Draft Final Five-Year Review Report
First Five-Year Review Report For
Fort Ord Superfund Site
Monterey, California

August 23, 2002

Department of the Army
U.S. Army Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814-2922

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TABLES

PLATES

APPENDIX

ACRONYMS AND ABBREVIATIONS

AAFES	Army and Air Force Exchange Service
ACL	Aquifer Cleanup Level
AMPI	Action Memorandum Plug-In (Phase 2 EE/CA Action Memorandum)
ARARs	Applicable or Relevant Appropriate Requirements
Army	U.S. Department of the Army
ASR	Archive Search Report
AST	aboveground storage tank
AEHA	Army Environmental Hygiene Agency
BCT	Base Closure Team
BEC	BRAC Environmental Coordinator
BRAC	Base Realignment and Closure
bgs	below ground surface
BLM	Bureau of Land Management
BRAC	Base Realignment and Closure
CAMU	Corrective Action Management Unit
CAO	Cleanup and Abatement Order
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CIW	Community Involvement Workshop
CNCC	California Natural Coordinating Council
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CT	carbon tetrachloride
cy	cubic yards
DCA	dichloroethane
DCE	dichloroethene
DDESB	Department of Defense Explosive Safety Board
DEH	Directorate of Engineering and Housing
DoD	Department of Defense
DOL	Department of Logistics
DRMO	Defense Reutilization and Marketing Office
DTSC/Cal EPA	Department of Toxic Substance Control, Cal EPA
EE/CA	Engineering Evaluation/Cost Analysis
EG	East Garrison
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
ESD	Explanation of Significant Differences
ESS	Explosive Safety Submission
EW	extraction well
FAAF	Fritzsche Army Airfield
FDA	Fire Drill Area
FFA	Federal Facilities Agreement
FOSTA	Fort Ord Soil Treatment Area
FO SVA	Fort Ord Salinas Valley Aquiclude
FS	Feasibility Study

GAC	Granular Activated Carbon
gpm	gallons per minute
GTP	Groundwater Treatment Plant
Harding ESE	Harding ESE, Inc. (formerly Harding Lawson Associates [HLA])
HCRS	Heritage Conservation and Recreation Service
HLA	Harding Lawson Associates (now Harding ESE, Inc.)
HMX	cyclotetramethylenetetranitramine
IA	Interim Action
IT	International Technology Group
JMM	James M. Montgomery Consulting Engineering
LDSP	Land Disposal Site Plan
LRTC	Leadership Reaction Training Compound
MCL	Maximum Contaminant Level
MCPD	Monterey County Planning Department
MCWD	Marina County Water District
mg/kg	milligrams per kilogram
MGSTP	Main Garrison Sewage Treatment Plant
MOUT	Military Operations on Urban Terrain
MRTP	Monterey Regional Treatment Plant
MW	monitoring well
NCP	National Contingency Plan
NoA	No Action
NPDES	National Pollutant Discharge Elimination System
NRMA	natural resource management area
OD/OB	Open Detonation/Open Burning
OE	Ordnance and Explosives
OF	outfall
O&M	Operations and Maintenance
OU 1	Operable Unit 1
OU 2	Operable Unit 2
PAH	polynuclear aromatic hydrocarbons
PA/SI	Preliminary Assessment/Site Investigation
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
POL	petroleum/oil/ lubricant
POTW	Publicly Owned Treatment Works
PRG	Preliminary Remediation Goal
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RDX	cyclotrimethylenetrinitramine
RWQCB	Regional Water Quality Control Board
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
Sites 2/12	Sites 2 and 12
SOC	semi-volatile organic compound
SPRR	Southern Pacific Railroad Spur

SRE	Screening Risk Assessment
SRU	Soil Remedial Unit
SWOI	Surface Water Outfall Investigation
SWMU	Solid Waste Management Unit
TASC	Training and Audiovisual Service Center
TCE	trichloroethene
TCL	Target Cleanup Level
TCRA	Time-Critical Removal Action
TPH	total petroleum hydrocarbon
TRC	Technical Review Committee
µg/l	micrograms per liter
USAEDH	U.S. Army Design Engineering and Support Center, Huntsville
UST	underground storage tank
UV-Ox	ultraviolet chemical oxidation
USACE	United States Department of the Army Corps of Engineers
USRA	Underground Storage Tank Remediation Area
UXO	unexploded ordnance
VOC	Volatile Organic Compound

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Fort Ord		
EPA ID *(from WasteLAN)*: CA7210020676		
Region: 9	**State: CA**	**City/County: Monterey/Monterey**
SITE STATUS		
NPL status: **X** Final Deleted Other (specify)		
Remediation status (choose all that apply): **X** Under Construction **X** Operating **X** Complete		
Multiple OUs?* **X** YES NO	**Construction completion date:** ___ / ___ / 2015	
Has site been put into reuse? **X** YES NO		
REVIEW STATUS		
Lead agency: EPA State Tribe **X** Other Federal Agency – U.S. Army		
Author name: U.S. Army		
Author title:	**Author affiliation:**	
Review period:** 5 / 17 / 97 to 5 / 17 / 02		
Date(s) of site inspection: 1 / 30 / 02		
Type of review: **X** Post-SARA Pre-SARA NPL-Removal only Non-NPL Remedial Action Site NPL State/Tribe-lead Regional Discretion		
Review number: **X** 1 (first) 2 (second) 3 (third) Other (specify)		
Triggering action: Actual RA Onsite Construction at OU #____ **X** Actual RA Start at OU#2 Construction Completion Previous Five-Year Review Report Other (specify)		
Triggering action date *(from WasteLAN)*: 5 / 17 / 97		
Due date *(five years after triggering action date)*: 5 / 17 / 02		

* ["OU" refers to operable unit.]

** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Signature Sheet for the foregoing Five Year Review Report for the Former Fort Ord, California

This document has also been reviewed and approved by representatives of the United States Environmental Protection Agency, California Environmental Protection Agency, Department of Toxic Substances Control and the California Regional Water Quality Control Board.

James M. Willison
Director, Environmental & Natural Resources Management

23 July 02
Date

Kevin M. Rice
Colonel, U.S. Army
Commander

4 Sept 2002
Date

1.0 ISSUES

1.1 OU 1

Solvent contamination in groundwater has been identified outside the capture area of the OU 1 remedy. TCE is present over an area of approximately 50 acres downgradient of the existing OU 1 remedy. Concentrations of TCE in downgradient locations exceed the ACLs specified in the OU 1 ROD and will require remediation to be compliant with the ROD objectives and ARARs.

1.2 OU 2

1.2.1 Landfill Cap

A portion of landfill Cell E has not been closed. Final closure of this cell is scheduled for late 2002 after excavation of soil at Range 18.

Landfill gas is monitored around all landfill cells and meets regulatory requirements, with the exception in the vicinity of the eastern boundary of Cell F, where the landfill gas extraction system is operating.

1.2.2 Groundwater Treatment

This technical assessment did not identify any issues that could affect current or future protectiveness of the groundwater remedy. Additionally, this assessment did not identify any unresolved issues previously raised by regulatory agencies, the community, or other interested parties.

1.3 Site 31

The post remediation risk assessment concluded that unacceptable human health risks and hazards are considered unlikely to be associated with future recreational, commercial or residential development of Site 31 under the exposure conditions evaluated. The DTSC reviewer isolated an area around the remaining soil with the highest lead concentration and calculated an average lead concentration of 550 ppm for a sample depth range of 5 to 10 feet. DTSC indicated that this concentration could result in a child blood level of over 10 ug/dL based on a residential scenario. DTSC stated that a land use covenant should be completed to prohibit excavation, exposure of soil and the use of the area as part of any residential development. Based on the data present in the response to DTSC comment, the Army did not change the conclusion of the post remediation risk assessment. The land use covenant issues associated with Site 31 are still being negotiated between the Army and DTSC.

1.4 Site 39

The remedy cannot be fully implemented until ordnance has been removed from the site.

The proposed future reuse of a portion on Site 39 has been changed to mixed residential and commercial development. For the development areas within Site 39, EPA Region IX PRGs for lead, antimony and copper are used as action levels.

The sampling and analysis plan for Site 39 Ranges 18 and 19 proposes placement of excavated soil at the OU 2 Landfill, Cell E. The Army issued the *Draft Sampling and Analysis Plan for Characterization and Remediation Confirmation for Site 39 (Ranges 18 and 19)* in April 2002. Comments have not yet been received from the regulatory agencies.

The OU 2 Landfill may not have sufficient remaining capacity to contain the excavated soils as stated in the selected remedy. A pilot study is underway to evaluate potential treatment options.

1.5 Site 33

There is a potential for a change in the reuse of Site 33. A deed restriction must be maintained to restrict the site to non-residential uses unless the site is remediated to residential standards.

1.6 Site 3

There remains a potential for post remediation activities related to shifting sands and the possible subsequent discovery of areas with greater than 10 percent surface coverage of spent ammunition, and additional habitat monitoring at Site 3. These issues will be resolved before the Proposed Plan and Record of Decision finalizing the remedy selection for the site are issued.

2.0 RECOMMENDATIONS

2.1 OU 1

To achieve the objectives specified in the OU 1 ROD, operation of the existing groundwater remedy should continue until ACLs have been achieved and maintained within the designed capture area. To address the downgradient contamination the groundwater remedy should be expanded as described in the *Conceptual Design, OU 1 Groundwater Remedy Expansion* (*IT, 2001)*, and alternative technologies should be evaluated as enhancement or substitution for the conceptual design.

2.2 OU 2

2.2.1 Landfill Cap

Complete closure of landfill Cell E and prepare closure report for the OU 2 Landfill. Continue operation of the landfill gas treatment system until the landfill gas levels remain below regulatory standards. Continue to inspect and monitor the OU 2 Landfill in accordance with the Post Closure Operation and Maintenance Plan (*IT, 2000a*).

2.2.2 Groundwater

The OU 2 Groundwater Remedy should continue to be implemented as designed until either ACLs are reached or the next technical assessment is conducted.

2.3 Sites 2/12

The Sites 2/12 Groundwater Remedy should continue to operate as designed until either ACLs are reached or subsequent evaluation indicates that a modification is in order.

3.0 PROTECTIVENESS STATEMENT

All immediate threats at the site have been addressed, with the exception of Site 39 (Inland Ranges). The Site 39 remedy cannot be fully implemented until the ordnance removal is complete. The groundwater remedies are expected to be protective of human health and the environment after the groundwater cleanup goals are achieved. Restrictions, including deed restrictions on transferred property and a county ordinance, are in place to prevent access to contaminated groundwater.

1.0 INTRODUCTION

The purpose of the five-year review is to determine whether the remedy at a site continues to be protective of human health and the environment after a period of 5 years from the time the remedy was implemented (or from the time of a previous five-year review). The methods, findings, and conclusions of the five-year review are documented in a Five-Year Review report. In addition, the Five-Year Review report documents any newly identified site-related data or issues identified during the review, and identifies recommendations to address them as appropriate.

The Army is preparing this Five-Year Review report pursuant to Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Army interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) §300.430(f)(4)(ii) which states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

The Army conducted the five-year review of all remedies implemented at the Fort Ord Superfund Site in Monterey County, California (Figure 1). This document was developed during the period from December 2001 through May 2002. This report documents the results of the review, which is the first Five-Year Review conducted for remedies implemented at Fort Ord documented in Records of Decision (RODs) and other areas shown on Plate 2 and summarized below:

- Operable Unit 1 (OU 1) Record of Decision (ROD) Fritzsche Army Airfield
- Operable Unit 2 (OU 2) ROD Fort Ord Landfills
- Basewide Remedial Investigation Sites ROD
  - Sites 2/12 (Site 2: Main Garrison Sewage Treatment Plant (MGSTP); Site 12: Lower Meadow Disposal Area, Department of Logistics (DOL) Automotive Yard, Cannibalization Yard and Industrial Area, Southern Pacific Railroad (SPRR) Spur, Outfall 31 Area
  - Sites 16 and 17 (Site 16: DOL Maintenance Yard, Pete's Pond, Pete's Pond Extension; Site 17: Disposal Area and Other Areas)
  - Site 31 (Former Dump Site)
  - Site 39 (Inland Ranges)
  - Surface Water Outfalls (OF-1 through OF-14; OF-16 through OF-30; OF-32, OF-33)
  - Site 25 (Equipment Storage Area)

  - Site 33 (Golf Course Maintenance Area)

- Site 3 Interim ROD Beach Trainfire Ranges
- No Action Sites ROD
- Interim Action Sites ROD
- Other Investigations (not addressed under one of the RODs above)
  - Carbon Tetrachloride Investigation
  - Monterey Bay Enhanced Preliminary Assessment
  - East Garrison Magnetic Anomalies Investigation
  - Fritzsche Army Airfield Three Sites Investigation
  - Freon 113 Investigation
  - Fort Ord Soil Treatment Area (FOSTA) / Underground Storage Tank Remediation Area (USRA) Investigation
  - Resource Conservation and Recovery Act (RCRA) Closures
  - Ordnance and Explosives Program

The triggering action for this statutory review was the initiation of remedial action at the OU 2 Landfill on May 17, 1997. The five-year review is required since hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

1.1 Five-Year Review Report Organization

This Five-Year Review Report is organized as follows:

Section 1 – Introduction. Describes the purpose and scope of the Five-Year Review report and summarizes its organization.

Section 2 – Site Chronology Table. Summarizes the chronology of cleanup-related events at Fort Ord that are reviewed in this report.

Section 3 – Fort Ord Background. Describes the general physical characteristics and land uses at Fort Ord; the history of contamination; initial responses to the presence of contamination; and the basis for actions taken to address the contamination.

Section 4 – Five-Year Review Process. Summarizes the components of the Five-Year Review process, including administrative and community involvement components; and data review, site inspection, and interview procedures.

Section 5 – OU 1 ROD Fritzsche Army Airfield. Presents background information on OU 1 Fritzsche Army Airfield; a summary of remedial actions and a technical assessment of the actions taken at the site; 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 6 – OU 2 ROD - Fort Ord Landfills. Presents background information on OU 2 Fort Ord Landfills; a summary of remedial actions and a technical assessment of the actions taken at the site; 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 7 – Basewide Remedial Investigation Sites ROD. Presents background information on the Basewide Remedial Investigation sites; a summary of remedial actions and a technical assessment of the actions taken at these sites; identifies any issues related to the protectiveness of the remedies 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 – Site 3 Interim ROD. Presents background information on the Site 3 Interim ROD; a summary of remedial actions and a technical assessment of the actions taken at this site; 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 remedy.

Section 9 – No Action Sites ROD. Presents background information on the No Action Sites ROD; a summary of remedial actions and a technical assessment of the actions taken at these sites; identifies any issues related to the protectiveness of the remedies 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 – Interim Action Sites ROD. Presents background information on the Interim Action Sites ROD; a summary of remedial actions and a technical assessment of the actions taken at these sites; identifies any issues related to the protectiveness of the remedies 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 – Status of Other Investigations. Provides background information and status reports on other investigations at Fort Ord not addressed under one of the RODs described above.

Section 12 – Next Review. Describes the schedule for the next Five-Year Review to be conducted at Fort Ord.

Section 13 – References. Provides a list of references to pertinent documents cited in the report.

2.0 SITE CHRONOLOGY TABLE

The table below presents a summary of the chronology of cleanup-related events at Fort Ord that have occurred prior to the preparation of this five-year review document. The remaining actions that have occurred since 1997 are discussed throughout this document.

Event	Date
Pre-NPL Responses	
OU 1 (Fritzsche Army Airfield Fire Drill Area) Investigation	1984
OU 2 (Fort Ord Landfill) Investigation	1986
NPL Listing	2/90
Federal Facility Agreement signed	7/90
BRAC Listing	7/91
Panetta Legislation (Public Law 102-190)	12/91
Interim Action ROD	3/94
OU 2, Fort Ord Landfills, Record of Decision (ROD)	8/94
No Action Plug-In ROD	4/95
OU 1, Fritzsche Army Airfield, ROD	9/95
OU 2 Explanation of Significant Differences (ESD) #1	8/95
Remedial Investigation/Feasibility Study Completed	10/95
OU 2 ESD #2	8/96
OU 2 ESD #3	1/97
Interim ROD, Site 3 Beach Trainfire Ranges	1/97
Basewide Remedial Investigation Sites ROD	1/97

3.0 FORT ORD BACKGROUND

This section describes the general physical characteristics and land uses at Fort Ord; the history of contamination; initial responses to the presence of contamination; and the basis for actions taken to address the contamination.

3.1 Physical Characteristics

Fort Ord is adjacent to Monterey Bay in northwestern Monterey County, California, approximately 80 miles south of San Francisco (Plate 1). The base consists of approximately 28,000 acres adjacent to the cities of Seaside, Sand City, Monterey, and Del Rey Oaks to the south and Marina to the north. The Southern Pacific Railroad and Highway 1 pass through the western part of Fort Ord, separating the beachfront portions from the rest of the base. Laguna Seca Recreation Area and Toro Regional Park border Fort Ord to the south and southeast, respectively. Land use east of Fort Ord is primarily agricultural.

3.1.1 History

Beginning with its founding in 1917, Fort Ord served primarily as a training and staging facility for infantry troops. From 1947 to 1975, Fort Ord was a basic training center. After 1975, the 7th Infantry Division (Light) occupied Fort Ord. Light infantry troops operate without heavy tanks, armor, or artillery. Fort Ord was selected in 1991 for decommissioning, but troop reallocation was not completed until 1993. Although Army personnel still operate the base, no active Army division is stationed at Fort Ord.

In 1917, the U.S. Army bought the present day East Garrison and nearby lands on the east side of Fort Ord to use as a maneuver and training ground for field artillery and cavalry troops stationed at the Presidio of Monterey. Before the Army's use of the property, the area was agricultural, as is much of the surrounding land today. No permanent improvements were made until the late 1930s, when administrative buildings, barracks, mess halls, tent pads, and a sewage treatment plant were constructed.

In 1938, additional agricultural property was purchased for the development of the Main Garrison. At the same time, the beachfront property was donated to the Army. The Main Garrison was constructed between 1940 and the 1960s, starting in the northwest corner of the base and expanding southward and eastward. During the 1940s and 1950s, a small airfield within the Main Garrison was present in what is now the South Parade Ground. In the early 1960s, Fritzsche Army Airfield (FAAF) was completed. The Main Garrison airfield was then decommissioned and its facilities were redeveloped as motor pools and other facilities.

3.2 Land Use

Fort Ord consists of both developed and undeveloped land. The three principal developed areas are the East Garrison, the FAAF, and the Main Garrison; these areas collectively comprise approximately 8,000 acres. The remaining 20,000 acres are largely undeveloped areas. Land uses in both the developed and undeveloped areas are described below

3.2.1 Developed Land

With the presence of up to 15,000 active duty military personnel and 5,100 civilians during its active history, developed areas at Fort Ord resembled a medium-sized city, with family housing, medical facilities, warehouses, office buildings, industrial complexes, and gas stations. Individual land use categories were as follows:

- Residential areas included military housing, such as training and temporary personnel barracks, enlisted housing, and officer housing.

- Local services/commercial areas provided retail or other commercial services, such as gas stations, mini-markets, and fast food facilities.

- Military support/industrial areas included industrial operations, such as motor pools, machine shops, a cannibalization yard (area where serviceable parts are removed from damaged vehicles), and the FAAF.

- Mixed land use areas combined residential, local services/commercial, and military support operations.

- Schools included the Thomas Hayes Elementary, Roger S. Fitch Junior High, General George S. Patton Elementary, and Gladys Stone schools. High school students attended Seaside High, outside Fort Ord's southwest boundary.

- Hospital facilities included the Silas B. Hayes Army Hospital, medical and dental facilities, and a helipad.

- Training areas included a central running track and athletic field, firing ranges, and obstacle courses.

- Recreational areas included a golf course and club house, baseball diamonds, tennis courts, gymnasiums, and playgrounds.

The three principal developed areas are described below.

East Garrison: The East Garrison is on the northeast side of the base, adjacent to undeveloped training areas (Plate 2). Military/industrial support areas at the East Garrison include tactical vehicle storage facilities, defense recycling and disposal areas, a sewage treatment plant, and a small arms range. The East Garrison also contains recreational open space, including primitive camping facilities, baseball diamonds, a skeet range, and tennis courts. Recreational open space comprises 25 of the approximately 350 acres of the East Garrison.

Fritzsche Army Airfield: The FAAF is in the northern portion of Fort Ord, on the north side of Reservation Road and adjacent to the city limits of Marina (Plate 2). The primary land use is for military/industrial support operations; facilities include air strips, a motor park, aircraft fuel facilities, a sewage treatment plant, aircraft maintenance facilities, an air control tower, a fire and rescue station, and aircraft hangars.

