaminants remain above levels that allow for unlimited use and unrestricted exposure.
- The ROD for the site was signed on or after October 17, 1986.

1.2 Five-Year Review Trigger Date

According to the NCP, Five-Year Review reports are to be completed and signed within five years of the trigger date for a site, when, upon completion of the remedial action, hazardous substances, pollutants, or contaminants remain above levels that allow for unlimited use and unrestricted exposure.

This report is a comprehensive Five-Year Review for MCB Camp Pendleton that includes an overall evaluation of all five OUs, as well as other IR sites not included in an OU. The trigger date for the Five-Year Review process at Camp Pendleton was the date of the signing of the OU-3 ROD, because the land use controls required by the ROD became effective immediately upon implementation of the ROD (Southwest Division Naval Facilities Engineering Command [SWDIV], 1999). The first Five-Year Review for OU-3, specifically IR Site 7, was completed in March 2004, five years from March 31, 1999, the signing of the OU-3 ROD. IR Site 7 and Site 1A were the only OU-3 sites that required the completion of the CERCLA Five-Year Review process due to the presence of residual contaminants above levels that allow for unlimited use and unrestricted exposure. The second Five-Year Review was completed in March 2009 which focused on Sites 7 and 1D. This Five-Year Review includes a summary and evaluation of the remedial action progress at all sites closed with contamination in place, as well as those in the construction phase of remediation.

1.3 Document Organization

This Five-Year Review report is organized as follows:

Section 1.0 Introduction: Provides an introduction to the report and includes the purpose and authority for conducting the Five-Year Review; identifies the lead agency, the review number, and the trigger date; and summarizes the organization of the report.

Section 2.0 Site Chronology Table: Presents a summary of the chronology of cleanup-related events at MCB Camp Pendleton.

Section 3.0 MCB Camp Pendleton Background: Describes the general physical characteristics and land uses; the history of contamination; initial responses to the presence of contamination; and the basis for actions taken to address the contamination.

Section 4.0 Five-Year Review Process: Summarizes the components of the third Five-Year Review process, including administrative and community involvement components; and data review, site inspection, and interview procedures.

Section 5.0 Operable Unit 1: Presents background information on OU-1, including a summary of remedial actions and technical assessment of the actions taken at the site.

Section 6.0 Operable Unit 2: Presents background information on OU-2, including a summary of remedial actions and technical assessment of the actions taken at the site.

Section 7.0 Operable Unit 3: Presents background information on OU-3, including a summary of remedial actions, a technical assessment of the actions taken at the site, and progress since the last Five-Year Review; identifies any issues related to the protectiveness of the remedy based on the review; presents recommendations and follow-up actions, if needed, to address issues identified during the review; and provides a statement regarding the protectiveness of the site remedies.

Section 8.0 Operable Unit 4: Presents background information on OU-4, including a summary of remedial actions, a technical assessment of the actions taken at the site.

Section 9.0 Operable Unit 5: Presents background information on OU-5, including a summary of remedial actions, a technical assessment of the actions taken at the site, and progress since the last Five-Year Review; identifies any issues related to the protectiveness of the remedy based on the review; presents recommendations and follow-up actions, if needed, to address issues identified during the review; and provides a statement regarding the protectiveness of the site remedies.

Section 10.0 Status of Sites Not Included in an OU: Presents background information on sites not included in an OU, including a summary of remedial actions, a technical assessment of the actions taken at the site, and progress since the last Five-Year Review; identifies any issues related to the protectiveness of the remedy based on the review; presents recommendations and follow-up actions, if needed, to address issues identified during the review; and provides a statement regarding the protectiveness of the site remedies.

Section 11.0 Next Review: Provides the date for when the next Five-Year Review is planned.

Section 12.0 References: Lists all of the citations used throughout the report.

SECTION 2: SITE CHRONOLOGY TABLE

The chronology of cleanup-related events at MCB Camp Pendleton is provided in Table 2-1. Additional detailed information on the history of the site is located in various historical documents included in the Administrative Record file.

Table 2-1: Summary of the Chronology of Cleanup-Related Events at Camp Pendleton

Date	Event
March 1942	Construction of MCB Camp Pendleton started
October 1944	Base was dedicated as a permanent Base
November 1989	MCB Camp Pendleton was added to the NPL
October 1990	Signing of the Federal Facilities Agreement
October 1993	Remedial Investigation (RI) report for Group A sites conducted. IR Site 9 only site requiring remedial action via a feasibility study (FS)
1994	IR Site 9 FS completed
March 1995	RI report for Group B sites completed
December 12, 1995	Signing of the OU-1 ROD
1996	Box Canyon Landfill was designated a Corrective Action Management Unit (CAMU) for purposes of consolidating waste from various IR sites. This was accomplished by two separate Action Memorandums, one for Site 3, dated August 1996, and one for Site 6, dated April 1996.
September 23, 1996	RI and FS for Operable Unit 2, Site 8 and 22/23 Area Sites
November 12, 1996	RI report for Group C sites completed
July 16, 1997	Draft Final RI Report for Group D sites completed
September 30, 1997	Signing of the OU-2 ROD
May 1, 1998	Draft Final RI and FS for OU-3
1999	A CAMU was built within the landfill to contain impacted soils excavated from IR Sites 1A, 1E, 1F, and 2A
March 31, 1999	Signing of the OU-3 ROD
May 20, 2002	First Five-Year Review Report Submitted for OU-1 (IR Site 9)
January 2003	Final closure of IR Site 7 (Box Canyon Landfill) complete
December 19, 2003	FS report for OU-4 (Sites 1D, 1E-1, 1H and 30) completed
March 2004	First Five-Year Review for OU-3 (IR Site 7 [Box Canyon Landfill]), MCB Camp Pendleton completed

Date	Event
July 21, 2004	Draft Final RI for OU-5 (Sites 1A-1, 6A, 21, 1111, and 12 Area) completed
October 5, 2004	ESD signed for IR Site 9
September 29, 2005	Draft Final FS for OU-5 (Sites 1A-1, 1111, and 12 Area, Site 13) completed
June 27, 2007	Signing of the OU-4 ROD
September 25, 2007	ESD for IR Site 1a completed
September 27, 2007	Final Five-Year Review report submitted for OU-1 (IR Site 9)
January 30, 2008	Signing of the ROD for OU5 Sites 1A-1, 1H and 6A
March 31, 2009	Final Five-Year Review report submitted for OUs 1 through 5
November 24, 2009	Final Remedial Action Completion Report for OU5 Site 1A-1
June 21, 2010	Final Explanation of Significant Difference OU3 Site 7 (PV Panels)
August 1, 2010	Final Remedial Action Completion Report for OU4 Site 30
August 6, 2010	Final Action Memorandum Non-Time Critical Removal Action OU5 Site 33
August 26, 2010	Final Remedial Action Completion Report for OU3 Site 1A
January 10, 2011	Final Remedial Investigation Report and Feasibility Study for OU5 22/23 Area Groundwater Site
May 5, 2011	Final Remedial Action Completion Report for OU5 Site 1H
July 1, 2011	Final Proposed Plan for Cleanup of Groundwater at OU5 22/23 Area Groundwater Site
July 1, 2011	Final Proposed Plan for No Further Action at OU5 Site 1111
October 25, 2011	Final Remedial Action Completion Report for OU4 Site 1D (soils)
November 29, 2011	Final Memo to File OU3 Site 7 (LFG Extraction, no aerial surveys, reduce groundwater monitoring frequency, change LUC process)
December 15, 2011	Final Remedial Investigation Report for Site 1114
June 1, 2012	Final Action Memorandum Non-Time Critical Removal Action Site 1116
September 14, 2012	Revised Final Memo to File OU3 Site 7 (PV Panels – Phase II)
April 5, 2013	Final Record of Decision for No Further Action at Site 1111
April 15, 2013	Final Action Memorandum Non-Time Critical Removal Action Site 1114

SECTION 3: CAMP PENDLETON BACKGROUND

3.1 General Site Description

MCB Camp Pendleton is the primary Marine Corps amphibious training center on the west coast. In addition to amphibious training, training for many of the various Marine Corps missions also is accomplished at MCB Camp Pendleton. The Base, which occupies approximately 125,000 acres of land, is located almost entirely in northern San Diego County, California, approximately halfway between the cities of Los Angeles and San Diego (see Figure 3-1). Surrounding communities include San Clemente to the northwest, Oceanside to the south and Fallbrook to the east. The Base is bordered on the west by the Pacific Ocean and encompasses 17 miles of relatively undisturbed coastline. Rolling hills and valleys range inland an average of 10 to 12 miles. Construction of MCB Camp Pendleton started in March 1942, and President Franklin D. Roosevelt dedicated the Base in September 1942. Although MCB Camp Pendleton has been an important training facility since its inception in 1942, it was not designated a permanent Base until October 1944. The Base currently supports more than 36,000 military personnel and employs approximately 4,600 civilians.

The regional topography at MCB Camp Pendleton is varied and includes sandy coastal beaches and dunes, sea cliffs, coastal plains, marine terraces, hills, canyons, river valleys, and mountains rising to nearly 2,700 ft above mean sea level (amsl).

MCB Camp Pendleton lies within the Peninsular Range Geomorphic Province of Southern California. The oldest rocks that underlie the Base are intrusive and extrusive igneous and metamorphic rocks of Cretaceous age, exposed at the surface on hills and mountains in the central and eastern portions of the Base. Overlying these highly consolidated igneous and metamorphic basement rocks are a series of unconsolidated to semi consolidated sedimentary formations and alluvium of various thickness. Because development at the Base is largely on or near the alluvial valley floors, most developed areas are underlain by one or more of these sedimentary units.

Although groundwater is present in most sedimentary deposits throughout the Base, significant amounts of groundwater (capable of supporting domestic and agricultural needs) are restricted to the large alluvial river valleys, also called groundwater basins. These alluvial deposits are the water-bearing units, or aquifers, that supply most of the water used at MCB Camp Pendleton.

Four groundwater basins are located within the Base boundary: San Mateo Basin, San Onofre Basin, Las Flores Basin, and Santa Margarita Basin. The largest of these is the Santa Margarita Basin, which supplies the largest volume of groundwater to the Base.

3.2 Demography and Land Use

Land use within the perimeter of the Base consists of airfield operations, maneuver, and impact areas; troop and family housing; recreation areas; and out-leased areas used by various entities (e.g., San Onofre Nuclear Generating Station and agriculture). Most of the land within MCB Camp Pendleton is open and undeveloped and directly supports the training mission of the Base. Developed areas of the Base are isolated from one another by large areas of essentially undeveloped land used for training and maneuvers.

The largest concentration of development is at the Headquarters Area in the southeastern corner of the Base. The second largest concentration is the housing areas in the southwestern corner of the Base, near the Oceanside Gate (Innis-Tennebaum Architects, Inc., 1990).

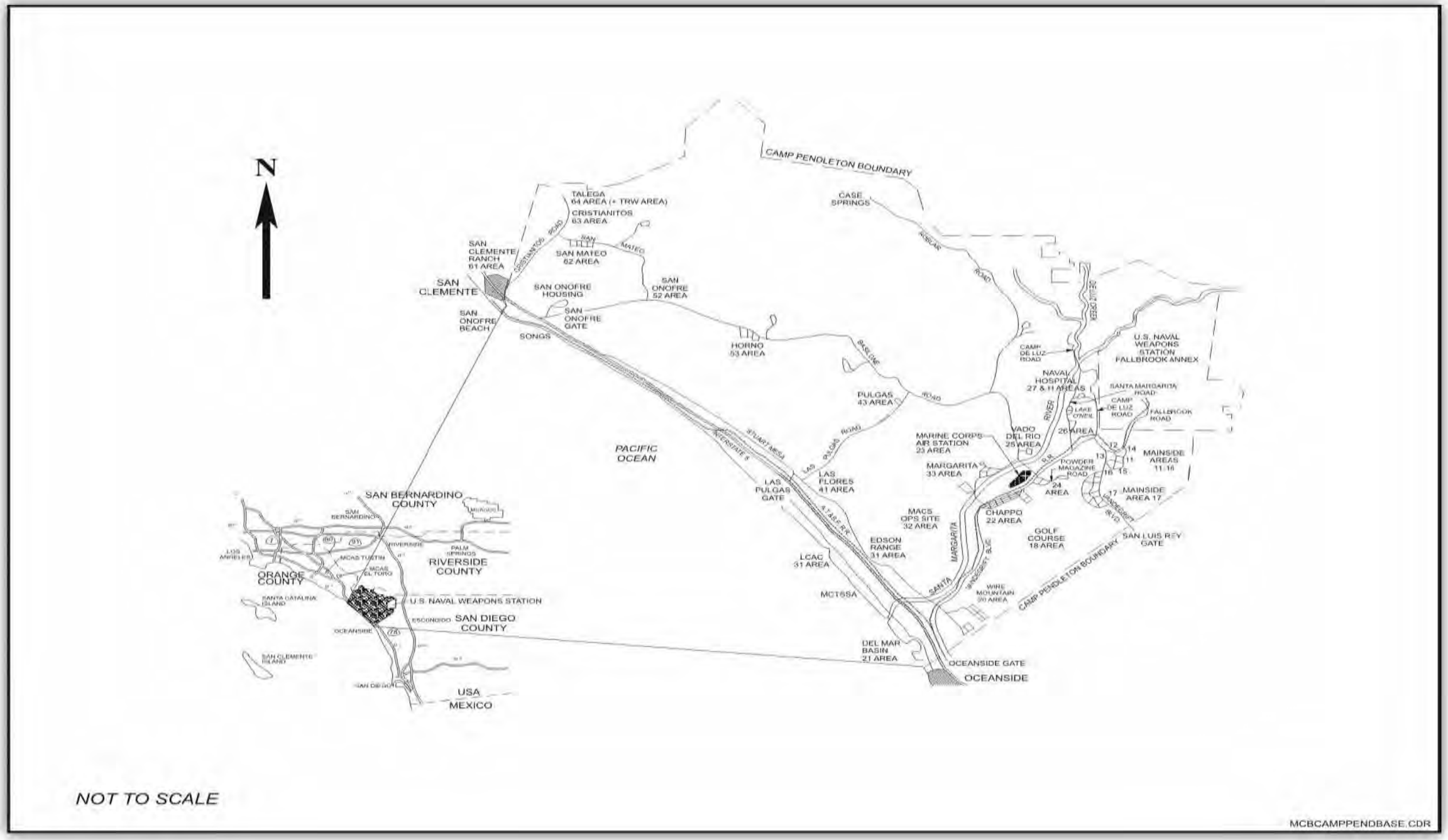


Figure 3-1: Location of MCB Camp Pendleton

3.3 History of Contamination

The history of contamination is discussed on a site-by-site basis in Sections 5.0 through 10.0.

3.4 Initial Response

In 1980, the DoD instructed each branch of the armed services to comply with the requirements of CERCLA (and later with Superfund Amendment and Reauthorization Act [SARA]). In response, the DON established its IR Program to investigate and clean up sites on Navy and Marine Corps Bases that had been contaminated by past waste disposal practices. Under the IR Program, sites can be cleaned up through either removal or remedial actions. A remedial action is conducted to control or clean up contamination not posing an immediate threat. A removal action is conducted to address immediate and significant dangers to the public or the environment. Removal actions may either be short-term or long-term solutions; remedial actions are long-term solutions. Both remedial and removal actions begin with a preliminary assessment/site inspection (PA/SI).

Naval Energy and Environmental Support Activity (NEESA) completed an Initial Assessment Study (IAS) of the Base in September 1984 (NEESA, 1984). The IAS fulfilled the requirements for a PA, and sites requiring further action were identified. In July 1988, SWDIV conducted a site inspection (SI) and identified 54 sites (MCB Camp Pendleton, 2002).

Based on the results of the SI, MCB Camp Pendleton was placed on the NPL of hazardous waste sites on November 15, 1989. Contamination at MCB Camp Pendleton was primarily the result of waste disposal practices occurring prior to the establishment of environmental regulatory guidance. Common practices at the Base that generated waste include maintenance and repair of trucks, tanks, and aircraft. Vehicular fluids and solvents have been the principal wastes generated on-Base. Other support operations, such as pest control and dry cleaning also have contributed to Base contamination.

In 1990, a FFA was entered into for MCB Camp Pendleton. The FFA is a legally binding document that outlines the schedule for completing the investigation and cleanup of contaminated sites. Parties to the FFA include the EPA, State of California Department of Health Services (this agency is now known as the DTSC), State of California RWQCB, the Navy, and the Marine Corps. The FFA specifies the working relationship between the DON and agencies during the environmental restoration process. It also states the responsibilities of the DON and each agency, and provides a schedule for completing activities (MCB Camp Pendleton, 2002).

