APPENDIX B

RISK ASSESSMENT

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RISK ASSESSMENT

This section presents the results of the munitions (MEC) risk assessment (RA) that addresses the explosive hazards associated with MEC in the Del Rey Oaks Munitions Response Area (Del Rey Oaks MRA). The risks associated with chemical hazards were addressed as part of the Basewide Range Assessment, which is a component of the Hazardous Toxic Waste (HTW) RI/FS program, separate from the Munitions Response RI/FS program. The risks related to chemicals are presented in *Draft Final Post-Remediation Risk Assessment, Site 39, Ranges 24, 25, and 26, Fort Ord California,* which is Appendix B of the Remedial Action Confirmation Report (*Shaw, 2000*).

This risk assessment focuses on the post-removal risks or risk associated with the current site conditions, with a short discussion of the pre-removal conditions and risk. This RA presents a description of the process used for preparing MEC risk assessments, summarizes the data used, describes the receptors evaluated and the inputs used to determine the Risk Scores, presents the results of the risk assessment and provides an uncertainty analysis. A brief discussion of the results of the Post-Remediation Risk Assessment associated with soil remediation of Ranges 24 and 25 is also provided.

B.1   MEC Risk Assessment Process for Fort Ord

The MEC risk assessments for Fort Ord provide a qualitative description of the risks of a receptor encountering a MEC item. Because the nature of these types of risk assessments is largely qualitative, a specific protocol was developed to evaluate current and future MEC risks to humans at Fort Ord. The Fort Ord Ordnance and Explosives Risk Assessment Protocol (protocol) (*Malcolm Pirnie, 2002*) was developed through the combined effort of the Army, DTSC, and U.S. Environmental Protection Agency (EPA), and allows for a comparative review of MEC risks at impacted sites. Unlike typical risk assessments that evaluate potential exposures to hazardous substances in environmental media, the

protocol does not calculate a numerical probability of adverse effects or a hazard index. Rather, it relies on an *a priori* assumption that any encounter with MEC will result in an adverse effect, and provides a qualitative description of the risk based on the likelihood of encountering a MEC item combined with the potential of the item to cause a serious injury if detonated. The Army is required to conduct a MEC risk assessment as part of the RI/FS process for munitions response sites at Fort Ord. The protocol is used to develop and allow for a comparative evaluation of various remedial alternatives in the FS.

The output of the risk assessment consists of 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 scores are supported by a brief narrative describing the assumptions used in developing the input factors. A summary of the protocol and the scoring tables is provided below.

B.1.1 Data and Data Usability

The data quality assessment for the Del Rey Oaks MRA is presented in Section 3.5 of the RI. Usable data is defined as those data with sufficient quality for use in the decision-making process. In the case of the Del Rey Oaks MRA, the removal was conducted according to Base Realignment and Closure (BRAC) Cleanup Team (BCT; consisting of the U.S. Army, U.S. Environmental Protection Agency (EPA), and California Department of Toxic Substances Control [DTSC]) approved work plans and all detected MEC was removed.

Selection of Data Set

The data available for performing the Risk Assessment for the Del Rey Oaks MRA includes:

- Data collected during Road and Trail Clearances within the Del Rey Oaks MRA;

- Data collected during the Fuelbreak Clearance along the eastern boundary of MRS-15 DRO 01 and MRS-15 DRO 02;

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- Data from grid sampling conducted for initial characterization of the Del Rey Oaks MRA;

- Site preparation activities conducted in support of soil remediation activities;

- Additional MEC sampling activities within MRS-15 DRO 01, DRO 02 and MRS-43;

- Non-time critical removal to depth conducted within specifically identified areas of the Del Rey Oaks MRA using a combination of digital and analog equipment;

- Range 26 Berm Excavation; and

- Machine Gun Link Area excavation.

The data sets used to prepare the RA are provided as Attachment A.

Data Usability

The removal actions were conducted according to BCT approved work plans that identified quality control procedures and data collection and analysis objectives. The data collection and management processes were subject to both contractor quality control and USACE quality assurance. The results of the USACE quality assurance review are detailed in Appendix P of the Final After Action Report, Geophysical Sampling, Investigation & Removal (*USA, 2001a*). According to the report, "the work completed met the specified objectives in the Del Rey Oaks Group Work Plan and removed the imminent safety hazard."

As discussed in Section 3.5 of the RI, an 11 grid area cleared as part of the Range 26 berm removal did not meet the quality control/quality assurance (QC/QA) requirements and required further evaluation. No other areas of QC/QA failures were noted.