Main Garrison: The Southern Pacific Railroad right-of-way and Highway 1 separate the coastal zone from Fort Ord's Main Garrison (Plate 2). The Main Garrison consists of a complex combination of the various land use categories. Facilities include schools; a hospital; housing; commercial facilities including a dry cleaner and a gasoline service station; and industrial operations including motor pools and machine shops.

3.2.2 Undeveloped Land

Coastal Zone: A system of sand dunes lies between Highway 1 and the shoreline (Plate 2). The western edge of the dunes has an abrupt drop in elevation of 40 to 70 feet, and the dunes reach an elevation of 140 feet above mean sea level on the gentler, eastern slopes. The dunes provide a buffer zone that isolates the Beach Trainfire Ranges (RI Site 3) from the shoreline to the west. In some areas, spent ammunition accumulated on the dune slopes as the result of years of range operation. Stilwell Hall (previously used as a recreation center), numerous former target ranges and ammunition storage facilities, and two inactive sewage treatment facilities lie east of the dunes.

Because of the presence of rare and/or endangered species and because of its visual attributes, Monterey County has designated Fort Ord's coastal zone an environmentally sensitive area. The California Natural Coordinating Council (CNCC) and the Heritage Conservation and Recreation Service (HCRS) have identified the dunes at Fort Ord as among the best coastal dunes in California because of significant features including coastal strand vegetation comprising many exotic ice plants

and the habitat of the black legless lizard (*Monterey County Planning Department [MCPD], 1984*).

Inland Areas: Undeveloped land in the inland portions of Fort Ord includes infantry training areas and open areas used for livestock grazing and recreational activities such as hunting, fishing, and camping. A large portion of this undeveloped land is occupied by the Inland Trainfire Ranges (part of Site 39); this area was used for advanced military training operations.

These undeveloped areas occur primarily in their natural state, and typically do not contain develop facilities.

3.2.3 Transferred Land

Over 10,000 acres of former Ford Ord property has been transferred. Parcel sizes ranged from 0.1 acre to over 4900 acres. The major property recipients have been the Bureau of Land Management (BLM), California State University Monterey Bay, University of California, the City of Marina and the City of Seaside.

3.3 History of Contamination

The history of contamination is discussed on a site-by-site basis in Sections 5.0 through 11.0.

3.4 Initial Responses

After completion of the first phase of Remedial Investigation/Feasibility Study (RI/FS) field work, it was evident that the sites could be categorized based on: (1) whether a release was identified at a site and (2) if a release had occurred, the nature and extent of the release. Therefore, using the initial site characterization information and existing pre-RI/FS data, the 43 sites were categorized as: (1) Basewide Remedial Investigation (RI) sites, (2) Interim Action (IA) sites, or (3) No Action (NoA) sites (Plate 2). These three categories are defined as follows; the individual RI, IA, and NoA sites are listed in Sections 7.0, 9.0, and 10.0, respectively:

- RI Sites: RI sites have sufficient contamination to warrant a full Remedial Investigation, (RI), Baseline Risk Assessment (BRA), Ecological Risk Assessment (ERA), and Feasibility Study (FS)

- NoA Sites: NoA sites do not warrant remedial action under CERCLA

- IA Sites: IA sites have limited volume and extent of contaminated soil and, as a result, are easily excavated, as an interim action

To accelerate the cleanup process, IA and NoA sites were addressed in separate remedial categories from the RI sites and were supported by their own records of decision (RODs). These RODs provided a process for accelerated transfer of NoA sites and cleanup of IA sites under BRAC, rather than delaying cleanup or transfer actions until a final ROD for Fort Ord is signed. The NoA ROD was signed in April 1995, and the IA ROD was signed in March 1994. The RI sites ROD was signed in January 1997, and addressed cleanup of a range of sites for which full RI/FSs were deemed necessary.

In addition to the RI, NoA, and IA sites RODs, two operable units at Fort Ord (OU 1, the Fritzsche Army Airfield (FAAF) Fire Drill Area, and OU 2, the Fort Ord Landfills; Plate 2) were also supported by their own RODs and follow individual paths to the final ROD for Fort Ord. The ROD for OU 1 was signed in September 1995, and the OU 2 ROD was signed in August 1994.

3.5 Basis for Action

The basis for the action is discussed on a site-by-site basis in Sections 5.0 through 11.0.

4.0 FIVE-YEAR REVIEW PROCESS

This section summarizes the components of the Five-Year Review process, including administrative and community involvement components; and data review, site inspection, and interview procedures.

4.1 Administrative Component

Members of the Base Closure Team (BCT) were notified of the initiation of the five-year review on November, 2000. The Fort Ord Five-Year Review team was led by Gail Youngblood, the Base Realignment and Closure (BRAC) Environmental Coordinator (BEC), and the team included members from the United States Army Corps of Engineers (USACE) staff and their contractors, with expertise in hydrogeology, geology, treatment system operations and risk assessment.

4.2 Community Involvement

Activities to involve the community in the five-year review were initiated with an announcement that was made available at the Community Involvement Workshop (CIW), Technical Review Committee (TRC) meeting and on the Fort Ord web page in February 2002.

4.3 Data Review

This five-year review consisted of a review of relevant documents including operations and maintenance (O&M) records and monitoring data; records of decision (RODs); Explanation of Significant Differences to the RODs (ESDs), where appropriate; confirmation reports; closure reports; applicable groundwater cleanup standards; Preliminary Remediation Goals (PRGs); and others reports listed in Section 13.0 (References) and referenced herein.

4.4 Site Inspections

Inspections at the sites were conducted on January 30, 2002, by Mark Reese, Fort Ord Department of Environmental and Natural Resources Management; Marc Edwards, USACE; and Edward Ticken, Harding ESE. The purpose of the inspections were to assess the protectiveness of the remedies at Operable Unit 2 (OU 2; Fort Ord Landfills), and the Basewide Remedial Investigation (RI) Sites, including Site 3, the Beach Trainfire Ranges. Operable Unit 1 (OU-1; Fritzsche Army Airfield) is routinely inspected as part of the groundwater treatment system operation and was not included in the site inspection.

4.4.1 OU 2 Landfill

The former Area A appears to be revegetated and no signs of erosion were evident. There was erosion of the vegetative layer in a section of Cell F where the liner is now exposed. These erosional problems were believed to be caused by an animal burrow near the drainage system which caused a small section of the liner to be exposed. The area will be repaired after the end of the rainy season and the areas around the drainage system will be periodically inspected for animal burrows. A pilot test is in progress to reduce the amount of landfill gas at the property line of Cell F to meet regulatory standards. The OU 2 groundwater treatment system is periodically inspected by the USACE and was not included in this inspection. No new uses of groundwater within the OU 2 plume area were observed.

4.4.2 RI Sites

Sites 2/12 – The excavation area at Lower Meadow at Site 12 is revegetated and there are no signs of erosion. The 2/12 groundwater treatment system is periodically inspected by the USACE and was not included in this inspection.

No new uses of groundwater within the 2/12 plume area were observed.

Sites 16/17 – The excavation area at Pete's Pond at Sites 16/17 is revegetated and there are no signs of erosion except in one area where there was recent a break in the water main which was repaired by the installation staff.

Site 25 – No activities or changes were noted within Site 25.

Site 31 – The excavation area at Site 31 is revegetated and there are no signs of erosion or other activities on the excavated slope.

Site 33 – There were no residential development noted at Site 33 where restrictions limit the reuse to other than residential-type uses. The site is continuing to be used as a golf course maintenance area.

Site 39 – This site was not inspected because the remedy has not yet been implemented and ordnance and explosive cleanup activities are in progress at the site.

4.4.3 Site 3

The remediation areas at Site 3 are revegetated and there are no signs of erosion.

4.5 Interviews

Interviews specific to the Five-Year Review were not conducted because the Army currently maintains an active community relations program that allows continuous community involvement in the cleanup of the former Fort Ord. This is accomplished through several outreach activities aimed at establishing and sustaining two-way communication between the Army and members of the local communities. Participants include, but are not limited to: Technical Review Committee (TRC) members, local political and civic leaders, special interest groups, minority, ethnic, and religious organizations. Interviews and surveys are conducted by the community relations staff within affected communities to support the Community Relations Plan. Interviews allow the community relations staff to maintain a current evaluation of the community members assessment of the Fort Ord cleanup activities. Monthly Community Involvement Workshops and Quarterly TRC Meetings provide a continuing forum for input from members of the local communities, representatives of local and regional regulatory agencies and commissions, natural resource trustees, civic and educational institutions.

5.0 OU 1 ROD FRITZSCHE ARMY AIRFIELD FIRE DRILL AREA

This section presents background information on OU 1, Fritzsche Army Airfield Fire Drill Area; a summary of remedial actions and a technical assessment of the actions taken at the site; 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.

5.1 OU 1 Background

The Fritzsche Army Airfield Fire Drill Area (FDA) was established in 1962 as a training area for the Fort Ord Fire Department (Plate 2). As part of training activities, fuel was discharged from an onsite storage tank into a pit, ignited, and then extinguished. Training activities at the FDA were discontinued in 1985 and the associated structures were removed. Fort Ord's first site investigation was conducted at the FDA, and concluded that soil and groundwater cleanups were required in this area. About 4,000 cubic yards of contaminated soil was removed from the FDA, and the area was then backfilled with clean fill (soil). In addition to the soil cleanup, a water treatment facility was constructed in 1988 in order to remediate trichloroethylene (TCE) and other related groundwater contaminants. During operation of the treatment system, surrounding groundwater is sampled and checked to verify the treatment system is operating effectively. Since 1988, water samples have been collected every three months (and were collected more frequently during the initial operation period). This information has been compiled into annual reports to show the long-term trends of system operation (Harding ESE, *Annual Evaluation Report, October 1999 through September 2000, OU 1 and OU 2 Groundwater Remedies, Former Fort Ord, California*, June 20, 2001). In addition, a large-scale study of all data is summarized in the OU 1 site-specific 5-Year Review, *Draft Final, Five-Year Status Report and Effectiveness Evaluation, Operable Unit 1 Groundwater Treatment System, Fort Ord, California* (*HLA, 1999c*).

5.2 Remedial Actions

5.2.1 Remedy Selection

Groundwater

The remedial alternatives listed in the OU 1 RI/FS (*HLA, 1987*) are as follows:

Alternative 1

- Air stripping of groundwater with vapor phase carbon treatment of effluent and biodegradation of soil.

Alternative 2

- Air stripping of groundwater with vapor phase carbon off-gas treatment, aqueous carbon polishing of effluent and biodegradation of soil.

Alternative 3

- Aqueous carbon effluent treatment of groundwater and biodegradation of soil.

Soil

The OU 1 ROD approved no further action for soil based on the results of the Remediation Confirmation Study (*HLA, 1999d*).

5.2.2 Remedy Implementation

Alternative 3 was selected, approved and implemented in June 1987 based on the RI/FS and was approved in the OU 1 ROD.

5.2.3 System Operations and Maintenance

Operations and maintenance (O&M) of the OU 1 remedy have kept the groundwater treatment system functioning in accordance with design parameters and the objectives stated in the ROD since the inception of operations in 1988. To date, the system has processed over 100 million gallons of water and removed over 25 pounds of contaminants, of which approximately 88 percent is TCE. The system continues to use two 33-cubic-foot (1,000-pound) carbon vessels connected in series for treatment with a third off-line unit used for replacement of spent carbon. The system operates continuously except for periods of routine maintenance, carbon servicing, and replacement of worn equipment. In general, the system is in operation approximately 99% of the time. Carbon replacement in the system occurs approximately every 4 to 6 months.

No design changes have been made to the system since the modifications that were made in 1989, which increased the flow capacity of the system by 33%. The only operational change that has been made is cessation of pumping from extraction well EW-OU1-18-A, as recommended in the 5-Year Status Report and Effectiveness Evaluation (*HLA, 1999c*) for OU 1, because cleanup levels have been achieved and maintained in that well's capture area. An additional benefits recognized from this change includes cost savings from reduced carbon consumption. Groundwater monitoring of this area is continuing to evaluate changes that may result from discontinued pumping.

5.3 Technical Assessment

5.3.1 Question A

Is the remedy functioning as intended by the decision document?

Operations and maintenance (O&M) of the treatment system is performed as described in the O&M Manual (*HLA, 1996m*). Details regarding operation and system performance are described in the June 20, 2001 *Annual Evaluation Report, October 1999 Through September 2000, OU 1 and OU 2 Groundwater Remedies, Former Fort Ord, California (Harding ESE/IT 2001b)*. The OU 1 groundwater remedy is continuing to effectively reduce the total mass of solvents in groundwater, and is functioning in accordance with design parameters and the objectives stated in the OU 1 ROD (*Army, 1995b*). Concentrations of chemicals of concern (COCs) have continued to decrease within the designed capture area except where recent increased precipitation recharge and groundwater elevation increases have locally remobilized vadose zone solvents previously held in capillary suspension. Within the designed capture area this contaminant mass is expected to be adequately addressed by the existing remedy. Other than occasional equipment failures and replacement, and periodic shutdowns for routine maintenance and testing, the system has operated continuously and effectively.

Evaluation of monitoring and test data have indicated that aquifer cleanup levels (ACLs) in the vicinity of extraction well EW-OU1-18-A have been achieved and sustained for a significant period of time. Furthermore, aquifer test data has indicated that the existing system may be optimized by cessation of pumping from EW-OU1-18-A (already achieved), and doubling the pumping rate in EW-OU1-17-A, which would increase the area of hydraulic capture.

Increasing pumping rates will enhance hydraulic capture in the vicinity of the former burn pit and adjacent areas. However, COCs above the ACLs have been identified and the additional area delineated northwest (downgradient), of the former burn pit and outside of the capture area (*Harding ESE/IT, 2001c*) for which remediation will be required. A conceptual design describing a proposed expansion of the OU 1 remedy to include the downgradient area has been issued (*Harding ESE/IT, 2001f*). Concurrently, a pilot study program is being developed by the Army to evaluate the potential effectiveness of additional treatment technologies, such as in situ oxidation, to

supplement remediation of the downgradient areas.

5.3.2 Question B

Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

The property in and around the OU 1 area has been transferred, and the land use has changed slightly since the time the ROD was issued (currently a biological reserve). However, land use has not changed sufficiently to alter the exposure assumptions used for development of the ACLs specified in the ROD. The standards for site ACLs were based on state and federal maximum contaminant levels (MCLs) except where more stringent values were developed from the health risk assessment. The MCLs for the OU 1 COCs have not changed since the ROD was signed, so the ACLs remain compliant, or more conservative than MCLs. In summary, no concentrations of COCs have been detected in excess of the maximums indicated in the ROD, potential exposure pathways have not appreciably changed, and the ACLs are still in compliance with, or more conservative than, federal and State standards. Therefore, the standards continue to be protective of human health, and no re-evaluation of health risks for the OU 1 remedy is necessary.

5.3.3 Question C

Has any information come to light that could call into question the protectiveness of the remedy?

The OU 1 remedy is operating in accordance with design parameters and is compliant with the objectives of the ROD within the designed hydraulic capture area. However, groundwater monitoring has indicated that COCs are present in groundwater outside, and downgradient of, the capture area of the current remedy *(Harding ESE/IT 2001c)*. This appears to be an uncaptured portion of the original groundwater plume. The existing groundwater remedy is inadequate to address these downgradient areas in a manner sufficient to comply with the ROD and regulatory parameters. Modification of the current system is necessary to address the downgradient areas in order to protect potential beneficial uses of the groundwater and to be protective of human health. Planning for this modification is underway.

5.4 Issues

Changes under consideration for the treatment system include increasing the pumping rate from extraction well EW-OU1-17-A to increase the potential capture area and potentially reduce contaminant residence time. This would require no modifications to the treatment system because of the additional processing capacity available from shutting down extraction well EW-OU1-18-A. These changes and proposed changes are in accordance with the established system operation parameters and objectives of the ROD.

Solvent contamination in groundwater has been identified outside the capture area of the OU 1 remedy. TCE is present over an area of approximately 50 acres downgradient of the existing capture of the OU 1 remedy. Concentrations of TCE in downgradient locations exceed the ACLs specified in the OU 1 ROD and will require remediation to be compliant with the ROD objectives and applicable or relevant and appropriate requirements (ARARs).

The existing OU 1 groundwater remedy is protective over the area for which it was designed, but cannot remediate the downgradient contamination without modification. Solvent contamination in the downgradient areas poses a potential risk to health via degradation of water quality. Treatment system modification or expansion, or alternative remediation methods will need to be implemented in order to apply the cleanup standards of the ROD to the entire area of the plume as it is now known.

No unresolved issues raised by regulatory agencies, the community, or other interested parties have been identified.

5.5 Recommendations and Follow-Up Actions

To achieve the objectives specified in the OU 1 ROD, operation of the existing groundwater remedy should continue until ACLs have been achieved and maintained within the designed capture area. To address the downgradient contamination, the groundwater remedy should be expanded as described in the *Conceptual Design, OU 1 Groundwater Remedy Expansion* (*Harding ESE/IT, 2001f)*, and alternative technologies should be evaluated as enhancement or substitution for the conceptual design.

5.6 Protectiveness Statement

The remedy is protective of human health and the environment within the designed capture area by maintaining hydraulic control of the contaminant plume and by actively reducing contaminant levels. The remedy is compliant with ARARs in the area for which it was designed, but does not address the downgradient aspect of the solvent plume and is not currently protective of human health and the environment in that area. The Army is presently evaluating methods to remediate the downgradient aspect of the plume. All transferring parcels, which are located over the groundwater plume, will include a Covenant To Restrict Use Of Property (CRUP) recorded with the deed. The CRUP will prohibit construction of wells for injection or extraction of any groundwater until the ACLs are attained. In addition, there is a Monterey County ordinance that regulates water well installation within either the "Groundwater Prohibition Zone" or "Groundwater Consultation Zone" which include the known groundwater plumes at the former Fort Ord.
It is anticipated that the next five-year evaluation of OU 1 will be completed in 2007 in conjunction with the Basewide Five-Year Evaluation for the Former Fort Ord.

6.0 OU 2 ROD – FORT ORD LANDFILLS

This section presents background information on OU 2 Fort Ord Landfills; a summary of remedial actions and a technical assessment of the actions taken at the site; 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.

6.1 OU 2 Background

Operable Unit 2 (OU 2), the Fort Ord Landfills site, consists of landfills covering approximately 150 acres, the immediate surrounding area, and the underlying contaminated groundwater (Plate 2).

The landfills were used for over 30 years for residential and commercial waste disposal. The landfills include the main landfill and the north landfills. The north landfills were operated from 1956 to 1966. The main landfill was operated from 1960 until 1987, and may have received a small amount of chemical waste along with household and commercial refuse. The main landfill facility stopped accepting waste for disposal in May 1987 because of the initiation of interim closure of the facility.

As a result of detections of volatile organic compounds (VOCs) in Fort Ord and Marina County Water District (MCWD) water supply wells, the Regional Water Quality Control Board (RWQCB) issued Cleanup and Abatement Order (CAO) 86-87 that required Fort Ord to initiate studies of soil and groundwater to assess the potential impact of the Fort Ord Landfills on underground water resources. The RWQCB also issued CAO Nos. 86-317 and 88-139 for the investigation and cleanup of groundwater contamination caused by the landfills and Waste Discharge Report (WDR) No. 87-153 requiring landfill closure by 1989. The Army initiated studies (*HLA, 1988a*) to evaluate whether chemicals from the landfills had affected either soil beneath the landfills or the quality of groundwater beneath the sites, or both.

The *Final Remedial Investigation Report* (*Dames and Moore, 1993*) indicated the presence of low levels of semi-volatile organic compounds (SOCs) and pesticides in soil at maximum total detected concentrations of 5.6 milligrams per kilogram (mg/kg) and 0.12 mg/kg, respectively. Metals were also detected in all soil samples. Soil gas sampling detected VOCs and methane at maximum concentrations of 6.0 micrograms per liter (µg/l) and 550,000 µg/l, respectively. VOCs were also detected in groundwater samples collected from both the A-aquifer and the 180-foot aquifer. TCE was the most frequently detected chemical in groundwater with a maximum concentration of 80 µg/l. Other VOCs detected in groundwater samples included: tetrachloroethene (PCE), benzene, cis-1,2-dichloroethene, and dichloromethane. Recent data indicates that a portion of the carbon tetrachloride plume described in Section 11.1, has migrated to the southeast where it commingles with the OU 2 plume.

6.2 Remedial Actions

6.2.1 Remedy Selection

Using the RI data, a Baseline Risk Assessment (*Dames and Moore, 1993*) and a feasibility study (*Dames and Moore, 1993*) were prepared. These documents provided evaluations of the potential risks to human health and the environment from contamination in soil and groundwater at the landfills, and alternatives for remediating contamination.