The parties to the FFA initially assigned the IR sites at the Base to four groups (Groups A, B, C, and D) based on each site's potential impact to human health and the environment. Those sites that potentially posed the most significant threat were placed into Group A and were investigated first (SWDIV, 1993), and those sites with the lowest potential for such impacts were placed into Group D and were investigated last (SWDIV, 1997).

To streamline the cleanup process, a majority of the IR sites then were incorporated into five OUs. RODs have been signed for all five OUs (Table 2-1). IR Program remedial activities and investigations are ongoing for OU-5 sites, as well as nine other sites that are being addressed individually, without

incorporation into an OU. Figure 3-2 is a map that presents the location of each open IR site at MCB Camp Pendleton, and provides a reference location for the individual site maps that are provided in subsequent sections of this report.

3.5 Basis for Taking Remedial Action

The basis for the action is discussed on a site-by-site basis in Sections 5.0 through 10.0.

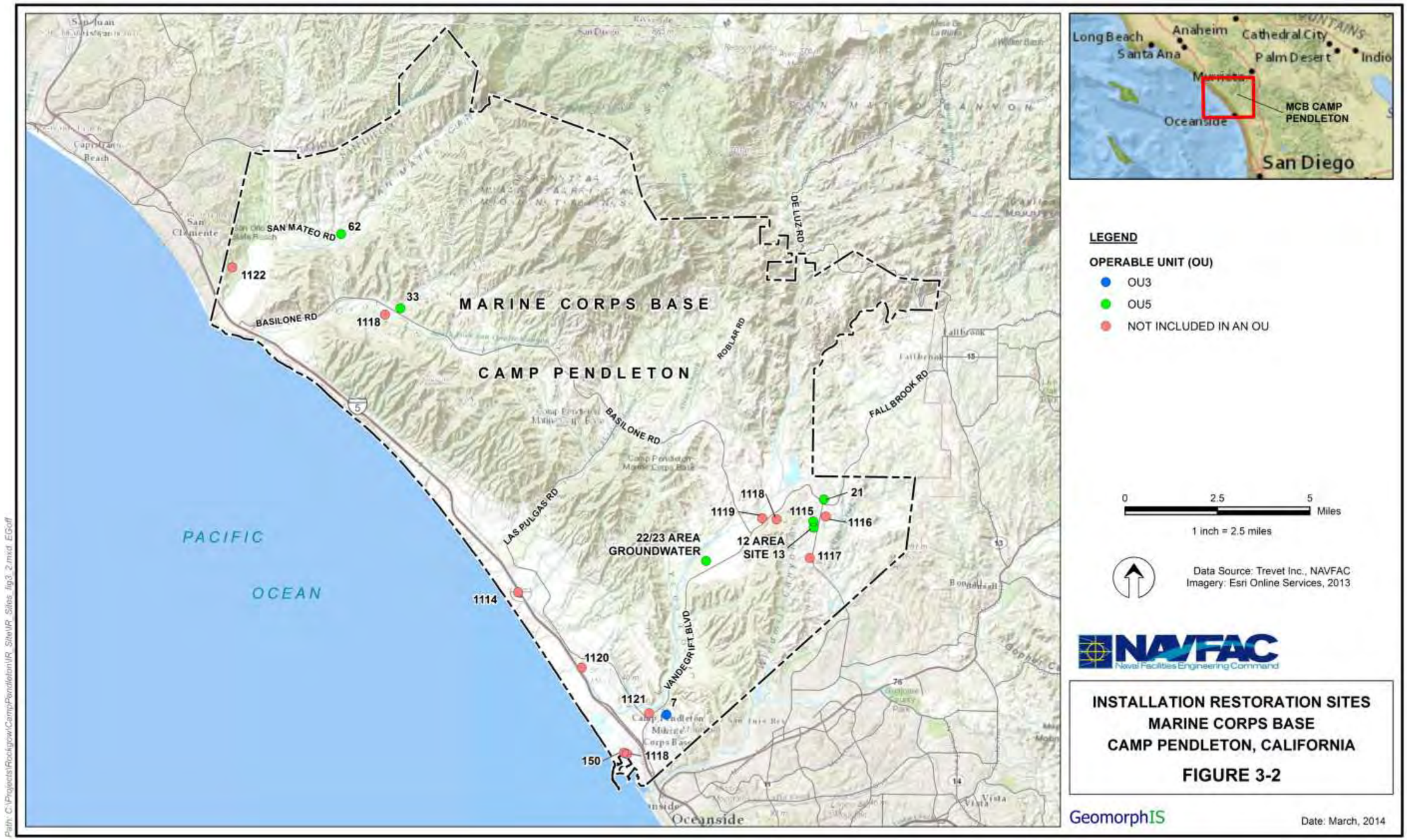


Figure 3-2: MCB Camp Pendleton Installation Restoration Site Locator Map

SECTION 4: FIVE-YEAR REVIEW PROCESS

EPA's Comprehensive Five-Year Review Guidance (EPA, 2001) and DON Policy for Conducting CERCLA Statutory Five-Year Reviews (DON, 2004a) outline the Five-Year Review process and the elements required. This section describes the review process and presents the data reviewed as part of this Five-Year Review for MCB Camp Pendleton.

4.1 Administrative Components

This section provides the identification of review team members and outlines components and the schedule of the Five-Year Review.

From September to December 2013, DON Remedial Project Manager, Mr. Adam Hill, of NAVFAC SW, led this Five-Year Review process, with participation from the following team members:

- Ms. Theresa Morley, PE, Remedial Project Manager, NAVFAC SW
- Mr. Joseph Murtaugh, MCB Camp Pendleton Environmental Security
- Mr. Bob Breglio, Project Manager (Trevet [NAVFAC contractor])

Mr. Hill was supported by NAVFAC SW technical, legal, and managerial staff.

The Five-Year Review consisted of the general tasks:

- Community notification
- Document review
- Data review
- Site inspection
- Interviews and questionnaires
- Five-Year Review report development

4.2 Community Notification

Public notices that the Five-Year Review was being conducted for the Base and that a final report will be made available to the public for review and comment were published in the MCB Camp Pendleton Scout newspaper on January 24, 2014, and the North County Times newspaper on January 24, 2014. A contact telephone number was provided in each publication for interested parties requiring additional information. The public notice was reviewed and approved by the Public Participation Specialist for DTSC.

4.3 Data Review

This third Five-Year Review consisted of a review of relevant documents including operation and maintenance (O&M) records and monitoring data; RODs; ESD and Memo to File (MTF) to the RODs, where appropriate; confirmation reports; closure reports; applicable soil and groundwater cleanup standards; and other reports listed in Section 12.0 (References) and referenced herein. Appendix A presents a summary of the status of all IR sites at MCB Camp Pendleton.

4.4 Site Inspection

Inspections at the 16 IR sites that are the focus of this Five-Year Review were conducted on December 19, 2013, for the purpose of assessing the protectiveness of the remedies. The Navy conducted the site inspections. Appendix B contains photographs of the current conditions of the sites.

Erosion controls include practices such as preserving vegetation, hydroseeding, geotextiles and mats, and earth dikes and drainage swales.

4.4.1 OU-3 IR Sites

For Site 7 (Box Canyon Landfill), detailed site inspections were conducted in May, October, and December 2013 by Trevet, Inc. in accordance with the final Post-Closure Monitoring and Maintenance Plan (PCMMP) (NAVFAC, 2008a) and a site visit was conducted in December 2013 by the Navy. Maintenance and inspection activities for Site 7 are documented in the Annual Inspection and Site Maintenance Report (Trevet, 2013). Maintenance and inspection activities for the landfill include weed control, well/gas probe sampling, inspection of landfill cover and ancillary structures prior to and after the rainy season, and surveying of two settlement monuments, SM-1 and SM-2, every six months by a licensed surveyor.

Findings as reported in the latest Annual Site Maintenance Report (Trevet, 2013) were:

- The ancillary structures in relation to the cover (e.g., drainage channels and erosion control structures) were free from damages that would otherwise impact their functionality.
- Overgrown vegetation was removed from the drainage structures and from areas adjacent to wells and gas probes to improve access for monitoring and sampling activities.
- Broad areas of vegetation across the site were cleared in 2010 and 2012 in preparation for the installation of photovoltaic panels across the site.
- Areas of standing water were not observed nor were visible signs of erosion present.

Site inspection activities conducted during the previous Five-Year Review were revisited during NAVFAC's December 2013 site visit and included inspection of the landfill cap, access roads, drainage ditches and outfalls, fencing, signs, and monitoring points.

The landfill cap was covered with vegetation across the majority of the cap with some areas undergoing re-vegetation following installation of the solar panels..

Landfill access roads are all-weather accessible, well maintained, and in good operable condition, and drainage ditches and outfalls observed during the site inspection appeared to be well maintained and in good working condition).

The site is secured by a chain-link perimeter fence along the top deck. Gates allowing access to the landfill are locked. In general, the perimeter fence was in good condition and areas of disrepair were not observed. A "no trespassing" sign was placed on the main entrance to the landfill. No safety concerns were noted.

4.4.2 OU-5 IR Sites

Pilot studies are being conducted at 12 Area Site 13, 21, 22/23 Area groundwater and will begin soon at Site 1115. The first phase of a Removal Action (excavation) has been completed at Site 33 and a second phase is schedule to begin in early 2014. No concerns were noted.

Site 62 is not undergoing any active remediation. Photos in Appendix B show the current conditions of these sites. No concerns were noted.

4.4.3 Sites Not Incorporated into an OU

A Removal Action has been completed at Site 1114, the excavation has been backfilled, and bioremediation substrate was placed into the excavation before it was backfilled. Groundwater monitoring has been instituted at the site. The first phase of a Removal Action (excavation) has been completed at three of the nine subsites that comprise Site 1116; pilot studies are scheduled to begin at two of the three subsites in early 2014. Sites 1117 through 1122 were not undergoing any active remediation. No concerns were noted.

4.5 Land Use Controls

At MCB Camp Pendleton, the Site Approval process is used to manage land use controls (LUCs) and open IR sites instead of the Base Master Plan (Innis-Tennebaum Architects, Inc., 1990). The Base created the Site Approval process wherein a Preliminary Environmental Determination (PED) must be filled out by the project proponent before any projects on base are initiated. The PED describes the project, including timeframe, location, and proposed invasive activity, and is routed through Environmental Security to identify potential issues before allowing the project. The IR Manager located in the Environmental Security office at MCB Camp Pendleton compares the PED against the geographic information system (GIS) layer of IR sites and makes a determination on whether the project may proceed or not. This determination is then forwarded to the planning branch of Environmental Security. If the project has no potential IR or other environmental issues (as determined by other environmental departments), a categorical exclusion (CATEX) or other appropriate National Environmental Policy Act (NEPA) document is issued and the project is approved. If there are potential issues, the PED is rejected and sent back to the initiator unapproved and with a written explanation of why the project was not approved. In this way, LUCs are managed for open IR sites and IR Site 7. The Memorandum To File (Trevet, 2011b) documented the use of the Site Approval Request (SAR) Process instead of the Base Master Plan process as stated in the Record of Decision for OU-3.

4.6 Interviews

Interviews or questionnaire forms regarding remedy performance and remedy functions were conducted or filled out in December 2013 by the following individuals:

- Mr. Adam Hill, NAVFAC Project Manager

Interview summaries and completed questionnaire forms are provided in Appendix C. The interviews and questionnaires augmented the assessment of remedy implementation and identification of issues or concerns.

SECTION 5: OPERABLE UNIT 1

Seven IR sites (3, 4, 4A, 5, 6, 9, and 24) were originally included in the Group A RI (SWDIV, 1993). Currently, OU-1 includes four of these seven sites (IR Sites 4, 4A, 9, and 24). The OU-1 RI indicated that soil contamination at IR Sites 4, 4A, 9 and soil and groundwater contamination at IR Site 24 were acceptable for unrestricted land use. Site 9 met the RAOs as documented by ESD (PWC, 2004a) except for VOCs in monitoring well 9W-07A. The VOCs in monitoring well 9W-07A were identified as new IR Site 1114 designated the 41 Area Arroyo Site and Site 9 was closed. Further discussion of Site 1114 is found in Section 10. Further evaluation of the groundwater at IR Sites 4 and 4A was transferred for inclusion in the 22/23 Area Groundwater site (now a part of OU-5 [see Section 9.3]). Removal actions were performed for Sites 3, 5, and 6, and these sites were subsequently placed in OU-2.

The requirement for Five-Year Reviews has been completed or was not required for any of the OU-1 IR sites; thus, no further discussions for these sites will be included in this report.

SECTION 6: OPERABLE UNIT 2

OU-2 is comprised of 13 IR sites: 3, 5, 6, 8A, 19, 20, 22, 2B, 28, 31, 43, 44, and 45. "No Action" was the remedy stipulated in the OU-2 ROD (EPA, 1997) for sites 8A, 19, 20, 22, 2B, 28, 31, 43, 44, and 45. Removal actions (soil excavation) were completed at Sites 3, 5, and 6 and resulted in clean closures for all three sites as documented in the Draft Site Closeout Report for Site 3 (OHM, 1997a), the Draft Final Site Closeout Report for Site 5 (OHM, 1996) and the Draft Final Removal Action Site Closure Report for Site 6 (OHM, 1997b). The "No Action" remedy for Sites 3, 5, and 6 was specified in the OU-2 ROD (EPA, 1997). All 13 OU-2 sites have been closed with unrestricted land use. The remedies are protective in the long-term of both human health and the environment. Therefore, Five-Year Reviews are not required for any of the OU-2 IR sites and no further discussions for these sites will be included in this report.

SECTION 7: OPERABLE UNIT 3

The ROD for OU-3 was signed in March 1999 and addressed 28 IR sites: 7, 1D, 1E, 2A, 10, 16, 17, 27, 35, 1A, 1B, 1C, 1F, 1I, 2C, 2D, 2F, 2G, 18, 32, 34, 36, 37, 38, 39, 40, 41, and 42. In addition, as described in the OU-3 ROD (SWDIV, 1999), five sites originally included in OU-3 (1G, 1H, 2E, 29, and 30), either were removed from the CERCLA process (1G and 29), could not be found (2E), or were transferred to another OU for further evaluation (1H [OU-5] and 30 [OU-4]). The OU-3 ROD (SWDIV, 1999) presented the selected remedial actions for six sites (1A, 1D, 1E, 1F, 2A, and 7). IR Sites 1A, 1D, 1E, and 1F are all former refuse burning grounds, IR Site 2A is a former grease disposal pit, and IR Site 7 is a landfill (Box Canyon Landfill). In 2000, Site 1D was transferred out of OU-3 and is being addressed in OU-4. The OU-3 ROD stipulated "No Action" was necessary for the remaining 22 IR sites included in OU-3.

The selected remedy for IR Sites 1E, 1F, and 2A included excavation with disposal of the excavated soil at a waste disposal unit located at the Base (i.e., IR Site 7 was designated as a CAMU). Groundwater was not impacted by the contaminated soil at each of these sites, and thus was not included as a medium of concern. Remedial actions were completed for Sites 1E, 1F, and 2A and the three sites were closed. All three sites were remediated to achieve cleanup standards stated in the OU-3 ROD as documented in Remedial Action Site Closure Reports (IT Corporation, 2003a; IT Corporation, 2003b; IT Corporation, 2003c). The selected remedy for IR Site 1A was soil excavation, backfill, off-base disposal, and site restoration as outlined in the OU-3 ESD (NAVFAC Southwest, 2008). Excavation was completed in 2009 and demonstrated completion of the remedial action as documented in the Remedial Action Completion Report (Battelle, 2010b).

Because exposure to residual contamination at IR Sites 1A, 1E, 1F, and 2A was acceptable for unrestricted land use, a Five-Year Review is not required; therefore, these IR sites are not discussed further in this report.

A description of the current status of the one remaining IR Site that required remedial action (Site 7) is provided below. Evaluations of the effectiveness of the remedial alternatives implemented are also provided.

7.1 Site 7

7.1.1 Background

IR Site 7, Box Canyon Landfill, is located near the southwestern corner of the Base in the 20 Area, east of Vandegrift Boulevard and less than one mile northeast of Stuart Mesa Road (see Figure 3-2). The inactive landfill covers an area of approximately 28 acres. The majority of Box Canyon in which landfilling activities were conducted has been filled with landfill material to the surface of the surrounding marine terrace, which is approximately 140 ft above the Santa Margarita riverbed. Near the canyon entrance, the landfill slopes steeply down to the north and terminates approximately 1,000 ft from the Santa Margarita River.

