

APPENDIX H

Response to Comments

Response to Comments

Draft Group 3 Remedial Investigation / Feasibility Study Work Plan, dated February 27, 2009
Review Comments provided by Judy Huang of EPA, dated April 24, 2009

No.	Comment Type / Report Section	Comment/Response
1	General Comment	<p>Comment:</p> <p>The Draft Group 3 Remedial Investigation/Feasibility Study Work Plan, Interim Action Ranges, Military Operations in Urban Terrain, Laguna Seca Parking, and Del Rey Oaks/Monterey Munitions Response Areas, Former Fort Ord, California dated February 27, 2009 (hereinafter referred to as the Draft Group 3 RI/FS WP), contains Section 3.0, Initial Evaluation. Review of the subsections of this section reveals that the total number of MEC items recovered in their respective Munitions Response Areas (MRAs) does not coincide with the number of items assigned a hazard classification in that MRA. While there is likely a logical reason for what appears to be a discrepancy, that reason is not stated in the narrative. Please revise the subsections of Section 3.0 where this disparity occurs to include an explanation for the differences.</p> <p>Response:</p> <p>Discrepancies in the total number of MEC items and the number of items assigned a hazard classification were noted in Section 3.1 (Interim Action Ranges MRA) and Section 3.2 (MOUT Site MRA). Sections 3.1 and 3.2 have been revised as follows:</p> <p>Section 3.1:</p> <ul style="list-style-type: none"> • 10,1657 UXO items • 84 DMM items • 125 Insufficient Data (ISD) items (could not be classified as UXO, DMM, or MD) • 196,996 pounds of MD <p>Of the 10,374013 MEC items and 27 pyrotechnic mixtures recovered from the MRA (which includes ISD items, as defined in the SEDR) that were assigned hazard classifications, 3 items had a hazard classification of 0 (inert munitions item that will cause no injury), 8,7640 items and 27 pyrotechnic mixtures had a hazard classification of 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), 120 items had a hazard classification of 2 (MEC that will cause major injury or, in extreme cases, could cause death to an individual if functioned by an individual's activities), and 1,130 items</p>

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		<p>had a hazard classification of 3 (MEC that will kill an individual if detonated by an individual's activities). The remaining items recovered from the MRA (3337 MEC items) were not assigned hazard classification values due to insufficient information.</p> <p>Section 3.2:</p> <p>Of the 1142 MEC items recovered from the MRA that were assigned hazard classifications, 1 item had a hazard classification of 0 (inert munitions item that will cause no injury), 99 items had a hazard classification of 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), 5 items had a hazard classification of 2 (MEC that will cause major injury or, in extreme cases, could cause death to an individual if functioned by an individual's activities), and 7 items had a hazard classification of 3 (MEC that will kill an individual if detonated by an individual's activities).</p>
2	General Comment	<p>Comment:</p> <p>There are a number of instances where numbered Munitions Response Sites (MRSs) are mentioned in the discussion of the MRAs included in the Draft Group 3 RI/FS WP. The locations of these MRSs are not provided in related figures found in the Figures section. Please revise the noted figures to include the identity and the boundaries of each MRS mentioned in the narratives associated with each specific MRA.</p> <p>Response:</p> <p>Figures have been added to the report that show the MRS locations for each MRA.</p>
1	Specific Comment, Glossary, Page ix	<p>Comment:</p> <p>The definition of the term "Material Potentially Presenting an Explosive Hazard (MPPEH)" does not coincide with that found in Department of Defense Ammunition and Explosives Safety Standards (DoD 6055.09-STD, February 29, 2008 with Change 1, March 24, 2009). That definition reads as follows:</p> <p>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);</p>