The following five remedial alternatives were evaluated in the FS:

Alternative 1

- No Action: This alternative assumes current site conditions will be unchanged except for implementation of a groundwater monitoring program to assess the status of the groundwater plume. The no action alternative is required to be considered under CERCLA to provide a baseline for comparison to the other proposed alternatives.

Alternative 2

- Containment: This alternative consists of containment of groundwater and waste within the present boundaries of the contamination.

Alternative 3

- A-Aquifer Cleanup and Landfill Capping: Under this alternative, groundwater extraction wells are screened only in the A-aquifer, with a system designed to achieve groundwater and chemical removal as well as containment in the A-aquifer. This alternative also includes construction of a landfill cap to minimize exposure, and reuse or recharge of treated water to the subsurface.

Alternative 4

- A-Aquifer Cleanup and Landfill Capping – Interim Action on the 180-Foot Aquifer: In addition to the actions identified in Alternative 3, this alternative includes removal and treatment of groundwater and chemicals from the 180-foot aquifer.

Alternative 5

- A-Aquifer Cleanup and Removal, Treatment, and Disposal of Landfill Waste – Interim Action on 180-foot Aquifer: Groundwater from both the A- and 180-foot aquifers is removed and treated as in Alternative 4. Instead of capping, the waste from the landfill areas is excavated using conventional earthmoving equipment. The excavated waste is then segregated and disposed according to current regulations.

Selected Remedy

The Army's preferred cleanup for OU 2 was Alternative 4: Upper Aquifer Cleanup and Landfill Capping - Interim Action on the 180-Foot Aquifer. The Federal Facilities Agreement (FFA) parties approved Alternative 4, and a ROD for OU 2 was signed by the FFA parties in August 1994. The following documents identified additional remediation criteria that were not specified in the OU 2 ROD:

Explanation of Significant Differences (ESD) 1

In August, 1995, the *Explanation of Significant Differences, Operable Unit 2, Fort Ord Landfills* (*U.S. Army, 1995c*) was signed. This ESD finalized the 180-foot aquifer cleanup goals consistent with those established for the A-aquifer in the OU 2 ROD.

ESD 2

In August, 1996, the *Explanation of Significant Differences, Area A, Operable Unit 2, Fort Ord Landfills* (*U.S. Army, 1995d*) was signed. This ESD addressed the identification of cleanup criteria for areas outside the main landfill that would be excavated and consolidated within the main landfill boundaries.

ESD 3

In January 1997 the *Explanation of Significant Differences, Consolidation of Remediation Waste in a Corrective Action Management Unit (CAMU), Operable Unit 2, Fort Ord Landfills* (*U.S. Army, 1997a*) was signed. This ESD addressed soil and debris (remediation waste) that would be excavated from remediation areas at Fort Ord and consolidated within the main landfill boundaries.

6.2.2 Remedy Implementation

Landfill Cap

A cap has been constructed over the main portion of the landfill containing debris. An approximate 25-acre area of the landfill (Area A) was excavated and transferred to the main portion of the landfill to consolidate the debris in one area. This soil consolidation action allowed for clean closure of Area A, which is now available for unrestricted use (*IT, 2001a*). The remaining areas of the landfill (Cells B, C, D and F) have been closed, and they are covered by a landfill cap constructed after consolidation activities were completed. A seven-acre portion of Area E is covered with an interim cap, but will be completely closed pending completion of soil excavations at Range 18.

Groundwater Treatment

A groundwater treatment facility was constructed in 1995 to remediate groundwater underlying the landfill. Remediation is expected to take about 30 years. During the operation of the treatment system, groundwater is sampled to confirm that the treatment system is operating effectively. Since 1995, groundwater samples have been collected and analyzed every three months. This information has been compiled into quarterly and annual reports to show the long-term trends of system operation.

6.2.3 System Operations and Maintenance

Landfill Cap

Operations and maintenance of the landfill includes inspection and maintenance of the landfill cover, landfill gas vents survey monuments, and settlement plates; and erosion and drainage control. Landfill gas emissions and landfill cover settlement are also monitored periodically (*IT, 2000a*).

Groundwater Treatment

Operations and maintenance have kept the OU 2 groundwater treatment system functioning in accordance with design parameters since the inception of operations in 1995. The OU 2 groundwater remedy is operated in accordance with the *Work Plan, Revision 0, Operation and Maintenance, Groundwater Treatment Systems, former Fort Ord, California (Harding ESE/IT, 2000a)* and *Sampling and Analysis Plan, Revision 1, Operable Unit 1, Operable Unit 2, and Sites 2 and 12 Groundwater Treatment Systems, Former Fort Ord, California (Harding ESE/IT 2001e).* Operations and maintenance activities are summarized for every three-month quarterly period in treatment system data summary reports. The most recent quarterly report describing OU 2 operations and maintenance is the *Quarterly Groundwater Treatment Systems Operation Data Summary Report, July through September 2001, Operable Unit 1, Operable Unit 2, Sites 2/12, Former Fort Ord, California* (*Harding ESE/IT 2001c*). To date, the system has processed over 1.77 billion gallons of water and removed over 240 pounds of contaminants, of which approximately 63 percent is TCE. The system operates continuously except for periods of routine maintenance, carbon servicing, and replacement of worn equipment. To date, the system has been in operation approximately 97% of the time. Carbon replacement in the system has occurred approximately every 2 to 4 months since operation began.

The OU 2 groundwater treatment system originally consisted of carbon adsorption followed by catalyzed ultraviolet chemical oxidation (UV-Ox) polishing. The carbon adsorption was accomplished using two 20,000-pound carbon vessels connected in series. The original system extracted water from two Upper 180-foot aquifer extraction wells and 13 A-aquifer extraction wells to produce a total flow of approximately 600 gallons per minute (gpm). Following treatment, the extracted water was injected back into either the A-aquifer or Upper 180-foot aquifer.

Expansion of the OU 2 treatment system was initiated following discovery that the aquifer area with COCs greater than ACLs was larger than originally recognized during the groundwater treatment system design. Hydraulic capture of the resulting plume by the original system was not complete, and a system expansion was initiated to enable complete plume capture and fulfill the remediation objectives of the OU 2 ROD. Groundwater monitoring is continuing throughout the OU 2 treatment area and within all the effected aquifers to evaluate changes that may result from the expanded system and to monitor the effectiveness of the remedy.

System modifications were completed in April 2001, in accordance with the *Groundwater Remedial Action Work Plan, Operable Unit 2 Groundwater Remedy System Expansion* (*IT, 1999d*). Modifications included removal of the UV-Ox system, installation of a second set of two additional 20,000-pound carbon vessels connected in series, and installation of seven additional extraction wells. A portion of the OU 2 effluent is piped to the Sites 2/12 area and is injected with the Sites 2/12 effluent.

6.3 Technical Assessment

6.3.1 Question A

Is the remedy functioning *as intended by the decision document?*

Landfill Cap

The landfill cap is functioning as intended.

Groundwater Treatment

The OU 2 groundwater remedy is functioning as intended. Both the original system installed in 1995 and the expanded system completed in 2001 achieved the groundwater extraction and treatment design parameters described in design documents. System operation has been relatively constant (97% of the time) since system startup in 1995. Details regarding operation and system performance are described in the *Annual Evaluation Report, October 1999 Through September 2000, OU 1 and OU 2 Groundwater Remedies, Revision 0, Former Fort Ord, California* (*Harding ESE/IT, 2001b*).

Statistical evaluation of data obtained from OU 2 treatment system influent samples indicate that concentrations are generally decreasing over time. The influent chemistry data indicates that the OU 2 groundwater remedy is effectively reducing the total mass of COCs in groundwater, and is functioning in accordance with the objectives stated in the OU 2 ROD (*Army, 1994c*), *Final Record of Decision, Operable OU 2, Fort Ord Landfills Army, Fort Ord, California,* dated July 15.

The expanded OU 2 groundwater remedy is operating at the designed flow rates. Based on monitoring performed since system modification, it appears to have achieved hydraulic capture of the groundwater containing COCs at concentrations above ACLs. The groundwater contaminant mass within the hydraulic capture area is expected to be adequately addressed by the existing remedy.

Opportunities for future system optimization include discontinued groundwater pumping from individual wells where cleanup goals (ACLs) have been attained. Ending extraction at an individual well will allow for increased extraction from other existing wells and will reduce operations and maintenance costs associated with the well.

6.3.2 Question B

*Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (*RAOs*) used at the time of the remedy selection still valid?*

Landfill Cap

The exposure and toxicity criteria used to evaluate health risks are still valid.

Groundwater Treatment

The property in and around the OU 2 plume area has been transferred for civilian use. However, land use has not changed sufficiently to alter the exposure assumptions that were used during the original risk assessment and development of ACLs. The aquifer cleanup levels for the COCs identified in the OU 2 ROD were based on State or federal MCLs with the exceptions of chloroform, 1,2-dichloropropane, tetrachloroethene, and vinyl chloride, for which the ACLs are lower than State or federal MCLs. The lower ACLs were based on risk calculations for each COC that estimated a combined excess cancer risk of 6×10^{-5} (*Dames and Moore, 1993*). Since the original risk assessment, the State or federal MCLs that were selected as ACLs have not changed, and toxicity values for the additional calculated ACLs have not changed, with the exception of vinyl chloride. The toxicity values for vinyl chloride are still within the parameters used for the original risk calculations, and the ACLs designated for OU 2 remain protective of human health and the environment.

6.3.3 Question C

Has any information come *to light that could call into question the protectiveness of the remedy?*

Landfill Cap

Perimeter gas probes indicated that landfill gas concentrations exceed the regulatory standards along the eastern boundary of Cell F. Migration of landfill gas is addressed by California Integrated Waste Management Board regulations for Solid Waste Landfills, Title 14 California Code of Regulations, Chapter 3, Article 7.8 – an ARAR as identified in the OU 2 ROD." A landfill gas extraction and treatment system pilot study is in progress. Ambient air monitoring near the closest residence (368 feet from the landfill perimeter) has been initiated. The treatment system appears to be successfully remediating the landfill gas problem.

Groundwater Treatment

The OU 2 groundwater remedy has consistently operated in accordance with either the original design or the more recent system expansion design. Current system operation is compliant with the objectives of the OU 2 ROD, and is protective of human health and the environment. To date, the system has processed over 1.77 billion gallons of water and removed over 240 pounds of contaminants. In the 5 years of operation, the OU 2 remedy has reduced the average TCE concentration influent to the treatment plant from approximately 20 parts per billion to approximately 10 parts per billion, and a trend of decreasing concentrations of COCs appears to be continuing.

6.4 Issues

Landfill Cap

A portion of landfill Cell E has not been closed. Final closure of this cell is scheduled for late 2002 after excavation of soil at Range 18.

Landfill gas is monitored around all landfill cells and meets regulatory requirements, with the exception in the vicinity of the eastern boundary of Cell F, where the landfill gas extraction system is operating.

Groundwater Treatment

This technical assessment did not identify any issues that could affect current or future protectiveness of the groundwater remedy. Additionally, this assessment did not identify any unresolved issues previously raised by regulatory agencies, the community, or other interested parties.

6.5 Recommendations and Follow-Up Actions

Landfill Cap

Completed closure of landfill Cell E and prepare closure report for the OU 2 Landfill. Continue operation of the landfill gas treatment system

until landfill gas levels remain below regulatory standards. Continue to inspect and monitor the OU 2 Landfill in accordance with the Post Closure Operation and Maintenance Plan (*IT, 2000a*).

Groundwater Treatment

The OU 2 Groundwater Remedy should continue to be implemented as designed until either ACLs are reached or the next technical assessment is conducted.

6.6 Protectiveness Statement

The OU 2 groundwater remedy is compliant with ARARs and is expected to be protective of human health and the environment upon attainment of the ACLs. The groundwater remedy is actively maintaining hydraulic control of the VOC plume areas and reducing levels of COCs in groundwater. All transferring parcels, which are located over the groundwater plume, will include a Covenant To Restrict Use Of Property (CRUP) recorded with the deed. The CRUP will prohibit construction of wells for injection or extraction of any groundwater until the ACLs are attained. In addition, there is a Monterey County ordinance that regulates water well installation within either the "Groundwater Prohibition Zone" or "Groundwater Consultation Zone" which include the known groundwater plumes at the former Fort Ord.

The OU 2 landfill remedy is compliant with ARARs, with the addition of the landfill gas treatment system, and is expected to be protective of human health and the environment.

7.0 BASEWIDE REMEDIAL INVESTIGATION SITES ROD

This section presents background information on the Basewide Remedial Investigation sites; a summary of remedial actions and a technical assessment of the actions taken at these sites; identifies any issues related to the protectiveness of the remedies 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.

7.1 Sites 2/12

7.1.1 Background

7.1.1.1 Site 2 – Main Garrison Sewage Treatment Plant (MGSTP)

The Main Garrison Sewage Treatment Plant (MGSTP) occupied an unpaved area of approximately 28 acres west of Range Road between Trainfire Range No. 9 and Stilwell Hall (Plate 2). The MGSTP was the primary sewage treatment facility for Fort Ord, serving the majority of the housing areas and the main industrial areas from the late 1930s until May 1990 when it was decommissioned. The former treatment facility was fenced and contained several buildings and two large trickling filters. Outside of the fenced area were three unlined sewage ponding areas and 10 asphalt-lined sludge-drying beds. During operation, effluent from the MGSTP was discharged under a National Pollutant Discharge Elimination System (NPDES) permit to a storm drain that emptied onto Indianhead Beach during low tide and discharged to Monterey Bay during high tide. Sewage from Fort Ord now flows via gravity feed to a pumping station in Marina and is then pumped to the Monterey Regional Treatment Plant (MRTP), also in Marina. Potential contaminants associated with the former MGSTP included metals, pesticides, and hydrocarbons.

7.1.1.2 Site 12

The four major areas of Site 12 include the Lower Meadow Disposal Area, the Department of Logistics (DOL) Automotive Yard, the Cannibalization Yard, and the Southern Pacific Railroad Spur, as described below (Plate 2).

Lower Meadow Disposal Area

The Lower Meadow was a grassy field of approximately 2 acres east of Highway 1 near the Twelfth Street gate. The site is bounded to the east by the DOL Automotive Yard and to the west by First Avenue. The Lower Meadow was approximately 5 feet lower than the DOL Automotive Yard and received runoff from it. Several drainpipes (including Outfall 31) are in the southeast corner and the eastern side of the site. It is uncertain if the pipes were designed as drainage lines. No buildings were present in the Lower Meadow. The Lower Meadow was previously used to dispose of waste material such as scrap metal, oil, and batteries generated by the DOL. The area also appeared to contain road construction waste. Contaminated soils and associated debris were excavated during cleanup activities at the site, and the area was backfilled with clean soil.

DOL Automotive Yard

The DOL Automotive Yard is east of Highway 1 and northeast of the Southern Pacific Railroad Spur (SPRR) that runs east from First Avenue. The 8.5-acre fenced site is bounded by Twelfth Street to the north and the Lower Meadow to the west. The site included a paint shop, two wash racks, one temporary hazardous waste container storage area, an oil/water separator, an aboveground storage tank (AST), and several buildings used for automotive repair. The site is paved and slopes gently to the west. Previous site activities included transmission repair, degreasing, engine testing, steam cleaning and washing vehicles, and petroleum/oil/ lubricant

(POL) storage. A buried container, which was originally used as a muffler for exhaust from engine testing, may also have been used for liquid waste storage. Tanks and contaminated soils were excavated during cleanup activities at the site, and the area was backfilled with clean soil.

Cannibalization Yard and Industrial Area

The Cannibalization Yard is a small (0.5-acre) paved and fenced area located within the larger (18.5 acre) paved and fenced Industrial Area. The entire 18.5-acre area is bounded by Highway 1 to the west, a baseball field to the east, and Tenth Street to the south. The SPRR spur separates the Industrial Area from the DOL Automotive Yard to the north. The area included a machine shop, a furniture repair shop, a laundry facility, a temporary hazardous waste container storage area, an oil/water separator, and an aboveground storage tank (AST) used for storing waste oil. Beginning in 1964, the Cannibalization Yard was used to disassemble old equipment, primarily decommissioned military vehicles. Used motor oil was collected and stored onsite in 55-gallon drums. Between January 1988 and August 1988, waste oil was stored in a 450-gallon AST in the hazardous waste storage area at the machine shop adjacent to the yard. Other vehicle maintenance activities included removal and storage of the following types of fluids and parts gasoline (leaded and unleaded), diesel fuel, brake fluid, asbestos-containing brake shoes and linings, antifreeze/coolants, lead and acid from batteries, lubricating greases, and transmission fluids. Prior to the installation of the oil/water separator at the northeast corner of the yard, runoff from the site flowed down the sloped area northeast of the Cannibalization Yard toward the baseball field. The site is no longer active, and contaminated soils were excavated during cleanup activities at the site, and the area was backfilled with clean soil.

Southern Pacific Railroad (SPRR) Spur

The SPRR spur (part of Site 13), an area of approximately 0.8 acres, consisted of the right-of-way along a portion of the railroad spur that extends northward from the Southern Pacific Railroad track west of Highway 1 and curves east through an industrial complex. The portion of the railroad track discussed here extends east from the main track east of Highway 1, across First Avenue, and between the DOL Automotive Yard and the Cannibalization Yard and surrounding Industrial Area. The rest of the railroad spur was investigated during the characterization of Site 13. The relatively flat right-of-way is mostly unpaved except in the areas adjacent to loading docks and where the spur crosses First Avenue. The railroad spur was used to transport troop materials and equipment from the main rail line to storage facilities between the DOL Automotive Yard and the Industrial Area. The SPRR spur is of concern because oil or fuels may have been sprayed in this area for dust control. Contaminated soils were excavated during cleanup activities at the site, and the area was backfilled with clean soil.

7.1.2 Remedial Actions

One groundwater and three soil remedial units were defined at Sites 2 and 12, as described below.

Groundwater Remedial Unit (VOC Plume at Sites 2 and 12)

The groundwater remedial unit is defined as groundwater at Sites 2 and 12 containing the dissolved volatile organic compounds (VOCs) TCE, 1,2-dichloroethane (DCA), dichloroethene (DCE), and tetrachloroethene (PCE) that exceed aquifer cleanup levels (ACLs).

The vertical extent of the affected groundwater ranges from the top of the water table to the top of the sandy silt layer that divides the 180-foot aquifer into upper and lower zones. The

affected water-bearing zone beneath Sites 2 and 12 is the Upper 180-foot aquifer, which is the uppermost water-bearing zone in the vicinity and has approximately 75 to 80 feet of saturated thickness. Depth to water is approximately 70 to 80 feet below ground surface (bgs) at the eastern edge of the plume (Site 12) and approximately 40 feet bgs at the western edge (Site 2). The sandy silt layer dividing the 180-foot aquifer appears to have limited vertical migration of dissolved VOCs.

Soil Remedial Unit 1 (Lower Meadow Disposal Area)

The Lower Meadow Disposal Area is an approximately 0.5-acre portion of the Lower Meadow on Site 12, a grassy field east of Highway 1 near the Twelfth Street Gate defined as Soil Remedial Unit 1 (SRU 1), which contained concrete rubble and other construction debris intermixed with total petroleum hydrocarbon (TPH)-contaminated soil.

Soil Remedial Unit 2 (Outfall 31 Area)

Soil Remedial Unit 2 (SRU 2) was defined as the Outfall 31 Area east of SRU 1, a grass-covered depression that received surface runoff and storm drainage flow from Outfall 31 and several other pipes. It had a catch basin area that collected precipitation and rainfall runoff. The catch basin was connected to subsurface piping, which ran to the west from the Outfall 31 Area to Outfall 15. The primary contaminants in soil associated with the outfall included total petroleum hydrocarbons (TPH) of unknown origin (TPH-unknown) and as diesel (TPH-D).

Soil Remedial Unit 3 (Cannibalization Yard Area)

Soil Remedial Unit 3 (SRU 3) was the Cannibalization Yard Area. This area was a shallow surface drainage subject to runoff from the DOL Automotive Yard, and the Industrial Area to the west and south, respectively. Surface and shallow borings near an oil/water separator and along the eastern margin of the Cannibalization Yard indicated shallow soil contained elevated concentrations (greater than 500 mg/kg) of TPH. No TPH concentrations greater than 500 mg/kg were detected in soil samples collected below 0.5 feet below ground surface. The vertical and horizontal limits were defined by soil borings and surface samples.

7.1.2.1 Remedy Selection

Sites 2 and 12: Description of Alternatives

The following four remedial alternatives were evaluated in the Sites 2 and 12 Feasibility Study.

Alternative 1

- No action other than groundwater and surface water outfall monitoring. The no action alternative is required to be considered under CERCLA to provide a baseline for comparison to the other proposed alternatives.
- Assumes long-term monitoring program for existing groundwater wells and two surface water outfalls.