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B.1.2   Description of Proposed Reuse and Potential Receptors

Proposed Reuse

The Fort Ord Reuse Authority plans indicate that the parcels that comprise the Del Rey Oaks MRA would be used as a visitor serving area, business park, and light industrial and office park. Specific reuses are not identified for the visitor serving area; however, intended reuses reportedly include a golf course, lodging, and retail. These were the anticipated land uses when the area was identified for possible early transfer. The Army's assessment of the site conducted as part of the Finding of Suitability for Early Transfer (FOSET) (*Army 2004*), indicated that with the exception of the 11 grid area, the property could be transferred with no restriction on land use. However, the Army has agreed to enter into a Covenant with the DTSC and agreed to by the City of Del Rey Oaks, placing additional use restrictions on the transferring property (i.e., Del Rey Oaks MRA). In accordance with California Health and Safety Code Section 25232 (1) the property is restricted from the following use: residential, day care center for children (except day care centers that meet certain requirements to prevent contact with soil), a school for persons under 21 years of age, and hospital for humans. The property was transferred to Fort Ord Reuse Authority (FORA) as part of an early transfer in December 2005.

Recent discussions with the City of Del Rey Oaks and the DTSC have evaluated the possible removal of the restrictions identified in the Covenant. Based on these discussions, residential development may also be included within the Del Rey Oaks MRA and for completeness and evaluated in the Del Rey Oaks MRA risk assessment.

Potential Receptors

Based on the proposed reuses described above for the Del Rey Oaks MRA, the following receptors were identified for evaluation in the risk assessment:

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- Recreational User; (Golfer, hotel guest)

- Indoor Worker; (office staff, retail worker)

- Outdoor Maintenance Worker; (landscaping, golf course maintenance)

- Construction Worker, (heavy equipment operator), and

- Adult/Child Resident (full time resident).

A description of each receptor evaluated and the associated activities and exposure assumptions is presented in Table B.1.

B.1.3   Discussion of MEC Risk Assessment Protocol

As discussed above, the Fort Ord MEC Risk Assessment Protocol is a qualitative risk assessment approach, with seven qualitative and quantitative input factors. Two matrices combine six of the input factors into scores for accessibility and exposure. A third matrix combines the scores for accessibility and exposure with overall hazard (the seventh input factor) into a qualitative score for estimating MEC risk. The seven input factors are shown below in Figure 1.

Figure 1: Fort Ord MEC Risk Assessment Protocol Process
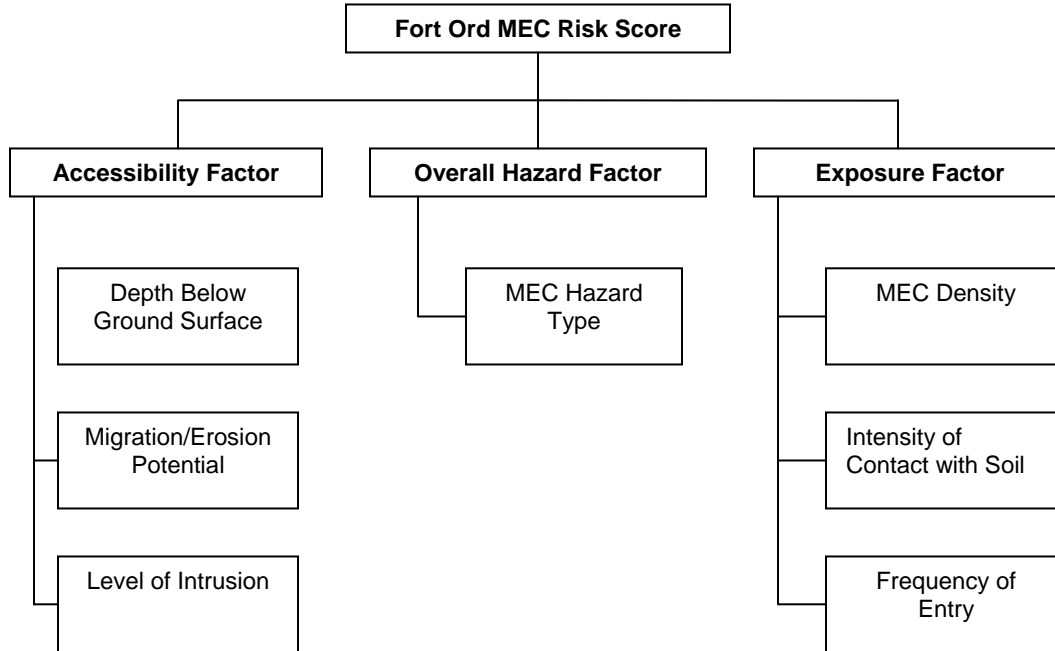
B.1.3.1   Definition of Input Factors and Assumptions

The following sections discuss each of the input factors and matrices used to determine an overall MEC

risk score, and are adapted from the Fort Ord Ordnance and Explosives Risk Assessment Protocol

(*Malcolm Pirnie, 2002*).

Accessibility Factor

The accessibility factor reflects how likely the MEC would be accessible to receptors. Three factors are

considered; (1) depth of MEC below ground surface (Table B.2), (2) the level, or depth, of soil intrusion

by the receptor (Table B.3), and (3) the migration/erosion potential, which evaluates whether the apparent

depth of MEC items will decrease over time as a consequence of soil erosion (Table B.4).

