

**Final
Track 2 Munitions Response
Remedial Investigation/Feasibility Study
Del Rey Oaks Munitions Response Area
Former Fort Ord, California
Revision 1**

Prepared for

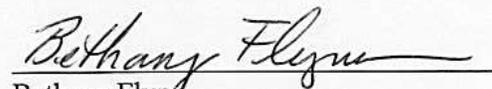
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CONTENTS

ACRONYMS	vi
GLOSSARY	ix
1.0 INTRODUCTION	1-1
1.1 Description of the Munitions Response RI/FS Program.....	1-2
1.2 Track 2 MR RI/FS	1-3
1.2.1 Purpose	1-3
1.2.2 Elements of the Track 2 MR RI/FS	1-3
1.3 Report Organization.....	1-4
2.0 BACKGROUND	2-1
2.1 Physical Setting.....	2-1
2.1.1 Location	2-1
2.1.2 General History.....	2-1
2.1.3 Land Use.....	2-2
2.1.3.1 Developed Land.....	2-2
2.1.3.2 Undeveloped Land.....	2-2
2.1.3.3 Future Land Use	2-3
2.1.4 Site Features.....	2-4
2.1.4.1 Climate	2-4
2.1.4.2 Ecological Setting.....	2-4
2.1.4.3 Topography and Surface Waters	2-5
2.1.5 Subsurface Conditions	2-6
2.1.5.1 Geology	2-6
2.1.5.2 Hydrogeology	2-6
2.2 MR RI/FS Background	2-6
2.2.1 Summary of Military Munitions Response Program.....	2-6
2.2.2 Regulatory Background	2-8
3.0 REMEDIAL INVESTIGATION	3-1
3.1 Site Description.....	3-1
3.2 Site History and Development	3-1
3.3 History of MR Investigations.....	3-2
3.3.1 History of Investigations and Removals	3-2
3.4 Conceptual Site Model.....	3-6
3.4.1 Training Practices	3-7
3.4.1.1 Training Up Through the 1940s	3-7
3.4.1.2 1950s Training.....	3-10
3.4.1.3 1960s Training.....	3-12
3.4.1.4 1970s, 1980s, and Early 1990s Training	3-12
3.4.2 Site Features.....	3-13
3.4.3 Potential Sources and Locations of MEC Discovered and Removed.....	3-14
3.4.4 Potential Exposure Routes	3-16
3.5 Site Evaluation.....	3-17

3.5.1	Literature Review	3-17
3.5.2	Removal Action Review	3-18
3.5.2.1	Investigation Design	3-18
3.5.2.2	Equipment Review	3-19
3.5.2.3	Quality Assurance/Quality Control	3-21
3.6	Conclusions and Recommendations	3-24
3.6.1	Conclusions.....	3-24
3.6.1.1	Site Use and Development	3-24
3.6.1.2	Removal Adequacy	3-24
3.6.2	Recommendations.....	3-25
4.0	RISK ASSESSMENT	4-1
5.0	FEASIBILITY STUDY	5-1
5.1	Remedial Action Objectives	5-1
5.2	Application of Risk Assessment Results	5-2
5.3	Land Use Control Guidelines.....	5-3
5.4	Ongoing and Future MEC-Related Activities.....	5-6
5.5	Identification of Applicable Response Actions	5-8
5.5.1	Deed and/or Zoning Restrictions	5-9
5.5.2	Excavation Ordinance.....	5-9
5.5.3	Construction Support	5-10
5.5.4	MEC Recognition and Safety Training.....	5-11
5.5.5	Residential Use Restriction.....	5-11
5.5.6	Draft Protocol for Authorizing Residential Use	5-12
5.6	Long Term Management Measures Specific to the Del Rey Oaks MRA.....	5-12
5.7	Description of Remedial Alternatives.....	5-12
5.7.1	Alternative 1—No Further Action	5-13
5.7.2	Alternative 2—Conditions on Soil Disturbance Activities to Minimize MEC Exposure.....	5-13
5.7.3	Alternative 3—Conditions on Soil Disturbance Activities to Minimize MEC Exposure and Residential Use Restrictions Including Contingency to Address Proposed Change in Site Reuse	5-14
5.8	Evaluation and Comparison of Remedial Alternatives.....	5-16
5.8.1	Overall Protection of Human Health and the Environment.....	5-17
5.8.2	Compliance with ARARs	5-17
5.8.3	Short-Term Effectiveness	5-18
5.8.4	Long-Term Effectiveness and Permanence	5-18
5.8.5	Reduction of Toxicity, Mobility, or Volume Through Treatment.....	5-18
5.8.6	Implementability	5-18
5.8.7	Cost.....	5-18
5.8.8	State Acceptance.....	5-19
5.8.9	Community Acceptance.....	5-19
5.9	Identification of the Preferred Alternative.....	5-19
6.0	APPROVAL PROCESS	6-1
7.0	REFERENCES	7-1

FIGURE

- 1-1 Del Rey Oaks MRA CERCLA Process

PLATES

- 1-1 Site Location Map
- 1-2 Del Rey Oaks Munitions Response Area
- 3-1 Grids by Type
- 3-2 Munitions Debris Removed from the Del Rey Oaks Munitions Response
- 3-3 Munitions and Explosives of Concern Removed from the Del Rey Oaks Munitions Response Area
- 3-4 Conceptual Site Model

APPENDIXES

- A EVALUATION OF PREVIOUS WORK CHECKLIST
- B RISK ASSESSMENT
- C LIST OF MUNITIONS FOUND (CD)
- D CITY OF DEL REY OAKS EXCAVATION ORDINANCE
- E RESIDENTIAL USE RESTRICTION AND APPLICABILITY OF DRAFT DTSC
RESIDENTIAL QUALITY ASSURANCE PROTOCOL
- F COST ESTIMATES FOR IMPLEMENTATION OF REMEDIAL ALTERNATIVES
- G ARMY RESPONSES TO COMMENTS ON THE DRAFT DEL REY OAKS MRA RI/FS
- H COMMENTS ON THE DRAFT FINAL DEL REY OAKS MRA RI/FS

ATTACHMENT

- A UXO SAFETY SPECIALIST QUALIFICATIONS

ACRONYMS

AARs	after action reports
AP	antipersonnel
AR	Automatic rifle
ARARs	Applicable or Relevant and Appropriate Requirements
ARTEP	Army Training and Evaluation Program
ASRs	archives search reports
AT	antitank
BADT	best available detection technology
bgs	below ground surface
BLM	Bureau of Land Management
BRA	Basewide Range Assessment
BRAC	Base Realignment and Closure
CA	Chemical Agent
CDFG	California Department of Fish and Game
Cal/EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CRUP	Covenant to Restrict Use of Property
CSM	Conceptual site model
CSUMB	California State University Monterey Bay
CTT	Closed, Transferring, or Transferred
DDESB	Department of Defense Explosives Safety Board
DMM	Discarded Military Munitions
DoD	Department of Defense
DQO	Data Quality Objectives
DRO	Del Rey Oaks
DTSC	Department of Toxic Substances Control
EC	Engineering Control
EE/CA	Engineering Evaluation/Cost Analysis
EM	Engineer Manual
EOD	Explosive Ordnance Disposal
EP	Engineer Pamphlet
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
F	Fahrenheit
FAAF	Fritzsche Army Airfield
FFA	Federal Facility Agreement
FORA	Fort Ord Reuse Authority
FOSET	Finding of Suitability for Early Transfer
FS	Feasibility Study
GIS	Geographic Information System
GPS	Global Positioning System
HE	high explosive
HEAT	high explosive antitank
HH	hand held

HMP	Habitat Management Plan
HTRW	Hazardous, Toxic, and Radioactive waste
HTW	Hazardous and Toxic Waste
IC	Institutional Control
ITRC	Interstate Technology and Regulatory Council
LAW	Light Antitank Weapon
lbs	pounds
LDSP	Land Disposal Site Plan
LE	low explosive
LTM	long-term management
MACTEC	MACTEC Engineering and Consulting, Inc.
MC	Munitions Constituents
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
mm	millimeters
MMCX	Military Munitions Center of Expertise
MMRP	Military Munitions Response Program
MOUT	Military Operations on Urbanized Terrain
MR	Munitions Response
MRA	Munitions Response Area
MRS	Munitions Response Site
NAVSCOLEOD	Naval School, Explosive Ordnance Disposal
NCP	National Contingency Plan
NOI	Notice of Intent
NPV	net present value
NRMA	Natural Resources Management Area
ODDS	Ordnance Detection and Discrimination Study
OE MCX	Ordnance and Explosives Mandatory Center of Expertise
OE	Ordnance and Explosives
OMB	Office of Management and Budget
OSWER	Office of Solid Waste and Emergency Response
QA	Quality Assurance
QC	Quality Control
RA	Risk Assessment
RAOs	Remedial action objectives
RD/RAWP	Remedial Design/Remedial Action Work Plan
RDX	Cyclotrimethylenetrinitramine
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSP	Render Safe Procedures
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SAW	Squad Automatic Weapon
SOP	Standard Operating Procedures
TCRAs	Time-critical removal actions
TIP	technical information paper
TNT	Trinitrotoluene
TP	target practice

TRC	Technical Review Committee
USA	USA Environmental, Inc.
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering Support Center, Huntsville
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
UXO	Unexploded Ordnance
WP	white phosphorous
WWII	World War II

GLOSSARY

- Closed Range:** A military range that has been taken out of service and either has been put to new uses that are incompatible with range activities or is not considered by the military to be a potential range area. A closed range is still under the control of a Department of Defense (DoD) component. Source: (2).
- Construction Support:** Assistance provided by DoD, EOD or UXO-qualified personnel and/or personnel during intrusive construction activities on property known or suspected to contain UXO, other munitions that may have experienced abnormal environments (e.g., DMM), munitions constituents in high enough concentrations to pose an explosive hazard, to ensure the safety of personnel or resources from any potential explosive hazards. Source: (5).
- Discarded Military Munitions (DMM):** Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations. (10 U.S.C. 2710(e)(2) (6)). For the purposes of the Basewide Munitions Response Program being conducted at the former Fort Ord, DMM does not include small arms ammunition .50 caliber and below. Source: (6).
- Engineering Control (EC):** Engineering Controls are used to mitigate the effects of unintentional or intentional explosions if the calculated minimum separation distance for the MEC items to be destroyed cannot be met. The primary goals of engineering controls are to improve personal safety and/or reduce the minimum separation distance. Some examples of ECs include fences, signs, guards, landfill caps, soil covers, and provision of potable water, slurry walls, sheet pile (vertical caps), pumping and treatment of groundwater, monitoring wells, and vapor extraction systems. Source: (4).
- Expended:** The state of munitions debris in which the main charge has been expended leaving the inert carrier. Source: (1).
- Explosive Ordnance Disposal (EOD) Personnel:** Military personnel who have graduated from the Naval School, Explosive Ordnance Disposal (NAVSCOLEOD); are assigned to a military unit with a Service-defined EOD mission; and meet Service and assigned unit requirements to perform EOD duties, EOD personnel have received specialized training to address explosive and certain CA hazards during both peacetime and wartime. EOD personnel are trained and equipped to perform Render Safe Procedures (RSP) on nuclear, biological, chemical, and conventional munitions, and on improvised explosive devices. Source: (7).

- Explosive Soil:** Explosive soil refers to mixtures of explosives in soil, sand, clay, or other solid media at concentrations such that the mixture itself is explosive.
- (a) The concentration of a particular explosive in soil necessary to present an explosion hazard depends on whether the particular explosive is classified as “primary” or “secondary.” Guidance on whether an explosive is classified as “primary” or “secondary” can be obtained from the Ordnance and Explosives Mandatory Center of Expertise (OE MCX) or Chapters 7 and 8 of TM 9-1300-214, Military Explosives.
 - (b) Primary explosives are those extremely sensitive explosives (or mixtures thereof) that are used in primers, detonators, and blasting caps. They are easily detonated by heat, sparks, impact, or friction. Examples of primary explosives include Lead, Azide, Lead Styphnate, and Mercury Fulminate.
 - (c) Secondary explosives are bursting and boosting explosives (i.e., they are used as the main bursting charge or as the booster that sets off the main bursting charge). Secondary explosives are much less sensitive than primary explosives. They are less likely to detonate if struck or when exposed to friction or electrical sparks. Examples of secondary explosives include Trinitrotoluene (TNT), Composition B, and Ammonium Picrate (Explosive D).
 - (d) Soil containing 10 percent or more by weight of any secondary explosive or mixture of secondary explosives is considered “explosive soil”. This determination was based on information provided by the U.S. Army Corps of Engineers (USACE) as a result of studies conducted and reported in USACE Report AMXTH-TE-CR 86096.
 - (e) Soil containing propellants (as apposed to primary or secondary high explosives) may also present explosion hazards. (ER 1110-1-8153). Source: (4).
- Feasibility Study (FS):** An evaluation of potential remedial technologies and treatment options that can be used to clean up a site. Source: (1).
- Impact Area:** The impact area consists of approximately 8,000 acres in the southwestern portion of former Fort Ord, bordered 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. Source: (1).
- Institutional Control (IC):** (a) Non-engineered instruments such as administrative and/or legal controls that minimize the potential for human exposure to contamination by limiting land or resource use; (b) are generally to be used in conjunction with, rather than in lieu of, engineering measures such as waste treatment or containment; (c) can be used during all stages of the cleanup process to accomplish various cleanup-related objectives; and (d) should be “layered” (i.e., use multiple ICs) or implemented in a series to provide overlapping assurances of protection from contamination. Source: (10).

Land Use Controls:	Land Use Controls are physical, legal, or administrative mechanisms that restrict the use of, or limit access to, real property, to manage risks to human health and the environment. Physical mechanisms encompass a variety of engineering remedies to contain or reduce contamination and/or physical barriers to limit access to real property, such as fences or signs. Source: (5).
Magnetometer:	An instrument used to detect ferromagnetic (iron-containing) objects. Total field magnetometers measuring the strength of the earth's natural magnetic field at the magnetic sensor location. Gradient magnetometers, sensitive to smaller near-surface metal objects, use two sensors to measure the difference in magnetic field strength between the two sensor locations. Vertical or horizontal gradients can be measured. Source: (8).
Military Munitions Response Program (MMRP):	DoD-established program to manage the environmental, health and safety issues presented by MEC. Source: (1).
Military Munitions:	<p>Military munitions means all ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the DoD, the Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants, explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives and chemical warfare agents, chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges, and devices and components thereof.</p> <p>The term does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components, other than non nuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) have been completed. (10 U.S.C. 101(e)(4). Source: (6).</p>
Munitions Constituents (MC):	Any materials originating from UXO, DMM, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (10 U.S.C. 2710 (e) (3)). Source: (6).
Munitions Debris:	Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarizations, or disposal. Source: (5).

Munitions and Explosives of Concern (MEC):	Distinguishes specific categories of military munitions that may pose unique explosives safety risks, such as: UXO, as defined in 10 U.S.C. 101 (e) (5); discarded military munitions, as defined in 10 U.S.C. 2710 (e) (2); or munitions constituents (e.g., TNT, Cyclotrimethylene trinitramine [RDX]), as defined in 10 U.S.C. 2710 (e) (3), present in high enough concentrations to pose an explosive hazard. Source: (6). For the purposes of the Basewide Munitions Response Program being conducted for the former Fort Ord, MEC does not include small arms ammunition .50 caliber and below. Source (1).
Munitions Response Area (MRA):	Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples are former ranges and munitions burial areas. A MRA comprises of one or more munitions response sites. Source: (6).
Munitions Response Site (MRS):	A discrete location within a MRA that is known to require a munitions response. Source: (6).
Mortar:	Mortars typically range from approximately 1 inch to 11 inches in diameter or larger, and can be filled with explosives, toxic chemicals, white phosphorus or illumination flares. Mortars generally have thinner metal casing than projectiles but use the same types of fuzing and stabilization. Source: (3).
MEC Sampling:	Performing MEC searches within a site to determine the presence of MEC. Source: (1).
Operating Grids:	Typically, 100-foot by 100-foot parcels of land as determined by survey and recorded by Global Positioning System (GPS), marked at each corner with wooden stakes. Sites are divided into operating grids prior to the commencement of work by brush removal or OE sweep teams. A single grid may be occupied by only one team at any time, and the grid system facilitates the maintenance of safe distances between teams. They are identified sequentially using an alpha-numeric system (e.g., E-5). Source: (1).
Projectile:	An object projected by an applied force and continuing in motion by its own inertia, as a bullet, bomb, shell, or grenade. Also applied to rockets and to guided missiles. Source: (3).
Range-Related Debris:	Debris, other than munitions debris, collected from operational ranges or from former ranges (e.g., target debris, military munitions packaging and crating material). Source: (5).
Remedial Investigation (RI):	Exploratory inspection conducted at a site to delineate the nature and extent of chemicals, and in this case OE, present at the site. Source: (2).
Removal Depth:	The depth below ground surface to which all ordnance and other detected items are removed. Source: (1).
SiteStats/GridStats:	Programs developed by QuantiTech for the Huntsville Corps of Engineers to predict the density of ordnance on sites with spatially random dispersal of ordnance. Source: (9).

- Surface Removal: Removal of OE from the ground surface by UXO teams using visual identification sometimes aided by magnetometers. Source: (1).
- Track 0 Areas: Areas of the former Fort Ord that contain no evidence of MEC and have never been suspected of having been used for military munitions-related activities of any kind. This definition has been clarified in the *Explanation of Significant Differences, Final Record of Decision, No Action Regarding Ordnance-related Investigations (Track 0 ROD), former Fort Ord, California (March 2005)* to include areas not suspected as having been used for military munitions-related activities of any kind, but where incidental military munitions have been discovered. Source: (1).
- Track 1 Sites Sites at the former Fort Ord where military munitions were suspected to have been used, but based on the results of the Munitions Response Remedial Investigation/Feasibility Study (MR RI/FS) each site falls into one of the following three categories: Category 1: There is no evidence to indicate military munitions were used at the site (i.e., suspected training did not occur); or Category 2: The site was used for training, but the military munitions items used do not pose an explosive hazard (i.e., training did not involve explosive items); or Category 3: The site was used for training with military munitions, but military munitions items that potentially remain as a result of that training do not pose an unacceptable risk based on site specific evaluations conducted in the Track 1 OE RI/FS. Field investigations identified evidence of past training involving military munitions, but training at these sites involved only the use of practice and/or pyrotechnic items that are not designed to cause injury. In the unlikely even that a live item of the type previously observed at the site is found, it is not expected that the item would function by casual contact (i.e., inadvertent and unintentional contact). Source: (1).
- Track 2 Sites: Sites at the former Fort Ord where MEC items were present, and MEC removal has been conducted (i.e., Del Rey Oaks MRA). These areas are evaluated in area-specific RI/FSs to assess whether they are in a protective state based on their reasonably anticipated future land uses. Possible outcomes of a Track 2 RI/FS and ROD could include no further action, land use control, and/or additional MEC removal. Source: (1).
- Track 3 Sites: Track 3 Sites are those areas where MEC is suspected or known to exist, but investigations are not yet complete or need to be initiated, or any area identified in the future. Source: (1).
- Transferred Range: A military range that is no longer under military control and has been leased, transferred, or returned to another entity, including Federal entities. This includes a military range that is no longer under military control but was used under the terms of a withdrawal, executive order, special-use permit or authorization, right-of-way, public land order, or other instrument issued by the Federal land manager. Source: (2).

- Transferring Range:** A military range that is proposed to be leased, transferred, or returned from the DoD to another entity, including Federal entities. This includes a military range that is used under the terms of a withdrawal, executive order, special-use permit or authorization, right-of-way, public land order, or other instrument issued by the Federal land manager. An active range will not be considered a “transferring range” until the transfer is imminent. Source: (2).
- Unexploded Ordnance (UXO):** Military munitions that:
- (A) Have been primed, fuzed, armed, or otherwise prepared for action;
 - (B) Have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or materials; and
 - (C) Remain unexploded, whether by malfunction, design, or any other cause. (10 U.S.C. 101 (e)(5). Source: (6).
- For the purpose of the Basewide Munitions Response Program being conducted for the former Fort Ord, UXO does not include small arms ammunition .50 caliber and below.
- UXO Technician:** Personnel who are qualified for and filing Department of Labor, Service Contract Act, and Directory of Operations contractor positions of UXO Technician I, UXO Technician II, and UXO Technician III. Source: (7).
- UXO-Qualified Personnel** Personnel who have performed successfully in military EOD positions, or are qualified to perform in the following Department of Labor, Service Contract Act, Directory of Operations contractor positions: UXO Technician II, UXO Technician III, UXO Safety Officer, UXO Quality Control Specialist, or Senior UXO Supervisor. Source: (7).

Sources:

- (1) Non-standard definition developed to describe Fort Ord-specific items, conditions, procedures, principles, etc. as they apply to issues related to the MEC cleanup.
- (2) Management Guidance for the Defense Environmental Restoration Program published by the office of the Under Secretary of Defense (Installations and Environment), September 2001.
- (3) "Unexploded Ordnance (UXO): An Overview", October 1996. DENIX.
- (4) Ordnance and Explosives Response Engineer Manual (EM) 1110-1-4009. U.S. Army Corps of Engineers, June 23, 2000.
- (5) Memorandum for the Assistant Chief of Staff for Installation Management, Subject: Munitions Response Terminology (April 21, 2005).
- (6) Federal Register/Volume 70. No. 192/Wednesday, October 5, 2005/Rules and Regulations, 32 CFR Part 179, Munitions Response Site Prioritization Protocol, Department of Defense, Final Rule. October, 2005.
- (7) Department of Defense Explosive Safety Board Technical Paper 18 (Minimum Qualification for Unexploded Ordnance [UXO]. Technicians and Personnel). December 20, 2004.
- (8) Survey of Munitions Response Technologies, June 2006. ITRC (Interstate Technology and Regulatory Council) with ESTCP (Environmental Security and Technology Certification Program) and SERDP (Strategic Environmental Research and Development Program).
- (9) Evaluation of Statistical Methodologies used in U.S. Army Ordnance and Explosive Work. September 1999. Ostrouchov, George, Zimmerman, Gregory P., Beauchamp, John J., Federov, Valerii V., and Downing, Darryl J. Prepared by Oak Ridge National Laboratory for the U.S Army Engineering and Support Center.

- (10) Institutional Controls: A Site Managers' Guide to Identifying, Evaluating, and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups. US EPA Office of Solid Waste and Emergency Response (OSWER) 9355.0-74FS-P, EPA 540-F-00-005.

1.0 INTRODUCTION

The former Fort Ord is located near Monterey Bay in northwestern Monterey County, California (Plate 1-1). Since 1917, portions of the former Fort Ord were used by Army units for maneuvers, target ranges, and other purposes. Military munitions were fired into, fired upon, or used on the facility in the form of artillery and mortar projectiles, rockets and guided missiles, rifle and hand grenades, practice land mines, pyrotechnics, bombs, and demolition materials. As a result, a wide variety of conventional munitions and explosives of concern (MEC), both unexploded ordnance (UXO) and discarded military munitions (DMM) items, have been encountered at sites throughout the former Fort Ord.