The site was used for quarry operations from approximately 1946 to 1970. The site began Class III landfill operations in May 1974, and ended operations in 1984. The landfill has been inactive since 1984. Typical wastes accepted for landfilling reportedly included household and construction refuse consisting of tree and lawn clippings, scrap lumber and metal, appliances, furniture, paper, fill, dirt, asphalt, concrete, tile, cans, containers, magazines, and boxes. The site also reportedly received dry-cleaning sludges containing stoddard solvent; contaminated soil and dumpster waste containing fuels, petroleum, oil, and lubricants (POLs), solvents, thinners, strippers, epoxies, sealants, paint wastes, and chemical cleaners.

In 1996, IR Site 7 was designated a CAMU for purposes of consolidating remediation wastes from various MCB Camp Pendleton IR sites. IR Site 7 contains wastes (approximately 406,000 tons of treated [stabilized] and untreated soil) from two CERCLA removal actions conducted in 1996 at IR Sites 3 and 6 (CAMU 1) and a CERCLA remedial action conducted in 1999 at IR Sites 1A, 1E, 1F, and 2A (CAMU 2). In general, CAMU 1 contains pesticide-impacted soil and CAMU 2 contains metal-impacted soil. Figure 7-1 shows the locations of the CAMUs within the landfill. After emplacement of the waste and soils in the landfill, the site was covered with clean soil and the upper surface was contoured and seeded with native plant species.

The landfill material is known to be contaminated; however, sampling of the fill material was not conducted as recommended in the EPA Presumptive Remedy Guidance (EPA, 1993). The site was investigated to determine the potential for off site gas migration and the potential impact to groundwater during the RI. The potential for gas migration was determined not to be a concern. However, remedial action (engineered cap) was recommended in the OU-3 ROD (SWDIV, 1999) for long-term protection of groundwater in the vicinity of Site 7.

7.1.2 Remedial Actions

The selected remedy for IR Site 7 (Box Canyon Landfill) addressed the low-level threats posed by the landfill. This remedy required containment of the wastes, elimination of exposure pathways, and long-term monitoring and maintenance of the containment system. Because the remedy for IR Site 7 allowed contaminants to remain on site above levels that allow for unlimited use and unrestricted exposure, a Five-Year Review is required. The OU-3 ROD (SWDIV, 1999) stipulated the following as the necessary remedial action at the landfill:

- Installation of an evapotranspiration (ET) cover consisting of a vegetated topsoil layer (minimum thickness of 12 inches), a minimally compacted middle soil layer (minimum thickness of 48 inches), and a compacted low-permeability bottom layer (minimum thickness of 12 inches).
- Installation of lined surface water drainage structures and erosion control measures.
- Construction of an access road.
- Implementation of a post-construction monitoring and maintenance plan.
- Documentation of the remedial action process, quality control confirmation test data, and final as-built conditions.

The final remedy and associated land use control requirements for IR Site 7 were issued under the ROD for OU-3 in January 1999. The site began closure construction in July 2001. A 6-foot-thick (minimum) earthen closure cover was completed and the site was revegetated in December 2002. Final closure of the landfill was completed by the installation of the permanent perimeter fence, and post-closure monitoring activities were initiated in February 2003.

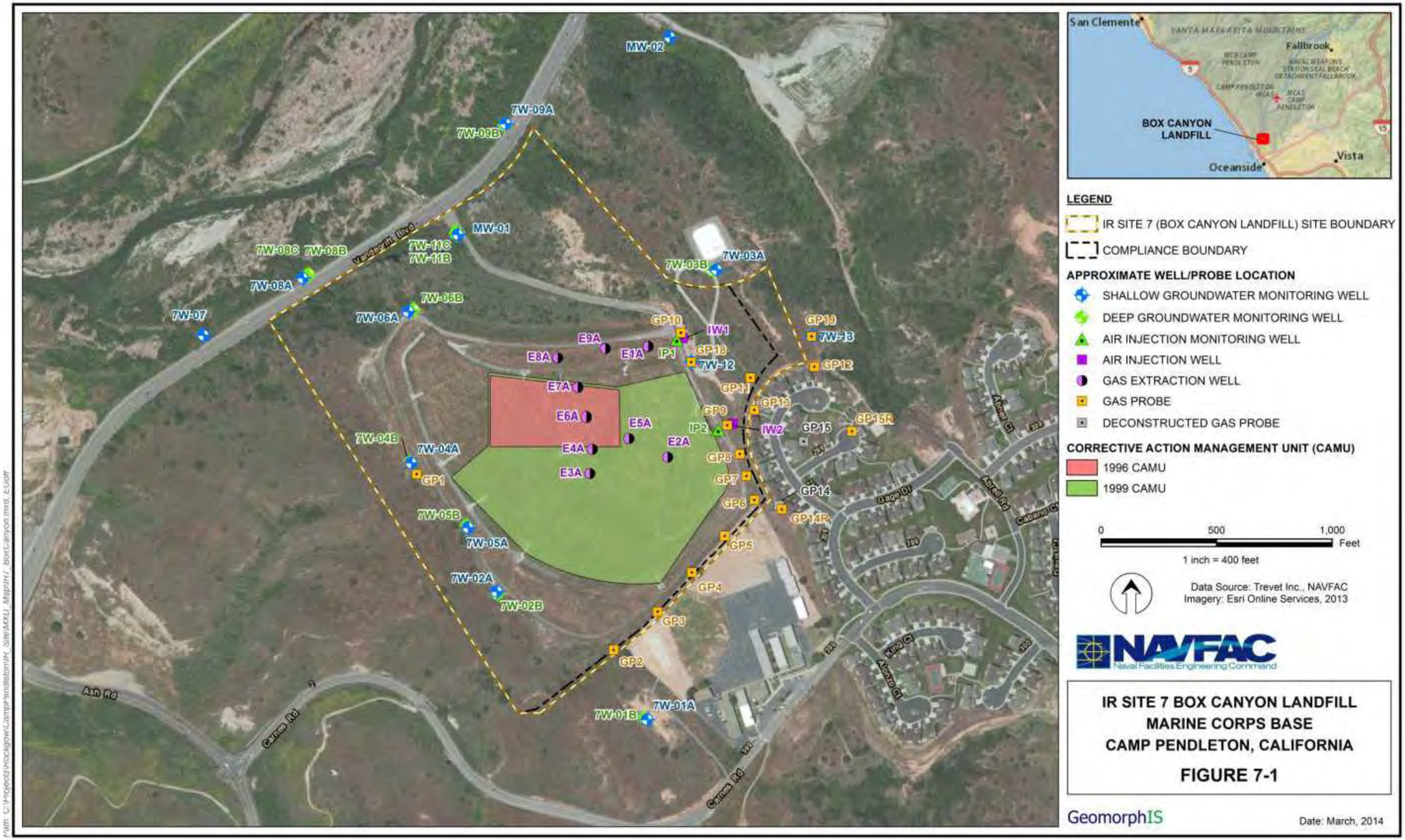


Figure 7-1: Box Canyon Landfill Layout

7.1.3 System Operation and Maintenance

There continues to be post-closure monitoring of groundwater and landfill gas, as well as maintenance of the landfill cover and associated drainage ditches and access roads. The Final PCMMP was issued on April 25, 2008 (NAVFAC, 2008b). This document establishes uniform procedures for conducting long-term post-closure maintenance and monitoring activities required by the ROD. Detailed plans have been developed for controlling erosion and sedimentation, monitoring groundwater, monitoring landfill gas, and conducting cover, drainage, and vegetation maintenance. In addition, a detailed contingency plan was included that outlines possible courses of action should monitoring indicate chemical concentrations in landfill gas monitoring locations exceed their respective action limits. Table 7-1 summarizes the post-closure monitoring frequency requirements for the tasks. Actual costs for post-closure maintenance and monitoring for 2013 are provided in Table 7-2.

Table 7-1: Post-Closure Monitoring Frequency (NAVFAC, 2008b)

Task	Frequency of Task	General Reporting Requirements
Post-Closure Landfill Gas Monitoring	Quarterly – for sampling locations with reported methane concentrations less than 1.25%	Within 90 days of sampling
	Monthly – for sampling locations with reported methane concentrations greater than 1.25% but less than 4%	
	Bi-weekly – for sampling locations with reported methane concentrations greater than 4%	
Water Quality Monitoring Program	Annually	Annually
Surface Vegetation (check for coverage and ponding)	Semi-annually	Annually
Earthen Cover	Same as surface vegetation	Annually
Settlement Monument Surveys	Semi-annually	Annually
Drainage Structures	Same as surface vegetation	Annually

Table 7-2: Post-Closure Maintenance and Monitoring Costs[1]

Task	Cost
Groundwater monitoring and reporting	$55,000[2]
Landfill gas monitoring and reporting	$75,000
Inspections and maintenance	$32,000
Settlement monitoring	$5,000
LFG system operation and maintenance	$112,000

1. Costs are actual awarded contract costs for calendar year 2013 rounded to the nearest $1,000
2. 2013 groundwater monitoring included a limited suite of analytes. A full suite is run every three years at an additional cost of $15,000. The next full suite is due 2014

In 2010 an ESD (SDVJV) was completed to change the land use specified in the ROD to include a 1.48 Megawatt (MW) solar photovoltaic (PV) system over six acres of the landfill cap. Construction was completed in January 2011. A Memo to File (MTF) was completed in May 2011 (CH2M HILL) adding an additional 1.44 MW of photovoltaic panels over six acres of the landfill cap. The MTF was revised in September 2012 (CH2M HILL) to incorporate a new design with only four acres on the landfill cap and two acres to the south of the landfill.

Figure 7-12 shows the completed Phase I and final design for Phase II of the PV system.

In November, 2011, a MTF (Trevet) was completed to document future activities and changes to the OU-3 ROD. The MTF included the following:

1. Installation of landfill Gas (LFG) extraction wells to be used as part of a future LFG Mitigation System. The installation of the extraction wells breached the landfill cap.
2. Removal of the aerial survey requirement due to installation of photovoltaic panels and lack of landfill settling.
3. Changing the groundwater monitoring frequency from quarterly to annual.
4. Changing the land-use controls process from the Base Master Plan (BMP) to the Site Approval Request (SAR) Process.

In 2012 seven gas extraction wells with solar-powered vent flares and two air injections wells were installed at the site to address methane levels in the landfill compliance wells, specifically GP-9. The details of the system and installation are outlined in the Box Canyon Landfill Gas Mitigation System Technical Memorandum Addendum (Trevet, 2012a). Air injection was completed in March 2012, and methane levels at GP-9 and GP-10 have remained below the five percent compliance threshold. Two additional extraction wells with vent flares and one additional air injection well were installed in December 2013.

7.1.3.1 Groundwater Monitoring

A total of 22 groundwater wells are installed at or near the site. Groundwater in select wells is monitored annually in accordance with the Baseline Groundwater Quality Sampling and Analysis Plan (IT Corporation, 2003), as amended and the Final PCMMP (NAVFAC, 2008b). The ROD provided for semi-annual sampling at IR Site 7 for five years; however, a review of data collected through 2005 supported a conclusion agreed to by the regulatory community that a less frequent sampling schedule would provide adequate data density (General Dynamics Information Technology, 2007; NAVFAC, 2008b). The objective of groundwater monitoring is to monitor groundwater quality both up gradient and downgradient of the site to assess whether contaminants associated with the landfill are potentially affecting local groundwater.

The most recent groundwater monitoring event occurred in February 2013. Results from this event as reported in the 2013 Annual Groundwater Monitoring Report (Trevet, Inc., 2013) are summarized below.

In 2013, groundwater levels and analyte concentrations were consistent with results from previous sampling events. Low concentrations of VOCs and methane exist in groundwater. Only one VOC (1,2-DCA at 1.6 µg/L) exceeded its MCL of 0.5 µg/L. VOC results do not show seasonal variations. Detected methane concentrations ranged from 1.0J to 340 µg/L in eight of the twelve wells sampled. These results are consistent with results from previous sampling events.

7.1.3.2 Perimeter Landfill Gas Monitoring Results

The potential for landfill gas migration has been monitored at 17 locations installed along the perimeter of Site 7 since August 2001. Each monitoring point contains one, two, or three depth-discrete probes per location. A total of 38 gas probes (GPs) were installed in the most likely gas migration pathways (the coarsest, most permeable soils) surrounding the landfill. Probe spacing was reduced near the Santa Margarita Elementary School (250-ft spacing) and military housing areas (125-ft spacing) to ensure protectiveness of human health. The current landfill gas monitoring network consists of 38 GPs installed at various depths in 17 wells: 11 along the site boundary and six located outside the IR Site 7 compliance boundary. GP-14 and GP-15 in the Wire Mountain Housing Area were abandoned in 2013 due to water infiltration resulting from landscape irrigation. Replacement gas probes were installed outside of the inundated areas. These landfill GPs have been monitored in accordance to the approved sampling plan since they were installed during the cover construction and continue to be monitored as per the Final PCMMP (NAVFAC, 2008b).

Concentrations of methane in shallow perimeter landfill GPs located at the property boundary nearest the Wire Mountain Military Housing development (GP-8 and GP-11) have remained below detection limits since monitoring began in 2005. Following air injection in March 2012 and installation of the landfill gas extraction wells in June 2012 the other perimeter monitoring well near the boundary by the Wire Mountain Military Housing development, GP-9, has maintained methane concentrations below the 5 percent by volume State compliance criterion.

In 2011 a comprehensive landfill gas study was done at all 38 GPs for non-methane organic compounds (NMOCs). In addition a Human Health Risk Assessment (HHRA) was completed using the analytical data acquired from the sampling event. The results presented in the Landfill Gas Monitoring Report (Trevet, 2012) of the sampling and HHRA demonstrate that landfill gas do not present an unacceptable risk to potential receptors at the housing area or adjacent elementary school and the selected remedy remains protective of human health with respect to inhalation of NMOCs.

7.2 Progress Since Last Review

According to the last Five-Year Review (NAVFAC, 2009), the remedial action at OU-3 IR Site 7 was found to be protective of human health and the environment because potential exposure pathways that could result in unacceptable risks were being controlled and monitored.

Potential issues identified during the last Five-Year Review (NAVFAC, 2009) and follow-up actions taken within the last five years to address them are summarized in Table 7-3.

Figure 7-2: IR Site 7 Box Canyon Landfill

7.3 Technical Assessment

7.3.1 Is the Remedy Functioning as Intended by the Decision Document?

The remedy selected for IR Site 7 in the OU-3 ROD (SWDIV, 1999) has been implemented successfully. As described in Section 7.1.2, actions at IR Site 7 included installation of an ET cover to close the CAMU and the landfill, installation of lined drainage structures and erosion control devices, construction of access roads, initiation of a routine groundwater and landfill gas monitoring program, initiation of post-closure site monitoring and maintenance, and initiation of the documentation of the remedial action process. The components of the remedial action appear to be performing per the ROD. Based on the site inspection, interviews, and review of available information, the landfill cover, drainage structures and erosion control devices, access roads, and other controls are properly constructed.

Table 7-3: Potential Issues Identified and Follow-up Actions

Issue Identified in 2009 Five Year Review	Issue Resolution Since 2009
Methane levels in compliance GP-9 continue to be near the 5 percent by volume criterion	A two approach solution was adopted in 2012 to reduce methane concentrations: air injection and vent flares. Methane concentrations have been held below 5 percent by volume since.

A description of the PCMMP was provided in Section 7.1.3 along with a schedule and actual O&M costs. The O&M costs for IR Site 7 include groundwater and landfill gas monitoring and maintenance of the cover, vegetation, drainage structures, access roads, and operation and maintenance of the landfill gas mitigation system.

7.3.1.1 Institutional Controls

At MCB Camp Pendleton, the Site Approval process is used to manage land use controls (LUCs) and open IR sites instead of the Base Master Plan (Innis-Tennebaum Architects, Inc., 1990). The Base created the Site Approval process wherein a Preliminary Environmental Determination (PED) must be filled out by the project proponent before any projects on base are initiated. The PED describes the project, including timeframe, location and proposed invasive activity, and is routed through Environmental Security to identify potential issues before allowing the project. The IR Manager at the Base compares the PED against the geographic information system (GIS) layer of IR sites and makes a determination on whether the project may proceed or not. This determination is then forwarded to the planning branch of Environmental Security. If the project has no potential IR or other environmental issues (as determined by other environmental departments), a categorical exclusion (CATEX) or other appropriate National Environmental Policy Act (NEPA) document is issued and the project is approved. If there are potential issues, the PED is rejected and sent back to the initiator unapproved and with a written explanation of why the project was not approved. In this way, LUCs are managed for open IR sites and IR Site 7.