MEC Depth Below Ground Surface

For the Baseline Risk Assessment (Post-Removal) a MEC Depth Below Ground Surface Score of 1 was used for all receptors because 100 percent of the detected MEC was removed and the detection and removal procedures met the quality objectives outlined in the work plan (See Section B.1.1).

Level of Intrusion

The level of intrusion is dependent on the receptor. Both the recreational user and indoor receptor are not expected to intrude below the ground surface resulting in use of a score of 1 for level of intrusion. The outdoor maintenance worker is assumed to intrude up to 3 feet resulting in an intrusion score of 4. The adult/child resident is assumed to intrude up to 4 feet also resulting in an intrusion score of 4. The construction worker is assumed to intrude to 5 feet, which results in an intrusion score of 5.

Migration/Erosion Potential

This potential is estimated using the Universal Soil Loss Equation, and is assumed to be less than 3/100 inches per year for the Del Rey Oaks MRA. This is consistent with that estimated for the Parker Flats MRA (*Malcolm Pirnie, 2005*). This is a reasonable estimate for soil loss for areas of established vegetation even shortly after a burn; however, higher rates of erosion could be expected in disturbed areas such as roads and excavation areas. The migration/erosion potential score of 1 was therefore applied for this factor.

A score is assigned for each factor using the established criteria, and these input factors are combined to produce an overall score for the accessibility factor using the scoring matrix presented in Table B.5.

Exposure Factor

The exposure factor (Table B.10) assesses the likelihood that someone will be exposed to the MEC when in the exposure area. Three input factors are evaluated: (1) MEC density, (2) intensity of contact with soil; and (3) frequency of entry.

MEC Density

MEC density is based on the number of MEC items per acre, and is assessed to the level of intrusion for the specific receptor (Table B.6). MEC densities for the Baseline Risk Assessment (Post-Removal) for the Del Rey Oaks MRA are assigned a score of 1 for all receptors because 100 percent of detected MEC was removed to level of intrusion and the removal action met the quality objectives as noted above in Section B1.1. Table B.7 presents a summary of the MEC densities prior to conducting the removal action. This information was used to evaluate pre-removal risk scores that could be used for comparison purposes. This pre-removal risk is discussed further in Section B.1.4.2.

Intensity of Contact With Soil

The intensity of contact with soil (Table B.8) represents an hours-per-day assessment of the receptor's contact with soil. The intensity of contact with soil is receptor dependent and was assumed to be only 0.5 hours per day for the indoor worker, 2 hours for the adult/child resident, six hours for the recreational user, and up to 8 hours per day for the outdoor maintenance worker and the construction worker.

Frequency of Entry

The frequency of entry (Table B.9) evaluates the number of entries per year, month, and week based on a person-days-per-year approach. Thus, the frequency of entry is the same if one person visits the site one day each month for a year or if 12 people visited the site for one day during the year. The exposure

duration is fixed at one year for all receptors and the number of exposures during that year is evaluated. All receptors were expected to frequently enter the area.

MEC density, intensity of contact with soil, and frequency of entry are combined in an overall Exposure Factor Scoring Matrix (Table B.10) to an overall score for the exposure factor.

Overall Hazard Factor

The overall hazard factor is an assessment of the inherent hazard of the specific MEC item, and must be determined by UXO-trained personnel. The overall hazard factor relates to the MEC Hazard Classification score that considers the energetic material present in the MEC item and functioning of the item, and assumes that all items are fuzed and portable. The scoring is based on both the likelihood of the MEC to cause an injury, and the severity of the injury. Based on the factors identified above, four possible scores for the MEC Hazard factor are possible and are presented in Table B.11. The scores range from 0 to 3, with 0 assigned to inert items and 3 representing the highest hazard. In August 2005, the explosive hazard risk code classifications were updated (*USACE, 2005*). This updated information was used in selecting the hazard factors used in this risk assessment.

Overall MEC Risk

The overall MEC risk is determined by combining the accessibility, exposure, and overall hazard factors in a matrix to yield (Table B.12) an overall risk score designated by the letters A through E, where A represents the lowest risk, and E represents the highest risk. In addition to the letter score, accompanying narrative will explain the assumptions used in calculating the risk score. It should be noted that the risk score represents the highest risk level for the receptors and does not necessarily represent the expected risk.

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

B.1.4   MEC Risk Assessment Results

This section describes the results of the current (post-removal) risk for each identified receptor, and also describes the pre-removal risk for comparison purposes.

B.1.4.1   Current or Post-Removal Risks

A summary of the input factors and MEC current or post-removal risks for each receptor is presented in Table B.13. For each receptor, the risk posed by each MEC Hazard Classification is scored separately and the highest of the three scores will be used as the overall score for the receptor. The post-removal MEC risk assessment results for each receptor are presented in Tables B.14 through B.18. The tables present the results and a brief description of the inputs used to generate the resultant score. The post-removal results for all receptors is an A or lowest risk.