MEC consists of specific categories of military munitions that may pose unique explosives safety risks, such as: UXO, as defined in 10 U.S.C.101(e)(5); discarded military munitions, as defined in 10 U.S.C. 2710(e)(2)(6); or munitions constituents (e.g., TNT, Cyclotrimethylene trinitramine [RDX]), as defined in 10 U.S.C. 2710(e)(3), present in high enough concentrations to pose an explosive hazard. Small arms ammunition that is .50 caliber and below is not being considered as MEC under the Track 2 Munitions Response Remedial Investigation/Feasibility Study (RI/FS) or basewide MR RI/FS Program. Site assessment, site characterization, remedial design, and remediation activities to address the presence of small arms ammunition .50 caliber and below and munitions constituents at the former Fort Ord are being conducted under the Basewide Range Assessment Program (BRA; *IT, 2001*). All necessary response actions with respect to lead in soil from previous small arms use have been conducted within the Del Rey Oaks early transfer area (*Army, 2004*). No further action is required with respect to any contaminants evaluated under the BRA (*MACTEC/Shaw, 2006*). Both the U.S. Environmental Protection Agency (EPA) and the Department of Toxic Substances Control, Cal/EPA (DTSC) have concurred that, in terms of exposure to residual chemicals in soil, no restrictions on reuse of the property are necessary.

On behalf of the U.S. Army Corps of Engineers (USACE) – Sacramento District, MACTEC Engineering and Consulting, Inc. (MACTEC), at the direction of Shaw E&I has prepared this Track 2 Remedial Investigation/Feasibility Study for the Del Rey Oaks Munitions Response Area (Del Rey Oaks MRA RI/FS). This Draft Final report was revised based on comments received on the draft report. The comments and associated responses are provided in Appendix G.

The Del Rey Oaks (DRO) MRA includes munitions response sites (MRS) MRS-15 DRO 01 MRS-15 DRO 02 and a portion of MRS-43 (Plate 1-2). MRS-15 DRO 01 and MRS-15 DRO 02 were part of the former Fort Ord Impact Area. The Army has conducted removal actions to remove all detected MEC to depth over the entire Del Rey Oaks MRA. Track 2 Sites are defined as those areas where: (1) MEC items were present, and (2) MEC removal has been conducted. The Del Rey Oaks MRA meets both of these criteria because MEC items were found during removal actions, and all detected MEC has been removed. MEC removal actions were designed to address MEC to depths of four feet below ground surface (bgs); however, all anomalies (i.e., ferromagnetic material), even those deeper than four feet bgs, were investigated and all detected MEC was removed. All further statements in the document referring to “removals to four feet bgs” should be understood to include the prosecution of all detected anomalies to resolution, regardless of their depth bgs.

The property comprising the Del Rey Oaks MRA includes reuse Parcels E29a, E29b.1, E31a, E31b, E31c, and E36 (Plate 1-2). The property was transferred to the City of Del Rey Oaks under the Early Transfer Authority, as authorized under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), with approval by the U.S. Environmental Protection Agency (EPA) Administrator and

concurrence by the Governor of the State of California. The Del Rey Oaks MRA CERCLA process is shown on Figure 1-1.

The proposed reuse of the property includes the development of a resort hotel and golf course, commercial/retail facilities, offices and associated infrastructure (Army, 2004). In addition, residential use of portions of the Del Rey Oaks MRA came into consideration by the City of Del Rey Oaks after the land had been transferred to the City.

A UXO Safety Specialist with Shaw has provided technical review of this document. Qualifications of the UXO Safety Specialist are provided as Attachment A to this report.

This Track 2 Del Rey Oaks MRA RI/FS is based on the evaluation of previous work conducted for the Del Rey Oaks MRA according to the guidance provided in the *Final Plan for the Evaluation of Previous Work* (HLA, 2000c) and the Track 2 Data Quality Objectives Technical Memorandum (DQO Tech Memo) (MACTEC, 2003). This report has been prepared in accordance with Shaw Contract No. DACW05-96-D-0011 PO 246485.

1.1 Description of the Munitions Response RI/FS Program

The Munitions Response RI/FS (MR RI/FS) program, which is part of the basewide MR RI/FS program, is described in detail in the Final OE RI/FS Work Plan (Army, 2000a) and is being conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Elements of the basewide MR RI/FS program include a literature review, preparation of a Sampling and Analysis Plan (SAP) for additional MEC characterization activities, evaluation of previous MEC contractors work, performance of an Ordnance Detection and Discrimination Study (ODDS), identification of Applicable or Relevant and Appropriate Requirements (ARARs), evaluation of risks, development of long-term risk management measures, a community relations plan, and a health and safety plan. This MR RI/FS only addresses the physical or explosive risk from MEC. The potential chemical risk from soil contamination from small arms and military munitions ranges has been addressed under the basewide Range Assessment (BRA) program as part of the hazardous and toxic waste (HTW) investigations at Fort Ord (IT, 2001). All necessary response actions with respect to lead in soil from previous small arms use have been conducted within the Del Rey Oaks early transfer area (Army, 2004). No further action is required with respect to any contaminants evaluated under the BRA (MACTEC/Shaw, 2006). Both EPA and DTSC have concurred that, in terms of exposure to residual chemicals in soil, no restrictions on reuse of the property are necessary.

The information gathered and evaluated during the literature review and the basewide MR RI/FS is being used to categorize all areas of the former Fort Ord according to actions that have been taken or where actions are identified as necessary to mitigate MEC hazards. The information being evaluated to form decisions includes, but is not limited to, the knowledge of the site, the quality of the available information, the work completed, and the intended future land uses. Areas will be addressed during the basewide MR RI/FS process within one of four proposed "tracks" (Tracks 0 through 3) as described in the OE RI/FS Work Plan (Army, 2000c). Definitions of the tracks are presented in the Glossary at the front of this report.

1.2 Track 2 MR RI/FS

This section describes the elements and the purpose of the Track 2 MR RI/FS, and presents background information on the evaluation of previous work for the Del Rey Oaks MRA identified for inclusion in this report.

1.2.1 Purpose

The RI/FS process as outlined in the EPA guidance (*EPA, 1988*) represents the methodology that the Superfund program has established for characterizing the nature and extent of risk posed by contaminated sites and for evaluating potential remedial options. The purpose of the Track 2 Del Rey Oaks MR RI/FS is to: (1) describe the site conditions and the results of the evaluation of previous work performed for the Del Rey Oaks MRA; (2) to determine whether the existing Del Rey Oaks MRA data can be used to complete a Risk Assessment (RA) and Feasibility Study (FS); and (3) if the data are useable, complete the RA and FS, and evaluate remedial alternatives and present a preferred alternative to address risks from any potentially remaining MEC at the site.

The Del Rey Oaks MRA RI/FS will be used to support the Del Rey Oaks MRA Proposed Plan and Record of Decision (ROD) that will identify the selected remedy for implementation and complete the CERCLA process for the site.

1.2.2 Elements of the Track 2 MR RI/FS

This report is divided into three main parts: (1) the Remedial Investigation (RI), (2) the Risk Assessment (RA), and (3) the Feasibility Study (FS). Each of these parts is described below.

Remedial Investigation

The RI is divided into two parts. The first part presents background information including a description of the site, the site history and development, a description of the MEC potentially present based on historical use of the area, history of MEC investigations, and a conceptual site model. As part of the conceptual site model, the anticipated future reuse for the site is identified and potential receptors are presented. The second part summarizes the evaluation of previous work. As part of the evaluation, archival and sampling and removal data were reviewed and checklists were prepared according to the Final Plan for Evaluation of Previous Work (*HLA, 2000c*). Information evaluated for the Del Rey Oaks MRA included the adequacy of the removal actions conducted, the performance of the geophysical equipment used during the investigation, and data quality.

The information used in preparation of the RI included, but was not limited to, historical training maps, aerial photographs, MR contractor after action reports (AARs), technical information papers (TIPs), the archives search reports (ASRs), evaluation of previous work (*HLA, 2000c*) including Data Quality Objectives (DQOs), the ODDS report, field training manuals, and interviews. References for each of the sources used are provided in the RI (Section 3.0).

Information from historical training maps and aerial photographs was integrated into a Geographic Information System (GIS) by MACTEC and other USACE contractors.

Risk Assessment

The RA was conducted based on the data set used in the RI, which consists of MEC-related investigation and sampling data collected from within MRS-15 DRO 01 and MRS-15 DRO 02, and portions of MRS-43. The RA was performed based on the data set that represents the current state of the Del Rey Oaks MRA using the Fort Ord Ordnance and Explosives Risk Assessment Protocol (Risk Protocol; *Malcolm Pirnie, 2002*) that was developed to qualitatively estimate MEC risks (Overall MEC Risk Scores) associated with any MEC that potentially remains at the site for each receptor expected to be present during development and reuse of the area.

Feasibility Study

The FS describes the remedial action objectives (RAOs), screening, development, and evaluation and comparison of remedial alternatives, and identification of a preferred alternative for the Del Rey Oaks MRA.

1.3 Report Organization

This Del Rey Oaks MRA RI/FS is organized as follows:

Section 1 – Introduction. Provides the background information on the Track 2 process and describes the purpose and organization of the report.

Section 2 – Background. Describes the physical setting at the former Fort Ord, and presents background and regulatory information on the basewide MR RI/FS.

Section 3 – Remedial Investigation (RI). Presents a description of the site, the history of the site use and previous MR investigations, a Conceptual Site Model, a site evaluation (including an assessment of the data quality and a literature review), and conclusions and recommendations.

Section 4 – Risk Assessment (RA). Presents the results of the qualitative risk assessment conducted based on MEC data identified in the RI and planned future reuses.

Section 5 – Feasibility Study (FS). Presents the remedial action objectives; potential response actions, development, evaluation and comparison of remedial alternatives based on their ability to achieve the nine CERCLA criteria, and identification of the preferred remedial alternative.

Section 6 – Approval Process. Describes the approval process for documenting the preferred alternative for implementation at the Del Rey Oaks MRA in the RI/FS Proposed Plan and ROD.

Section 7 – References. Presents a list of references for pertinent documents cited in the report.

2.0 BACKGROUND

This section provides a description of the physical setting of the former Fort Ord, including the location, general history, land use, site features, and subsurface conditions, and background and regulatory information on the basewide MR RI/FS.

2.1 Physical Setting

2.1.1 Location

The Del Rey Oaks MRA is comprised of 324 acres located in the southwestern portion of the former Fort Ord. The Del Rey Oaks MRA is divided by South Boundary Road. The area on the north side of South Boundary Road includes a portion of the former Impact Area (MRS-15 DRO 01 and MRS-15 DRO 02) and is bounded by MRS-15 SEA 01, MRS-BLM and MRS-15 DRO 02A and MRS-15 MOCO 01 (Plate 1-2). The area on the south side of South Boundary Road includes a portion of MRS-43 and is bounded by the former Fort Ord boundary and South Boundary Road.

The Del Rey Oaks MRA is comprised of three MRSs (Plate 1-2). MRS-15 DRO 01 comprises 272 acres and is located in the northeast portion of the Del Rey Oaks MRA. The boundary of MRS-15 DRO 01 was developed to support the transfer of Parcel E29a and not on evidence of munitions use. It should be noted that the habitat management unit MRS-15DRO 01A is not included in the Del Rey Oaks MRA. MRS-15 DRO 02 is 34 acres located directly southeast of MRS-15 DRO 01. The boundary of MRS-15 DRO 02 was developed to support the transfer of Parcel E29b.1 and not on evidence of munitions use. A portion of MRS-43, which is located southeast of MRS-15 DRO 01, is included in the Del Rey Oaks parcel. This portion of MRS-43 is comprised of the following transfer parcels: E31a, E31b, E31c, and E36. These parcels are 5, 3, 4, and 6 acres, respectively.

Portions of the former Firing Ranges 24, 25, and 26 are located within MRS-15 DRO 01, with a small portion of Range 26 located in MRS-15 DRO 02. These ranges are located along the general perimeter of the larger historical Impact Area, and are oriented such that the weapons firing points are located within the Del Rey Oaks MRA, with weapons firing generally directed toward the center of the Impact Area, and away from the Del Rey Oaks MRA. With the exception of Range 24, the portions of the range fans within the Del Rey Oaks MRA consist of the firing lines/firing points and areas between the firing lines and the first set of targets (Plate 1-2).

2.1.2 General History

Military training at the former Fort Ord began in approximately 1917 with the purchase of over 15,000 acres, including the Del Rey Oaks MRA, by the Army that was designated as an artillery range (Cozzens, 1922). The property was used as a maneuver and training area primarily for the 11th Cavalry and the 76th Field Artillery stationed at the Presidio of Monterey. During the spring and summer months the 30th Infantry Regiment stationed at the Presidio of San Francisco participated in maneuvers as did other Army Reserve and National Guard Units (HLA, 2000b). By 1933 the Camp Ord Military Reservation was established and was comprised of three camps, Camp Clayton, Camp Ord, and Camp Huffman. In 1940, the 7th Infantry Division was activated and Fort Ord was named a permanent Army post. Other divisions that were activated at Fort Ord following the 7th Division included the 4th Division, the 5th Division, and the 6th Division. In 1957 Fort Ord became a United States Army Infantry Training Center, serving in this capacity until 1974. In October 1974, the 7th Infantry Division was reactivated at

Fort Ord. The 7th Division was converted to a light division in 1983. The former Fort Ord was selected in 1991 for Base Realignment and Closure (BRAC), and was officially closed in September 1994.

Most of the ranges present on the western side of the Impact Area, which were along the approximate present day eastern boundary of the Del Rey Oaks MRA, were abandoned by 1958 and the firing lines for the ranges that remained active were moved west to locations closer to General Jim Moore Boulevard. By 1961, numbers had been assigned to some of the ranges following the numbering scheme already in use at the beach ranges. A training map from 1964 indicates that, by this date, all of the ranges within the Impact Area and Del Rey Oaks MRA were consecutively numbered. The locations and limits of the individual ranges have not changed appreciably since that time. At the time of base closure, twenty-eight ranges (numbered between 18 through 48) were active or considered operational. Munitions that have been fired into, fired upon, or used at the Impact Area include artillery and mortar projectiles, rockets and guided missiles, rifle and hand grenades, practice land mines, pyrotechnics, bombs, small arms ammunition, and demolition materials.

The firing lines to three ranges (Ranges 24, 25, and 26) fall within the Del Rey Oaks MRA, with the line of fire pointing into the Impact Area for all three ranges (Plate 1-2). Range 24 was an Automatic Rifle-Transition Sniper Range, used for small arms training, automatic rifle training, antitank (AT) 35mm subcaliber training, and practice 40mm grenade training (*Parsons, 2003*). Range 25 was an Offensive Overhead Firing range and was also used for small arms training, automatic rifle training, and 37mm gun training. Finally, Range 26, the Machine Gun Transition and Field Firing range, may have also been used for 2.36-inch rocket training, 3.5-inch rocket training, 37mm gun training, and mortar training, based on identification and removal of these types of MEC items during previous MEC sampling and/or removal actions.

2.1.3 Land Use

The former Fort Ord consists of both developed land (approximately 8,000 acres) and undeveloped land (approximately 20,000 acres). The developed areas include the East Garrison, the Fritzsche Army Airfield (FAAF), and the Main Garrison. The Del Rey Oaks MRA, which is comprised of approximately 324 acres, was acquired by the Army in 1917 and is currently undeveloped.

2.1.3.1 Developed Land

The Del Rey Oaks MRA does not currently include developed land other than access roads and trails. Developed areas adjacent to the Del Rey Oaks MRA include residences within the City of Seaside on the west side of General Jim Moore Boulevard; however, the neighboring land within the former Fort Ord is undeveloped.

2.1.3.2 Undeveloped Land

The Del Rey Oaks MRA consists of undeveloped land along the southwestern border of the former Fort Ord. The Del Rey Oaks MRA is primarily left in its natural state, with only minor development of support facilities associated with training that occurred at the firing ranges (e.g., access roads).

2.1.3.3 Future Land Use

The future land uses presented in this section are primarily based upon the Fort Ord Reuse Authority (FORA) March 1997 Fort Ord Base Reuse Plan (Reuse Plan; *FORA, 1997*) with consideration of reuse being contemplated by the City of Del Rey Oaks. Additional information about habitat management within the Del Rey Oaks MRA is provided in the Installation-Wide Multispecies Habitat Management Plan for Fort Ord (*USACE, 1997*).

The Reuse Plan identified approximately 20 land-use categories at former Fort Ord (*FORA, 1997*) including habitat management, open space/recreation, institutional/public facilities, commercial, industrial/business park, and residential uses. The Reuse Plan for the Del Rey Oaks MRA, which was put forth when the area was identified for early transfer, includes a visitor serving area, an office park, a business park, and a light industrial area, although the specific development plan was not known.

The Del Rey Oaks parcels were identified for early transfer of the property for the purpose of assisting in the economic recovery of the area and preventing further job and revenue loss by expediting reuse. When federal property, on which hazardous substances have been stored for more than a year, are known to have been released or have been disposed of, by deed, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires a covenant indicating that all remedial action necessary to protect human health and the environment, with respect to any hazardous substances remaining on the property, has been taken prior to transfer of such property by deed. The required reuse of the property is consistent with protection of human health and the environment during the deferral period. The purpose of the FOSET is to identify environmental factors of concern associated with the proposed property transfer and to demonstrate that the proposed property transfer prior to the completion of all remedial actions, with any appropriately required land use controls, is consistent with the protection of human health and the environment. The FOSET was completed in 2004 and the property transferred to FORA in 2005.

Although the CERCLA covenant is deferred through the early transfer process, the Army is still responsible for satisfying the covenant under CERCLA. The Army has performed munitions response actions on the Del Rey Oaks parcels prior to early transfer pursuant to the Fort Ord Federal Facilities Agreement (FFA). This Del Rey Oaks RI/FS documents these actions, and is required under CERCLA; and is the first step in preparing the formal decision document to complete the CERCLA process for transferring the property.

At the time of the early transfer of the parcels, the Army entered into a Covenant to Restrict the Use of Property with DTSC that has been agreed to by the City of Del Rey Oaks, to place additional restrictions on the Del Rey Oaks MRA. These restrictions prevent residential use, day care centers that do not prevent contact with soil, schools for persons under 21 years of age, and hospitals for humans. More recently, DTSC and the City of Del Rey Oaks have discussed removing the restriction on residential development. As part of the environmental review process, the City of Del Rey Oaks issued the *Draft Initial Study and Mitigated Negative Declaration for the City of Del Rey Oaks Housing Element and Amendments to the General Plan, Redevelopment Plan, and Zoning Ordinance* in 2006 (*Denise Duffy & Associates, 2006*); however, the City of Del Rey Oaks is now preparing an Environmental Impact Report for that project.

Parcels E29a and E29b.1 were identified in the HMP as Borderland Development Areas along a Natural Resources Management Area (NRMA) Interface; therefore, these parcels are subject to specific use

restrictions and/or conservation, management, monitoring and reporting requirements. These restrictions will be followed by the future property owner as outlined in the early-transfer Deed.

Currently, the proposed reuse on the portion of the Del Rey Oaks MRA consisting of MRS-15 DRO 01 and MRS-15 DRO 02 (Plate 1-2) includes the development of a resort hotel and golf course and associated infrastructure (Army, 2004 -FOSET). Recreational users including golfers are expected for this land use type. Residential reuse within portions of the Del Rey Oaks MRA is also being considered. Construction workers are expected for each of these reuse designations, as are outdoor maintenance workers.

Commercial/retail facilities and offices are planned for the portion of MRS-43 that is within the Del Rey Oaks MRA. For this land use type, indoor workers and outdoor maintenance workers may be anticipated.

2.1.4 Site Features

The following section summarizes site features at the former Fort Ord.

2.1.4.1 Climate

The area's climate is characterized by warm, dry summers and cool, rainy winters. The Pacific Ocean is the principal influence on the climate at the former Fort Ord, and the source of fog and onshore winds that moderate temperature extremes. Daily ambient air temperatures typically range from 40 to 70 degrees Fahrenheit (F), but temperatures in the low 100s have occurred. Thick fog is common in the morning throughout the year. Winds are generally from the west.

The average annual rainfall of 18 inches occurs almost entirely between November and April. Because the predominant soil is permeable sand, runoff is limited and stream flow occurs only intermittently and within the very steep canyons in the eastern portion of the Impact Area.

2.1.4.2 Ecological Setting

The former Fort Ord is located on California's central coast, a biologically diverse and unique region. The range and combination of climatic, topographic, and soil conditions at the former Fort Ord support many biological communities. Initial field surveys were conducted from 1991 through 1994 to provide detailed site-specific, as well as basewide, information regarding plant communities, botanical resources, observed and expected wildlife, and biological resources of concern. Plant communities were mapped for the whole base as described in the *Draft Basewide Biological Inventory, Fort Ord, California* (HLA, 1992). Additional flora and fauna monitoring and reporting has occurred since 1994 to document the affects to rare, threatened, and endangered species as the result of Army predisposal actions.

Among the more than 260 vertebrates known to occur or potentially occur at the former Fort Ord, some are considered special-status species, as documented in the Fort Ord *Draft Basewide Biological Inventory, Fort Ord, California*, dated December 8, 1992. These wildlife species, in addition to plant species and native biological communities, are collectively called special status natural resources. They receive various levels of protection under local, state, or federal laws, regulations, and codes. The closure and disposal of former Fort Ord is considered a major federal action that could affect several species of concern and other rare species listed by the California Department of Fish and Game and/or the California Native Plant Society or listed as threatened or endangered under the federal Endangered Species Act

(ESA). The U.S. Department of the Interior, Fish and Wildlife Service (USFWS) Final Biological Opinion for the Disposal and Reuse of Fort Ord (USFWS, 1993) required that an installation-wide Multispecies Habitat Management Plan (HMP) (USACE, 1997) be developed and implemented to reduce the incidental take of listed species and loss of habitat that supports these species.

Other subsequent biological opinions (USFWS, 1999, 2002, 2005) addressed reasonable and prudent measures to mitigate impacts to listed species and critical habitat for species such as the California tiger salamander (*Ambystoma californiense*), Contra Costa goldfields (*Lasthenia conjugens*), Monterey spineflower (*Chorizanthe pungens* var. *pungens*), Seaside bird's beak (*Cordylanthus rigidus*), and the sand gilia (*Gilaa triodan*). The HMP (USACE, 1997), the Biological Opinions mentioned above, as well as an Assessment (Zander, 2002), a Memorandum of Understanding (BLM/Army, 2004), and a Revised Attachment A - Habitat Management Plan Map (USACE, 2005) establish the guidelines for the conservation and management of wildlife and plant species and habitats that largely depend on former Fort Ord land for survival.