The LUCs for IR Site 7 were identified in the ROD for OU-3 (SWDIV, 1999) and are required to ensure that human health and the environment are protected in the future. In general, the LUCs for IR Site 7

stipulate that no breaching of the soil cap through trenching, excavation, or any other similar activity may occur unless prior approval of the FFA signatories is obtained; however, this restriction does not apply to maintenance activities for purposes of preservation or restoration of the physical integrity of the cap. The ROD also stipulates that if major land use changes are planned that may disrupt the effectiveness of the remedy, or that might alter or negate the need for the land use restriction, the FFA signatories must be provided with written notification of such a proposed action at least 60 days prior to the beginning of the implementation of the proposed action. MCB Camp Pendleton must also notify the FFA signatories of any plan to lease or transfer IR Site 7 to a non-Federal or another Federal entity.

The landfill cap is intact and there are no plans for land use changes or property transfer. The LUCs and notice requirements have been provided in Section 6.7 of the PCMMP (NAVFAC, 2008b). The LUCs are also included in Section 6.7 of the Post Closure Monitoring and Maintenance Plan (PCMMP) for IR Site 7 which is managed by the Navy and the Marine Corps (NAVFAC, 2008b). The PCMMP states that LUCs are implemented at the site by fencing and signage and are maintained through regular site inspection and maintenance activities described in Section 6.6. The section also describes the Site Approval process.

During site inspections, interviews, and review of questionnaires, no activities that could violate the LUCs as described in the ROD were identified. The landfill cap is intact and there are no plans for land use changes or property transfer.

7.3.1.2 Monitoring Activities

As discussed in Section 7.1.3, monitoring activities at IR Site 7 consist of cap inspections, including settlement marker surveying, groundwater monitoring, and landfill gas monitoring. The number of settlement monitoring points and gas probes appear to be sufficient for monitoring purposes.

7.3.2 Are the Assumptions Used at the Time of the Remedy Selection Still Valid?

There have been no changes that impact the validity of technical assumptions for the site since the OU-3 ROD was approved and signed in March 1999. While changes to state and Federal MCLs and toxicity values for constituents detected at the site have occurred since the ROD was signed, analytical results are below MCLs or have been shown to have no risk (Trevet, 2012 and Trevet, 2013). Appendix D provides information evaluated in answering this question on the basis of human-health and ecological risk assessment, and Federal and state regulations evaluated as potential ARARs for the remedial action.

7.3.3 Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No.

7.4 Technical Assessment Summary

Based on the results of the Five-Year Review process, the remedy for IR Site 7 was found to be protective of both human health and the environment. Potential exposure pathways that could result in unacceptable risks have been, and are currently being controlled and monitored.

7.5 Issues Identified

The potential issues identified during this review are:

- Vegetation associated with the ET cap has been removed due to construction of the PV system.

7.6 Recommendation and Follow-up Actions for Issues Identified

Recommendations for issues identified are:

- Vegetation in the Phase I area of the PV panels was replaced in the winter of 2012, and continues to mature. Phase II is currently undergoing re-vegetation. Both areas will need several years of biological monitoring and vegetation maintenance to ensure establishment of a successful ET cover.

7.7 Protectiveness Statement

Based on the results of the Five-Year Review process, the remedy for IR Site 7 was found to continue to be protective of both human health and the environment. Methane levels in compliance gas probes have been reduced below 5 percent by volume and samples from the gas probes and the monitoring wells do not indicate the presence of VOCs over action levels. Although methane is not a health hazard, it is a compliance issue. As such, methane and VOCs will continue to be monitored.

The final IR Site 7 landfill cover and associated monitoring systems were found to be isolating waste from the environment; minimizing sediment loading to nearby surface waters; functioning with an appropriate amount of maintenance; providing long-term performance; and protecting the public's health and safety. Measures have been in place to restrict access to the site since the date of the ROD implementation. Site access is controlled and is off limits to any training per Section 2002.1.h of Base Order P3500.1K, Range and Training Regulations Areas Prohibited from Training. LUCs have also been included in the PCMMP (NAVFAC, 2008b).

SECTION 8: OPERABLE UNIT 4

OU-4 originally was comprised of four sites (1D, 1E-1, 1H, 30) as well as the 22/23 Area Groundwater site, which is a composite of the groundwater beneath six separate sites. Each of the OU-4 sites was initially included in another OU, but subsequently was moved into OU-4 for further evaluation and remedy selection.

The OU-4 ROD was completed in June 2007 (NAVFAC, 2007c). The selected remedial activities for Sites 1D and 30 were soil excavation, backfill, pretreatment of soil, and off-Base disposal; Site 1E-1 was recommended for NFA. Potential alternatives for Site 1H and the 22/23 Area Groundwater were still under evaluation by the FFA Team during the completion of the OU-4 ROD; therefore, in order not to delay action on Sites 1D, 1E-1, and 30, a decision was made to move Site 1H and the 22/23 Area Groundwater site to OU-5 (refer to Section 9.0).

The selected remedy for Site 1D consisted of soil excavation, backfill, off-Base disposal and site restoration. During soil excavation drums and drum fragments were found in Cell G9. Further investigation showed that groundwater was impacted with select metals, pesticides, and VOCs above MCLs. Groundwater was extracted and treated between September 2009 and January 2011. It was agreed that Site 1D had reached RAOs for soil and no further action for soil was warranted; however the groundwater in the area would move forward as a new site, Site 1121. The Remedial Action for soil is documented in the 1D RACR (SDVJV, 2011b).

The selected remedy for Site 30 consisted of soil excavation, backfill, off-Base disposal, and site restoration. The RA commenced in February 2008 and was concluded in June 2010. The RACR demonstrates completion of the RAOs and thus is appropriate for closure and no further action with unrestricted land use (Battelle, 2010a).

Because exposure to residual contamination at IR Sites 1D, 1E-1, 30 was acceptable for unrestricted land use, a Five-Year Review is not required; therefore, these IR sites are not discussed further in this report. No Further Action is warranted for any of the OU-4 sites.

SECTION 9: OPERABLE UNIT 5

OU-5 was initially comprised of nine sites (1A-1; 6A; 1115; 12 Area, Site 13; 21; 33; 62; 1111; the 13 Area FSSG Lot; and the 22/23 Area Groundwater site). An OU-5 ROD, which was completed in January 2008 (NAVFAC, 2008c) includes IR Sites 1A-1, 1H, and 6A. No Further Action was the remedy for Site 6A. An OU-5 ROD for no further action for Site 1111 was completed in April 2013 following a removal action and a site closure report (SDV, 2013b).

The selected remedial alternative for Site 1A-1 was soil excavation, pretreatment of excavated soil and off-Base disposal. Excavation was performed on a grid pattern and over 28,000 tons of soil were excavated from IR Site 1A-1. This represents all contaminated grids that were identified in the 2008 ROD (NAVFAC, 2008c) to achieve unrestricted land use. The soil was manifested and disposed of at off-base facilities. Clean fill was continuously transported from on-base sources and the site was backfilled and the vegetation restored. Demonstration of completion is documented in the RACR and the site requires no further action with unrestricted land use (Battelle, 2009a).

The selected remedy for Site 1H consisted of removal and off-Base disposal of soil, burn ash, and debris followed by site restoration. The RA was performed from May 2008 to October 2010. As demonstrated by the RACR the RAO was attained and thus is appropriate for closure and no further action with unrestricted land use (Zwick Environmental Consultants, 2011).

A Five-Year Review is not required for IR Sites 1A-1, 1H, 6A, and 1111 as they are closed with unrestricted land use; therefore, these IR sites are not discussed further in this report. Evaluations of the remedial alternatives currently being implemented for the remaining OU-5 sites are also provided.

9.1 22/23 Area Groundwater

9.1.1 Background

The term "22/23 Area Groundwater" is used to denote the groundwater underlying an industrial area, which is located in the Santa Margarita River basin. Seven Base water supply wells are located within 2,500 ft of the site. Facilities present within the 22 and 23 Areas include an airfield, air Base complex, warehouses, and various industrial and office buildings. 22/23 Area Groundwater includes approximately 425 acres. For the 22/23 Area Groundwater, primary contaminants are associated with solvents present in groundwater, particularly chlorinated aliphatic hydrocarbons, at relatively low concentrations. Several chlorinated compounds were historically detected above MCLs and/or tap water RGs. No specific source or release point has been identified to account for the observed chlorinated contamination in groundwater. It is possible that past chronic releases from IR sites in the vicinity could be responsible for the current groundwater contamination. It is also possible that groundwater contamination may have been caused by small isolated releases to the ground surface in the past. Regardless, the size of the plume and the declining concentrations seen in the plume indicate that the presence of an ongoing vadose zone source of VOCs is not likely.

9.1.2 Remedial Actions

A Remedial Investigation and Feasibility Study (RI/FS) was completed in January, 2011 (Parsons, 2011), which presented 6 remedial alternatives:

Alternative 1. No action
Alternative 2. Land use controls and long-term monitoring
Alternative 3. Alternative water supply with Alternative 2
Alternative 4. Source area treatment via in situ technologies with Alternative 2
Alternative 5. Ex situ wellhead treatment at Base supply well with Alternative 2
Alternative 6. Wellhead treatment at Base supply well and reinjection of treated water with Alternative 2

A Proposed Plan was completed in 2011 (Parsons) documenting the preferred remedial alternative combination of Alternative 2 – LUCs, Alternative 3 – Alternative Water Supply and Alternative 4 – Source Area Treatment.

9.1.3 Technical Assessment

The ROD was finalized after submittal of the draft Five-Year Review; therefore, a technical assessment was not conducted. A technical assessment will be conducted during the next Five-Year Review.

9.2 Site 33

9.2.1 Background

Site 33 is located in the 52 Area in the northwestern portion of MCB Camp Pendleton (see Figure 3-2). The site is approximately 900 ft northeast of the intersection of Basilone Road and San Juan Road.

Site 33 consists of the area south of Building 520452 (52 Area Armory), where chlorinated chemicals are present in site groundwater, likely originating from a gun cleaning area. The gun cleaning area is located south of Building 520452 and consists of a concrete pad surrounded by a block wall, with a surface drainage outlet on the south end of the pad. This gun cleaning area also is known as the former solvent storage/usage area. A chain-link fence, with a gate on the eastern side, surrounds the armory. Active military operations are conducted at the site.

Several solvent spills have been reported at Site 33. The former solvent storage and usage area south of Building 520452 has historically been used for cleaning weapons. Many years ago the gun cleaning operation was modified to use tables that allowed for containment and off-site disposal of solvents. Several other buildings also are located south of Building 520452 and the former solvent storage/usage area. One underground storage tank (UST), used to store diesel fuel located near Building 52652, has been removed from an area south of the site (Ninyo and Moore, 1998).

9.2.2 Remedial Actions

A non time-critical removal action (NTCRA) was conducted in 2012 to reduce contaminant mass via source material removal to depths of 32 feet below ground surface. Approximately 14,400 cubic yards of contaminated soils was excavated and transported to a CERCLA approved landfill in Yuma, Arizona. In

addition, approximately 572,000 gallons of contaminated groundwater was treated and discharged to a Base wastewater treatment plant as part of the dewatering process prior to soil excavation. The site was backfilled using two on-Base sources and paved with asphalt for use as a parking lot. Details of the NTCRA can be found in the NTRCA Work Plan (Shaw, 2012). Another phase of the removal action is scheduled to begin at the gun cleaning pad in early 2014. A monitoring well network was installed in and around the excavation following backfill and paving.

9.2.3 Technical Assessment

The risk to receptors via the vapor intrusion pathway has been reduced through the first phase of the removal action. The second phase of the removal action will reduce concentrations of tetrachloroethylene (PCE) at the source.

9.3 Site 1115

9.3.1 Background

Site 1115, the 13 Area FSSG Lot, is an approximate 14.5 acre asphalt-paved lot located on the southwestern portion of MCB Camp Pendleton within the Mainside Area (11-16 Areas). It is situated at the southwestern corner of Vandegrift Boulevard and 16th Street (see Figure 3-2). Site 1115 consists of a series of buildings where various historical activities were conducted that collectively served as the 13 Area Motor Pool. A majority of the site buildings had associated USTs that were used to either store diesel heating fuel for boilers, oil, waste oil, solvents, or gasoline. Nine of the USTs and associated piping from two of the USTs were suspected of leaking petroleum hydrocarbons to the subsurface in significant enough concentrations to warrant environmental investigations.

An RI/FS is in the process of being finalized with multiple remedial alternatives for the Target Treatment Zones at the site.

9.3.2 Technical Assessment

A technical assessment has not been performed as the site is still undergoing investigation.

9.4 12 Area Site 13

9.4.1 Background

12 Area, Site 13 is located in the 12 Area in the eastern portion of MCB Camp Pendleton, approximately three miles southwest of the northeastern Base entrance, and approximately 500 ft west-southwest of the intersection of Vandergrift Boulevard and 19th Street (see Figure 3-2). Site 13 is located at the former location of Buildings 1280 and 1283. Former Building 1283 was a mess hall and former Building 1280 was a Quonset hut used for food storage. These buildings were demolished in November 1992, which is the same year Building 12052 was built. UST 13, which was associated with Building 1283 and removed prior to 1994, was a 1,500-gallon concrete tank used to store diesel fuel for heating.

A total of 27 samples were collected from site groundwater monitoring wells, including three newly installed groundwater monitoring wells. Based on historical site data, there is no evidence of a significant residual source of soil contamination at the site. Contaminants were detected in site

groundwater, including TCE at concentrations up to 10 µg/L and benzene at concentrations up to 10 µg/L.

Groundwater data and fate and transport modeling indicate that groundwater contaminants are not declining over time; as a result, 12 Area Site 13 was included in the OU-5 RI to determine nature and extent of contamination.

A SVE system was installed at the site as part of a pilot study and four quarters of groundwater monitoring are in progress to assess the effectiveness of the pilot study.

9.4.2 Technical Assessment

A technical assessment has not been performed as the site is still undergoing investigation and monitoring.

9.5 Site 62

9.5.1 Background

Site 62 is the location of a former asphalt batch plant located east of the intersection of San Mateo Canyon and San Mateo Road in the 62 Area of MCB Camp Pendleton (see Figure 3-2). The site includes two areas of concern (AOCs); AOC-1 and AOC-2, which were identified during investigation of suitable habitat for the arroyo toad (PWC, 2000). The lateral boundary of the site is defined by a 40-ft radius around each AOC.

Based on historical records, a transformer supporting a batch plant was undermined during a heavy rain event and fell, releasing polychlorinated biphenyls (PCBs) in the immediate area. The site and site vicinity are currently underdeveloped, sparsely vegetated land, with isolated chunks of residual asphalt pavement.

In 2000, a limited soil assessment was conducted to verify asphalt removal and to evaluate the presence of potential contaminants in AOC-1 and AOC-2 (PWC, 2000). The primary contaminants identified in AOC-1 were PCBs. The primary contaminants identified in AOC-2 were total petroleum hydrocarbons (TPH). In 2002, further investigations of AOC-1 and AOC-2 were performed in support of a Site Evaluation Report (SWDIV, 2003b). Between October and November 2002, 15 test pits were excavated (eight in AOC-1 and seven in AOC-2) and samples were taken.

Additional activities were conducted in January 2003 to define the limits of contaminated soil identified during the 2002 investigation. The results of the test pit confirmation samples collected from the floor and sidewalls of the AOC-2 test pit excavations indicated that all of the contaminated soil had been removed (SWDIV, 2003b). Roughly 200 yd3 of material was removed from AOC-2 and disposed of as nonhazardous waste at the Candeleria Environmental Biotreatment Facility. The results of the test pit confirmation samples collected from the floor and sidewalls of the AOC-1 test pit excavations indicated PCBs were still present in the upper 2 ft of soil in the northwestern, southeastern, and eastern portions of the excavation. A total of 1,076 tons of PCB-impacted soil were excavated and disposed of as

hazardous waste at the Kettleman Hills Landfill. The regulatory agencies decided to make this an IR site and the site was added to the program.

In 2009, a SI was conducted to delineate the extent of residual PCB-impacts at IR Site 62 with 6 test pits excavated and backfilled. In 2011 an ESI was conducted at on of the test pits which was positioned to encompass the locations where chemicals of potential concern (COPCs), including PCB Aroclors-1242, -1248, and -1260, were previously detected in soil samples above the screening criteria at approximately 1-foot bgs. The excavation was backfilled before the confirmation samples were received, and one small area containing Aroclor-1242 concentrations slightly above the human health RST remained at approximately 6.5 feet bgs in the test pit. Given that the historic release was a surface spill, and that concentrations of Aroclor-1242 decreased with depth within the test pit; the vertical extent of soil with concentrations of Aroclor-1242 above the human health RST was not expected to extend significantly beyond 6.5 feet bgs. Therefore, the Navy decided to remove this remaining contamination in order to mitigate potential risk to human health and the environment and obtain clean closure for the site.