Alternative 2

- Extraction of groundwater containing VOCs above cleanup goals and discharge of untreated groundwater to a Publicly Owned Treatment Works (POTW).
- Deed restriction on groundwater use.
- Capping and surface water controls for soil at the Lower Meadow Disposal and Outfall Areas, which would prevent leaching of chemicals to groundwater.
- Excavation of approximately 1,000 cubic yards of shallow soil containing concentrations of TPH above the cleanup level of 500 milligrams per kilogram (mg/kg) from the Cannibalization Yard, and placement at the OU 2 landfill.

Alternative 3

- Groundwater extraction and treatment by granular activated carbon.
- Disposal of treated groundwater by: (1) reuse aboveground, or (2) injection or infiltration of treated water back into the aquifer.
- Deed restriction on groundwater use.
- Capping of debris and selective excavation of approximately 1,600 cubic yards of soil containing TPH concentrations above the cleanup goal of 500 mg/kg from the Lower Meadow Disposal Area, and placement at the OU 2 landfill.
- Excavation of approximately 3,800 cubic yards of soil containing TPH concentrations above the cleanup goal of 500 mg/kg from the Outfall Area and Cannibalization Yard, and placement at the OU 2 landfill.

Alternative 4

- Groundwater extraction, treatment, and disposal as described for Alternative 3.
- Deed restriction on groundwater use.
- Excavation of approximately 16,000 cubic yards of soil and debris containing TPH concentrations above the cleanup goal of 500 mg/kg from the Lower Meadow Disposal Area, and placement at the OU 2 landfill.
- Excavation of approximately 3,800 cubic yards of soil containing TPH concentrations above the cleanup goal of 500 mg/kg from the Outfall Area and Cannibalization Yard, and placement at the OU 2 landfill.

Selected Remedy

Alternative 4 was selected as the remedy in accordance with the EPA's nine evaluation criteria because it provided the greatest degree of protection for the environment, removed any potential unknown risks associated with debris, complied with ARARs**,** was effective in the short and long term, was cost effective, and was readily implementable.

7.1.2.2 Remedy Implementation

Soil Remedy

The soil component of the remedy was addressed in accordance with approved plans *(HLA, 1995f*) by a series of soil removal actions which were completed and are documented in *Remedial Action Confirmation Report and Post-Remediation Health Risk Assessment, Site 12 Remedial Action, Basewide Remediation Sites, Fort Ord, California (IT, 1999c).* The soil remediation resulted in the site being available for unrestricted reuse.

Groundwater Remedy

Construction of a groundwater pump and treat system was initiated in April 1999 to remediate the plume of COCs in groundwater. Remediation is expected to take about 30 years. During the operation of the treatment system, groundwater has been sampled biweekly to verify that the treatment system is operating effectively. Since 1999, water samples and water levels from groundwater monitoring wells have been collected every three months. This groundwater monitoring information has been compiled into quarterly and annual reports to show the long-term trends resulting from system operation.

The groundwater treatment system components include groundwater extraction, aqueous phase carbon adsorption treatment of groundwater, and subsurface injection of treated groundwater. The carbon adsorption is accomplished using two 10,000-pound carbon vessels connected in series. The Sites 2/12 groundwater remedy consists of eight extraction wells located at Site 12, the groundwater treatment plant, and five Upper 180-foot aquifer recharge structures (2 injection wells and 3 infiltration galleries)

located at Site 2. Extracted groundwater is piped to the 2/12 Groundwater Treatment Plant (GWTP) where it undergoes pH adjustment by sulfuric acid addition and subsequent treatment of COCs via adsorption to granular activated carbon. Treated water from Site 12 extraction and OU 2 extraction is combined at the 2/12 GWTP and piped to the Site 2 aquifer recharge injection structures where it is injected into the Upper 180-foot aquifer. The performance goal of the design is groundwater extraction and hydraulic capture of the VOC plume while maintaining a groundwater mound at the Site 2 injection area adjacent to Monterey Bay. The purpose of the groundwater mound is to prevent additional seawater intrusion into the 180-foot aquifer as a result of groundwater extraction at Site 12.

The extraction capacity of the eight extraction wells was designed to allow for system operation flexibility in the event that saline groundwater (seawater) infiltrated Site 12 extraction wells. It was anticipated that if seawater appeared to be drawn toward or arrived at a Site 12 extraction wells, the extraction at that well would be reduced or discontinued and compensated for by an increased extraction rate at another extraction well assumed to have a lesser effect on saltwater movement into groundwater in the plume.

During the initial 3-month period of system operation, vinyl chloride concentrations greater than anticipated were observed in extracted groundwater from individual wells and in the combined influent to the Granular Activated Carbon (GAC) treatment system. Vinyl chloride twice exceeded the discharge compliance limit of 0.1 µg/L at the treatment system effluent sampling point. In response to the discharge exceedances, operational changes were implemented that used the extraction flexibility designed into the system to comply with discharge limits. The modifications consisted of reducing flow from extraction wells in which vinyl chloride was elevated, and moving the discharge compliance sampling point to a location that included both the treated OU 2 and Sites 2/12 water. Following the operational changes, no vinyl chloride or any other COC discharge exceedances have occurred.

System adjustments in response to the elevated vinyl chloride discharges included adjustment of extraction well flow rates and temporary shutdown of five extraction wells. As individual extraction wells were shut off, flow rates of the remaining wells were increased to maximize total system extraction. In addition, extraction pumps in extraction wells EW-12-04-180U and EW-12-04-180M were replaced with larger pumps to increase pumping rate capacities. Current extraction system operation consists of three wells pumping at a combined total of approximately 240 gallons per minute (gpm).

Treated water was initially supplied to the Site 2 aquifer injection structures only by the Sites 2/12 treatment plant while the pipeline to OU 2 was being constructed. Piping connections between the OU 2 treatment system and the Sites 2/12 system were completed in June 1999, and excess treated OU 2 water was initially diverted to the Site 2 aquifer injection structures in July 1999. Additional plumbing modifications to the OU 2 transfer pipeline were completed on October 1999, allowing increased transfer rates. The Sites 2/12 system currently requires the addition of OU 2 treated water to the 2/12 system discharge stream to maintain vinyl chloride discharge compliance.

A temporary discharge limit modification for vinyl chloride was requested and granted by the regulatory agencies for a period of one-year starting in March of 2002. The discharge limit was temporarily changed from 0.1 ug/L to 0.5 ug/L to allow for the operation of extraction wells currently not operating due to the 0.1 ug/L vinyl chloride discharge limit. The temporary operation of the groundwater remediation system at the elevated discharge limit is expected to allow for accelerated chemical mass removal.

A pilot study evaluating the effectiveness of in-situ chemical oxidation of vinyl chloride in Sites 2 and 12 groundwater was initiated in March 2002. Vinyl chloride concentrations in

groundwater observed at some of the Sites 2 and 12 extraction wells are in excess of the Sites 2 and 12 groundwater treatment system capabilities and are not effectively remediated by the GAC treatment. The in-situ oxidation pilot study is designed to evaluate the use of potassium permanganate to preferentially oxidize vinyl chloride in-situ as a pretreatment for the existing GAC treatment system. The pilot study evaluation is expected to be completed by October 2002.

All transferring parcels, which are located over the groundwater plume, will include a Covenant To Restrict Use Of Property (CRUP) recorded with the deed. The CRUP will prohibit construction of wells for injection or extraction of any groundwater until the ACLs are attained. In addition, there is a Monterey County ordinance that regulates water well installation within either the "Groundwater Prohibition Zone" or "Groundwater Consultation Zone" which include the known groundwater plumes at the former Fort Ord.

7.1.2.3 System Operations and Maintenance

The Sites 2 and 12 groundwater treatment system has been in operation since April 1999. The Sites 2 and 12 groundwater remedy is operated in accordance with the *Work Plan, Revision 0, Operation and Maintenance, Groundwater Treatment Systems, former Fort Ord, California (Harding ESE/IT, 2001a)* and *Sampling and Analysis Plan, Revision 1, Operable Unit 1, Operable Unit 2, and Sites 2 and 12 Groundwater Treatment Systems, Former Fort Ord, California* (*Harding ESE/IT, 2001e*). Operations and maintenance activities are summarized in treatment system data summary reports for every three-month quarterly period. The most recent quarterly report describing Sites 2 and 12 operation and maintenance is *Quarterly Groundwater Treatment Systems Operation Data Summary Report, July through September 2001, Operable Unit 1, Operable Unit 2, Sites 2/12, Former Fort Ord, California* dated November 29, 2001(*Harding ESE/IT, 2001c*). The report summarizing the entire period of system operation is *Revision C, Sites 2 and 12 Groundwater Remedy, Operating Properly and Successfully Evaluation Report Former Fort Ord, California* dated November 8, 2001 (*Harding ESE/IT, 2001d*). To date, the system has processed over 300 million gallons of water and removed over 130 pounds of contaminants, of which approximately 60 percent is TCE. The system operates continuously except for periods of routine maintenance, carbon servicing, and replacement of worn equipment, and has been operational approximately 93% of the time. Carbon replacement in the system has occurred approximately every 2 to 3 months since operation began.

7.1.3 Technical Assessment

7.1.3.1 Question A

Is the remedy functioning as intended by the decision document?

The Sites 2 and 12 groundwater remedy is functioning as intended, and is achieving the performance goals of the original conceptual design. An analysis of system performance to date is provided in *Revision C, Sites 2 and 12 Groundwater Remedy, Operating Properly and Successfully Evaluation Report Former Fort Ord, California* (*Harding ESE/IT, 2001d*).

The Sites 2 and 12 system operation data indicate the system has been pumping, treating, and discharging water in accordance with the approved plans. The system has extracted water at an average rate of 211 gallons per minute (gpm) and recharged water at an average rate of approximately 513 gpm (including effluent from the OU 2 treatment system). Groundwater chemistry monitoring data indicate the contaminant plume is decreasing in size as a result of Sites 2/12 groundwater remedy operation. Evaluation of water-level data indicates the presence of hydraulic features resulting from system operation that are consistent with hydraulic capture and an inward gradient throughout the plume.

The groundwater flow modeling of system operation indicates the groundwater remedy is reversing the original hydraulic gradient between Sites 2 and 12 and is hydraulically capturing the plume in this area. Although the simulated groundwater streamlines do not traverse areas east of EW-12-01-180 and EW-12-02-180, the presence of the plume in this area is uncertain. The interpreted presence of the plume in this eastern area is uncertain due to the large distances between the extraction wells EW-12-01-180 and EW-12-02-180 and eastern monitoring wells MW-12-03-180 and MW-12-09-180 and chemical contouring procedures. In view of this uncertainty in the area east of EW-12-01-180 and EW-12-02-180, conclusions about hydraulic capture in this area can not be made. The Army is evaluating techniques to increase groundwater extraction from EW-12-01-180 and EW-12-02-180 to increase the area of hydraulic capture and accelerate remediation. Increasing the pumping rates and resulting area of hydraulic capture will compensate for the uncertainties associated with the existing monitoring net work.

7.1.3.2 Question B

Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Land use has not changed sufficiently to alter the exposure assumptions that were used during the original risk assessment and development of ACLs. The aquifer cleanup levels for the COCs identified in the OU 2 ROD were based on State or federal MCLs with the exceptions of chloroform, 1,2-dichloropropane, tetrachloroethene, and vinyl chloride, for which the ACLs are lower than State or federal MCLs. The lower ACLs were based on risk calculations for each COC that estimated a combined excess cancer risk of 6×10^{-5}. Since the original risk assessment, the State or federal MCLs that were selected as ACLs have not changed, and toxicity values for the additional calculated ACLs have not changed, with the exception of vinyl chloride. The toxicity values for vinyl chloride are still within the parameters used for the original risk calculations, and the ACLs remain protective of human health and the environment.

7.1.3.3 Question C

Has any information come to light that could call into question the protectiveness of the remedy?

The Sites 2 and 12 groundwater remedy is achieving the performance goals of the original design, reducing concentrations and the areal extent of COCs. Current system operation is compliant with the objectives of the Basewide ROD.

7.1.4 Issues

This technical assessment did not identify any issues that could affect current or future protectiveness of the Sites 2 and 12 groundwater remedy. Additionally, this assessment did not identify any unresolved issues previously raised by regulatory agencies, the community, or other interested parties.

7.1.5 Recommendations and Follow-Up Actions

The Sites 2/12 groundwater remedy should continue to operate as designed until either ACLs are reached or subsequent evaluation indicates that a modification is in order. Opportunities for future system optimization include discontinuing groundwater pumping from individual wells where cleanup goals (ACLs) have been attained, and initiating pumping from additional wells following reduction of vinyl chloride concentrations. Ending extraction at an individual well will reduce the electricity and operations and maintenance costs associated with that well and allow for increased extraction from other existing wells. Initiating extraction at wells that are currently off line due to high concentrations of vinyl chloride would accelerate cleanup of COCs in those areas.

7.1.6 Protectiveness Statement

Soil – The remedial actions completed for soil contamination at Sites 2/12 are protective of human health and the environment for any reuse.

Groundwater – The Sites 2 and 12 groundwater remedy is expected to be protective of human health and the environment upon attainment of the ACLs, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. The groundwater remedy is compliant with ARARs and is actively maintaining hydraulic control of the contaminant plume and reducing levels of COCs in groundwater.

All transferring parcels, which are located over the groundwater plume, will include a Covenant To Restrict Use Of Property (CRUP) recorded with the deed. The CRUP will prohibit construction of wells for injection or extraction of any groundwater until the ACLs are attained. In addition, there is a Monterey County ordinance that regulates water well installation within either the "Groundwater Prohibition Zone" or "Groundwater Consultation Zone" which include the known groundwater plumes at the former Fort Ord.

7.2 Sites 16 and 17

7.2.1 Background

Site 16 consists of the DOL Maintenance Yard, Pete's Pond (a surface water drainage area), and Pete's Pond Extension. Site 17 consists of a Disposal Area and other areas (Plate 2). Sites 16 and 17 were combined into one site after the first phase of the RI activities because of the similar contamination identified at both sites.

Site 16

DOL Maintenance Yard

The DOL Maintenance Yard was used as a heavy equipment maintenance facility from the 1950s until base closure. The yard consisted of an approximately 4.5-acre facility containing five buildings, a former underground storage tank (UST), a steam-cleaning shed, a wash rack and associated oil/water separator, and a diesel fuel aboveground storage tank (AST). Run off from the DOL Yard drains in Pete's Pond.

The following potential sources of contamination were identified for investigation during the RI:

- A former UST location adjacent to Building 4900
- The oil/water separator and associated wash rack
- The diesel fuel AST
- Potential past spills from vehicles and equipment at the unpaved stained area near Building 4900
- A former paint shop
- Storm drain inlets.

Pete's Pond

Pete's Pond consisted of an approximate 3.3-acre triangular depression between Fifth Avenue, the Fifth Avenue Cut-Off, and Eighth Street. Six storm drains discharge to Pete's Pond; although the depression is dry most of the year, it occasionally fills with up to 5 feet of water for short periods of time during heavy rainfall.

The following potential sources of contamination were identified for investigation during the RI:

- Past dumping activities: Before the RI, trenching performed to improve drainage at Pete's Pond encountered scrap metal and a drum containing a clear, gel-like substance. Evidence of earthwork was also observed in historical aerial photographs reviewed during the RI.
- Potential chemical spill: A potential chemical spill was identified in 1951 aerial

photographs reviewed during Phase 1 of the RI.

- Storm drain outfalls: Discharge of potentially contaminated stormwater to Pete's Pond was suspected.

Pete's Pond Extension

Pete's Pond Extension consisted of a vacant area of approximately 3.5 acres between the DOL Maintenance Yard, Fifth Avenue, and the Fifth Avenue Cut-Off. Before the RI, trenching performed in this area to repair a stormwater drain encountered stained soils and debris including concrete, ordnance (a bazooka round), and other scrap metal. Evidence of earthwork and potential dumping was also observed in historical aerial photographs reviewed during Phase 1 of the RI.

Site 17

Disposal Area

The Disposal Area, part of the 1400 Block Motor Pool, consisted of an approximate 8-acre area used from 1977 until 1994 to service, maintain, and store light and heavy trucks and other army vehicles. The area is paved with asphalt except for a landscaped area along Eighth Street and Fifth Avenue, and contains a storage building and Buildings 1481 and 1483. Information available before Phase 1 of the RI suggested that waste, including medical debris generated at a former Fort Ord hospital and incinerated at Site 17's Building 1442 (incinerator), had been disposed at the adjacent baseball field. However, the Phase 1 RI indicated that disposal also occurred at the area now designated as the Site 17 Disposal Area. Therefore, as part of this RI, suspected landfilling activities at the Disposal Area and adjacent baseball field were investigated.

Other Areas

Other areas at Site 17 that were investigated during the RI consist of the 1400 Block Motor Pool excluding the 8-acre Disposal Area described above. The following potential sources of contamination were identified for investigation during the RI:

- A former UST at Building 1426
- An oil/water separator near Building 1490
- Two reported fuel spills of unknown volume into a drainage ditch near the Building 1497 fueling facility
- Leakage from sanitary sewer and storm drain joints.

7.2.2 Remedial Actions

Description of Remedial Units

Groundwater

Because the chemical compounds in groundwater at Sites 16 and 17 appear to be associated with the OU 2 plume, the groundwater is captured and treated as part of the OU 2 groundwater remediation and is not considered as a separate remedial unit for Sites 16 and 17.

Soil Remedial Unit 1

SRU 1 consisted of soil impacted by TPH at the DOL Maintenance Yard and contained approximately 1,100 cubic yards of soil exceeding the Target Cleanup level (TCL) of 500 mg/kg for TPH. TPH-impacted soil was estimated to be up to 8 feet below ground surface and extend over an area of 4,700 square feet.

Soil Remedial Unit 2

SRU 2 consisted of medical and miscellaneous debris and associated impacted soil at Pete's Pond, Pete's Pond Extension, and the Site 17 Disposal Area. Approximately 3,600 cubic yards of soil and debris was identified as requiring remediation at Pete's Pond and Pete's Pond Extension, and the rest of the debris identified at the Site 17 Disposal Area extended

to depths of 20 feet below ground surface with a thickness of up to 15 feet containing an estimated 67,000 cubic yards of soil distributed over an area of approximately 14 acres.

7.2.2.1 Remedy Selection

The following four remedial alternatives were evaluated in the FS.

Alternative 1

- No action would be taken at the site except continued groundwater monitoring. The no action alternative is required to be considered under CERCLA as a basis for comparison to other alternatives.

Alternative 2

- Construction of a cap over the areas containing debris and TPH-affected soil to limit contact and prevent surface water infiltration. Deed restrictions would be required.

Alternative 3

- Excavation of soil and debris from Pete's Pond and Pete's Pond Extension.
- Consolidation of debris from Pete's Pond and Pete's Pond Extension into the Site 17 Disposal Area, and placement of an impermeable cover layer material and 1 foot-thick layer of clean soil.
- Placement of TPH-affected soil at the OU 2 landfill, or treatment at the Fort Ord Soil Treatment Area (FOSTA), with onsite reuse.

Alternative 4

- Excavation of soil and debris containing concentrations of TPH above the cleanup goal of 500 mg/kg from Pete's Pond, Pete's Pond Extension, and the Site 17 Disposal Area.
- Placement of soil and debris from these areas at the OU 2 landfill as part of the foundation layer material.
- Placement of TPH-affected soil at the OU 2 landfill.

Selected Remedy

Alternative 4 was the selected remedy based on the assessment in the FS. Alternative 4 met the first two screening criteria and was judged to be superior in the following balancing criteria:

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume through treatment

7.2.2.2 Remedy Implementation

The Army has completed the remedial action at Sites 16 and 17 in accordance with CERCLA and the Basewide Remedial Investigation Sites ROD (*U.S. Army, 1997b*). The remedial action included removing debris and soil contaminated with TPH. Approximately 27,770 cubic yards of impacted soil was removed from Site 16, and approximately 107,000 cubic yards of soil were removed from Site 17. The soil was placed in the OU 2 Landfill, Area E, as general fill. All final confirmation samples contained less than 500 mg/kg of TPH. Field personnel observed and documented the removal of all debris, stained or odorous soil from the excavation. The post remediation risk assessment recommended that restrictions on land use at these sites was not warranted based on the analysis of the final confirmation soil samples results (*IT, 1999a*). The soil remediation resulted in the site being available for unrestricted reuse.

7.2.2.3 System Operations and Maintenance

There are no ongoing activities related to the remedy that require operations and maintenance.

7.2.3 Technical Assessment

7.2.3.1 Question A

Is the remedy functioning as intended by the decision document?

The completed remedial actions continue to allow unrestricted use at Sites 16 and 17.

7.2.3.2 Question B

Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of the remedy *selection still valid?*

The cleanup levels for TPH were based on the Fort Ord preliminary remediation goal (PRG) of 500 mg/kg for TPH. Because there is no EPA Region IX PRG for TPH, the Fort Ord PRG for TPH is still valid.