Two plant communities at Fort Ord are considered rare or declining and of highest inventory priority by the California Department of Fish and Game (CDFG; CDFG, 1997): central maritime chaparral and valley needlegrass grassland. Plant communities that are present near or within the Del Rey Oaks MRA predominantly include central maritime chaparral, with relatively minor occurrences of wetlands and grasslands.

The greatest diversity of wildlife species occurs in chaparral communities that potentially host special status wildlife species such as California black legless lizard (*Anniella pulchra nigra*), Monterey dusky footed woodrat (*Neotoma macrotis luciana*), coast horned lizard (*Phrynosoma coronatum*), golden eagle (*Aquila chrysaetos*) loggerhead shrike (*Lanius ludovicianus*), and the California tiger salamander.

In the grassland community, special status wildlife species are potentially represented by American badger, California tiger salamander, California horned lark (*Eremophila alpestris actia*), golden eagle, northern harrier (*Circus cyaneus*), loggerhead shrike, tricolored blackbird (*Agelaius tricolor*), prairie falcon (*Falco mexicanus*) and burrowing owl (*Athene cunicularia hypugaea*).

Special status wildlife species possibly occurring in the wetland community include Monterey ornate shrew (*Sorex ornatus salarius*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk, Northern harrier, yellow warbler, tricolored blackbird, California tiger salamander, and California linderiella (*Linderiella occidentalis*).

2.1.4.3 Topography and Surface Waters

The topography of the southwest portion of the former Fort Ord, which includes the Del Rey Oaks MRA, consists of low rolling hills typical for the dune sand deposits that underlie the southwestern portion of the former Fort Ord. The rolling hills that comprise the Del Rey Oaks MRA range in elevation from 150 to 300 feet above mean sea level.

Runoff is minimal in the southwestern portions of the former Fort Ord due to the high rate of surface water infiltration into the permeable dune sand; consequently, well-developed natural drainages are absent throughout much of this area. However, limited erosion has been observed primarily where roads were carved into slopes. In these areas small gullies are present, but generally end shortly after the topography flattens out. Closed drainage depressions typical of dune topography are common.

2.1.5 Subsurface Conditions

This section summarizes subsurface conditions at the former Fort Ord, emphasizing the conditions specific to the Del Rey Oaks MRA.

2.1.5.1 Geology

The geology over the majority of the southwestern portion of the former Fort Ord is Pleistocene-age dune deposits. These dune deposits, which are up to 250 feet thick, form the characteristic low rolling hills seen in this portion of the former Fort Ord.

2.1.5.2 Hydrogeology

The Salinas Basin and the Seaside Basin are the two main hydrogeologic structures underlying the former Fort Ord. The Salinas Basin underlies approximately the northern one-third of the former Fort Ord; the Seaside Basin underlies approximately the southern two-thirds of the installation, including the Del Rey Oaks MRA. Therefore, only the Seaside Basin is discussed in this report.

The Seaside Basin reportedly consists of the following four aquifers, from depth to ground surface: the Monterey Formation aquifer, the Santa Margarita Formation aquifer, the Paso Robles Formation aquifer, and a perched aquifer (*GTC, 1986*).

The Monterey Formation consists of marine siltstone and shale that is known to yield water from fractures. Water-supply wells in the city of Seaside produce water primarily from the Santa Margarita Formation aquifer, which pinches out beneath Seaside. The Paso Robles Formation aquifer is confined or semi-confined and is found beneath the Seaside Clay unit of the Paso Robles Formation. The Paso Robles aquifer is a major water-bearing unit in the Seaside Basin.

An unconfined, perched aquifer overlies the Seaside Clay unit of the Paso Robles Formation and may occur in one or more of the following units: Recent Alluvium, the Aromas Sand, and the upper member of the Paso Robles Formation.

2.2 MR RI/FS Background

This section summarizes the MR RI/FS and regulatory background for the former Fort Ord.

2.2.1 Summary of Military Munitions Response Program

Since BRAC listing and closure of Fort Ord in 1991, MEC removal actions have been performed and documented by the Army in preparation for transfer and reuse of the former Fort Ord property. These removal actions have not only reduced imminent hazards, but have also provided information about the type of MEC and level of hazard at each of the sites that can be used in the basewide MR RI/FS.

Work performed under the existing MR program has been conducted in accordance with the following documents:

- Time-critical removal actions (TCRAs) have been implemented as described in the *Fort Ord Ordnance and Explosive Waste Time-Critical Removal Action Memorandum (Army, 1994)*.

- Non-time-critical removal actions are addressed according to the *Final Action Memorandum, Phase 2 Engineering Evaluation/Cost Analysis, Ordnance and Explosive Sites, Former Fort Ord, Monterey County, California (Army, 1999)*. The Action Memorandum, Phase 2 Engineering Evaluation/Cost Analysis (EE/CA) identifies and describes the rationale for continuing with MEC removal actions at munitions response sites (MRSs) while the basewide MR RI/FS is being conducted, and addresses recommendations for future MEC removal actions.
- All removal actions have been implemented in accordance with the Land Disposal Site Plan (LDSP), LDSP amendments, and explosive safety submissions, 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 MEC contamination, the proposed future use of each area, and procedures for mitigating MEC hazards in a manner compatible with the proposed land reuse and in accordance with the Department of Defense (DoD) safety standards.

Other elements of the MR program implemented prior to the basewide MR RI/FS include the following:

- **Archive Search Report** – MRSs were identified and listed in the 1997 Draft Revised Archive Search Report (ASR; *U.S. Army Engineer Division, Huntsville [USAEDH], 1997a*), which is an update of previous ASRs (*USAEDH, 1993; 1994*). A preliminary site reconnaissance was conducted as part of the ASR to further identify/characterize potential MRSs; the results are contained in the 1997 ASR.
- **Site Investigation/Sampling** – Based on the 1993 ASR, several MRSs were identified for investigation. Human Factors Applications, Inc., and USA Environmental, Inc., performed sampling.
- **Phase 1 Engineering Evaluation/Cost Analysis (Phase 1 EE/CA; USAEDH, 1997b) and the Phase 2 Engineering Evaluation/Cost Analysis (Phase 2 EE/CA; Army, 1998b)** – The Phase 1 and Phase 2 EE/CAs were developed to describe the Munitions Response to MEC and management activities for sites known or suspected to contain MEC. The Phase 1 EE/CA addressed 29 MRSs and subsites (*USAEDH, 1997b*). The Phase 2 EE/CA addressed the remaining MRSs, including future sites (*Army, 1998b*).

Elements of the MR Program implemented as part of the basewide MR RI/FS include the following:

- **Draft Final Literature Review Report, Ordnance and Explosives, Remedial Investigation/Feasibility Study, Former Fort Ord, California (HLA, 2000b)** – This report was the first step in evaluating existing MEC related information for the former Fort Ord as part of the MR RI/FS program.
- **Draft Final Ordnance and Explosive Remedial Investigation/Feasibility Study Work Plan, Former Fort Ord, California (Army, 2000c)** – The OE RI/FS Work Plan describes the overall process for implementing the CERCLA process for MRSs at the former Fort Ord and introduces the management of sites within the four tracks (Tracks 0 through 3).
- **Record of Decision, Interim Action for Ordnance and Explosives at Ranges 43-48, Range 30A, and Site MRS-16, Former Fort Ord, California (Army, 2002a)** – This ROD describes the Interim Action for removal of MEC at two areas within the Impact Area and one area just to the north of the Impact Area. The interim action included vegetation removal through prescribed burns and removal

of surface and subsurface MEC. The action within MRS Ranges 43 through 48 is documented in the Final Ranges 43 through 48 Technical Information Paper (*Parsons, 2007*).

- **Record of Decision, No Action Regarding Ordnance-Related Investigation (Army, 2002b)** – This ROD addresses areas at the former Fort Ord that have no known history of munitions-related activities of any kind and have no evidence of MEC. The Track 0 “plug-in” process, which is described in the Track 0 ROD, defines the documentation and procedures required to prepare an Approval Memorandum for sites to become Track 0 sites and thus, be considered for a No Action decision.
- **Record of Decision, No Further Action Related to Munitions and Explosives of Concern – Track 1 Sites, No Further Remedial Action with Monitoring for Ecological Risks from Chemical Constituents at Site 3 (Army, 2005a)** – This ROD addresses sites at the former Fort Ord that were suspected to have been used for military training with military munitions, but based on the Track 1 Ordnance and Explosives Remedial Investigation/Feasibility Study, each site falls into one of three categories (Categories 1 through 3) and require no further action. The ROD also outlines a ‘plug-in’ process by which an Approval Memorandum will be prepared that presents the rationale for designating future sites as Track 1 sites. When approved by the regulatory agencies, the Approval Memorandum will become the decision document for the specific Track 1 site. Seventeen sites were identified for no further action as part of the Track 1 ROD. Several other groups of sites have also been identified as Track 1 sites and have proceeded through the Track 1 ‘plug in’ process.
- **Final Track 2 Munitions Response, Remedial Investigation/Feasibility Study, Parker Flats Munitions Response Area, Former Fort Ord, California (MACTEC, 2006)** – This is the first RI/FS prepared for Track 2 sites which are sites where MEC items were present, and MEC removal has been conducted. The Parker Flats MRA consists of 13 MRSs.

2.2.2 Regulatory Background

Since the base was selected for BRAC in 1991 and was officially closed in September 1994, MEC removal actions have been performed and documented in preparation for transfer and reuse of the former Fort Ord property. Limited removal actions began in 1993. The munitions response to MEC at identified MRSs continued after base closure because the expanded reuse of the former Fort Ord increased the possibility of the public being exposed to MEC hazards. The Army performed its activities pursuant to the President’s authority under the CERCLA Section 104, as delegated to the Army in accordance with Executive Order 12580 and in compliance with the process set out in CERCLA Section 120. The regulatory agencies (EPA and the California DTSC as part of the Cal/EPA) were provided copies of work plans and after action reports for review. The agencies had the opportunity to provide input during MEC investigation and removal actions; however, the removal actions were completed by the Army using its delegated removal authority under CERCLA.

In November 1998, the Army agreed to evaluate MEC at the former Fort Ord in an MR RI/FS consistent with CERCLA. The basewide MR RI/FS, which the Army is preparing to address MEC hazards on the former Fort Ord, will include input from the community and will require regulatory agency review and approval. The basewide MR RI/FS will evaluate past removal actions as well as recommend future remedial actions deemed necessary to protect human health and the environment under future uses.

In April 2000, an agreement was signed between the Army, EPA, and DTSC to evaluate MEC at the former Fort Ord subject to the provisions of the Fort Ord Federal Facility Agreement (FFA). The signatories agreed that the FFA provided the appropriate framework and process to address the Army's MEC activities. The FFA was originally signed in 1990 by the Army, EPA, California Department of Health Services (now known as DTSC), and the Regional Water Quality Control Board (RWQCB). The FFA established schedules for performing remedial investigations and feasibility studies, and requires that remedial actions be completed as expeditiously as possible.

In addition, to remain consistent with the Federal Endangered Species Act, the Army has completed consultations with the U.S. Fish and Wildlife Service on the Army's predisposal actions, including clean up of MEC. These consultations have resulted in biological opinions that include incidental take permits. If the Track 2 RI/FS results in impacts to HMP species not previously considered, the Army will consult with the USFWS in accordance with the Endangered Species Act.

The basewide MR RI/FS will contain a comprehensive evaluation of all MEC-related data for the entire former Fort Ord, and will evaluate long-term response alternatives for cleanup and risk management of MEC.

3.0 REMEDIAL INVESTIGATION

3.1 Site Description

The Del Rey Oaks Munitions Response Area (Del Rey Oaks MRA) is comprised of 324 acres in the southwestern portion of the former Fort Ord. The Del Rey Oaks MRA includes the following three MRSs: (1) MRS-15 DRO 01, (2) MRS-15 DRO02, and (3) portions of MRS-43 (Plate 1-2). Firing points from three former ranges fall within the Del Rey Oaks MRA, with firing directed toward the center of the Impact Area, at targets that were positioned down range.

3.2 Site History and Development

The initial use of the historical Fort Ord began in approximately 1917 when the U.S. Government purchased more than 15,000 acres of land and designated it as an artillery range (*Cozzens, 1922*). This included the Del Rey Oaks MRA. Cavalry and artillery troops stationed at the Presidio of Monterey, along with infantry troops stationed at the Presidio of San Francisco, conducted training activities within the Impact Area, which borders the Del Rey Oaks MRA. Although no training maps from this time period have been found, pre-World War II (WW II)-era military munitions have been removed during response actions within the Del Rey Oaks MRA.

The history of the Del Rey Oaks MRA is, in part, associated with that of the Impact Area MRA, because of the near proximity of the Impact Area MRA and because the Del Rey Oaks MRA contains three firing points positioned such that they fire into the Multi-Range Area. Several ranges partially within the Del Rey Oaks MRA were activated and then deactivated during the 1950s. Ranges 24, 25, and 26 were developed in MRS-15 DRO 01 in the 1960s, overlapped with some of the ranges from the 1950s, and remained until base closure. The positions of the Impact Area and Del Rey Oaks MRA ranges, and the types of weapons used at each range remained relatively static throughout the 1970s, 1980s, and 1990s (*Army, 1976, 1987b, 1992*). The three Del Rey Oaks ranges remained active or were considered operational until base closure (*Army, 1992*).

Prior to 1966, a range was present in approximately the same position as Range 24. The range was labeled as AR Table VIII in 1950s maps, and was used from 1957 to 1958. Range control files indicate Range 24 was constructed in 1966 and modified in 1975 and 1991. Based on available historical information, Range 24 was used for as an automatic rifle-transition sniper range and as an Army Training and Evaluation Program (ARTEP) Range. Weapons and ammunition authorized for use included small arms ammunition (5.56mm, 7.62mm, M60 machine gun); 90mm Recoilless Rifle, Sub-Caliber M72, Light Antitank Weapon (LAW), 90mm Sub-Caliber, and 40mm Practice were used at Range 24. The ranges were both oriented with firing occurring almost due east, into the Impact Area.

Ranges within the area of Range 25 are shown on maps dating back to 1956. AR Table VII Range was operated from 1953 to 1956. It was located within the Impact Area, at its boundary with the Del Rey Oaks MRA, overlapping the later Range 25, but at a different orientation. AR Table VII Range was oriented almost due east-west with weapons firing to the east, whereas Range 25 is oriented such that weapons were fired north-northeast. Review of range control files indicates Range 25 was converted from an inactive pistol range to an overhead offensive firing course in 1975. The range was deactivated in 1976 upon close of Basic Combat Training, then re-activated in 1981 and used through 1989. The use of small arms ammunition (7.62 mm) is indicated from historical records.

The firing point for Range 26 is in the vicinity of the firing point for the "Austin Anti-Tank" range, which is located partially within the southern portion of Del Rey Oaks MRA (Plate 3-2). From 1953 to 1956, the AR Table VIII range was operated with firing east-southeast such that the far end of the firing range may have overlapped with Range 26. The Machine Gun Table II range almost exactly overlaps with Range 26, and was operated from 1957 to 1958. This range appears to have been used primarily for machine gun fire since the mid 1950s. Information from the range control files indicates that the range was wired for M-30 Target Devices in 1966 and that, in November 1973, the range was modified from a Machine Gun Range to a Dry Fire and Movement Course used in conjunction with Range 27, located to the southeast of Range 26. Review of aerial photographs from 1966 and 1969 indicates that the berm may have been added to the range between 1966 and 1969. In February of 1975, Range 26 was reactivated as a Machine Gun Range. In 1991, the range was modified for Squad Automatic Weapon (SAW) firing. Small arms use (5.56mm and 7.62mm munitions) is indicated from historical records.

A small range, the Machine Gun Familiarization Range, was operated from 1953 to 1956. It was located just west-northwest of the firing point for Range 26.

No other known ranges at the former Fort Ord are likely to have contributed MEC or munitions debris to the Del Rey Oaks MRA.

It is noted that the above ranges are all contained in MRS-15 DRO 01, with a very small portion of Range 26 overlapping with MRS-15 DRO 02. There are no known occurrences of ranges within the remainder of the Del Rey Oaks MRA.

3.3 History of MR Investigations

Several investigations conducted in support of, or independent of the Fort Ord military munitions response program have been conducted within the Del Rey Oaks MRA. These include a road and trail clearance, a fuel-break removal action, Impact Area grid sampling, a GridStats/SiteStats sampling, remediation activities, non-time critical removal action, eastern boundary removal, berm removal, and machine gun link removal (Plate 3-1). The individual investigations and removals described above may have only covered a portion of the Del Rey Oaks MRA; however, after all of the above actions had been completed, 100 percent of the Del Rey Oaks MRA had been surveyed by one or more geophysical instruments and all detected MEC removed. The MEC sampling and removal actions were designed to address MEC to depths of four feet bgs; however, all anomalies, even those deeper than four feet bgs were investigated and all detected MEC was removed within the Del Rey Oaks MRA. All further statements in the document referring to "removals to four feet bgs" should be understood to include the prosecution of all detected anomalies to resolution, regardless of their depth bgs.

3.3.1 History of Investigations and Removals

Road and Trail Clearance

To facilitate safe travel within the Impact Area, removal actions were performed to depth over 100 percent of the road surface within selected portions of the Impact Area. Many of these roads were informally named for tracking purposes. Canister, Flechette, and Napalm roads are within the northern portion of MRS-15 DRO 01. MEC was not encountered during road and trail clearance activities and no munitions debris was discovered on the three roads (USA, 2001e).

Fuel-Break Removal Action

Between May and July of 1998, 30-foot wide fuel breaks were developed along the eastern boundaries of MRS-15 DRO 01 and MRS-15 DRO 02, as well as along the western and southern borders of the Del Rey Oaks MRA (USA, 2001c). The fuel break areas were divided into contiguous 30- by 110-foot grids, searched using a Schonstedt Model GA-52/Cx magnetometer, and MEC was removed to a minimum depth of 4 feet below ground surface (bgs).

The following MEC and munitions debris were found during this investigation (USA, 2001c):

- MRS-15 DRO 01: 35mm practice rockets were found. Munitions debris included 2.36-inch M7 practice rockets, 37mm projectiles, 75mm projectiles, and several fragments of unknown origin (Plates 3-2 and 3-3).
- MRS-15 DRO 02: No MEC or munitions debris were found.

Impact Area Grid Sampling

Between October 1997 and January 1998, 41 grids within the Impact Area were sampled to determine the necessity and scope of future MEC removal actions (USA, 2000a). Seven 100- by 100- foot grids were sampled in MRS-15 DRO 01 and one 100- by 100-foot grid was sampled in MRS-15 DRO 02. These grids were located behind and between range fans. No MEC or munitions debris was recovered from the grids that were sampled. No grids were located in MRS-43.

SiteStats/GridStats Sampling

In 1998, fifty-three grids within MRS-15 DRO 01 and MRS-43 were randomly selected to provide representative data for the Del Rey Oaks MRA. These grids were selected using SiteStats/GridStats software, which statistically selects random sampling locations within sampling grids in order to collect representative data for the site. Further description of the SiteStats/GridStats program is presented in the Engineering Evaluation/Cost Analysis- Phase 2, Former Fort Ord, Monterey, California (Army, 1998b). Thirty-four 100- by 200-foot grids were identified within MRS-15 DRO 01, while nineteen 100- by 200-foot grids were identified in MRS-43. Several MEC items as well as munitions debris were found during the MEC removal (USA, 2001f).

Remediation Activity MEC Removals

Between March, 1998, and July, 1999, MEC was removed from portions of MRS-15 DRO 01 during site preparation for remediation of spent small arms target areas and staging areas in Ranges 24, 25, and 26 (USA, 2001f). A total of 60, 100x100-foot grids and portions of 7 additional grids were subjected to MEC removal in the vicinity of Range 24. Areas identified for MEC removal near Range 25 included a staging area for crews and equipment, access and egress routes, and the area to be remediated. A total of 29 100x100-foot grids and portions of 4 additional grids were cleaned up in the vicinity of Range 26.

Initially, Schonstedt magnetometers were used for the surveys; however, the heavy concentration of metallic clutter precluded their use. Geonics EM61 digital geophysical instruments were used instead to complete the surveying. Following the survey, identified MEC and munitions debris were removed from the range areas. During the course of this MEC removal, sixty MEC and 974 munitions debris items were removed.

Additional Sampling Activities

On the basis of the sampling and removal results, it was determined that the characterization of MRS-15 DRO 01, MRS-15 DRO 02, and MRS-43 was inadequate and additional sampling was necessary (USA, 2001a). A total of 169 100 by 100 foot sampling grids were distributed throughout the Del Rey Oaks MRA and 100 percent grid sampling was performed. Of the 169 grids, two were not investigated as directed because they were located in the 5-acre habitat area within MRS-15 DRO 01. This five-acre portion of MRS-15 DRO 01 was subdivided from MRS-15 DRO, and is now identified as MRS-15 DRO 01A. MRS-15 DRO 01A was evaluated as a Track 1 plug-in site (Army, 2005a). Additionally, the seven SiteStats/GridStats grids completed in MRS-43 were re-sampled.

Non-Time Critical Removal Action

Based on previous work, four areas of concern were identified for removal actions to remove the threat to human health (public safety) or welfare or the environment from MEC, as presented in two Notices of Intent (NOIs) (Army, 1999b, 2000a). MEC removal to depth was conducted throughout the entire NOI areas using Schonstedt magnetometers. Fifty-two MEC items were removed during the operation.

As a separate part of the Non-Time Critical Removal Action, each grid within the entire DRO group, including the NOI areas and previously sampled grids, was resurveyed using geophysical equipment: either the EM61, EM61 hand held (HH), Schonstedt magnetometer, or the G-858 magnetometer. The Schonstedt was used to survey grids where digital equipment could not be used due to accessibility issues related to terrain or vegetation. The vegetation and terrain of the individual grids dictated the selection of the appropriate geophysical instrument for each grid. A total of 233 MEC items and 3,534 munitions debris items were found and removed from the Del Rey Oaks MRA during the 100 percent grid sampling, the removal action, and follow-up geophysical investigation (USA, 2001a).

Analog quality control (QC) audits over 10 percent of all completed geophysically surveyed grids were performed using a four step plan as presented in the contractor work plan (USA, 2000b) which included a pass/fail criteria for the QC audits of zero MEC items. No QC deficiencies were noted in the After Action Report (USA, 2001a). The USACE UXO Safety Specialists conducted final Quality Assurance (QA) inspections in the Del Rey Oaks MRA. All grids surveyed by EM61, EM61-HH and G-858 instruments within the Del Rey Oaks MRA passed U.S. Army Engineering Support Center, Huntsville (USAESCH) QA inspection standards and were accepted by the USACE (USA, 2001a).