In October 2013, ESI fieldwork was completed in order to delineate the remaining PCB contaminated soil detected at 6.5 feet bgs. A backhoe was used to excavate and remove soil from 6.5 to 8 feet bgs in the test pit. A total of five (5) confirmation samples were collected from the excavation (one bottom and four sidewall samples). Results of the analysis indicated that no PCBs were detected in any of the samples above the laboratory reporting limit, demonstrating that no remaining PCBs are present in the test pit at levels exceeding the human health RST. After review of the analytical results, the excavation was backfilled and compacted and the site was restored. The ESI report detailing the results is currently under regulatory agency review. (SDVJV, 2014).

9.5.2 Technical Assessment

A technical assessment has not been performed as the site is still undergoing investigation. The remedy at Site 62 is protective of human health and the environment in the short term because exposure pathways that could result in unacceptable risks are being controlled.

9.6 Site 21

9.6.1 Background

Site 21 is a former fuel dock facility that included an unlined surface impoundment, three 100,000-gallon concrete diesel fuel USTs and a storage area for solvents and cleaning compounds. The fuel dock was used from the early 1940s until 1993. Site 21 is bordered on the north by a pond that was formerly used as an oxidation pond for effluent from Sewage Treatment Plant 1. Discharge of wastewater to the oxidation pond was reportedly discontinued in mid-2000. The former oxidation pond discharges into an artificial channel that reconnects with natural drainage approximately 400 ft downgradient from the pond, which leads eventually to Lake O'Neill, approximately 3,600 ft down-canyon from the pond.

Although the risk associated with current receptors at the site appears to be minimal and area groundwater is an unlikely source for potable water, field work was conducted at Site 21 to determine if TCE in the pond was a source for groundwater and to develop a better understanding of site

hydrogeology. The results of the field work were documented in a Technical Memorandum (Noreas/Parsons, 2012) that confirmed the pond was not the source of TCE in groundwater.

9.6.2 Remedial Actions

A pilot study to determine the feasibility of implementing biological treatment is in progress.

9.6.3 Technical Assessment

A technical assessment has not been performed as the site is still undergoing investigation.

SECTION 10: SITES NOT CURRENTLY INCORPORATED IN AN OPERABLE UNIT

The following sites currently are not incorporated in an OU, and are being addressed individually:

- Site 150, 21 Area Amphibious School – The site is in the Remedial Investigation phase.
- Site 1114, formerly IR Site 9 – issued Removal Action has been completed and the site is in the performance monitoring stage.
- Site 1116, 14 Area Groundwater – The site is currently in the Removal Action phase.
- Site 1117, 15/16 Area Groundwater – The site is in the Remedial Investigation phase.
- Site 1118, Area 21/26/52 Groundwater– The site is in the Site Inspection phase.
- Site 1119, 26 Area Groundwater – The site is in the Remedial Investigation phase.
- Site 1120, Stuart Mesa Agricultural Fields Maintenance Areas – This site is in the Remedial Investigation phase
- Site 1121, Site 1D Groundwater – This site is in the Remedial Investigation phase.
- Site 1122, Shot Fall Zone – This site is in the Site Inspection phase.

10.1 Site 150

Site 150 is located in the 21 Area of MCB Camp Pendleton. The site is situated at the northwest corner of 9th Street and Basin Road, which consists of a combined storage yard and parking area associated with Building 210577, directly north of the site. Site 150 was established following a Freedom of Information Act request to the United States Marine Corps, NAVFAC, and U.S. EPA regarding the use of chemicals at Camp Pendleton to support a claim by former Marine and Vietnam veteran Mr. Tom Bowen. According to personal accounts of waste disposal actions from Mr. Bowen, who was stationed at Camp Pendleton during the latter portion of the 1960s, a disposal pit located within the project area was used to dispose of various chemical wastes during his time at the installation. In response, NAVFAC conducted a Discovery Site Assessment, which is documented in the Final Investigation Report for 21 Area and Camp De Luz, MCB Camp Pendleton, CA (Parsons 2008).

Beginning in 2008, the Navy performed an area-wide screening of locations in the 21 Area of MCB Camp Pendleton. The discovery site inspection was conducted because Mr. Tom Bowen, a former Marine that was stationed at MCB Camp Pendleton and worked in the 21 Area, was a witness to waste disposal activities at areas associated with 21 Area. As part of this investigation, 18 soil borings (two within the boundary of what is now IR Site 150) were drilled within 21 Area at six locations designated by Mr. Bowen. Subsurface soil and soil gas samples were collected from a selected set of these borings. Based on historic operations at this location and personnel accounts, samples were analyzed for VOCs, SVOCs, dioxins/furans, total petroleum hydrocarbons (TPH), and metals. The only chemical detected at concentrations above screening criteria was vinyl chloride (VC) from a soil gas sample collected from a boring located adjacent to a former disposal pit on the corner of 9th Street and Basin Road. This location has since been designated as IR Site 150. (Parsons 2008)

VC was detected at 1,600 micrograms per cubic meter in a soil gas sample collected. This is above California Human Health Screening Level for industrial sites of 44.8 micrograms per cubic meter. PCE

(tetrachloroethene), trichloroethene (TCE), 1,1,1- trichloroethane (TCA), 1,1-dichloroethylene, cis-1,2-dichloroethylene, 1,1-dichloroethane, toluene, ethylbenzene, and xylenes were also detected in the soil gas sample. VOCs, SVOCs, dioxin/furans, TPH, and metals were detected in soil at concentrations that were below screening thresholds or background levels, with the exception of arsenic, which was detected at concentrations considered to be within naturally occurring background concentrations for Southern California. (Parsons 2008)

SI field activities were conducted at the site in January and February 2012. The SI was designed to assess concentrations of VOCs in soil, soil gas, and groundwater. The study results indicated VOCs were detected above the project screening levels in soil, soil gas, and groundwater. Chemicals of potential concern (COPCs) detected above project screening levels included PCE, 1,1,1-TCA, 1,1-dichloroethane, naphthalene, and xylenes in groundwater; vinyl chloride and naphthalene in soil gas; and PCE in subsurface soil samples. No COPCs exceeded screening levels in the downgradient sample location, which was located to evaluate potential migration of COPCs toward the Del Mar Boat Basin. The results of the limited tidal study indicated that the groundwater under the site was tidally influenced and the hydraulic gradient during the study was toward the Del Mar Boat Basin (SDVJV, 2012b).

A Remedial Investigation is currently underway for this site. No technical assessment is necessary for this site since it is in the investigation stage.

10.2 Site 1114

10.2.1 Background

Site 1114 is located in the southwestern portion of MCB Camp Pendleton in the 41 Area. The site is located approximately one mile south of Las Flores Creek and one half mile east of the Pacific Ocean. The area is primarily used for military training. The VOCs in groundwater are designated as Site 1114, the 41 Area Arroyo and the boundaries of the site were defined based on the extent of VOCs exceeding MCLs in groundwater.

The Remedial Investigation determined that PCE concentrations were greatest at or near the water table. Soil and soil gas do not present a risk to current or future receptors. Dense, non-aqueous phase liquid conditions and product-level concentrations were not encountered. An Engineering Evaluation/Cost Analysis and Action Memorandum were completed in April 2013 (Battelle) and the preferred alternative was excavation of source materials, dewatering the excavation and treatment of groundwater, and application of a bioremediation substrate. Performance monitoring will be conducted to evaluate the effectiveness of the removal action.

10.2.2 Technical Assessment

It is likely that the removal action and substrate injection have reduced the concentrations of PCE in groundwater. The performance monitoring will evaluate when the site will qualify for closure; however it should be noted that the site is ½ mile upgradient of the non-beneficial use groundwater dividing line so the current risk is hypothetical.

10.3 Former UST Sites (1116, 1117, 1118)

Three of these IR Sites (1116, 1117, and 1118) consist of a group of petroleum UST sites that have either received regulatory closure from the RWQCB, San Diego Region or have ongoing assessments with RWQCB oversight. Those closures and ongoing assessments have been occurring under the MCB Camp Pendleton petroleum UST compliance program, outside of the Navy's IR and CERCLA process. Based on detections of non-petroleum-related VOCs at many of these UST Sites, the Navy has created IR Sites 1116, 1117, and 1118 to allow for their investigation and assessment under the CERCLA process. Based on a review of available data, the primary VOCs of potential concern include TCE and PCE and their degradation products. The names and numbers of the UST or structure located within these IR sites are summarized in Table 10-1. Locations of these sites are shown on Figure 3-2.

Table 10-1: Names and Numbers of the Structures Located in the IR Site

IR Site	UST/BLDG #	Site Name
1116	1441	Office Building
	1491	FSSG HQ
	14112	14 Area Pool
	14121	Admin Building
	14125	Admin Building
	14127	Office Building
	14131	Former Building
	14137	Administration Building
	140008	Bachelor/Base Enlisted Quarters
	14151-14157	One well only (MW-3)
1117	1523	Former Day Care Center
	1531	Lower Maintenance Shop
	1534	Mesa Maintenance Shop
	1536	Housing Office Building
	1575	Office Supply Shop
	1655	Former Building
1118	21565	Power Plant Boiler Room
	2666	Former Dry Cleaners
	520400	Former Gas Station

10.3.1 Site 1116

10.3.1.1 Background

Site 1116 was added to the IR Program in response to CERCLA contaminants (primarily TCE) detected during investigations of various UST sites (see Table 10-1 for UST sites) in the 14 Area. A Site Inspection has been completed for the nine former USTs (subsites) (Shaw, 2011). The SI Report recommended, and the agencies agreed, with no further action for six of the nine subsites (1441, 14121, 14125, 14127, 14131, 14137, 14151-14157). An Engineering Evaluation/Cost Analysis and Action Memorandum were completed (SDVJV, 2012a) and the preferred alternative was excavation of source materials for the

three remaining subsites (1491, 14112, 140008), a dual-phase extraction system for subsite 14112 and Enhanced InSitu Bioremediation (EISB) for subsite 1491. The excavations have been completed and the remediation systems are being installed. A limited investigation is also planned to delineate the TCE plumes between subsites 140008 and 1491 as the TCE plumes appear to be unrelated to the petroleum contamination that was previously located at the UST sites.

10.3.1.2 Technical Assessment: The excavations have remediated the petroleum contamination associated with the USTs, except for subsite 14112 which has free product. A dual-phase extraction system will reduce concentrations of groundwater at subsite 14112 and the EISB will reduce TCE at the plume between subsites 140008 and 1491. The results of the limited investigation will be used to determine the most appropriate remedial approach for the TCE plumes once they have been completely delineated. Due to high TDS and poor yield, there are no drinking water production wells within a couple miles of the site and no construction is planned for the future. The Site Approval Request process will ensure no projects are planned for the site until remediation is complete and there is no risk to receptors.

10.3.2 Site 1117

Site 1117 was added to the IR Program in response to CERCLA contaminants (primarily TCE and vinyl chloride) detected during investigations of UST Sites 1523, 1531, 1534, 1536, 1575, and 1655. A Site Inspection was completed for the six former USTs (subsites) (ERRG, 2012). The agencies requested soil gas analysis and additional groundwater monitoring to completely delineate the site so a Remedial Investigation is in progress. No technical assessment is necessary for this site since it is in the investigation stage.

10.3.3 Site 1118

Site 1118 was added to the IR Program in response to CERCLA contaminants (PCE, TCE, and dichlorethene [DCE]) detected during investigations of various UST sites (21565, 2666, and 520400) in the 21 and 26 Areas. A Site Inspection was completed for the three former USTs (subsites) (SES-TECH, 2011). The agencies requested soil gas analysis to complete the SI so an Expanded Site Inspection was conducted. The ESI Report is currently in agency review. No technical assessment is necessary for this site since it is in the investigation stage.

10.4 Site 1119

IR Site 1119 was created when TCE was discovered in two new production wells were drilled in the 26 Area. One well was never completed and the other was taken out of service by the Marine Corps to proactively address risk to receptors. Field work for the Remedial Investigation has been completed and the RI/FS is currently in agency review. No technical assessment is necessary for this site since it is in the investigation stage.

10.5 Site 1120

IR Site 1120 consists of multiple Areas of Concern (AOCs) that are associated with spills and maintenance areas managed by the farmer who previously leased the land. An Environmental Assessment was conducted as part of the cancellation of the lease (SDVJV, 2011c) so the site entered

the CERCLA program at the Remedial Investigation phase. No technical assessment is necessary for this site since it is in the investigation stage.

10.6 Site 1121

IR Site 1121 is the groundwater at former IR Site 1D which was closed for soils only. Groundwater has been impacted with VOCs, pesticides and metals. A Remedial Investigation is currently in progress. No technical assessment is necessary for this site since it is in the investigation stage.

10.7 Site 1122

IR Site 1122 includes the area impacted by the San Clemente Skeet and Trap Club (off-Base). The area is Marine Corps property but is leased to the State. A Site Inspection is currently in progress. No technical assessment is necessary for this site since it is in the investigation stage.

SECTION 11: NEXT REVIEW

The next Five-Year Review for MCB Camp Pendleton OUs 1 through 5 is due on March 30, 2019, which is five years from the due date of this review.

SECTION 12: REFERENCES

Barajas and Associates, Inc. (BAI). 2004. *Final Landfill Cover Drainage Optimization Work Plan, Box Canyon Landfill (IR Site 7), MCB Camp Pendleton, California.* November.

Battelle, 2009. *Final Five-Year Review for Operable Units 1 Through 5, Marine Corps Base Camp Pendleton, California*. April 2009.

Battelle. 2009a. *Remedial Action Completion Report OU-5 IR Site 1A-1 Marine Corps Base Camp Pendleton, California*. November 24.

Battelle. 2010a. *Final Remediation Action Completion Report for OU-4 IR Site 30, Marine Corps Base Camp Pendleton, California*. August 6.

Battelle. 2010b. *Final Remediation Action Completion Report for OU-3 IR Site 1A, Marine Corps Base Camp Pendleton, California.* August 26.

Battelle. 2013. *Final Non-Time Critical Removal Action, Action Memorandum Installation restoration Site 1114, Marine Corps Base Camp Pendleton, California.* April 15.

CH2M HILL. 2011. *Final Memorandum to File for Operable Unit 3 Record of Decision Installation Restoration Site 7 Marine Corps Base Camp Pendleton, California*. May.

CH2M HILL. 2012. *Revised Final Memorandum to File for Operable Unit 3 Record of Decision Installation Restoration Site 7 Marine Corps Base Camp Pendleton, California*. September 14.

Engineering/Remediation Resources Group, Inc. (ERRG). 2012. *Site Inspection Report for Installation Restoration Site 1117*. May 16.

General Dynamics Information Technology. 2007. *Final Technical Memorandum, 2007 Annual Groundwater Monitoring Report, Installation Restoration Program, Site 7, Box Canyon Landfill, Marine Corps Base Camp Pendleton, California*.

Innis-Tennebaum Architects, Inc. 1990. *Marine Corps Base Camp Pendleton, California, Master Plan, Volumes 1 and 2, Draft*. Prepared for SWDIV. August.

IT Corporation. 1998. *Remedial Investigation and Feasibility Study for Operable Unit 3, Marine Corps Base Camp Pendleton, California*. May 1.

IT Corporation. 2000. *Interim Confirmation Report Site 1A Remedial Action, Marine Corps Base Camp Pendleton*. November.

IT Corporation. 2001. *Addendum to Interim Confirmation Report Site 1A Remedial Action, Marine Corps Base Camp Pendleton*. January.

IT Corporation. 2003. *Groundwater Quality Baseline Sampling and Analysis Plan, Rev 1, IR Site 7, Box Canyon Landfill, Marine Corps Base Camp Pendleton, California*. January 15.

IT Corporation. 2003a. *Draft-Final Remedial Action Site Closure Report, Operable Unit 3, Installation Restoration Site 1E, 32 Area Refuse-Burning Ground, Camp Pendleton, California.* August.

IT Corporation. 2003b. *Draft-Final Remedial Action Site Closure Report, Operable Unit 3, Installation Restoration Site 1F, 43 Area Refuse-Burning Ground, Camp Pendleton, California.* August.

IT Corporation. 2003c. *Draft-Final Remedial Action Site Closure Report, Operable Unit 3, Installation Restoration Site 2A, 14 Area Grease Disposal Pit, Camp Pendleton, California.* August.

Kleinfelder. 1997. *Draft Engineering Evaluation/Cost Analysis (EE/CA) For Sites 1D/1003, 1E/1004, 30, and 35, Marine Corps Base Camp Pendleton, California*. March 18.