Although the risk is scored as an A for all receptors based on the risk protocol, it should be noted that the detection efficiency of the geophysical equipment is not assumed to be 100 percent and that while not expected, based on the uncertainty analysis presented in Section B.1.5, it is possible that MEC may remain below the surface at the site.

B.1.4.2   Pre-Removal Risks

Pre-Removal risks were scored for all receptors for comparison purposes. The risk scores for the site pre-removal are documented in Table B.19 and are an E (highest risk) for all receptors due to the presence of Type 3 MEC items on the surface.

B.1.5 Uncertainty

This section addresses the uncertainties in the risk assessment related to data used in the risk assessment, input scores, and assumptions about the uses of the land by future receptors.

B.1.5.1 Data

The data used in performance of the risk assessment went through a thorough QC/QA process as outlined in Section 3.5 of the RI and the removal actions met the objectives outlined in the Removal Action Work Plans (*USA, 2000*) with the exception of the 11 grid area. Except for the 11 grid areas, the objectives of the work plan were met, and all detected MEC was removed, and the data were considered usable for performing the risk assessment. If problems with the data quality are discovered in the future, the results of the risk assessment would need to be re-evaluated and higher risk scores could occur.

B.1.5.2 Input Scores

The following section address uncertainties related to some of the input scores including the Migration/Erosion Potential, the Level of Intrusion, the Frequency of Entry, and the Intensity of Contact with Soil. Most of the uncertainties are similar to those identified in the Parker Flats Risk Assessment (*Malcolm Pirnie, 2005*).

MEC Depth Below Ground Surface

Scores of "1" for all receptors were used in performing the Post-remediation risk assessment as specified in the protocol that states that the score of 1 is technically appropriate where "100 percent of detected MEC was removed considering the data quality for the site". Data quality is further defined as having detection and removal procedures meeting the DQOs for the site based on clearly identified investigational objectives. The removal actions within the Del Rey Oaks MRA did meet the investigational objectives as described in Section B.1.1. However, meeting the investigational objectives does not eliminate the possibility that MEC could still be present below the surface because the removal

efficiencies have not been shown to be 100 percent. The potential for MEC to remain below ground surface even though a score of "1" is used results in uncertainty in the "A" score. Based on review of USA After Action Report (*USA, 2001*), it appears that detection capabilities for instruments used in performing the removal action drop off below a foot for detection of some items (e.g., 37mm projectiles). Therefore items that penetrate deeper than one foot, although not likely, could still remain in the subsurface.

Migration/Erosion Potential

The same Erosion Potential Score was used for this risk assessment as was used for the Parker Flats MRA risk assessment (*Malcolm Pirnie, 2005*) based on similar soil, vegetation cover, and topographic conditions through most of the site. Erosion could be higher in areas where soil is disturbed such as excavation areas and along roads and trails. Erosion is expected to be low in well vegetated areas and areas that are paved or otherwise covered (structures built) in the future. Use of the lowest input factor could result in an underestimation of the overall risk; however, based on review of topographical data and because the site will be developed the score of "1" for erosion potential best represents the site conditions.

Level of Intrusion

The level of intrusion score is based on an assumed depth of soil intrusion by the receptor based on expected behavior. If a receptor intrudes to less than the assumed depth, the risk would be overestimated, and if a receptor intruded greater than the assumed depth, the risk would be underestimated.

MEC Density

MEC density scores of "1" for all receptors were used in performing the Post-remediation risk assessment as specified in the protocol that states that the score of 1 is technically appropriate where "100 percent of detected MEC was removed considering the data quality for the site". Data quality is further defined as having detection and removal procedures meeting the DQOs for the site based on clearly identified

investigational objectives including reuse and the detection of designated MEC. The removal actions

within the Del Rey Oaks MRA did meet the investigational objectives as described in Section B.1.1;

however, meeting the investigational objectives does not eliminate the possibility that MEC could still be

present below the surface because the removal efficiencies have not been shown to be 100 percent. The

potential for MEC to remain below ground surface even though a score of "1" is used results in

uncertainty in the "A" score.

Frequency of Entry and Contact with Soil

The frequency of entry factor depends on assumptions about the behavior of receptors that access the site.

The Frequency of entry factor is a measure of the number of times per year that a receptor (one or more

persons) will be in the area. If people were to visit the site more times per year than assumed in the risk

assessment, then the overall risk for that receptor would underestimate the actual risk. The opposite is

also true, that if people were to visit the site fewer times than assumed in the risk assessment, then the

overall risk would be overestimated.

Intensity of Contact with Soil

The intensity of contact with soil factor is a measure of the length of time the receptor will have contact

with the exposure medium (in this case, soil). It is difficult to evaluate the activities that will occur in the

future, and what the intensity of contact with the soil will be. As with the Frequency of Entry

uncertainties, if the receptor spends more time in contact with the soil than assumed, the overall risk for

the receptor would be underestimated, and if the receptor were to spend less time in contact with the soil,

the overall risk score could be overestimated.

