

# FORA ESCA REMEDIATION PROGRAM

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## FINAL Group 2 Remedial Investigation / Feasibility Study Volume 2: Risk Assessment

California State University Monterey Bay Off-Campus  
Munitions Response Area

Former Fort Ord  
Monterey County, California

February 18, 2013

*Prepared for:*

**FORT ORD REUSE AUTHORITY**

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Group 2 Remedial Investigation/Feasibility Study  
Volume 2: Risk Assessment  
Former Fort Ord  
Monterey County, California



18 Feb 2013

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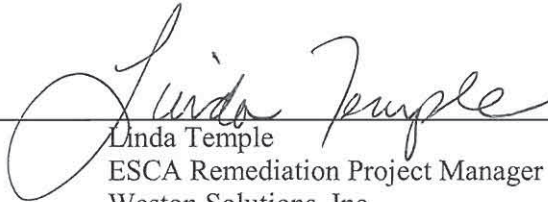
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## ACRONYMS AND ABBREVIATIONS

ac	acres
ACES	Areas Covered by Environmental Services
AOC	Administrative Order on Consent
ARAR	applicable or relevant and appropriate requirement
Army	United States Department of the Army
bgs	below ground surface
BO	biological opinion
BRA	Basewide Range Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm <sup>3</sup>	cubic centimeters
CSM	Conceptual Site Model
CSUMB	California State University Monterey Bay
DEM	digital elevation model
DMM	discarded military munitions
DOD	United States Department of Defense
DQO	data quality objective
DTSC	Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
ESCA RP	Environmental Services Cooperative Agreement Remediation Program
FFA	Federal Facility Agreement
FORA	Fort Ord Reuse Authority
FOSET	Finding of Suitability for Early Transfer
ft	feet
g	grams
GIS	geographic information system
HA	historical area
HFA	Human Factors Applications, Inc.
HMP	Habitat Management Plan
in <sup>2</sup>	square inches
in <sup>3</sup>	cubic inches
IRP	Installation Restoration Program
kg	kilograms

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MD	munitions debris
MEC	munitions and explosives of concern
MOUT	Military Operations in Urban Terrain
MR	Munitions Response
MRA	Munitions Response Area
MRS	Munitions Response Site
NRMA	natural resources management area
NPL	National Priorities List
ODDS	Ordnance Detection and Discrimination Study
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SEDR	Summary of Existing Data Report
SSURGO	Soil Survey Geographic
USA	USA Environmental, Inc.
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UXB	UXB International, Inc.
UXO	unexploded ordnance

## GLOSSARY

### **Anomaly**

Any item that is seen as a subsurface irregularity after geophysical investigation. This irregularity should deviate from the expected subsurface ferrous and non-ferrous material at a site (i.e., pipes, power lines, etc.).

### **Anomaly Avoidance**

Techniques employed by unexploded ordnance (UXO) personnel at sites with known or suspected munitions and explosives of concern (MEC) to avoid any potential surface MEC and any subsurface anomalies. This usually occurs at mixed hazard sites when hazardous, toxic, and radioactive waste investigations must occur prior to execution of an MEC removal action. Intrusive anomaly investigation is not authorized during ordnance avoidance operations.

**Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980**  
CERCLA authorizes federal action to respond to the release or threatened release of hazardous substances into the environment or a release or threatened release of a pollutant or contaminant into the environment that may present an imminent or substantial danger to public health or welfare.

### **Construction Support**

Assistance provided by United States Department of Defense (DOD) explosive ordnance disposal (EOD) or UXO-qualified personnel and/or by personnel trained and qualified for operations involving chemical agents (CA), regardless of configuration, 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, or CA, regardless of configuration, to ensure the safety of personnel or resources from any potential explosive or CA hazards.

### **Covenant Deferral Request (CDR)**

A letter along with a supporting information package known as a Covenant Deferral Request (CDR) is assembled by the Federal landholding to formally request deferral of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) covenant until all remediation has been accomplished prior to transfer. United States Environmental Protection Agency (EPA) requires that the information is: 1) of sufficient quality and quantity to support the request for deferral of the CERCLA covenant; and 2) that it provides a basis for EPA to make its determination. This information is submitted to EPA in the form of a CDR.

### **Deferral period**

The period of time that the CERCLA covenant warranting that all remedial action is complete before transfer, is deferred through the Early Transfer Authority.

### **Discarded Military Munitions (DMM)**

Generally, 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 UXO, 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])

### Early Transfers

The transfer by deed of federal property by United States Department of Defense (DOD) to a nonfederal entity before all remedial actions on the property have been taken. Section 120 (h)(3)(C) of the CERCLA allows Federal agencies to transfer property before all necessary cleanup actions have been taken. This provision, known as early transfer authority, authorizes the deferral of the CERCLA covenant when the findings required by the statute can be made and the response action assurances required by the statute are given. The Governor of the state where the property is located must concur with the deferral request for property not listed on the National Priorities List (NPL). For NPL property, the deferral must be provided by the EPA with the concurrence of the Governor. Upon approval to defer the covenant, DOD may proceed with the early transfer.

### Environmental Services Cooperative Agreement Remediation Program (ESCA RP Team)

ARCADIS U.S., Inc. (formerly LFR Inc.), Weston Solutions, Inc., and Westcliffe Engineers, Inc.

### Exclusion Zone

A safety zone established around a MEC work area. Only essential project personnel and authorized, escorted visitors are allowed within the exclusion zone. Examples of exclusion zones are safety zones around MEC intrusive activities and safety zones where MEC are intentionally detonated.

### Explosive

A substance or a mixture of substances that is capable by chemical reaction of producing gas at such temperature, pressure, and speed as to cause damage to the surroundings. The term “explosive” includes all substances variously known as high explosives and propellants, together with igniters, primers, initiators, and pyrotechnics (e.g., illuminant, smoke, delay, decoy, flare, and incendiary compositions).

### Feasibility Study (FS)

The primary objective of the FS is “to ensure appropriate remedial alternatives are being developed and evaluated and an appropriate remedy selected” (NCP 40 CFR 300.430[e]).

### Geophysical Reacquisition

Geophysical Reacquisition involves utilizing both a positioning method (i.e., Global Positioning System [GPS], ultrasonic, or tape from corners) and geophysical instruments to reacquire and pinpoint anomaly locations selected by the geophysical processors. The geophysical instruments include the original instrument used for the digital survey of the grid and the analog instrument being utilized by the UXO teams for intrusive activities. The intended result of this method is to pinpoint the location where the intrusive teams will find the subsurface item causing the anomaly.

**Intrusive Activity**

An activity that involves or results in the penetration of the ground surface at an area known or suspected to contain MEC. Intrusive activities can be of an investigative or removal action nature.

**Mag and dig**

Utilizing hand held geophysical instruments to detect anomalies and immediately investigating the anomalies (without using collection of digital data and post processing to determine which anomalies to dig) by manual digging or with the assistance of heavy equipment.

**Mag and flag**

Utilizing handheld geophysical instruments to detect anomalies, marking anomalies with a flag and later investigating the anomalies by manual digging or with the assistance of heavy equipment.

**Material Documented as Safe (MDAS)**

Material Potentially Presenting an Explosive Hazard (MPPEH) that has been assessed and documented as not presenting an explosive hazard and for which the chain of custody has been established and maintained. This material is no longer considered to be MPPEH.

**Material Documented as an Explosive Hazard (MDEH)**

MPPEH that cannot be documented as MDAS, that has been assessed and documented as to the maximum explosive hazards the material is known or suspected to present, and for which the chain of custody has been established and maintained. This material is no longer considered to be MPPEH.

**Material Potentially Presenting an Explosive Hazard (MPPEH)**

Material that, prior to determination of its explosives safety status, potentially contains explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris); or material potentially containing a high enough concentration of explosives such that the material presents an explosive hazard (e.g., equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated munitions production, demilitarization or disposal operations). Excluded from MPPEH are munitions within DOD's established munitions management system and other hazardous items that may present explosion hazards (e.g., gasoline cans, compressed gas cylinders) that are not munitions and are not intended for use as munitions.

**Memorandum of Agreement (MOA)**

“Memorandum of Agreement Among the Fort Ord Reuse Authority, Monterey County and Cities of Seaside, Monterey, Del Rey Oaks and Marina, California State University Monterey Bay, University of California Santa Cruz, Monterey Peninsula College, and the Department of Toxic Substances Control Concerning Monitoring and Reporting of Environmental Restrictions on the Former Fort Ord, Monterey County, California.”

**Military Munitions**

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 of the above. 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][A through C]).

**Military Munitions Response Program (MMRP)**

Department of Defense-established program that manages the environmental, health and safety issues presented by munitions of explosives concern.

**Minimum Separation Distance (MSD)**

Minimum distance between a potential explosion site (PES) and personnel, assets, or structures, required to provide the appropriate level of protection from a detonation (either intentional or unintentional) at the PES.

**Munitions and Explosives of Concern (MEC)**

This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks, means: (A) UXO, as defined in 10 U.S.C. 101(e)(5)(A) through (C); (B) Discarded military munitions (DMM), as defined in 10 U.S.C. 2710(e)(2); or (C) Munitions constituents (e.g., TNT, RDX), as defined in 10 U.S.C. 2710(e)(3), present in high enough concentrations to pose an explosive hazard.

**Munitions Constituents (MC)**

Any materials originating from UXO, discarded military munitions, 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).

**Munitions Debris (MD)**

Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal.

**Munitions Response Area (MRA)**

Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples include former ranges and munitions burial areas. A munitions response area is comprised of one or more munitions response sites.

**Munitions Response Site (MRS)**

A discrete location within an MRA that is known to require a munitions response.

**Ordnance and Explosives (OE)**

See MEC.

**Quality Assurance (QA)**

An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed to meet project requirements.

**Quality Control (QC)**

The overall system of operational techniques and activities that measures the attributes and performance of a process, item, or service against defined standards that are used to fulfill requirements for quality.

**Record of Decision (ROD)**

A ROD is the document used to record the remedial action decision made at a National Priorities List property. The ROD will be maintained in the project Administrative Record and project file.

**Remedial Investigation (RI)**

The RI is intended to “adequately characterize the site for the purpose of developing and evaluating an effective remedial alternative” (NCP, 40 CFR 300.430[d]). In addition, the RI provides information to assess the risks to human health, safety, and the environment that were identified during risk screening in the site investigation.

**Remedial Actions**

Those actions consistent with a permanent remedy taken instead of or in addition to removal actions in the event of a release or threatened release of a hazardous substance into the environment, to prevent or minimize the release of hazardous substances so that they do not migrate to cause substantial danger to present or future public health, welfare, or the environment. The term includes but is not limited to such actions at the location of the release as storage; confinement; perimeter protection using dikes, trenches, or ditches; clay cover; neutralization; cleanup of released hazardous substances and associated contaminated materials; recycling or reuse; diversion; destruction; segregation of reactive wastes; dredging or excavations; repair or replacement of leaking containers; collection of leachate and runoff; on-site treatment or incineration; provision of alternative water supplies; and any monitoring reasonably required to assure that such actions protect the public health, welfare, and the environment. The term includes the costs of permanent relocation of residents and businesses and community facilities where the President of the United States determines that, alone or in combination with other measures, such relocation is more cost-effective and environmentally preferable to the transportation, storage, treatment, destruction, or secure disposition off site of hazardous substances, or may otherwise be necessary to protect the public health or welfare. The term includes off-site transport and off-site storage, treatment, destruction, or secure disposition of hazardous substances and associated contaminated materials.

**Response Action**

Action taken instead of or in addition to a removal action to prevent or minimize the release of MEC so that it does not cause substantial danger to present or future public health or welfare or the environment.

**Technology-Aided Surface Removal**

A removal of UXO, DMM, or chemical warfare material (CWM) on the surface (i.e., the top of the soil layer) only, in which the detection process is primarily performed visually, but is augmented by technology aids (e.g., handheld magnetometers or metal detectors) because vegetation, the weathering of UXO, DMM, or CWM, or other factors make visual detection difficult.

**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, installation, personnel, or material; and (C) remain unexploded either by malfunction, design, or any other cause. (10 U.S.C. 101[e][5][A through C]).

**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 Occupations, contractor positions: UXO Technician II, UXO Technician III, UXO Safety Officer, UXO Quality Control Specialist, or Senior UXO Supervisor.

**UXO Technicians**

Personnel who are qualified for and filling Department of Labor, Service Contract Act, Directory of Occupations, contractor positions of UXO Technician I, UXO Technician II, and UXO Technician III.

## 1.0 INTRODUCTION

The former Fort Ord is located on Monterey Bay in northwestern Monterey County, California (Figure 1). Since 1917, portions of the former Fort Ord were used by the United States Department of the Army (Army) for maneuvers, target ranges, and other purposes. Military munitions were fired into, fired upon, or used on the facility. As a result, a wide variety of conventional munitions and explosives of concern (MEC), consisting of unexploded ordnance (UXO) and discarded military munitions (DMM) items, have been encountered at the former Fort Ord.

This Group 2 Remedial Investigation/Feasibility Study (RI/FS) Report was prepared by the Environmental Services Cooperative Agreement (ESCA) Remediation Program (RP) Team on behalf of the Fort Ord Reuse Authority (FORA) in accordance with an Administrative Order on Consent (AOC), which addresses cleanup of portions of the former Fort Ord in Monterey County, California. The ESCA RP Team consists of ARCADIS U.S., Inc. (formerly LFR Inc.), Weston Solutions, Inc., and Westcliffe Engineers, Inc.

This report has been prepared in accordance with the AOC Task 4 and Task 5. ARCADIS U.S., Inc., has prepared this document on behalf of FORA in accordance with industry standards and consistent with the requirements of the Remediation Services Agreement dated March 30, 2007 by and between ARCADIS U.S., Inc., and FORA including any applicable governing documents and applicable laws and regulations.

The AOC was entered into voluntarily by the United States Environmental Protection Agency (EPA) Region 9, the California Department of Toxic Substances Control (DTSC), FORA, and the United States Department of Justice Environment and Natural Resources Division (EPA Region 9 CERCLA Docket No. R9-2007-03). The AOC was issued under the authority vested in the President of the United States by Sections 104, 106, and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 United States Code (U.S.C.) §§ 9604, 9606, and 9622.

As described in the Summary of Existing Data Report (SEDR; ESCA RP Team 2008), Group 2 included the California State University Monterey Bay (CSUMB) Off-Campus Munitions Response Area (MRA) and the County North MRA, which was formerly referred to as the Development North MRA (Figure 1). In August 2009, the Track 1 Plug-In Approval Memorandum (“the Approval Memorandum”) was submitted for the County North MRA by the Army for public review and comment (Army 2009b). A notice announcing agency concurrence with the Approval Memorandum was published on March 16, 2010. The Track 1 Plug-In process was described in the Army’s “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 Contamination at Site 3 (MRS-22),” dated March 10, 2005 (Army 2005). Therefore, this Group 2 RI/FS Report only addresses the CSUMB Off-Campus MRA.

This Group 2 RI/FS Report: 1) describes the nature and extent of MEC; 2) assesses explosives safety risk that may be present; and 3) develops, screens, and evaluates alternatives to reduce the potential explosives safety risk to current and future property owners and the general public. The Group 2 RI/FS Report will be used by the Army in developing the Proposed Plan and making a decision on remedial actions. In accordance with the guidance provided in the Group 2 RI/FS Work Plan (ESCA RP Team 2009), the Group 2 RI/FS Report is based on the evaluation of previous work, including the subsurface removal of MEC, conducted for the CSUMB Off-Campus MRA.

## 1.1 Purpose of the Risk Assessment

The CERCLA or Superfund established the RI/FS process to identify the nature and extent of risks at a site and to determine the appropriate remedial methods. The RI/FS is an analytical process designed to support risk management decision-making for Superfund sites and risk assessment plays an essential role. According to CERCLA, the results of the risk assessment should help establish acceptable remediation levels for use in developing remedial alternatives during the FS. Risk due to potential chemical contamination in soil is addressed in the Basewide Range Assessment (BRA; Shaw 20012). Therefore, only MEC are addressed in this risk assessment. The MEC risk assessment does not establish acceptable remediation levels, but is used to develop and evaluate remedial alternatives during the FS. A MEC risk assessment is required as part of Task 4 of the AOC Scope of Work.

The MEC risk assessment is used to describe the qualitative and quantitative factors leading to an encounter between a receptor and a MEC item. Several methods exist for performing risk assessments on munitions response sites (MRSs); however, no MEC risk assessment methodology has been widely accepted, evaluated, and fully implemented for a variety of MRSs. Therefore, the Fort Ord MEC Risk Assessment Protocol (“the Protocol”) was prepared through a combined effort of the Army, the EPA, and the DTSC (Malcolm Pirnie 2002).

This risk assessment focuses on two sectors in the CSUMB Off-Campus MRA (Figure 2). Sector 1 is approximately 49 acres and the future land reuse is proposed as residential (CSUMB campus housing). Sector 2 is approximately 284 acres and the future land reuse is proposed as non-residential (CSUMB open space park). The risk assessment is based on both the field conditions and on the proposed future land reuse for the CSUMB Off-Campus MRA.

### 1.1.1 Cleanup Program Under the Army

The former Fort Ord was placed on the National Priorities List (NPL) in 1990 primarily because of chemical contamination in soil and groundwater that resulted from past Army use. To oversee the cleanup of the base, the Army, EPA, DTSC, and the Central Coast Regional Water Quality Control Board (RWQCB) entered into a Federal Facility Agreement (FFA). One of the purposes of the FFA was to ensure that the environmental impacts associated with past and present activities at the former Fort Ord were thoroughly investigated and appropriate remedial action taken as necessary to protect public health and

the environment. In accordance with the FFA, the Army was designated as the lead agency under CERCLA for conducting environmental investigations, making cleanup decisions, and taking cleanup actions at the former Fort Ord. The EPA was designated as the lead regulatory agency for the cleanup, while the DTSC and RWQCB were designated as supporting agencies.

The Army has conducted a number of MEC survey and clearance activities, including geophysical surveys. The Army has conducted its activities pursuant to the President of the United States' authority under CERCLA Section 104, as delegated to the Army in accordance with Executive Order 12580 and in compliance with CERCLA Section 120.

In November 1998, the Army agreed to evaluate MEC at the former Fort Ord and perform a basewide munitions response (MR) RI/FS consistent with CERCLA. The basewide MR RI/FS program addressed MEC hazards at the former Fort Ord and evaluated past removal actions as well as recommended 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 FFA. The signatories agreed that the FFA provided the appropriate framework and process to address the Army's MEC activities. The FFA established schedules for performing RIs and FSs, and required that remedial actions be completed expeditiously.

The basewide MR RI/FS program is described in the Draft Final Ordnance and Explosives RI/FS Work Plan (USACE 2000). Elements of the MR RI/FS program include a literature review, preparation of a Sampling and Analysis Plan for additional MEC characterization activities, evaluation of MEC work by previous contractors and FORA, performance of an Ordnance Detection and Discrimination Study (ODDS), identification of applicable or relevant and appropriate requirements (ARARs), evaluation of risks, and development of long-term risk management measures, a community relations plan, and a health and safety plan. The MR RI/FS program only addresses the physical risk from MEC. The potential for soil contamination from munitions constituents at the former Fort Ord is being addressed under the Army's BRA Program (Shaw 20012).

The Army's approach to categorizing areas within the former Fort Ord includes track groupings consisting of Track 0 through Track 3. Specifically, track definitions are as follows:

- Track 0: Areas that contain no evidence of MEC and have never been suspected of having been used for military munitions-related activities. In June 2002, the Army signed a Track 0 Record of Decision (ROD; Army 2002). The Track 0 ROD addresses selected land parcels, and also provides a Plug-In process to address future land parcels that are considered eligible for inclusion in the Track 0 process.
- Track 1: Sites where military munitions were suspected to have been used but, based on results, the sites fall into one of three categories: 1) sites with no evidence to indicate that military munitions were used; 2) sites used for training but military munitions used do not pose an explosive hazard; or 3) sites used for training but military munitions



potentially remaining do not pose an unacceptable risk. In April 2005, the Army signed a Track 1 ROD (Army 2005). The Track 1 ROD addresses selected land parcels, and also provides a Plug-In process to address future land parcels that are considered eligible for inclusion in the Track 1 process.

- Track 2: Sites where MEC were present and MEC removal has been conducted.
- Track 3: Sites where MEC are known or suspected but investigations have not been initiated or completed.

In addition, to remain consistent with the federal Endangered Species Act (ESA), the Army has completed consultations with the United States Fish and Wildlife Service (USFWS) on the Army's predisposal actions, including cleanup of MEC. These consultations have resulted in biological opinions (BOs) that include endangered species incidental take statements. These BOs allow impacts to and incidental take of listed species during MEC cleanup activities, but require mitigation measures to be implemented during the MEC cleanup activities to reduce and minimize impacts to the protected species and their habitats.

### 1.1.2 Early Transfer Property and Environmental Services Cooperative Agreement

The transfer of a portion of the former Fort Ord, pursuant to CERCLA Section 120(h)(3)(C), was requested by FORA in a letter dated May 18, 2005. Under CERCLA Section 120(h)(3), the United States is required to provide a covenant in deeds conveying the property warranting that all remedial action necessary to protect human health and the environment has been taken before the date of transfer. For a federal facility listed on the NPL, CERCLA Section 120(h)(3)(C) allows the EPA Administrator, with concurrence of the governor of the state, to defer the CERCLA covenant requirement. These types of transfers under CERCLA Section 120(h)(3)(C) are typically called "early transfers," in which the United States provides the warranty after transfer of the property when all of the response actions necessary to protect human health and the environment have been taken. The period between the transfer of title and the making of this final warranty is known as the "deferral period." Early transfers allow productive reuse of the property through access while final remediation work is being conducted. In addition, United States Department of Defense (DOD) and Army policy require that the military department proposing to transfer property prepare a Finding of Suitability for Early Transfer (FOSET).

The Army has completed the "Final Finding of Suitability for Early Transfer, Former Fort Ord, California, Environmental Services Cooperative Agreement (ESCA) Parcels, and Non-ESCA Parcels (Operable Unit Carbon Tetrachloride Plume)" ("FOSET 5"; Army 2007). The Army has requested deferral of the CERCLA covenant and EPA has approved, with the concurrence of the Governor of the State of California, the Covenant Deferral Request associated with the early transfer of the property.

On March 31, 2007, the Army and FORA entered into an ESCA to provide MEC remediation services during the deferral period, thereby allowing the Army to transfer approximately 3,340 acres of property and the responsibility of removing MEC to FORA as an Economic Development Conveyance. The former Fort Ord Property transferred under

the ESCA is collectively referred to as the Areas Covered by Environmental Services (ACES). In accordance with the ESCA, FORA is responsible for addressing response actions for the property except for those responsibilities retained by the Army. The ESCA and the AOC identify the Army-retained conditions for which the Army assumes responsibility. If these conditions are encountered, FORA is required to notify the Army of their presence in accordance with the guidelines set forth in the ESCA and the Army assumes responsibility. Included in the Army-retained conditions are:

- Radiological material
- Chemical or biological warfare agents
- Natural resource injuries or damages occurring as a result of contamination releases that have occurred due to Army ownership or activities except to the extent such injuries are a direct result of FORA's activities
- Unknown uninsured conditions, which include the management and cleanup of non-MEC-related hazardous and toxic wastes above insurance parameters
- Perchlorate contamination in soil or groundwater

To accomplish this effort, FORA entered into an agreement with the ESCA RP Team, to assist in the completion of the MEC cleanup activities in accordance with the ESCA and the AOC. During the ESCA RP, FORA is responsible for administrative and management program elements, while the ESCA RP Team conducts the MEC cleanup work under FORA oversight.