Lithgow Environmental. 2009. *Draft 2008 Annual Report of Site Maintenance Installation Restoration Site 7 Box Canyon Landfill Marine Corps Base Camp Pendleton San Diego, California.* January.

Marine Corps Base (MCB) Camp Pendleton. 2002. *Final Community Relations Plan for Marine Corps Base Camp Pendleton Installation Restoration Program*. January.

Naval Engineering and Environmental Support Activity (NEESA). 1984. *Initial Assessment Study of Marine Corps Base, Camp Pendleton, California*. NEESA 13-057. Prepared by SCS Engineers, Inc. September.

Naval Facilities Engineering Command, Southwest (NAVFAC). 2004. *Five-Year Review Report for Installation Restoration Site 7, Operable Unit 3, Marine Corps Base Camp Pendleton, Camp Pendleton, California*. March.

Naval Facilities Engineering Command, Southwest (NAVFAC). 2007a. *Final Five-Year Review Report for Installation Restoration Site 9, Operable Unit 1, Marine Corps Base Camp Pendleton, Camp Pendleton, California*. September 12.

Naval Facilities Engineering Command, Southwest (NAVFAC). 2007b. *Explanation of Significant Difference. Installation Restoration Site 1A, Marine Corps Base Camp Pendleton, California.* September 25.

Naval Facilities Engineering Command, Southwest (NAVFAC). 2007c. *Final Operable Unit 4 Record of Decision for Sites 1D, 1E-1, AND 30, Marine Corps Base Camp Pendleton, California*. June 27.

Naval Facilities Engineering Command, Southwest (NAVFAC). 2008a. *Final Remedial Design Addendum for Sites 1A and 1H, Marine Corps Base Camp Pendleton, California*. April 29.

Naval Facilities Engineering Command, Southwest (NAVFAC). 2008b. *Final Post-Closure Monitoring and Maintenance Plan, Installation Restoration Site 7, Box Canyon Landfill, Marine Corps Base Camp Pendleton, California*. April 25.

Naval Facilities Engineering Command, Southwest (NAVFAC). 2008c. *Final Record of Decision for Operable Unit 5, Sites 1A-1, 1H and 6A*. Marine Corps Base Camp Pendleton, California. January.

Naval Facilities Engineering Command, Southwest (NAVFAC). 2008d. *Preliminary Draft Site Inspection Summary Report Installation Restoration Site 1114. Marine Corps Base Camp Pendleton, California.* November 12.

Naval Facilities Engineering Command, Southwest (NAVFAC). 2012. *Final Non-Time Critical Removal Action, Installation Restoration Site 1116, Action Memorandum Marine Corps Base Camp Pendleton, California.* July 18.

Naval Facilities Engineering Command, Southwest (NAVFAC). 2013. *Final Non-Time Critical Removal Action, Installation Restoration Site 1114, Action Memorandum Marine Corps Base Camp Pendleton, California.* April 15.

Ninyo and Moore. 1998. *Environmental Site Assessment Report, Site 52652, Marine Corps Base Camp Pendleton, San Diego County, California*. May.

Noreas/Parsons. 2012. *Site 21 Groundwater Pilot Study Technical Memorandum, Marine Corps Base Camp Pendleton, San Diego County, California*. March

OHM. 1996. *Site Closeout Report, Non-Time-Critical Removal Action, Installation Restoration Program – Site 5, Marine Corps Air Station, Camp Pendleton, California.* September 20.

OHM. 1997a. *Site Closeout Report, Non-Time-Critical Removal Action, Installation Restoration Program – Site 3, Pest Control Wash Rack, Marine Corps Air Station, Camp Pendleton, California.* September 4.

OHM. 1997b. *Site Closeout Report, Non-Time-Critical Removal Action, Installation Restoration Program – Site 6, DPDO (DRMO) Scrap Yard, Marine Corps Air Station, Camp Pendleton, California.* September 12.

Parsons. 2004. *Operable Unit 5 Remedial Investigation for Sites 1A-1, 6A, 21, 1111, and 12 Area, Marine Corps Base Camp Pendleton, California*. July 21.

Parsons. 2008. *Final Investigation Report for 21 Area and Camp de Luz Marine Corps Base Camp Pendleton, California*. December 4.

Parsons. 2008. *Record of Decision for Operable Unit 5 Sites 1A-1, 1H, and* 6A *Marine Corps Base Camp Pendleton, California*. January 30.

Parsons. 2011. *22/23 Area Groundwater Remedial Investigation Report and Feasibility Study.* January 10.

Richard Brady & Associates. 2008. *Final Addendum 1 to the Final Sampling and Analysis Plan, Field Sampling Plan/Quality Assurance Project Plan, Installation Restoration Site 1114 Marine Corps Base Camp Pendleton, California.* April.

SDV Engineering and Construction, Joint Venture (SDVJV). 2012a. *Final Non-Time Critical Removal Action Installation Restoration Site 1116, Action Memorandum, Marine Corps Base Camp Pendleton, CA* July 19.

SDV Engineering and Construction, Joint Venture (SDVJV). 2012b. *Final Site Inspection Report IR Site 150, Marine Corps Base Camp Pendleton, CA* November 30.

SDV Engineering and Construction, Joint Venture (SDVJV). 2010. *Final Explanation of Significant Difference for Operable Unit 3 Record of Decision Installation Restoration Site 7 Marine Corps Base Camp Pendleton, California*. July.

SDV Engineering and Construction, Joint Venture (SDVJV). 2011a. *Final Remediation Action Completion Report IR Site 1H, Marine Corps Base Camp Pendleton, California*. May 5.

SDV Engineering and Construction, Joint Venture (SDVJV). 2011b. *Final Remediation Action Completion Report for Soil IR Site 1D, Marine Corps Base Camp Pendleton, California*. October 27.

SDV Engineering and Construction, Joint Venture (SDVJV). 2011c. *Phase II Environmental Site Assessment for Stuart Mesa Agricultural Field Marine Corps Base Camp Pendleton, California*. December 29.

SDV Engineering and Construction, Joint Venture (SDVJV). 2013a. *Final Project Completion Report for 12 Area Site 13 Marine Corps Base Camp Pendleton, California*. March.

SDV Engineering and Construction, Joint Venture (SDVJV). 2013b *Final Record of Decision for Operable Unit 5 Installation Restoration Site 1111, Marine Corps Base Camp Pendleton, California.* April 5.

SDV Engineering and Construction, Joint Venture (SDVJV). 2014. *Draft Expanded Site Inspection Report Installation Restoration Site 62 Marine Corps Base Camp Pendleton, California. January.*

SES-TECH. 2011. *Final Site Inspection Report for IR Site 1118*. July 20.

Shaw, 2011. *Final Site Inspection Report Installation Restoration (IR) Site 1116, Marine Corps Base (MCB) Camp Pendleton*. February 22, 2011.

Shaw, 2012. *Final Site Inspection Report at Installation Restoration (IR) Site 150, Marine Corps Base (MCB) Camp Pendleton*. November 2012.

Shaw, 2012. *Non Time-Critical Removal Action Work Plan Installation Restoration Site 33 Marine Corps Base Camp Pendleton, California*. January.

Shaw. 2011. *Final Site Inspection Report IR Site 1116 Marine Corps Base Camp Pendleton, California*. February 22.

Southwest Division Naval Facilities Engineering Command (SWDIV). 1993. *Draft Final RI Report for Group A Sites, Remedial Investigation/Feasibility Study, Marine Corps Base Camp Pendleton, California*. Prepared by Jacobs Engineering Group. October.

Southwest Division Naval Facilities Engineering Command (SWDIV). 1994. *Draft Final Feasibility Study for Group A Sites, Site 9 – Operable Unit 1, Remedial Investigation/Feasibility Study, Marine Corps Base Camp Pendleton, California*. Prepared by Jacobs Engineering Group. September.

Southwest Division Naval Facilities Engineering Command (SWDIV). 1997. *Draft Final Report for Group D Sites, Remedial Investigation/Feasibility Study, Marine Corps Base Camp Pendleton, California*. Prepared by Jacobs Engineering Group, Inc. July.

Southwest Division Naval Facilities Engineering Command (SWDIV). 1998. *Draft Final Report for OU-3, Remedial Investigation/Feasibility Study, Marine Corps Base Camp Pendleton, California*. Prepared IT Corporation. May 1.

Southwest Division Naval Facilities Engineering Command (SWDIV). 1999. *Marine Corps Base Camp Pendleton, California, Record of Decision, Operable Unit 3*. Final. EPA/ROD/R09-99/046. February.

Southwest Division Naval Facilities Engineering Command (SWDIV). 2003a. *Technical Memorandum, Summary of Soil and Monitoring Well Sampling, IR Site 9, Marine Corps Base Camp Pendleton, California, prepared by Navy Public Works Center.* July.

Southwest Division Naval Facilities Engineering Command (SWDIV). 2003b. *Draft Site Evaluation, IR Site 62 Former Asphalt Batch Plant, Marine Corps Base Camp Pendleton, California*. December.

SulTech. 2005. *Final Landfill Gas Extraction Pre-Design Pilot Study Technical Memorandum, IR Site 7, Box Canyon Landfill MCB Camp Pendleton, California*. August 26.

TEC. 2012. *Final Site Inspection Report, IR Site 150 Marine Corps Base Camp Pendleton, California*. November

Trevet, 2013. *Final 2012 Annual Inspection and Site Maintenance Report for Installation Restoration Site 7, Box Canyon Landfill, Marine Corps Base Camp Pendleton, San Diego, California*. May 2013.

Trevet. 2011. *Memorandum to File for Operable Unit 3 Record of Decision Installation Restoration Site, 7 Box Canyon Landfill Marine Corps Base Camp Pendleton, California*. November 29.

Trevet. 2012a. *Final Box Canyon Landfill Gas Mitigation System Technical Memorandum Addendum Installation Restoration Site 7 Marine Corps Base Camp Pendleton, California*. March 16.

Trevet. 2012b. *Final Landfill Gas Monitoring Report Installation Restoration Site 7 Marine Corps Base Camp Pendleton, California*. November 21.

Trevet. 2013. *Final Annual Groundwater Monitoring Report Installation Restoration Site 7, Box Canyon Landfill Marine Corps Base Camp Pendleton, California*. October 25.

U.S. Environmental Protection Agency (EPA). 1995. *Marine Corps Base Camp Pendleton, California, Record of Decision for Operable Unit 1 – Site 9 and Group A No Action Sites. Draft Final*. Revision 1. EPA/ROD/R09-96/143. October.

U.S. Environmental Protection Agency (EPA). 1997. *Marine Corps Base Camp Pendleton, California, Record of Decision, Operable Unit 2. Draft Final*. Revision 0. EPA/ROD/R09-97/191. February.

United States Department of the Navy (DON). 2004a. *Navy and Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Statutory Five-Year Reviews* November 2001, revised May.

United States Department of the Navy (DON). 2006. *Environmental Restoration Program Manual*.

United States Environmental Protection Agency (EPA). 1990. EPA Region IX/State of California/Marine Corps Federal Facility Agreement (FFA), Marine Corps Base Camp Pendleton, California. October.

United States Environmental Protection Agency (EPA). 1993. *Presumptive Remedy for CERCLA Municipal Landfill Sites*. Directive 9355.0-49FS. EPA 540-F-93-035, PB93-963339, Office of Solid Waste and Emergency Response. September.

United States Environmental Protection Agency (EPA). 2001. *Final Comprehensive Five-Year Review Guidance*, EPA/540/R-01-007, OSWER Directive 9355.7-03B-P, Office of Emergency and Remedial Response, Washington, DC, June.

United States Navy Public Works Center, San Diego (PWC). 2000. *Limited Site Assessment Report, Former Asphalt Batch Plan, 62 Area, Marine Corps Base Camp Pendleton, California.*

United States Navy Public Works Center, San Diego (PWC). 2003. *Evaluation of the Geology, Hydrogeology, and Geochemistry, Installation Restoration (IR) Site 7, Box Canyon Landfill, Marine Corps Base Camp Pendleton, California.* May.

United States Navy Public Works Center, San Diego (PWC). 2004a. *Explanation of Significant Difference for Operable Unit 1 Record of Decision, Installation Restoration Site 9, Stuart Mesa Stabilization Pond, Marine Corps Base Camp Pendleton*, May 10.

United States Navy Public Works Center, San Diego. 2004b. *Final Sampling and Analysis Plan, Field Sampling Plan/Quality Assurance Project Plan, Installation Restoration Site 1114 Marine Corps Base Camp Pendleton, California.* February.

Zwick Environmental Consultants, LLC (Zwick) 2011. *Final Remedial Action Completion Report, Installation Restoration Site 1H, Marine Corps Base Camp Pendleton, California*. May 2011.

APPENDIX A:
Summary of Sites Included in Operable Units 1 through 5 and Additional Sites not Incorporated into an Operable Unit

IR Site	Site Name	Five-Year Review	Impacted Medium				Description	OU	Status
			Soil	Sediment	Groundwater	Surface Water			
1A	14 Area Refuse Burning Ground	No	X		X		Refuse burning ground in training region in the 14 Area	3	The remediation has been completed and the regulatory agencies have agreed with No Further Action as documented in the ROD and the RACR.
1A-1	Ash and Debris Disposal Area (14 Area)	No	X		X		Disposal area for refuse burning ground 1A in the 14 Area	5	The remediation has been completed and the regulatory agencies have agreed with No Further Action as documented in the ROD and the RACR.
1B	11 Area Refuse Burning Ground	No	X		X		Refuse burning ground in the 11 Area	3	Documented NFA in OU-3 ROD
1C	13 Area Refuse Burning Ground	No	X		X		Refuse burning ground in the 13 Area	3	Documented NFA in OU-3 ROD
1D	20 Area Refuse Burning Ground	No	X		X		Refuse burning ground in the 20 Area	4	The remediation has been completed and the regulatory agencies have agreed with No Further Action for soil only as documented in the ROD and the RACR . Groundwater is now IR Site 1121.
1E	32 Area Refuse Burning Ground	No	X		X		Refuse burning ground in the 32 Area	3	Letter finalizing Remedial Action Closure Report and No Further Action dated September 23, 2003
1E-1	Former Burn Pits	No	X				Site 1E-1 is a former refuse burning area located in 32 Area along MACS Road, approximately 3,000 feet from the Santa Margarita River. The site is a series of burn pits adjacent to Site 1E.	4	Documented NFA in OU-4 ROD
1F	43 Area Refuse Burning Ground	No	X		X		Refuse burning ground in the 43 Area	3	Letter finalizing Remedial Action Closure Report and No Further Action dated October 2, 2003
1G	52 Area Refuse Burning Ground (at San Onofre landfill)	No	X		X		Refuse burning ground that is a part of Site 14, the San Onofre Landfill	N/A	Removed from CERCLA, part of Site 14 - San Onofre Landfill.
1H	62 Area Refuse Burning Ground	No	X		X		Refuse burning ground in the 62 Area	5	The remediation has been completed and the regulatory agencies have agreed with No Further Action as documented in the ROD and the RACR .
1I	64 Area Refuse Burning Ground	No	X		X		Refuse burning ground in the 63 Area	3	Documented NFA in OU-3 ROD