B.1.5.3   Removal Uncertainties

Review of the RI indicated that the majority of the Type 3 hazard items (37mm projectiles and 2.36-inch

rockets) removed from the Del Rey Oaks MRA were found in the northern and southern sections of the

MRA. In addition, penetrating projectiles (primarily 75mm Shrapnel, and 37mm projectiles) both as MEC and munitions debris were also found primarily in the northern and southern portions of the Del Rey Oaks MRA. Because these items represent the highest hazard if encountered and are more likely to be found in the subsurface greater uncertainty is associated with the removal in these areas.

B.2   Human Health Risk Assessment Chemical Hazards

The potential for risk to human receptors from the exposure to chemicals within the Del Rey Oaks MRA was addressed as part of the *Final Post-Remediation Risk Assessment, Site 39, Ranges 24, 25, and 26, Fort Ord, California* (*PRRA, Shaw, 2000*) Appendix B to the Draft Final Remedial Action Report. The PRHRA was performed following removal of metals impacted soil at Ranges 24 and 25. The receptors evaluated in the PRHRA included the adult and youth recreational users of a golf course, construction workers, and landscape maintenance workers. To assess the need for a restriction on land use, a residential exposure scenario was also evaluated. For all receptors evaluated, the exposure to chemicals of potential concern (COPCs) (antimony, copper, and lead) via ingestion, inhalation of particulates, and dermal contact with soil were assessed to evaluate potential cancer and noncancer health hazards. The noncancer hazard indices (HISs) for all of the receptor scenarios were below the EPA's threshold level (i.e., an HI of 1). The estimated lead levels for Ranges 24 and 25 and sitewide are below the threshold level of 10 μ/dl blood, indicating that the amount of risk due to an exposure to lead in soils it below the level of concern established by Cal/EPA and EPA. Based on the conservative evaluation of potential risks and hazards under post-remediation conditions, adverse noncancer health effects and cancer risks are considered unlikely to be associated with future recreation, commercial or residential development at the Del Rey Oaks parcel under the exposure conditions evaluated. In addition, due to the reduction in human health risks following the remediation of Ranges 24 and 25, a restriction on residential development is not recommended.

B.3   Ecological Risk Assessment Chemical Hazards

Ecological risks were addressed as part of the *Final Post-Remediation Ecological Risk Assessment,*

Site 39, Ranges 24, 25, and 26, Fort Ord, California (PRERA, *Shaw, 2000*) Appendix B to the Draft

Final Remedial Action Report. The PRERA included a screening level problem formulation, ecological

effects assessment, exposure estimation, risk estimation, and uncertainty analysis. Ecological receptors

evaluated in the PRERA included terrestrial plants, soil invertebrates, deer mouse, and gray fox.

Exposure pathways for these receptors included direct contact/uptake (for plants and soil invertebrates),

soil ingestion, contaminated food item ingestion, and dermal exposure (for deer mouse and gray fox).

The results of the PRERA indicated that significant risks to ecological receptors exposed to residual

concentrations of metals remaining in soil at Ranges 24, 25, and 26 are not expected and no further action

was recommended.

B.4   Conclusions

The following conclusions can be made based on the results of the risk assessment.

- The pre-removal MEC risks for all receptors are highest risk (E). This score is based on the types and

  densities of MEC identified and removed during investigation and removal actions within the Del

  Rey Oaks MRA. The pre-removal risk assessment is provided for comparison purposes.

- The post-removal risks (Current) for all receptors are lowest risk (A). Although the risks scores are A

  or lowest, it should be noted that the instrument detection efficiencies are not expected to be 100

  percent; therefore, it is possible that MEC may remain at the site.

- Because MEC may remain below the surface it is possible that an intruding receptor could encounter

  a MEC item. To reduce the possibility of an encounter, land use controls should be evaluated as part

  of remedial alternatives to support safe reuse activities (e.g., recreational use, outdoor maintenance

  work, construction, and possible residential development).

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- Review of the RI data indicates that penetrating Type 3 items were discovered during the removal action. Type 3 hazard items would be expected to present a greater likelihood of adverse effect if encountered. Areas of the MRA where these items could be present should be further addressed in the FS.