7.2.3.3 Question C

Has any information come to light that could call into question the protectiveness of the remedy?

There is no new information that calls into question the effectiveness of the remedy.

7.2.4 Issues

A deed restriction will be placed on the property prohibiting drilling of wells because the sites are located over the OU 2 Landfill groundwater plume.

7.2.5 Recommendations and Follow-Up Actions

There are no recommendations or follow-up actions.

7.2.6 Protectiveness Statement

The post-remediation risk assessment indicated that the implemented remedy was protective of human health and the environment for any reuse (*IT, 1999a*). None of the associated health risk criteria have changed, therefore the remedy continues to be protective of human health and the environment. All transferring parcels, which are located over the groundwater plume, will include a Covenant To Restrict Use Of Property (CRUP) recorded with the deed. The CRUP will prohibit construction of wells for injection or extraction of any groundwater until the ACLs are attained. In addition, there is a Monterey County ordinance that regulates water well installation within either the "Groundwater Prohibition Zone" or "Groundwater Consultation Zone" which include the known groundwater plumes at the former Fort Ord.

7.3 Site 31

7.3.1 Background

Site 31 is a former dump site in the southern part of the East Garrison in, and is adjacent to a ravine approximately 0.2 miles southeast of the intersection of Watkins Gate Road and Barloy Canyon Road. This dump site was at the boundary of the Leadership Reaction Training Compound (LRTC) on the northern side of the ravine. The visible extent of disposal encompassed an approximately 500-foot-long section of the northern slope of the ravine. The dump site was reportedly used in the 1940s and 1950s. Apparently, during this time, refuse was wholly or partially incinerated in a 500-ton incinerator, which was adjacent to the ravine and the incineration waste was dumped over the side of the north side of the ravine.

The site is underlain by fine- to medium- sand to silty- or clayey-sand. Undisturbed and slightly cemented sand outcrops in several areas adjacent to, and north of the ravine, as well as at the base of the western portion of the ravine.

7.3.2 Remedial Actions

Description of Remedial Units

Groundwater

No groundwater remedial units were defined for Site 31 because no chemicals were identified in soil that pose a threat to groundwater.

Soil Remedial Unit

On the basis of the health-based level of concern for lead (1860 mg/kg), a single soil remedial unit was defined on the North Slope of Site 31 based on lead contamination in the soil. The area is steep (1 foot horizontal per 1 foot vertical) and heavily vegetated. Despite the heavy vegetation, the steep slope and sandy, non-cohesive soil make it unstable. The soil remedial unit consisted of shallow soil (up to 3 feet below ground surface) at five sample locations where lead in soil was above 1,860 mg/kg.

The remainder of the debris and soil at the site has not been shown to pose a human-health risk, and therefore does not require remediation. In addition, debris removal or treatment will not be performed in these other areas of Site 31 because of (1) the steep topography and inaccessibility of the ravine and associated biological hazards (e.g., poison oak); (2) sensitive habitat that could be disturbed; (3) overhead power lines traversing the site, which would make equipment difficult to maneuver; and (4) unstable soil conditions.

7.3.2.1 Remedy Selection

The following four remedial alternatives were evaluated in the FS.

Alternative 1

- No action would be taken at the site. The no action alternative is required to be considered under CERCLA as a basis for comparison to other alternatives.

Alternative 2

- Excavation and segregation of approximately 350 cubic yards of soil and debris containing lead above the health-based level of concern of 1,860 mg/kg.
- Placement of soil and debris at the OU 2 landfill as part of the foundation layer.
- Deed restrictions.

Alternative 3

- Excavation of approximately 350 cubic yards of soil and debris containing lead above the health-based level of concern of 1,860 mg/kg, and consolidation onsite. The consolidated soil and debris would be capped to limit potential direct human exposure to the waste materials and water infiltration and to limit offsite migration of debris and lead-containing soil. Deed restrictions would be required.

Alternative 4

- Excavation of approximately 350 cubic yards of soil and debris containing lead above the health-based level of concern of 1,860 mg/kg.
- Offsite transportation and disposal at a Class I landfill facility.
- Deed restriction.

Selected Remedy

Alternative 2 was the selected remedy based on the assessment in the FS. Alternative 2 met the first two screening criteria and was judged to be superior in the following balancing criteria:

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume through treatment
- Short-term effectiveness

7.3.2.2 Remedy Implementation

The Army has completed the remedial action at Site 31 in accordance with CERCLA and the Basewide Remedial Investigation Sites ROD (*U.S. Army, 1997b*). The remedial action included removing soil contaminated with lead. Approximately 1,500 cubic yards of impacted soil was removed from Site 31. The soil was placed in the OU 2 Landfill, Area E, as general fill. All final confirmation samples contained less than 1860 mg/kg and therefore met the cleanup objectives defined in the ROD. The post remediation health risk assessment stated that unacceptable human health risks and hazards are considered unlikely to be associated with future recreational, commercial, or residential development of Site 31 under the exposure conditions evaluated (*IT, 1999b*). The post remediation ecological risk assessment concluded that significant risks to ecological receptors that are exposed to chemicals remaining at Site 31 are not expected (*IT, 1999b*).

7.3.2.3 System Operations and Maintenance

There are no ongoing activities related to the remedy that require operations and maintenance.

7.3.3 Technical Assessment

7.3.3.1 Question A

Is the remedy functioning as intended by the decision document?

The Army has completed the remedial action at Site 31 in accordance with CERCLA and the RI Sites ROD, and met the objectives defined in the ROD. Therefore, the remedy is functioning as intended by the decision document.

7.3.3.2 Question B

Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

The exposure and toxicity criteria used to evaluate health risks are still valid.

7.3.4.3 Question C

Has any information come to light that could call into question the protectiveness of the remedy?

There is no new information that calls into question the effectiveness of the remedy.

7.3.4 Issues

The post remediation risk assessment concluded that unacceptable human health risks and hazards are considered unlikely to be associated with future recreational, commercial or residential development of Site 31 under the exposure conditions evaluated. The DTSC reviewer isolated an area around the remaining soil with the highest lead concentration and calculated an average lead concentration of 550 ppm for a sample depth range of 5 to 10 feet. DTSC indicated that this concentration could result in a child blood level of over 10 ug/l based on a residential scenario. DTSC stated that a land use covenant should be completed to prohibit excavation, exposure of soil and the use of the area as part of any residential development. Based on the data present in the response to DTSC comment, the Army did not change the conclusion of the post remediation risk assessment. The land use covenant issues associated with Site 31 are still being negotiated between the Army and DTSC.

7.3.5 Recommendations and Follow-Up Actions

The remedy is functioning as intended, therefore no follow-up actions are recommended.

7.3.6 Protectiveness Statement

The post-remediation risk assessment indicated that the implemented remedy was protective of human health and the environment (*IT, 1999b*). None of the associated health risk criteria have changed, therefore the remedy continues to be protective of human health and the environment.

7.4 Site 39 (Includes Sites 5 and 9)

7.4.1 Background

Site 39 is in the southwestern portion of the former Fort Ord and includes the Inland Ranges (approximately 8,000 acres) and the 2.36-inch Rocket Range (approximately 50 acres). The Inland Ranges are bounded by Eucalyptus Road to the north, Barloy Canyon Road to the east, South Boundary Road to the south, and North-South Road to the west. The 2.36-inch Rocket Range is immediately north of Eucalyptus Road, near the north-central portion of the Inland Ranges.

The Inland Ranges were reportedly used since the early 1900s for ordnance training exercises, including onshore naval gunfire. Over the years, various types of ordnance have been used or found in the Inland Ranges, including hand grenades, mortars, rockets, mines, artillery rounds, and small arms rounds. Some training activities using petroleum hydrocarbons were also conducted. The 2.36-inch Rocket Range was reportedly used for anti-armor (bazooka) training during and shortly after World War II.

The proposed future use of most of the Inland Ranges will be as a natural resource management area (NRMA). This area will be managed by the U.S. Department of the Interior, Bureau of Land Management, and public access will be restricted. Several areas within, but along the periphery of, the Inland Ranges have a proposed future land use other than as a NRMA. The Military Operations on Urban Terrain (MOUT) Area, in the northeastern edge of the Inland Ranges, are proposed for use as a peace officer training area. The areas along the south boundary of the Inland Ranges are proposed for several uses, including city and county parks, a school expansion, and relocation of Highway 68.

7.4.2 Remedial Actions

Description of Remedial Units

Groundwater

No groundwater remedial unit was defined for Site 39 because (1) the vertical extent of contamination is limited to shallow soil, (2) the depth to groundwater beneath Site 39 is estimated to range from 60 to 180 feet below ground surface, (3) the presence of potential contaminants (i.e., antimony and nitrates) in groundwater has not been confirmed, and (4) groundwater data from monitoring wells indicated there is little potential for contamination of groundwater as a result of site activities.

Soil Remedial Unit 1

SRU 1 includes soil with detectable concentrations of cyclotrimethylenetrinitramine (RDX), beryllium, or TPH at or above the Target Cleanup Levels of 0.5 mg/kg, 2.8 mg/kg, and 500 mg/kg, respectively, from the following areas: Range 36A, Range 40A, Range 33, and the Explosive Ordnance Target Areas.

Based on the chemical data presented in the RI for Site 39, SRU 1 is defined by the distribution of chemicals present in the soil as discussed below.

- Range 40A – One area with concentrations of TPH above the Target Cleanup Level that consists of approximately 175 cubic yards of soil.
- Range 33 – Two locations at isolated target areas where concentrations of RDX are above the Target Cleanup Level. The remedial unit area extends to 2 feet below

ground surface and contains a total of approximately 60 cubic yards of soil.

- Explosive Ordnance Target Areas – Three general areas where concentrations of RDX are above the Target Cleanup Level. The first area is in the vicinity of Ranges 35, 36, and 37 and the 2.36-Inch Rocket Range and contains approximately 30 cubic yards of soil. The second area is in the vicinity of Ranges 43, 45, and 48, and contains approximately 120 cubic yards of soil. The third area is in the vicinity of Ranges 30 and 30A and contains approximately 30 cubic yards of soil. The remedial unit areas extend to about 2 feet below ground surface and contain a total of approximately 180 cubic yards of soil.

Soil Remedial Unit 2

SRU 2 primarily includes soil containing lead above the health-based level of concern of 1,860 mg/kg in the explosive ordnance target areas and small arms ranges. For the explosive ordnance target areas, the distribution of lead with concentrations at or above 1,860 mg/kg defines the remedial unit. For the small arms ranges, chemical data for lead in soil and the distribution of lead above 1,860 mg/kg is believed to correspond to the distribution of spent ammunition based on the Site 3 investigation. Because the conditions at the small arms ranges are similar to Site 3, the same model for site characterization was applied to these ranges. SRU 2 consists of the following:

- Explosive Ordnance Target Area – Two areas in the vicinity of Ranges 37 and 48 that extend to 2.5 feet below ground surface. These two areas consist of approximately 60 cubic yards of soil, and include one detection of beryllium above the Target Cleanup Level of 2.8 mg/kg.

- Small Arms Ranges – Based on visual observations of bullet distribution made during the RI for Site 39, the following areas are included in the remedial unit:

  – Range 19 – The sand backstop and up to 100 feet behind the backstop, consisting of approximately 550 cubic yards of spent ammunition and soil.

  – Range 21 – The backstop and up to 100 feet behind the backstop, consisting of 1,650 cubic yards of spent ammunition and soil.

  – Range 22 – Within 1 meter of targets, this area consists of approximately 25 cubic yards of spent ammunition and soil.

  – Range 23 – The fronts of the bunker and target areas, consisting of approximately 50 cubic yards of spent ammunition and soil.

  – Range 25 – The backstop area, consisting of approximately 900 cubic yards of spent ammunition and soil.

  – Range 26 – The firing lines, consisting of approximately 150 cubic yards of spent ammunition and soil.

  – Range 39 – The backstop and firing lines, consisting of approximately 550 and 225 cubic yards, respectively, of spent ammunition and soil.

7.4.2.1 Remedy Selection

The following four remedial alternatives were evaluated in the FS.

Alternative 1

- No action would be taken at the site except continued groundwater monitoring. The no action alternative is required to be considered under CERCLA as a basis for comparison to other alternatives.

Alternative 2

- Institutional controls including: (1) construction of a perimeter fence to

restrict and completely enclose the remedial units at Site 39, (2) posting of warning placards at appropriate intervals along the fence, and (3) land use (deed) restrictions placed on the property for future development.

Alternative 3

- Excavation of approximately 4,520 cubic yards of soil.
- Soil containing TPH and RDX above the cleanup goal and health-based level of concern of 500 and 0.5 mg/kg, respectively, would be placed at the OU 2 landfill.
- Soil containing lead and beryllium concentrations above the health-based levels of concern of 1,860 and 2.8 mg/kg, respectively, would be placed in the OU 2 landfill.
- Deed restrictions until remaining ordnance and explosives are removed.

Alternative 4

- Excavation of approximately 4,520 cubic yards of soil.
- Soil containing TPH and RDX above the cleanup goal and health-based level of concern of 500 and 0.5 mg/kg, respectively, would be placed at the OU 2 landfill.
- Soil containing lead and beryllium above the health-based levels of concern of 1,860 and 2.8 mg/kg, respectively, would be transported offsite and disposed at a Class I landfill facility, and spent ammunition would be screened and recycled.
- Deed restrictions until remaining ordnance and explosives are removed.

Selected Remedy

Alternative 3 was the selected remedy based on the assessment in the FS. Alternative 3 met the first two screening criteria and was judged to be superior in the following criteria:

- Long-term effectiveness and permanence.
- Reduction of toxicity, mobility, and volume through treatment.
- Short-term effectiveness.

7.4.2.2 Remedy Implementation

The remedy for Site 39 has not been fully implemented due to the presence of ordnance and explosives (OE) at the site. Lead contaminated soils were excavated from portions of Ranges 24, 25 and 26 after the OE hazard was removed (*IT, 2000c*). The remedy will continue to be implemented as areas are cleared of OE.

7.4.2.3 System Operations and Maintenance

There are presently no operations and maintenance required based on the chemical contamination. Operations and maintenance related to OE issues will be evaluated in the Ordnance and Explosives RI/FS.

7.4.3 Technical Assessment

7.4.3.1 Question A

Is the remedy functioning as intended by the decision document?

The remedy has not been implemented.

7.4.3.2 Question B

Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

The remedy has not been implemented. However, criteria used for the remedial design have not changed and remain valid.

7.4.3.3 Question C

Has any information come to light that could call into question the protectiveness of the remedy?

No information has been identified that could call the protectiveness of the remedy into question.

7.4.4 Issues

The remedy cannot be fully implemented until ordnance has been removed from the site.

The proposed future reuse of a portion of Site 39 has been changed to mixed residential and commercial development. For the development areas within Site 39, EPA Region IX PRGs for lead, antimony and copper are used as action levels.

The sampling and analysis plan for Site 39 Ranges 18 and 19 proposes placement of excavated soil at the OU 2 Landfill, Cell E. The Army issued the *Draft Sampling and Analysis Plan for Characterization and Remediation Confirmation for Site 39 (Ranges 18 and 19)* in April 2002. Comments have not yet been received from the regulatory agencies.

The OU 2 Landfill may not have sufficient remaining capacity to contain the excavated soils as stated in the selected remedy. A pilot study is underway to evaluate potential treatment options.

7.4.5 Recommendations and Follow-Up Actions

Remove ordnance from the site to enable implementation of the remedy. Additional investigations of small arms ranges within Site 39 are being conducted under the Basewide Range Assessment (*IT, 2001b*)

7.4.6 Protectiveness Statement

Once implementation is complete, the remedy is expected to be protective of human health and the environment.

7.5 Surface Water Outfalls

7.5.1 Background

The Basewide Surface Water Outfall Investigation (SWOI) evaluated contamination within, and adjacent to, thirty-five outfalls and manholes. The outfalls at Fort Ord are part of a surface water drainage system made up of aboveground natural and engineered drainages that discharge to, or receive discharge from, the subsurface storm drain system. Water in the drainage system may have come in contact with areas of known historical chemical usage. The surface water outfalls OF-1 through OF-14, OF-16 through OF-30, OF-32, and OF-33 were included in RI Sites ROD because they were investigated as part of the Basewide RI/FS.

Results of the SWOI indicated that soil and sediment near or in the surface water outfalls contained the following contaminants: TPH, organic chemicals, pesticides, lead, cadmium, and polychlorinated biphenyls (PCBs).

7.5.2 Remedial Actions

7.5.2.1 Remedy Selection

Chemicals of potential concern (COPC) in soil and sediment from the surface water outfalls were evaluated in a Human Health Screening Risk Assessment (SRE). The SRE indicated that soil and sediment from OF-15, OF-34, and OF-35 should be removed for the protection of human health. These areas were excavated under the Interim Action program at Fort Ord (Section 10.0). Details of the soil remedial activities are presented in Section 10.2.2. No further action was required for the other outfalls investigated.

7.5.2.2 Remedy Implementation

Soil and sediment have been removed from OF-15, OF-34, and OF-35. The selected remedy for the remaining outfalls was no further action and allows for unrestricted reuse.

7.5.2.3 System Operations and Maintenance

No operations or maintenance are necessary for the selected remedy.

7.5.3 Technical Assessment

7.5.3.1 Question A

Is the remedy functioning as intended by the decision document?

Soil and sediment were removed from 3 outfalls in accordance with the IA ROD (*Army, 1994a*). The SRE indicated that no further action was required on remaining outfalls. Therefore, the remedy is functioning as intended by the appropriate decision documents.

7.5.3.2 Question B

Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy.

Changes in Standards To Be Considered

Fort Ord specific Preliminary Remediation Goals (PRGs) listed in the No Action ROD were used as the basis for the No Action decision. The Fort Ord specific PRGs were compared to the most recent EPA Region IX PRGs (*EPA, 1999*). Four chemicals, arsenic, 1,3-dichlorobenzene, ethylbenezene, and naphthalene, now have a published Region IX EPA PRG which are lower than the Fort Ord-specific PRGs. For arsenic, although the Fort Ord-specific PRG exceeds the new EPA PRG, the exceedances are equivalent to Fort Ord background concentrations and therefore would not require reassessment of the need for remediation. For the other three chemicals, there were no detections at the No Action sites that exceed either of the new EPA Region IX PRGs.

7.5.3.3 Question C

Has any information come to light that could call into question the protectiveness of the remedy?

There is no new information that calls into question the effectiveness of the remedy.

7.5.4 Issues

There are no unresolved issues pertaining to the Surface Water Outfalls that have been identified in regard to the protectiveness of human health and the environment.

7.5.5 Recommendations and Follow-Up Actions

No follow-up actions are necessary.

7.5.6 Protectiveness Statement

Soil and sediment were removed from three outfalls and the remaining outfalls were found to require no further action. Therefore, the selected remedy is protective of human health and the environment and is available for unrestricted reuse.

7.6 Site 25

7.6.1 Background

Site 25 is an 11-acre, unpaved field in the Main Garrison used from 1950 to 1972 to store decommissioned equipment, including

transformers containing polychlorinated biphenyls (PCBs). It was later used for military training and vehicle parking.

The Human Health Risk Assessment for soil at Site 25 evaluated exposure of a construction worker and resident to chemicals of potential concern (COPCs). Based on the assessment, adverse health effects are not expected, and no further action was required at the site. A quantitative Ecological Risk Assessment (ERA) was also performed (*HLA, 1996l*). Ecological impacts were evaluated by collecting plants and animals and measuring chemical concentrations of COPCs in their tissues. The results of the ERA indicated that tissue concentrations in prey were not likely to produce adverse effects in the animal populations. Furthermore, tissue concentrations in plants also did not indicate the surrounding habitat would be adversely affected.

7.6.2 Remedial Actions

7.6.2.1 Remedy Selection

The risk evaluation for Site 25 indicated that no further action was required at this site.

7.6.2.2 Remedy Implementation

The selected remedy was no further action and allows for unrestricted reuse.

7.6.2.3 System Operations and Maintenance

No operations or maintenance are necessary for the selected remedy.

7.6.3 Technical Assessment

7.6.3.1 Question A

Is the remedy functioning as intended by the decision document?

The selected remedy for the site was no further action.

7.6.3.2 Question B

Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

The exposure and toxicity criteria used to evaluate health risks are still valid. Therefore the selected "No Further Action" remedy is still valid.

7.6.3.3 Question C

Has any information come to light that could call into question the protectiveness of the remedy?

No new information has been identified that could call the protectiveness of the remedy into question.

7.6.4 Issues

There are no unresolved issues pertaining to the Site 25 that have been identified in regard to the protectiveness of human health and the environment.

7.6.5 Recommendations and Follow-Up Actions

No follow-up actions are necessary.