### 1.1.3 FORA ESCA Remediation Program

The purpose of the ESCA RP is to provide the necessary environmental services to FORA, which include characterization, assessment of risk of explosive hazards, FS, remediation alternatives analysis, and performance of remediation excluding the Army-retained conditions described in Section 1.1.2) in accordance with the ESCA and the AOC. The primary objective of the ESCA RP is timely cleanup of the property in accordance with the ESCA and AOC. The potential for soil contamination from munitions constituents at the former Fort Ord is being addressed under the Army's BRA Program (Shaw 20012). As stated in FOSET 5, based on the BRA Program, no further action was recommended for historical areas (HAs) within the CSUMB Off-Campus MRA (Army 2007). In addition, Installation Restoration Program (IRP) Site 39B (Inter-Garrison Site) is located within the CSUMB Off-Campus MRA. As stated in the FOSET, the EPA and the DTSC have concurred that no further action is necessary at IRP Site 39B (Army 2007): however, subsequent soil sampling performed within the MRA resulted in a recommendation for an Interim Action to remove soil contamination from one area with an elevated concentration of lead in shallow soil (Army 2009a). In February 2010, Shaw Environmental, Inc. (on behalf of the Army) excavated approximately 20 cubic yards of soil from HA-161 and disposed of the soil in the Operable Unit 2 landfills. Confirmation samples collected from the excavation indicated that residual soil concentrations for lead were below the target cleanup concentrations. The results of the soil removal activities were presented in the Draft Final Interim Action Confirmation Report (Shaw 2011). As a follow-up to the 3<sup>rd</sup> Five-Year Review, an

additional evaluation is being conducted by the Army to determine the protectiveness of the human health-based cleanup levels for the Interim Action sites with lead in soil, including Site 39B (Army 2012). This evaluation is expected to be completed by December 2013.

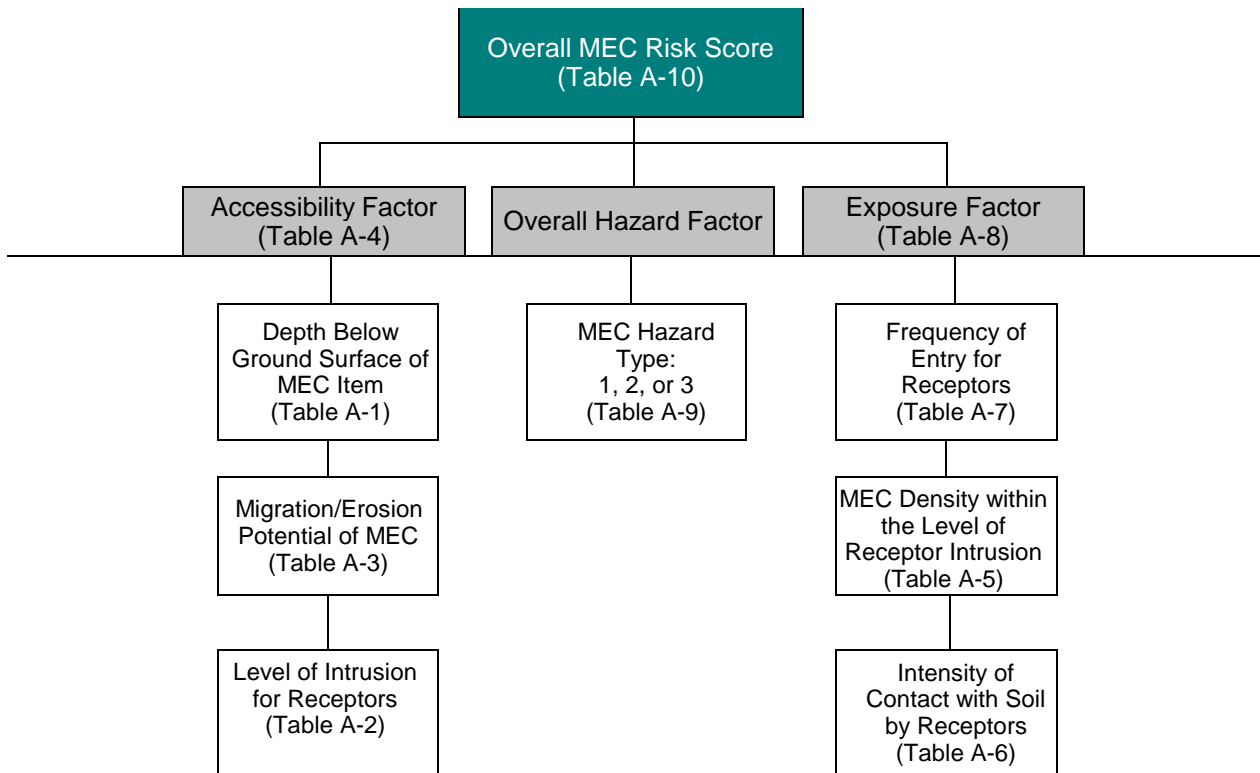
The SEDR was completed for the ACES as required under Task 2 of the AOC Scope of Work (ESCA RP Team 2008). In the SEDR, the ACES were combined into nine MRAs to facilitate the implementation of the AOC. The SEDR provided a site overview, evaluation of existing data, identification of data gaps, a conceptual site model (CSM) including an initial assessment of explosives safety risks, and proposed future use for each MRA. The SEDR also presented conclusions and recommendations for further actions and formed the basis for the RI planning efforts.

The nine MRAs were consolidated into four groups, according to similar pathway-to-closure characteristics (Figure 3). Group 1 consists of the Parker Flats and Seaside MRAs. Group 2 consists of the CSUMB Off-Campus and County North MRAs. Group 3 consists of the Interim Action Ranges, Laguna Seca Parking, Military Operations in Urban Terrain (MOUT) Site, and Del Rey Oaks/Monterey MRAs. Group 4 consists of the Future East Garrison MRA (ESCA RP Team 2008). The Interim Action Ranges MRA was subsequently removed from Group 3 for independent evaluation as agreed upon by FORA, the EPA, DTSC, and the Army.

## 1.2 Fort Ord MEC Risk Assessment Protocol

The Fort Ord MEC Risk Assessment Protocol (Malcolm Pirnie 2002) was prepared through a combined effort of the Army, the DTSC, and the EPA. The purpose of the Protocol is to allow for comparative review of MEC risks at sites where MEC was encountered at the former Fort Ord. The Protocol does not calculate the probability of adverse consequences, but instead assumes that encounters with MEC items will result in adverse consequences and, therefore, describes and estimates the MEC risk recognizing that basic assumption. The Protocol is not designed to assess absolute risk, but is rather an approach for understanding risks and comparing the relative risk between remedial alternatives on a site where MEC was encountered at the former Fort Ord.

The Protocol is a qualitative risk assessment approach based on seven input scores used to generate three input factors. These input scores are both qualitative and quantitative. The definitions and correlations between the seven input scores are discussed in Section 2.0, Section 3.0, and Appendix A of this report and are illustrated below:



The Protocol output is an overall MEC risk score designated by the letters A through E, with “A” representing the lowest risk and “E” representing the highest risk. The overall MEC risk score produced by this Protocol should not be compared to risks from other facilities where MEC was encountered, because the Protocol was developed for the former Fort Ord using site-specific conditions. The overall MEC risk score is supported by a narrative describing the assumptions used to generate the input factors. There are three input factors: the accessibility factor, the overall hazard factor, and the exposure factor. The accessibility factor is composed of three input scores based on information about the depth below ground surface (bgs) of any potentially remaining MEC, the potential for migration or erosion, and the level of intrusion into the soil by a receptor. The overall hazard factor is composed solely of the MEC hazard type input score, which is based on the MEC found in the sector. The exposure factor is composed of three input scores based on the frequency of entry into the sector by a receptor, the density of the remaining MEC, and the intensity of contact with the soil by a receptor. A summary of the Protocol, including input scoring tables, is provided in Appendix A.

### 1.3 Report Organization

This MEC risk assessment evaluates the current conditions of the CSUMB Off-Campus MRA after removal actions and the Residential Quality Assurance (RQA) Process Pilot Study have been conducted. Section 3.0 of Volume 1 of the Group 2 RI/FS Report

summarizes the history and the previous grid sampling, investigations, and removal actions conducted at the MRA, including the RQA Process Pilot Study.

The remainder of this risk assessment is organized as follows:

- Section 2.0: Data Usability and Data
- Section 3.0: Reuse Areas and Future Land Use Receptors
- Section 4.0: MEC Risk Assessment Results
- Section 5.0: Uncertainty
- Section 6.0: Conclusions

Appendix A provides a summary of the Protocol, including input scoring tables, which were used to develop this risk assessment for the CSUMB Off-Campus MRA. Appendix B provides summary tables of MEC items found within the CSUMB Off-Campus MRA by sector. Appendix C provides the erosion input calculations used to generate the potential for migration or erosion input score as part of the accessibility factor.

## 2.0 DATA USABILITY AND DATA

The data used to support the risk assessment at the CSUMB Off-Campus MRA are presented in Volume 1 of the Group 2 RI/FS Report. Section 2.0 of this risk assessment summarizes the site condition data.

In addition to the information presented in Volume 1 of the Group 2 RI/FS Report, sources of information used to support the risk assessment included:

- Soil Survey Geographic (SSURGO) database developed by United States Department of Agriculture (USDA) Natural Resources Conservation Service, which provided information on soil structure and type.
- United States Geological Survey (USGS) Digital Elevation Model, which provided elevation and slope information used to determine the migration/erosion potential input scores.

The remainder of this section describes the usability of the data and the approach for deriving the information needed to select input scores for the input factors related to site conditions.

### 2.1 Data Usability

Data usability is defined as data with sufficient quality for use in the project decision-making process. The evaluation of the usability of data conducted during the RI is presented in Appendix B of Volume 1 of the Group 2 RI/FS Report. An evaluation of the equipment performance is presented in Section 3.3 of Volume 1 of the Group 2 RI/FS Report. The equipment evaluation and the evaluation of work presented in the RI supports the conclusion that the data are usable for the risk assessment.

### 2.2 Data Used

Field data were collected during the grid sampling and removal actions conducted by the Army in the CSUMB Off-Campus MRA beginning in 1994 and during the RQA Process Pilot Study conducted by FORA beginning in 2009. Geophysical surveys were conducted over the entire MRA and the MEC items found were removed. The removal actions and the RQA Process Pilot Study are described in detail in Section 3.2 and Section 3.5, respectively, of Volume 1 of the Group 2 RI/FS Report and summarized as follows:

- Grid sampling was conducted at MRS-04C, MRS-07, MRS-08, MRS-13B, and MRS-18 in 1994 (HFA 1994).
- A 3-foot (-ft) removal action was conducted in the western three quarters of MRS-31, identified as the “CSU Footprint” by the contractor Human Factors Applications, Inc. (HFA), which included MRS-04C, MRS-07, MRS-08, MRS-13B, and MRS-18 (HFA 1994).

- A 4-ft removal action was conducted in two areas: the eastern portion of MRS-31 (approximately 70 acres identified as “Site CSU” by the contractor UXB International, Inc. [UXB]; UXB 1995a), and the north-central portion of the MRA in the CSU Footprint (approximately 6 acres identified as “Site HFA/CSU” by the contractor UXB; UXB 1995b).
- A munitions response removal to a depth of 4 ft was conducted over the entire MRS-13C in 1997 by the contractor USA Environmental, Inc. (USA; USA 2000).
- The RQA Process baseline digital geophysical mapping survey was conducted in an approximately 17-acre portion of the proposed future residential reuse area, followed by a soil scrape and post-scrape verification in an approximately 5-acre portion of the area performed by FORA in 2008 and 2009, and an instrument aided site walk verification was performed in the remaining approximately 31 acres of the proposed future residential reuse area by FORA in 2011 (RQA Process Pilot Study; ESCA RP Team 2012).

Throughout the grid sampling and removal actions, Schonstedt instruments were used to detect MEC for removal. During the RQA Process Pilot Study, a modified EM61-MK2 towed-array using a sled with lowered sensors (referred to as “the FORA ESCA Sled,”) and Schonstedt Model GA-52Cx magnetometers were used to detect MEC for removal to depth of detection. The field data identifying the MEC items found on the CSUMB Off-Campus MRA is summarized by sector in Appendix B, Tables B-1 and B-2 (Sector 1 and Sector 2, respectively). These data served as the basis for MEC hazard type input scores for the CSUMB Off-Campus MRA risk assessment. The MEC items found during the grid sampling and removal actions were included in this risk assessment.

Depth information was not available for some MEC items found in the CSUMB Off-Campus MRA. The presence of burial pits was noted in the above-referenced reports; however, this information was not documented by the contractors. For the purposes of the risk assessment, MEC items were not considered to be found in burial pits. This is discussed further in Section 5.0.

## 2.3 MEC Hazard Type

The MEC hazard type is the only component of the overall hazard factor and was determined by a team of specialists qualified in recognizing and evaluating military munitions and MEC. The MEC hazard type input scores in the Protocol are as follows:

<u>Score</u>	<u>Description</u>
--------------	--------------------

- |   |   |
|---|---|
| 0 | Inert, will cause no injury (therefore, the item was not considered MEC and was not evaluated in the risk assessment)                     |
| 1 | Will cause an injury or, in extreme cases, could cause major injury or death to an individual if functioned by an individual's activities |

- 2 Will cause major injury or, in extreme cases, could cause death to an individual if functioned by an individual's activities
- 3 Will kill an individual if detonated by an individual's activities

The MEC hazard type is not variable and provides reliable input scores for the overall hazard factor of the CSUMB Off-Campus MRA risk assessment.

## 2.4 MEC Density

The MEC density is a component of the exposure factor. It represents the potential density (items per acre) of MEC remaining on a site at a depth interval that is likely to be accessed by a receptor. The MEC density input scores in the Protocol are as follows:

### Score   Description

- 1 100% of detected MEC removed to level of intrusion <sup>1</sup>
- 2 Low MEC density (< 0.1 item per acre)
- 3 Medium MEC density (0.1 to 1 item per acre)
- 4 High MEC density (> 1 item per acre)

<sup>1</sup> Detection and removal procedures meeting the data quality objectives (DQOs) for a sector based on clearly defined investigation objectives including reuse and the detection of designated MEC. If DQOs have not been established for a sector, the quality of data should be reviewed and approved to score a '1.'

According to the referenced grid sampling and removal action reports in Section 2.2 above, the grids within the CSUMB Off-Campus MRA were investigated and 100% of the items detected with the Schonstedt instruments were removed to the depth of detection. MEC was removed to a depth of 3 ft bgs in Sector 1 (HFA 1994) and to 3 and 4 ft bgs in Sector 2 (HFA 1994 and UXB 1995a and 1995b); however, according to the after-action reports approval would be requested to investigate anomalies at depths greater than 3 and 4 ft bgs. During the grid sampling and removal actions, the items that were found were removed, which corresponds to an input score of "1" for MEC density, if the DQOs were met during the grid sampling and removal actions or if the quality of the data was reviewed and approved in the absence of established DQOs. The grid sampling and removal actions were performed before it was standard practice to establish DQOs for MEC. Because there were no DQOs in place at the time of the fieldwork, the quality of the data was evaluated using the Munitions Response Activity Evaluation Checklists (Appendix B presented in Volume 1 of the Group 2 RI/FS Report). In the Munitions Response Activity Evaluation Checklist, Part 2: Removal Evaluation, Question "A", it was concluded that the data can be used for performance of the risk assessment.

Additionally, the MEC items evaluated in the risk assessment were non-penetrating and, therefore, would be expected on the surface or at shallow depths below ground surface and



would not be expected at depths greater than 1 ft bgs unless they were deposited in burial pits. The items evaluated in this risk assessment that were non-penetrating included munitions components (firing devices, fuzes, and igniters), blasting caps, flares, hand grenades, mines, smoke, parachute projectiles, pots/pyrotechnic/explosive mixtures, signals, smoke rifle grenades, and squibs. Since no anomalies were left uninvestigated within the depth of detection and possibly deeper, the MEC density input score of “1” (the lowest possible score) is not affected by the fact that the anomalies were not identified as having been in a burial pit. Therefore, a MEC density input score of ‘1’ is appropriate for all depths.

In accordance with the RI, the distribution of MEC and munitions debris (MD) at CSUMB Off-Campus MRA did not exhibit a pattern of use characteristic of a target range with identifiable and consistently used targets. The distribution did show patterns of use characteristic of tactical training.

## 2.5 MEC Depth

The MEC depth is a component of the accessibility factor and represents the potential depth at which a MEC item might remain at the site. The MEC depth input scores in the Protocol are as follows:

### Score   Description

- |   |   |
|---|---|
| 1 | 100% of detected MEC removed considering the data quality for the sector <sup>1</sup> |
| 2 | All MEC > 5 ft bgs  |
| 3 | All MEC ≥ 4 ft bgs  |
| 4 | All MEC ≥ 3 ft bgs  |
| 5 | All MEC ≥ 2 ft bgs  |
| 6 | All MEC ≥ 1 ft bgs  |
| 7 | No MEC on the surface and MEC bgs   |
| 8 | Any MEC on the surface  |

<sup>1</sup> Detection and removal procedures meeting the DQOs for the sector based on clearly defined investigation objectives including reuse and the detection of designated MEC. If DQOs have not been established for a sector, the quality of data should be reviewed and approved to score a ‘1’.

The MEC depth input score of “1” was selected for the CSUMB Off-Campus MRA, indicating that 100% of detected MEC was removed to the depth of detection (Appendix A, Table A-1). This input score reflects the performance of the grid sampling and removal actions at the CSUMB Off-Campus MRA, which were considered to be more efficient than the equipment evaluation indicated in Section 3.3 of Volume 1 of the Group 2 RI/FS Report as removal actions were conducted until anomalies were resolved. The use of this input score is considered valid for the CSUMB Off-Campus MRA because removal actions were

conducted over the entire MRA (with the exception of the former fueling facility as discussed in the RI) to a depth of 3 and 4 ft bgs and deeper in some areas, if approved.

## 2.6 Migration / Erosion Potential

The migration/erosion potential is a component of the accessibility factor and based on an estimate of erosion that occurs at a site. Erosion is estimated using the Universal Soil Loss Equation (7 Code of Federal Regulations 610.12-610.14). The equation is as follows:

$$A = R \times K \times LS \times C \times P$$

Where:

A = the estimation of average annual soil loss in tons per acre caused by sheet and rill erosion

R = rainfall erosivity factor

K = soil erodibility factor

LS = slope length and steepness factor

C = cover and management factor

P = support practice factor

The data used to support the erosion estimate calculation is from sources listed in Appendix C. The erosion estimate step-by-step calculation is provided in Appendix C. The erosion estimate for the CSUMB Off-Campus MRA was calculated as 0.000016 inch, which equates to a migration/erosion potential input score of 1 (Appendix A, Table A-3). A score of 1 indicates: “Very stable: MEC will not migrate. Annual erosion is equal to or less than the site-wide average of 3/100 inch per year.” Erosion may have occurred on the MRA, but it is expected to be associated mostly with roads, firebreaks, and trails.

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### 3.0 REUSE AREAS AND FUTURE LAND USE RECEPTORS

This section identifies the two reuse areas as sectors and the general representative receptors for the two sectors considered in the MEC risk assessment for the CSUMB Off-Campus MRA. A description of the receptors and the input scores for level of intrusion associated with the accessibility factor and for frequency of entry and intensity of contact with soil associated with the exposure factor are provided in Table 1 for the MEC risk assessment.

#### 3.1 Description of Reuse Areas

The CSUMB Off-Campus MRA is located in the north-central portion of the former Fort Ord, bordered by Inter-Garrison Road to the north, the County North MRA to the east and southeast, the Parker Flats MRA to the south, and 8th Avenue and CSUMB campus property to the west and southwest (Figure 4). The MRA boundaries generally correspond to the boundaries of land transfer Parcel S1.3.2 (Figure 4). The CSUMB Off-Campus MRA is wholly contained within the jurisdictional boundaries of Monterey County. The CSUMB Off-Campus MRA is approximately 333 acres in size and composed of several MRSs that were described in detail in Volume 1 of this Group 2 RI/FS Report.

The Installation-Wide Habitat Management Plan (HMP) for the former Fort Ord (USACE 1997) identified the CSUMB Off-Campus MRA as a development parcel with a borderland development area along the natural resource management area (NRMA) interface. The HMP does not designate specific reuses for the CSUMB Off-Campus MRA. The general development land use category described in the HMP encompasses numerous different potential reuses including infrastructure activities such as roadway and utility construction, as well as commercial/retail, parks, possible residential use, and borderland activities.

The Base Reuse Plan (FORA 1997) indicated that the area of the CSUMB Off-Campus MRA is proposed for school/university reuse with residential infill opportunities. The CSUMB Master Plan further defines the proposed use of the area for future residential and open space. Therefore, the following reuse areas have been identified for the purpose of this risk assessment:

- Residential (CSUMB campus housing; Sector 1) — The western one-sixth (approximate) of the MRA is proposed for use as off-campus housing for CSUMB (CSUMB 2007). This area is approximately 49 acres. Construction of buildings and roads, installation of utilities, as well as the activities of future residents are expected within the MRA.
- Non-residential (CSUMB open space park; Sector 2) — The eastern five-sixths (approximate) of the MRA is proposed for an oak woodland and maritime chaparral open space park with a 100-ft buffer along the NRMA interface (ESCA RP Team 2008). The area is approximately 284 acres. Vegetated areas and hiking trails may require maintenance such as planting and weeding. Recreational hiking and bicycling/horseback riding on dirt paths are expected to occur.

Current land use restrictions for the property transfer parcel include prohibition of the following:

- any uses other than investigation and/or remediation of MEC and installation of utilities/ roadways until specified remedial action completion certification has occurred
- the use of the property for residence, hospital, school (for persons under the age of 21, except for post-secondary schools), and a day care center for children
- activities (including soil disturbance) in violation of the Excavation Ordinance, as modified

Additionally, the current land use restrictions require:

- the buyer, lessee, or sub-lessee be given written notice that there is the potential for the presence of MEC in the soil of the property
- DTSC, the United States working through the Army, and their contractors and/or agents to have reasonable right-of-entry and access to the property for inspection, monitoring, testing, sampling and other activities consistent with the covenant as deemed necessary by the DTSC in order to protect the public health and safety or the environment and oversee any required activities

### 3.2 Description of Receptors

Given the proposed reuses discussed in the previous section, five general representative receptors were chosen for analysis in the MEC risk assessment: trespasser, recreational user, maintenance worker (such as a utility worker, firefighter, emergency response worker, and ancillary worker), resident, and construction worker. These receptors represent a range of uses, levels of intrusion into the soil, frequency of entry, and intensity of contact with the soil at the CSUMB Off-Campus MRA. Each receptor and associated input scores for levels of intrusion into the soil, frequency of entry, and intensity of contact with the soil are described in more detail in Table 1.