IR Site	Site Name	Five-Year Review	Impacted Medium				Description	OU	Status
			Soil	Sediment	Groundwater	Surface Water			
1111	Ash and Debris Disposal Area (26 Area)	No	X		X		Burn layer in the 26 Area adjacent to OU-2, Site 3 (pest control wash rack). The site was exposed during excavation activities at Site 3.	5	A Removal Action and four subsequent quarters of groundwater monitoring have been completed. A Project Completion Report presented the soil and groundwater data confirming the site met the criteria for unrestricted land use. The information was then documented in a No Further Action ROD that has been signed by the FFA..
2A	14 Area Grease Disposal Pit	No	X		X		Grease disposal pit in the 14 Area	3	Letter finalizing Remedial Action Closure Report and No Further Action dated October 2, 2003
2B	32 Area Grease Disposal Pit	No	X				Site 2B - Grease Disposal Pit in 32 Area is located along MACS Road, approximately 0.75 mile northwest of Stuart Mesa Road. The grease pit boundary is approximately 80 feet long and 60 feet wide, as delineated through field reconnaissance and aerial photographs.	2	Document NFA in OU-2 ROD
2C	33 Area Grease Disposal Pit	No	X		X		Grease disposal pit in the 33 Area	3	Documented NFA in OU-3 ROD
2D	43 Area Grease Disposal Pit	No	X		X		Grease disposal pit in the 43 Area	3	Documented NFA in OU-3 ROD
2E	53 Area Grease Disposal Pit	No	X		X		Grease disposal pit in the 53 Area. Site could not be located during surveying, photographs or field reconnaissance.	3, N/A	Site was originally included in OU-3, but this site could not be located. If the site is located, it will be addressed as a new site.
2F	62 Area Grease Disposal Pit	No	X		X		Grease disposal pit in the 62 Area	3	Documented NFA in OU-3 ROD
2G	31 Area (MCTSSA) Grease Disposal Pit	No	X		X		Grease disposal pit in the 31 Area	3	Documented NFA in OU-3 ROD
3	26 Area Pest Control Washrack	No	X	X	X		Site 3 included a pest control wash rack, unlined drainage ditches in the vicinity of and downstream from the wash rack, and surrounding areas used to mix and dispose of pesticide solutions.	2	Removal Action Completed.NFA for soil, sediment and groundwater in OU-2 ROD.
4/4A	MCAS Drainage Ditch & Concrete Lined Surface Impoundment	No	X		X		Site 4 included a drainage ditch (5 feet deep and 20 feet wide) along Vandegrift Boulevard, 23 Area MCAS. Site 4a extended Site 4 to include a concrete lined surface impoundment located between the drainage ditch and MCAS operations near Building 2378.	1 (for soil), 2 (for gw)	Soil only, NFA in OU-1 ROD. Groundwater transferred to Site 6.
5	Fire Fighter Drill Field	No	X		X		Site 5 is located in the middle of the MCAS in the 23 Area. The site includes a grassy, unlined circular burn pit, 60 to 70 feet in diameter, surrounded by a 1-foot-high earthen berm.	2	Removal Action completed in 1995. NFA in OU2 ROD

IR Site	Site Name	Five-Year Review	Impacted Medium				Description	OU	Status
			Soil	Sediment	Groundwater	Surface Water			
6/6A/22/23 Area Groundwater	Site 6/6A - DRMO Scrap Yard/Bldg 2241 NORM Site 6 - 22/23 Area Groundwater (sites 4/4A, 6, 16, 17, 27)	Yes	X	X	X	X	The Site 6 is located at the extreme southwestern end of the 22 Area in the Santa Margarita Basin. The site includes the current paved scrap yard operated by the DRMO (formerly DPDO), an unpaved, low-lying area approximately 300 feet south of Building 2241, drainage ditches running along and through the site, and an area near the Building 2243 railroad tracks. The site is within the 100-year floodplain.	2,5 (for Site 6 soil) 4,5 (for Site 6A soil and 22/23 area groundwater)	An RI/FS has been completed for the site and a Record of Decision with a combination of three remedial alternatives has been transmitted to the EPA for signature.
7	20 Area Box Canyon Landfill	Yes	X		X		Box Canyon Landfill in the 20 Area. Inactive landfill that covers approximately 28 acres.	3	In accordance with the ROD, continue groundwater and soil vapor monitoring and semi-annual site maintenance (Nov. winterization and May restoration, SWPPP inspections and maintenance after significant rain events). Solar-powered flare units and landfill gas extraction wells were installed and have reduced methane concentrations below compliance threshold. Perform five-year reviews.
8	Las Pulgas Landfill	No	X		X		Site 8 is the Las Pulgas Landfill which is currently active	2	Landfill removed from CERCLA and moved to State of California Landfill program
8A	Las Pulgas Landfill	No	X		X		Portion of the ephemeral Las Flores stream channel to the east of the Las Pulgas Landfill	2	No Action
9	41 Area Stuart Mesa Waste Stabilization Pond	No	X		X		Site 9 was the 41 Area Stuart Mesa waste stabilization pond located approximately 1 mile south of Las Flores Creek and 0.5 miles east of the Pacific Ocean. Operated as a sewage lagoon for the percolation and oxidation of raw sewage.	1	ESD for NFA signed October 5, 2004
10	26 Area Sewage Sludge Composting Yard	No	X		X		Sewage sludge composting yard in the 26 Area	3	Documented NFA in OU-3 ROD
11	22/23 Area JP-5 Fuel Spill	No	X	X	X	X	The Site 6 is located at the extreme southwestern end of the 22 Area in the Santa Margarita Basin. The site includes the current paved scrap yard operated by the DRMO (formerly DPDO), an unpaved, low-lying area approximately 300 feet south of Building 2241, drainage ditches running along and through the site, and an area near the Building 2243 railroad tracks. The site is within the 100-year floodplain.	2,5 (for Site 6 soil) 4,5 (for Site 6A soil and 22/23 area groundwater)	Now under 22/23 Area groundwater.
12	14 Area Assault Vehicle Fueling Area	No	X		X		IR Site 1116 consists of nine UST sites in the 14 Area	N/A	Now under Site 1116 - 14 Area Groundwater.
13	12 Area Asphalt Plant	No	X				The asphalt plant is located north of the Naval Regional Medical Center. Soil contamination was reported at this plant in 1985.	N/A	Excluded from CERCLA under petroleum exclusion in January 25, 1995. Remediated by base under ACOE contract.
14	San Onofre Landfill	No	X		X		Site 14 is the San Onofre Landfill. Landfill is currently active.	2	Landfill removed from CERCLA and moved to State of California Landfill program

IR Site	Site Name	Five-Year Review	Impacted Medium				Description	OU	Status
			Soil	Sediment	Groundwater	Surface Water			
15	Nearby Groundwater to Site 3	No			X		Groundwater near Site 3	2	OU-2 NFA ROD completed November 1997
16	22 Area Building 22151 & 22187 Ditch Confluence & Ditch	No	X		X		Buildings 22151 and 22187 ditch confluence and ditch in the 22 Area.	2 (for groundwater), 3 (for soil, sediment and surface water)	OU-3 NFA for soil ROD completed March 31, 1999. Groundwater under 22/23 Area Groundwater.
17	22 Area Building 22187 Marsh and Ditch	No	X	X	X	X	Building 22187 marsh and ditch in the 22 Area. Only petroleum hydrocarbons were detected in soil.	2 (for groundwater), 3 (for soil, sediment and surface water)	Petroleum exclusion site for soil only (9-12-96). Documented NFA for soil in OU-3. Groundwater under 22/23 Area Groundwater.
18	13/16 Area Bldg Spill & Ditch	No	X		X		Buildings 1687 spill and ditch in the 13 and 16 Areas.	3	Documented NFA in OU-3 ROD
19	31 Area ACU-5 LCAC Two Surface Impoundments	No	X	X	X	X	Site 19, ACU-5 (LCAC) Two Surface Impoundments, is located in the 31 Area, between Interstate 5 and the Pacific Ocean. This complex provides training and maintenance facilities for LCAC amphibious vehicles. The impoundments are lined and receive water from a concrete area used for vehicle washing and minor maintenance.	2	Documented NFA in OU-2 ROD
20	43 Area Las Pulgas Vehicle Wash Rack	No	X	X	X	X	Site 20, 43 Area Las Pulgas Vehicle Wash Rack, is located approximately 100 feet north of Basilone Road, immediately east of its intersection with Las Pulgas Road. The impoundment is approximately 106 feet long and 36 feet wide and receives runoff from the vehicle washing area. Wash water from the impoundment drains into the oil/water separator before discharging to a shallow ephemeral drainage ditch that intersects Las Flores Creek. The site is bordered on the northeast side by a concrete and asphalt paved area, on the southeast by moderate to dense vegetation, on the west by light vegetation and Basilone Road, and on the north by light vegetation and an unpaved access road.	2	Documented NFA in OU-2 ROD
21	14 Area Surface Impoundment	No			X		Unlined ditch near the 14 Area fuel dock previously used to contain fuel spills	5 (both for gw only)	Pilot study to determine feasibility of bioremediation awarded.
22	23 Area Unlined Surface Impoundment	No	X	X	X	X	Site 22 - 23 Area Unlined Surface Impoundment, is located at the MCAS, approximately 60 feet southeast of Papa Taxiway. This site is noted as Building 2388 on MCB Camp Pendleton general development maps.	2	Documented NFA in OU-2 ROD
24	26 Area MWR Maintenance Facilities	No	X		X		Site 24 included the 26 Area, Morale, Welfare and Recreation Maintenance facility. This site included a welding ship, paint shop, and a former hazardous waste storage area.	1	Documented NFA in OU-1 ROD

IR Site	Site Name	Five-Year Review	Impacted Medium				Description	OU	Status
			Soil	Sediment	Groundwater	Surface Water			
27	22 Area Ditches Behind Bldg 22210	No	X		X		Ditches behind Building 22210 in the 22 Area	2 (for groundwater), 3 (for soil, sediment and surface water)	Documented NFA for soil in OU-3 ROD. Groundwater under 22/23 Area Groundwater.
28	26 Area Trash Haulers Maintenance Area	No	X		X		Site 28 - 26 Area Trash Haulers Maintenance Area, is located in 26 Area, approximately 1,800 feet southwest of the intersection of Vandegrift Boulevard and Santa Margarita Road. The site is surrounded by a chain-link fence, with an entryway on the east. The unpaved area is graded and contains a small concrete pad, 55 feet long by 15 feet wide, and no natural vegetation. The area west of the fence contains natural vegetation and native soil.	2 (for groundwater)	Petroleum exclusion site for soil only (9-12-96). Documented NFA for groundwater in OU-2 ROD.
29	25 Area Skeet Range	No	X		X		Active skeet range in the 25 Area. There are no current plans to close or stop using the range for training purposes.	N/A	Removed from IR Program - active range
30	30 Firing Range Soil Fill in 31 Area	No	X				Firing range soil fill in the 31 Area. Soil fill material reportedly containing lead from a firing range was used as fill material along a dirt road.	4	The remediation has been completed and the regulatory agencies have agreed with No Further Action as documented in the ROD and the RACR .
31	Building 210801 Transformer	No	X				Site 31 - Building 210801 Transformer, is located in 21 Area, at the intersection of 13th Street and 'C" Street. The transformer previously held fluid containing PCBs.	2	Documented NFA in OU-2 ROD
32	Drum Storage Area and Drainage Between Bldgs 41303 & 41366	No	X		X		Drum storage and drainage area between Buildings 41303 and 41366 in the 41 Area	3	Documented NFA in OU-3 ROD
33	52 Area Armory (Bldg 520452) and Drainage to Southeast	Yes	X		X		Armory (Building 520452) and drainage to the southwest in the 52 Area	5	An RI/FS was completed that recommended remedial alternatives, including excavation and off-base disposal of soil, and treatment of excavated groundwater. This preferred alternative was documented in an Action Memorandum and the first phase of the removal action is complete. The second phase will begin in late 2013.
34	Combat Engineers Maintenance Facility Bldgs 62580-62583	No	X		X		Combat engineer's maintenance facility, Buildings 62580-83, in the 62 Area	3	Documented NFA in OU-3 ROD
35	25 Area Former Sewage Treatment Plant	No	X		X		Former sewage treatment plant in the 25 Area	3	Documented NFA in OU-3 ROD
36	Debris Pile behind STP 11	No	X		X		Debris pile area behind the ponds at the Sewage Treatment Plant II	3	Documented NFA in OU-3 ROD
37	Pesticide POL Handling Area at San Clemente Ranch	No	X		X		Pesticide and petroleum, oils, and lubricant handling areas, San Clement Ranch	3	Documented NFA in OU-3 ROD
38	52 Area Sewer Line Bldg 52188	No	X		X		Building 52188 sewer line, 52 Area	3	Documented NFA in OU-3 ROD
39	41 Area Sewer Line Bldg 41300 & 41346	No	X		X		Buildings 41300 and 41346 sewer line, 41 Area	3	Documented NFA in OU-3 ROD
40	13 Area Sewer Line Bldg 13103	No	X		X		Building 13103 sewer line, 13 Area	3	Documented NFA in OU-3 ROD
41	13 Area Sewer Line Bldg 13128	No	X		X		Building 13128 sewer line, 13 Area	3	Documented NFA in OU-3 ROD
42	13 Area Sewer Line Bldg 13129	No	X		X		Building 13129 sewer line, 13 Area	3	Documented NFA in OU-3 ROD

IR Site	Site Name	Five-Year Review	Impacted Medium				Description	OU	Status
			Soil	Sediment	Groundwater	Surface Water			
43	SMB Groundwater Study	No			X		The objectives of the Santa Margarita Basin groundwater study were to determine whether groundwater quality throughout the Santa Margarita Basin has been affected by developed areas	2	Documented NFA in OU-2 ROD.
44	SMB Surface Water & Sediment Study	No		X		X	The objectives of the Santa Margarita Basin surface-water and sediment study were to evaluate surface-water and sediment quality upstream and downstream from developed areas along the Santa Margarita River	2	Documented NFA in OU-2 ROD.
45	Santa Margarita Coastal Wetland Study	No	X	X	X		The objectives of the Site 45 study were to evaluate whether developed areas upstream/upgradient from the site have contaminated coastal wetlands.	2	Documented NFA in OU-2 ROD. Closed all media.
46	Groundwater Study Outside SMB	No			X		Unknown	N/A	Areas under investigation were studied as individual sites.
47	Surface Water & Sediment Study Outside SMB	No		X		X	Unknown	N/A	Areas under investigation were studied as individual sites.
48	Coastal Wetland Study Outside SMB	No		X		X	Unknown	N/A	Areas under investigation were studied as individual sites.
62	Asphalt Batch Plant	Yes	X		X		Former asphalt batch plant in the 62 Area	5	An Expanded Site Inspection Report is with the regulatory agencies for review.
150	SEERMA Site	Yes	X		X		Site 150 is located in the 21 Area of MCB Camp Pendleton. The site is situated at the northwest corner of 9th Street and Basin Road, which consists of a combined storage yard and parking area associated with Building 210577, directly north of the site.	N/A	SI results indicated VOCs were detected above the project screening levels in soil, soil gas, and groundwater. An RI is currently underway.
1114	41 Area TCE Plume	Yes			X		IR Site 1114 is located in the southwestern portion of MCB Camp Pendleton in the 41 Area. The site is southwest of Stuart Mesa Road approximately one mile south of Las Flores Creek and one-half mile east of the Pacific Ocean.	N/A	An RI/FS was completed that recommended remedial alternatives, including excavation and off-base disposal of soil, and treatment of excavated groundwater. This preferred alternative was documented in an Action Memorandum and the removal action is complete. A bioremediation substrate was added to site groundwater before the site was backfilled and performance monitoring is currently underway.
1115 and 12 Area, Site 13	13 Area FSSG Lot/Former Mess Hall and 12 Area, Site 13	Yes	X		X		Former vehicle maintenance facility (FSSG lot) in the 13 Area and former UST at Building 1280	5	Site 1115 – An RI/FS is in the process of being finalized with multiple remedial alternatives for the Target Treatment Zones at the site. 12 Area Site 13 - A SVE system was installed at the site and four quarters of groundwater monitoring are in progress.

IR Site	Site Name	Five-Year Review	Impacted Medium				Description	OU	Status
			Soil	Sediment	Groundwater	Surface Water			
1116	14 Area Groundwater	Yes			X		IR Site 1116 consists of nine UST sites in the 14 Area	N/A	The Site Inspection recommended No Further Action for six of the nine subsites. An Action Memorandum documented remedial alternatives for the remaining three subsites. Excavation of contaminated soil in the source zones have been completed and both an EISB and DPE system are currently being installed at two of the subsites.
1117	15/16 Area Groundwater	Yes			X		IR Site 1117 contains three UST sites, two in 15 Area and one in 16 Area	N/A	Currently in the Remedial Investigation stage.
1118	21/26 Area Groundwater	Yes			X		IR Site 1118 consists of three USTs: one in the 21 Area, one in the 26 Area and one in the 52 Area. Due to the nature of the Site 1118 facilities it is likely they were the source of the VOC contamination.	N/A	An Expanded Site Inspection Report is with the regulatory agencies for review.
1119	26 Area Groundwater	Yes	X		X		IR Site 1119 is a TCE plume in the 26 Area.	N/A	An RI/FS is currently in agency review recommending multiple remedial alternatives for the TCE plume.
1120	Stuart Mesa Ag Fields	Yes	X		X		IR Site 1120 consists of multiple Areas of Concern (AOCs) that are associated with spills and maintenance areas managed by the farmer who previously leased the land.	N/A	Currently in the Remedial Investigation stage.
1121	Site 1D Groundwater	Yes			X		IR Site 1121 is the groundwater at former IR Site 1D which was closed for soils only.	N/A	Currently in the Remedial Investigation stage.
1122	Shot Fall Zone	Yes	X	X	X		IR Site 1122 includes the area impacted by the San Clemente Skeet and Trap Club (off base). The area is Marine Corps property but is leased to the State.	N/A	Currently in the Site Inspection stage.