7.6.6 Protectiveness Statement

Because the human health and ecological risk assessments determined that adverse health and ecological effects are not expected, and no further action was required at the site, the site remedy is protective of human health and the environment and is available for unrestricted reuse.

7.7 Site 33

7.7.1 Background

Site 33 includes the golf course maintenance area, which consists of a pesticide mixing area, an unpaved surface drainage area, and a former pesticide storage area. The golf course was established in the early 1950s, and pesticides and herbicides were used regularly since operations began. Pesticides, herbicides, and metals were detected in soil at concentrations below Preliminary Remediation Goals (PRGs) set for reuse of this site.

The Human Health Risk Assessment for soil at Site 33 evaluated exposure of a golf course maintenance worker to COPCs. Based on the assessment, adverse health effects are not expected for the proposed reuse. A quantitative Ecological Risk Assessment was also performed(*HLA, 1996g*). Ecological impacts were evaluated by collecting plants and animals and measuring chemical concentrations of COPCs in their tissues. Results of the ecological evaluation indicated that tissue concentrations in prey were not likely to produce adverse effects in animal populations, nor would tissue concentrations in plants within the surrounding habitat be adversely affected.

7.7.2 Remedial Actions

7.7.2.1 Remedy Selection

The remedy for Site 33 will be a deed restriction on the property for nonresidential use.

7.7.2.2 Remedy Implementation

The remedial action was to maintain restrictions on the deed to the property for other than residential uses.

7.7.2.3 System Operations and Maintenance

Periodic review of deed restrictions may be required, and continuing five-year reviews will be required at this site.

7.7.3 Technical Assessment

7.7.3.1 Question A

Is the remedy functioning as intended by the decision document?

The remedy is functioning as intended by maintaining deed restrictions to protect human health and the environment.

7.7.3.2 Question B

Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

The exposure and toxicity criteria that were used for the risk evaluation are still valid.

7.7.3.3 Question C

Has any information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that could call the protectiveness of the remedy into question.

7.7.4 Issues

There is a potential for a change in the reuse of Site 33. A deed restriction must be maintained to restrict the site to non-residential uses unless the site is remediated to residential standards.

7.7.5 Recommendations and Follow-Up Actions

Maintain the deed restriction.

7.7.6 Protectiveness Statement

Maintenance of the deed restriction will limit use of the site to non-residential purposes, which is consistent with the selected remedy for the site, and is protective of human health and the environment.

8.0 SITE 3 INTERIM ROD

This section presents background information on the Site 3 Interim ROD; a summary of remedial actions and a technical assessment of the actions taken at this site; 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 remedy.

8.1 Background

Site 3, the Beach Trainfire Ranges, extends approximately 3.2 miles along the coastline of Monterey Bay at the western boundary of Fort Ord, and was used for small arms training since the 1940s. In general, trainees fired small arms weapons from firing lines in the eastern portion of the site toward targets spaced at varying intervals to the west. Spent ammunition accumulated on the east-facing (leeward) sides of the sand dunes that formed the "backstops" for the targets. Site 3 is proposed for reuse as a state park consisting of hiking trails, campgrounds, and ancillary facilities. The excavation of contaminated soil on this site is complete. A post remediation risk assessment for both ecological and human health was completed (*HLA, 1998c, IT, 2000c*). In addition, the Army will complete a proposed plan, public comment period, and Record of Decision addressing ecological risks at this site.

8.2 Remedial Actions

Soil Remedial Unit

A health-based level of concern of 1,860 mg/kg for lead in soil was developed. Concentrations of lead above 1,860 mg/kg occur mainly in areas where greater than 10 percent of the surface is covered by spent ammunition. Although some areas with moderate bullet distribution contain lead above the health-based level of concern, the ecological risk assessment (ERA) recommended remediation only in areas of heavy bullet distribution to minimize impacts to the sensitive ecological habitat in other areas. Therefore, the soil remedial unit is defined by those areas of heavy bullet distribution (greater than 10%).

8.2.1 Remedy Selection

Alternative 1

Alternative 1 consists of taking no further action to control or remediate contamination at the site. The No Action alternative is required for consideration under CERCLA guidance, and forms a baseline against which to compare other alternatives.

Alternative 2

Alternative 2 consists of mechanical and hand excavation of areas with greater than 10 percent coverage of spent ammunition and soil followed by mechanical separation using screens and gravity-feed separation techniques. In addition, spent ammunition and fragments would be cleaned by a scrap metal dealer and recycled at a refinery. Depending on the residual concentrations of lead after separation, the soil would be treated by one of three methods: stabilization, soil washing, or asphalt batching.

Alternative 3

Alternative 3 consists of excavation and separation as described above for Alternative 2. However, instead of recycling and treatment, spent ammunition would be recycled, and soil would be placed in a Corrective Action Management Unit (CAMU) at the OU 2 landfill as foundation layer, or would be disposed of at an appropriate landfill facility. This alternative provides flexibility in planning and management of the large volume of soil to be excavated from Site 3 through consideration of two options. Disposal Option 1, placement of the soil in a CAMU at the OU 2 landfill, would meet the intent and purpose of the CAMU regulations in

that it would offer an onsite location for management of the soil in an innovative, cost-effective, and protective manner. Disposal Option 2, transportation, pretreatment, and disposal at a Class I landfill, could be used in conjunction with Option 1 for excess soil not needed for the OU 2 foundation layer.

Selected Remedy

Alternative 3 was selected as the preferred alternative because it would protect human health and the environment and would comply with ARARs. It would also provide flexibility in management of the large volume of soil from Site 3, long-term effectiveness, is readily implementable, reduces the mobility and volume of contamination (soil and spent ammunition), and is the most cost-effective remedial alternative if a significant volume of soil is placed at the OU 2 CAMU.

8.2.2 Remedy Implementation

The Army has completed the remedial action at Site 3 in accordance with CERCLA and the Site 3 Interim ROD (*U.S. Army, 1997c*). The remedial action included excavation of soil contaminated with lead and associated spent ammunition. Approximately 162,800 cubic yards of impacted soil were removed from Site 3, of which approximately 129,200 cubic yards of soil were transported to the screening plant for separation of spent ammunition from soil. The remaining 33,600 cubic yards, composed of approximately 26,700 cubic yards of vegetation and 6,900 cubic yards of soil from over excavated areas (containing little spent ammunition) were not screened and were used as general fill at the OU 2 Landfill, Area E. Of the screened material, approximately 42,000 cubic yards were used for the foundation layer at Area E; 49,200 cubic yards for the foundation layer at Area F; and 38,000 cubic yards were used as general fill at Area E. Approximately 719,000 pounds of spent ammunition recovered from the screening plant was recycled and reclaimed at an offsite facility.

All final confirmation samples contained less than 1860 mg/kg and therefore met the health-based cleanup level of 1,860 mg/kg lead as defined in the ROD. The post remediation health risk assessment stated that unacceptable human health risks and hazards are considered unlikely to be associated with future recreational, commercial, or residential development of Site 3 under the exposure conditions evaluated (*IT, 2000c*). The post remediation health ecological risk assessment concluded that significant risks to herbivorous birds and carnivorous/omnivorous mammals from exposure to residual chemicals remaining in the soil at Site 3 are not expected (*HLA, 1998c*). Potentially significant risks were identified for two "hot spot" areas where soil concentrations were elevated. However, significant risks to populations of small mammals and plants from exposure to residual chemicals in soil are not expected. The soil remediation resulted in the site being available for unrestricted reuse.

8.2.3 System Operations and Maintenance

There are presently no operations and maintenance requirements identified for Site 3.

8.3 Technical Assessment

8.3.1 Question A

Is the remedy functioning as intended by the decision document?

The remedy is functioning as intended. However, the Interim ROD has not been finalized.

8.3.2 Question B

Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

The exposure and toxicity criteria used to evaluate health risks are still valid. Therefore the selected remedy is valid.

8.3.3 Question C

Has any information come to light that could call into question the protectiveness of the remedy?

No new information has been identified that could call the protectiveness of the remedy into question.

8.4 Issues

There remains a potential for post remediation activities related to shifting sands and the possible subsequent discovery of areas with greater than 10 percent surface coverage of spent ammunition, and additional habitat monitoring at Site 3. These issues will be resolved before the Proposed Plan and Record of Decision finalizing the remedy selection for the site are issued.

8.5 Recommendations and Follow-Up Actions

The Interim ROD for Site 3 should be finalized.

8.6 Protectiveness Statement

The post-remediation risk assessment indicated the implemented remedy was protective of human health and the environment (*IT, 2000c*) and is available for unrestricted reuse. None of the associated health risk criteria have changed, therefore the remedy continues to be protective of human health and the environment.

9.0 NO ACTION SITES ROD

This section presents background information on the No Action Sites ROD; a summary of remedial actions and a technical assessment of the actions taken at these sites; identifies any issues related to the protectiveness of the remedies 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.

9.1 No Action Sites Background

A No Action Record of Decision (NoA ROD) was signed in April 1995 and is based on the U.S. Army's No Action Proposed Plan (*No Action Proposed Plan for Selected Areas at Fort Ord, California*, August 30, 1994). The NoA ROD defines the criteria that a site must meet to qualify as a No Action (NoA) site and describes the approval process. NoA sites at Fort Ord are either:

- Category 1 Sites: already in a protective state and pose no current or potential threat to human health or the environment.
- Category 2 Sites: where CERCLA does not provide authority to take any remedial action. These sites may be regulated by State or local agencies and follow their requirements.

The criteria and approach for these sites are conservative and consistent with those presented for the operable units (OUs) and RI sites.

For each proposed NoA site, the evaluation process began with a site characterization investigation and report. The regulatory agencies reviewed the report and approved it after their comments were addressed. If the site met the criteria, a No Action approval memorandum was submitted for public comment and regulatory agency approval. If the approval memorandum was accepted, the site was included in the NoA ROD process. If approval was not granted, the site was transferred to the interim action category (Section 10.0).

9.2 Remedial Actions

9.2.1 Remedy Selection

The selected remedy for the NoA sites consisted of no further action.

9.2.2 Remedy Implementation

Site 11 – Army and Air Force Exchange Service Fueling Station

Site 11, the Army and Air Force Exchange Service (AAFES) Main Service Station, is in the Main Garrison. The site consists of a garage for automotive engine work, a small store for auto supplies and sundries, and an active gas station that includes six gasoline underground storage tanks, one waste oil underground storage tank, and one oil/water separator (*HLA, 1996n*). This site has completed the no action approval process. Subsequent cleanup actions have been completed as required under regulations governing underground storage tanks.

Site 13 – Railroad Right-of-Way

Site 13 is a 5,000-foot-long railroad spur and right-of-way adjacent to an industrial area in the Main Garrison. Third Street, Eleventh Street, Highway 1, and First Avenue bound the site. The railroad tracks head north (immediately east of and paralleling Highway 1) then curve eastward into the industrial area (*HLA, 1994b*). This site was included in the no action process and has completed the approval process.

Site 18 – 1600 Block Facility

Site 18, the 1600 Block Facility in the Main Garrison, is a multi-purpose complex that includes maintenance and support facilities for motor pool vehicles, the DOL Busworks Yard, and several light industrial buildings. Potential areas of concern were former underground storage tanks (waste oil, diesel, and gasoline), six wash racks with associated oil/water separators, five grease racks, drum storage areas at the DOL Busworks Yards and the Training and Audiovisual Service Center (TASC) Plastics Shop, and a dry well at the TASC Graphics Shop. Approximately 99 percent of the site is covered with either asphalt or concrete. Investigations determined this site required no further action (*HLA, 1995c*). This site was included in the no action process and has completed the approval process.

Site 19 – 2200 Block Facility

Site 19, the 2200 Block Facility in the Main Garrison, is 90 percent paved and consists of storage, administration, and light industrial buildings. Three potential areas of concern were Buildings T-2241, T-2251, and T-2253. Building T-2241 (the photographic laboratory, formerly the telephone and telegraph building) consisted of an area where wastes were reportedly discharged through a floor drain into a suspected dry well beneath the building. Building T-2251 consisted of an area where an oily substance reportedly flowed to a drain east of the building during wet weather. Building T-2253 (a former gasoline service station) consisted of an area where one soil sample collected during tank removal activities in 1991 contained TPH constituents. Investigations determined this site required no further action (*HLA, 1995d*). This site was included in the no action process and has completed the approval process.

Site 23 – 3700 Block Motor Pool Complex

Site 23, the 3700 Block Motor Pool Complex, is an approximate 19-acre parcel in the eastern portion of the Main Garrison where vehicle maintenance activities were performed. Potential areas of concern included six former underground storage tanks, three former grease racks, three oil/sand interceptors with oil/sand separators, and three hazardous waste storage sheds. A previous investigation consisted of drilling three soil borings and installing three monitoring wells. The borings were at the former underground storage tanks, and the monitoring wells were along the east site boundary, in the central portion of the site, and along the west site boundary to determine the groundwater flow direction. Investigations determined this site required no further action (*HLA, 1997d*). This site was included in the no action process and has completed the approval process.

Site 26 – Sewage Pump Stations, Buildings 5871 and 6143

The Imjin sewage pump station is in Building 5871, and the Clark sewage pump station is in Building 6143. Both buildings are southwest of the Fritzsche Army Airfield. There have been eight documented sewage spills from these stations since 1988; however, soil contamination from the sewage spills is not expected. Investigations determined this site required no further action (*HLA, 1995e*). This site was included in the no action process and has completed the approval process.

Site 27 – Army Reserve Motor Pool

Site 27, the Army Reserve Motor Pool, is immediately south of the former Fritzsche Army Airfield (FAAF). Potential areas of concern are the wash rack and the associated oil/water separator, a 500-gallon waste oil underground storage tank, and a hazardous materials storage area. The assessments of the existing waste oil underground storage tank and the hazardous materials storage area are being handled under the current underground storage tank management program and the Resource Conservation and Recovery Act (RCRA)-type facility program, respectively. Investigations determined this site required no further action

(*HLA, 1994e*). This site was included in the no action process and has completed the approval process.

Site 28 – Barracks and Main Garrison Area

Site 28 consists of three buildings in the Main Garrison Area: the Visual Information Center (Building T-2842), the Photo Developing Unit (Building T-2850), and the Print Shop (Building T-2353). Potential chemicals of concern associated with Site 28 include solvents, PCE, and chemicals used for photograph development. Investigations determined this site required no further action (*HLA, 1995b*). This site was included in the no action process and has completed the approval process.

Site 29 – Defense Reutilization Marketing Office

Site 29, the Defense Reutilization Marketing Office, is in the East Garrison and centers around Buildings 110 and 111, where polychlorinated biphenyl (PCB)-containing transformers may have been stored in the past, and an unpaved field adjacent to the Defense Reutilization and Marketing Office (DRMO) hazardous materials storage area. Potential contaminants are PCB-containing waste oil, metals, and PCBs. Investigation determined that this site required no further action (*HLA, 1994c*). This site was included in the no action process and has completed the approval process.

Site 35 – Fritzsche Army Airfield (FAAF) Aircraft Cannibalization Yard

Site 35, the FAAF Aircraft Cannibalization Yard, is an approximate 11-acre undeveloped area across which aircraft debris has been scattered, west of the northern portion of the FAAF. The FAAF burn pit is approximately 800 feet north of the site. Debris consisted of helicopter and small plane fuselages, jet engines, and wing sections. Potential contaminants associated with the site are engine oils and fuels that may have leaked from the aircraft parts, and possibly solvents from aircraft cannibalization activities. Investigations determined this site required no further action (*HLA, 1995a*). This site was included in the no action process and has completed the approval process.

Site 37 – Trailer Park Maintenance Shop

Site 37, the Trailer Park Maintenance Shop, is near the northwest portion of Fort Ord and serves as the maintenance storage yard for the adjacent trailer park. Potential areas of concern were the waste oil drum storage area, degraded and stained asphalt at a former location of an aboveground tank, and the storm drain inlet that collects runoff from the site. Investigation determined that this site required no further action (*HLA, 1994a*). This site was included in the no action process and has completed the approval process.

Site 38 – Army and Air Force Exchange Service Dry Cleaners

Site 38 is a Army and Air Force Exchange Service (AAFES) dry cleaning facility in the Main Garrison. The site consisted of three underground storage tanks, all of which have been removed. Investigations determined that this site required no further action (*HLA, 1995g*). This site was included in the no action process and has completed the approval process.

9.2.3 System Operations and Maintenance

There are no operations and maintenance requirements for the NoA sites.

9.3 Technical Assessment

9.3.1 Question A

Is the remedy functioning as intended by the decision document?

The selected remedy was no further action, which is continuing to function as the intended.

9.3.2 Question B

Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

There have been no changes in the assumptions for the NoA site that would affect the protectiveness of the remedy.

9.3.2.1 Changes in Standards To Be Considered

Fort Ord specific Preliminary Remediation Goals (PRGs) listed in the No Action ROD were used as the basis for No Action decisions. The Fort Ord specific PRGs were compared to the most recent EPA Region IX PRGs (*EPA, 1999*). Four chemicals, arsenic, 1,3-dichlorobenzene, ethylbenezene, and naphthalene, now have a published Region IX EPA PRG which are lower than the Fort Ord-specific PRGs. For arsenic in soil, although the Fort Ord-specific PRG exceeds the new EPA PRG, the exceedances are equivalent to Fort Ord background soil concentrations and therefore would not require reassessment of the need for remediation. For the other three chemicals, there were no detections at the No Action sites that exceed either of the new EPA Region IX PRGs.

9.3.3 Question C

Has any information come to light that could call into question the protectiveness of the remedy?

There is no new information that calls into question the effectiveness of the remedy.

9.4 Issues

There are no unresolved issues that have been identified in regard to the protectiveness of human health and the environment.

9.5 Recommendations and Follow-Up Actions

There are no recommendations for follow-up actions.

9.6 Protectiveness Statement

The risk assessment indicated that the implemented remedy was protective of human health and the environment and the sites are available for unrestricted reuse. None of the associated health risk criteria have changed, therefore the remedy continues to be protective of human health and the environment.

10.0 INTERIM ACTION SITES ROD

This section presents background information on the Interim Action Sites ROD; a summary of remedial actions and a technical assessment of the actions taken at these sites; identifies any issues related to the protectiveness of the remedies 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.

10.1 Background

An Interim Action Record of Decision (IAROD) was signed in March 1994(*Army, 1994a*). The IAROD was based on the interim action FS and proposed plan (*HLA, 1993a; HLA, 1993b*). The IAROD defined criteria that a site must meet to qualify as an IA site, and described the approval process for implementing interim actions. The primary criteria include: (1) the maximum depth of affected soil that could be addressed as an Interim Action was 25 feet below ground surface, and (2) the volume of affected soil that could be addressed as an Interim Action was limited typically to between 500 and 5,500 cubic yards. The cleanup goals and approach for these sites were consistent with those presented for the operable units (OUs) and RI sites at Fort Ord.

For each proposed Interim Action (IA) site, the process began with a site characterization investigation and report. The regulatory agencies reviewed the report and approved it after their comments were addressed. If the site met the criteria, an Interim Action approval memorandum was submitted for regulatory agency approval. The public was notified that an approval memorandum was submitted, and if the approval memorandum was approved, public notice of the proposed action was provided two weeks before work began. The interim action was then implemented and a Confirmation Report was prepared. If the report was approved, the site was included in the Interim Action ROD process. If the confirmation report was not approved, it was resubmitted after additional action was taken to address agency concerns. If it was determined that the contamination was too extensive to be remediated under the IAROD, the site was transferred to the RI sites category. An RI/FS report would then be prepared for the site and it would be included in the Basewide RI Sites ROD.

10.2 Remedial Actions

10.2.1 Remedy Selection

Alternative 1

- No Action and was considered, as required, under CERCLA as a baseline for comparison to the other proposed alternatives.

Alternative 2

- Excavating, treating, recycling and/or disposal of contaminated soil from IA areas and backfilling with clean soil.

Selected Remedy

Alternative 2 was the selected remedy because it was protective of human health and the environment, complied with ARARs and allowed timely transfer of Army property.

10.2.2 Remedy Implementation

Site 1 – Ord Village Sewage Treatment Plant

Site 1 is the former Ord Village Sewage Treatment Plant in the southwest corner of Fort Ord within the coastal dunes. Sewage treatment operations ceased in 1964; currently, the facility is used as a sewage pump station. Potential chemicals of interest include petroleum

hydrocarbons, VOCs, SOCs, mercury and other metals, fecal coliform, and nitrates. The cleanup of the site included excavation of the sludge drying beds and additional soil excavations in areas noted in the original site investigation. All cleanup is complete and the Interim Action Confirmation Report, Site 1 - Ord Village Sewage Treatment Plant, Fort Ord, California (*HLA, 1997j*) was submitted in 1997. The confirmation report received concurrence from EPA and is pending concurrence from DTSC.