## 4.0 MEC RISK ASSESSMENT RESULTS

After-action receptor scenarios were analyzed to evaluate the overall MEC risk at the CSUMB Off-Campus MRA. The following sections describe the results of the MEC risk assessment for each of the sectors. Figure 2 shows the sectors in the CSUMB Off-Campus MRA.

### 4.1 Input Score Summary

The after-action receptor scenario analysis considers the MEC risk at the site following the removal actions performed on the CSUMB Off-Campus MRA and represents the current state of the CSUMB Off-Campus MRA. The removal work performed in the CSUMB Off-Campus MRA included MEC investigation and removal, as discussed in Volume 1 of the Group 2 RI/FS Report (Section 4.0). The MEC risk assessment is composed of the exposure factor, the accessibility factor, and the overall hazard factor, which are based on seven input scores. Tables 2 and 3 provide summaries of the input scores and factors and the MEC risk assessment results for Sectors 1 and 2, respectively.

The exposure factor components for Sectors 1 and 2 included: input scores for frequency of entry and intensity of contact with soil, which were provided for each receptor in Table 1; and input scores for MEC density, which were discussed in Section 2.4. The input scores for MEC density in Sectors 1 and 2 were “1” (100% of detected MEC removed to level of intrusion) due to the completed removal actions and the fact that the MEC found was predominantly non-penetrating, with the exception of miscellaneous items for which a historical use in the area was not identified and did not show a pattern of use, as documented in the RI. The input scores for frequency of entry and intensity of contact with soil varied depending on the receptor.

The accessibility factor components for Sectors 1 and 2 included: input scores for level of receptor intrusion, which were provided in Table 1; input scores for MEC depth, which were discussed in Section 2.5; and input scores for migration/erosion potential, which were calculated in Appendix C and discussed in Section 2.6. The input scores for MEC depth in Sectors 1 and 2 were “1”, indicating that 100% of detected MEC removed considering the data quality for the sector, due to the completed removal actions and the fact that the MEC found was predominantly non-penetrating, with the exception of miscellaneous items for which a historical use in the area was not identified and did not show a pattern of use, as documented in the RI. The input scores for migration/erosion potential were “1”, representing very stable soil where MEC will not migrate, for the MRA. The input scores for level of receptor intrusion varied depending on the receptor.

The overall hazard factor component consists only of input scores based on the MEC hazard types found within the MRA, which were discussed in Section 2.3. The input scores for the MEC hazard types found in Sectors 1 and 2 of the CSUMB Off-Campus MRA, as presented in Appendix B, were “1,” will cause an injury or, in extreme cases, could cause major injury or death to an individual if functioned by an individual's activities; “2,” will cause major

injury or, in extreme cases, could cause death to an individual if functioned by an individual's activities; and “3,” will kill an individual if detonated by an individual's activities.

## 4.2 Description of Overall MEC Risk

The overall MEC risk scores were determined by considering the accessibility of the sector (accessibility factor), the potential for exposure at the sector (exposure factor), and the overall hazard of the MEC type in the sector (overall hazard factor). The input scores were applied to the Protocol to determine the overall MEC risk. Appendix A provides the summary of the risk assessment protocol, including input scoring tables.

Tables 2 and 3 provide summaries of the input scores and factors and the overall MEC risk assessment results for Sectors 1 and 2, respectively. For each receptor, the risk posed by each MEC hazard type is scored separately.

### 4.2.1 Sector 1 Overall MEC Risk Score

The proposed land use of Sector 1 is residential. The identified receptors included:

- trespasser (who is rarely in the area and does not intrude bgs)
- recreational user (who is frequently in the area and intrudes 6 inches bgs)
- maintenance worker (who is frequently in the area and intrudes 24 inches bgs)
- resident (who is frequently in the area and intrudes 48 inches bgs)
- construction worker (who is frequently in the area and intrudes 60 inches bgs)

Since erosion was not expected to affect the potential for exposure to MEC and the depth and density of the MEC was scored as “1” (because removal actions were conducted over the entire MRA and MEC items found were non-penetrating), the accessibility factor and exposure factor for Sector 1 resulted in scores of “1”. The overall hazard factor varied in score from “1” to “3” because of the MEC hazard types found within the MRA.

Therefore, the overall MEC risk score for each receptor in Sector 1 was “A”, the lowest risk (Table 2).

### 4.2.2 Sector 2 Overall MEC Risk Score

The proposed land use of Sector 2 is non-residential. The identified receptors included:

- trespasser (who is rarely in the area and may intrude 12 inches bgs)
- recreational user (who is frequently in the area and intrudes 6 inches bgs)
- maintenance worker (who is frequently in the area and intrudes 24 inches bgs)
- construction worker (who is frequently in the area and intrudes 60 inches bgs)

Since erosion was not expected to affect the potential for exposure to the MEC and the depth and density of the MEC was scored as “1” (because removal actions were conducted over the entire MRA and MEC items found were non-penetrating), the accessibility factor and exposure factor for Sector 2 resulted in scores of “1”. The overall hazard factor varied in score from “1” to “3” because of the MEC hazard types found within the MRA.

Therefore, the overall MEC risk score for each receptor in Sector 2 was “A”, the lowest risk (Table 3).



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## 5.0 UNCERTAINTY

This section discusses the potential uncertainties related to the Protocol inputs and the resulting change in the overall MEC risk score determined for the CSUMB Off-Campus MRA.

### 5.1 Depth Below Ground Surface Uncertainties

It was assumed for the risk assessment that no items were found in burial pits; however, the presence of burial pits was noted in the after-action reports, but not documented. Since no anomalies were left uninvestigated within the depth of detection and possibly deeper, the MEC density score of “1” (the lowest possible score) is not affected by the lack of notation regarding the presence or absence of burial pit.

The MEC depth input score of “1”, indicating that 100% of the detected MEC was removed considering the data quality for the sector, did not increase the overall MEC risk score. Despite efforts to detect and remove MEC at the site, it is possible that undetected MEC may remain at the site. This input score may underestimate the depth of potentially remaining undetected MEC items, and therefore, may underestimate the overall MEC risk score.

### 5.2 Migration/Erosion Potential Uncertainties

The Universal Soil Loss Equation was used to derive the number of inches per year of erosion anticipated to occur at the CSUMB Off-Campus MRA. The uncertainty in using this calculation to determine the level of erosion involves the change in land surface due to human activities at the site. It is possible that the erosion potential in specific areas of the CSUMB Off-Campus MRA is higher than this estimate, which could increase the overall MEC risk score. However, migration/erosion potential was found to be only a modifying factor in the development of the Protocol, so it is assumed that the change in the risk score would be minor.

### 5.3 Level of Intrusion Uncertainties

The level of intrusion and the MEC depth input scores are related in the accessibility factor and subsequently in the scoring of the overall MEC risk. Specifically, the accessibility factor depends on the depth between the level of intrusion and the shallowest MEC item expected on the site. As the interval between the level of intrusion and MEC depth bgs decreases to less than 1 ft, the accessibility factor score increases. However, the MEC depth bgs has been scored as “1” (“100% of detected MEC removed considering data quality for the sector”); therefore, the contribution to the overall MEC risk by the level of intrusion score is negated. If the MEC depth bgs input score indicates that there is no MEC to encounter, it does not matter how deep the receptor intrudes into the ground. The uncertainty is that despite efforts to detect and remove 100% of the MEC at the site, MEC may remain bgs. Therefore, the

level of intrusion input score, being negated because of a MEC depth input score of “1”, may underestimate the overall MEC risk score depending on the receptor.

## 5.4 Frequency of Entry Uncertainties

The frequency of entry and the MEC density input scores are related in the exposure factor and subsequently in the scoring of the overall MEC risk. Receptors are more likely to come in contact with a MEC item if they are at the site frequently than if they rarely go to the site. This input is a measure of the number of times per year that the receptor will be in an area potentially containing MEC. It is difficult to estimate how frequently individual receptors will be in the CSUMB Off-Campus MRA. The overall MEC risk score increases with the frequency of entry. However, the MEC density has been scored as a “1” (“100% of detected MEC removed to level of intrusion”); therefore, the contribution to the overall MEC risk score by the frequency of entry input score is negated. If the MEC density score indicates that there is no MEC to encounter, it does not matter how many times a receptor enters the area. The uncertainty is that despite efforts to detect and remove 100% of the MEC at the site, MEC may remain bgs. Therefore, the frequency of entry input score, being negated because of a MEC density input score of “1”, may underestimate the overall MEC risk score depending on the receptor.

## 5.5 Intensity of Contact with Soil Uncertainties

The intensity of contact with soil and MEC density input scores are related to the exposure factor and subsequently in the scoring of the overall MEC risk. For an individual receptor to come in contact with a MEC item, the individual will need to be in contact with the medium where the MEC is located. This input is a measure of the length of time the receptor will have contact with the soil. Receptors are more likely to come in contact with a MEC item if they are at the site for a longer period of time. However, the MEC density has been scored as a “1” (“100% of detected MEC removed to level of intrusion”); therefore, the contribution to the overall MEC risk score by the intensity of contact with soil input score is negated. If the MEC density input score indicates there is no MEC to encounter, it does not matter how long the receptor is in contact with the soil. The uncertainty is that despite efforts to detect and remove 100% of the MEC at the site, MEC may remain bgs. Therefore, the intensity of contact with soil input score, being negated because of the MEC density input score of “1”, may underestimate the overall MEC risk score depending on the receptor.

## 5.6 Depth and Density Input Score Uncertainties

The MEC depth and density input scores rely on the removal action documentation stated in the after-action reports that 100% clearance was achieved to 3- or 4-ft depths bgs, and possibly deeper, across the MRA. This information, coupled with the fact that the majority of the items found were non-penetrating and that the historical military information did not indicate a pattern of use as an artillery range, allowed for the MEC depth and density to be scored as “1”. For MEC density, the input score of “1” means that 100% of detected MEC was removed to the level of intrusion and for MEC depth, the input score of “1” means that

100% of detected MEC removed considering the data quality for the sector. If MEC was not detected or if the clearance was not achieved to the 3- or 4-ft depth bgs, then the overall MEC risk score would be underestimated for only penetrating items.

## 5.7 Overall MEC Risk Score Uncertainties

The uncertainties for the input scores discussed in Sections 5.1 through 5.6 may underestimate the overall MEC risk score depending on the receptor scenario. Input scores to the Protocol do not reflect the uncertainty related to the depth and density of MEC items potentially remaining at the site because documentation supports a removal action to depth of 3 and 4 feet across the MRA. If MEC at the CSUMB Off-Campus MRA was not removed during the removal actions, then the overall MEC risk score would be underestimated.

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## 6.0 CONCLUSIONS

Tables 4 and 5 provide summaries of the overall MEC risk scores for the after-action receptor scenario analysis of the CSUMB Off-Campus MRA. The overall MEC risk score for each receptor for each of the three overall hazard factors is “A”, lowest risk. This is a qualitative assessment of the risk, and therefore uncertainties associated with the determination. The Protocol was not designed to assess absolute risk. The overall MEC risk score is an approach for comparing the relative risk between remedial alternative where MEC has been encountered on sites at the former Fort Ord.

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## 7.0 REFERENCES

- California State University Monterey Bay (CSUMB). 2007. CSUMB Master Plan, Volume I, Design Plan, prepared by Moore Iacofano Goltsman, Inc. and others. December.
- Environmental Services Cooperative Agreement Remediation Program Team (ESCA RP Team). 2008. Final Summary of Existing Data Report, Former Fort Ord, Monterey County, California. November 26. (Fort Ord Administrative Record No. ESCA-0130)
- . 2009. Final Group 2 Remedial Investigation/Feasibility Study Work Plan, California State University at Monterey Bay Off-Campus and County North Munitions Response Areas, Former Fort Ord, Monterey County, California. July 8. (Fort Ord Administrative Record No. ESCA-0161)
- . 2012. Final Residential Quality Assurance Process Pilot Study Technical Information Paper CSUMB Off-Campus MRA, California State University Monterey Bay Off-Campus Munitions Response Area, Former Fort Ord, Monterey County, California. October 8. (Fort Ord Administrative Record No. ESCA-0257B)
- Fort Ord Reuse Authority. (FORA). 1997. Fort Ord Reuse Plan, prepared by EMC Planning Group Inc. and EDAW, Inc. June 13.
- Human Factors Applications, Inc. (HFA). 1994. OEW Sampling and OEW Removal Action, Ft. Ord, Final Report. Prepared for the U.S. Army Corps of Engineers, Huntsville Division. December 1. (Fort Ord Administrative Record Nos. OE-0012, OE-0011, and OE-0013)
- Malcolm Pirnie. 2002. Final Fort Ord Ordnance and Explosives Risk Assessment Protocol. Prepared for the U.S. Army Corps of Engineers, Sacramento District. October. (Fort Ord Administrative Record No. OE-0402G)
- Shaw Environmental, Inc. (Shaw). 2011. Draft Final Interim Action Confirmation Report; Area 39B, Historical Area 161 Excavation; Inter Garrison Training Area; Former Fort Ord, California. March 24. (Fort Ord Administrative Record No. IAFS-236A)
- . 2012. Final Comprehensive Basewide Range Assessment Report. Former Fort Ord, California, Revision 2. January 17. (Fort Ord Administrative Record No. BW-2300L)
- Troeh, Frederick R., and Louis M. Thompson. 1991. Soil and Soil Fertility. Oxford Press.
- United States Army Corps of Engineers (USACE). 1997. Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California (HMP). With



- Technical Assistance from Jones and Stokes, Sacramento, California. April 1. (Fort Ord Administrative Record No. BW-1787)
- . 2000. Draft Final Ordnance and Explosives Remedial Investigation/Feasibility Study (OE RI/FS) Work Plan. January 4. (Fort Ord Administrative Record No. OE-0233M)
- United States Department of Agriculture Soil Conservation Service (USDA). 1983. Guides for Erosion and Sediment Control. August.
- United States Department of the Army (Army). 2002. Final Record of Decision, No Action Regarding Ordnance-Related Investigation, Former Fort Ord, California. June 19. (Fort Ord Administrative Record No. OE-0406)
- . 2005. Record of Decision, No Further Action Related to Munitions and Explosive of Concern - Track 1 Sites, No Further Remedial Action with Monitoring for Ecological Risks from Chemical Contamination at Site 3 (MRS-22), Former Fort Ord, California. March 10. (Fort Ord Administrative Record No. OE-0526)
- . 2007. Final Findings of Suitability for Early Transfer (FOSET), Former Fort Ord, Environmental Services Cooperative Agreement (ESCA) Parcels and Non-ESCA Parcels (Operable Unit Carbon Tetrachloride Plume) (FOSET 5). June 26. (Fort Ord Administrative Record No. FOSET-004J)
- . 2009a. Approval Memorandum, Proposed Interim Action Excavation, IA Areas 39B HA-161, Site 39B - Inter Garrison Training Area, Former Fort Ord, California. March 18. (Fort Ord Administrative Record No. IAFS-233)
- . 2009b. Track 1 Plug-In Approval Memorandum County North Munitions Response Area Former Fort Ord, California. August 26. (Fort Ord Administrative Record No. ESCA-0169)
- . 2012. 3<sup>rd</sup> Five-Year Review, Fort Ord Superfund Site (including FORA ESCA RP Sites), Monterey, California. September 17. (Fort Ord Administrative Record No. BW-2632)
- USA Environmental, Inc. (USA). 2000. Final OE Removal Action After Action Report, Inland Range Contract, Former Fort Ord, California, Site OE-13C. Prepared for the U.S. Army Corps of Engineers, Sacramento District. December 26. (Fort Ord Administrative Record OE-0227A)
- UXB International, Inc. (UXB). 1995a. Final Report for Ordnance and Explosives Removal Action, Fort Ord, California, Site CSU. November 1. (Fort Ord Administrative Record No. OE-0121)

- . 1995b. Final Report for Ordnance and Explosives Removal Action, Fort Ord, California, Site HFA/CSU. November 1. (Fort Ord Administrative Record No. OE-0122)

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**Table 1**  
**After-Action Receptors for CSUMB Off-Campus MRA MEC Risk Assessment**

Receptor	Reuse Area	Description	Level of Intrusion <sup>1</sup>	Frequency of Entry <sup>2</sup>	Intensity of Contact with Soil <sup>3</sup>
Trespasser	Residential Area (Sector 1)	Not a likely receptor once housing is built. Anticipated activity is taking a short cut through development, but not spending an extended amount of time on the property and is not assumed to intrude below the surface.	1 Not expected to intrude below the surface	1 Rare	1 < 1 hr/day in contact with the soil
	Non-Residential Area (Sector 2)	A likely receptor. Likely to remain in the area for an extended period because the area is not fenced and not likely to be well guarded.	2 May intrude to a depth of 1 foot below the surface	3 Occasional	3 < 6 hrs/day in contact with the soil
Recreational User	Residential Area (Sector 1)	A likely receptor. Expected recreational uses include outdoor games (e.g., frisbee, football, etc.) and bicycling on paved paths/roads.	2 Expected to be in contact with the first 6 inches of soil	4 Frequent	1 < 1 hr/day in contact with the soil
	Non-Residential Area (Sector 2)	A likely receptor. Expected recreational uses include bicycling and hiking on dirt paths.	2 Not expected to intrude below the surface. However, due to the impact of bicycles on dirt, the recreational user may be in contact with the first 6 inches of soil.	4 Frequent	2 < 3 hrs/day in contact with the soil
Maintenance Worker	Residential Area (Sector 1)	Likely receptor. Expected to perform intrusive activities for planting and defoliating the trails.	3 Below the surface to a depth of 2 feet	4 Frequent	4 8 hrs/day in contact with the soil
	Non-Residential Area (Sector 2)	Likely receptor. Expected to perform intrusive activities for planting and defoliating the trails.	3 Below the surface to a depth of 2 feet	4 Frequent	4 8 hrs/day in contact with the soil

**Table 1**  
**After-Action Receptors for CSUMB Off-Campus MRA MEC Risk Assessment**

Receptor	Reuse Area	Description	Level of Intrusion <sup>1</sup>	Frequency of Entry <sup>2</sup>	Intensity of Contact with Soil <sup>3</sup>
Resident	Residential Area (Sector 1)	Likely receptor. Adult resident is expected to perform yard maintenance. A child is expected to play in the yard, possibly digging.	4 Below the surface to a depth of 4 feet	4 Frequent	2 < 3 hrs/day in contact with the soil
Construction Worker	Residential Area (Sector 1)	Likely receptor. The area is currently undeveloped, so there will be a number of buildings and utilities required for the reuse to occur. Construction workers are expected to perform excavations for foundations and utilities and build structures.	5 Below the surface to a depth of 5 feet	4 Frequent	4 8 hrs/day in contact with the soil
	Non-Residential Area (Sector 2)	Likely receptor. The area is currently undeveloped, so there may be an out building and utilities required for the reuse to occur. Construction workers are expected to perform excavations for foundations and utilities and build structures.	5 Below the surface to a depth of 5 feet	4 Frequent	4 8 hrs/day in contact with the soil

**Notes:**

**<sup>1</sup> Level of Intrusion Scores**

1 = Non-intrusive. Activity on the ground surface only.

2 = Minor Intrusions. Activity on ground surface and ground disturbances to a depth of 1 foot bgs.

3 = Moderate Intrusions. Ground disturbances to a depth of 2 feet bgs.

4 = Significant Intrusions. Ground disturbances to a depth of 4 feet bgs.

5 = Highly Intrusive. Ground disturbances greater than 4 feet bgs.

**<sup>2</sup> Frequency of Entry Scores**

1 = Rare. Not likely to occur ( $\leq 1$  time per year).

2 = Infrequent. Seldom occurs ( $< 1$  time per season to 1 time per month).

3 = Occasional. Likely to occur from time to time ( $> 1$  time per month).

4 = Frequent. Occurs frequently (1 time per week to  $> 1$  time per week).

**<sup>3</sup> Intensity of Contact with Soil Scores**

1 = Very low:  $\leq 1$  hour/day

2 = Low:  $\leq 3$  hours/day

3 = Moderate:  $\leq 6$  hours/day

4 = High:  $\leq 9$  hours/day

5 = Very high:  $> 9$  hours/day

**Table 2**  
**After-Action MEC Risk Assessment Results for CSUMB Off-Campus MRA, Sector 1, Residential Land Use**

Receptor	MEC Hazard Type <sup>1</sup>	MEC Depth bgs <sup>2</sup>	Migration / Erosion Potential <sup>3</sup>	Level of Receptor Intrusion <sup>4</sup>	Accessibility Factor <sup>5</sup>	Frequency of Receptor Entry <sup>6</sup>	MEC Density <sup>7</sup>	Intensity of Receptor Contact with Soil <sup>8</sup>	Exposure Factor <sup>9</sup>	Overall MEC Risk <sup>10</sup>
Trespasser (surface)	1	1	1	1	1	1	1	1	1	A
	2	1	1	1	1	1	1	1	1	A
	3	1	1	1	1	1	1	1	1	A
Recreational User (down to 6 inches bgs)	1	1	1	2	1	4	1	1	1	A
	2	1	1	2	1	4	1	1	1	A
	3	1	1	2	1	4	1	1	1	A
Maintenance Worker (down to 24 inches bgs)	1	1	1	3	1	4	1	4	1	A
	2	1	1	3	1	4	1	4	1	A
	3	1	1	3	1	4	1	4	1	A
Resident (down to 48 inches bgs)	1	1	1	4	1	4	1	2	1	A
	2	1	1	4	1	4	1	2	1	A
	3	1	1	4	1	4	1	2	1	A
Construction Worker (down to 60 inches bgs)	1	1	1	5	1	4	1	4	1	A
	2	1	1	5	1	4	1	4	1	A
	3	1	1	5	1	4	1	4	1	A

**Notes:**

MEC = munitions and explosives of concern

bgs = below ground surface

<sup>1</sup> **MEC Hazard Type:**

1 = Will cause an injury or, in extreme cases, could cause major injury or death to an individual if functioned by an individual's activities.

2 = Will cause major injury or, in extreme cases, could cause death to an individual if functioned by an individual's activities.

3 = Will kill an individual if detonated by an individual's activities.

<sup>2</sup> **MEC Depth bgs:**

1 = 100% of detected MEC removed considering data quality for the sector.

**<sup>3</sup> Migration/Erosion Potential:**

1 = Very Stable, MEC will not migrate.

**<sup>4</sup> Level of Receptor Intrusion:**

1 = Non-intrusive - activity on the ground surface only.

2 = Minor Intrusions - activity on ground surface and ground disturbances to a depth of 1 foot bgs.

3 = Moderate Intrusions - ground disturbances to a depth of 2 feet bgs.

4 = Significant Intrusions - ground disturbances to a depth of 4 feet bgs.

5 = Highly Intrusive - ground disturbances greater than 4 feet bgs.