B.5   References

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TABLES

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Table B.1 Description of Receptors Evaluated in the Track 2 Del Rey Oaks MRA RI/FS

Receptor	Description	Level of Intrusion	Frequency of Entry	Intensity of Contact with Soil
Recreational User	Expected recreational uses of the property include walking on established paths, golfing, and bicycling on established paths and roads.	A recreational user is not expected to intrude below the surface.	A recreational receptor is expected to frequently enter the area.	A recreational user is expected to spend up to six hours in contact with the soil.
Indoor Worker	An indoor worker would include an office worker, retail worker, indoor maintenance worker, and a janitorial worker.	An indoor worker is not expected to intrude below the surface.	Indoor worker receptors are expected to frequently enter the area.	An Indoor worker is expected to spend less than 0.5 hours per day in contact with the soil.
Outdoor Maintenance Worker	An outdoor maintenance worker is assumed to be responsible for landscape and gardening activities in the area. The activities may range from golf course maintenance to planting associated with retail and hotel landscaping.	An outdoor maintenance worker is expected to intrude below the surface up to a depth of 3 feet.	An outdoor maintenance worker is expected to frequently enter the area.	An outdoor maintenance worker is expected to spend up to 8 hours per day in contact with the soil.
Construction Worker	Construction workers are expected to perform excavations for foundations and utilities and to construct structures in the area. Construction workers would also perform earth moving equipment associated with building roads and recreational facilities such as golf courses.	A construction worker is expected to intrude below the surface up to a depth of 5 feet.	A construction worker is expected to frequently enter the area.	A construction worker is expected to spend 8 hours per day in contact with the soil.
Adult/Child Resident	A resident is a likely receptor based on the proposed reuse. Potential development in the area could include single and multifamily developments as well as senior housing. An adult resident is expected to perform lawn maintenance and gardening in the yard. The child resident is expected to spend time playing in the yard and possibly digging.	An adult/child resident is expected to intrude below the surface to a depth of up to 4 feet.	An adult/child resident is expected to frequently enter the area.	An adult/child resident is expected to spend 2 hours per day in contact with the soil.

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Table B.2 Depth Below Ground Surface

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

Notes:
- (a) The shallowest MEC item found determines the depth below ground surface 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 DQOs for the sector based on clearly defined investigational objectives including reuse and the detection of designated MEC. If DQOs have not been established for the sector, the quality of data should be approved by the BCT to score a "1".

Table B.3 Level of Intrusion

Score	Description (a)(b)
1	Non-Intrusive: Activity on the ground surface, none below the surface
2	Minor Intrusions: Activity on ground surface and ground disturbances to a depth of one foot bgs
3	Moderate Intrusions: Ground disturbances to a depth of two feet bgs.
4	Significant Intrusions: Ground disturbances to a depth of four feet bgs
5	Highly Intrusive: ground disturbances greater than four 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 highest score.

Table B.4 Migration/Erosion Potential

Score	Description (a)
1	Very Stable: MEC will not migrate. 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 period of time (more than two five-year reviews). Annual Erosion is greater then the average site-wide condition but less than one inch (b).
3	Significant Migration: Recurring and extreme natural events will bring MEC to the surface within the first recurring review. Annual Erosion is more than one inch (c).

Notes:
- (a) The Migration/Erosion Factor should consider the potential for changes in the depth of MEC 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 Fort Ord is likely limited to areas disturbed by human activity, such as roads or firebreaks.

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Table B.5 Accessibility Factor Scoring Matrix

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 area.	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	1
	4. Significant Intrusion (<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 (<1 foot bgs)	1	1	1
	3. Moderate Intrusion (<2 feet bgs)	1	1	1
	4. Significant Intrusion (<4 feet bgs)	1	2	3
	5. Highly Intrusive (>4 feet bgs)	3	3	4
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	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
6. MEC > 1 feet bgs	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
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

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.

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Table B.6 MEC Density

Score	Description*
1	100% of detected MEC removed to level of intrusion
2	Low MEC density (<0.1 items per acre)
3	Medium MEC Density (0.1 to 1 item per acre)
4	High MEC Density (>1 item per acre)

*Detection and removal procedures meeting the DQOs for the site based on clearly defined investigational objectives including reuse on the detection of designated MEC. If DQOs have not been established for the sector, the quality of data should be approved by the BCT to score a "1".

Table B.7 MEC Density Based on Removal

Depth (feet)	# Items			Density*			MEC Input Factor Score		
	MEC Hazard Type			MEC Hazard Type			MEC Hazard Type		
	1	2	3	1	2	3	1	2	3
All	174	3	58	0.54	0.009	0.18	3	2	3

*Site is 324 acres. Densities are based on the number of items found during removal action.

Table B.8 Intensity of Contact with Soil

Score	Description
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:
Direct contact with soil can range from simply walking on the ground to digging in the soil.

Table B.9 Frequency of Entry

Score	Description
1	Rare: It 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)

Note:
UXO-trained professionals and others covered by MEC-specific health and safety plans are not considered in the Frequency of Entry scoring.

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Table B.10 Exposure Factor Scoring Matrix (a)

Frequency of Entry	MEC density	Intensity of Contact with Soil				
		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
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

(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.