N/A - not applicable

APPENDIX B:
Inspection Photographs

Site 7 (Box Canyon Landfill) PV Panels Phase I

Site 7 (Box Canyon Landfill) PV Panels Phase II

Site 1A

Site 1115 (13 Area FSSG lot)

12 Area Site 13

Site 21

Site 33 (52 Area Armory)

Site 33 (52 Area Armory)

Site 62 (Asphalt Batch Plant)

22/23 Area Groundwater

Site 1A-1

Site 1H

Site 150 (SEERMA Site)

Site 1114 (41 Area Arroyo)

Site 1116 (14 Area groundwater) Subsite 1491 – Old UST excavation area

Site 1116 (14 Area groundwater) Subsite 1491 – TCE plume

Site 1116 (14 Area groundwater) Subsite 140008

Site 1116 (14 Area groundwater) Subsite 14112

Site 1117 (15/16 Area groundwater) Subsite 1655

Site 1118 (21/26/52 Area groundwater) Subsite 21565

Site 1118 (21/26/52 Area groundwater) Subsite 2664

Site 1118 (21/26/52 Area groundwater) Subsite 520400

Site 1119 (26 Area groundwater)

Site 1120 (Stuart Mesa Agricultural Fields) Maintenance Facility Compound

Site 1121 (Site 1D groundwater)

Site 1122 (Shotfall Zone)

APPENDIX C:
Inspection Checklist and Interview Report

Five-Year Review Site Inspection Checklist IR Site 7

("N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: IR Site 7	**Date of inspection: December 19, 2013**
Location and Region: California/Region 9	**EPA ID: CA2170023533**
Agency, office, or company leading the Five-Year Review: NAVFAC	**Weather/temperature: Rainy, low-60s**

Remedy Includes: (Check all that apply)

- ☑ **Landfill cover/containment**
- ☑ **Access controls**
- ☑ **Institutional controls**
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☑ Groundwater Monitoring_____
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

4. **Other interviews** (optional) ☑ **Report attached. See interview sheets in this appendix.**

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☐ O&M manual — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ As-built drawings — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Maintenance logs — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks_____None on-site_____

2. **Site-Specific Health and Safety Plan** — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Contingency plan/emergency response plan — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks_____ None on-site _____

3. **O&M and OSHA Training Records** — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks_____ None on-site _____

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Other permits_____ — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks_____ None on-site _____

5. **Gas Generation Records** — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks_____ None on-site _____

6. **Settlement Monument Records** — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks_____ None on-site _____

7. **Groundwater Monitoring Records** — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks_____ None on-site _____

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks____ None on-site _____

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Water (effluent) — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks_____ None on-site _____

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — ☐ N/A

    Remarks_____ None on-site _____

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☑ **Contractor for Federal Facility**
☐ Other_____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☑ Funding mechanism/agreement in place
Original O&M cost estimate ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____	_____	☐ Breakdown attached	
Date Date	Total cost		
From_____ To_____	_____	☐ Breakdown attached	
Date Date	Total cost		
From 3/1/2011 To 2/28/2012	$615,000	☐ Breakdown attached	
Date Date	Total cost		
From 3/1/2012 To 2/28/2013	$270,000	☐ Breakdown attached	
Date Date	Total cost		
From 3/1/2013 To 2/28/2014	$310,000	☐ Breakdown attached	
Date Date	Total cost		

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: 2011 O&M costs increased significantly due to installation of new LFG control measures._____

V. ACCESS AND INSTITUTIONAL CONTROLS ☑ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☑ **Gates secured** ☐ N/A

Remarks_____no damage observed_____

B. Other Access Restrictions

1. **Signs and other security measures** ☐Location shown on site map ☐ N/A

Remarks____No Trespassing sign on gate_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☑ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☑ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) ____inspection as part of site maintenance_____
Frequency _____semi-annual_____
Responsible party/agency _____MCB Camp Pendleton_____
Contact _____IR Manager at Environmental Security Office on Base.

Reporting is up-to-date ☑ **Yes** ☐ No ☐ N/A
Reports are verified by the lead agency ☑ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☑ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☑ N/A
Other problems or suggestions: Γ Report attached

_____
_____
_____
_____

2. **Adequacy** ☑ **ICs are adequate** ☐ ICs are inadequate ☐ N/A
Remarks_____
_____
_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☑ **No vandalism evident**
Remarks_____
_____

2. **Land use changes on site** ☐ N/A
Remarks: 10 acres of PV panels have been installed on the landfill cap_____
_____

3. **Land use changes off site** ☐ N/A
Remarks_____none; same as when ROD implemented_____
_____

VI. GENERAL SITE CONDITIONS

A. Roads ☑ **Applicable** ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☑ **Roads adequate** ☐ N/A
Remarks_____
_____

B. Other Site Conditions

Remarks __random equipment parked to side of landfill _____
_____
_____
_____
_____

VII. LANDFILL COVERS ☑ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☑ **Settlement not evident**
Areal extent_____ Depth_____
Remarks_____
_____

2. **Cracks** ☐ Location shown on site map ☑ **Cracking not evident**
Lengths_____ Widths_____ Depths_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☑ **Erosion not evident**
Areal extent_____ Depth_____
Remarks__geofence can be seen in several places _____
_____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
Areal extent_____ Depth_____
Remarks_____
_____

5. **Vegetative Cover** ☑ **Grass** ☐ Cover properly established ☐ No signs of stress
☑ Trees/Shrubs (indicate size and locations on a diagram)
Remarks_Cover consists of a mix of California native plants commonly found in a Coastal Sage Brush environment_____
_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☑ **N/A**
Remarks_____
_____

7. **Bulges** ☐ Location shown on site map ☑ **Bulges not evident**
Areal extent_____ Height_____
Remarks_____
_____

8. **Wet Areas/Water Damage** ☑ **Wet areas/water damage not evident**
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____
_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☑ **No evidence of slope instability**
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☑ **N/A**
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☑ **Applicable** ☐ N/A
(Channel lined with erosion control mats, **riprap**, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☑ **No evidence of settlement**
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☑ **No evidence of degradation**
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☑ **No evidence of erosion**
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☑ **No evidence of undercutting**
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☑ **No obstructions**
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☑ **No evidence of excessive growth**
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☑ Applicable ☐ N/A

1. **Gas Vents**
☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☑ Properly secured/locked ☑ Functioning ☑ **Routinely sampled** ☑ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☑ Properly secured/locked ☑ **Functioning** ☑ Routinely sampled
☑ Good condition ☐ Evidence of leakage at penetration
☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Settlement Monuments** ☑ **Located** ☑ **Routinely surveyed** ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☑ Applicable X N/A

1. **Gas Treatment Facilities**
☑ Flaring ☐ Thermal destruction ☐ Collection for reuse
☑ Good condition ☐ Needs Maintenance
Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
☑ Good condition ☐ Needs Maintenance
Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs Maintenance ☐ N/A
Remarks_____

F. Cover Drainage Layer ☐ Applicable ☑ **N/A**

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☑ **N/A**

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☐ Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____

H. Retaining Walls ☐ Applicable ☑ **N/A**

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☑ **Applicable** ☐ N/A

1. **Siltation** ☐ Location shown on site map ☑ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____lined rip rap –good condition_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☑ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☑ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ☑ **Functioning** ☐ N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☑ **N/A**

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks_____
_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☑ **N/A**

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks_____
_____
_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks_____
_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____
_____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks_____
_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks_____
_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____
_____

C. Treatment System □ Applicable □ N/A

1. **Treatment Train** (Check components that apply)
   - □ Metals removal □ Oil/water separation □ Bioremediation
   - □ Air stripping □ Carbon adsorbers
   - □ Filters_____
   - □ Additive (*e.g.*, chelation agent, flocculent)_____
   - □ Others_____
   - □ Good condition □ Needs Maintenance
   - □ Sampling ports properly marked and functional
   - □ Sampling/maintenance log displayed and up to date
   - □ Equipment properly identified
   - □ Quantity of groundwater treated annually_____
   - □ Quantity of surface water treated annually_____

   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   - □ N/A □ Good condition □ Needs Maintenance

   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   - □ N/A □ Good condition □ Proper secondary containment □ Needs Maintenance

   Remarks_____

4. **Discharge Structure and Appurtenances**
   - □ N/A □ Good condition □ Needs Maintenance

   Remarks_____

5. **Treatment Building(s)**
   - □ N/A □ Good condition (esp. roof and doorways) □ Needs repair
   - □ Chemicals and equipment properly stored

   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   - □ Properly secured/locked □ Functioning □ Routinely sampled □ Good condition
   - □ All required wells located □ Needs Maintenance □ N/A

   Remarks_____

D. Monitoring Data

1. Monitoring Data
   - □ Is routinely submitted on time □ Is of acceptable quality

2. Monitoring data suggests:
   - □ Groundwater plume is effectively contained □ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   □ Properly secured/locked □ Functioning □ Routinely sampled □ Good condition
   □ All required wells located □ Needs Maintenance □ N/A
   Remarks_____
   _____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
_____Cover intact, vegetation plenty, perimeter drainage ditches in good condition_____
_____
_____
_____
_____
_____
_____
_____
_____

INTERVIEW RECORD 1

Site Name: IR Site 7 Box Canyon Landfill		**EPA ID No.:**
Subject: Five-Year Review interview/inspection	**Time:** 1300	**Date:** 12/19/2013
Type: ☐ Telephone ☑ Visit ☐ Other **Location of Visit:** 1220 Pacific Highway, San Diego, CA	☐ Incoming ☐ Outgoing	

Contact Made By:

Name: Theresa Morley	**Title:** Remedial Project Manager	**Organization:** NAVFAC

Individual Contacted:

Name: Adam Hill	**Title:** Remedial Project Manager	**Organization:** NAVFAC
Telephone No: (619) 532-4340 **Fax No:** (619) 532-4160 **E-Mail Address:** adam.j.hill@navy.mil	**Street Address:** 1220 Pacific Highway **City, State, Zip:** San Diego, CA 92132-5181	

Summary Of Conversation

1. What is your overall impression of the project? (general sentiment). *Going well – cover is being re-vegetated in the PV panels areas and maintained outside those areas.*

2. Is the remedy functioning as expected? How well is the remedy performing? *Yes, the remedy is working out well. Soil gas concentrations have been below the compliance threshold and near zero percent since the installation of the vent flares and air injection wells.*

3. What effects have site operations had on the surrounding community? *The community has not voiced any concerns since the last 5-year review report.*

4. Are you aware of any community concerns regarding the site or its operation and administration? *None*

5. a. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.
   No.
   b. have there been any complaints violations, or other incidents related to the site requiring a response by your office or state/local office? *No.*

6. Do you feel well informed about the site's activities and progress? *Yes.*

7. Do you have any comments, suggestions, or recommendations regarding the site's management or operation? *No.*

8. What do the monitoring data show? Are there any trends that show contaminant levels are decreasing? *No trends observed for the groundwater monitoring data – very few VOCs, decrease of SVOCs and metals. Soil gas concentrations have decreased in GP-9*

9. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities. *A Post-Closure Monitoring and Maintenance Plan was finalized in April 2008. All schedules for monitoring and inspections are provided in there. The maintenance schedule described in this plan has been followed since the ROD was signed. The vent flares receive monthly inspection and maintenance to ensure proper operation and collect data on up-time.*

INTERVIEW RECORD 1

Site Name: IR Site 7 Box Canyon Landfill		**EPA ID No.:**
Subject: Five-Year Review interview/inspection		**Time:** 1300 **Date:** 12/19/2013
Type: ☐ Telephone ☑ Visit ☐ Other **Location of Visit:** 1220 Pacific Highway, San Diego, CA		☐ Incoming ☐ Outgoing
Contact Made By:		
Name: Theresa Morley	**Title:** Remedial Project Manager	**Organization:** NAVFAC
Individual Contacted:		
Name: Adam Hill	**Title:** Remedial Project Manager	**Organization:** NAVFAC

10. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts. *The maintenance schedule described in this plan has been followed since the ROD was signed.*

11. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.
A two method approach was implemented to address landfill gas concerns at GP-9 and GP-10 in 2012 and recently expanded to include GP-18. This has increased O&M costs by about $100,000 per year.

12. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.
LFG sampling is based upon the percent of methane found in the GP. This has allowed us to reduce sampling to in most wells.

13. Do you have any comments, suggestions, or recommendations regarding the project? *No.*

14. Describe the gas mitigation system that was installed.
Seven solar powered vent flares were installed on seven extraction wells spread across the landfill cap. Two of the wells were existing from the previous pilot study and the other five were new. Also, air injection wells and monitoring wells were installed near GP-9 and GP-10. GP-9 and GP-10 have received one round of air injection to date. Two additional extraction wells with solar powered vent flares were added this week.

15. Describe the results of most recent settlement monuments survey – when? Results compared to last survey?
The results from the last survey indicated that the cover has settled about 0.50 feet since the last 5-year review, but this settlement will not affect the protectiveness and it is within tolerance limits.

16. Who performs the O&M of the site?
It is all done by Trevet and their subcontractors.

17. Has there been any damage to or degradation of: integrity of site security, site access roads, stormwater management system, gas and groundwater monitoring wells, landfill cap? *No*.

18. Any non-routine maintenance performed? *Phase I of the PV panel install was re-vegetated to reestablish the ET cap. Phase II is also currently undergoing re-vegetation by the construction contractor.*

19. Do the Land use and site conditions remain the same? *The land-use was modified to allow 10 acres of PV panels to be installed on the cap.*

INTERVIEW RECORD 1

Site Name: IR Site 7 Box Canyon Landfill		**EPA ID No.:**
Subject: Five-Year Review interview/inspection		**Time:** 1300 **Date:** 12/19/2013
Type: ☐ Telephone ☑ Visit ☐ Other **Location of Visit:** 1220 Pacific Highway, San Diego, CA		☐ Incoming ☐ Outgoing
Contact Made By:		
Name: Theresa Morley	**Title:** Remedial Project Manager	**Organization:** NAVFAC
Individual Contacted:		
Name: Adam Hill	**Title:** Remedial Project Manager	**Organization:** NAVFAC

20. Does the change in land use effect the protectiveness of the remedy? *No, the change was thoroughly studied prior to construction and the design accounts for the ROD requirements to maintain an ET cap and to not penetrate the cap.*

APPENDIX D:
Comparison of Numeric Criteria and ARARs

D.1: INTRODUCTION

The information provided herein was used to evaluate the question, "Are the exposure assumptions, toxicity data, cleanup levels, and RAO used at the time of remedy selection still valid?" on the basis of human-health and ecological risk assessment, federal and state regulations evaluated as potential ARARs for the remedial action, and achievement of the RAO. Appendix A of the Post-Closure Monitoring and Maintenance Plan (PCMMP) (NAVFAC, 2008b) provides a summary of all applicable or relevant and appropriate requirements (ARARs) for the final closure cover at IR Site 7, including the IR Sites that used IR Site 7 to dispose of excavated soil (i.e., 1A, 1D, 1E, 1F, and 2A).

D.2: ARARs

IR Site 7 is the only IR site where ARARs are a concern. As discussed in the PCMMP (NAVFAC, 2008), the primary requirements for establishing a post-closure water quality monitoring program for IR Site 7 was stated to be in Title 22, Code of California Regulations (22 CCR), (§) 66264.94 and 66264.98. However, the associated requirements are actually from §66264.91 through §66264.100 of Article 6, Chapter 14, Division 4.5 of 22 CCR. The PCMMP was developed to incorporate the requirements of from §66264.91 through §66264.100 of Article 6, Chapter 14, Division 4.5 of 22 CCR.

Following is a summary of ARARs for Site 7 as discussed in the PCMMP:

- 8 CCR - Ch. 4, Subchapter 4 (Construction Safety Orders) and Ch.4, Subchapter 7 (General Industry Safety Orders)
- 40 CFR 258.61(a) and (b); 27 CCR 21180 (a); 22 CCR 66264.94(a)(1) and (3)(c), (d) and (e); 22 CCR 66264.98; Water Code 13240 - Post-closure Water Quality Monitoring Requirements
- 40 CFR 258.61(a)(4); 14 CCR 17783 (a)(1), (2) and (3); 22 CCR 66264.310 (c); APCD Rule 59 (d)(1)(ii) - Post-closure Landfill Gas Monitoring Requirements
- 40 CFR 258.61 (a) and (b); 27 CCR 21142 (b); 27 CCR 21180 (a); 22 CCR 66264.117 (b)(1) and (2) - Post-closure Landfill Maintenance Requirements

D.2 References

IT Corporation. 1998. *Marine Corps Base Camp Pendleton, California Remedial Investigation and Feasibility Study for Operable Unit 3,* Volume 1. Irvine, CA. May 1.