**<sup>5</sup> Accessibility Factor:** qualitative score related to MEC Depth bgs, Migration/Erosion Potential, and Level of Receptor Intrusion (Appendix A, Table A-4).

**<sup>6</sup> Frequency of Receptor Entry:**

1 = Rare – is not likely to occur ( $\leq 1$  time per year).

4 = Frequent – will occur frequently (1 time per week to  $>1$  time per week).

**<sup>7</sup> MEC Density:**

1 = 100% of detected MEC removed to Level of Intrusion.

**<sup>8</sup> Intensity of Receptor Contact with Soil:**

1 = Very Low ( $\leq 1$  hour per day).

2 = Low ( $\leq 3$  hours per day).

4 = High ( $\leq 9$  hours per day).

**<sup>9</sup> Exposure Factor:** qualitative score related to Frequency of Receptor Entry, MEC Density, and Intensity of Receptor Contact with Soil (Appendix A, Table A-8).

**<sup>10</sup> Overall MEC Risk:** qualitative score related to MEC Hazard Type, Accessibility Factor, and Exposure Factor:

A = Lowest Risk (Appendix A, Table A-10).

**Table 3**  
**After-Action MEC Risk Assessment Results for CSUMB Off-Campus MRA, Sector 2, Non-Residential Land Use**

Receptor	MEC Hazard Type <sup>1</sup>	MEC Depth bgs <sup>2</sup>	Migration/Erosion Potential <sup>3</sup>	Level of Receptor Intrusion <sup>4</sup>	Accessibility Factor <sup>5</sup>	Frequency of Receptor Entry <sup>6</sup>	MEC Density <sup>7</sup>	Intensity of Receptor Contact with Soil <sup>8</sup>	Exposure Factor <sup>9</sup>	Overall MEC Risk <sup>10</sup>
Trespasser (down to 12 inches bgs)	1	1	1	2	1	3	1	3	1	A
	2	1	1	2	1	3	1	3	1	A
	3	1	1	2	1	3	1	3	1	A
Recreational User (down to 6 inches bgs)	1	1	1	2	1	4	1	2	1	A
	2	1	1	2	1	4	1	2	1	A
	3	1	1	2	1	4	1	2	1	A
Maintenance Worker (down to 24 inches bgs)	1	1	1	3	1	4	1	4	1	A
	2	1	1	3	1	4	1	4	1	A
	3	1	1	3	1	4	1	4	1	A
Construction Worker (down to 60 inches bgs)	1	1	1	5	1	4	1	4	1	A
	2	1	1	5	1	4	1	4	1	A
	3	1	1	5	1	4	1	4	1	A

**Notes:**

MEC = munitions and explosives of concern

bgs = below ground surface

<sup>1</sup> **MEC Hazard Type:**

1 = Will cause an injury or, in extreme cases, could cause major injury or death to an individual if functioned by an individual's activities.

2 = Will cause major injury or, in extreme cases, could cause death to an individual if functioned by an individual's activities.

3 = Will kill an individual if detonated by an individual's activities.

<sup>2</sup> **MEC Depth bgs:**

1 = 100% of detected MEC removed considering data quality for the sector.

<sup>3</sup> **Migration/Erosion Potential:**

1 = Very Stable, MEC will not migrate.

<sup>4</sup> **Level of Receptor Intrusion:**

2 = Minor Intrusions - activity on ground surface and ground disturbances to a depth of 1 foot bgs.



3 = Moderate Intrusions - ground disturbances to a depth of 2 feet bgs.

5 = Highly Intrusive - ground disturbances greater than 4 feet bgs.

<sup>5</sup> **Accessibility Factor:** qualitative score related to MEC Depth bgs, Migration/Erosion Potential, and Level of Receptor Intrusion (Appendix A, Table A-4).

<sup>6</sup> **Frequency of Receptor Entry:**

3 = Occasional - will likely occur from time to time (> 1 time per month).

4 = Frequent - will occur frequently (1 time per week to > 1 time per week).

<sup>7</sup> **MEC Density:**

1 = 100% of detected MEC removed to Level of Intrusion.

<sup>8</sup> **Intensity of Receptor Contact with Soil:**

2 = Low ( $\leq$  3 hours per day).

3 = Moderate ( $\leq$  6 hours per day).

4 = High ( $\leq$  9 hours per day).

<sup>9</sup> **Exposure Factor:** qualitative score related to Frequency of Receptor Entry, MEC Density, and Intensity of Receptor Contact with Soil (Appendix A, Table A-8).

<sup>10</sup> **Overall MEC Risk:** qualitative score related to MEC Hazard Type, Accessibility Factor, and Exposure Factor:

A = Lowest Risk (Appendix A, Table A-10).

**Table 4**  
**MEC Risk Assessment Summary for CSUMB Off-Campus MRA, Sector 1, Residential Land Use**

Receptor	MEC Hazard Type <sup>1</sup>	Overall MEC Risk <sup>2</sup>
Trespasser (Surface)	1	A
	2	A
	3	A
Recreational User (down to 6 inches bgs)	1	A
	2	A
	3	A
Maintenance Worker (down to 24 inches bgs)	1	A
	2	A
	3	A
Resident (down to 48 inches bgs)	1	A
	2	A
	3	A
Construction Worker (down to 60 inches bgs)	1	A
	2	A
	3	A

**Notes:**

MEC = munitions and explosives of concern

bgs = below ground surface

<sup>1</sup>**MEC Hazard Type:**

1 = Will cause an injury or, in extreme cases, could cause major injury or death to an individual if functioned by an individual's activities.

2 = Will cause major injury or, in extreme cases, could cause death to an individual if functioned by an individual's activities.

3 = Will kill an individual if detonated by an individual's activities.

<sup>2</sup>**Overall MEC Risk:** qualitative score related to MEC Hazard Type, Accessibility Factor, and Exposure Factor:

A = Lowest Risk (Appendix A, Table A-10).

**Table 5**  
**MEC Risk Assessment Summary for CSUMB Off-Campus MRA, Sector 2, Non-Residential Land Use**

Receptor	MEC Hazard Type <sup>1</sup>	Overall MEC Risk <sup>2</sup>
Trespasser (down to 12 inches bgs)	1	A
	2	A
	3	A
Recreational User (down to 6 inches bgs)	1	A
	2	A
	3	A
Maintenance Worker (down to 24 inches bgs)	1	A
	2	A
	3	A
<b>Construction Worker</b> (down to 60 inches bgs)	<b>1</b>	<b>A</b>
	<b>2</b>	<b>A</b>
	<b>3</b>	<b>A</b>

**Notes:**

MEC = munitions and explosives of concern

bgs = below ground surface

<sup>1</sup>**MEC Hazard Type:**

1 = Will cause an injury or, in extreme cases, could cause major injury or death to an individual if functioned by an individual's activities.

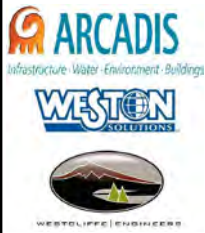
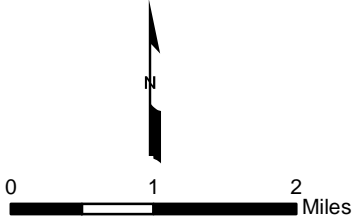
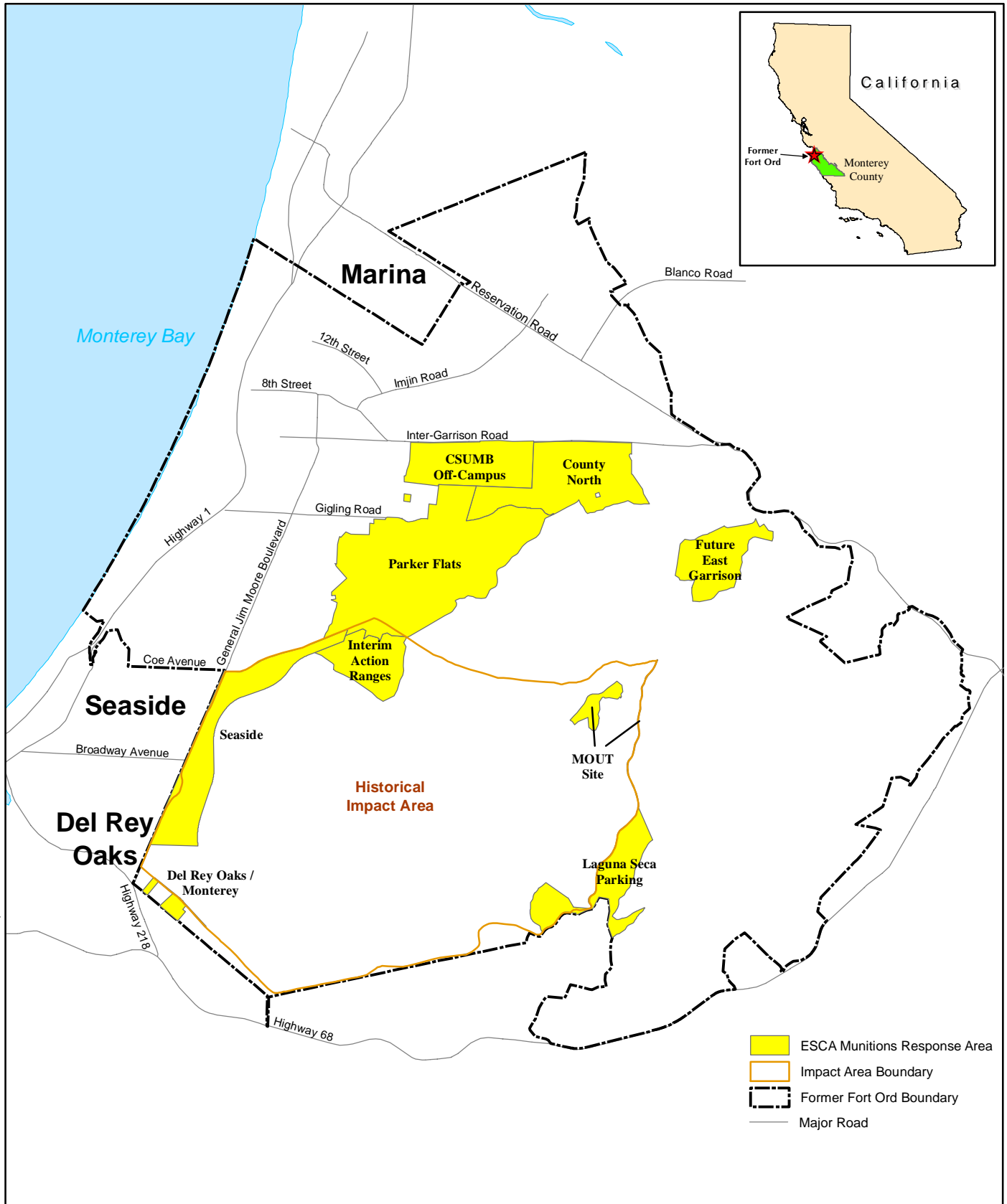
2 = Will cause major injury or, in extreme cases, could cause death to an individual if functioned by an individual's activities.

3 = Will kill an individual if detonated by an individual's activities.

<sup>2</sup>**Overall MEC Risk:** qualitative score related to MEC Hazard Type, Accessibility Factor, and Exposure Factor:

A = Lowest Risk (Appendix A, Table A-10).

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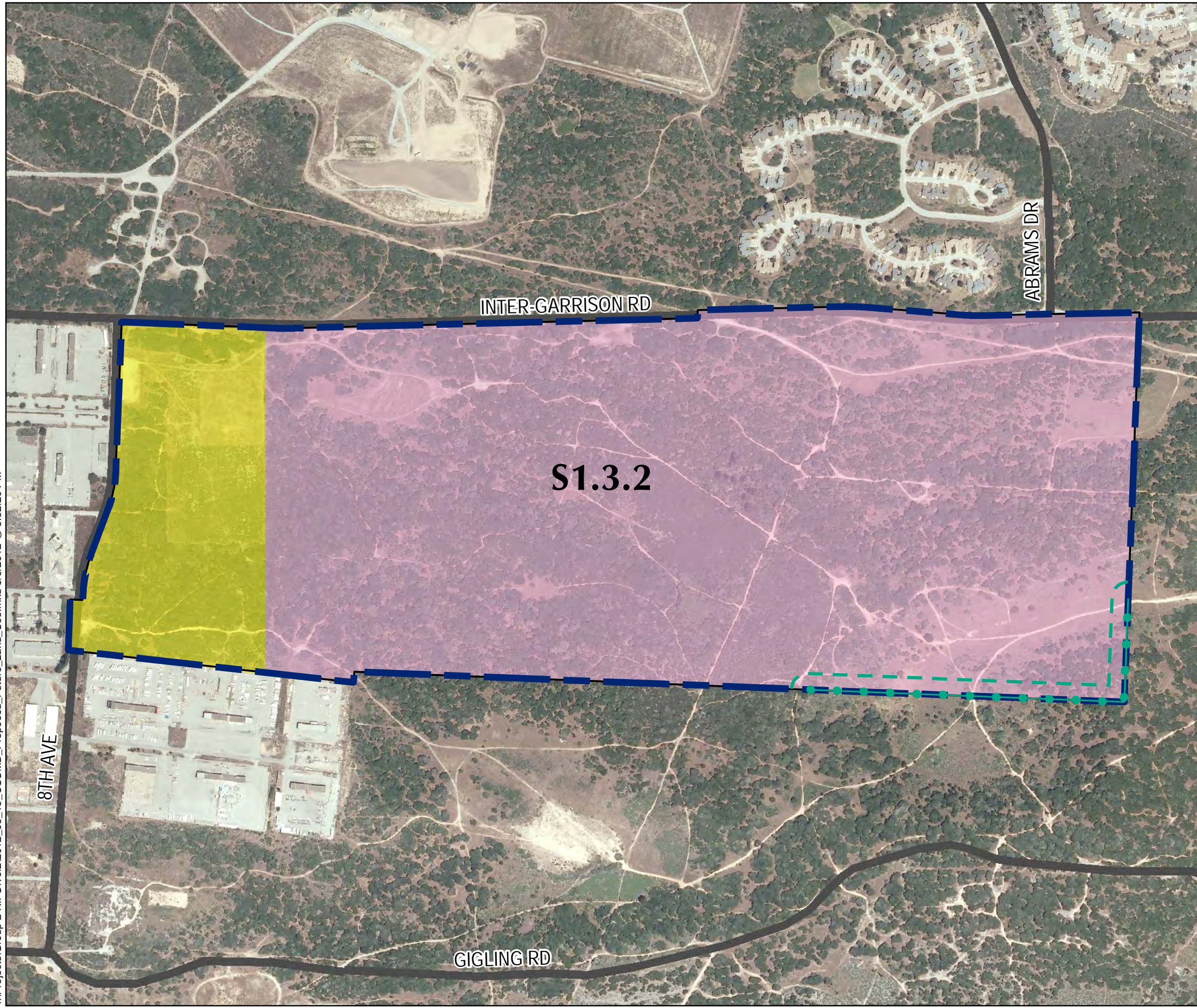


**Former Fort Ord Location Map**






FORA ESCA RP  
Monterey County, California

**Figure 1**



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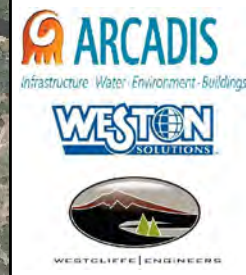
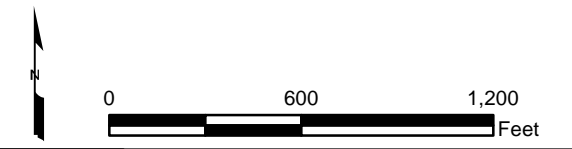
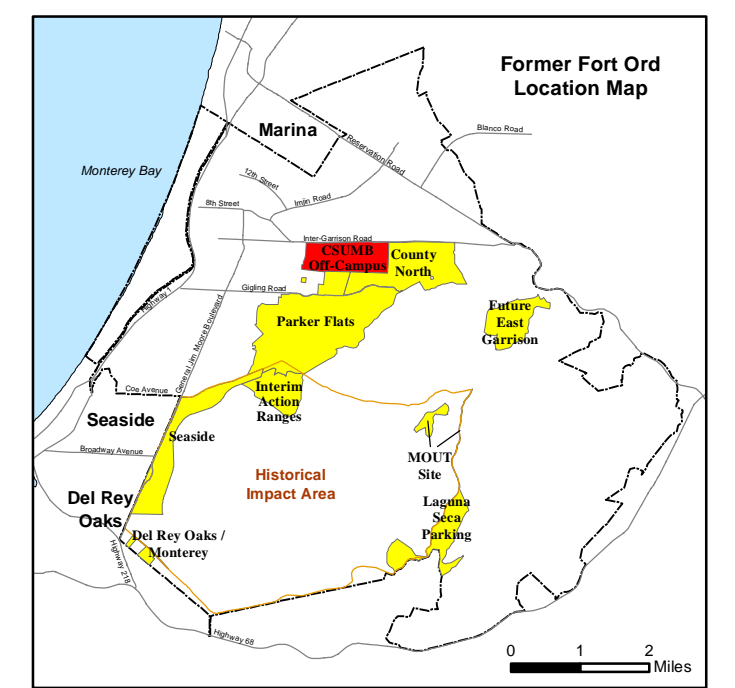


### Legend

-  Munitions Response Area
-  Major Road
-  USACE Parcel
-  Borderland Interface
-  100-Foot Buffer from Borderland Interface

### Proposed Future Land Use

-  Residential (CSUMB Campus Housing)
-  Non-Residential (CSUMB Open Space Park)

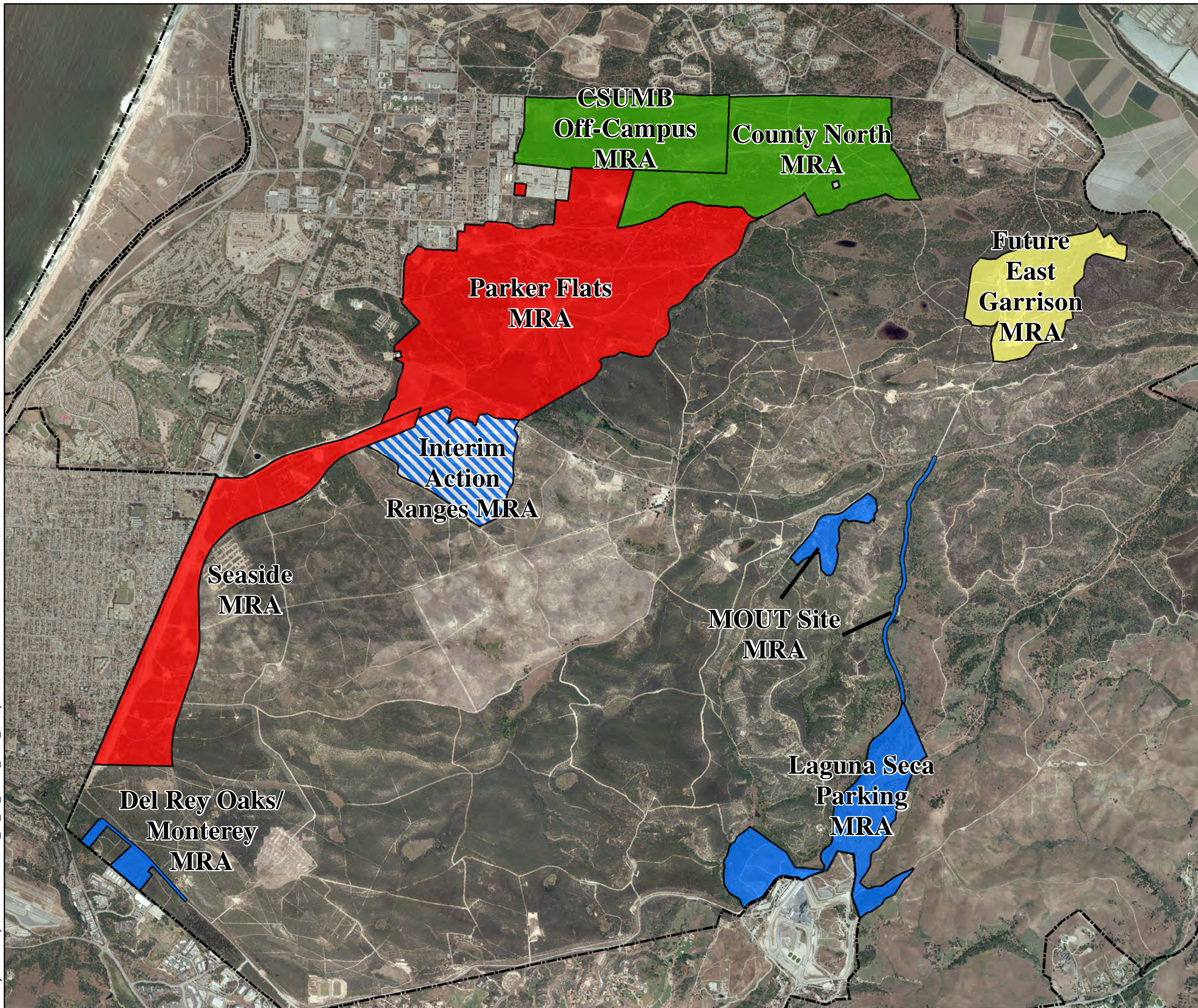


### CSUMB Off-Campus MRA Proposed Future Land Use











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Monterey County, California

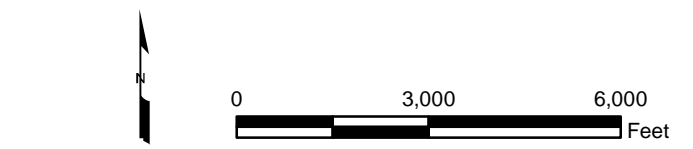
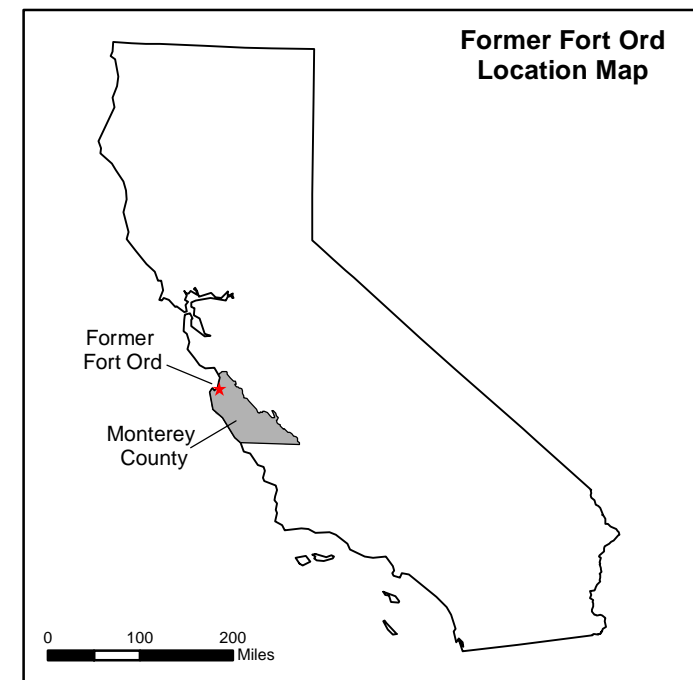
Figure 2