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		<p>or potentially contains 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 with munitions production, demilitarization, or disposal operations). Excluded from MPPEH are munitions with DoD's established munitions management system and other hazardous items that my present explosion hazard (e.g., gasoline cans, compressed gas cylinders) that are not munitions and are not intended for use as munitions.</p> <p>The original definition has been modified somewhat by the insertion of the phrase "prior to determination of its explosives safety status." This was done to accommodate two new definitions found in DoD 6055.09-STD that read as follows:</p> <p><u>Material Documented as Safe (MDAS):</u> 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.</p> <p><u>Material Documented as an Explosive Hazard (MDEH):</u> 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 as been established and maintained. This material is no longer considered to be MPPEH.</p> <p>Please revise the definition of MPPEH to read consistent with the official definition found in DoD 6055.09-STD. Also, please take note of the two additional definitions that will likely be used in the future actions documenting the status of items initially classified as MPPEH.</p> <p>Response:</p> <p>The definition has been revised to be consistent with the official definition found in DOD 6055.09-STD. The definitions for the terms MDAS and MDEH have been added to the glossary.</p>

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2	Specific Comment, Section 2.1.1, Interim Action Ranges MRA, Page 2-3	<p>Comment:</p> <p>The sixth bullet on this page reads “Analog removal to depth at 1,261 100-foot by 100-foot grids from December 2003 to July 2005 (Parsons 2007).” This bullet does not specify the portion of the MRA (i.e., which range or ranges) where the 1,261 grids were located. Please revise the cited bullet to provide the missing information noted above.</p> <p>Response:</p> <p>The 16th bullet after the third paragraph of Section 2.1.1 has been revised as follows:</p> <ul style="list-style-type: none"> • Analog removal to depth at 1,261 100-foot by 100-foot grids <i>on 271.8 acres of Ranges 43-48</i> from December 2003 to July 2005, <i>and analog removal to depth at 10 100-foot by 100-foot grids on 2.3 acres of Ranges 43-48 from May 2005 to October 2005 following the completion of sifting operations</i> (Parsons 2007)
3	Specific Comment, Section 2.1.3, Laguna Seca Parking MRA, Page 2-5	<p>Comment:</p> <p>The last paragraph on this page states that, “It was reported that six 100-foot by 100-foot grids were omitted from the removal action at MRS-14A because of accessibility issues (i.e., steep grade, heavy brush, or deep ravine; USA 2001b).” As there are two removal actions listed in the MRS-14A subsection that precede the cited paragraph, it is unclear as to which removal the six grids were associated. Please revise the noted paragraph to include the identity of the removal (or removals) that omitted the six grids.</p> <p>Response:</p> <p>In response to this comment, and to the Army comment number 10, the second to last paragraph of Section 2.1.3 has been revised as follows:</p> <p>“It was reported that six 100-foot by 100-foot grids were omitted from the removal action <i>conducted from June 1997 to April 1998</i> at MRS-14A because of accessibility issues (i.e., steep grade, heavy brush, or deep ravine; USA 2001ba).”</p>
4	Specific Comment, Section 3.2, MOUT Site MRA Evaluation,	<p>Comment:</p> <p>The last sentence on page 3-3, which extends onto page 3-4, contains a statement that reads, “...and high concentrations of subcaliber artillery simulators were encountered...” It is unclear as to what exactly is meant by the phrase “subcaliber artillery simulators.” Please revise the cited section to</p>

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	Page 3-3 and 3-4	<p>include the correct nomenclature of the noted items.</p> <p>Response:</p> <p>The third sentence of the second to last paragraph of Section 3.2 has been revised as follows: “MEC consistent with use as a troop maneuver area were encountered east of Barloy Canyon Road, as expected, and high concentrations of subcaliber artillery simulators practice projectiles were encountered west east of the southern end of Barloy Canyon Road.”</p>