Table B.11 MEC Hazard Classification

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

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

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Table B.12 Overall MEC Risk Scoring Matrix (a)

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
O. 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 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 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) The 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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Table B.13 MEC Risk Assessment Analysis Results
Baseline Risk Analysis (Following Removal Action)

Receptor	MEC Hazard Type	MEC Depth Below Ground Surface	Migration/Erosion Potential	Level of Intrusion	Accessibility Factor Score	MEC Density	Frequency of Entry	Intensity of Contact with Soil	Exposure Factor Score	Overall MEC Risk Score
Recreational User	1	1	1	1	1	1	4	3	1	A
	2	1	1	1	1	1	4	3	1	A
	3	1	1	1	1	1	4	3	1	A
Indoor Worker	1	1	1	1	1	1	4	1	1	A
	2	1	1	1	1	1	4	1	1	A
	3	1	1	1	1	1	4	1	1	A
Outdoor Maintenance Worker	1	1	1	4	1	1	4	4	1	A
	2	1	1	4	1	1	4	4	1	A
	3	1	1	4	1	1	4	4	1	A
Construction Worker	1	1	1	5	1	1	4	4	1	A
	2	1	1	5	1	1	4	4	1	A
	3	1	1	5	1	1	4	4	1	A
Adult/Child Resident	1	1	1	4	1	1	4	2	1	A
	2	1	1	4	1	1	4	2	1	A
	3	1	1	4	1	1	4	2	1	A

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Table B.14 MEC Baseline Risk Analysis for a Recreational User
(Following Removal Action)

Sector	Del Rey Oaks MRA		
Proposed Property Reuse	Mixed Use Development		
Receptor Type	Recreational User		
Analysis	Post-Removal		
MEC Risk Score	**A**	Accessibility 1	• MEC items in the DRO MRA are not accessible because a removal to depth has been completed and all detected MEC items have been removed, the work was completed according to a BCT approved work plan, and the recreational user is not expected to intrude below the surface. • The area is on gently sloping terrain and is not expected to be significantly affected by erosion. In addition, the area is expected to be developed and covered with either structures or landscaping which would also limit erosion.
		Exposure 1	• The Frequency of Entry for a recreational user is frequent and the Intensity of Contact with Soil is moderate: however, a removal to depth has been completed and all detected MEC items have been removed. The work was completed according to the BCT approved work plan; therefore, the Exposure is low.
		MEC Type 3	The types of MEC discovered in the DRO MRA include 37mm projectiles, high explosive hand grenades, and 2.36-inch antitank rockets. These items are considered type 3 items. Some Type 1 items such as practice hand grenades and practice hand grenade fuzes were also identified. All items at Fort Ord are assumed to be fuzed (if not inert) and portable.
		Data Quality	The data used in preparing the Baseline was collected according to the BCT approved work plan and is considered usable for performing the risk assessment.

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Table B.15 MEC Baseline Risk Analysis for an Indoor Worker
(Following Removal Action)

Sector	Del Rey Oaks MRA		
Proposed Property Reuse	Mixed Use Development		
Receptor Type	Indoor Worker		
Analysis	Baseline		
MEC Risk Score	A	Accessibility 1	• MEC items in the DRO MRA are not accessible because a removal to depth has been completed and all detected MEC items have been removed, the work was completed according to a BCT approved work plan, and the Indoor worker is not expected to intrude below the surface. • The area is on gently sloping terrain and is not expected to be significantly affected by erosion. In addition, the area is expected to be developed and covered with structures or landscaping which would also limit erosion.
		Exposure 1	• The Frequency of Entry for a recreational user is frequent and the intensity of contact with soil is expected to be very low. In addition, a removal to depth has been completed according to a BCT approved work plan and all detected MEC items have been removed; therefore, the Exposure is low.
		MEC Type 3	The types of MEC discovered in the DRO MRA include 37mm projectiles, high explosive hand grenades, and 2.36-inch antitank rockets. These items are considered Type 3 items. Some Type 1 items such as practice hand grenades and practice hand grenade fuzes were also identified. . All items at Fort Ord are assumed to be fuzed (if not inert) and portable.
		Data Quality	The data used in preparing the Baseline was collected according to the BCT approved work plan and is considered usable for performing the risk assessment.

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Table B.16 MEC Baseline Risk Analysis for a Outdoor Maintenance Worker (Following Removal Action)

Sector	Del Rey Oaks MRA		
Proposed Property Reuse	Mixed Use Development		
Receptor Type	Outdoor Maintenance Worker		
Analysis	Baseline		
MEC Risk Score	**A**	Accessibility 1	• MEC items in the DRO MRA are not accessible because a removal to depth has been completed and all detected MEC items have been removed, and the work was completed according to a BCT approved work plan. The Outdoor maintenance worker is expected to intrude up to 3 feet below ground surface; however, because the removal to depth has been completed according to an approved work plan, the MEC depth score is low. • The area is on gently sloping terrain and is not expected to be significantly affected by erosion. In addition, the area is expecting to be developed and covered with either structures or landscaping which would also limit erosion.
		Exposure 1	• The Frequency of Entry for an outdoor maintenance worker is frequent and the intensity of contact with soil is high; however a removal to depth has been completed and all detected MEC items have been removed. The work was completed according to a BCT approved work plan; therefore the Exposure is low.
		MEC Type 3	The types of MEC expected in the DRO MRA include 37mm projectiles, high explosive hand grenades, and 2.36-inch antitank rockets. These items are considered Type 3 items. Some Type 1 items such as practice hand grenades and practice hand grenade fuzes were also identified. All items at Fort Ord are assumed to be fuzed (if not inert) and portable.
		Data Quality	The data used in preparing the Baseline was collected according to the BCT approved project work plan is considered useable for performing the risk assessment.