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### Legend

-  Former Fort Ord Boundary
- Group 1 MRAs**
  -  Seaside MRA
  -  Parker Flats MRA
- Group 2 MRAs**
  -  CSUMB Off-Campus MRA
  -  County North MRA
- Group 3 MRAs**
  -  MOUT Site MRA
  -  Del Rey Oaks/Monterey MRA
  -  Laguna Seca Parking MRA
  -  Interim Action Ranges MRA
- Group 4 MRA**
  -  Future East Garrison MRA

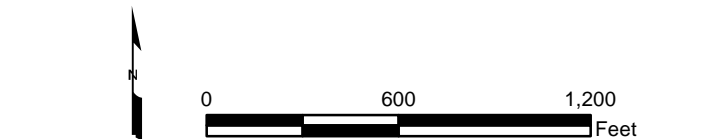
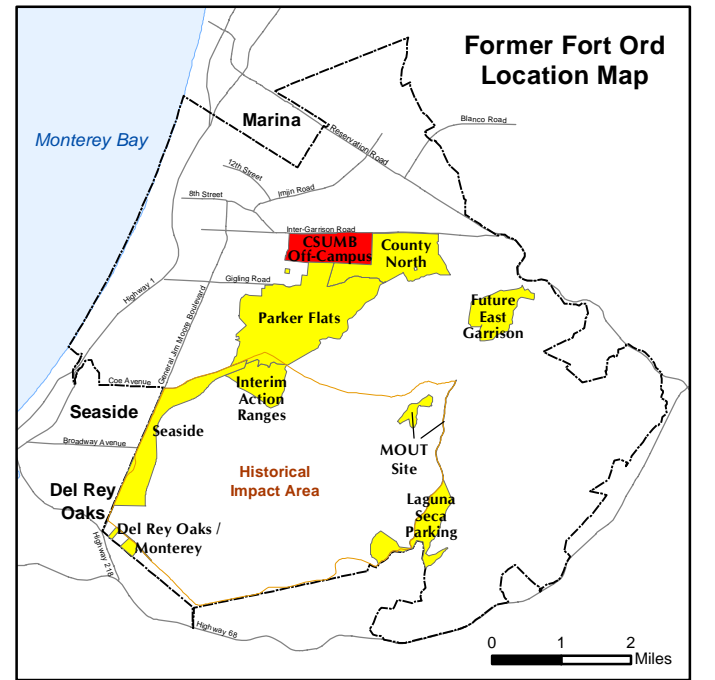
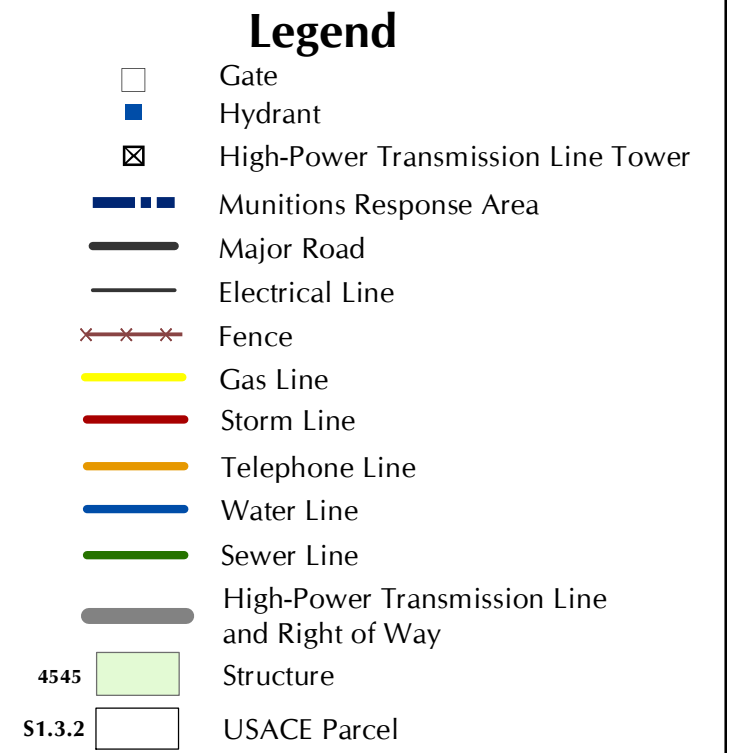
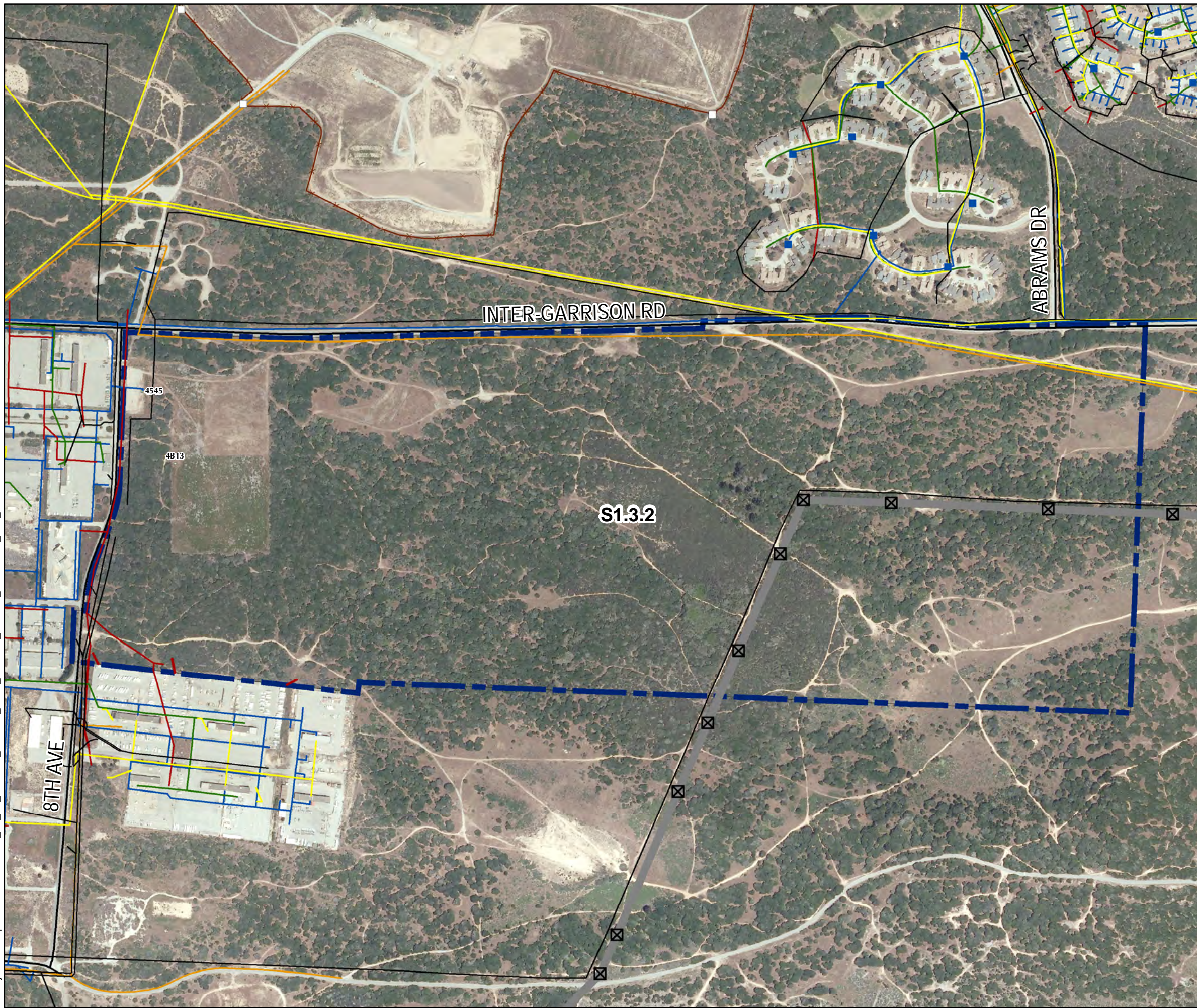


### ESCA Munitions Response Area Groups

FORA ESCA RP  
Monterey County, California

Figure 3

T:\Projects\Group 2 RIFS\Vol2\2012\_05\_18\_CSUMB\_USACE\_Land\_Transfer\_Parcels\_Structures\_and\_Utillities.mxd 6/11/2012 @ 4:36:53 PM



**CSUMB Off-Campus MRA  
USACE Land Transfer Parcels,  
Structures, and Utilities**

FORA ESCA RP  
Monterey County, California

**Figure 4**

## APPENDIX A

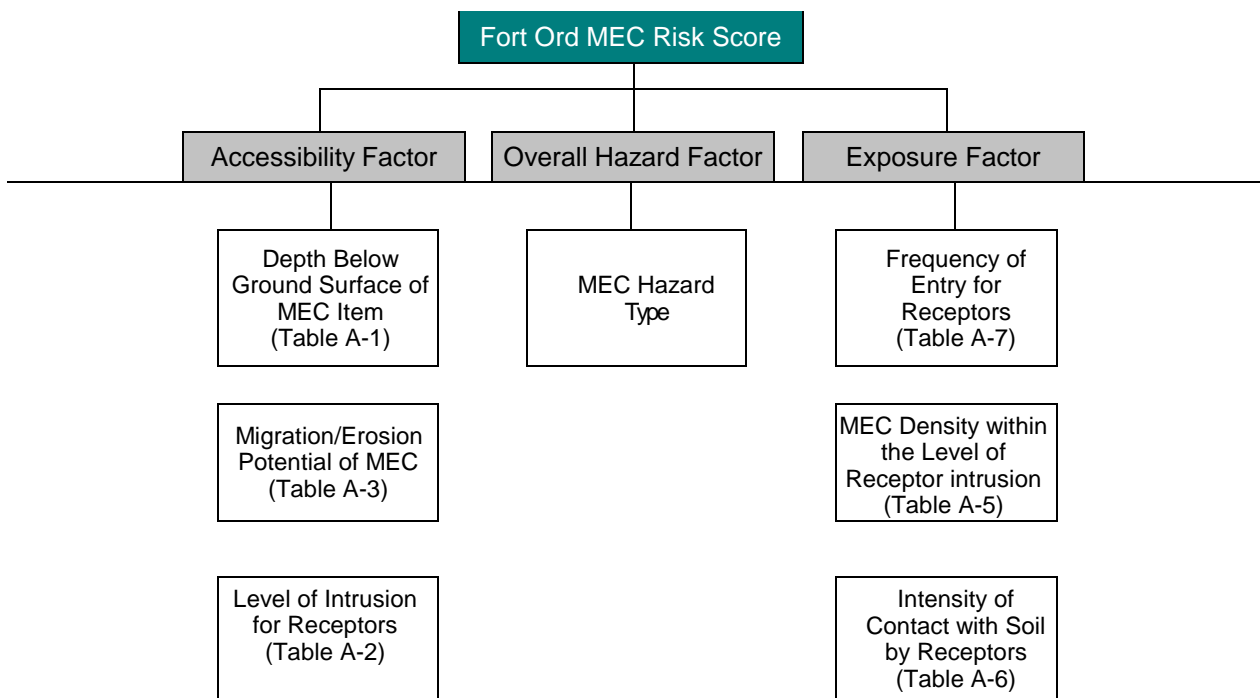
### Summary of the Risk Assessment Protocol



## 1.0 GENERAL OVERVIEW

The Fort Ord MEC Risk Assessment Protocol (“the Protocol”; Malcolm Pirnie 2002) is a qualitative risk assessment approach based on seven input factors. The input factors are both qualitative and quantitative. Two process matrices combine six of the input factors into scores for accessibility and exposure. A third process matrix combines the scores for accessibility, exposure, and overall hazard (the seventh input factor) into a single qualitative score for estimating munitions and explosives of concern (MEC) risk. The seven input factors are shown on Figure 1 below.

Figure A-1. Fort Ord MEC Risk Assessment



## 2.0 DEFINITION OF INPUT FACTORS AND ASSUMPTIONS

The following sections provide each of the input factors and the matrices used to determine an overall MEC risk score. For more information on the scoring process, please refer to the Protocol (Malcolm Pirnie 2002).

### 2.1 Accessibility Factor

The accessibility factor reflects how likely it is that the MEC items in the area are accessible by considering the three input scores related to MEC depth below ground surface (bgs), level of intrusion, and migration/erosion potential as described here. MEC depth bgs (Table A-1)

refers to the minimum depth of a MEC item below the surface, level of intrusion (Table A-2) considers the depth of soil intrusion for proposed activities, and migration/erosion potential (Table A-3) examines whether the depth of a MEC item will change from soil movement. A value is assigned for each of the three input scores using well-defined, set criteria, and then a scoring matrix combines the three input scores to produce a score for the accessibility factor.

The following tables identify the scoring for each of the inputs used to determine the accessibility factor.

Table A-1. MEC Depth Below Ground Surface

Score	Description <sup>(a) (b) (c)</sup>
1	100% of detected MEC removed considering data quality for the sector <sup>(d)</sup>
2	MEC > 5 feet bgs
3	MEC ≥ 4 feet bgs
4	MEC ≥ 3 feet bgs
5	MEC ≥ 2 feet bgs
6	MEC ≥ 1 foot bgs
7	No MEC on the surface and MEC below surface
8	Any MEC on the surface

Notes:

- a. The shallowest MEC item found determines the depth below ground surface (bgs) for the sector.
- b. If significant uncertainty exists about the depth of the MEC item, it may be appropriate to assign the next highest score.
- c. Depth should be based on actual field measurements of MEC items found.
- d. Detection and removal procedures meeting the Data Quality Objectives (DQOs) for the sector based on clearly defined investigation objectives including reuse and the detection of designated MEC. If DQOs have not been established for the sector, the quality of data should be reviewed and approved to score a '1'.

Table A-2. Level of Intrusion

Score	Description <sup>(a) (b)</sup>
1	Non-Intrusive: Activity on the ground surface, none below the surface
2	Minor Intrusions: Activity on the ground surface and ground disturbances to a depth of 1 foot bgs
3	Moderate Intrusions: Ground disturbances to a depth of 2 feet bgs
4	Significant Intrusions: Ground disturbances to a depth of 4 feet bgs
5	Highly Intrusive: Ground disturbances greater than 4 feet bgs

Notes:

- a. The deepest intrusion level expected for a given reuse determines the intrusion level of activity for the sector.
- b. If significant uncertainty exists about the depth of intrusion, it may be appropriate to assign the next higher score.

Table A-3. Migration/Erosion Potential

Score	Description <sup>(a)</sup>
1	Very Stable: MEC will not migrate. Annual erosion is equal to or less than the site-wide average of 3/100 inches.
2	Minor Migration: Recurring and extreme natural events may cause MEC to migrate upward, potentially reaching the intrusion level, over a long period of time (more than two five-year reviews). Annual erosion is greater than the average site-wide condition but less than 1 inch. <sup>(b)</sup>
3	Significant Migration: Recurring and extreme natural events will bring MEC to the surface within the first recurring review. Annual erosion is more than 1 inch. <sup>(c)</sup>

## Notes:

- a. The migration/erosion factor should consider the potential for change in depth of a MEC item due to erosion. The presence of human activities, streams, gullies, or steep slopes in an area may require a more thorough investigation of the potential for erosion.
- b. Average annual site-wide erosion potential is 3/100 inches.
- c. Significant erosion at the former Fort Ord will likely be limited to areas disturbed by human activity, such as roads or firebreaks.

The accessibility factor is determined using the qualitative scoring matrix in Table A-4.

Table A-4. Accessibility Factor Scoring Matrix <sup>(a)</sup>

MEC Depth Below Ground Surface	Level of Intrusion	Migration/Erosion Potential		
		1. Very Stable	2. Minor Migration	3. Significant Migration
1. 100% of detected MEC removed considering data quality for the sector	1. Non-Intrusive (surface only)	1	1	1
	2. Minor Intrusion ( $\leq 1$ foot bgs)	1	1	1
	3. Moderate Intrusion ( $\leq 2$ feet bgs)	1	1	1
	4. Significant Intrusion ( $\leq 4$ feet bgs)	1	1	1
	5. Highly Intrusive ( $> 4$ feet bgs)	1	1	1
2. MEC $> 5$ feet bgs	1. Non-Intrusive (surface only)	1	1	1
	2. Minor Intrusion ( $\leq 1$ foot bgs)	1	1	1
	3. Moderate Intrusion ( $\leq 2$ feet bgs)	1	1	1
	4. Significant Intrusion ( $\leq 4$ feet bgs)	1	2	3
	5. Highly Intrusive ( $> 4$ feet bgs)	3	3	4

Table A-4. Accessibility Factor Scoring Matrix <sup>(a)</sup>

MEC Depth Below Ground Surface	Level of Intrusion	Migration/Erosion Potential		
		1. Very Stable	2. Minor Migration	3. Significant Migration
3. MEC ≥ 4 feet bgs	1. Non-Intrusive (surface only)	1	1	1
	2. Minor Intrusion (≤ 1 foot bgs)	1	1	1
	3. Moderate Intrusion (≤ 2 feet bgs)	1	1	2
	4. Significant Intrusion (≤ 4 feet bgs)	3	3	4
	5. Highly Intrusive (> 4 feet bgs)	5	5	5
4. MEC ≥ 3 feet bgs	1. Non-Intrusive (surface only)	1	1	1
	2. Minor Intrusion (≤ 1 foot bgs)	1	1	2
	3. Moderate Intrusion (≤ 2 feet bgs)	1	2	3
	4. Significant Intrusion (≤ 4 feet bgs)	5	5	5
	5. Highly Intrusive (> 4 feet bgs)	5	5	5
5. MEC ≥ 2 feet bgs	1. Non-Intrusive (surface only)	1	1	3
	2. Minor Intrusion (≤ 1 foot bgs)	1	2	3
	3. Moderate Intrusion (≤ 2 feet bgs)	3	3	4
	4. Significant Intrusion (≤ 4 feet bgs)	5	5	5
	5. Highly Intrusive (> 4 feet bgs)	5	5	5
6. MEC ≥ 1 foot bgs	1. Non-Intrusive (surface only)	1	2	3
	2. Minor Intrusion (≤ 1 foot bgs)	3	3	4
	3. Moderate Intrusion (≤ 2 feet bgs)	5	5	5
	4. Significant Intrusion (≤ 4 feet bgs)	5	5	5
	5. Highly Intrusive (> 4 feet bgs)	5	5	5
7. No MEC on the surface and MEC below surface	1. Non-Intrusive (surface only)	4	5	5
	2. Minor Intrusion (≤ 1 foot bgs)	5	5	5
	3. Moderate Intrusion (≤ 2 feet bgs)	5	5	5
	4. Significant Intrusion (≤ 4 feet bgs)	5	5	5
	5. Highly Intrusive (> 4 feet bgs)	5	5	5
8. Any MEC on the surface	1. Non-Intrusive (surface only)	5	5	5
	2. Minor Intrusion (≤ 1 foot bgs)	5	5	5
	3. Moderate Intrusion (≤ 2 feet bgs)	5	5	5
	4. Significant Intrusion (≤ 4 feet bgs)	5	5	5
	5. Highly Intrusive (> 4 feet bgs)	5	5	5

Notes:

(a) Accessibility factor scores are defined as:

1. Least Potential for Accessibility
2. Not Likely to be Accessible
3. May Be Accessible
4. Likely to be Accessible
5. Greatest Potential for Accessibility

## 2.2 Exposure Factor

The exposure factor assesses how likely it is that someone will be exposed to the MEC item if they are in the area by considering the following three inputs: MEC density, intensity of contact with soil, and frequency of entry. MEC density (Table A-5) is the density of MEC items (excluding scrap) within the level of intrusion; intensity of contact with soil (Table A-6) is an hours/day assessment of the receptor's contact with soil based on proposed site use; and frequency of entry (Table A-7) refers to the number of times receptors enter an area based on proposed site use. A value is assigned for each of the three input scores using well-defined, set criteria, and then a scoring matrix combines the three input scores to produce a score for the exposure factor.

Table A-5. MEC Density

Score	Description <sup>(a) (b) (c)</sup>
1	100% of detected MEC removed to level of intrusion <sup>(d)</sup>
2	Low MEC density (< 0.1 item per acre) <sup>(e)</sup>
3	Medium MEC density (0.1 to 1 item per acre)
4	High MEC density (> 1 item per acre)

Notes:

- a. MEC density depends on actual MEC items in the level of intrusion from Table A-2. MEC scrap should not be considered.
- b. If significant uncertainty exists about MEC density, it may be appropriate to assign the next higher score.
- c. Density should be based on actual field measurements of MEC items.
- d. Detection and removal procedures meeting the DQOs for the sector based on clearly defined investigation objectives including reuse and the detection of designated MEC. If DQOs have not been established for the sector, the quality of data should be reviewed and approved to score a '1.'
- e. As available, the measurement of number of items per acre should be determined from the aerial extent of the area and the level of intrusion.

Table A-6. Intensity of Contact with Soil

Score	Description <sup>(a) (b)</sup>
1	Very Low: ≤ 1 hour/day

2	Low: ≤ 3 hours/day
3	Moderate: ≤ 6 hours/day
4	High: ≤ 9 hours/day
5	Very High: > 9 hours/day

Notes:

- a. Activities involving direct contact with soil should be considered in this category. Direct contact with soil can range from walking on the soil to digging in the soil.
- b. If significant uncertainty exists about intensity of contact with soil, it may be appropriate to assign the next higher score.

Table A-7. Frequency of Entry

Score	Description <sup>(a) (b)</sup>
1	Rare: Is not likely to occur (less than once per year to once per year)
2	Infrequent: Will seldom occur (less than once per season to once per month)
3	Occasional: Will likely occur from time to time (more than once per month)
4	Frequent: Will occur frequently (once a week to more than once a week)

Notes:

- a. Unexploded Ordnance- (UXO-) trained professionals and others covered by MEC-specific health and safety plans should not be considered in the frequency of entry categories.
- b. Depending on the type of reuse, different sectors may have different entry frequencies for the same activity.

The exposure factor is determined using the qualitative scoring matrix given in Table A-8.

Table A-8. Exposure Factor Scoring Matrix <sup>(a)</sup>

Frequency of Entry	MEC Density	Intensity of Contact with Soil				
		1. Very Low: < 1 hr/day	2. Low: ≤ 3 hrs/day	3. Moderate: ≤ 6 hrs/day	4. High: ≤ 9 hrs/day	5. Very High: > 9 hrs/day
1. Rare	1. 100% of detected MEC removed to intrusion depth	1	1	1	1	1
	2. Low MEC density	1	2	2	3	3
	3. Medium MEC density	2	3	3	3	3
	4. High MEC density	3	3	3	4	4
2. Infrequent	1. 100% of detected MEC removed to intrusion depth	1	1	1	1	1
	2. Low MEC density	1	2	2	3	3
	3. Medium MEC density	2	3	3	4	4
	4. High MEC density	3	3	4	4	4

3. Occasional	1. 100% of detected MEC removed to intrusion depth	1	1	1	1	1
	2. Low MEC density	2	2	3	3	3
	3. Medium MEC density	3	3	4	4	4
	4. High MEC density	3	4	5	5	5
4. Frequent	1. 100% of detected MEC removed to intrusion depth	1	1	1	1	1
	2. Low MEC density	2	2	3	4	4
	3. Medium MEC density	3	4	4	5	5
	4. High MEC density	4	5	5	5	5

## Notes:

(a) Exposure factor scores are defined as:

1. Least Potential for Exposure
2. Not Likely to be Exposed
3. May be Exposed
4. Likely to be Exposed
5. Greatest Potential for Exposure

## 2.3 Overall Hazard Factor

The overall hazard factor examines how hazardous the MEC item itself is. This is based on the type of MEC item present, which must be determined by UXO-trained personnel. The overall hazard factor is then given a score based on how likely the MEC type is to cause injury and how severe the injury may be.