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1	p.2-11, Section 2.3.1 Current Land Use.	<p>Comment:</p> <p>This section should describe the current land use at the Laguna Seca Parking MRA.</p> <p>Response:</p> <p>The following text has been added to Section 2.3.1 to describe the current land use of the Laguna Seca Parking MRA:</p> <p>“The Group 3 MRAs currently consist of mostly undeveloped open space, with the exception of paved roadways, such as Barloy Canyon Road and South Boundary Road, and the mock city located on the MOUT Site MRA that is currently used for tactical training of military, federal, and local law enforcement agencies. <i>The current uses for the Laguna Seca Parking MRA are associated with Laguna Seca Raceway events. These include parking, staging, and event-related roadway access along Barloy Canyon Road and South Boundary Road.</i> In addition, there are residual structures that supported training activities at the Interim Action Ranges MRA. Most of these residual structures have been abandoned.”</p>
2	P.2-12, Section 2.3.2 Future Land Use.	<p>Comment:</p> <p>The majority of the Interim Action Ranges MRA is within the Natural Resource Management Area (NRMA). Several portions of the Group 3 MRAs contain Borderland Interface areas that require specific land management measures. The current and future habitat protection and management requirements are documented in <i>Installation-wide Multispecies Habitat Management Plan for Fort Ord</i> dated April 1997 (HMP; Administrative Record #BW-1787). Therefore this section should identify the HMP as the source of future reuse information for portions of the Group 3 MRAs where habitat management requirements apply. Furthermore, we understand that Fort Ord reuse Authority is leading an effort to develop a Habitat Conservation Plan for Fort Ord, which would further clarify the intended future activities in the habitat reserve areas. If relevant information is available, it should be included in this section.</p> <p>Response:</p> <p>Section 2.3.2 has been revised as follows:</p> <p>“The Fort Ord Base Reuse Plan, adopted by FORA on June 13, 1997, serves as a general development plan for the former base (FORA 1997). Future land uses for the Group 3 MRAs include: nonresidential development, including</p>

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		<p>infrastructure improvements and a roadway easement for a future bypass of Highway 68, borderland interface, and habitat reserve. The mock city located on the MOUT Site MRA is expected to continue being used as a tactical training area for law enforcement agencies.</p> <p><i>Special circumstances apply at the Group 3 MRAs for the following types of reuse areas: (1) habitat reserve areas, and (2) borderlands between habitat reserve areas and development areas. The Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California (HMP; USACE 1997) and modifications to the HMP provided in the Assessment, East Garrison—Parker Flats Land Use Modifications, Fort Ord, California (Zander 2002) present the boundaries of habitat reserve and development areas and describe land use, conservation, management, and habitat monitoring requirements for target species within the Group 3 MRAs. The HMP for former Fort Ord was prepared in accordance with the U.S. Fish and Wildlife Service (USFWS) Biological Opinion and establishes the guidelines for the conservation and management of wildlife and plant species and habitats that largely depend on former Fort Ord land for survival (USACE 1997).</i></p> <p>More detailed information on the future land uses of the Group 3 MRAs has been documented in the SEDR as CSMs. The CSMs for the Interim Action Ranges, MOUT Site, Laguna Seca Parking, and DRO/Monterey MRAs from the SEDR are provided as Appendices A, B, C, and D, respectively, of this work plan.”</p>
3	Section 2.2 Physical Setting.	<p>Comment:</p> <p>Information regarding the presence of special status species and their habitat, HMP land use designations (e.g. NRMA, Borderland Interface), and associated habitat management requirements should be described under this section.</p> <p>Response:</p> <p>Information regarding special status species, their habitat, HMP land use designations, and the habitat management requirements has been added to Sections 2.2.1, 2.2.2, 2.2.3, and 2.2.4.</p>