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Table B.17 MEC Baseline Risk Analysis for a Construction Worker (Following Removal Action)

Sector	Del Rey Oaks MRA		
Proposed Property Reuse	Mixed Use Development		
Receptor Type	Construction Worker		
Analysis	Baseline		
MEC Risk Score	A	Accessibility 1	• MEC items in the DRO Impact Area are not accessible because a removal to depth has been completed and all detected MEC items have been removed and the work was completed according to a BCT approved work plan. The construction worker is expected to intrude to 5 feet; however, because the removal to depth has been completed according to a BCT approved work plan, the MEC depth score is low. • The area is on gently sloping terrain and is not expected to be significantly affected by erosion. In addition, the area is expected to be developed and covered with either structures or landscaping which would also limit erosion.
		Exposure 1	• The Frequency of Entry for a Construction Worker is frequent and the Intensity of Contact with Soil is high: however, a removal to depth has been completed and all detected MEC items have been removed. The work was completed according to the BCT approved work plan; therefore the Exposure is low.
		MEC Type 3	The types of MEC expected in the DRO MRA include 37mm projectiles, high explosive hand grenades, and 2.36-inch antitank rockets. These items are considered Type 3 items. Some Type 1 items such as practice hand grenades and practice hand grenade fuzes were also identified. All items at Fort Ord are assumed to be fuzed (if not inert) and portable
		Data Quality	The data used in preparing the Baseline was collected according to the BCT approved project work plan and is considered useable for performing the risk assessment.

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Table B.18 MEC Baseline Risk Analysis for an Adult/Child Resident (Following Removal Action)

Sector	Del Rey Oaks MRA		
Proposed Property Reuse	Mixed Use Development		
Receptor Type	Adult/Child Resident		
Analysis	Baseline		
MEC Risk Score	A	Accessibility 1	• MEC items in the DRO Impact Area are not accessible because a removal to depth has been completed; all detected MEC items have been removed, and the work was completed according to an approved work plan. The adult/child resident is expected to intrude to a depth of 4 feet; however, because the removal to depth has been completed according to a BCT approved work plan, the MEC depth score is low. • The area is on gently sloping terrain and is not expected to be significantly affected by erosion. In addition, the area is expected to be developed and covered with either structures or landscaping which would also limit erosion.
		Exposure 1	• The Frequency of Entry for a construction worker is frequent and the Intensity of Contact with Soil is low. Although the frequency of entry is high for the resident the potential exposure is low because a removal to depth has been completed and all detected MEC items have been removed. The work was completed according to the BCT approved work plan; therefore the Exposure is low.
		MEC Type 3	The types of MEC expected in the DRO MRA include 37mm projectiles, high explosive hand grenades, and 2.36-inch antitank rockets. These items are considered Type 3 items. Some Type 1 items such as practice hand grenades and practice hand grenade fuzes were also identified. All items at Fort Ord are assumed to be fuzed (if not inert) and portable
		Data Quality	The data used in preparing the Baseline was collected according to the BCT approved project work plan and is considered useable for performing the risk assessment.

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Table B.19 MEC Risk Assessment Analysis Results
(Before Removal Action)

Receptor	MEC Hazard Type	MEC Depth Below Ground Surface	Migration/Erosion Potential	Level of Intrusion	Accessibility Factor Score	MEC Density	Frequency of Entry	Intensity of Contact with Soil	Exposure Factor Score	Overall MEC Risk Score
Recreational User	1	8	1	1	5	3	4	3	4	D
	2	7	1	1	4	2	4	3	3	D
	3	8	1	1	5	3	4	3	4	E
Indoor Worker	1	8	1	1	5	3	4	1	3	D
	2	7	1	1	4	2	4	1	2	C
	3	8	1	1	5	3	4	1	3	E
Outdoor Maintenance Worker	1	8	1	4	5	3	4	4	5	D
	2	7	1	4	4	2	4	4	4	D
	3	8	1	4	5	3	4	4	5	E
Construction Worker	1	8	1	5	5	3	4	4	5	D
	2	7	1	5	4	2	4	4	4	D
	3	8	1	5	5	3	4	4	5	E
Adult/Child Resident	1	8	1	4	5	3	4	2	5	D
	2	7	1	4	4	2	4	2	4	D
	3	8	1	4	5	3	4	2	5	E

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