Site 6 – Range 39, Abandoned Car Dump

Site 6 is an approximate 400-foot by 1,000-foot undeveloped parcel 1.5 miles southeast of the intersection of Eucalyptus and Parker Flats roads, within the multi-range area, where vehicles, scrap metal, and other items were disposed. All contaminated soil in this area has been removed, and the Interim Action Confirmation Report, Site 6 – Range 39 (Abandoned Car Dump), Fort Ord, California (*HLA, 1997a*) was submitted in 1997. The confirmation report received concurrence from EPA and is pending concurrence from DTSC.

Site 8 – Range 49, Molotov Cocktail Range

Site 8, an undeveloped parcel at Inland Range 49, was a former training area where troops practiced using Molotov cocktails. Contamination associated with Site 8 includes flammable liquids (possibly leaded gasoline, transmission oil, and motor oil) in soils adjacent to the two armored vehicles that were used as practice targets for the Molotov cocktails. All contaminated soils were removed under the interim action process. The Interim Action Confirmation Report, Site 8 – Range 49 (Molotov Cocktail Range), Fort Ord, California (*HLA, 1996j*) was submitted in 1996. The confirmation report received concurrence from EPA and is pending concurrence from DTSC.

Site 10 – Burn Pit

Site 10 is a former burn pit approximately 160 feet south of the Fort Ord Fire Station in the Main Garrison. The site was an unlined, rectangular pit (approximately 45 feet long, 25 feet wide, and 2 feet deep) into which flammable liquids were placed, ignited, and subsequently extinguished for firefighting training. A 2-inch diameter pipe apparently was used to regulate fluid levels in the pit, and a narrow drainage ditch exits the pit to the south. The southern portion of the 2-inch-diameter pipe is buried within surface soils. The pit is no longer in use and is partially overgrown with grass. All contaminated soils have been removed and the Interim Action Confirmation Report, Site 10 - Burn Pit, Fort Ord, California (*HLA, 1996k*) was submitted in 1996. The confirmation report received concurrence from EPA and is pending concurrence from DTSC.

Site 14 – 707th Maintenance Facility

Site 14 is an approximate 19-acre area at the northwest corner of the intersection of 3rd Street and 6th Avenue in the Main Garrison. The site was used as a maintenance and fueling facility for military vehicles, beginning in the early 1950s. Potential areas of concern include soil associated with gasoline, diesel, and waste oil underground storage tanks; hazardous materials storage areas; grease racks; wash racks, and oil/water separators. Through a series of soil excavation actions, all contamination has been removed. All underground storage tanks in this area have been removed and clean-closed. The cleanup of this site is complete and the Confirmation Report, Site 14 - 707th Maintenance Facility, Fort Ord, California (*HLA, 1996b*) was submitted in 1996. The confirmation report received concurrence from EPA and is pending concurrence from DTSC.

Site 15 – Directorate of Engineering and Housing (DEH) Yard

Site 15, the Directorate of Engineering and Housing (DEH) Yard is an approximate 10-acre, developed parcel in the Main Garrison. The site consists mainly of administration buildings, with some areas used for light industry and/or storage. Soil contaminated with pesticides and metal has been excavated and removed from this area in accordance with the Interim Action process. The Confirmation Report Site 15 Directorate of Engineering and Housing Yard, Fort Ord (*HLA, 1996i*) was submitted in 1996 and received concurrence from the regulatory agencies in 1998.

Site 20 – South Parade Ground and 3800 and 519th Motor Pools

Site 20 is in the Main Garrison and consists of the 9.5-acre South Parade Ground, the 27-acre troop training area west of the parade ground, the 6-acre 3800 Motor Pool, and the 20-acre 519th Motor Pool. With completion of the notification process as outlined for the eligible Interim Action sites, contaminated soils were excavated. The cleanup of this area is complete. The Interim Action Confirmation Report, South 20 - South Parade Ground 3800 and 519th Motor Pools, Fort Ord, California (*HLA, 1996e*) was submitted in 1996 and received concurrence from the regulatory agencies in 1998.

Site 21 – 4400/4500 Block Motor Pool East

Site 21, the 4400/4500 Block Motor Pool East, was used for motor vehicle service, maintenance, and storage, and is in the eastern portion of the Main Garrison. Potential areas of concern included a 400-gallon gasoline fuel spill near Building 4495 that occurred in 1979, six oil/water separators, a concrete-lined canal and its unpaved discharge area, nine wash racks and nine grease racks, and twenty current and former underground storage tanks. The cleanup of this site is complete. The Interim Action Confirmation Report, Site 21 - 4400/4500 Motor Pool, East Block, Fort Ord, California (*HLA, 1996f*) was submitted in 1996. The confirmation report received concurrence from EPA and is pending concurrence from DTSC.

Site 22 – 4400/4500 Block Motor Pool West

Site 22, the 4400/4500 Block Motor Pool West, was used for motor vehicle service, maintenance, and parking, and is in the eastern portion of the Main Garrison. Potential areas of concern included 16 current and former underground storage tanks, a fueling facility, maintenance shops, four grease racks, and three oil/water separators. The cleanup of this site was completed. The Site Interim Action Confirmation Report, Site 22 - 4400/4500 Motor Pool, West Block, Fort Ord, California (*HLA, 1996d*) was submitted in 1996 and received concurrence from the regulatory agencies in 1998.

Site 24 – Old Directorate of Engineering and Housing (DEH) Yard

Site 24 is a grassy vacant lot (including a 1/4-mile jogging track), and is the location of the former DEH Yard and a former plant nursery within the Main Garrison. Areas within Site 24 that may have been potential sources of contamination included a maintenance facility, a grease rack, drum and asphalt storage areas, aboveground tanks, and the nursery. With the removal of the contaminated soil and buried drums at this site, the cleanup of this site is complete. The Interim Action Confirmation Report, Site 24 - Old DEH Yard, Fort Ord, California (*HLA, 1997b*) was submitted in 1997 and received concurrence from regulatory agencies in 1998.

Site 30 – Driver Training Area

Site 30, the Driver Training Area, is a partially developed parcel in the East Garrison. Former facilities at the site representing potential areas of concern included a former grease rack with

stained surface soils, a former gasoline station with two underground storage tanks, and an abandoned wash rack. The site cleanup is complete. The Confirmation Report, Site 30 - Driver Training Area, Fort Ord, California (*HLA, 1996c*) was submitted in 1996. The confirmation report received concurrence from EPA and is pending concurrence from DTSC.

Site 32 – East Garrison Sewage Treatment Plant

Site 32, the East Garrison Sewage Treatment Plant in the northern portion of the East Garrison, consists of sludge beds, a percolation pond, and Dotton-sedimentation tanks. Potential contaminants include TPH as gasoline (TPHg), TPHd, VOCs, metals, fecal coliform bacteria, and nitrogen. The contaminated soils at this site were excavated and the cleanup is complete. The Interim Action Confirmation Report, Site 32 - East Garrison Sewage Treatment Plant, Fort Ord, California (*HLA, 1998a*) was submitted in 1998. The confirmation report received concurrence from EPA and is pending concurrence from DTSC.

Site 34 – Fritzsche Army Airfield (FAAF) Fueling Facility

Site 34 includes the former Fritzsche Army Airfield (FAAF) Fueling Facility and developed areas. Potential areas of concern included: four helicopter wash aprons, one vehicle wash rack, and associated oil/water separators at various locations. Helicopters were cleaned at the wash aprons using solvent solutions, and vehicles were cleaned at the wash rack using soap and water. Each wash apron or wash rack is a relatively large, 12-inch-thick concrete pad where helicopters or vehicles were washed. Each pad either sloped inward toward a central drain or sloped uniformly in the direction of a perimeter drain adjacent to an associated oil/water separator. The contaminated soil was excavated in accordance with the remedy outlined in the Interim Action Record of Decision, and additional soil contamination resulting from former underground storage tanks was removed. The underground storage tanks and contaminated soil has been removed and the cleanup is complete. The Interim Action Confirmation Report, Site 34, Fritzsche Army Airfield Fueling Facility, Fort Ord, California (*Uribe, 1998*) was submitted in 1998. The confirmation report received concurrence from EPA and is pending concurrence from DTSC.

Site 36 – Fritzsche Army Airfield (FAAF) Sewage Treatment Plant

Site 36 is the inactive FAAF Sewage Treatment Plant near the northern border of Fort Ord. The facility consisted of an Imhoff tank, two evaporation ponds, and two sludge beds. Potential contaminants included TPH as gasoline, TPH as diesel, volatile organic compounds (VOCs), metals, fecal coliform bacteria, and Kjeldahl nitrogen. The contaminated soil in this area was remediated in accordance with the Interim Action Record of Decision and is complete. The Interim Action Confirmation Report, Site 36 - Fritzsche Army Airfield Sewage Treatment Plant, Fort Ord, California (*HLA, 1997g*) was submitted in 1997 and received concurrence from the regulatory agencies in 1998.

Site 39A – East Garrison Ranges

The East Garrison Ranges are on the west side of the East Garrison. The ranges included three small-bore shooting ranges (EG-1, EG-2, and EG-3), a skeet range, and a target area that appears to have been part of a decommissioned moving target range. Weapons use was limited to pistols (.45 caliber or less) at Ranges EG-1 and EG-2, and to small-bore (.22 caliber) rifles at Range EG-3. Bullets were fired at targets 25 or 50 meters away and became embedded in the hillsides at the back of the range. The skeet range was primarily a recreational shooting range for trap and skeet. Potential contaminants were arsenic, antimony, copper, and lead associated with spent ammunition, and polyaromatic hydrocarbons (PAHs) from clay pigeons that contain 32 percent petroleum pitch (asphalt). Soil was excavated and the cleanup of this area is complete. The Interim Action

Confirmation Report, Site 39A - East Garrison Ranges, Former Fort Ord, California (*HLA, 1998d*) was submitted in 1998. The confirmation report received concurrence from EPA and is pending concurrence from DTSC.

Site 39B – Inter-Garrison Training Area

Site 39B is located east of the Main Garrison, south of Inter-Garrison Road between Eighth Avenue and Abrams Drive. In 1994, when an unexploded ordnance (UXO) clearance crew found a small container while excavating a site, two crewmembers became dizzy and nauseated. The crew also noted metal debris and odors at a second location within 50 feet of the containers. An emergency response action was initiated to treat the UXO crew and secure the site. Other items found in the vicinity of the incident included oil filters, scrap metal, paint cans, engines, and ammunition canisters. A Time-Critical Removal Action was completed in 1994, and soil was determined to be contaminated with lead, oil and grease, and diesel fuel. The soil contamination in this area was excavated and the cleanup is complete. The Interim Action Confirmation Report, Site 39B - Inter-Garrison Site, Fort Ord, California (*HLA, 1997e*) was submitted in 1997. The confirmation report received concurrence from EPA and is pending concurrence from DTSC.

Site 40 – Fritzsche Army Airfield (FAAF) Helicopter Defueling Area

Site 40, the FAAF Helicopter Defueling Areas, is near Building 533 in the northwest portion of the FAAF. Based on interviews with Building 533 employees, four separate potential areas of concern were identified as locations where helicopters were defueled or where chemicals associated with helicopter maintenance may have been released. One of these areas was also a suspected landfill site. The cleanup of this site is complete. The Interim Action Confirmation Report, Site 40 - Fritzsche Army Airfield Defueling Area, Fort Ord, California (*HLA, 1997a*) was submitted in 1997 and received concurrence from regulatory agencies in 1998.

Site 41 – Crescent Bluff Fire Drill Area

Site 41 consists of four small fire-fighting training pits identified during personnel interviews located on a bluff approximately 0.75 mile southeast of the East Garrison. The training pits were overgrown and contained ponded water during wet seasons. Potential contaminants associated with training pits were flammable liquids (e.g., fuels and solvents). The contaminated soil in this area was excavated and removed in accordance with the Interim Action Record of Decision and all the cleanup related to the site is complete. The Interim Action Confirmation Report, Site 41 - Crescent Bluff Fire Drill Area, Fort Ord, California (*HLA, 1997c*) was submitted in 1997. The confirmation report received concurrence from EPA and is pending concurrence from DTSC.

Outfall OF-15

Outfall OF-15 included a storm drain and channel immediately west of Trainfire Range No. 11 on the Beach Trainfire Ranges (Site 3). The contaminated soil in this area was excavated and removed in accordance with the Interim Action Record of Decision and the cleanup related to this site is complete. The Interim Action Confirmation Report, Outfall 15, Former Fort Ord, California (*HLA, 1998b*)was submitted in 1998. EPA provided minor comments which are being addressed. The site is pending concurrence from the regulatory agencies.

Outfalls OF-34 and OF-35

Outfalls OF-34 and OF-35 discharged into a vegetated drainage channel west of Building 533 at the western end of FAAF. Interviews with former base employees and research indicated chemicals used in Building 533 and/or other buildings at FAAF may have entered storm drain inlets upstream of OF-34 and OF-35. The contaminated soil in this area was excavated and removed in accordance with the Interim Action

Record of Decision and the cleanup related to this site is complete. The Interim Action Confirmation Report, Outfalls 34 and 35 - Fritzsche Army Airfield, Fort Ord, California (*HLA, 1997f*) was submitted in 1997 and received concurrence from the regulatory agencies in 1998.

10 2.3 System Operations and Maintenance

There are no operations and maintenance requirements under the Interim Action ROD.

10.3 Technical Assessment

10.3.1 Question A

Is the remedy functioning as intended by the decision document?

The completed interim actions continue to allow unrestricted use of the Interim Action Sites.

10.3.2 Question B

Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

There have been no changes in the physical conditions of the IA sites that would affect the protectiveness of the remedy.

10.3.2.1 Changes in Standards To Be Considered

Fort Ord specific Preliminary Remediation Goals (PRGs) listed in the Interim Action ROD were used as the basis for No Action decisions. The Fort Ord specific PRGs were compared to the most recent EPA Region IX PRGs (*EPA, 1999*). Four chemicals, arsenic, 1,3-dichlorobenzene, ethylbenezene, and naphthalene, now have a published Region IX EPA PRG which are lower than the Fort Ord-specific PRGs. For arsenic in soil, although the Fort Ord-specific PRG exceeds the new EPA PRG, the exceedances are equivalent to Fort Ord background soil concentrations and therefore would not require reassessment of the need for remediation. For the other three chemicals, there were no detections at the Interim Action Sites that exceed either of the new EPA Region IX PRGs.

10.3.3 Question C

Has any information come to light that could call into question the protectiveness of the remedy?

There is no new information that calls into question the effectiveness of the remedy.

10.4 Issues

There are no unresolved issues that have been identified in regard to the protectiveness of human health and the environment.

10.5 Recommendations and Follow-Up Actions

There are no recommendations for follow-up actions.

10.6 Protectiveness Statement

The post-remediation risk assessment indicated that the implemented remedy was protective of human health and the sites with agency concurrence are available for unrestricted reuse. None of the associated health risk criteria have changed, therefore the remedy continues to be protective of human health and the environment.

11.0 STATUS OF OTHER INVESTIGATIONS

This section provides background information and status reports on other investigations at Fort Ord not addressed under one of the RODs previously described.

11.1 Carbon Tetrachloride Investigation

11.1.1 Background

Carbon tetrachloride (CT) was originally detected in groundwater samples collected from two wells in 1992. The continued but erratic detection of CT in both the A- and Upper 180-Foot aquifers as part of the quarterly monitoring program suggested the presence of a nearby vertical conduit through the laterally extensive Fort Ord Salinas Valley Aquiclude (FO-SVA) clay. Nearby abandoned municipal wells were evaluated and determined to have been inadvertently constructed with insufficient sanitary seals, providing vertical conduits to the Upper and Lower 180-Foot Aquifers. Soil gas samples collected as part of a separate investigation in 1987 indicate a possible CT source area; however, land use of this area does not indicate any obvious source of solvents, including CT.

Current data suggests that CT migrated from the suspected source area downward to the A-Aquifer, then migrated northwest where it was intercepted by several vertical conduits downward through vertical conduits into the Upper 180-Foot Aquifer. A portion of the Upper 180-Foot Aquifer plume continued to migrate downward where it eventually entered the Lower 180-Foot Aquifer; another portion migrated to the southeast where it commingled with the OU 2 plume and entered the Lower 180-Foot Aquifer through the Intermediate 180-Foot Aquitard about a mile away. This has resulted in two distinct CT plumes in the Lower 180-Foot Aquifer, each representing a different pathway.

This plume represents complex pathways and volatile organic compound (VOC) distribution due to the previous vertical conduits at the municipal wells and varying groundwater flow directions in each aquifer. The A-Aquifer plume extends about 1.5 miles from the source area to the northwest; the Upper 180-Foot Aquifer plume extends at least one mile from the vertical conduits to the southeast; and the Lower 180-Foot Aquifer plume extends about one mile east of the vertical conduits (based on preliminary data from Westbay wells). The investigation to delineate CT in each aquifer is ongoing and will be documented in a separate ROD.

11.1.2 Status Report

As of January 2002, the carbon tetrachloride plume has been observed in the A-Aquifer, the Upper 180-Foot Aquifer, and the Lower 180-Foot Aquifer. The A-Aquifer plume extends about one mile northwest of the suspected source area and is delineated by 38 monitoring wells, of which carbon tetrachloride is consistently in 19 wells. The highest concentration detected to date has been 18 micrograms per liter (µg/L) at monitoring well (MW)-BW-27-A, which exceeds the State maximum contaminant level (MCL) for carbon tetrachloride of 0.5 µg/L. The source of carbon tetrachloride is still unknown, but an area of elevated soil gas concentrations indicates the suspected source area location may be near Imjin Road within the Preston Park housing area.

The Upper 180-Foot Aquifer plume extends from several vertical conduits surrounding previously used, and now destroyed, drinking water wells. The plume extends about 4,000 feet from these conduits to the southeast where it appears to migrate through the underlying aquitard and enters the Lower 180-Foot Aquifer. The Upper 180-Foot Aquifer is delineated by nine monitoring wells, of which

carbon tetrachloride is consistently detected in six wells. The highest concentration of carbon tetrachloride detected to date in the Upper 180-Foot Aquifer has been 9.8 µg/L at MW-B-13-180.

The Lower 180-Foot Aquifer is delineated by a series of Westbay monitoring wells, a private irrigation well, a USACE monitoring well installed in 1963 for monitoring seawater intrusion, and historical data from now-destroyed drinking water wells.

The Westbay wells include 35 monitoring ports installed in the Lower 180-Foot and 400-Foot Aquifers. These wells were recently installed and preliminary data indicates carbon tetrachloride is present only in the Lower 180-Foot Aquifer. Carbon tetrachloride has also been consistently detected at a private irrigation well at concentrations ranging from 4.5 µg/L to 6.95 µg/L. However, the highest concentration from the now-destroyed drinking water wells (also screened in the Lower 180-Foot Aquifer) prior to their destruction was 11 µg /L (FO-28). Samples from a well installed to monitor seawater intrusion recently indicated the presence of carbon tetrachloride at a concentration of 1.6 µg/L. This plume appears to extend about 5,000 feet east of the vertical conduits and is almost 2,000 feet wide at its widest point, based on available data.

In addition to the Lower 180-Foot Aquifer plume emanating from vertical conduits surrounding the now-destroyed drinking water wells, a second plume has formed downgradient of where the Upper 180-Foot Aquifer apparently migrates into the Lower 180-Foot Aquifer. Data from wells installed to delineate the OU 2 plume indicate that the Upper 180-Foot Aquifer plume commingles with the OU 2 plume in the Lower 180-Foot Aquifer further south and west of the source area. Carbon tetrachloride has consistently been detected at MW-OU2-66-180, and recent data indicate it is also present at MW-OU2-69-180; however, concentrations have not yet exceeded the State MCL of 0.5 µg/L in this area. This second Lower 180-Foot Aquifer plume may extend across an area with an approximate diameter of 2,000 feet and is expected to migrate to the east/southeast.

An evaluation of natural attenuation of carbon tetrachloride in groundwater identified in recent investigations was conducted by Harding ESE for the A-Aquifer and the Upper 180-Foot Aquifer (*Harding, 2001d*) and will be evaluated during the RI/FS process. After additional data collection, an RI/FS will be prepared to start the ROD process for the carbon tetrachloride plume.

11.2 Monterey Bay Enhanced Preliminary Assessment

11.2.1 Background

An investigation was performed to evaluate past Army activities at Fort Ord and adjacent areas that could have affected the restricted zone in Monterey Bay, and to assess the likelihood of current and future impacts from these activities. The restricted zone is an area of 18 square nautical miles adjacent to the west side of Fort Ord, to which access was restricted in order to protect the public during Army training exercises. The investigation included compilation of a chronological history of Army activities in, and around, Fort Ord based on the following:

- Review of Federal Register
- Literature on sediments/currents, and biological studies in the bay
- Previous investigations
- Reported sewage releases and chemical discharges
- Historical aerial photographs
- Review of regional newspapers
- Personal communications/interviews.