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4	p.3-1, Section 3.1 Interim Action MRA Evaluation.	<p>Comment:</p> <p>The first paragraph includes this sentence: “The Army’s removal actions were completed over a majority of the footprint of the MRA, except for approximately 227 acres designated by the Army as SCAs (special case areas) or non-completed areas.” Please note that the approximately 227 acres of SCAs and non-completed areas are distributed throughout the footprint of the munitions response site (MRS) Ranges-43-48, not necessarily within the Interim Action Ranges MRA. In addition, this work was conducted as an interim remedial action in accordance with <i>Record of Decision, Interim Action For OE at Ranges 43-48, Range 30A, and Site OE-16</i>, September 2002 (Interim Action ROD; Administrative Record #OE-0414). Please consider modifying the sentence to avoid potential confusion by some readers.</p> <p>Response:</p> <p>The first paragraph of Section 3.1 has been modified as follows:</p> <p>“The documented historical use of the Interim Action Ranges MRA was as a weapons and troop training area, and it contained the firing points for Ranges 43, 44, 45, 46, and 47 (Appendix A). Previous work in the Interim Action Ranges MRA conducted by the Army included grid sampling, OE support for the establishment of trails and fuel breaks, limited surface removal, a surface TCRA, OE support for a prescribed burn, and surface and subsurface removal actions <i>conducted as part of the interim remedial action in accordance with the Interim Action ROD for Ranges 43-48, Range 30A, and Site OE-16 (Army 2002)</i>. The Army’s removal actions were completed over a majority of the footprint of the MRA, except for approximately 227 44 acres <i>within the MRA</i> designated by the Army as SCAs or non-completed areas (<i>Parsons 2007</i>). Subsurface removal was not completed in the SCAs and non-completed areas for a variety of reasons, including high concentrations of debris/anomalies. <i>The remaining risks present at the Interim Action Ranges, including the SCAs, will be evaluated as part of the Group 3 RI/FS.</i> It is anticipated that SCAs and non-completed areas would contain types of MEC similar to those found in the adjacent areas.”</p>
5	p.3-1, Section 3.1 Interim Action Ranges MRA Evaluation.	<p>Comment:</p> <p>Additionally, this work plan should recognize that the Interim Action Ranges MRA holds a different regulatory status than other portions of the Group 3 MRAs, in that an interim remedy has been selected on the basis of the Interim Action ROD. This information is highly relevant for the process for planning the eventual site closeout for this MRA.</p>

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		<p>Response:</p> <p>The first paragraph of Section 3.1 has been modified as follows:</p> <p>“The documented historical use of the Interim Action Ranges MRA was as a weapons and troop training area, and it contained the firing points for Ranges 43, 44, 45, 46, and 47 (Appendix A). Previous work in the Interim Action Ranges MRA conducted by the Army included grid sampling, OE support for the establishment of trails and fuel breaks, limited surface removal, a surface TCRA, OE support for a prescribed burn, and surface and subsurface removal actions <i>conducted as part of the interim remedial action in accordance with the Interim Action ROD for Ranges 43-48, Range 30A, and Site OE-16 (Army 2002).</i> The Army’s removal actions were completed over a majority of the footprint of the MRA, except for approximately 227 44 acres <i>within the MRA</i> designated by the Army as SCAs or non-completed areas (<i>Parsons 2007</i>). Subsurface removal was not completed in the SCAs and non-completed areas for a variety of reasons, including high concentrations of debris/anomalies. <i>In accordance with the Interim Action ROD, the remaining risks present at the Interim Action Ranges, including the SCAs, will be evaluated as part of the Group 3 RI/FS.</i> It is anticipated that SCAs and non-completed areas would contain types of MEC similar to those found in the adjacent areas.”</p>
6	p.3-2, Section 3.1 Interim Action Ranges MRA Evaluation.	<p>Comment:</p> <p>Second to the last paragraph suggests that the Army’s Military Munitions Response Program (MMRP) database might not include information concerning subsurface munitions and explosives of concern (MEC) that were recovered during the Range 45 scraping and sifting operations. All MEC items recovered during the sifting operations at Range 45 are reported in <i>Final MRS-Ranges 43-48 Interim Action Technical Information Paper</i> dated January 26, 2007 (Administrative Record #OE-0590L), and information about these items are available in the MMRP database.</p> <p>Response:</p> <p>The second to last paragraph of Section 3.1 has been revised as follows:</p> <p>“The MMRP database indicates that the majority of the MEC removed from the Interim Action Ranges MRA was located on the surface.; hHowever, these data may not include subsurface MEC removed during the Range 45 scraping and sifting operations. <i>the nature of the scraping and sifting operations was such that it was not possible to track the depth of the MEC</i></p>