After operations ended, three additional areas were identified as requiring additional removal work: the easternmost portion of MRS-15 DRO 01 and MRS-15 DRO 02, the Range 26 berm, and an area to the west of the Range 26 berm comprised of 9-grids. These areas were identified because (1) the digital geophysical investigation that was to be completed over transfer parcels E29a and E29b.1 stopped short of the parcel boundaries at the eastern MRS boundary and (2) it was believed that MEC potentially remained in the subsurface of the Range 26 berm and adjacent 9-grid area.

Supplemental MEC removal work was therefore performed at MRS-15 DRO 01 and MRS-15 DRO 02 to complete the work required for the early land transfer of the DRO parcels. This supplemental work in MRS-15 DRO 01 and MRS-15 DRO 02 had three major objectives: (1) complete the geophysical investigation of transfer parcels E29a and E29b.1, by mapping and investigating their approximately 30-foot-wide eastern edge; (2) excavate, map, and investigate the Range 26 berm; and (3) clear machine gun

links from the 9-grid area adjacent to the western slope of the Range 26 berm in preparation for the ensuing mapping and investigation of the area.

Eastern Boundary Clearance: A 30-foot wide, 2-mile long strip of land, which included 3.3 acres of the eastern boundary of MRS-15 DRO 02 was geophysically surveyed and subjected to MEC removal (*Parsons, 2003*). Analog Schonstedt GA-52/Cx magnetometers were used to survey the area, then all detected anomalies were excavated and removed. During this analog MEC removal, 10 suspected MEC items were discovered. Of these, eight (five 35mm subcaliber practice rockets and three 2.36-inch rockets) were determined to be MEC and two (two 2.36-inch practice rockets) were determined to be munitions debris. All were removed. The area was then re-surveyed using digital geophysical instruments (EM61-MK2s), and anomalies identified from the processed data were investigated until their sources were removed. No MEC was found during the digital geophysical investigation; however, over 71 pounds of munitions debris and 181 pounds of range-related debris were found and removed (*Parsons, 2003*).

With the exception of one grid, all 103 operating grids in the eastern boundary investigation area passed the quality control (QC) inspections. The grid failure resulted from the finding of the aluminum body of an illumination signal in grid A20116 during the QC inspection. This finding, along with the munitions debris encountered during QC on the Range 26 berm, led to a corrective action mandating that UXO dig teams use digital geophysical equipment along with analog equipment to recheck excavations in order to ensure that excavated areas are satisfactorily cleared. During the QC survey, an expended 2.36-inch practice rocket (munitions debris) was found outside the work area in grid A2G1F7; however, because the item was found outside the work area, it did not constitute a failure.

Berm Excavation: Because the Range 26 berm area had previously been determined to be saturated with metallic clutter, a scraper removed the top 5 feet (approximately) of soil from the berm and deposited the soil over adjacent areas to the north and east of the berm. The Range 26 berm supplemental work area (comprised of the berm [11 grids] and the adjacent areas where the berm material was deposited [22 grids]) was then investigated using digital geophysical equipment to detect and locate potential subsurface MEC. All anomalies detected were investigated and resolved. Anomaly excavations produced one MEC item (37mm projectile) and 7,941 lbs of range-related debris (*Parsons, 2003*).

During the anomaly excavations, layers of machine gun links were found below the surface, indicating that the level of the scraped berm did not match the contour of the preexisting terrain in some areas.

During QC, munitions debris was found at anomaly excavations in 10 grids. It was initially believed that the UXO dig teams needed to recheck the excavations more thoroughly. It was later determined that the metallic clutter in the berm material covering the areas adjacent to the berm prevented the analog equipment (used to recheck the initial anomaly excavations) from detecting larger anomalies when near the clutter. These findings led to a corrective action mandating that UXO dig teams use digital geophysical equipment along with analog equipment to recheck excavations in order to ensure that anomaly excavations are satisfactorily cleared.

Although all 33 grids passed the digital QC survey, an expended practice hand grenade and an expended 37mm projectile were found during QC procedures. Both were in proximity to the identified anomaly location but outside the required search radius around anomalies. Although this did not constitute a QC failure, the search radius around anomalies was expanded to 6 feet.

With the exception of one grid, all 33 grids passed the analog QC inspection. One QC failure resulted from a metallic item unrelated to MEC (a 10-inch, square, concrete block with 6-inch, by ½-inch steel bolts).

Because of the metallic clutter in the area, an analog QA inspection could not be performed. During the digital QA survey, an approximately 1-inch by 8-inch cylindrical ferrous metal item was found. As a corrective measure, all anomalies in the grid selected by USACE QA were checked again and resolved.

Machine Gun Link Clearance: Machine gun links were removed from approximately 2.5 acres comprising 12 grids in western Range 26 within MRS-15 DRO 01, immediately west of the berm area (Parsons, 2003). Initially, nine grids were identified for this work. The top foot of soil on the initial nine grids was removed and stockpiled in the southwest corner of the work area. Areas within these 9 grids that still contained links were further excavated to between 3 and 4 feet below the original surface, until links were no longer visible. During this work, links were observed in grids north and west of the work area, and the work area was expanded to include three additional grids, for a total of 12 grids. The machine gun link area was thereafter referred to as the 12-grid area or 12-grid machine gun link area.

After excavation, the 12 grids were digitally surveyed with an EM61-MK2, the resulting anomalies were investigated, and no MEC was found. Anomaly excavations produced only a single munitions debris item, 3 lb of munitions debris, and 2,740 lbs of range-related debris. No MEC items were found.

Because of metallic clutter remaining over these 12 grids, the planned QC and analog QA inspections could not be performed. Instead, QC/QA in the 12-grid area consisted of visually inspecting the anomaly excavations and checking the spoils from the excavated soil as the soil was being sifted. These activities satisfied the functional requirements of QC/QA, however, it is noted that the potential for MEC may still exist in these 12 grids because of the metallic clutter. The stockpiled soil in the southeast corner of the work area was sifted, inspected, and returned to the scraped areas. The southeast corner was then scraped and sifted, and subjected to a digital geophysical survey and the anomaly reacquisition and excavation processes.

As mentioned previously, the individual investigations and removals described in this section may have only covered a portion of the Del Rey Oaks MRA; however, after these actions had been completed, the entire Del Rey Oaks MRA had been surveyed, and all detected MEC removed.

3.4 Conceptual Site Model

Conceptual site models (CSMs) are generally developed during the preliminary site characterization phase of work to provide a basis for the sampling design and identification of potential release (functioning of the MEC item; e.g., detonation) and exposure routes. CSMs usually incorporate information regarding the physical features and limits of the area of concern (the site), nature and source of the contamination (in this case MEC), and exposure routes (potential scenarios that may result in contact with MEC).

The CSMs for the Del Rey Oaks MRA are based on site-specific removal data and general historical information including literature reviews, aerial photographs, maps, training manuals, technical manuals, and field observations. The CSMs address training practices that occurred within the Del Rey Oaks MRA from acquisition of the property by the Army through base closure. The CSM is broken out into four

sections: Training Practices, Site Features, Potential Sources and locations of MEC, and Potential Exposure Pathways.

Plate 3-4 presents a graphical view of the CSMs for the Del Rey Oaks MRA. The plate shows the types of training that occurred historically, and the planned reuses for the area.

3.4.1 Training Practices

Training practices are discussed below to provide information on the types of military munitions that may have been used at the site.

3.4.1.1 Training Up Through the 1940s

Documentation of pre-World War II (WWII) training activities at the former Fort Ord is limited to footage from a 1938 film entitled *A Year on a Calvary Post, 1938 – 11th Calvary, Presidio, Monterey, CA*, National Archives footage from 1940, topographic maps from 1918, 1933, and 1938 (*DOI, 1918; Army, 1933 - 1934, 1938*), a set of aerial photographs from 1941, and information presented in *The American Arsenal (Hogg, 2001)*. No training maps are available from this time period, and very little range information is available from 1917 to 1940.

Potential types of training that may have occurred based on MEC and munitions debris identified during the removal actions are described below.

37mm Projectile Training

Based on sampling and removal results it appears that 37mm training occurred during or prior to the 1940's. MK II HE and the MK I LE 37mm projectiles as munitions debris and MEC were discovered within the Del Rey Oaks MRA (Plates 3-2 and 3-3). The distribution of the 37mm projectiles found is discussed further in Section 3.4.3.

37mm projectiles (munitions debris and MEC) were found in three general locations within MRS-15 DRO 01, near Range 26, near Range 24, and within MRS-43. A description of the types of weapons that may have been used for 37mm training is provided below.

The M3A1 light antitank weapon may have been used to fire the type 37mm projectiles removed from the site. The M3A1 was capable of firing high explosive (HE), antipersonnel, and canister projectiles, and had a maximum range of 12,800 yards when firing a high explosive projectile (*Hogg, 2001*).

The M1916 gun, with an M5 Subcaliber mount for 37mm munitions was used for training in the firing of the 75mm Howitzer M1A1 and may also have been used at the site. The M1916 gun and its recoil mechanism were fastened to the 37mm Subcaliber Mount, M5, and used for training in the handling and firing of the 75mm Howitzer M1A1 (*Hogg, 2001*).

It is anticipated that these weapons may have been fired from outside of the Del Rey Oaks MRA towards the hillside in MRS-43.

75mm Training

75mm projectiles as fragments and other 75mm munitions debris were found scattered between Range 24 and Range 26. MK I HE and M309 HE 75mm projectiles (as munitions debris) were found. Due to the limited extent and limited number of 75mm projectiles found in the Del Rey Oaks MRA it is believed that the presence of these items is associated with their use at other locations and not associated with training in the Del Rey Oaks MRA.

Stokes Mortar Training

A total of four 3-inch and 4-inch practice Stokes trench mortars (munitions debris), one 4.2-inch HE mortar (munitions debris) and one 4-inch WP filled Stokes trench mortar (MEC) were found in the northern portion of the Del Rey Oaks MRA. Due to the limited number and location of mortars found in the Del Rey Oaks MRA it is believed that the presence of these items is associated with their use at other locations and not associated with training in the Del Rey Oaks MRA.

2.36-inch Rocket Training

M7 series practice, M6 AT, and M6 HEAT 2.36-inch rockets were found in the portions of the Del Rey Oaks MRA that overlaps with the "Austin Anti-Tank Range." The Austin-Antitank range is identified on a 1945 training map. The M7 series practice rockets were the most common 2.36-inch rockets discovered in the Del Rey Oaks MRA (primarily munitions debris).

The 2.36-inch rocket was designed to be fired from a Bazooka-type launcher at ground targets. The M6 series 2.36-inch rocket was designed to be effective against the armor plate of tanks and armored vehicles. The optimum range of the M6 series 2.36-inch rocket was 200 yards, although the maximum range of the rocket was 600 yards. The M7 series practice rockets contained inert warheads and a live rocket motor that was loaded to conform to the characteristics of a live round, (Hogg, 2001). Based on configuration of the range fan, firing was to the north toward the center of the Impact Area. Because the 2.36-inch rocket became increasingly less effective against armor developments for tanks, it was gradually replaced by the 3.5-inch M28 AT rocket in post-World War II years.

60mm and 81mm Illumination Mortar Training

Illumination mortars (munitions debris) were identified within the Del Rey Oaks MRA. Illumination mortars are generally used to provide illumination in the field. Illumination mortar projectiles fired from the M1 and later model mortars (M29 and M29A1) found within the Del Rey Oaks MRA include the, M301. These were found at and around the Austin Antitank Range. Models of 60mm illumination mortars that were or may have been used in the Del Rey Oaks MRA include the M83 series and the M721, both as illumination projectiles. Several 60mm illumination mortars as munitions debris were found at the Austin Tank Range, with an isolated occurrence in MRS-43. It is believed that the use of illumination mortars could have been in support of nighttime firing at the Austin Anti-tank range.

Rifle Grenade Training

The 1997 ASR indicates that the ridge passing through MRS-43 may have been used as a backstop for rifle grenade training in 1942 and 1943. Rifle grenades found within the Del Rey Oaks MRA included primarily M11 practice rifle grenades and various rifle smoke grenades (munitions debris). Four M9

antitank rifle grenades (MEC) were found at a depth of 2 feet bgs on the north side of South Boundary Road within MRS-15 DRO 01 (Plate 3-2). Based on the depth that these items were found and because they were found together, it appears that the rifle grenades were intentionally buried at this location (Plate 3-3).

The M11 series antitank practice rifle grenade was available for use in the 1940s and 1950s. This item was an inert loaded dummy grenade similar in shape and weight to the M9 series high explosive antitank (HEAT) grenade. No explosive charge was associated with this practice item. Practice rifle grenades are inert. They are propelled downrange by a special blank cartridge used to fire the grenade from a launcher attached to the rifle.

Range configuration information for practice rifle grenade training was obtained from *Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat* (Army, 1983). Technical information for recent rifle grenade training was obtained from TM 43-0001-29 (Army, 1987a). Information on WWII Grenade launchers was obtained from the American Arsenal (Hogg, 2001). According to the 1983 policies and procedures manual, live rifle grenades are fired behind a protective barrier equivalent to a screen of sandbags 0.5 meter thick or reinforced concrete walls 0.16 meter thick. It is suspected that sandbags could have been used in a practice training area. The maximum range of the practice rifle grenade M29 (model described in TM 43-0001-29) is 150 meters. The maximum range of the M11 series rifle grenade was also 150 meters. According to information in *The American Arsenal*, the depth to which the launcher is inserted into the rifle stabilizer tube determines the range attained by the fired grenade. Therefore, it is expected that targets would be placed at various distances to practice firing at different ranges.

General information on the use of pyrotechnic items, including smoke rifle grenades, was obtained from Army field and technical manuals (Army, 1977c, and 1987b). Pyrotechnics are generally used for signaling and ground smoke. The M22 can be used for both signaling and laying of smoke screens. The grenades are fired from a rifle equipped with a grenade launcher and function on impact. At impact, a firing pin strikes a primer producing a flame, which ignites a starter mixture charge, which in turn ignites a smoke mixture charge. It is possible that the signaling or laying of smoke screens occurred within the Del Rey Oaks MRA.

Mine Training

Antitank practice mine fuzes (primarily M1A1), were found mostly scattered near the firing point of Range 24. All of the antitank mine fuzes were reported as munitions debris. The presence of these fuzes likely indicates training, because they were found scattered over a relatively small area. A 1945 training map shows a Moving Vehicle Range located in close proximity (to the north) of Range 24 (Army, 1945). Practice mines may have been used during training at this site. It should be noted; however, that no practice mines were found.

M1A1 practice mine fuzes were used in the M1 series practice antitank mines. Practice antitank mines were used for training in the proper methods and precautions to be observed in the care, handling, laying, boobytrapping, arming and disarming of the M1 antitank mine.

Two M6A1 combination mine fuzes were found about 50 feet from Cannister Road, and about 150 feet from each other. These fuzes were used in mines and in flares, such as the M48 parachute flare, which was used during World War II. Because there are only two occurrences of these fuzes, and they are in

close proximity to each other as well as to Canister Road, it is likely that these fuzes were discarded, instead of indicating mine training.

A single occurrence of the M604 mine fuze, which was used in a variety of practice antitank mines (e.g., M10, M12, M12A1 and M20), was found just west of Range 26 in the Del Rey Oaks MRA, about 70 feet north of a trail. This finding is more likely to be discarded munitions, rather than indicating training with the M10 practice land mine, because this is an isolated occurrence.

3.4.1.2 1950s Training

Various ranges were developed at the former Fort Ord in the 1950s, with several Automatic Rifle (AR) Table ranges present within the Del Rey Oaks MRA. A Machine Gun Familiarization Range also operated from 1953 to 1956. The 'AR Table' designation indicates use of automatic rifle training for small arms. MRS-43 and MRS-15 DRO 02 did not contain any known ranges during the 1950s, and no MEC-related training is known to have occurred within the Del Rey Oaks MRA during the 1950s, based on historical records. However, as explained below, 1950s-era MEC (3.5-inch practice rockets) were found at and around Range 26 during removal activities and hand grenade fuzes as MEC and munitions debris and practice hand grenades as munitions debris were found between Ranges 24 and 26 and near Range 26.

It is not expected that 37mm gun and 2.36-inch practice rocket training continued into the 1950s. However, rifle grenade training may have continued into the 1950s. A description of this type of training is provided above, in information about training in the 1940s.

Range 24 Area

AR Table VII and AR Table VIII, identified in maps from the 1950s as being in approximately the same position as the later Range 24, were used for automatic rifle training, with firing reportedly to the east. No MEC-related training was identified from historical records.

Range 25 Area

AR Table II Range, which overlaps spatially with the later Range 25, was used for overhead firing training. No MEC-related training was identified from historical records.

Range 26 Area

From 1953 to 1956, AR Table VIII range was operated with firing east-southeast such that the far end of the firing range may have overlapped with later Range 26. Machine Gun Table II range almost exactly overlaps with Range 26, and was operated from 1957 to 1958. This range appears to have been used primarily for machine gun fire since the mid 1950s.

A small range, the Machine Gun Familiarization Range, was operated for small arms from 1953 to 1956. It was located just west-northwest of Range 26.

3.5-Inch Rocket Training

3.5-inch practice rockets (M29A2), as munitions debris, were found within and near Range 26. Available training maps do not indicate a range for 3.5-inch rocket training in this area; however, it is possible that they were associated with the "Austin Anti-Tank Range" in the early 1950.

The 3.5-inch rocket gradually replaced the 2.36-inch rocket after World War II, but came fully into use, in 1950. It was phased out of use in the early 1960s, when it was replaced by the M72 LAW (light antitank weapon) disposable rocket launcher. The M29A2 was the training equivalent of the M28A2, which had a maximum launch range of about 300 yards. The 3.5-inch rocket launcher (M20) is a two-piece, smooth bore, open-tube weapon that is fired electrically and could be used for both the M29A2 and M28A2.

A 3.5-inch rocket range typically includes an impact area, ricochet areas to the side and behind the impact area, and secondary danger zones located outside of the ricochet areas. Minimum distance to targets is 250 meters and range length from firing point to the end of the impact area is 950 meters (*Army, 1983*).

Hand Grenade Training

Although no specific hand grenade training areas are identified on available training maps, the types of practice hand grenades found in the Del Rey Oaks MRA were available for use in the 1940s and 1950s. MEC and munitions debris, including fuzes, for hand grenades of different types were primarily found in three areas: at and near Range 26, west of Range 26, and along the northern boundary of MRS-15 DRO 01. Additionally, 35 MKII fragmentation hand grenades (MEC) were found within MRS-15 DRO 01 in burial pits at a depth of two feet bgs on the north side of South Boundary Road. These hand grenades were determined to be DMM.

Live hand grenade training areas usually consist of throwing bays or trenches, observation bays, and targets. According to the 1983 guidance, targets are a minimum of 25 meters from the throwing bays. Throwing bays should be separated by 20 meters unless they are separated by another physical barrier such as an earthen berm or concrete. It is anticipated that similar guidance would have been used prior to 1983. The maximum danger area for hand grenades is 450 feet.

MK II and MK I hand grenades were used prior to the 1950s, with the M205 series or the M10 series fuzes. The MK II practice hand grenade used the M205 series or the M10 series fuze on earlier models, and was designed to train personnel to arm and throw hand grenades (*Army, 1977c*). It was identical to the MK II fragmentation hand grenade, except for a filling hole in the base and a cork stopper to close the hole after the black powder strips had been inserted. The black powder strips provided noise and smoke without fragments upon functioning. It was functioned when a soldier removed the safety pin from the safety lever and threw the grenade allowing the safety lever to fly free, releasing the spring-loaded striker to strike the primer (FM 3-23.30; *Army, 2000b*).

The MK I illumination hand grenade was used for area illumination. Information obtained from FM 3-23.30 indicated that it could also be used as an incendiary agent. The grenade contained 3.5 ounces of illuminating pyrotechnic composition and a special igniter fuze. The filler would burn for 25 seconds and could illuminate an area 200 meters in diameter (*Army, 2000b*).

3.4.1.3 1960s Training

In 1961 the existing ranges at the former Fort Ord were numbered consecutively. Historical records indicate that the range locations remained essentially the same from the 1960s to base closure. Ranges 24, 25, and 26 fall within the MRS-15 DRO 01 portion of the Del Rey Oaks MRA. A small portion of Range 26 is contained in MRS-15 DRO 02.

Range 24

Range 24 was constructed in 1966 and subsequently used for automatic rifle training. Prior to this, a range is present in aerial photos at about the same location. In a 1965 photo mosaic, this range was labeled Range 21; however, it is labeled AR Table VII and AR Table VIII on 1950s maps. The AR Tables were used for automatic rifle training. None of the historical information for this range indicated MEC-related training in the 1960s.

Range 25

AR Table II was active during this time, indicating only small arms usage. A berm may have been added to range 25 based on differences in aerial photographs from 1966 to 1969. However, no MEC-related training was identified from historical records.

Range 26

Information from the range control files indicates that Range 26 was wired for M-30 Target Devices in 1966 and that, in November 1973, the range was modified from a Machine Gun Range to a Dry Fire and Movement Course. Review of aerial photographs from 1966 and 1969 indicates that the berm may have been added to the range between 1966 and 1969.

3.4.1.4 1970s, 1980s, and Early 1990s Training

According to available records, Ranges 25 and 26 were used for small arms training from the 1970s to base closure. Military munitions other than small arms were authorized for use at Range 24 during this time period.

Range 24

Based on historical documents from 1973, Range 24 was used for AR Field Fire and Qualification, with six small arms firing points authorized.

In 1975, the range use changed to ARTEP training. Authorized munitions and weapons included machine guns, small arms (5.56mm, 7.62mm), M60 MG Sub-Caliber M72 35 mm, 90mm recoilless rifle, and M781 40mm practice rounds. In 1991, Range 24 was identified for sniper training. Authorized munitions included small arms (5.56mm, 7.62mm), M60 MG, LAW, 90mm Sub-Caliber, and 40mm target practice (TP). A description of the types of training that may have occurred at Range 24 based on authorized weapons is provided below.

35mm Rocket Training

Subcaliber 35mm M73 practice rockets were found as MEC and munitions debris within Range 24. The Light Antitank Weapons (LAW) rocket replaced the 3.5-inch rocket in the early 1960s. LAW practice training employed the 35mm rockets with the reusable M190 shoulder launcher. The 35mm subcaliber rockets would be expected to be found primarily near down range targets.

40mm Projectiles Training

M781 40mm practice projectiles were found primarily at Range 24, although a few were scattered throughout the Del Rey Oaks MRA. M781 40mm practice grenades are launched with the M203 grenade shoulder launcher. This attached to M16 assault rifles or the M4 Carbine, although stand-alone versions also exist.