The Army participated in an effort with the Monterey Bay National Marine Sanctuary, the

US Geological Survey, regulatory agencies, and local marine research facilities to investigate sediment and biota, and map the ocean floor in the restricted zone and adjacent areas in Monterey Bay off the former Fort Ord.

11.2.2 Status Report

Review of data indicated minor impacts to the restricted zone occurred during the Army's tenure in the area, but these impacts were not significant with regard to environmental concerns. Some of the impacts that were noted included the potential for limited small arms projectiles and ordnance and explosives (OE) on the ocean floor, a sunken amphibious vehicle, physical disturbance of beaches, and the discharge of contaminants and effluent through storm drain outfalls. However, these impacts are insufficient to adversely effect marine biota or human usage of the area and no additional action is necessary (*HLA, 1999a*).

11.3 East Garrison Magnetic Anomalies Investigation

11.3.1 Background

The Central Coast Regional Water Quality Control Board was notified that metal drums may have been buried in the East Garrison of the former Fort Ord in open areas between Buildings T-29, T-30, T-33, T-34, 35, and T-36. Subsequent investigations using magnetic and ground-penetrating radar surveys identified seven shallow subsurface magnetic anomalies in the suspect areas. One of the anomalies was identified as being associated with underground utilities. A detailed investigation was initiated to identify the remaining six anomalies.

11.3.2 Status Report

Investigations of the anomalies included trenching and soil sampling to identify the magnetic anomalies and evaluate whether there was a potential for associated chemical contamination. The investigation was completed in 1998, and included excavation of the anomalies, air monitoring in the work areas, sampling soil adjacent to the anomalies for chemical analysis, and confirmation that the magnetic anomalies had been removed using geophysical methods. In addition, a screening risk evaluation (SRE) of chemical data was performed to evaluate whether additional investigation was needed. Chemical analyses included volatile and semi-volatile organic compounds, petroleum hydrocarbons, and priority pollutant metals. The results of the investigation indicated that no buried drums were present, no chemical contamination was present in excess of Preliminary Remediation Goals (PRGs), and that each of the magnetic anomalies was associated with inert metal scrap, metal grounding rods, or buried asphalt pavement. Details of the investigation are described in the Draft Data Summary Report, Investigation of Magnetic Anomalies, East Garrison Area, Former Fort Ord, California (*Harding, 2001a*) has been approved by the regulatory agencies and a draft final report will be issued. No further action will be required at this site.

11.4 Fritzsche Army Airfield (FAAF) Three Sites Investigation

11.4.1 Background

An investigation was initiated to evaluate three suspected sites in the vicinity of the former Fritzsche Army Airfield (FAAF) which were discovered after completion of the Basewide RI/FS. The three sites included a debris disposal site, a former unpaved vehicle staging area, and a possible former burn pit. A fourth suspected location where a geophysical anomaly was identified during borehole clearance activity for an adjacent site investigation (OU 1) was added to the investigation. The purpose of the evaluation was to evaluate whether contaminants were discharged or leached to soil at any of the sites.

11.4.2 Status Report

Chemical analyses of soil samples indicated concentrations of metals were below Fort Ord background soil concentrations at all sites. No organic compounds were detected in samples from the vehicle staging area or the geophysical anomaly area, other than common laboratory contaminants. Samples from the debris disposal area contained concentrations of petroleum hydrocarbons that were considerably lower than the Fort Ord PRG. At the potential burn pit site, several organic compounds were detected along with elevated concentrations of petroleum hydrocarbons in the soil.

The investigation report (*Harding, 2001b*), concluded that no further work was necessary at any of the sites other than the former burn pit. The report recommended excavation of soil under the IA ROD. The draft report is currently under agency review.

11.5 Freon 113 Investigation

11.5.1 Background

Freon 113 was discovered in the subsurface near the former Fritzsche Army Airfield (FAAF) (now the Marina Airport) during investigations intended to identify the extent of TCE in groundwater at OU 1. In December 1996, a groundwater investigation performed by the USACE identified the presence of Freon 113 in groundwater northeast of the OU 1 monitoring well network. Previous investigation at the adjacent Site 40 in 1993 and 1994 indicated contamination associated with former site practices appeared to be limited to surface soil and did not affect groundwater (*HLA, 1996a*); however, low concentrations of Freon 113 were subsequently reported in groundwater samples from the Site 40 monitoring well.

An investigation was performed by Harding in 1997 to evaluate the nature and extent of Freon 113 in the OU 1/Site 40 area and attempt to identify a source of Freon. Field activities included geophysical testing, drilling and sampling 13 test borings, and installing four groundwater monitoring wells. The investigation identified Freon 113 in groundwater over an area of approximately 600 by 1,600 feet downgradient of Site 40 at concentrations up to 420 micrograms per liter. Only two of the samples from monitoring wells in which Freon 113 was identified contained concentrations of Freon greater than 300 micrograms per liter. All other samples contained concentrations of Freon under 21 micrograms per liter.

11.5.2 Status Report

Based on the results of the 1999 investigation, it was concluded that concentrations of Freon 113 in groundwater were below the maximum contaminant level (MCLs) established by the State of 1,200 micrograms per liter. Consequently, no further work was recommended. The *Technical Memorandum Regarding Freon 113 in the Subsurface Near OU 1 and Site 40, Former Fort Ord, California* (*Harding ESE, 2000b*)concluded on the basis of the identified concentrations and areal extent of Freon 113 in the subsurface, and the presence of existing monitoring wells in appropriate locations to monitor the plume for changes, that no further action was necessary.

11.6 Fort Ord Soil Treatment Area (FOSTA)/ Underground Storage Tank Remediation Area (USRA)

11.6.1 Background

11.6.1.1 Fort Ord Soil Treatment Area (FOSTA)

The FOSTA was designed as a bioremediation soil treatment facility constructed for remediation of TPH-containing soil from IA sites at Fort Ord. From 1995 to 1998, soils excavated during Fort Ord Interim Actions were stored and/or bioremediated at the FOSTA. After treatment, the soils were transported to the

OU 2 Landfill. Closure activities began in November 1998 and were completed April 1999.

11.6.1.2 Underground Storage Tank Remediation Area (USRA)

The USRA was designed as a Class II waste pile for receiving non-hazardous soils from regulated underground storage tank (UST) sites at Fort Ord. From 1995 to 1998, soils excavated during UST remediation were stored and/or bioremediated at the USRA. After treatment, the soils were transported to the OU 2 Landfill. Closure activities began in November 1998 and were completed April 1999.

11.6.2 Status Report

11.6.2.1 Fort Ord Soil Treatment Area (FOSTA)

All phases of the construction and field sampling activities for the FOSTA were completed in accordance with the Closure Plan (*Uribe, 1999a*) and the Quality Control Project Plan/Sampling and Analysis Plan (QCPP/SAP) (*Uribe, 1999b*). The Final Closure Report, (*Uribe, 1999d*) was submitted in December 1999. Based on the laboratory analytical results, no detrimental impacts to underlying soil occurred during the operation of the FOSTA (*Uribe, 1999d*).

11.6.2.2 Underground Storage Tank Remediation Area (USRA)

All phases of the construction and field sampling activities for the USRA were completed in accordance with the Closure Plan (*Uribe, 1999a*) and the QCPP/SAP (*Uribe, 1999b*). The Final Closure Report, (*Uribe, 1999c*) was submitted December 1999. Based on the laboratory analytical results, no detrimental impacts to underlying soil occurred during the operation of the USRA (*Uribe, 1999c*).

11.7 Resource Conservation and Recovery (RCRA) Closures

11.7.1 Defense Reutilization and Marketing Office (DRMO)

Background

The Defense Reutilization and Marketing Office (DRMO) was used for the storage and ultimate disposition of all hazardous waste, surplus hazardous materials, and other non-hazardous surplus items generated at the former Fort Ord. When the base was active, these wastes, materials, and surplus items were also received from other selected installations in the surrounding area for storage and ultimate disposal. Site usage began in 1973, and storage of hazardous materials on paved areas began in 1975. Paving of the entire site was completed in 1976, and hazardous materials were accepted for storage until November 1994.

The DRMO waste container storage unit comprised eight storage bays that were used to segregate various waste types. Each bay was surrounded by an asphalt berm to isolate potential spills and prevent mixing of incompatible wastes. Evaluation of the site for closure was initiated with the Draft Final Closure Plan, DRMO Hazardous Waste Container Storage Unit, Former Fort Ord, California (*HLA, 1999b*). Closure activities included installation of soil borings, soil excavation, removal of sediment from storm drains, and a video survey of the storm drain system. Additional activities included chemical analysis of soil, sediment, and rinsate samples collected from borings, surface rinsate, and storm drains.

Status Report

The closure investigation indicated the presence of contaminants at various locations onsite; however, residual concentrations were all below the target cleanup levels. Excavated soil was

transferred to the Fort Ord landfill for use as cover material, the storm drains were sufficiently cleaned, and the site was closed. Details of the closure investigation are presented in the Closure Certification Report, DRMO Hazardous Waste Container Storage Unit, Former Fort Ord, California (*HLA, 2000a*).

11.7.2 Silver Recovery Unit

Background

The silver recovery unit(unit) was located in the basement of the Silas B. Hayes Hospital (Building 4385), and was operated until 1993 and removed in 1994. Solutions containing recoverable silver were transported to the unit from Fort Ord's photography and dental laboratories, the hospital's x-ray facility, and Fort Hunter Liggett, the Presidio of Monterey, Camp Roberts, and the Consolidated Medical Clinic. The original unit consisted of two stainless steel open vats. A bermed cage was constructed adjacent to the unit in 1989, which contained various subsequent configurations of the unit and associated equipment and storage containers. The system was upgraded in the early 1980s to include a fiberglass collection container on the first floor of the hospital, and piping that drained to the original basement location where the actual recovery unit and additional holding tanks were located. In addition, the hospital's nine x-ray developing machines discharged used photochemicals into the unit via a dedicated drain system.

Army documents indicate that work was performed in 1988 to repair concrete that was damaged by spilled acetic acid associated with the recovery process. The unit was temporarily moved, the damaged concrete was removed, and underlying soil was sampled and excavated. Analysis of soil samples indicated that silver was present in soil to a depth of 30 inches. Soil was excavated to a depth of 36 inches, replaced with clean fill, and the concrete floor was replaced along with construction of the bermed cage area.

In September 2000, the Department of Toxic Substances Control (DTSC)/Cal-EPA determined that the silver recovery unit was no longer regulated under State law. The Army identified the unit as Solid Waste Management Unit (SWMU) FTO-021 and developed a site closure plan, the *Draft Final Work Plan, Silver Recovery Unit (Solid Waste Management Unit FTO-021), Former Fort Ord, California*, dated March 26, 2001(*Harding, 2001c*).

Status Report

Site closure sampling was performed in June, 2001, to evaluate whether residual contamination was present in the area of the former silvery recovery unit. Sampling was performed in accordance with the closure plan, which included wipe samples and chip sampling of porous surfaces associated with the former unit. Analysis of samples indicated that silver residue was present at the site. However, all results were below the cleanup goals developed for the site, and no additional remedial work was determined to be necessary. Details of site closure activities are described in the *Closure Report, Silver Recovery Unit (Solid Waste Management Unit FTO-021), Former Fort Ord, California* (*Harding ESE, 2002*).

11.7.3 Building T-111

Background

The Building T-111 site was used for temporary container storage of wastes contaminated with polychlorinated biphenyls (PCBs) from 1985 through January 1995. The building contained three epoxy-lined storage bays separated by four-foot high cement block berms, and an adjoining concrete-surfaced yard. Hazardous waste storage permit application data indicates that the facility anticipated handling an estimated 3,000 kilograms of PCB and associated material annually. A variety of other hazardous wastes also were stored at the site for a 10-month period in 1989. Specific waste types that were stored onsite and other site details are presented in the Draft Closure Plan, DRMO

PCB Storage Building T-111, Former Fort Ord, California (*HLA, 2002b*).

Status Report

Comments have been received on the draft site closure plan and the draft final closure plan will be issued in June 2002.

11.7.4 Range 36A

Background

Range 36A was an explosive ordnance disposal (EOD) range and was used for disposal of various types of commercial explosives and military ordnance and ammunition. Disposal of ordnance and explosives (OE) occurred by open burning and open detonation (OB/OD). The range was used until October 1992, when Fort Ord's EOD unit was deactivated as part of the closure of Fort Ord. In January 1994, Range 36A was reactivated for disposal of OE identified from Fort Ord's Time-Critical Removal Action Program for OE found outside the Inland Ranges. Potential contaminants present at the range as a result of past activities include explosive compounds and metals.

Investigations were conducted at Range 36A by James M. Montgomery Consulting Engineering (JMM) and by HLA. In 1990, JMM performed a Preliminary Assessment/Site Investigation (PA/SI) at Range 36A to evaluate the presence of explosive compounds and metals as a result of past activities at the site. The JMM investigation consisted of drilling two soil borings and installing three wells. Twenty-four soil samples, plus one split sample and one duplicate sample, were collected from the two borings and three monitoring well boreholes, and the samples were analyzed for explosive compounds and metals.

In 1992, HLA performed an RI at Range 36A. This investigation included:

- Drilling 23 borings to depths of 15 to 20 feet below ground surface on an approximate 50-foot grid
- Collecting 69 surface and subsurface soil samples for lithologic characterization and chemical and physical analysis
- Analysis of soil samples for explosive compounds and priority pollutant metals.

The findings of the field investigations at Range 36A indicated the following:

- The explosive compounds cyclotetramethylenetetranitramine (HMX) and cyclotrimethylenetrinitramine (RDX) were present at low levels (maximum concentrations of 1.84 and 16.5 mg/kg, respectively), were generally limited to shallow soil, and were below PRGs. The PRG for HMX is 803 mg/kg and the PRG for RDX is 4 mg/kg.

With the exception of beryllium detected at a maximum concentration 0.89 mg/kg in shallow soil, metals in soil at the site were below background or PRG concentrations. The Fort Ord PRG for beryllium is 0.39 mg/kg. The most recent EPA Region 9 PRG for beryllium is 150 mg/kg.

Status Report

The Draft Closure Plan, Range 36A, Former Fort Ord, California (*HLA, 1997i*) was submitted in 1997. A work plan for additional sampling to investigate the areas used after the previous investigations and to verify the presence of RDX above the PRG will be issued in June 2002. The Draft Closure Plan will be revised based on the results of the proposed additional sampling.

11.7.5 Solid Waste Management Units (SWMUs)

Background

In support of Fort Ord's Resource Conservation and Recovery Act (RCRA) Part B permit application, the Army Environmental Hygiene Agency (AEHA) identified 58 SWMUs in 1988. All but two of these 58 SWMUs were in areas

investigated during the RI/FS or were previously identified as Operable Units. In 1996, the Army identified 14 additional SWMUs. The Draft Field Investigation and Data Review, Solid Waste Management Units, Fort Ord, California (*HLA, 1996h*) recommended no additional sampling under the SWMU program.

Status Report

The following SWMUs are presently active:

- FTO-010 – AAFES Service Station
- FTO-027 – Building 4495 Temporary Container Storage
- FTO-068 – Auto Craft Shop Temporary Container Storage
- FTO-055 – Army Reserve Center Motor Pool Temporary Container Storage
- FTO-017 – Golf Course Maintenance Area Temporary Container Storage

The SWMU report will be updated in 2002 to reflect present conditions.

11.8 Ordnance and Explosives Program

11.8.1 Background

The Army is in the process of preparing an RI/FS for ordnance and explosives (OE) at Fort Ord. Prior to and concurrent with the preparation of the OE RI/FS, the Army has been conducting OE cleanup activities that consist of implementing and documenting OE removal actions in areas with imminent OE hazards. These removal actions have not only reduced imminent OE hazards but have also provided information about the type of OE and level of OE hazard at each of the sites for use in the OE RI/FS.

Work for the existing OE program has been conducted in accordance with the following documents:

- Time-critical removal actions have been implemented as described in the Fort Ord Ordnance and Explosive Waste Time-Critical Removal Action Memorandum (*Army, 1994b*).
- Non-time-critical removal actions are being addressed via protocols outlined the *Action Memorandum, Phase 2 Engineering Evaluation/Cost Analysis, Ordnance and Explosives Sites, Former Fort Ord, Monterey County, California* (*Army, 1999*). The Phase 2 EECA Action Memorandum identified and described the rationale for continuing with OE removal actions at OE sites while the OE RI/FS is being conducted and addressed recommendations for future OE removal actions.
- All removal actions have been implemented in accordance with the Land Disposal Site Plan (LDSP), LDSP amendments, and explosive safety submissions (ESSs), which have been approved by the Department of Defense Explosives Safety Board (DDESB). These plans are required to describe the nature, extent, and types of known or suspected OE contamination, the proposed future use of each area, and procedures for mitigating OE hazards in a manner compatible with the proposed land reuse and in accordance with Department of Defense (DoD) safety standards.
- Known or suspected OE sites have been identified and listed in the 1997 Draft Revised Archive Search Report (ASR; *USAEDH, 1997*), which is an update of previous ASRs (*USAEDH, 1993; 1994*).
- Previously identified, known, or suspected OE sites, identified at the time the ASR was issued, were listed in the Phase 1 Engineering Evaluation/Cost Analysis (Phase I EE/CA; *USAEDH, 1997*) and the Phase 2 Engineering Evaluation/Cost Analysis (Phase 2 EE/CA; *Army, 1998c*). Because past military training activities resulted in the deposition of UXO in some areas on the former Fort Ord, the Phase 1

and Phase 2 EE/CAs (*USAEDH, 1997*; *Army, 1998c*) were developed to describe the OE removal and management activities for sites known or suspected to contain OE. The Phase 1 EE/CA addressed 29 OE sites and subsites (*USAEDH, 1997*). The Phase 2 EE/CA addressed the remaining OE sites, including future sites (*Army, 1998c*). Sites for which no further OE removal actions were recommended in the Phase 1 EE/CA (*USAEDH, 1997*) were addressed in the Action Memorandum 1, Phase 1 EE/CA, Twelve Ordnance and Explosives Sites (*Army, 1998a*). The Phase 2 EE/CA established a "plug-in" evaluation process designed to address cleanup of any OE sites on the former Fort Ord (*Army, 1998c*), and the Action Memorandum Plug-In (AMPI), Phase 2 EE/CA documented the process (*Army, 1999*).

- The Phase 2 EE/CA process addressed additional known or suspected OE sites not evaluated in Action Memorandum 1 by developing categories for each site based on: (1) expected type of OE present, (2) soil type, and (3) future land use of the site (*USAEDH, 1998*). Five removal alternatives were developed to address each category of site. OE data was obtained from the Archives Search Report (ASR) prepared in December 1993, the ASR Supplement prepared in November 1994, and the Revised Draft ASR completed in 1997 (*USAEDH, 1993; 1994; 1997*). A preliminary site reconnaissance was conducted as part of the ASR to further identify/characterize potential OE sites; the results are contained in the 1997 ASR. The Phase 2 EE/CA provided a summary of the amounts and types of OE found during removal actions at OE sites on the former Fort Ord at the time the EE/CA was prepared (*Army, 1998c*). OE-related data identified since that time (and on an ongoing basis as removal actions are performed) will be provided in After Action Reports and in the OE RI/FS.

Area of the former Fort Ord will be managed during the OE RI/FS process within one of four proposed tracks (Tracks 0 through 3) which will identify their status based on established decision criteria.

- Track 0 areas are those that contain no evidence of OE and have never been suspected as having been used for OE-related activities of any kind based on the current knowledge.
- Track 1 areas are those where OE was suspected to have been used but was not found.
- Track 2 areas are those where OE was found and a removal action has been completed.
- Track 3 areas are those where OE is suspected or known to exist, but investigations are not yet complete.

11.8.2 Status Report

A Proposed Plan proposing no action at the Track 0 areas was submitted in February 2000 (*U.S. Army, 2000*), and a ROD for the Track 0 Areas has been prepared and is awaiting final regulatory agency approval. The Army is also preparing RI/FS reports for Tracks 1 through 3 based on an agency-approved schedule.

The Army is proposing OE-related interim actions at three areas at Fort Ord prior to completion of the OE RI/FS. The *Draft Final Ordnance and Explosives Remedial Investigation/Feasibility Study for Ranges 43-48, Range 30A and Site OE-16, Former Fort Ord, California* was issued on January 18, 2002. A Proposed Plan and ROD for OE Interim Action are also scheduled to be issued in 2002.

12.0 NEXT FIVE-YEAR REVIEW

The next five-year review will be submitted in May 2007. The next review will include only those sites with ongoing remediation, sites that have not received final agency approval for closure prior to this report, and sites where institutional controls are in place to preclude residential use.

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