Table A-9. MEC Hazard Classification

Score	Description <sup>(a)</sup>
0	Inert MEC, will cause no injury <sup>(b)</sup>
1	MEC that will cause an injury, or in extreme cases, could cause major injury or death to an individual if functioned by an individual's activities <sup>(c)</sup>
2	MEC that will cause major injury, or in extreme cases, could cause death to an individual if functioned by an individual's activities <sup>(d)</sup>
3	MEC that will kill an individual if detonated by an individual's activities

## Notes:

- (a) MEC type must only be determined by UXO-trained personnel.
- (b) Inert describes the condition of a munition, or component thereof, which contains no explosive, pyrotechnic, or chemical agent.
- (c) An injury is defined as a flesh wound or a minor burn.
- (d) A major injury is defined as the loss of sight, hearing, or limb, or a major burn.

## 2.4 Overall MEC Risk

The overall MEC risk is determined by the accessibility factor, the exposure factor, and the overall hazard factor. The three factors are combined in a matrix to yield an overall MEC risk score designated by the letters A through E, where A represents the lowest risk and E represents the highest risk. The scoring matrix for the overall MEC risk score is given in Table A-10 below. Information on the MEC type and accessibility factors is in the first two columns, while exposure factor information is given in a row across the top.

Table A-10. Overall MEC Risk Scoring Matrix <sup>(a)</sup>

MEC Type	Accessibility	Exposure				
		1. Least Potential for Exposure	2. Not Likely to be Exposed	3. May be Exposed	4. Likely to be Exposed	5. Greatest Potential for Exposure
0. Inert MEC	1. Least Potential for Accessibility	A	A	A	A	A
	2. Not Likely to be Accessible	A	A	A	A	A
	3. May be Accessible	A	A	A	A	A
	4. Likely to be Accessible	A	A	A	A	A
	5. Greatest Potential for Accessibility	A	A	A	A	A
1. MEC that will cause an injury	1. Least Potential for Accessibility	A	A	A	B	B
	2. Not Likely to be Accessible	A	B	B	B	B
	3. May be Accessible	A	B	B	C	C
	4. Likely to be Accessible	B	B	C	D	D
	5. Greatest Potential for Accessibility	B	C	D	D	D
2. MEC that will cause a major injury	1. Least Potential for Accessibility	A	A	B	B	B
	2. Not Likely to be Accessible	A	B	B	C	C
	3. May be Accessible	A	B	C	D	D
	4. Likely to be Accessible	B	C	D	D	E
	5. Greatest Potential for Accessibility	B	C	D	E	E
3. MEC that will kill	1. Least Potential for Accessibility	A	B	B	C	C
	2. Not Likely to be Accessible	B	B	C	D	D
	3. May be Accessible	B	C	D	E	E
	4. Likely to be Accessible	C	C	D	E	E
	5. Greatest Potential for Accessibility	C	D	E	E	E

**Notes:**

- (a) Overall MEC risk scores are defined as:
- A. Lowest Risk



- B. Low Risk
- C. Medium Risk
- D. High Risk
- E. Highest Risk

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## APPENDIX B

### MEC Items Found by Sector

Table B-1: MEC Items Found on the CSUMB Off-Campus MRA Sector 1 (Residential Area)

Northing**	Easting**	Final Model Description	Hazard Type	Quantity	Depth (inches)
<b>Items with Final Model Description and Risk Code</b>					
2132843.5	5745170	Grenade, rifle, antitank, practice, M11 series	0	5	0
2133143.5	5744870	Rocket, 3.5inch, practice, M29 series	0	1	0
2132943.5	5744870	Rocket, 3.5inch, practice, M29 series	0	1	0
2132327.75	5745018.75	Cap, blasting, electric, M6	1	1	6
2133143.5	5745070	Flare, surface, trip, M49 series	1	1	0
2132843.5	5745370	Flare, surface, trip, M49 series	1	1	0
2131342.737	5744276.447	Fuze, grenade, hand, M10 series	1	2	0
2131843.251	5744370.267	Fuze, grenade, hand, M10 series	1	1	0
2132943.5	5744770	Fuze, grenade, hand, M10 series	1	1	0
2132643.5	5745170	Fuze, grenade, hand, M10 series	1	1	0
2132643.5	5745070	Fuze, grenade, hand, practice, M205 series	1	1	0
2132726.3	5745224.78	Fuze, grenade, hand, practice, M205 series	1	33	12
2132843.5	5744770	Grenade, hand, incendiary, TH3, AN-M14	1	8	0
2132543.5	5744770	Grenade, hand, riot, CS, M7A3	1	1	0
2132943.5	5744970	Grenade, hand, riot, CS, M7A3	1	1	0
2132543.5	5744770	Grenade, hand, smoke, M18 series	1	1	0
2132743.5	5745170	Grenade, hand, smoke, M18 series	1	3	0
2132643.5	5745270	Mine, antitank, practice, M1A1	1	1	0
2131843.251	5744370.267	Projectile, 40mm, parachute, star, M662	1	1	0
2132943.5	5744770	Simulator, detonation, explosive, M80	1	1	0
2131343.5	5744570	Simulator, launching, antitank guided missile and rocket, M22	1	1	0
2132943.5	5744570	Flare, parachute, trip, M48	2	1	0
2133043.5	5744770	Flare, parachute, trip, M48	2	1	0
2132543.5	5744770	Flare, parachute, trip, M48	2	1	0
2132543.5	5744870	Flare, parachute, trip, M48	2	1	0
2132820	5745273	Signal, illumination, ground, M125 series	2	1	3
2132843.5	5745370	Grenade, hand, fragmentation, MK II	3	1	0
Northing**	Easting**	Original Nomenclature	Hazard Type	Quantity	Depth (inches)
<b>Items with NO Final Model Description or Risk Code</b>					
2131343.5	5744870	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	1	0
2131343.5	5745170	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	1	0
2131443.5	5744370	FUZE, M12 (Model Unknown)	1*	3	0
2133143.5	5744670	PROJECTILE, 20MM, TPT (Model Unknown)	0*	1	0
2133043.5	5744670	PROJECTILE, 37mm (Model Unknown)	3*	1	0

2131244.187	5744469.979	PROJECTILE, WITH FUZE MK2/MOD12 1.1 INCH (Model Unknown)	3*	1	0
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**Notes:**

MEC = munitions and explosives of concern

MM = millimeter

\* No risk code assigned in the MMRP database. Risk code assigned by the ESCA RP Team based on professional judgment.

\*\* The depths of items recovered by HFA and UXB were not recorded at the time of removal activities; therefore, the MMRP database has assigned the depth of zero (on the surface) for the recovered items. The exact locations (northing and easting coordinates) of items recovered by HFA and UXB were not recorded at the time of removal activities. To facilitate mapping of these items, the MMRP database has assigned the depth of zero and the northing and easting of the recovered items to the center of the grids in which the items were found.

**MEC Risk Code:**

0 = Inert, will cause no injury

1 = Will cause an injury or, in extreme cases, could cause major injury or death to an individual if functioned by an individual's activities.

2 = Will cause major injury or, in extreme cases, could cause death to an individual if functioned by an individual's activities.

3 = Will kill an individual if detonated by an individual's activities.

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

Northing**	Easting**	Final Model Description	Hazard Type	Quantity	Depth (inches)
<b>Items with Final Model Description and Risk Code</b>					
2131541.013	5749019.891	Grenade, rifle, antitank, practice, M11 series	0	1	0
2131645.875	5747578.5	Mine, antipersonnel, practice, M68 (claymore)	0	2	0
2132148.625	5747676	Mine, antipersonnel, practice, M68 (claymore)	0	1	0
2131947.062	5747881.479	Mine, antipersonnel, practice, M68 (claymore)	0	1	0
2132943.5	5745570	Mine, antipersonnel, practice, M68 (claymore)	0	2	0
2131730.03	5749517.444	Projectile, 37mm, armor piercing tracer, M80	0	1	0
2131239.875	5750127.25	Projectile, 37mm, armor piercing tracer, M80	0	1	0
2132443.5	5745970	Rocket, 2.36inch, practice, M7	0	1	0
2131543.459	5748599.876	Rocket, 2.36inch, practice, M7	0	1	0
2131249.58	5749034.764	Rocket, 2.36inch, practice, M7	0	1	0
2132045.685	5749116.324	Rocket, 2.36inch, practice, M7	0	1	0
2132145.358	5749247.829	Rocket, 2.36inch, practice, M7	0	1	0
2132643.5	5746770	Rocket, 3.5inch, practice, M29 series	0	1	0
2132246.772	5748999.939	Rocket, 3.5inch, practice, M29 series	0	1	0
2133143.5	5746770	Rocket, 3.5inch, practice, M29 series	0	1	0
2132043.5	5746570	Activator, mine, antitank, practice, M1	1	2	0
2132146.374	5747269.916	Activator, mine, antitank, practice, M1	1	1	0
2131947.938	5747372.021	Activator, mine, antitank, practice, M1	1	1	0
2132349.562	5747775.979	Activator, mine, antitank, practice, M1	1	1	0
2133043.5	5745970	Activator, mine, antitank, practice, M1	1	1	0
2131745.729	5747985.396	Activator, mine, antitank, practice, M1	1	1	0
2132751.666	5747874.375	Base, coupling, firing device	1	2	0
2132037.125	5749705	Base, coupling, firing device	1	1	0
2132843.931	5747976.261	Base, coupling, firing device	1	1	0
2131239.875	5750127.25	Cap, blasting, electric, M6	1	1	0
2131244.414	5750324.432	Cap, blasting, electric, M6	1	3	0
2131244.414	5750324.432	Cap, blasting, electric, M6	1	10	0
2132037.125	5749705	Cap, blasting, electric, M6	1	1	0
2132037.125	5749705	Cap, blasting, electric, M6	1	10	0
2131358.651	5750814.69	Cap, blasting, electric, M6	1	1	0
2131356.25	5750715	Cap, blasting, electric, M6	1	2	0
2131249.25	5750522.5	Cap, blasting, electric, M6	1	8	0
2131249.25	5750522.5	Cap, blasting, electric, M6	1	1	0
2131249.25	5750522.5	Cap, blasting, electric, M6	1	1	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2131055	5750310	Cap, blasting, electric, M6	1	1	1
2131050	5750225	Cap, blasting, electric, M6	1	3	1
2131070	5750025	Cap, blasting, electric, M6	1	1	6
2131095	5749705	Cap, blasting, electric, M6	1	1	6
2131165	5750280	Cap, blasting, electric, M6	1	1	4
2131185	5749850	Cap, blasting, non-electric, M7	1	1	6
2132352.396	5750170.898	Firing device, multi-option, M142	1	1	0
2132543.5	5745970	Firing device, pull friction, M2	1	1	0
2132543.5	5746270	Firing device, pull friction, M2	1	4	0
2132549.125	5748589.5	Firing device, pull friction, M2	1	1	0
2132443.5	5746470	Firing device, pull, M1	1	1	0
2131947.938	5747372.021	Firing device, pull, M1	1	1	0
2132349.688	5747674.021	Firing device, pull, M1	1	1	0
2132148.625	5747676	Firing device, pull, M1	1	2	0
2132048.041	5747676.875	Firing device, pull, M1	1	7	0
2132651.354	5747773.354	Firing device, pull, M1	1	5	0
2132550.646	5747774.146	Firing device, pull, M1	1	3	0
2132450.125	5747775	Firing device, pull, M1	1	9	0
2132349.562	5747775.979	Firing device, pull, M1	1	8	0
2132248.938	5747777.021	Firing device, pull, M1	1	3	0
2131846.625	5747780.5	Firing device, pull, M1	1	2	0
2131645.5	5747782.5	Firing device, pull, M1	1	1	0
2131343.73	5747785.23	Firing device, pull, M1	1	2	0
2131947.062	5747881.479	Firing device, pull, M1	1	3	0
2132943.5	5745970	Firing device, pull, M1	1	1	0
2132843.5	5745970	Firing device, pull, M1	1	1	0
2132743.5	5745970	Firing device, pull, M1	1	1	0
2132643.5	5745970	Firing device, pull, M1	1	2	0
2132543.5	5745970	Firing device, pull, M1	1	1	0
2132443.5	5745970	Firing device, pull, M1	1	1	0
2132743.5	5746270	Firing device, pull, M1	1	1	0
2131444.125	5747886	Firing device, pull, M1	1	1	0
2131745.729	5747985.396	Firing device, pull, M1	1	1	0
2132650.5	5748181	Firing device, pull, M1	1	3	0
2133166.508	5749086.859	Firing device, pull, M1	1	1	0
2132751.666	5747874.375	Firing device, release, M1	1	1	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2132556.332	5750358.377	Firing device, release, M1	1	1	0
2132821.423	5745157.611	Firing device, release, M1	1	4	0
2132851.916	5748077.375	Firing device, release, M5	1	1	0
2132943.5	5746770	Firing device, release, M5	1	1	0
2132843.5	5746770	Firing device, release, M5	1	2	0
2131646.251	5747171.127	Firing device, release, M5	1	1	0
2132445.75	5747270	Firing device, release, M5	1	1	0
2132345.75	5747270	Firing device, release, M5	1	3	0
2132146.374	5747269.916	Firing device, release, M5	1	1	0
2131947.938	5747372.021	Firing device, release, M5	1	1	0
2132547.997	5747469.874	Firing device, release, M5	1	1	0
2132148.625	5747676	Firing device, release, M5	1	2	0
2132048.041	5747676.875	Firing device, release, M5	1	16	0
2131248.711	5747684.531	Firing device, release, M5	1	1	0
2132651.354	5747773.354	Firing device, release, M5	1	8	0
2132550.646	5747774.146	Firing device, release, M5	1	2	0
2132450.125	5747775	Firing device, release, M5	1	12	0
2132349.562	5747775.979	Firing device, release, M5	1	12	0
2132047.625	5747880.5	Firing device, release, M5	1	5	0
2131947.062	5747881.479	Firing device, release, M5	1	5	0
2131846.438	5747882.521	Firing device, release, M5	1	1	0
2132843.5	5745970	Firing device, release, M5	1	1	0
2132743.5	5745970	Firing device, release, M5	1	1	0
2132643.5	5745970	Firing device, release, M5	1	1	0
2132543.5	5745970	Firing device, release, M5	1	1	0
2132743.5	5746270	Firing device, release, M5	1	1	0
2132650.5	5748181	Firing device, release, M5	1	3	0
2132945.3	5748074.687	Firing device, release, M5	1	1	0
2132845.392	5748075.844	Firing device, release, M5	1	1	0
2132743.5	5746670	Firing device, tension and release, M3	1	1	0
2132445.75	5747270	Firing device, tension and release, M3	1	1	0
2132345.75	5747270	Firing device, tension and release, M3	1	2	0
2131947.938	5747372.021	Firing device, tension and release, M3	1	1	0
2132349.875	5747572	Firing device, tension and release, M3	1	1	0
2132349.688	5747674.021	Firing device, tension and release, M3	1	4	0
2132048.041	5747676.875	Firing device, tension and release, M3	1	10	0



Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2132450.125	5747775	Firing device, tension and release, M3	1	4	0
2132349.562	5747775.979	Firing device, tension and release, M3	1	5	0
2132743.5	5745570	Firing device, tension and release, M3	1	1	0
2132543.5	5746270	Firing device, tension and release, M3	1	5	0
2132650.688	5748079.021	Firing device, tension and release, M3	1	1	0
2132549.875	5748182	Firing device, tension and release, M3	1	1	0
2132449.416	5748182.875	Firing device, tension and release, M3	1	1	0
2133043.5	5746770	Flare, surface, trip, M49 series	1	1	0
2132445.25	5747170	Flare, surface, trip, M49 series	1	1	0
2132570.545	5750835.57	Flare, surface, trip, M49 series	1	1	0
2131531.125	5749622.75	Flare, surface, trip, M49 series	1	1	0
2131933.5	5749612.173	Flare, surface, trip, M49 series	1	1	0
2131832.833	5749615.377	Flare, surface, trip, M49 series	1	1	0
2132443.5	5746070	Flare, surface, trip, M49 series	1	1	0
2133232.438	5746270.027	Flare, surface, trip, M49 series	1	1	0
2132543.5	5746270	Flare, surface, trip, M49 series	1	1	0
2132533.563	5749590.52	Flare, surface, trip, M49 series	1	1	0
2132135.5	5749603.25	Flare, surface, trip, M49 series	1	1	0
2132634.938	5749685.52	Flare, surface, trip, M49 series	1	1	0
2131432.689	5749724.521	Flare, surface, trip, M49 series	1	1	0
2131741.979	5750009.852	Flare, surface, trip, M49 series	1	1	0
2131242.082	5750226.051	Flare, surface, trip, M49 series	1	1	0
2131550.479	5750407.352	Flare, surface, trip, M49 series	1	1	0
2133057.75	5748477.75	Flare, surface, trip, M49 series	1	1	0
2131845.312	5748493.979	Flare, surface, trip, M49 series	1	1	0
2132957.538	5748680.713	Flare, surface, trip, M49 series	1	1	0
2131844.938	5748698.021	Flare, surface, trip, M49 series	1	2	0
2131443.524	5748910.19	Flare, surface, trip, M49 series	1	1	0
2131250.707	5748919.186	Flare, surface, trip, M49 series	1	1	0
2131341.564	5749027.166	Flare, surface, trip, M49 series	1	1	0
2133166.508	5749086.859	Flare, surface, trip, M49 series	1	1	0
2131541.109	5749146.42	Flare, surface, trip, M49 series	1	3	0
2131643.534	5749269.045	Flare, surface, trip, M49 series	1	1	0
2131440.685	5749283.747	Flare, surface, trip, M49 series	1	1	0
2131016	5749883	Flare, surface, trip, M49 series	1	1	24
2131142	5745923	Flare, surface, trip, M49 series	1	1	4