90mm Training

90mm recoilless rifles and the 90mm subcaliber device were authorized for use at Range 24, in the 1970's, 1980's and 1990's, according to range documentation. One instance of munitions debris (a tail boom) from a 90mm M348 HEAT projectile was found within Range 24. No MEC or other munitions debris associated with 90mm recoilless rifles was found during the various removal actions at the Del Rey Oaks MRA. The M67 90mm recoilless rifle was single loading and able to fire rounds at a rate of about one round per minute. The 90mm Subcaliber device (M49A1) permits realistic gunner and loader training and eliminates the use of expensive service ammunition. Ammunition used is a 7.62mm subcaliber cartridge.

Range 25

After the 1960s, Range 25 was authorized only for small arms fire. Historical documents from 1973 state that Range 25 was a small arms range used for Machine Gun Field Fire. By 1975, the range was inactive. In that same year, the range was converted to an overhead offensive training, with small arms (7.62mm) ammunitions use. However, in 1976, this range was deactivated with the closing of Basic Combat Training. In 1981 the range was reactivated as an overhead offensive firing range.

Range 26

After the 1960s, available records indicate Range 26 was used for small arms only. As of 1991, Range 26 was a machine gun range. 5.56mm and 7.62mm small arms ammunition was authorized for use (*Army, 1992*).

3.4.2 Site Features

The prominent features of the Del Rey Oaks MRA include hills, ridges, and valleys, along with several low areas or depressions. A ridge runs parallel to, and just inside the former Fort Ord border. A berm was constructed at Range 26, and a berm may have been constructed at Range 25 between 1966 and 1969. Based on the distribution of MEC and munitions debris removed from the Del Rey Oaks MRA, it appears that topographic features played a role in the types of training that occurred. For instance, the ridge in MRS-43 was reportedly used as a backstop for rifle grenades and shoulder launched weapons. MEC and munitions debris findings during removal actions support this.

Some erosion of non-maintained trails is evident within the site. The Del Rey Oaks MRA area has been, and currently is, undeveloped. The area does include several roads and trails, some of which were present prior to the 1960s.

3.4.3 Potential Sources and Locations of MEC Discovered and Removed

A breakdown of locations where MEC was removed is presented below following the era of use format above.

1940s

37mm Projectile

Review of the sampling and removal data indicates that 37mm projectiles as MEC and munitions debris were found in MRS-43, primarily along the ridge and also in the northern portion of the site, primarily perpendicular to the ridge located in MRS-43. This distribution indicates that high explosive (HE) and low explosive (LE) 37mm projectiles were possibly fired toward MRS-43, which contains portions of MRS-43 included in the Del Rey Oaks MRA. Presumably, these munitions were fired from M3A1 light AT weapons or from M1916 guns with an M5 subcaliber mount for 37mm munitions.

The guns were probably fired from within Fort Ord, out toward MRS-43. Historical 37mm projectiles were also discovered in the southern portion of the Del Rey Oaks MRA. These items may also be related to the training identified above or as a result of other training in the Range 26 area.

2.36 inch Rocket

M7 series practice, M6 AT, and M6 HEAT 2.36-inch rockets were found in portion of the MRS-15 DRO 01 that overlaps with the Austin Anti-Tank Range. Their scatter extends into MRS-15 DRO 02, and there are a few isolated occurrences of 2.36-inch rockets as munitions debris elsewhere in the Del Rey Oaks MRA. Most of the MEC and munitions debris overlap approximately with the Austin Anti-Tank Range, which was known to exist as early as 1945. Based on the range configuration, firing occurred inward toward the center of the historical Impact Area, the occurrences of 2.36-inch rockets very likely are associated with firing point(s).

Rifle Grenade

Historical information suggests that the ridge that runs along MRS-43 was used as a backstop for rifle grenade training. The results of various investigations in this area support the use of the ridge as a backstop; M11 Practice rifle grenades (munitions debris) were scattered in the flat area in front of the ridge, along the border between MRS-43 and MRS-15 DRO 01, as well as on the ridge. Rifle grenades were also found near Range 26, which may represent a separate rifle grenade training area.

1950s

Based on historical records, the active ranges in the Del Rey Oaks MRA in the 1950s were used for small arms training. However, it is possible that the rifle grenade training and rocket training continued into the 1950s. In addition, based on the results of the removal action, a hand grenade training area may have

been present in the 1950s. The distribution of rifle grenades is described above, while the distribution of 3.5-inch practice rockets and hand grenade related items is described below.

3.5-Inch Practice Rockets

Practice M29A2 3.5-inch rockets, which were used in the 1950's, were found primarily in the Range 26 area, as well as 1,000 feet west of Range 26 and 1,500 feet northwest of Range 26 (Plate 3-2). The typical range length for this munition is 950 meters, and the longest distance between the three 3.5-inch rocket occurrences is about 500 yards, which suggests that the three locations represent independent uses of these munitions, such as three separate firing points or staging areas.

It is possible that the 3.5-inch rockets were associated with the Austin Anti-Tank Range, which is a firing range that was present as early as 1945. The Austin Anti-Tank Range overlaps slightly with the northwestern edge of the Del Rey Oaks MRA, near Range 26, and firing occurred inward, toward the center of the historical Impact Area. This range was used for firing 2.36-inch rockets from a Bazooka launcher in the 1940s. The 2.36-inch rocket was later replaced by the 3.5-inch rocket, which was also fired from a Bazooka launcher, and was used during the Korean War.

Hand Grenades

Hand grenades, primarily expended and live fuzes associated with practice hand grenades, were found at the western end of AR Table VIII and near Range 26. Based on the localized distribution of these items it is possible that practice hand grenade training occurred in these areas in the 1950s.

Additionally, 35 MKII fragmentation hand grenades (DMM) were found in a burial pit on the north side of south Boundary Road. These items are considered DMM and do not indicate that training with fragmentation hand grenades occurred within the Del Rey Oaks MRA.

1960s

Historical records indicate that training within the Del Rey Oaks MRA in the 1960s used only small arms.

1970s, 1980s, and Early 1990s

Based on available historical records, military munitions other than small arms ammunition were only authorized for use on Range 24. The distribution of MEC and munitions debris identified at Range 24 is described below.

Range 24

35mm Rocket

Subcaliber 35mm M73 practice rockets, both MEC and munitions debris, were found in and adjacent to Range 24. Subcaliber 35mm M73 practice rockets were not found anywhere else in the Del Rey Oaks MRA. Based on review of the removal data and training maps the rockets were fired toward the center of the historical Impact Area, away from the Del Rey Oaks MRA.

Historical records indicating that Range 24 was used for firing sub caliber LAW rockets corroborate well with removal action findings at Range 24; these munitions were known to have been fired away from the Del Rey Oaks MRA and these munitions were found only within and near Range 24.

40mm Practice and Illumination Projectiles

Historical records indicate the firing of M781 40mm practice projectiles at Range 24 in the 1970s, 1980s, and 1990s. M781 40mm practice projectiles were found at Range 24 during removal actions conducted in the Del Rey Oaks MRA. Historical records indicating that Range 24 was used for firing M781 40mm practice projectiles corroborate well with removal action findings at Range 24; these munitions were known to have been fired away from the Del Rey Oaks MRA and these munitions do not occur elsewhere within the Del Rey Oaks MRA.

90mm Training

Historical records indicated that 90mm recoilless rifles were authorized for use at Range 24, however only one piece of munitions debris, a tail boom to a 90mm M348 HEAT projectile was identified during the removals conducted in the Del Rey Oaks MRA. No further munitions of this type were found within the Del Rey Oaks MRA. It is likely that the 90mm training conducted at Range 24 was the M49A1 subcaliber device that used a 7.62mm subcaliber cartridge.

3.4.4 Potential Exposure Routes

The area within the Del Rey Oaks MRA includes six reuse parcels. Land reuse plans have been developed for these parcels. Plate 3-4 presents a conceptual model showing previous use and proposed reuse. As part of the transfer of the property to Del Rey Oaks the Army entered into Covenant to Restrict the Use of Property (CRUP). The CRUP placed a restriction against residential use.

At the time of property transfer, proposed parcel reuse in the Del Rey Oaks MRA included the establishment of a golf course with lodging over much of MRS-15 DRO 01, and development of a business park for light industrial use and research and development. The proposal for revising the reuse to include residential development was not officially reflected in the base reuse plan. All of the proposed reuse scenarios could result in ground disturbing activities occurring (e.g., construction/excavation and landscaping). Because the City of Del Rey Oaks has identified possible residential reuse for the early transfer parcels, residential reuse is also considered in the reuse scenarios.

Although removal actions to depth have been completed across the entire Del Rey Oaks MRA and all detected MEC was removed, the detection efficiency of the geophysical instruments used to detect anomalies is not 100 percent; therefore, the possibility exists that MEC could still be present. It is expected that any remaining MEC would be similar to the types of MEC items that were found in the Del Rey Oaks MRA. MEC items in Del Rey Oaks MRA have been described above.

Potential receptors include construction workers, outdoor maintenance workers, office workers, recreational users, and residents. Based on the proposed reuse, other receptors including office workers and recreational users, are not expected to encounter MEC during in their activities on site because these receptors are not expected to intrude below the ground surface.

Construction workers, maintenance workers, and residents in particular may be more likely to intrude below the ground surface, but it is unlikely that these receptors will encounter MEC because a 100 percent removal to depth has been completed across the Del Rey Oaks MRA.

3.5 Site Evaluation

The available data (e.g., archival and removal data) regarding the Del Rey Oaks MRA were reviewed and evaluated according to procedures described in the *Final Plan for Evaluation of Previous Work* (HLA, 2000c). The evaluation process is documented through the completion of a series of checklists. Checklists were prepared for the area encompassing the Del Rey Oaks MRA (MRS-15 DRO 01, MRS-15 DRO 02 and portions of MRS-43). Copies of the checklists are provided as Appendix A. This section presents a summary of the results of the checklist evaluation. It is divided into two sections; an assessment of the literature review and an assessment of the removals performed at the site. A detailed evaluation of reconnaissance and sampling performed at the Del Rey Oaks MRA is not provided because a removal action was completed.

3.5.1 Literature Review

Several training locations were identified on Fort Ord historical facility maps within the southeastern and northern parts of the Del Rey Oaks MRA, including five ranges (Ranges 24, 25, 26, Austin Antitank, and MG Table II). The expected types of military munitions associated with these activities include 2.36-inch and 3.5-inch rockets, 37mm projectiles, rifle grenades, 35mm subcaliber, and 40mm practice projectiles, 90mm Recoilless Rifles, pyrotechnics, simulators, signals, firing devices, and fuzes and small arms ammunition. Details regarding these types of training and munitions are presented in Section 3.4.

Additional information based on interviews was identified for MRS-43. As part of the Archives Search, an interview was conducted with Mr. Fred Stephani. Mr. Stephani served as a Fort Ord fire fighter from 1942 to 1944 at which time he left the Fort Ord fire department and joined the Army. Mr. Stephani returned to the Fort Ord fire department in 1947 where he worked until he retired, as Fire Chief, in 1978. Mr. Stephani indicated that a portion of the ridge in MRS-43 was used as a backstop for rifle grenades and shoulder-launched projectiles from 1942 to 1944 (*USAEDH, 1997a*). According to Mr. Stephani, firing positions (trenches) were excavated along South Boundary Road and firing was from the southeast to the northwest at a diagonal to the hill. The firing positions were buried when the use was discontinued and the area was control burned in the early 1940s to support this training.

Subsequent Use of the Area

The use of MRS-43 for military munitions related training is not identified on post 1940s Training Maps and the property remains undeveloped. Property to the west of MRS-43 (off base) was subsequently developed. Ranges within MRS-15 DRO 01 are evident on aerial photographs from the mid 1960s through base closure. Ranges, 24, 25 and 26 were utilized as a sniper range (small arms range), overhead firing range (small arms range), and a machine gun transition range respectively at the time of base closure (*USAEDH, 1997a*). From base closure to the present, all of the Del Rey Oaks MRA remains undeveloped. Because the property has not been developed, no conclusions on property conditions related to subsequent use can be developed.

Establishment of Site Boundaries

The establishment of the Del Rey Oaks MRA boundary is not based on a single defined area of use. The Del Rey Oaks MRA encompasses several MRSs which were established to facilitate property transfer rather than on the basis of known military munitions training site boundaries. No clear areas of training are present on aerial photographs for the MRS 43 portion of the Del Rey Oaks MRA. The training areas within the southeastern and northern parts of the Del Rey Oaks MRA are evident on historical aerial photographs from the 1960s until base closure (Appendix A). The ranges extend from within the Del Rey Oaks MRA into MRS-15 BLM. Because the site boundaries were established based on reuse areas rather than on historical information related to military munitions training, no changes to the boundaries are recommended.

Summary of Literature Review Analysis

Based on a review of site literature, there was sufficient historical evidence to warrant sampling for military munitions within the Del Rey Oaks MRA. The historical information reviewed indicates that a wide variety of training activities have been conducted within the Del Rey Oaks MRA including activities involving the use of military munitions.

3.5.2 Removal Action Review

This section describes the Del Rey Oaks MRA based on the results of the military munitions investigations. The historical information related to the removal results as summarized in checklist questions 1 through 14 are not discussed in detail in this section. This information is presented in Section 3.4 and on Plates 3-2 and 3-3. There is a discussion regarding sampling equipment, methods, and quality control measures used during prior sampling and removal efforts.

3.5.2.1 Investigation Design

This section summarizes the information contained in removal checklist questions 15 through 17 (Appendix A). The boundary of the Del Rey Oaks MRA is based on the limits of investigation as defined in the removal contractor's scope of work and not on defined areas of military munitions use. The Del Rey Oaks MRA contains several MRSs investigated as part of the former Fort Ord military munitions response program. Initial sampling was conducted at each site within the Del Rey Oaks MRA to determine if further action (removal) was necessary.

Based on the results of the sampling, MEC removal areas were delineated and recommended for non-time critical removal. Following MEC removal in the defined non-time critical removal areas, 100 percent geophysical investigation was completed at the remainder of the site to support early transfer according to the Final Site OE-15 Del Rey Oaks Group Geophysical Work Plan, which was reviewed and approved by the regulatory agencies. After completion of the non-time critical MEC removal action and additional geophysical investigation and removal activity, it was determined that three areas within the DRO Group Sites required further work; the approximately 30-foot by 2 mile sliver area at the edge of MRS-15 DRO 01 and MRS-15 DRO 02 which was not yet surveyed, Range 26 berm area, and the machine gun link area. This additional MEC removal was conducted in accordance with the *Final OE-15 DRO.1-2 Site Specific Work Plan (Parsons, 2001)* which was reviewed and approved by the regulatory agencies prior to work implementation. The objective of the MEC removal was to remove all detected MEC from each site to a depth of four feet bgs. The entire Del Rey Oaks MRA footprint was subjected to a removal-to-depth

action. In addition, according to the April 24, 2001 *Geophysical Sampling, Investigation & Removal, Inland Range Contract, Former Fort Ord, Site Del Rey Oaks Group, After Action Report (USA, 2001a)*, all anomalies encountered, even those below 4 feet, were actively pursued during 4-foot removal operations. Anomalies identified as a result of the Schonstedt investigation were intrusively investigated until the geophysical instrument no longer showed a response. Anomalies identified using the digital equipment (i.e., EM61) were investigated until the source of the anomaly was resolved. If an anomaly was detected below 4 feet bgs, permission from the USACE UXO Safety Specialist was obtained prior to continuing the investigation (*USA, 2001a*). Based on the statements in the USA report, all anomalies detected within the Del Rey Oaks MRA were investigated and all military munitions removed.

3.5.2.2 Equipment Review

This section describes results of a review of the geophysical instruments used during the removal action performed within the Del Rey Oaks MRA. Information used in this review included the ODDS (*Parsons, 2002*), and results of the Del Rey Oaks Removal Final After Action Report specifically the Del Rey Oaks MRS-15DRO.1, MRS-15DRO.2, and MRS-43 Geophysical Survey Quality Assurance Technical Analysis Technical Memorandum provided as Appendix P to the After Action Report (*USA, 2001a*).

Schonstedt Model GA-52/Cx Magnetometer

The investigation for MEC within Del Rey Oaks performed by USA Environmental, Inc. included using a Schonstedt Model GA-52/Cx magnetometer. This instrument is a passive dual flux-gate magnetometer – a highly sensitive magnetic locator that detects ferrous (iron) metal objects; however, it cannot detect non-ferrous metal objects (e.g., lead, brass, copper, aluminum). In general, magnetometers make passive measurements of the earth's natural magnetic field; ferrous metal objects (and rocks) are detected because they produce localized distortions (anomalies) in the magnetic field. The Schonstedt magnetometer actually detects slight differences in the magnetic field (the “gradient”) by means of two sensors mounted a fixed distance apart within the instrument's staff. Because the magnetic response falls off (changes) greatly even over a short distance, a gradient magnetometer like the Schonstedt is especially sensitive to smaller, near-surface ferro-metal objects (*Breiner, 1973*).

The Schonstedt GA-52/Cx magnetometer is a hand-held device that, when properly adjusted, will emit a distinctive tone when placed near a ferrous metal object; the volume and pitch of this tone can provide an experienced operator with qualitative information about the nature of the detected object (e.g., size, location, subsurface depth). It should be noted, however, that Schonstedt magnetometers will also respond to soil and rock containing ferrous minerals (“hot rocks”). It should also be noted that asphalt pavement may contain enough ferrous mineralization to produce a Schonstedt response, which can mask the response from potential MEC items. Accordingly, it is recognized that the interpretation of the Schonstedt instrument response can be subjective; for deeper targets, especially, the operator often must analyze a subtle change in the audio output and decide whether the instrument is responding to a potential MEC item or to pavement or soil mineralization. Additionally, it can be difficult to determine the exact location of a more deeply buried object because the Schonstedt's audio response may be dispersed over an area that is several feet wide.

The Schonstedt magnetometer is a so-called analog device that does not itself record (save) any data; typically, the location of a detected object (a “hit”) is marked in the field or promptly excavated to uncover the detected object. For that reason, Schonstedt surveys are sometimes called “mag and flag” or

“mag and dig” surveys. The Schonstedt GA-52/Cx was used to survey 1,284 grids within the Del Rey Oaks MRA (USA, 2001a).

Geonics EM61

The Geonics EM61 time domain metal detector is capable of detecting both ferrous and non-ferrous metallic objects while being less sensitive to cultural features such as fences, buildings, and power lines. The instruments typically utilize a transceiver coil 1-meter square but smaller versions are also available. The instrument is easy to use in open areas but is difficult to use in areas of thick vegetation or steep terrain. Two versions, the man-towed cart, and the hand-held versions were used within the Del Rey Oaks MRA. The EM61 hand held (EM61-HH) was only used in special sampling grids. The primary difference between the EM61 and the EM61-HH is that the effective sensing depth of the instrument is less than that of the standard EM61 and requires smaller survey lane spacing to achieve similar coverage.

Geometrics G-858

The Geometrics G-858 is a cesium vapor magnetometer, which detects only ferrous objects. The instrument is relatively light and compact and can be easily used in open areas. In areas of steep or uneven terrain, or areas of thick vegetation, the instruments are more difficult to use.

Del Rey Oaks Survey Procedures

The Del Rey Oaks MRA comprises a number of designated munitions response sites that were surveyed as part of the Del Rey Oaks Group removal actions by USA in 2000 and by Parsons between June 2002 and February 2003 (Parsons, 2003). The vegetation at Del Rey Oaks is characterized as central maritime chaparral and includes oak trees, manzanita, and poison oak. Del Rey Oaks was mechanically cleared of brush to facilitate the MEC surveys, although large oak trees were not removed. The terrain is mostly gentle slopes with some limited depressions. The cleared areas were divided into 100- by 100- foot grids and surveyed along a series of adjacent search lanes. The USA investigations utilized the Schonstedt GA-52/Cx, EM61, and G-858 instruments while the Parsons investigation only used the Schonstedt GA-52/Cx and EM61 as the main instrument to identify anomalies in the eastern boundary (sliver area) investigation area.

During the USA investigations, the EM-61 was used to survey all grids accessible to the cart-mounted instrument. If the grid was not accessible to the EM-61 due to terrain or vegetation constraints, digital geophysics surveys were accomplished using either the EM-61-HH or the G-858. Portions of the Del Rey Oaks MRA were not accessible to any digital instruments and were investigated using the Schonstedt GA-52/Cx.

Schonstedt GA-52/Cx survey procedures, as documented in the USA and Parsons work plans, were performed as follows: the hand-held Schonstedt instrument, which resembles a “walking stick” in appearance, was swung from side to side as the operator walked down the centerline of 5-foot wide search lanes (USA) and 3-foot wide search lanes (Parsons) delineated by lengths of rope laid on the ground. Schonstedt responses indicative of potential MEC items (“hits”) were marked in the field with pin flags and the hit location was excavated until a metal object was encountered or the instrument no longer showed a response.

Digital geophysical investigations procedures as described in the USA and Parsons work plan were performed as follows: surveys were performed on a two to five foot line spacing and a sampling rate of 10 readings/second depending on the type of equipment. The data was then preprocessed, analyzed and processed and individual anomalies were then selected for investigation (excavation) from this data. An EM-61 was used in a three foot radius of the selected anomaly for reacquisition of the anomaly. If the anomaly could not be reacquired, a Schonstedt GA-52/Cx was used to reacquire the anomaly.

Functional checks of the Schonstedt GA-52/Cx and digital geophysical instruments (EM-61 and G858) were performed daily. Additionally, QC and QA surveys were performed. QC procedures entailed a resurvey of at least 10 percent of each grid by a USA QC Officer and a Parsons QC officer for the three follow up areas. QA procedures generally entailed a second 10 percent resurvey by USACE personnel.

Evaluation of Instrument Detection Efficiency at the Del Rey Oaks MRA

As part of the Del Rey Oaks Group removal action, a technical analysis of the performance of instruments used during the geophysical surveys was conducted. In addition to the technical analysis of the performance of instruments, the study also analyzed the survey teams and survey methods used to conduct the MEC removal Actions (USA, 2001a, Parsons, 2003). The technical analysis included seeding 55 QA sets of munitions debris and other target items. Results of the study indicated that 12 of the 55 QA seeded items were not detectable because they were either too small or buried deeper than the instrument could detect. The contractor was able to detect 37 of the 43 detectable seeded items during the removal action, which represents a detection efficiency of 86 percent.

The results of the seeded test were evaluated in the Technical Analysis Memorandum. The evaluation identified only small data gap issues, and concluded that the Del Rey Oaks geophysical investigation successfully detected, excavated and recovered the desired UXO items, that the specified objectives in the Del Rey Oaks Group Work Plan were met, and the imminent safety hazard has been removed.

3.5.2.3 Quality Assurance/Quality Control

The QA/QC procedures used by USA and Parsons during the field operations are described below. The results of the QA/QC review are used to support the “yes” response to Removal Evaluation Checklist Question 24 (Appendix A).

USA Field Operations QA/QC

QA/QC was performed by USA throughout the removal action, including daily operational checks and QC inspections, as documented in the Final After Action Report for the Del Rey Oaks MRA (USA, 2001a). In accordance with the USA work plan (USA, 2001a), all instruments requiring maintenance and/or calibration were checked prior to the start of each workday, batteries were replaced as needed, and the instruments were checked against a known source. The USA Quality Control (QC) specialist was responsible for ensuring that personnel perform operational checks and made appropriate log entries. The QC specialists performed random unscheduled checks of the various sites to ensure the personnel performed the work as specified in the work plan.

Analog QA/QC

The USA quality control audit of grids that were subjected to an analog survey using the Schonstedt magnetometer employed a four-step plan. The contractual Pass/Fail criterion for these audits is zero MEC items. USA also re-examined grids where MEC-like items or five or more uninvestigated anomalies were encountered. The following steps were taken for QC of Schonstedt-surveyed grids:

- Step One – 100 percent Schonstedt magnetometer survey of three grids. Grids 24AB, 31S, and 44F were selected by USA QC. The grids met the QC objective and QC procedures advanced to Step Two.
- Step Two – 30 percent magnetometer surveys of five grids. Grids 17C, 36X, 26R, 25F, and 8F. These five grids met the QC objective and QC procedures advanced to Step Three.
- Step Three – 20 percent magnetometer survey of five grids. Grids 14AC, 24AL 19N, 31D, and 05S. These five grids met the QC objective and QC procedures advanced to Step Four.
- Step Four – Magnetometer survey of the remainder of the Schonstedt-surveyed grids at a 10 percent level. All Schonstedt-surveyed grids passed contractual QC (*USA, 2001a*). Additional QC discussion is provided in the after action report (*USA, 2001a*).

Each grid that was investigated with the Schonstedt magnetometer also underwent a Quality Assurance (QA) survey by the USACE OE Safety Specialist. All grids passed the U.S. Army Engineering Support Center, Huntsville (USAESCH) QA inspection standards and were accepted by the USACE. QA acceptance records are provided in the after action report (*USA, 2001a*).

Digital QA/QC

Grids that were digitally surveyed with the G-858, EM61 or the EM61-HH digital geophysical instruments were also subjected to QC audits by USA. QC of these grids included placement of metal nails or tent pegs at the survey starting and ending points of each grid, to confirm data repeatability including positioning accuracy and the data reduction process. Additional QC was accomplished by performing a secondary geophysical survey using the same instrument as the initial survey. The pass-fail criteria for the second survey audits was zero MEC items encountered, zero MEC like items encountered, and fewer than five anomalies. USA selected the grids to be surveyed, although the data collection was performed by Parsons' personnel. The QC grid-surveying was performed using the following four-step plan:

- Step One - Resurvey 100 percent of three grids. If the grids passed the pass-fail criteria, the QC moved on to Step Two.
- Step Two - Resurvey 30 percent of five grids. If the grids passed the pass-fail criteria, the QC moved on to Step Three.
- Step Three - Resurvey 20 percent of five grids. If the grids passed the pass-fail criteria, the QC moved on to Step Four.
- Step Four - Resurvey all remaining grids at a 10 percent level. There were no grid failures at the 10 percent level.

Quality Assurance provided by the USACE QA personnel included final QA inspections using a Schonstedt magnetometer, and seeding items. All grids passed the USACE QA inspections. Further information about the QA results is provided in the final after action report (USA, 2001a)

Parsons Field Operations QA/QC (G-858, EM61 and EM61-HH)

Throughout investigations of the Eastern Boundary (Sliver area) of the DRO MRA, Parsons performed daily operational checks and QC inspections, as documented in the Final After Action Report for MRS-15 DRO 01 and 02 (Parsons, 2003). All instruments requiring maintenance and/or calibration were checked prior to the start of each workday, batteries were replaced as needed, and instruments were checked against a known source. The Parsons Quality Control (QC) specialist were responsible for ensuring that personnel perform operational checks and made appropriate log entries.

The Parsons QC performed in the Sliver area consisted of a three-step process as follows:

- Step One (QC-1) – Digital check of anomaly excavations to ensure that the source of the anomalies had been removed.
- Step Two (QC-2) – Digital Step-Down survey in which Parsons QC teams checked a percentage of each grid in the Sliver area for any remaining items using a EM-61.
- Step Three (QC-3) – Analog 10 percent survey in which the Parsons QC specialist inspected 10 percent of each grid in the Sliver area using a Schonstedt magnetometer.

There were no QC deficiencies noted in the After Action Reports.

For QA, the on-site USACE UXO Safety Specialist inspected 10% of each grid within the Sliver area with a Schonstedt, because analog surveys using the Schonstedt were completed prior to the digital surveys with the EM61-MK2s. In addition, the USACE geophysicist conducted QA by monitoring digital geophysical data collection and management. Anomaly excavations resulted in no significant items. All grids surveyed with the G-858, EM61 and EM61-HH digital geophysical instruments at the Del Rey Oaks MRA passed USACE QA inspection standards and were accepted by the USACE (USA, 2001a).

Data Management QA/QC

Parsons performed a 100 percent QC review of the data associated with the Del Rey Oaks MRA. This review followed the guidelines presented in the USACE Technical Analysis. This evaluation included a review of the field grid records and the former Fort Ord Munitions Response database. The USACE implemented QA review of ten percent of the data reviewed by Parsons. The QA review included a comparison of the data set with the data set reported in the AAR. The requirements of the USACE QA review are described in the MMRP Database Users Manual (USACE, 2004b). The purpose of the QC data review was to complete a 100 percent check of all available grid records to identify discrepancies between the after action reports and the grid records, if any. Discrepancies were then researched and corrections made, if appropriate, prior to loading the data into the project database.

3.6 Conclusions and Recommendations

The following section presents conclusions and recommendations for the Del Rey Oaks MRA based on the review and analysis of the data associated with historical information and sampling and removal data (Appendix C).

3.6.1 Conclusions

3.6.1.1 Site Use and Development

Based on the results of the literature review, sampling results, and removal action (munitions response), the site appears to have been used for the following types of training:

- Artillery (37mm) prior to WWII.
- Antitank training and practice hand grenade training - firing of shoulder-launched projectiles including practice rifle grenades and practice rockets (2.36-inch and 3.5-inch), in the 1940s and possibly into the early 1950s. Training with practice hand grenades in the 1940s and 1950s and training with practice landmines in the 1940s.
- Small arms ammunition firing ranges (automatic rifles and machine guns) established in the 1950s and 1960s.
- Small arms weapons including overhead firing, machine gun firing, sniper training, and SAW training, and ARTEP using a variety of weapons in the 1970s through 1980s.
- Other MEC and MD not related to the training listed above were also found within the Del Rey Oaks MRA, but appear to be primarily the result of items being discarded in the area.
- Areas of heaviest military munitions concentration were generally associated with the locations of the historical range fans.
- The area remains undeveloped with multiple reuses planned for the area.

3.6.1.2 Removal Adequacy

- Removal actions were performed throughout the Del Rey Oaks MRA; all anomalies were investigated or resolved, and all detected MEC items were removed or destroyed.
- Digital geophysical surveys (MEC removal) using the cart mounted EM61 geophysical instrument were completed in all areas of the Del Rey Oaks MRA that were accessible to the instrument. In areas that were inaccessible to the EM61 because of the terrain or vegetation, digital geophysical surveys were completed using the EM61-HH (hand held) or the G-858 digital geophysical instruments. Areas that were not accessible to any digital instrumentation were investigated using the analog Schonstedt Model GA-52/Cx.
- The Geonics EM61 is capable of detecting both ferrous and non-ferrous metallic objects while being less sensitive to cultural features such as fences, buildings, and power lines. Use of the instrument is

most efficient in open areas becoming more difficult to use in areas of steep terrain and heavy vegetation. The Geometrics G-858 only detects ferrous objects and is easily used in open areas. In areas of steep or uneven terrain, or areas of thick vegetation, the instrument is more difficult to use.

- The Schonstedt Model GA-52/Cx, Geonics EM61, and Geometrics G-858 were evaluated as part of a Geophysical Survey Quality Assurance Technical Analysis and also as part of the Del Rey Oaks MRA removal actions. The results of the evaluation indicate that the instruments are capable of detecting the types of MEC potentially present at the site. The report also stated that based on the QA analysis that the Contractor achieved the desired data quality for the whole site with the exception of a very small number of missed items.
- The Schonstedt Model GA-52/Cx is less effective for detecting the smaller (less than two pounds) or more deeply buried (greater than two feet) objects. For example, surveys conducted as part of the USACE QA program show that a 37mm projectile (1.75 lbs), while readily detected six inches below ground surface (bgs), is difficult to detect and may be undetectable at 18 inches bgs or deeper. In addition, the Schonstedt GA-52/Cx is not effective for detecting some fuzes because they contain little or no ferrous metal. It should be noted that fuzes located in burial pits and as single items were detected during the removal at depths greater than three feet bgs.
- The site boundaries represent the limits of the removal action as specified in the removal contract, and may not reflect the limits of MEC in the area. The Impact Area MRA adjacent to the Del Rey Oaks MRA will be evaluated in a separate MR RI/FS.
- Review of the above data has resulted in the determination that the data is usable for conducting a Risk Assessment and Feasibility Study.

3.6.2 Recommendations

The following recommendations are made for the Del Rey Oaks MRA:

- Review of the available literature, removal results, and equipment performance results indicate that the Del Rey Oaks geophysical investigation successfully detected, excavated and recovered the desired UXO items and that the imminent safety hazard had been removed, however, it is possible for residual concentrations of MEC to remain in the Del Rey Oaks MRA; therefore, a risk assessment and feasibility study should be performed.
- This site qualifies as a Track 2 site because a removal action has been performed and the data are useable for preparation of a risk assessment and feasibility study.

4.0 RISK ASSESSMENT

This section presents a summary of the risk assessment performed for the Del Rey Oaks MRA. The risk assessment focuses on the current or post removal risks. The details of the risk assessment including a discussion of the factors used in scoring the risks are provided in Appendix B.

The MEC risk assessments for Fort Ord provide a qualitative description of the risk related to a receptor encountering a MEC item. Because of the nature of these types of risk assessments is largely qualitative, a specific protocol was developed to evaluate current and future MEC risks to humans at Fort Ord. The Risk Protocol (*Malcolm Pirnie, 2002*), was developed through the combined effort of the Army, DTSC, and EPA, and allows for a comparative review of MEC risks at impacted sites to potential receptors.

The receptors evaluated as part of the risk assessment are based on the proposed reuses for the site. Identified reuses include visitor serving area, a business park, and light industrial and office park (*Army, 2004*). Specific reuses for the visitor service area are not identified however; intended reuses reportedly include a golf course, lodging, and retail. In addition, residential uses were also considered. The site is currently undeveloped. Based on the proposed reuse described above, a recreational user (golfer), indoor worker, outdoor maintenance worker, construction worker, and adult/child resident were evaluated as potential receptors for the risk assessment.

The outcome of the risk assessment is a score for each receptor ranging from A (lowest risk) to E (highest risk). The post removal (a.k.a. "current condition") risks for all of the identified receptors were an A or lowest risk. Although the risk is scored as an A for all receptors based on the Risk Protocol, because of uncertainties identified in the risk assessment, it is not possible to confirm that all MEC has been removed from the site. It is anticipated that receptors that intrude below the ground surface (e.g., construction workers, outdoor maintenance workers, and residents) would have a greater chance of encountering any potentially remaining MEC than non-intruding receptors. To reduce the possibility of an encounter, remedial alternatives should be evaluated in the FS. In particular, review of the RI data indicated that the majority of the high hazard "Type 3" items (37mm projectiles and 2.36-inch rockets) were removed from the northern and southern portions of the Del Rey Oaks MRA. In addition, penetrating projectiles (primarily 75mm Shrapnel, and 37mm projectiles), both as MEC and munitions debris, were found primarily in the northern and southern portions of the Del Rey Oaks MRA. Because these items represent the highest hazard if encountered, and are more likely to be found in the subsurface, greater uncertainty is associated with the removal in these areas. These data should be considered further when evaluating land use controls in the FS.

The risks associated with chemical hazards were addressed as part of the Basewide Range Assessment, which is a component of the Hazardous and Toxic Waste (HTW) RI/FS program. No restrictions related to chemical contamination in soil were recommended following completion of a post remediation risk assessment for the area.

5.0 FEASIBILITY STUDY

This section describes the remedial action objectives; incorporation of risk assessment results; ongoing and future munitions and explosives of concern (MEC)-related activities at the former Fort Ord; and the remedial alternative identified and selected to address the risk to future land users from any MEC that potentially remains at the Del Rey Oaks MRA despite the conclusion that the risk to future users is very low.

The RI/FS process as outlined in the U.S. Environmental Protection Agency's (EPA's) *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA, 1988)* (EPA's RI/FS Guidance) represents the methodology that the Superfund program has established for characterizing the nature and extent of risk posed by contaminated sites and for evaluating potential remedial options. This FS was prepared based on the process outlined in the Guidance; however, it was adapted to fit the unique circumstances related to MEC at the Track 2 sites, and specifically the Del Rey Oaks MRA. As described in EPA's RI/FS Guidance, Section 3.4.2 (Risk Characterization) (*EPA, 1988*), the results of the baseline risk assessment may indicate that the site poses little or no threat to human health or the environment. In such situations, the FS should be either scaled down as appropriate to that site and its potential hazard, or eliminated altogether. If it is decided that the scope of the FS will be less than what is presented in the guidance or eliminated altogether, the lead agency should document this decision and receive the concurrence of the support agency.

Based on discussions amongst the project team (The Army, USACE, EPA, and the DTSC, a part of the Cal/EPA), the scope of this FS follows the guidance. However, based on the results of the RI that indicated MEC removal actions were completed, and the RA that indicated the risks to future users from any potentially remaining MEC at the site is very low, and is limited to reusers performing intrusive activities, the discussions are scaled down to a level appropriate for evaluating and comparing remedial alternatives that do not differ significantly in terms of (1) mitigating the risk to future users from any potentially remaining MEC at the site that is very low and can be addressed through Land Use Controls; or (2) their ability to achieve the remedial action objectives and nine CERCLA evaluation criteria specified in the EPA's RI/FS Guidance described in the following sections (*EPA, 1989*).

5.1 Remedial Action Objectives

The primary remedial action objectives (RAOs) for the Del Rey Oaks MRA based on EPA's RI/FS Guidance (*EPA, 1989*) are to achieve the EPA's threshold criteria of "Overall Protection of Human Health and the Environment" and "Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)". In order to achieve these RAOs, based on the results of the RI and RA, a reuse area:

- Must already be in a state that is protective of human health and the environment and complies with ARARs, or
- Risk management measures must be implemented to mitigate the risks from any potentially remaining MEC at the site, and comply with ARARs.

As described in EPA's Land Use in the CERCLA Remedy Selection Process (*EPA, 2000b*), "Remedial action objectives provide the foundation upon which remedial cleanup alternatives are developed. In general, remedial action objectives should be developed in order to develop alternatives that would

achieve cleanup levels associated with the reasonably anticipated future land use over as much of the site as possible. EPA's remedy selection expectations described in section 300.43.0 (a) (1) (iii) of the National Contingency Plan (NCP) should also be considered when developing remedial action objectives. Where practicable, EPA expects to treat principal threats, to use engineering controls such as containment for low-level threats, to use institutional controls to supplement engineering controls....”

In keeping with EPA's expectations above, (1) the principal threats at the Del Rey Oaks MRA have already been treated (i.e., MEC removal actions have been completed), and (2) institutional controls (herein referred to as Land Use Controls) will be considered in the development of alternatives to address the risk to future land users from any MEC that potentially remains at the site, despite the conclusion that the risk to future users is very low. The Reuse Plan for the Del Rey Oaks MRA, which was put forth in the Fort Ord Reuse Plan (*FORA, 1997*) when the area was identified for early transfer, includes a visitor serving area, an office park, a business park, and a light industrial area.

These RAOs will be achieved through development of alternatives for the Del Rey Oaks MRA reuse that (1) apply the results of the risk assessment to guide selection of risk management measures to mitigate the MEC risks that may remain, and (2) comply with ARARs and other guidelines. A discussion of these components and their consideration in the development of remedial alternatives for the Del Rey Oaks MRA is presented below.

5.2 Application of Risk Assessment Results

As part of the basewide MR RI/FS process for the former Fort Ord, the Army is required to conduct a MEC risk assessment. According to CERCLA, the results of the risk assessment should help establish acceptable remediation levels for use in developing remedial alternatives during the FS.

As described in the EPA guidance *Handbook on the Management of Ordnance and Explosives at Closed, Transferring, and Transferred Ranges and Other Sites (EPA, 2002)*, the evaluation of risk from contact with MEC that may remain onsite cannot be quantitatively estimated based on current information and scientific practices. However, a qualitative estimate of overall MEC risks can serve as a valuable tool in guiding the evaluation of risk management measures to achieve RAOs during reuse.

A risk assessment is used, in this case, to describe the qualitative and quantitative factors leading to an encounter between a potential reuse receptor and a MEC item. Several methods exist for performing risk assessments on MRSs; however, no MEC risk assessment methodology has been widely accepted, evaluated, and fully implemented for a variety of MRSs. As described in Section 4.0, for the basewide MR RI/FS being conducted at the former Fort Ord, the project team (the Army, EPA, and DTSC; a part of Cal/EPA) developed a unique risk assessment protocol to qualitatively estimate MEC risks for sites including Track 2 sites such as the Del Rey Oaks MRA (Risk Protocol; *Malcolm-Pirnie, 2002*). For the Del Rey Oaks MRA Risk Assessment, because MEC removals have been completed, “After-Action” (after MEC removal) reuse conditions were evaluated. “Overall MEC Risk Scores” were developed for the after action reuse scenarios and multiple anticipated “receptors” assumed to be present during development and reuse of the Del Rey Oaks MRA. The MEC risk assessment does not establish acceptable remediation levels, but is used to develop and evaluate remedial alternatives during the FS.

The RA results are based on the following three key factors that are assigned reuse-specific values and are weighted in importance: (1) MEC Hazard Type, (2) Accessibility, (3) Exposure. These factors were used

according to the Risk Protocol to develop an Overall MEC Risk Score for each potential receptor at a given reuse area as follows:

Overall MEC Risk Score	A	B	C	D	E
	Lowest	Low	Medium	High	Highest

These qualitative Overall MEC Risk Scores are used in this FS to guide the development and evaluation of alternatives. The results of the RA for the Del Rey Oaks MRA indicated the MEC sampling and removal actions completed decreased the Overall MEC risks for all of the reuse-specific receptors evaluated: a recreational user (golfer), indoor worker, outdoor maintenance worker, construction worker, and adult/child resident. That is, Overall MEC Risk Scores were estimated as the lowest (A) based on current site conditions and anticipated reuses. Although the risk is scored as an A for all receptors based on the Risk Protocol, because of uncertainties identified in the risk assessment, it is not possible to confirm that all MEC has been removed from the site. It is anticipated that receptors that intrude below the ground surface (e.g., construction workers, outdoor maintenance workers, and residents) would have a greater chance of encountering any potentially remaining MEC than non-intruding receptors. To reduce the possibility of an encounter, the RA indicated land use controls should be evaluated as part of the remedial alternatives evaluated in the FS.

5.3 Land Use Control Guidelines

Section 121 of CERCLA requires that site cleanups comply with federal and state laws that are “applicable or relevant and appropriate requirements” (ARARs). Under CERCLA Section 121(d)(2), the federal ARARs for a remedial action could include requirements under any of the federal environmental laws. State ARARs include promulgated requirements under state environmental or facility siting laws that are more stringent than federal ARARs, and that have been identified in a timely manner, pursuant to 40 Code of Federal Regulations (CFR) Part 300.400(g)(4). A requirement may be either “applicable” or “relevant and appropriate.”

This section presents a discussion of ARARs and land use control guidelines. In determining whether a requirement is pertinent to MEC at the former Fort Ord, potential ARARs are initially screened for applicability. If determined not to be applicable, the requirement is then reviewed for both relevance and appropriateness. Requirements that are considered to be relevant and appropriate command the same importance as applicable requirements. Potential ARARs that are determined to be applicable or relevant and appropriate for a site are those substantive requirements related to implementation of a response action, and do not include administrative or procedural requirements.

No potential federal and state ARARs were determined to apply for land use controls at the Del Rey Oaks MRA; however, remedial alternatives will be implemented in compliance with land use control guidelines described below. While the Army does not consider California laws and regulations concerning Land Use Covenants to be potential ARARs, the Army has entered into a state Land Use Covenant at the time the property was transferred, and after the Del Rey Oaks MRA ROD is signed, the existing covenant will be modified to document the land use restrictions that are selected as part of the remedy. Although the DTSC and EPA disagree with the Army’s determination that California laws and regulations concerning Land Use Covenants are not potential ARARs, they will agree - to - disagree on this issue if the covenant is modified to be consistent with the ROD and modifications are acceptable to the DTSC. Land Use

Covenants signed by the Army and the State of California in the past restricting the reuse of the property were acceptable to the DTSC.

The following guidelines set forth by the EPA, Department of Defense (DoD), and DTSC are relevant to potential land use controls that may be selected for the Del Rey Oaks MRA will be considered in the development and implementation of remedial alternatives.

As described in the Management Principles for Implementing Response Actions at Closed, Transferring, and Transferred Ranges (DoD/EPA, 2000):

- Land use controls must be clearly defined, established in conjunction with affected parties, and enforceable.
- Land use controls will be considered as part of the development and evaluation of alternatives for a given Closed, Transferring, or Transferred (CTT) range.
- DoD (the Army) will conduct periodic reviews to ensure the long-term effectiveness of response actions, including Land Use Controls.

In addition, DoD/EPA guidelines specifically address the requirement for institutional controls (Land Use Controls) when MEC contamination has been or may still be on the site as follows:

“Property transfer records shall detail past munition and explosive contamination and decontamination efforts; provide requisite residual contamination information; and advise the user not to excavate or drill in a residual contamination area without a metal detection survey.”

The EPA policy *Institutional Controls and Transfer of Real Property under CERCLA Section 120 (h)(3)(A), (B), or (C)* (EPA, 2000a) requires the responsible agency to perform the following activities:

- "Monitor the institutional controls' effectiveness and integrity.
- Report the results of such monitoring, including notice of violation or failure of control to the appropriate EPA and/or State regulator, local or Tribal government, and designated party or entity responsible for enforcement.
- Enforce the institutional controls should a violation or failure of controls occur."

In addition, the policy states that “In order to ensure long-term protection of human health and safety in the presence of potential explosive hazards, institutional controls must be enforceable against whoever may gain ownership or control of the property in the future.”