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2131130	5745960	Flare, surface, trip, M49 series	1	1	48
2132132.624	5749505.198	Fuze, grenade (model unknown)	1	1	0
2131832.833	5749615.377	Fuze, grenade (model unknown)	1	1	0
2132432.165	5749495.69	Fuze, grenade (model unknown)	1	10	0
2132145.896	5749990.899	Fuze, grenade (model unknown)	1	1	0
2131237.75	5750028	Fuze, grenade (model unknown)	1	3	0
2131338.25	5750025.5	Fuze, grenade (model unknown)	1	2	0
2131239.875	5750127.25	Fuze, grenade (model unknown)	1	15	0
2132432.165	5749495.69	Fuze, grenade (model unknown)	1	1	0
2132037.125	5749705	Fuze, grenade (model unknown)	1	1	0
2131635.979	5749819.025	Fuze, grenade (model unknown)	1	1	0
2131744.582	5750107.128	Fuze, grenade (model unknown)	1	1	0
2131752.521	5750398.648	Fuze, grenade (model unknown)	1	1	0
2131962.497	5750680.21	Fuze, grenade (model unknown)	1	1	0
2132143.5	5746570	Fuze, grenade, hand, M10 series	1	1	0
2132343.75	5746870	Fuze, grenade, hand, M10 series	1	1	0
2132047.625	5747880.5	Fuze, grenade, hand, M10 series	1	2	0
2131443.687	5748602.479	Fuze, grenade, hand, M10 series	1	1	0
2131085	5748715	Fuze, grenade, hand, M10 series	1	1	1
2131025	5748725	Fuze, grenade, hand, M10 series	1	1	1
2132910.621	5748468.355	Fuze, grenade, hand, practice, M205 series	1	1	0
2132543.5	5746470	Fuze, grenade, hand, practice, M205 series	1	1	0
2132843.5	5746670	Fuze, grenade, hand, practice, M205 series	1	1	0
2132145.25	5747170	Fuze, grenade, hand, practice, M205 series	1	1	0
2132850.734	5747670.358	Fuze, grenade, hand, practice, M205 series	1	1	0
2132148.625	5747676	Fuze, grenade, hand, practice, M205 series	1	4	0
2132048.041	5747676.875	Fuze, grenade, hand, practice, M205 series	1	8	0
2132651.354	5747773.354	Fuze, grenade, hand, practice, M205 series	1	17	0
2132550.646	5747774.146	Fuze, grenade, hand, practice, M205 series	1	4	0
2132450.125	5747775	Fuze, grenade, hand, practice, M205 series	1	4	0
2132349.562	5747775.979	Fuze, grenade, hand, practice, M205 series	1	6	0
2132047.625	5747880.5	Fuze, grenade, hand, practice, M205 series	1	1	0
2132432.165	5749495.69	Fuze, grenade, hand, practice, M205 series	1	3	0
2131745.729	5747985.396	Fuze, grenade, hand, practice, M205 series	1	1	0
2132650.688	5748079.021	Fuze, grenade, hand, practice, M205 series	1	1	0
2132650.5	5748181	Fuze, grenade, hand, practice, M205 series	1	2	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2132449.416	5748182.875	Fuze, grenade, hand, practice, M205 series	1	2	0
2132448.896	5748386.646	Fuze, grenade, hand, practice, M205 series	1	1	0
2132549.125	5748589.5	Fuze, grenade, hand, practice, M205 series	1	2	0
2131744.562	5748596.979	Fuze, grenade, hand, practice, M205 series	1	2	0
2131343.606	5748810.481	Fuze, grenade, hand, practice, M205 series	1	1	0
2131250.512	5748816.437	Fuze, grenade, hand, practice, M205 series	1	1	0
2131443.524	5748910.19	Fuze, grenade, hand, practice, M205 series	1	1	0
2131541.013	5749019.891	Fuze, grenade, hand, practice, M205 series	1	1	0
2131341.564	5749027.166	Fuze, grenade, hand, practice, M205 series	1	1	0
2131249.58	5749034.764	Fuze, grenade, hand, practice, M205 series	1	1	0
2133166.508	5749086.859	Fuze, grenade, hand, practice, M205 series	1	1	0
2132957.861	5749091.663	Fuze, grenade, hand, practice, M205 series	1	2	0
2132650.398	5749101.728	Fuze, grenade, hand, practice, M205 series	1	1	0
2131541.109	5749146.42	Fuze, grenade, hand, practice, M205 series	1	1	0
2131247.437	5746769.977	Fuze, grenade, hand, practice, M228	1	1	0
2132450.21	5747571.21	Fuze, grenade, hand, practice, M228	1	1	0
2132650.688	5748079.021	Fuze, grenade, hand, practice, M228	1	1	0
2131103	5748803	Fuze, grenade, hand, practice, M228	1	1	1
2132943.5	5745970	Fuze, mine (model unknown)	1	1	0
2132343.5	5746470	Fuze, mine, antitank, practice, M604	1	1	0
2132743.5	5746670	Fuze, mine, antitank, practice, M604	1	1	0
2132743.5	5746770	Fuze, mine, antitank, practice, M604	1	1	0
2132343.5	5746770	Fuze, mine, antitank, practice, M604	1	1	0
2132145.25	5747170	Fuze, mine, antitank, practice, M604	1	1	0
2131947.938	5747372.021	Fuze, mine, antitank, practice, M604	1	1	0
2132651.084	5747875.125	Fuze, mine, antitank, practice, M604	1	1	0
2132643.5	5745970	Fuze, mine, antitank, practice, M604	1	2	0
2132543.5	5745970	Fuze, mine, antitank, practice, M604	1	1	0
2132650.875	5747977	Fuze, mine, antitank, practice, M604	1	1	0
2131250.512	5748816.437	Fuze, mine, antitank, practice, M604	1	1	0
2132843.5	5746770	Fuze, mine, antitank, practice, M604	1	3	0
2133043.5	5746770	Fuze, mine, combination, M10 series	1	1	0
2132651.354	5747773.354	Fuze, mine, combination, M10 series	1	1	0
2132943.5	5745970	Fuze, mine, combination, M10 series	1	1	0
2131732.29	5749617.832	Fuze, mine, combination, M10 series	1	1	0
2132247.71	5747370.168	Grenade, hand, Illumination, MK I	1	1	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2132148.046	5747370.628	Grenade, hand, Illumination, MK I	1	1	0
2132031.637	5749508.571	Grenade, hand, Illumination, MK I	1	1	0
2131933.5	5749612.173	Grenade, hand, Illumination, MK I	1	1	0
2131933.5	5749612.173	Grenade, hand, Illumination, MK I	1	1	0
2131933.5	5749612.173	Grenade, hand, Illumination, MK I	1	2	0
2133143.5	5745970	Grenade, hand, Illumination, MK I	1	1	0
2131936.125	5749709.75	Grenade, hand, Illumination, MK I	1	1	0
2132198	5750178	Grenade, hand, Illumination, MK I	1	1	0
2131744.582	5750107.128	Grenade, hand, Illumination, MK I	1	1	0
2132770.633	5750824.11	Grenade, hand, Illumination, MK I	1	1	0
2131745.729	5747985.396	Grenade, hand, Illumination, MK I	1	2	0
2131945.688	5748595.021	Grenade, hand, Illumination, MK I	1	1	0
2131543.459	5748599.876	Grenade, hand, Illumination, MK I	1	1	0
2131543.353	5748702.353	Grenade, hand, Illumination, MK I	1	1	0
2131443.563	5748705.021	Grenade, hand, Illumination, MK I	1	1	0
2131443.501	5748807.543	Grenade, hand, Illumination, MK I	1	1	0
2131443.524	5748910.19	Grenade, hand, Illumination, MK I	1	1	0
2131343.38	5748913.88	Grenade, hand, Illumination, MK I	1	1	0
2133166.508	5749086.859	Grenade, hand, Illumination, MK I	1	1	0
2131643.534	5749269.045	Grenade, hand, Illumination, MK I	1	1	0
2130994	5749873	Grenade, hand, Illumination, MK I	1	1	6
2132143.125	5749894	Grenade, hand, Illumination, MK I	1	1	0
2131239.875	5750127.25	Grenade, hand, incendiary, TH3, AN-M14	1	1	0
2131336.27	5749925.856	Grenade, hand, practice, M21	1	1	0
2131231.458	5749729.377	Grenade, hand, practice, M30	1	3	0
2132047.686	5750093.23	Grenade, hand, practice, M30	1	1	0
2131329.938	5749627.521	Grenade, hand, practice, MK II	1	1	0
2131941.332	5749903.878	Grenade, hand, practice, MK II	1	1	0
2132256.582	5750370.379	Grenade, hand, practice, MK II	1	1	0
2132256.582	5750370.379	Grenade, hand, practice, MK II	1	1	0
2132256.582	5750370.379	Grenade, hand, practice, MK II	1	7	0
2132256.582	5750370.379	Grenade, hand, practice, MK II	1	1	0
2131965.021	5750777.148	Grenade, hand, practice, MK II	1	1	0
2131229.375	5749630	Grenade, hand, practice, MK II	1	2	0
2132259.25	5750466.75	Grenade, hand, practice, MK II	1	1	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2132343.75	5746870	Grenade, hand, riot, CS, M7A3	1	1	0
2132845.75	5747270	Grenade, hand, riot, CS, M7A3	1	1	0
2132349.875	5747572	Grenade, hand, riot, CS, M7A3	1	1	0
2132048.041	5747676.875	Grenade, hand, riot, CS, M7A3	1	3	0
2132651.354	5747773.354	Grenade, hand, riot, CS, M7A3	1	1	0
2132248.938	5747777.021	Grenade, hand, riot, CS, M7A3	1	2	0
2131645.5	5747782.5	Grenade, hand, riot, CS, M7A3	1	1	0
2131341.564	5749027.166	Grenade, hand, riot, CS, M7A3	1	1	0
2131180	5748790	Grenade, hand, riot, CS, M7A3	1	1	2
2132349.562	5747775.979	Grenade, hand, riot, CS-1, ABC-M25A2	1	1	0
2131846.125	5748086.5	Grenade, hand, riot, CS-1, ABC-M25A2	1	1	0
2131239.875	5750127.25	Grenade, hand, smoke, HC, AN-M8	1	2	0
2132336.146	5749593.647	Grenade, hand, smoke, HC, AN-M8	1	1	0
2132236.332	5749597.879	Grenade, hand, smoke, HC, AN-M8	1	1	0
2132445.75	5747270	Grenade, hand, smoke, M18 series	1	1	0
2131651.543	5750402.872	Grenade, hand, smoke, M18 series	1	1	0
2131242.082	5750226.051	Grenade, hand, smoke, M18 series	1	1	0
2132843.5	5745970	Grenade, hand, smoke, M18 series	1	1	0
2131246.562	5746169.978	Grenade, hand, smoke, M18 series	1	2	0
2133043.5	5746270	Grenade, hand, smoke, M18 series	1	2	0
2132943.5	5746270	Grenade, hand, smoke, M18 series	1	3	0
2132346.896	5749978.398	Grenade, hand, smoke, M18 series	1	1	0
2132031.637	5749508.571	Grenade, hand, smoke, M18 series	1	1	0
2131332.167	5749726.873	Grenade, hand, smoke, M18 series	1	1	0
2132650.5	5748181	Grenade, hand, smoke, M18 series	1	2	0
2132549.875	5748182	Grenade, hand, smoke, M18 series	1	1	0
2132348.771	5748183.604	Grenade, hand, smoke, M18 series	1	1	0
2131443.687	5748602.479	Grenade, hand, smoke, M18 series	1	2	0
2131443.563	5748705.021	Grenade, hand, smoke, M18 series	1	1	0
2131343.749	5748707.707	Grenade, hand, smoke, M18 series	1	4	0
2131341.564	5749027.166	Grenade, hand, smoke, M18 series	1	1	0
2132247.027	5749114.119	Grenade, hand, smoke, M18 series	1	3	0
2131541.109	5749146.42	Grenade, hand, smoke, M18 series	1	1	0
2132538.233	5749372.771	Grenade, hand, smoke, M18 series	1	1	0
2131332.637	5749419.965	Grenade, hand, smoke, M18 series	1	1	0
2131555.875	5750602.75	Grenade, hand, smoke, M18 series	1	1	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2131040	5750325	Grenade, hand, smoke, M18 series	1	1	2
2131130	5748830	Grenade, hand, smoke, M18 series	1	1	2
2131110	5748810	Grenade, hand, smoke, M18 series	1	1	24
2131254	5750721.5	Grenade, rifle, smoke, M22 series	1	1	0
2130975	5749982	Grenade, rifle, smoke, M22 series	1	1	10
2130972	5749894	Grenade, rifle, smoke, M22 series	1	1	12
2130992	5749878	Grenade, rifle, smoke, M22 series	1	1	6
2130951	5749898	Grenade, rifle, smoke, M22 series	1	1	6
2130948	5749863	Grenade, rifle, smoke, M22 series	1	1	12
2130946	5749887	Grenade, rifle, smoke, M22 series	1	1	18
2131035	5750325	Grenade, rifle, smoke, M22 series	1	1	2
2131020	5749950	Grenade, rifle, smoke, M22 series	1	1	12
2131075	5749978	Grenade, rifle, smoke, M22 series	1	1	12
2131035	5749980	Grenade, rifle, smoke, M22 series	1	2	12
2131045	5749945	Grenade, rifle, smoke, M22 series	1	1	10
2131160	5750115	Grenade, rifle, smoke, M22 series	1	4	48
2131180	5748870	Grenade, rifle, smoke, M22 series	1	1	2
2131936.125	5749709.75	Grenade, rifle, smoke, M23 series	1	3	0
2131229.375	5749630	Grenade, rifle, smoke, M23 series	1	1	0
2132449.312	5750071.48	Igniter, time fuse, blasting, M60	1	1	0
2132843.5	5745570	Mine, antipersonnel, practice, M2A1B1	1	1	0
2132743.5	5745670	Mine, antipersonnel, practice, M2A1B1	1	1	0
2132943.5	5745970	Mine, antipersonnel, practice, M2A1B1	1	1	0
2132843.5	5745970	Mine, antipersonnel, practice, M2A1B1	1	1	0
2132743.5	5745970	Mine, antipersonnel, practice, M2A1B1	1	1	0
2132643.5	5745970	Mine, antipersonnel, practice, M2A1B1	1	1	0
2133043.5	5746170	Mine, antipersonnel, practice, M2A1B1	1	3	0
2133043.5	5746270	Mine, antipersonnel, practice, M2A1B1	1	1	0
2132549.125	5748589.5	Mine, antipersonnel, practice, M2A1B1	1	1	0
2132550.087	5747570.795	Mine, antipersonnel, practice, M8 series	1	2	0
2132843.5	5745970	Mine, antipersonnel, practice, M8 series	1	1	0
2132743.5	5745970	Mine, antipersonnel, practice, M8 series	1	1	0
2132643.5	5745970	Mine, antipersonnel, practice, M8 series	1	3	0
2132443.5	5745970	Mine, antipersonnel, practice, M8 series	1	1	0
2132443.5	5746470	Mine, antitank, practice (model unknown)	1	1	0
2133043.5	5745570	Mine, antitank, practice (model unknown)	1	1	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2132743.5	5745670	Mine, antitank, practice (model unknown)	1	1	0
2132943.5	5745970	Mine, antitank, practice (model unknown)	1	1	0
2132943.5	5745970	Mine, antitank, practice (model unknown)	1	1	0
2132843.5	5745970	Mine, antitank, practice (model unknown)	1	1	0
2132743.5	5745970	Mine, antitank, practice (model unknown)	1	1	0
2132643.5	5745970	Mine, antitank, practice (model unknown)	1	1	0
2132457.457	5750359.877	Mine, antitank, practice (model unknown)	1	1	0
2131040	5749030	Mine, antitank, practice, M1	1	1	2
2131085	5749015	Mine, antitank, practice, M1	1	1	2
2132547.997	5747469.874	Mine, antitank, practice, M10	1	1	0
2132345.75	5747270	Mine, antitank, practice, M12 series	1	1	0
2132843.5	5745970	Mine, antitank, practice, M12 series	1	1	0
2132743.5	5745970	Mine, antitank, practice, M12 series	1	1	0
2132643.5	5745970	Mine, antitank, practice, M12 series	1	2	0
2133043.5	5746170	Mine, antitank, practice, M12 series	1	1	0
2132943.5	5746270	Mine, antitank, practice, M12 series	1	2	0
2132843.5	5746270	Mine, antitank, practice, M12 series	1	1	0
2131343.749	5748707.707	Mine, antitank, practice, M1A1	1	1	0
2133144.25	5746970	Mine, antitank, practice, M20	1	1	0
2131746.107	5747170.607	Mine, antitank, practice, M20	1	1	0
2132048.041	5747676.875	Mine, antitank, practice, M20	1	2	0
2132349.562	5747775.979	Mine, antitank, practice, M20	1	1	0
2132743.5	5745670	Mine, antitank, practice, M20	1	1	0
2132943.5	5745970	Mine, antitank, practice, M20	1	1	0
2131745.729	5747985.396	Mine, antitank, practice, M20	1	2	0
2132650.5	5748181	Mine, antitank, practice, M20	1	2	0
2131644.562	5748291.979	Pot, 2.5lb, smoke, HC, screening, M1	1	1	0
2131065	5750360	Projectile, 22mm, subcaliber, practice, M744	1	2	0
2131329.938	5749627.521	Projectile, 40mm, parachute, illumination, M583 series	1	2	0
2131190	5748975	Projectile, 40mm, parachute, star, M662	1	1	1
2130980	5750245	Projectile, 40mm, practice, M382	1	1	6
2131145	5750185	Projectile, 40mm, practice, M382	1	1	48
2132346.896	5749978.398	Rocket, 35mm, subcaliber, practice, M73	1	6	0
2132259.25	5750466.75	Signal, illumination, aircraft, AN-M37 series	1	1	0
2132945.3	5748074.687	Signal, illumination, aircraft, AN-M37 series	1	1	0
2131746.125	5747781.5	Signal, illumination, comet 1260	1	3	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2131645.5	5747782.5	Signal, illumination, comet 1260	1	1	0
2132247.021	5748796.104	Signal, illumination, comet 1260	1	2	0
2131542.5	5750116	Signal, illumination, ground, parachute, rifle, M19 series	1	1	0
2132870.471	5750818.639	Signal, illumination, ground, parachute, rifle, M19 series	1	1	0
2132632.56	5749588.978	Signal, illumination, ground, parachute, rifle, M19 series	1	1	0
2131957.311	5750486.23	Signal, smoke, ground, M62 series	1	1	0
2131736.685	5749815.403	Simulator, detonation, explosive, M80	1	1	0
2131744.582	5750107.128	Simulator, explosive boobytrap, flash, M117	1	1	0
2132745.75	5747270	Simulator, flash artillery, M110	1	1	0
2131428.236	5749525.246	Simulator, launching, antitank guided missile and rocket, M22	1	1	0
2131739.375	5749912.75	Simulator, launching, antitank guided missile and rocket, M22	1	2	0
2132347	5749978.5	Simulator, launching, antitank guided missile and rocket, M22	1	1	0
2131338.25	5750025.5	Simulator, launching, antitank guided missile and rocket, M22	1	1	0
2131558.375	5750701	Simulator, launching, antitank guided missile and rocket, M22	1	1	0
2132336.146	5749593.647	Simulator, projectile, airburst, M74 series	1	1	0
2132135.5	5749603.25	Simulator, projectile, airburst, M74 series	1	1	0
2131936.125	5749709.75	Simulator, projectile, airburst, M74 series	1	2	0
2131936.125	5749709.75	Simulator, projectile, airburst, M74 series	1	1	0
2131533.312	5749722.229	Simulator, projectile, airburst, M74 series	1	1	0
2131231.458	5749729.377	Simulator, projectile, airburst, M74 series	1	1	0
2131329.938	5749627.521	Simulator, projectile, airburst, M74 series	1	1	0
2131233.686	5749828.729	Simulator, projectile, airburst, M74 series	1	1	0
2131338.25	5750025.5	Simulator, projectile, airburst, M74 series	1	1	0
2131542.561	5750115.98	Simulator, projectile, airburst, M74 series	1	1	0
2131745.729	5747985.396	Simulator, projectile, airburst, M74 series	1	2	0
2131845.916	5748188.375	Simulator, projectile, airburst, M74 series	1	2	0
2131443.521	5748192.605	Simulator, projectile, airburst, M74 series	1	1	0
2131343.5	5748195	Simulator, projectile, airburst, M74 series	1	1	0
2131543.353	5748702.353	Simulator, projectile, airburst, M74 series	1	2	0
2131443.563	5748705.021	Simulator, projectile, airburst, M74 series	1	3	0
2131343.749	5748707.707	Simulator, projectile, airburst, M74 series	1	1	0
2131543.375	5748805	Simulator, projectile, airburst, M74 series	1	2	0
2131443.501	5748807.543	Simulator, projectile, airburst, M74 series	1	1	0
2131343.606	5748810.481	Simulator, projectile, airburst, M74 series	1	6	0
2131250.512	5748816.437	Simulator, projectile, airburst, M74 series	1	1	0
2133166.508	5749086.859	Simulator, projectile, airburst, M74 series	1	1	0



Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2131643.534	5749269.045	Simulator, projectile, airburst, M74 series	1	1	0
2131735.929	5749399.078	Simulator, projectile, airburst, M74 series	1	1	0
2131435.006	5749415.123	Simulator, projectile, airburst, M74 series	1	2	0
2131332.637	5749419.965	Simulator, projectile, airburst, M74 series	1	2	0
2131629.282	5749519.949	Simulator, projectile, airburst, M74 series	1	1	0
2131533.25	5749722.25	Simulator, projectile, airburst, M74 series	1	1	0
2131229.375	5749630	Simulator, projectile, airburst, M74 series	1	1	0
2131065	5748930	Simulator, projectile, airburst, M74 series	1	4	2
2131160	5750115	Simulator, projectile, airburst, M74 series	1	3	48
2131110	5748815	Simulator, projectile, airburst, M74 series	1	1	48
2131936.125	5749709.75	Squib, electric	1	1	0
2132432.165	5749495.69	Squib, electric	1	30	0
2130960	5750095	Squib, electric	1	1	24
2131155	5745965	Charge, 0.25lbs, demolition, TNT	2	1	8
2132143.125	5749894	Charge, 0.5lbs, demolition, TNT	2	76	0
2132543.5	5745970	Charge, 0.5lbs, demolition, TNT	2	1	0
2132336.146	5749593.647	Charge, 0.5lbs, demolition, TNT	2	10	0
2132198	5750178	Charge, 0.5lbs, demolition, TNT	2	0	0
2132198	5750178	Charge, 0.5lbs, demolition, TNT	2	1	0
2131231.458	5749729.377	Charge, 0.5lbs, demolition, TNT	2	0	0
2131231.458	5749729.377	Charge, 0.5lbs, demolition, TNT	2	0	0
2131231.458	5749729.377	Charge, 0.5lbs, demolition, TNT	2	0	0
2132446.849	5749110.14	Charge, 0.5lbs, demolition, TNT	2	15	0
2131210	5749725	Charge, 0.5lbs, demolition, TNT	2	1	12
2132943.5	5745570	Flare, parachute, trip, M48	2	1	0
2132843.5	5745970	Flare, parachute, trip, M48	2	1	0
2132743.5	5745970	Flare, parachute, trip, M48	2	1	0
2131332.167	5749726.873	Flare, parachute, trip, M48	2	1	0
2133166.508	5749086.859	Flare, parachute, trip, M48	2	1	0
2131541.109	5749146.42	Flare, parachute, trip, M48	2	2	0
2132570.545	5750835.57	Flare, parachute, trip, M48	2	1	0
2132360.69	5746174.71	Flare, parachute, trip, M48	2	1	0
2132645.25	5747170	Projectile, 81mm, mortar, practice, M43 series	2	4	0
2132266.858	5750756.391	Signal, illumination, ground, M125 series	2	1	0
2132132.624	5749505.198	Signal, illumination, ground, M125 series	2	1	0
2131242.082	5750226.051	Signal, illumination, ground, M125 series	2	1	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2131635.979	5749819.025	Signal, illumination, ground, M125 series	2	1	0
2131635.979	5749819.025	Signal, illumination, ground, M125 series	2	1	0
2131936.125	5749709.75	Signal, illumination, ground, M125 series	2	1	0
2131933.5	5749612.173	Signal, illumination, ground, M125 series	2	3	0
2131936.125	5749709.75	Signal, illumination, ground, M125 series	2	1	0
2132539.313	5749782.52	Signal, illumination, ground, M125 series	2	1	0
2133047.044	5750360.623	Signal, illumination, ground, M125 series	2	1	0
2131250.707	5748919.186	Signal, illumination, ground, M125 series	2	2	0
2131341.564	5749027.166	Signal, illumination, ground, M125 series	2	4	0
2133166.508	5749086.859	Signal, illumination, ground, M125 series	2	1	0
2131227.064	5749530.521	Signal, illumination, ground, M125 series	2	2	0
2132140.75	5749797.25	Signal, illumination, ground, M125 series	2	3	0
2132031.734	5749508.937	Signal, illumination, ground, M125 series	2	4	0
2131327.5	5749527.751	Signal, illumination, ground, M125 series	2	1	0
2131229.375	5749630	Signal, illumination, ground, M125 series	2	3	0
2132039.75	5749802	Signal, illumination, ground, M125 series	2	1	0
2132952.125	5750455.5	Signal, illumination, ground, M125 series	2	1	0
2132460.375	5750456.25	Signal, illumination, ground, M125 series	2	1	0
2131760.625	5750689.5	Signal, illumination, ground, M125 series	2	1	0
2130965	5749992	Signal, illumination, ground, M126 series	2	1	4
2131120	5745965	Signal, illumination, ground, M126 series	2	1	12
2131160	5750115	Signal, illumination, ground, M126 series	2	1	48
2131140	5749070	Signal, illumination, ground, M126 series	2	1	1
2131933.5	5749612.173	Simulator, grenade, hand, M116A1	2	11	0
2131651.543	5750402.872	Simulator, grenade, hand, M116A1	2	1	0
2132743.5	5746670	Grenade, hand, fragmentation, MK II	3	1	0
2132148.188	5747879.771	Grenade, hand, fragmentation, MK II	3	1	0
2132135.5	5749603.25	Grenade, hand, fragmentation, MK II	3	1	0
2132336.146	5749593.647	Grenade, hand, smoke, white phosphorous, M15	3	2	0
2132910.621	5748468.355	Grenade, rifle, antitank, M9 series	3	2	0
2132821.423	5745157.611	Grenade, rifle, smoke (model unknown)	3	4	0
2131656.936	5750597.23	Grenade, rifle, smoke (model unknown)	3	1	0
2131244.414	5750324.432	Grenade, rifle, smoke (model unknown)	3	1	0
2131936.125	5749709.75	Grenade, rifle, smoke (model unknown)	3	1	0
2131943.5	5745570	Grenade, rifle, smoke, white phosphorous, M19A1	3	2	0
2132251.685	5750177.23	Grenade, rifle, smoke, white phosphorous, M19A1	3	1	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2131040	5750330	Grenade, rifle, smoke, white phosphorous, M19A1	3	1	6
2133232.899	5746670.026	Rocket, 2.36inch, high explosive antitank, M6	3	1	0
2132844.75	5747070	Rocket, 2.36inch, high explosive antitank, M6	3	1	0
2131752.521	5750398.648	Ash, Pyrotechnic	999	0	0
2131654.146	5750500.148	Ash, Pyrotechnic	999	0	0
2132864.04	5750733.082	Ash, Pyrotechnic	999	1	0
2131732.29	5749617.832	Ash, Pyrotechnic	999	0	0
2132145.896	5749990.899	Ash, Pyrotechnic	999	1	0
2132346.896	5749978.398	Ash, Pyrotechnic	999	1	0
2131438.875	5750022.673	Ash, Pyrotechnic	999	1	0
2131438.875	5750022.673	Ash, Pyrotechnic	999	1	0
2131446.704	5750315.088	Ash, Pyrotechnic	999	1	0
2131936.125	5749709.75	Ash, Pyrotechnic	999	1	0
2132198	5750178	Ash, Pyrotechnic	999	1	0
2131936.125	5749709.75	Ash, Pyrotechnic	999	0	0
2131936.125	5749709.75	Ash, Pyrotechnic	999	0	0
2131237.75	5750028	Ash, Pyrotechnic	999	0	0
2131229.375	5749630	Ash, Pyrotechnic	999	0	0
2132138.082	5749700.128	Ash, Pyrotechnic	999	1	0
2131231.458	5749729.377	Ash, Pyrotechnic	999	2	0
2131936.125	5749709.75	Ash, Pyrotechnic	999	1	0
2131640.918	5750014.372	Ash, Pyrotechnic	999	1	0
2132770.633	5750824.11	Ash, Pyrotechnic	999	0	0
2131343	5750222.25	Ash, Pyrotechnic	999	1	0
2131239.875	5750127.25	Explosive, bulk, HE	999	0	0
2132457.457	5750359.877	Ordnance Components	999	1	0
2132031.734	5749508.937	Ordnance Components	999	4	0
<b>Northing**</b>	<b>Easting**</b>	<b>Original Nomenclature</b>	<b>Hazard Type</b>	<b>Quantity</b>	<b>Depth (inches)</b>
<b>Items with NO Final Model Description or Risk Code</b>					
2132443.5	5746070	106MM RECOILLESS TRAINING ROUND (PROJECTILE, FUZE, AND CANISTER) (Model Unknown)	***	1	0
2132446.438	5749975.52	3.5 INCH ROCKET (Model Unknown)	0*	1	0
2131760.607	5750689.642	40mm AIRBURST FLARE (Model Unknown)	1*	1	0
2131656.936	5750597.23	40mm AIRBURST FLARE (Model Unknown)	1*	1	0
2131239.875	5750127.25	40MM BASE FUZE (Model Unknown)	***	1	0
2131936.125	5749709.75	40MM FLARE (Model Unknown)	1*	3	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2131936.125	5749709.75	40mm FLARE PISTOL (Model Unknown)	1*	2	0
2131936.125	5749709.75	40mm FLARE PISTOL (Model Unknown)	1*	1	0
2132346.896	5749978.398	40mm ILLUM (Model Unknown)	1*	5	0
2131933.5	5749612.173	40MM ILLUM M58 (Model Unknown)	1*	1	0
2132037.125	5749705	40MM PISTOL FLARE (Model Unknown)	1*	1	0
2131242.082	5750226.051	40mm SIGNAL GROUND FLARE (Model Unknown)	1*	1	0
2132460.209	5750456.167	40MM SMOKE (Model Unknown)	1*	1	0
2131629.409	5749519.915	40MM SMOKE (Model Unknown)	1*	1	0
2131741.979	5750009.852	40mm, ILLUM (STAR ONLY) (Model Unknown)	1*	1	0
2131231.458	5749729.377	60MM ILLUM (Model Unknown)	2*	10	0
2132443.5	5745970	60MM ILLUMINATION ROUND (Model Unknown)	2*	1	0
2131443.687	5748602.479	60MM ILLUMINATION ROUND (Model Unknown)	2*	1	0
2131231.458	5749729.377	81MM, M3, PROP CHARGE (Model Unknown)	1*	1	0
2132821.423	5745157.611	ACTIVATOR, MINE (Model Unknown)	***	46	0
2131933.5	5749612.173	AIR ILLUM (SLAP FLARE) (Model Unknown)	2*	1	0
2132256.582	5750370.379	AIRCRAFT SIGNAL (Model Unknown)	2*	1	0
2132670.713	5750830.202	AP MINE PRACTICE M2 (Model Unknown)	1*	1	0
2132037.125	5749705	BASE COMPOUND (Model Unknown)	***	1	0
2131835.06	5749713.903	CART M3 (Model Unknown)	1*	60	0
2131835.06	5749713.903	CART M6 (Model Unknown)	1*	18	0
2131835.06	5749713.903	CART M7 (Model Unknown)	1*	50	0
2131936.125	5749709.75	COMPOUND SLAG AND OEW (Model Unknown)	0*	0	0
2132458	5747866	DEVICE PYROTECHNIC SIMULATOR (Model Unknown)	2*	250	0
2131648.875	5750305.75	DRAGON SIMULATORS (Model Unknown)	1*	2	0
2132745.75	5747270	ELECTRICAL, BOOBY TRAP, SIMULATORS (Model Unknown)	***	1	0
2132743.5	5746670	FIRING DEVICE, M10 (Model Unknown)	1*	1	0
2131746.107	5747170.607	FIRING DEVICE, M10 (Model Unknown)	1*	1	0
2132550.646	5747774.146	FIRING DEVICE, M10 (Model Unknown)	1*	1	0
2132349.562	5747775.979	FIRING DEVICE, M10 (Model Unknown)	1*	1	0
2131846.625	5747780.5	FIRING DEVICE, M10 (Model Unknown)	1*	1	0
2132543.5	5745970	FIRING DEVICE, M57 (Model Unknown)	0*	1	0
2132037.125	5749705	FLARE MOTOR (Model Unknown)	2*	8	0
2132037.125	5749705	FLARE PART (Model Unknown)	***	1	0
2131936.125	5749709.75	FLARE ROCKET MOTOR (Model Unknown)	2*	41	0
2131327.652	5749527.837	FLARE SIGNAL (Model Unknown)	2*	1	0
2132945.25	5747170	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	1	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2131646.396	5747272.646	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	1	0
2132148.625	5747676	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	1	0
2131745.729	5747985.396	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	2	0
2131845.916	5748188.375	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	1	0
2132348.062	5748591.479	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	3	0
2131945.688	5748595.021	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	1	0
2131543.459	5748599.876	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	3	0
2131443.687	5748602.479	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	3	0
2131543.353	5748702.353	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	1	0
2131443.563	5748705.021	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	3	0
2131343.749	5748707.707	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	3	0
2131543.375	5748805	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	3	0
2131443.501	5748807.543	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	2	0
2131343.606	5748810.481	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	3	0
2131343.38	5748913.88	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	1	0
2131541.013	5749019.891	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	2	0
2131341.564	5749027.166	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	1	0
2132650.398	5749101.728	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	1	0
2132045.685	5749116.324	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	1	0
2131643.534	5749269.045	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	1	0
2131440.685	5749283.747	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	1	0
2131332.637	5749419.965	FLARE, SIGNAL, M18A1 (Model Unknown)	1*	3	0
2131231.458	5749729.377	FLASH BANG (Model Unknown)	2*	1	0
2132047.686	5750093.23	FLASH, BANG, M47 (Model Unknown)	2*	2	0
2132457.457	5750359.877	FRAG BOMB FUZE (Model Unknown)	***	0	0
2131239.875	5750127.25	FUZES (Model Unknown)	***	14	0
2132632.56	5749588.978	GRENADE HAND PRACTICE (Model Unknown)	1*	1	0
2131542.561	5750115.98	GRENADE SIMULATOR (Model Unknown)	2*	1	0
2132148.188	5747879.771	GRENADE, M33, PRACTICE, W/P (Model Unknown)	***	1	0
2131343.5	5748195	GRENADE, RIFLE, FLARE (Model Unknown)	2*	1	0
2131443.563	5748705.021	GRENADE, RIFLE, FLARE (Model Unknown)	2*	1	0
2131250.512	5748816.437	GRENADE, RIFLE, FLARE (Model Unknown)	2*	1	0
2131341.564	5749027.166	GRENADE, RIFLE, FLARE (Model Unknown)	2*	1	0
2133166.508	5749086.859	GRENADE, RIFLE, FLARE (Model Unknown)	2*	1	0
2132957.861	5749091.663	GRENADE, RIFLE, FLARE (Model Unknown)	2*	1	0
2132045.685	5749116.324	GRENADE, RIFLE, FLARE (Model Unknown)	2*	1	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2131541.109	5749146.42	GRENADE, RIFLE, FLARE (Model Unknown)	2*	2	0
2132037.106	5749390.346	GRENADE, RIFLE, FLARE (Model Unknown)	2*	1	0
2132458	5747866	GRENADES, RIFLE, SMOKE (Model Unknown)	3*	4	0
2131239.875	5750127.25	HE (Model Unknown)	999*	0	0
2131730.03	5749517.444	ILLUM GRENADE (Model Unknown)	1*	1	0
2131231.458	5749729.377	ILLUM GRENADE (Model Unknown)	1*	1	0
2132037.125	5749705	ILLUM GRENADE (Model Unknown)	1*	1	0
2132037.125	5749705	ILLUM GRENADE (Model Unknown)	1*	1	0
2131936.125	5749709.75	ILLUM GRENADE (Model Unknown)	1*	1	0
2131231.458	5749729.377	ILLUM MATERIAL FLASH GROUND (Model Unknown)	1*	7	0
2131936.125	5749709.75	ILLUMINATING GRENADE (Model Unknown)	1*	1	0
2131837.75	5749811.25	ILLUMINATION GRENADE (Model Unknown)	1*	1	0
2131242.082	5750226.051	M1 RIFLE SMOKE PARTIAL (Model Unknown)	3*	1	0
2132854.749	5750454.708	M2 PRACTICE MINE (Model Unknown)	1*	2	0
2131353.375	5750615.5	M8 ELECTRIC CAP (Model Unknown)	1*	1	0
2131231.458	5749729.377	MATERIAL FLASH SOUND (Model Unknown)	1*	13	0
2132138.082	5749700.128	MK2 GRENADE (Model Unknown)	3*	1	0
2132751.666	5747874.375	MK2 HAND GRENADE (Model Unknown)	3*	1	0
2132037.125	5749705	PARACHUTE FLARE MOTOR (Model Unknown)	2*	4	0
2132039.854	5749802.102	PARACHUTE FLARE MOTOR (Model Unknown)	2*	1	0
2131936.125	5749709.75	PARACHUTE FLARE MOTOR (Model Unknown)	2*	10	0
2131936.125	5749709.75	PARACHUTE FLARE MOTOR (Model Unknown)	2*	15	0
2131936.125	5749709.75	PARACHUTE FLARE MOTOR (Model Unknown)	2*	23	0
2131936.125	5749709.75	PARACHUTE FLARE MOTOR (Model Unknown)	2*	5	0
2132037.125	5749705	PARACHUTE FLARE MOTOR (Model Unknown)	2*	20	0
2132037.125	5749705	PARACHUTE FLARE MOTOR (Model Unknown)	2*	2	0
2131936.125	5749709.75	PARACHUTE FLARE ROCKET MOTOR (Model Unknown)	2*	25	0
2131338.25	5750025.5	PISTOL FLARE (Model Unknown)	2*	1	0
2131233.686	5749828.729	PRACTICE GRENADE (Model Unknown)	1*	1	0
2131231.458	5749729.377	PRACTICE GRENADE (Model Unknown)	1*	2	0
2131233.686	5749828.729	PRACTICE GRENADE RED FILLER (Model Unknown)	1*	1	0
2131859.023	5750587.974	PRIMER (Model Unknown)	1*	0	0
2132336.146	5749593.647	PRIMER, PERCUSSION (Model Unknown)	1*	7	0
2132953.97	5749220.634	PROJECTILE, 105MM, WITH FUZE (Model Unknown)	3*	1	0
2132856.261	5750550.862	PULL FLARE DEVICE (Model Unknown)	2*	2	0
2131656.936	5750597.23	RIFLE FLARE (Model Unknown)	2*	1	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2131542.561	5750115.98	RIFLE FLARE (Model Unknown)	2*	1	0
2132140.663	5749797.007	RIFLE GRENADE (Model Unknown)	3*	1	0
2132457.457	5750359.877	RIFLE GRENADE (Model Unknown)	3*	1	0
2131239.875	5750127.25	RIFLE GRENADE (Model Unknown)	3*	12	0
2131933.5	5749612.173	RIFLE GRENADE DET (Model Unknown)	2*	6	0
2132962.174	5750730.653	RIFLE GRENADE ILLUMINATION (Model Unknown)	1*	1	0
2131936.125	5749709.75	RIFLE GRENADE RED SMOKE (Model Unknown)	1*	1	0
2131242.082	5750226.051	RIFLE GRENADE, RED SMOKE (Model Unknown)	1*	1	0
2132037.125	5749705	RIFLE GRENADES (Model Unknown)	3*	2	0
2131231.458	5749729.377	SIGNAL FLASH SOUND (Model Unknown)	2*	3	0
2131233.686	5749828.729	SIGNAL FLASH SOUNDS (Model Unknown)	2*	5	0
2131242.082	5750226.051	SIGNAL, FLASH & SOUND (Model Unknown)	2*	2	0
2131543.459	5748599.876	SIGNAL, ILLUMINATION (Model Unknown)	2*	3	0
2131249.58	5749034.764	SIGNAL, ILLUMINATION (Model Unknown)	2*	2	0
2132821.423	5745157.611	SIMULATOR, GUNFLASH (Model Unknown)	1*	9	0
2131235.792	5749928.373	SLAP FLARE MOTORS (Model Unknown)	2*	10	0
2132037.125	5749705	SLAP FLARE MOTORS (Model Unknown)	2*	19	0
2132037.125	5749705	SLAP FLARE TAIL ASSY (Model Unknown)	2*	35	0
2131231.458	5749729.377	SMOKE GRENADE (Model Unknown)	3*	1	0
2132346.896	5749978.398	SMOKE GRENADE (Model Unknown)	3*	2	0
2131539.81	5750018.904	SMOKE GRENADE (Model Unknown)	3*	1	0
2131343.018	5750222.108	SMOKE GRENADE (Model Unknown)	3*	1	0
2131237.75	5750028	SMOKE GRENADE (Model Unknown)	3*	1	0
2133135.744	5749477.687	SMOKE GRENADE (Model Unknown)	3*	1	0
2131635.979	5749819.025	SMOKE GRENADE (Model Unknown)	3*	1	0
2131233.686	5749828.729	SMOKE GRENADE (Model Unknown)	3*	1	0
2131338.25	5750025.5	SMOKE GRENADE (Model Unknown)	3*	1	0
2131340.374	5750124.423	SMOKE GRENADE FUZE (Model Unknown)	1*	1	0
2131752.521	5750398.648	SMOKE POT (Model Unknown)	1*	1	0
2132037.125	5749705	SMOKE POT (Model Unknown)	1*	1	0
2132047.686	5750093.23	SMOKE POTS (Model Unknown)	1*	2	0
2131231.458	5749729.377	SMOKE RIFLE (Model Unknown)	1*	1	0
2131643.607	5750111.392	SMOKE, GRENADE, INCEN. (Model Unknown)	3*	1	0
2132346.896	5749978.398	TOW SPOTTING CHARGE (Model Unknown)	***	1	0
2132665.548	5750740.659	TRIP FLARE (Model Unknown)	2*	1	0
2131231.458	5749729.377	TRIP FLARE (Model Unknown)	2*	2	0

Table B-2: MEC Items Found on the CSUMB Off-Campus MRA Sector 2 (Non-Residential Area - Open-Space Park)

2131938.814	5749806.77	TRIP FLARE (Model Unknown)	2*	1	0
2131736.685	5749815.403	TRIP FLARE (Model Unknown)	2*	1	0
2131539.81	5750018.904	TRIP FLARE (Model Unknown)	2*	1	0
2131936.125	5749709.75	TRIP FLARE (Model Unknown)	2*	1	0
2133139.645	5750071.146	TRIP FLARE (Model Unknown)	2*	1	0
2132198	5750178	TRIP FLARES (Model Unknown)	2*	2	0

**Notes:**

MEC = munitions and explosives of concern

MM = millimeter

\* No risk code assigned in the MMRP database. Risk code assigned by the ESCA RP Team based on professional judgment.

\*\* The depths of items recovered by HFA and UXB were not recorded at the time of removal activities; therefore, the MMRP database has assigned the depth of zero (on the surface) for the recovered items. The exact locations (northing and easting coordinates) of items recovered by HFA and UXB were not recorded at the time of removal activities. To facilitate mapping of these items, the MMRP database has assigned the depth of zero and the northing and easting of the recovered items to the center of the grids in which the items were found.

\*\*\* No risk code assigned in the MMRP database. Item description does not include sufficient information to assign a risk code based on professional judgment.

**MEC Risk Code:**

0 = Inert, will cause no injury

1 = Will cause an injury or, in extreme cases, could cause major injury or death to an individual if functioned by an individual's activities.

2 = Will cause major injury or, in extreme cases, could cause death to an individual if functioned by an individual's activities.

3 = Will kill an individual if detonated by an individual's activities.

Risk code 999 was assigned to items in the MMRP when the exact item could not be identified.



## APPENDIX C

### Erosion Input Calculations

## EROSION CALCULATION

The erosion input is based on an estimate of erosion that occurs at the site. Erosion is estimated using the Universal Soil Loss Equation. The data used to support the erosion estimate is from reference documents. The Universal Soil Loss Equation and a step-by-step example calculation are provided as follows:

$$A = R \times K \times LS \times C \times P$$

Where:

A = the estimation of average annual soil loss in tons per acre caused by sheet and rill erosion

R = rainfall erosivity factor

K = soil erodibility factor

LS = slope length and steepness factor

C = cover and management factor

P = support practice factor

Values for each of the above factors were calculated or taken from references as indicated below:

- R = United States Department of Agriculture (USDA) Soil Conservation Service (now called Natural Resource Conservation Service), Davis, CA. "Guides for Erosion and Sediment Control," Appendix A. August 1983 (USDA 1983).
- K = Soil Survey Geographic (SSURGO) Database published by the USDA.
- LS = Site-specific information calculated by using digital elevation model (DEM) data set (published by the United States Geological Survey [USGS]), and by applying a geographic information system (GIS) tool developed by Robert J. Hickey (May 2002).
- C and P = Frederick R. Troeh and Louis M. Thompson. Soil and Soil Fertility. Oxford Press. 1991 (Troeh et. al. 1991).

### Calculation of R, Rainfall Erosivity Factor

Step 1: Determine the 2-year 6-hour precipitation in tenths of an inch by looking at appropriate map in Appendix A of "Guides for Erosion and Sediment Control" (USDA 1983). The former Fort Ord is within the 10 tenths of an inch isopluvial. Convert to inches (10 tenths of an inch = 1 inch).

Step 2: Refer to Figure A-1 of "Guides for Erosion and Sediment Control" (USDA 1983) to determine the R Factor Zone. The former Fort Ord is located in R Factor Zone 1.

Step 3: Use Table A-1 (USDA 1983) to look up the Rounded Annual "R" Values for California R Zones. The former Fort Ord, which is in R Zone 1 and has a 2-year 6-hour precipitation of 1.0 inch, has an R Factor value of 15. (R values in R Zone 1 are based on the equation  $R = 16.552 \times P^{2.17}$  where P = the 2-year 6-hour precipitation).

**R Factor = 15**

### Calculation of K, Soil Erodibility Factor

Look up the soil erodibility or K Factor value for the soil type. The SSURGO Database published by the USDA was used to determine the K Factor value. The former Fort Ord has three soil types according to the SSURGO Database; the Arnold-Santa Ynez Complex, Baywood Sand, and Oceano Loamy Sand. The K Factors for each of the three soil types found at the former Fort Ord are listed below:

Oceano Loamy Sand, K = 0.1  
Arnold-Santa Ynez Complex, K = 0.49  
Baywood Sand, K = 0.15

The soil type for the entire CSUMB Off-Campus MRA is Oceano Loamy Sand (ESCA RP Team 2008).

**K Factor = 0.1**

### Calculation of LS, Slope Length and Steepness Factor

Step 1: Obtain a data set for slope length and steepness. The digital elevation model (DEM) dataset, published by the USGS was used to obtain these values for the former Fort Ord. The DEM data is a grid system of 100 square ft grids.

Step 2: Input data found in Step 1 into a GIS and use a calculation tool to determine the LS Factor value. The tool developed by Robert J. Hickey was used to calculate the LS factor for the former Fort Ord. This tool uses the DEM grid system and the calculation shown below to determine the LS Factor:

$$LS = (I/72.6m) \times (65.41 \sin^2 B + 4.56 \sin B + 0.065)$$

Where:

I = the cumulative slope length in ft

B = the downhill slope angle

**LS Factor = 0.054 (mean)**

## Calculation of C, Cover and Management Factor

This factor is based on land cover and management practices. According to Soils and Soil Fertility (Troeh et. al. 1991, pg 381), the C Factor for a good growth of permanent pasture is 0.004. Because most of the former Fort Ord is covered by native vegetation, this value was chosen.

$$\mathbf{C\ Factor = 0.004}$$

## Calculation of P, Support Practice Factor

According to Soils and Soil Fertility (Troeh et. al. 1991, pg 381), this factor is assigned a value of 1.0 unless special practices are used to reduce erosion. No special erosion reducing practices are used at the former Fort Ord; therefore, the value of 1.0 was used.

$$\mathbf{P\ Factor = 1.0}$$

## Calculation of A, Estimation of Average Annual Soil Loss in Tons per Acre Caused by Sheet and Rill Erosion

$$\mathbf{A = R \times K \times LS \times C \times P}$$

$$A \text{ (tons per acre)} = 15 \times 0.1 \times 0.054 \times 0.004 \times 1 = 0.003 \text{ tons per acre}$$

### Conversion to inches

Conversion factors:

$$1 \text{ US ton} = 907.2 \text{ kilograms (kg)}$$

$$1 \text{ kg} = 1,000 \text{ grams (g)}$$

$$1 \text{ acre (ac)} = 6,170,256 \text{ square inches (in}^2\text{)}$$

Average Soil Bulk Density = 1.65 g per centimeter cubed (cm<sup>3</sup>; assumed bulk density for undisturbed soils [Troeh et. al. 1991, pg 53])

Conversion calculations:

$$A \text{ (cubic inches/ac)} = \frac{0.003 \text{ tons}}{1 \text{ acre}} \times \frac{907.2 \text{ kg}}{1 \text{ ton}} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \text{ cm}^3}{1.65 \text{ g}} \times \frac{1 \text{ in}^3}{16.39 \text{ cm}^3} = \frac{100.6 \text{ in}^3}{\text{acre}}$$

$$A \text{ (inches)} = \frac{100.6 \text{ in}^3}{1 \text{ acre}} \times \frac{1 \text{ acre}}{6,170,256 \text{ in}^2} = 0.000016 \text{ inch}$$

The erosion input factor of 0.000016 inches equates to a migration/erosion potential score of 1 (Appendix A, Table A-3). A score of 1 indicates: “Very stable: MEC will not migrate. Annual erosion is equal to or less than the site-wide average of 3/100 inch per year.” Erosion

may have occurred on the MRA, but it is expected to be associated mostly with roads, firebreaks, and trails.