In 1987, DTSC developed policy recommending the use of a Land Use Covenant to Restrict the Use of Property based on statutory authority in the California Health and Safety Code (Chapters 6.5, 6.8, 6.85) and the California Civil Code, Section 1471, which allows a nonowner of property to enter into environmental restrictions due to the presence of hazardous materials, hazardous wastes or constituents, or hazardous substances that will remain at the property at levels which are not suitable for unrestricted use of the land. In April, 2003, DTSC adopted regulations to add Section 67391.1—Requirements for Land Use Covenants to Restrict the Use of Property—to Title 22, Division 4.5, Chapter 39, of the California Code of Regulations.

These regulations apply only to DTSC and specify that a Land Use Covenant imposing appropriate limitations on land use shall be executed and recorded at a county recorder's office so that they will be found during a title search of county records. The Land Use Covenant regulations require DTSC to clearly set forth and define land use limitations or covenants in a remedy selection or response action decision document (for the Del Rey Oaks MRA under CERCLA, the Record of Decision) prior to approving or concurring with a response action. The decision document must also include an implementation and enforcement plan.

Land Use Covenants are proprietary controls, agreed to by property owners, to allow ongoing use of the property as long as the cleanup remedy is not compromised by current or future development. Land Use Covenants include written instruments and agreements restricting land uses, easements, servitudes, covenants and land use restrictions, i.e., they are non-engineering mechanisms to restrict activities and site access to limit exposure pathways of human and environmental receptors to prevent exposure to contaminants. Land Use Covenants "run with the land", i.e., they are binding on current and subsequent property owners, and remain in effect until they are formally removed or modified, pursuant to the California Health and Safety Code, sections 25233, 25234, and 25398.7. These regulations state that DTSC may later modify or terminate Land Use Covenants if it is determined such modification or termination is protective of public health and safety and the environment.

For sites requiring Land Use Covenants, DTSC policy requires that the property owner enter into a Land Use Covenant to Restrict the Use of Property Agreement to ensure that the state will have authority to implement, monitor, and enforce protective restrictions. Restrictions agreed to in Land Use Covenant are typically intended to do the following:

- Prevent inappropriate land use on property containing residual contamination or the surrounding property;
- Guarantee that information about property containing residual contamination is available to local governments and the public;
- Disclose to real estate transactions participants (buyers, sellers, lending institutions, brokers, title companies) that the property in question contains residual contamination;
- Ensure that long-term mitigation measures or monitoring requirements are carried out and maintained;
- Ensure that the integrity and stability of the remedy is maintained;
- Ensure that subsequent property owners or lessees have a duty to assume responsibility for any requirements or restrictions pertaining to residual contamination when they take over the property;
- Ensure that DTSC will be contacted prior to change in land use or the cleanup remedy; and
- Ensure that only DTSC can terminate or modify the remedy (Land Use Covenant to Restrict the Use of Property per DTSC policy).

5.4 Ongoing and Future MEC-Related Activities

This section describes ongoing and future MEC-related activities at the former Fort Ord that are components of the Army's basewide efforts to promote MEC safety because of Fort Ord's history as a military base. Many of these activities are described in the Army's Community Relations Plan (*Army, 2006*; updated periodically) and the Army's Munitions Response Site Security Program (*Army, 2005b/2006*; reviewed and updated annually). These long-term measures are in place for the former Fort Ord regardless of the selected remedial alternatives implemented at a munitions response site (MRS) or area (MRA). Section 5.6 describes measures that are specific to implementation and management of the remedial alternatives selected for the Del Rey Oaks MRA.

Five-Year Review

A review of the basewide MR RI/FS sites will be conducted as part of the Fort Ord five-year review process. 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 five 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 newly identified site-related data or issues that are identified during the review, and the report identifies recommendations to address them as appropriate. The Second Five Year Review for the Fort Ord Superfund Site is to be completed in 2007, and the Third Five Year Review will be completed in 2012.

Deed Notice

The following general type of notice is typically included in the deed for any property transferring from former Fort Ord.

- "Munitions Response (MR) investigations indicate that it is not likely that MEC are located within the property. However, there is a potential for MEC to be present because military munitions were used throughout the history of Fort Ord."

The Del Rey Oaks MRA has been early-transferred and the Deed included a notice of the potential presence of munitions and explosives of concern (*Army, 2004*).

MEC Incident Reporting

There is a potential for MEC to be present on the former Fort Ord because military munitions were used throughout its history. In the event MEC is discovered by a future user of former Fort Ord land, a process has been developed for reporting such finds to an appropriate local law enforcement agency. The local law enforcement agency will arrange a response by competent UXO-qualified personnel, who will promptly be dispatched to dispose of any discovered MEC. This process is documented and must be acknowledged by the future grantee, its successors or assigns. A "Safety Alert" pamphlet and the Ordnance and Explosives Incident Reporting Form are provided to the property users. The process for reporting the discovery of MEC is provided in the Deed for Del Rey Oaks Parcels E29a, 29b.1, E31a, E31b, E31c, and E36.

MEC Recognition and Safety Training

The Army offers “MEC recognition and safety training” to anyone conducting ground disturbance activities (e.g., digging holes, excavating trenches, repairing underground utilities, etc.) at the former Fort Ord. The Army or the Army’s representative conducts a 30-minute training session. This training session includes a lecture on what type of MEC might be found and the procedure to follow if something is found. The “Safety Alert” brochure is also distributed. Trained construction personnel will contact an appropriate local law enforcement agency if a potential military munitions item is encountered. The local law enforcement agency will then arrange a response by UXO-qualified personnel. The following organizations have received MEC recognition and safety training: California State University Monterey Bay (CSUMB), Pacific Gas & Electric, Pacific Bell, the Bureau of Land Management, and various contractors used by developers at Fort Ord. MEC recognition and safety training can be scheduled by contacting the Fort Ord BRAC office at (831) 242-7919. The Deed for Del Rey Oaks Parcels E29a, 29b.1, E31a, E31b, E31c and E36 states that MEC recognition and safety training is available. MEC recognition and safety training is provided by the Army at no cost to the property owner.

School Education

Since 1997, the former Fort Ord has had a MEC Safety Education Program that is offered to local public and private schools annually. The objective of this program is to provide school-age children with the ability to recognize the visible attributes of various MEC items likely to exist on the former Fort Ord, associate danger with MEC items and former Fort Ord MEC areas, and understand the actions to be taken when a possible item is observed. This program has a three-tiered approach that includes distribution of the “Safety Alert” to organizations and agencies who provide information to the local community, a 1-hour MEC safety presentation for local elementary and middle schools for 5th, 6th, and 7th grade students, and distribution of the “Safety Alert” to parents of children in the local schools and high school students. Representatives from the Army conduct the MEC safety presentation.

Community Involvement

The Army is committed to develop opportunities to assist community members in understanding and participating in the cleanup decision-making process at the former Fort Ord. The Army holds public meetings, Community Involvement Workshops, Technical Review Committee (TRC) meetings, open houses, and conducts public information sessions through booths or tables at local community events. The Army provides public and media tours of former Fort Ord cleanup activities, distributes fact sheets, and makes presentations to special interest and community groups as necessary to address specific community concerns or explain significant cleanup activities. The Army also maintains document repositories available to the public including the administrative record and several information repositories at local libraries. Additionally, the Army administers a public environmental cleanup web site and mails monthly cleanup updates (www.fortordcleanup.com). The web site provides background information, a description of current activities, documents available for public comment, maps, notices, and agendas for upcoming public meetings. The monthly cleanup update includes information on recent cleanup activities, recently published documents and fact sheets, and is mailed to those who have requested to be on the community relations mailing list and distributed at community involvement events. Community involvement activities are documented in a Community Relations Plan that is updated annually.

Local and State Ordinances

Some local jurisdictions have established ordinances to monitor or control intrusive activities in specified areas of the former Fort Ord to manage risks of encountering potential MEC. The City of Del Rey Oaks' Excavation Ordinance, which applies to the Del Rey Oaks MRA, is presented in Appendix D and summarized below in Section 5.5.2.

5.5 Identification of Applicable Response Actions

This section describes the applicable response actions that could mitigate and manage the risk to future land users from any MEC that potentially remains at the Del Rey Oaks MRA despite the conclusion that the risk to future users is very low because MEC removals were completed at the site. The response actions considered include:

- No Further Action
- Land Use Controls.

The individual components of the Land Use Controls described herein are screened and developed into reuse area-specific remedial alternatives in Section 5.7. The No Further Action Alternative is provided, as required under CERCLA and the National Contingency Plan (NCP), as a baseline for comparison to the other proposed remedial alternatives. This alternative assumes no further action would be taken related to MEC at the Del Rey Oaks MRA.

Land Use Controls

The reuse-specific Land Use Controls currently in-place or that are potentially applicable for the Del Rey Oaks MRA are described in the following sections. If selected as part of the remedy for the Del Rey Oaks MRA reuse areas, these Land Use Controls will be implemented in accordance with the guidelines presented in Section 5.3 (Land Use Control Guidelines), and will be described in further detail in the Remedial Design/Remedial Action Work Plan (RD/RAWP). Under the Federal Facility Agreement (FFA) between the Army, EPA, and DTSC, a schedule for preparation of the RD/RAWP for the Del Rey Oaks MRA will be submitted within 21 days of signature of the record of decision (ROD). A Land Use Covenant to Restrict the Use of Property imposing limitations on land use was executed at the time of the land transfer.

The following Land Use Controls are currently in-place or will be considered for the Del Rey Oaks MRA reuse areas and are described below:

- Deed and/or Zoning Restrictions;
- Excavation Ordinance;
- Construction Support;
- MEC Recognition and Safety Training; and
- Residential Use Restriction.

5.5.1 Deed and/or Zoning Restrictions

These types of restrictions may be appropriate if placing controls on, or limits to, property use would prevent or limit exposure to potentially remaining MEC at a reuse area. Specific types of restrictions would vary depending on the reuse area conditions, potential MEC risks, and anticipated future land use. Examples could include restrictions that require the property owner to apply for and obtain a permit from the local jurisdiction prior to excavation of soil, or restrictions that prevent residential use of the property. This control would identify who would be responsible for implementation, monitoring, reporting, and enforcement. If selected for implementation at the Del Rey Oaks MRA reuse areas, these restrictions would be described in further detail in the remedial design/remedial action work plan (RD/RAWP).

Deed restrictions that are currently in-place for Del Rey Oaks Parcels E29a, 29b.1, E31a, E31b, E31c and E36 include a residential use restriction. The City of Del Rey Oaks is currently in the process of changing the zoning ordinance applicable to former Fort Ord property within their jurisdiction.

Deed and/or zoning restrictions regarding potential MEC risks at a Del Rey Oaks MRA reuse area would establish the appropriate restriction that indicates:

- Specified reuses evaluated in the RA that were designated and approved at the time the Army transferred the property must be maintained by all property owners.
- Potential MEC risks may increase if changes in the designated and approved reuse are implemented.

At the time of the next five-year review, the Army or Army's representatives would assess whether the restrictions should continue. If experience indicates that no MEC items have been found in the course of development or redevelopment of the reuse area, it is anticipated that the restrictions may, with the approval of the regulatory agencies, be discontinued, subject to reinstatement if a MEC item is encountered in the future.

5.5.2 Excavation Ordinance

Pursuant to an agreement with the DTSC, the City of Del Rey Oaks has adopted a City Ordinance (City Ordinance 259, Chapter 15.48), which addresses the potential explosives safety risks posed by MEC, particularly unexploded ordnance (UXO), by requiring permits for certain excavation activities. The City of Del Rey Oaks has designated all real property within the City's land use jurisdiction, which was formerly part of Fort Ord and identified as a possible location of UXO as an "Ordnance Remediation District" ("District"). This includes the Del Rey Oaks MRA. A copy of the Excavation Ordinance is presented in Appendix D. In summary, the Ordinance indicates a permit shall be required prior to the commencement of ground disturbing activities of any kind, and that any person engaging in the following activities must first obtain a permit from the City: excavation, digging, development, or ground disturbance of any type involving the displacement of 10 cubic yards or more of soil. The requirements to be followed under a permit include MEC safety and recognition training, and construction support by UXO-qualified personnel. In addition, the City of Del Rey Oaks will notify the owners of property within the Del Rey Oaks MRA and those utilities known to be providing services within the City, of the requirements of the Excavation Ordinance and provide those persons with the Safety Alert – Ordnance and Explosives at Former Fort Ord. The City will also annually notify the owners of property within the Del Rey Oaks MRA, as shown on the equalized tax rolls, of the requirements of the Excavation Ordinance and provide those persons with a copy of the requirements.

5.5.3 Construction Support

The Army has completed munitions response actions within the Del Rey Oaks MRA. The clearance effort was completed to the level of appropriate technology and the Army's standard, except for portions of Parcels E29a and E29b.1 within Range 26 (Range 26 Berm Area). With the exception of the Range 26 Berm Area, the Army does not believe construction support is necessary at the Del Rey Oaks MRA. As a result of regulatory agency review of the site data and input from the project team, however, the Army is including site-wide construction support as a land use control requirement throughout the Del Rey Oaks MRA, but the City of Del Rey Oaks is responsible for its implementation. In an agreement between the DTSC, the City of Del Rey Oaks, and the Fort Ord Reuse Authority (FORA), the City of Del Rey Oaks will provide on-site UXO-qualified personnel to conduct construction support within all of the Del Rey Oaks MRA during any intrusive or ground-disturbing construction activities at these reuse areas to address potential MEC risks to construction personnel.

Construction support would be arranged during the construction planning stages of the project prior to the start of any intrusive activities. UXO-qualified personnel would monitor construction activities for the potential presence of MEC during any intrusive activities. If evidence of MEC is found during intrusive construction activities, the work would cease; a process has been developed for reporting such finds to an appropriate local law enforcement agency. The local law enforcement agency would promptly dispatch or arrange a response by competent UXO-qualified personnel.

Based on the results of the MEC removal operations as identified in the RI and RA (Sections 3.0 and 4.0), no further munitions response actions are recommended within the Del Rey Oaks MRA. However, a portion of Parcels E29a and E29b.1 (within 11 grids in the Range 26 berm area) were transferred with restrictions in accordance with AR 405-90, Appendix D-4(b) (*Army, 1985*). The berm includes 11 MEC removal grids, identified as requiring construction support during intrusive work operations that exceed a depth of 4 feet. The Army will provide construction support within the "11 grid area" during soil excavation or movement at depths exceeding 4 feet bgs. All intrusive operations in this area (exceeding a depth of 4 feet) shall be in accordance with Engineer Pamphlet (EP) 75-1-2 (*USACE, 2004a*). Machine gun links found in this area indicate that the excavated level of the berm, in some areas, does not match the surrounding undisturbed terrain. The specific location of each of the 11 grid area is delineated on Plate 3-3. Construction support may be applicable in the short-term during development of the reuse area, and/or in the long-term during established reuse. Any MEC-related data that may be identified during construction support would be reported by the City of Del Rey Oaks under the annual letter reporting, and the results would be presented in the Army's five-year review report.

As part of ongoing annual letter reporting and five-year review reporting, a review of any MEC-related data collected during and after development would be performed and documented for assessment by the project team (the Army, EPA, and DTSC; a part of Cal/EPA) to determine whether construction support during and after established reuse should continue. At the time of the next five-year review, the need for continued construction support would be assessed. If experience indicates that no MEC items have been found in the course of development, redevelopment, or reuse of an area, it is anticipated that the requirements may, with the approval of the regulatory agencies, be discontinued, subject to reinstatement if a MEC item is encountered in the future.

5.5.4 MEC Recognition and Safety Training

For the Del Rey Oaks MRA, digging or underground "intrusive" activities are planned for the proposed reuses and development. The Army recommends that construction personnel involved in intrusive operations at these reuse areas attend the "MEC recognition and safety training" to increase their awareness of and ability to identify MEC items as specified in the Deed Restriction. Prior to planned intrusive activities, the Army will, at its own expense, provide MEC recognition and safety training, upon request, for all workers performing intrusive activities as appropriate to area-specific conditions identified in the RD/RAWP.

At the time of each five-year review, the Army or Army's representatives would assess whether the training program should continue. If information indicates that no MEC items have been found in the course of development or redevelopment of the reuse area, it is anticipated that the program for the DRO MRA may, with the approval of the regulatory agencies, be discontinued, subject to reinstatement if a MEC item is encountered in the future.

5.5.5 Residential Use Restriction

Because the Army has completed munitions response actions within the Del Rey Oaks MRA, the Army believes a residential use restriction is not necessary. Although the response action is complete, because the detection efficiency of the geophysical equipment is not assumed to be 100 percent, it is possible that MEC may remain at the Del Rey Oaks MRA. Based on the review of the site information, the regulatory agencies identified residential use restrictions should be placed on the property; therefore, at the time of early transfer of the property, the Army agreed to enter into a Land Use Covenant to Restrict the Use of Property with the DTSC prohibiting the Del Rey Oaks MRA from residential use. . For the purpose of this document, residential use includes, but is not limited to, residences, schools, daycare facilities, hospitals, and hospices (*DTSC, 2002*). The Residential Use Restriction would only apply to specified areas where regulatory agency review of the RI data indicated the northern and southern portions of the Del Rey Oaks MRA contained:

- The majority of the high hazard "Type 3" items (37mm projectiles and 2.36-inch rockets); and
- Penetrating projectiles (primarily 75mm Shrapnel, and 37mm projectiles), both as MEC and munitions debris.

Because these items represent the highest hazard if encountered, and are more likely to be found in the subsurface, the regulatory agencies expressed a greater uncertainty associated with the completeness of the MEC removals in these areas. Plate E-1 of Appendix E shows the approximate northern and southern portions of the site where in discussions with the Army and EPA, DTSC provided a representation of where they have determined the residential use restriction would apply, until successful implementation of the DTSC's 2004 *Draft Protocol for Authorizing Residential Uses at Del Rey Oaks* (Residential Quality Assurance Protocol) summarized in Appendix E and described below, as verified by DTSC. Any proposal for residential development in the Del Rey Oaks MRA where this restriction applies will be subject to regulatory review.

5.5.6 Draft Protocol for Authorizing Residential Use

As described in Section 5.5.5 above, residential use is restricted under the current deed for the entire Del Rey Oaks MRA. However, DTSC has proposed a Residential Quality Assurance Protocol that it believes will be sufficient to further evaluate MEC areas and, if necessary, remove MEC items to provide assurance that residential and other uses are appropriate. That protocol is summarized in Appendix E.

5.6 Long Term Management Measures Specific to the Del Rey Oaks MRA

Long Term Management Measures that will be implemented at the Del Rey Oaks MRA include (1) a deed restriction, (2) annual letter reporting by the City of Del Rey Oaks, unless a variance has been granted pursuant to the 2004 DTSC agreement, and (3) five-year review reporting by the Army. These measures are considered as implementation and management aspects of the remedial alternatives, rather than specific mitigation measures and are implemented as a standard process under any remedial alternative. These measures would be described in further detail in the RD/RAWP. Information from annual letter reporting and five-year review report within the Del Rey Oaks MRA and any MEC-related data that may be identified after transfer of the property will be collected and reported. The Army will review the letter report on a yearly basis, and the information will be considered in the five-year review.

5.7 Description of Remedial Alternatives

The following restrictions and conditions on the use and occupancy (Land Use Controls) have been identified to address remaining risks at Del Rey Oaks MRA parcels. These restrictions and conditions on the use and occupancy of Del Rey Oaks MRA parcels would be described in the revised federal deed and state Land Use Covenant. The following three remedial alternatives were developed for evaluation and comparison based on EPA's nine criteria:

- **Alternative 1: No Further Action**—Provided as a baseline for comparison to the other remedial alternatives as required under CERCLA and the National Contingency Plan (NCP).
- **Alternative 2: Conditions on Soil Disturbance Activities to Minimize MEC Exposure**—Includes MEC recognition and safety training and construction support workers conducting intrusive activities, that would be described in further detail in the RD/RAWP.
- **Alternative 3: Conditions on Soil Disturbance Activities to Minimize MEC Exposure and Residential Use Restrictions Including Contingency to Address Proposed Change in Site Reuse**—Includes MEC recognition and safety training and construction support for workers conducting intrusive activities, and a modified residential use restriction that would be removed upon successful implementation of the Residential Quality Assurance Protocol, as verified by DTSC.

It should be noted that (1) grading activities are part of redevelopment activities and are not considered part of the Land Use Control remedial alternatives; and (2) compliance with environmental requirements associated with redevelopment would be the reuser's responsibility.

5.7.1 Alternative 1—No Further Action

The No Further Action Alternative is provided, as required under CERCLA and the NCP, as a baseline for comparison to the other proposed remedial alternatives. This alternative assumes no further action would be taken to manage the risk to future land users from MEC that potentially remain in the Del Rey Oaks MRA where MEC investigations and removal actions have been completed. The deed and Covenant to Restrict the Use of Property would be modified to remove the following Land Use Controls: construction support in the 11 grids in the Range 26 berm area and unrestricted/residential use restriction.

5.7.2 Alternative 2—Conditions on Soil Disturbance Activities to Minimize MEC Exposure

This alternative was developed to address the uncertainty regarding the detection efficiency for the geophysical equipment that is not assumed to be 100 percent, rather than to mitigate a known risk posed by MEC that is not expected to be present at the site. The following conditions on soil disturbance activities would be implemented and maintained for the Del Rey Oaks MRA:

- MEC Recognition and Safety Training for Entire Site—The Army recommends reasonable and prudent precautions be taken when conducting intrusive operations and will provide MEC recognition and safety training, upon request, for any persons that will be conducting such activities. MEC recognition and safety training is required for workers involving soil disturbance activity within the 11 grids in the Range 26 berm area at depths exceeding 4 feet.
- Construction Support in 11-Grid Area—The Army will provide construction support within 11 grids in the Range 26 berm area during soil excavation or movement at depths exceeding 4 feet.
- Site-Wide Construction Support—The City of Del Rey Oaks (the land owner) will provide site-wide construction support in compliance with the Excavation Ordinance everywhere else at the site as defined in the agreement between the City of Del Rey Oaks and DTSC at the time of early transfer of the property. The Army does not believe site-wide provision for construction support is necessary based on the results of the RI and RA; however, pursuant to the Del Rey Oaks – DTSC Agreement, the City of Del Rey Oaks agreed to implement this requirement, at the transferee's expense, through establishment and maintenance of a city ordinance.

These conditions on soil disturbance activities would be implemented in accordance with the guidelines presented in Section 5.3 of this report, and will be described in further detail in the Remedial Design/Remedial Action Work Plan (RD/RAWP). Under the Federal Facility Agreement (FFA) between the Army, EPA, and DTSC, a schedule for preparation of the RD/RAWP for the Del Rey Oaks MRA will be submitted within 21 days of signature of the ROD. After the signature of the ROD, the current federal deed and state Land Use Covenant will be modified, if necessary, to be consistent with the final remedy.

These conditions on soil disturbance activities would be maintained by the Army and City of Del Rey Oaks until EPA and DTSC concur that the site is protective of human health and environment without construction support and MEC recognitions and safety training on the basis of: 1) further site evaluation incorporating new information (e.g. limited geophysical mapping, site development) and/or 2) where, using construction support, it is determined that the depth of soil disturbance related to development activities is sufficient to address the uncertainty of MEC remaining in soil and any MEC found as part of the development are removed.

At the time of five-year reviews, the Army will evaluate the effectiveness of each of the conditions on soil disturbance activities. If information indicates that no MEC items have been found in the course of development, redevelopment, or reuse of an area, it is anticipated that the conditions may, with the approval of the regulatory agencies, be modified or discontinued.

In the event that a MEC item is discovered at the site, the reuser is to immediately report to the local law enforcement agency. In accordance with established procedures, the local law enforcement agency will in turn request a response by authorized UXO-qualified personnel (e.g., an Explosive Ordnance Disposal [EOD] unit) who will promptly be dispatched to destroy or otherwise take control of the reported military munitions item.

5.7.3 Alternative 3—Conditions on Soil Disturbance Activities to Minimize MEC Exposure and Residential Use Restrictions Including Contingency to Address Proposed Change in Site Reuse

This alternative was developed assuming that a modified Residential Use Restriction would be implemented and maintained in specified areas of the Del Rey Oaks MRA in order to address proposed changes in site reuse until the Residential Quality Assurance Protocol is successfully implemented, as verified by DTSC. For the purpose of this document, residential use includes, but is not limited to, residences, schools, daycare facilities, hospitals, and hospices. The Residential Use Restriction would only apply to specified areas where regulatory agency review of the RI data indicated the northern and southern portions of the Del Rey Oaks MRA contained:

- The majority of the high hazard “Type 3” items (37mm projectiles and 2.36-inch rockets); and
- Penetrating projectiles (primarily 75mm Shrapnel, and 37mm projectiles), both as MEC and munitions debris.

Because these items represent the highest hazard if encountered, and are more likely to be found in the subsurface, the regulatory agencies expressed a greater uncertainty associated with the completeness of the MEC removals in these areas. Plate E-1 of Appendix E shows the approximate northern and southern portions of the site where in discussions with the Army and EPA, DTSC provided a representation of where they have determined the residential use restriction would apply, until successful implementation of the Residential Quality Assurance Protocol, as verified by DTSC.

The Residential Use Restrictions is included in Alternative 3 in addition to the conditions on soil disturbance activities described for Alternative 2 above, as follows:

Conditions on Soil Disturbance Activities to Minimize Exposure to MEC

- MEC Recognition and Safety Training—The Army recommends reasonable and prudent precautions be taken when conducting intrusive operations and will provide MEC recognition and safety training, upon request, for any persons that will be conducting such activities. MEC recognition and safety training is required for workers involving soil disturbance activity within the 11 grids in the Range 26 berm area at depths exceeding 4 feet.
- Construction Support in the 11-Grid Area—The Army will provide construction support within 11 grids in the Range 26 berm area during soil excavation or movement at depths exceeding 4 feet.

- **Site-Wide Construction Support**—The City of Del Rey Oaks (the land owner) will provide site-wide construction support in compliance with the Excavation Ordinance everywhere else at the site as defined in the agreement between the City of Del Rey Oaks and DTSC at the time of early transfer of the of the property. The Army does not believe site-wide provision for construction support is necessary based on the results of the RI and RA; however, pursuant to the Del Rey Oaks – DTSC Agreement, the City of Del Rey Oaks agreed to implement this requirement, at the transferee’s expense, through establishment and maintenance of a city ordinance.

These land use controls would be maintained by the Army and City of Del Rey Oaks until EPA and DTSC concur that the site is protective of human health and environment without construction support and MEC recognitions and safety training on the basis of: 1) further site evaluation incorporating new information (e.g. limited geophysical mapping, site development) and/or 2) where, using construction support, it is determined that the depth of soil disturbance related to development activities is sufficient to address the uncertainty of MEC remaining in soil and any MEC found as part of the development are removed.

Residential Use Restrictions

- The Army believes that a residential use restriction is not necessary for the entire Del Rey Oaks MRA, but based on regulatory agency input regarding explosive items that were present in the northern and southern parts of the Del Rey Oaks MRA, a residential use restriction in these portions of the site will be required (Plate E-1). In the central portion of the MRA, the regulatory agencies do not believe that the residential use restriction must continue; therefore, the existing deed limiting the property with those restrictions would need to be modified. The residential use restriction on the remainder of the Del Rey Oaks MRA would be modified to allow for residential use if the Residential Quality Assurance Protocol is successfully implemented, as verified by DTSC. Any proposal for residential development in the Del Rey Oaks MRA where this restriction applies will be subject to regulatory review. Residential use for these specified areas will be prohibited until 1) the land owner (currently the City of Del Rey Oaks) notifies the Army, EPA and DTSC in writing of its intent to change the designated site use from recreational/commercial to residential, in advance; and 2) DTSC is satisfied that residential use is appropriate, on the basis of the Residential Quality Assurance Protocol or further site evaluation incorporating new information (e.g., geophysical mapping, site development etc.).

The above conditions on soil disturbance activities, excluding the residential use restrictions, would be maintained by the Army and City of Del Rey Oaks until EPA and DTSC concur that the site is protective of human health and environment without construction support and MEC recognitions and safety training on the basis of: 1) further site evaluation incorporating new information (e.g. limited geophysical mapping, site development) and/or 2) where, using construction support, it is determined that the depth of soil disturbance related to development activities is sufficient to address the uncertainty of MEC remaining in soil and any MEC found as part of the development are removed.

At the time of five-year reviews, the Army will evaluate the effectiveness of each of the conditions on soil disturbance activities. If experience indicates that no MEC items have been found in the course of development, redevelopment, or reuse of an area, it is anticipated that the conditions may, with the approval of the regulatory agencies, be modified or discontinued.

In the event that a MEC item is discovered at the site, the reuser is to immediately report to the local law enforcement agency. In accordance with established procedures the local law enforcement agency will in turn request a response by authorized UXO-qualified personnel (e.g., an Explosive Ordnance Disposal [EOD] unit) who will promptly be dispatched to destroy or otherwise take control of the reported military munitions item.

5.8 Evaluation and Comparison of Remedial Alternatives

This section presents the evaluation and comparison of remedial alternatives for the Del Rey Oaks MRA based on the nine CERCLA evaluation criteria specified in the EPA's RI/FS Guidance (EPA, 1989).

The evaluation and comparison of potentially applicable remedial alternatives is based on the following nine evaluation criteria specified in the EPA's RI/FS Guidance (EPA, 1989).

Threshold Criteria (Remedial Action Objectives; See Section 5.1)

- 1) *Overall Protection of Human Health and the Environment* – An alternative must eliminate, reduce, or control threats to public health and the environment through treatment or institutional controls.
- 2) *Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)* – The alternative must meet Federal and State environmental statutes, regulations, and other requirements that pertain to the site or area unless a waiver is justified.

Balancing Criteria

- 1) *Long-Term Effectiveness and Permanence* – Considers the ability of an alternative to maintain protection of human health and the environment over time.
- 2) *Reduction of Toxicity, Mobility, or Volume Through Treatment* – Evaluates the alternative's use of treatment (for which there is a statutory preference) to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
- 3) *Short-Term Effectiveness* – Considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
- 4) *Implementability* – Considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services. Technical feasibility considerations include the availability of services, necessary equipment, and skilled workers to implement a particular alternative. Administrative feasibility includes obtaining necessary permits and regulatory approvals for implementation of the alternative.
- 5) *Cost* – Capital and long-term management (LTM) costs are estimated for each alternative based on quotes for labor, materials, and equipment necessary to implement the alternative. For annual LTM costs, the net present value (NPV) is calculated over the expected period of years it will take to implement the alternative based on real discount rates (similar to interest rates) that vary according to the period of performance for federal projects. For those alternatives whose life-cycle is indeterminate or exceeds 30 years, for the purposes of evaluating and comparing alternatives as specified in EPA's RI/FS Guidance (EPA, 1989), a period of 30 years is used for estimating long-term LTM costs. USACE/EPA provide guidelines for estimating remedial alternative costs in the

Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-75 (January 2007; updated yearly), Office of Management and Budget (OMB), Executive Office of the President, Appendix C. The guidelines for federal projects are applied to cost estimates provided by Army/USACE contractors for the alternatives. These cost estimates are intended to have an accuracy of +50 percent/-30 percent.

Modifying Criteria

- 1) State Acceptance – Evaluates technical and administrative issues and concerns that the state may have regarding each alternative. State Acceptance will be addressed in the Del Rey Oaks MRA RI/FS ROD once comments on the RI/FS report and Proposed Plan have been received (*EPA, 1989*).
- 2) Community Acceptance – Evaluates issues and concerns that the public may have regarding each alternative. Community Acceptance will be addressed in the Del Rey Oaks MRA RI/FS ROD once comments on the report and Proposed Plan have been received (*EPA, 1989*).

5.8.1 Overall Protection of Human Health and the Environment

MEC removal actions were conducted at the Del Rey Oaks MRA and all detected MEC and MD was investigated and removed. Therefore, MEC is not expected at the site.

Each of the remedial alternatives would provide protection of the environment at the Del Rey Oaks MRA.

Alternative 1 would not be protective of human health for the receptors assumed in the RA to be conducting intrusive activities in the 11-grid area. Alternatives 2 and 3 would be protective of human health for the receptors assumed in the RA to conduct intrusive activities during development or reuse of the area. Receptors that are expected to perform intrusive activities during or after development would be protected under this alternative because the landowner will be required to implement and maintain the Land Use Controls identified. Alternative 3 would provide an additional level of protection by maintaining and implementing a Residential Use Restriction in specified areas to address proposed changes in site reuse.

5.8.2 Compliance with ARARs

There are no ARARs that apply to implementation of Alternative 1. No potential federal and state ARARs were determined to apply for land use controls at the Del Rey Oaks MRA; however, remedial alternatives will be implemented in compliance with land use control guidelines. While the Army does not consider California laws and regulations concerning Land Use Covenants to be potential ARARs, the Army has entered into a state Land Use Covenant at the time the property was transferred, and after the Del Rey Oaks MRA ROD is signed, the existing covenant will be modified to document the land use restrictions that are selected as part of the remedy. Although the DTSC and EPA disagree with the Army's determination that California laws and regulations concerning Land Use Covenants are not potential ARARs, they will agree - to - disagree on this issue if the existing covenant is modified to be consistent with ROD and the modifications are acceptable to the DTSC. Land Use Covenants signed by the Army and the State of California in the past restricting the reuse of the property were acceptable to the DTSC.

5.8.3 Short-Term Effectiveness

Alternative 1 would not be effective in the short term because no further action would be taken to mitigate MEC risks to workers assumed in the RA to conduct intrusive activities during development or reuse. Alternatives 2 and 3 would be effective in the short term (during development) because land use controls would be implemented to mitigate MEC risks to workers assumed in the RA to conduct intrusive activities during development or reuse.

5.8.4 Long-Term Effectiveness and Permanence

Alternative 1 would not provide long-term effectiveness or permanence because no further action would be taken to mitigate MEC risks to workers assumed in the RA to conduct intrusive activities during long-term reuse. Alternatives 2 and 3 would provide long-term effectiveness and permanence because land use controls would be implemented to mitigate MEC risks to workers assumed in the RA to conduct intrusive activities during long-term reuse. Alternative 3 would provide an additional level of long-term effectiveness and permanence by maintaining and implementing a Residential Use Restriction in specified areas to address proposed changes in site reuse.

5.8.5 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative 1 would not provide reduction of these parameters through treatment because no further action would be taken to mitigate MEC risks to workers assumed in the RA to conduct intrusive activities. The principal threats have already been treated (i.e., MEC removal actions have been completed); therefore, Alternatives 2 and 3 would not provide additional reduction of these parameters through treatment.

5.8.6 Implementability

Alternative 1 would not be administratively feasible to implement, because the necessary approvals to take no further action to mitigate MEC risks to workers assumed in the RA to conduct intrusive activities are not expected. Alternatives 2 and 3 would be administratively feasible to implement, because the necessary approvals to implement and maintain Land Use Controls are already in place and/or are expected to be obtained. The necessary services, equipment, and skilled workers to implement this alternative are readily available. These alternatives would involve a moderate level of effort to implement from a technical perspective during development and reuse, because the following activities would need to be coordinated prior to the start of intrusive work: (1) provide MEC recognition and safety training to all construction personnel performing intrusive activities and refresher training on an ongoing basis as appropriate, and (2) mobilize UXO-qualified personnel to provide construction support during intrusive construction activities. The need for construction support during reuse would be assessed after development has been completed.

5.8.7 Cost

Cost estimating assumptions, unit costs, and real discount rates (that vary according to the period of performance) that are associated with implementation of the remedial alternatives are provided in Appendix F, and costs for the alternatives are summarized on Table F-1.

Long Term Management Measures (deed restriction, annual letter reporting, and five-year review reporting) will be implemented at the Del Rey Oaks MRA as implementation and management aspects of the selected remedial alternative. The costs associated with implementing these measures for the Del Rey Oaks MRA over a period of 30 years are approximately \$97,000. Cost estimates for these measures are provided in Appendix F, Table F-2.

There are no costs associated with implementation of Alternative 1. The costs associated with implementing conditions on soil disturbance activities under Alternatives 2 and 3 include capital costs of approximately \$67,000 associated with the Army implementing construction support within the 11-grid area at depths greater than 4 feet bgs. Cost estimates for this alternative are provided in Appendix F, Table F-3. The following costs are assumed by the City of Del Rey Oaks (the land owner): (1) annual letter reporting; (2) construction support within the entire Del Rey Oaks MRA (except for depths greater than 4 feet bgs in the approximate 2.5-acre 11 grid area, which are included as Army costs on Table F-3); and (3) application of DTSC's Residential Quality Assurance Protocol in applicable areas.

5.8.8 State Acceptance

State acceptance will be addressed in the Del Rey Oaks MRA RI/FS ROD once comments on the RI/FS report and Proposed Plan have been received.

Alternative 1 is not likely to be acceptable to the regulatory agencies because it does not take action to mitigate MEC risks to workers assumed in the RA to conduct intrusive activities during the planned development and reuse of the site. Alternatives 2 may be acceptable to the regulatory agencies because it takes action in both the short and long term to mitigate MEC risks to workers assumed in the RA to conduct intrusive activities during the planned development and reuse, thereby providing protection of human health. Alternative 3 is likely to be acceptable to the regulatory agencies because it takes action both in the short and long term to mitigate MEC risks to workers assumed in the RA to conduct intrusive activities during the planned development and reuse, thereby providing protection of human health. In addition, Alternative 3 is anticipated to be preferable to the regulatory agencies because it provides an additional layer of protection by maintaining and implementing a Residential Use Restriction in specified areas to address proposed changes in site reuse.

5.8.9 Community Acceptance

Community acceptance will be addressed in the Del Rey Oaks MRA RI/FS ROD once comments on the RI/FS report and Proposed Plan have been received.

Alternative 1 is not likely to be acceptable to the public because it does not take action to mitigate MEC risks to workers assumed in the RA to conduct intrusive activities during the planned development and reuse. Alternatives 2 and 3 are likely to be acceptable to the public because they take action both in the short and long term to mitigate MEC risks to workers assumed in the RA to conduct intrusive activities during the planned development and reuse, thereby providing protection of human health.

5.9 Identification of the Preferred Alternative

This section presents a summary of the preferred alternative of Conditions on Soil Disturbance Activities to Minimize MEC Exposure and Residential Use Restriction Including Contingency to Address Proposed Change in Site Reuse, that best met the evaluation criteria and was selected for implementation at the Del

Rey Oaks MRA. In addition, this alternative accommodates the proposed change in reuse by the current property owner, and is expected to be acceptable to DTSC. The costs associated with implementing this alternative include capital costs of approximately \$67,000 associated with the Army implementing construction support within the 11-grid area at depths greater than 4 feet bgs (Appendix F, Table F-3).

In addition, the following Long Term Management Measures will be implemented: (1) a deed restriction, (2) annual letter reporting by the City of Del Rey Oaks, unless a variance has been granted pursuant to the 2004 DTSC agreement, and (3) five-year review reporting by the Army. These measures will be implemented to (1) warn property owners of potential MEC risks associated with intrusive activities, (2) monitor and report any MEC-related data during development or reuse, and (3) assess and manage information regarding the continued protectiveness of these alternatives over time. The implementation and maintenance of these measures are estimated to have a total cost over a period of 30 years of approximately \$97,000 (Appendix F, Table F-2).

Conditions on Soil Disturbance Activities to Minimize Exposure to MEC

- MEC Recognition and Safety Training—The Army recommends reasonable and prudent precautions be taken when conducting intrusive operations and will provide MEC recognition and safety training, upon request, for any persons that will be conducting such activities. MEC recognition and safety training is required for workers involving soil disturbance activity within the 11 grids in the Range 26 berm area at depths exceeding 4 feet.
- Construction Support in the 11-Grid Area—The Army will provide construction support within 11 grids in the Range 26 berm area during soil excavation or movement at depths exceeding 4 feet.
- Site-Wide Construction Support—The City of Del Rey Oaks (the land owner) will provide site-wide construction support in compliance with the Excavation Ordinance everywhere else at the site as defined in the agreement between the City of Del Rey Oaks and DTSC at the time of early transfer of the of the property. The Army does not believe site-wide provision for construction support is necessary based on the results of the RI and RA; however, pursuant to the Del Rey Oaks – DTSC Agreement, the City of Del Rey Oaks agreed to implement this requirement, at the transferee’s expense, through establishment and maintenance of a city ordinance.

These land use controls will be maintained by the Army and City of Del Rey Oaks until EPA and DTSC concur that the site is protective of human health and environment without construction support and MEC recognitions and safety training on the basis of: 1) further site evaluation incorporating new information (e.g. limited geophysical mapping, site development) and/or 2) where, using construction support, it is determined that the depth of soil disturbance related to development activities is sufficient to address the uncertainty of MEC remaining in soil and any MEC found as part of the development are removed.

Residential Use Restrictions

- The Army believes that a residential use restriction is not necessary for the Del Rey Oaks MRA, but based on regulatory agency input regarding explosive items that were present in the northern and southern parts of the Del Rey Oaks MRA, a residential use restriction in these portions of the site will be required (Plate E-1). In the central portion of the MRA, the regulatory agencies do not believe that the residential use restriction is required; therefore, the existing deed limiting the property with those restrictions would need to be modified. The residential use restriction on the remainder of the Del

Rey Oaks MRA will be modified to allow for residential use if the Residential Quality Assurance Protocol is successfully implemented, as verified by DTSC. Any proposal for residential development in the Del Rey Oaks MRA where this restriction applies will be subject to regulatory review. Residential use for these specified areas will be prohibited until 1) the land owner (currently the City of Del Rey Oaks) notifies the Army, EPA and DTSC in writing of its intent to change the designated site use from recreational/commercial to residential, in advance; and 2) DTSC is satisfied that residential use is appropriate, on the basis of the Residential Quality Assurance Protocol or further site evaluation incorporating new information (e.g., geophysical mapping, site development etc.).

The conditions on soil disturbance activities, excluding the residential use restrictions will be implemented in accordance with the guidelines presented in Section 5.3 of this report, and will be described in further detail in the Remedial Design/Remedial Action Work Plan (RD/RAWP). Under the Federal Facility Agreement (FFA) between the Army, EPA, and DTSC, a schedule for preparation of the RD/RAWP for the Del Rey Oaks MRA will be submitted within 21 days of signature of the ROD. After the signature of the ROD, the current federal deed and state Land Use Covenant will be modified to remove the residential use restriction from the central portion of the Del Rey Oaks MRA and provide that the residential restriction on the remainder of the Del Rey Oaks MRA will be removed upon successful implementation of the Residential Quality Assurance Protocol, as verified by DTSC.

The above conditions on soil disturbance activities, excluding the residential use restrictions, will be maintained by the Army and City of Del Rey Oaks until EPA and DTSC concur that the site is protective of human health and environment without construction support and MEC recognitions and safety training on the basis of: 1) further site evaluation incorporating new information (e.g. limited geophysical mapping, site development) and/or 2) where, using construction support, it is determined that the depth of soil disturbance related to development activities is sufficient to address the uncertainty of MEC remaining in soil and any MEC found as part of the development are removed.

At the time of five-year reviews, the Army will evaluate the effectiveness of each of the conditions on soil disturbance activities. If experience indicates that no MEC items have been found in the course of development, redevelopment, or reuse of an area, it is anticipated that the conditions may, with the approval of the regulatory agencies, be modified or discontinued.

In the event that a MEC item is discovered at the site, the reuser is to immediately report to the local law enforcement agency. In accordance with established procedures the local law enforcement agency will in turn request a response by authorized UXO-qualified personnel (e.g., an Explosive Ordnance Disposal [EOD] unit) who will promptly be dispatched to destroy or otherwise take control of the reported military munitions item.

The regulatory agencies identified this draft Residential Quality Assurance Protocol as a suitable mechanism to lift the residential use restriction. Successful implementation of the draft Residential Quality Assurance Protocol would confirm that the subject area is suitable for unrestricted use and the residential use restriction would be removed. During redevelopment activities by the property owner, initial grading of the top layer of soil would be followed by a geophysical investigation described in DTSC's Residential Quality Assurance Protocol to confirm that MEC are not present in those areas as summarized in Appendix E. Because unrestricted residential reuse was not part of the designated use at the time the property was transferred from the Army, any cost associated with changing the reuse by implementing this or any other activity would be the reuser's responsibility.

6.0 APPROVAL PROCESS

The approval process for the Del Rey Oaks MRA RI/FS includes the following components:

- Prepare the RI/FS report with regulatory agency and public review of the Draft and Draft Final reports.
- Prepare a Proposed Plan that presents the Army's preferred alternative for the Track 2 Del Rey Oaks MRA and summarizes the results of the RI, RA, and FS.
- Solicit public comments on the Proposed Plan during a 30-day review period.
- Provide an opportunity for a public meeting on the Proposed Plan where written and verbal comments can be submitted.
- Prepare the Record of Decision (ROD) that (1) summarizes the results of the RI, RA, and FS, (2) includes a Responsiveness Summary that summarizes any public comments received on the Proposed Plan, and Army responses to comments, and (3) specifies the details of the selected remedy(s), including plans for development and submittal of a Remedial Design/Remedial Action Work Plan (RD/RAWP). Under the Federal Facility Agreement (FFA) between the Army, EPA, and DTSC, a schedule for preparation of the RD/RAWP for the Del Rey Oaks MRA will be submitted within 21 days of signature of the ROD.
- Receive EPA approval of the ROD, and review by DTSC.

Announce the decision regarding the remedy selection in a local major newspaper and place copies of the RI/FS, Proposed Plan, and ROD in the Administrative Record and local information repositories.

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Footnote: Identifiers that appear in [brackets] at the end of a reference are the Fort Ord Administrative Record number for that document.