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		<i>items recovered. Therefore, a depth may not have been recorded in the database for the MEC items removed during the Range 45 scraping and sifting operations.”</i>
7	p.4-7, Section 4.7.1 Initial Identification of Potential Applicable or Relevant and Appropriate Requirements (ARARs).	<p>Comment:</p> <p>Please note that the Interim Action ROD identified the ARARs that relate to the interim remedial action that was selected for MRS-Ranges 43-48, including the Interim Action Ranges MRA.</p> <p>Response:</p> <p>The following information has been added to the second sentence of Section 4.7.1:</p> <p>“The list of potential ARARs was based on existing/previous Army decisions regarding munitions response actions (MACTEC 2007; Harding ESE 2002a; Army 2002).”</p>
8	p.4-10. Section 4.9.3 Implementation of Community Relations Activities.	<p>Comment:</p> <ul style="list-style-type: none"> • First bullet, we recommend referencing the new Environmental Services Cooperative Agreement (ESCA) Remediation Program (RP) website fora-esca-rp.com. • Second bullet, there is no regulatory requirement for “hearings” under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or the National Contingency Plan (NCP) concerning the Group 3 MR RI/FS. The term used in the NCP is “public meeting” and should be used instead of “community workshops and hearings” to avoid potential confusion. • Fifth bullet, fact sheets developed by FORA ESCA RP are not posted on the Army’s cleanup website, www.fortordcleanup.com. Our website provides a hyperlink to the FORA ESCA RP website at fora-esca-rp.com. <p>Response:</p> <ul style="list-style-type: none"> • The new ESCA RP website address has been referenced. • The second bullet has been modified as follows: “Hold public meetings community workshops and hearings as necessary to satisfy regulatory requirements.” • The fifth bullet has been modified as follows: “Publish fact sheets distributed by direct mail to local residents, community leaders, minority

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		community organizations, and those who have requested to be on the CIOP mailing list. Fact sheets will also be <i>provided at community involvement activities and</i> posted on the FORA ESCA RP website (http://www.fora-esca-rp.com). <i>A hyperlink to the newsletters posted on the FORA ESCA RP website will also be provided on the Army's Fort Ord Cleanup website.</i> on the Fort Ord Cleanup website, and at community involvement activities."
9	Table 1 Potential ARARs.	<p>Comment:</p> <p>a. p.1, National Pollutant Discharge Elimination System (NPDES), 40CFR Parts 122, 123 and 125 and p.3 Porter Cologne Water Quality Control Act, California Water Code, Division 7, Section 13200. Please refer to comments by the Army and U.S. Environmental Protection Agency concerning the same item in <i>Draft Final Group 2 RI/FS Work Plan</i> by the ESCA RP Team dated February 16, 2009. The identification of these specific sections of the Clean Water Act and California Water Quality Control Act compel further evaluation. The Army will further discuss this item with EPA and the State of California. Additionally, the "Remarks" indicate that obtaining NPDES and/or state Waste Discharge Requirements (permits) may be required. Please delete the remarks since procedural requirements such as obtaining permits do not become ARARs for onsite remedial actions.</p> <p>b. p.2, California Fish and Game Code Section 4800 et seq. Please refer to comments by the Army concerning the same item in <i>Draft Final Group 2 RI/FS Work Plan</i> by the ESCA RP Team dated February 16, 2009. The "Remarks" include a statement: "In fact, the use of fire to set back plant community succession will result in an improvement to wildlife habitat that will benefit mountain lions." This statement implies that prescribed burning is being considered as part of possible remedial alternative(s) for the Group 3 MRAs. If this is the case, evaluation of vegetation clearance alternatives would be required, and the work plan should then address the procedures for such an evaluation. If prescribed burning is not being considered to be evaluated as a part of any of the possible remedial alternative for these MRAs, please revise the remarks. Please re-examine the remarks and make appropriate updates to the document.</p> <p>c. p.4, California Clean Air Act, Health and Safety Code Section 41701. Please refer to comments by the Army concerning the same item in <i>Draft Final Group 2 RI/FS Work Plan</i> by the ESCA RP Team dated February 16, 2009. The "Remarks" include statements that imply that prescribed burning is being considered as part of possible remedial alternative(s) for the Group 3 MRAs. If this is the case, evaluation of vegetation clearance</p>

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		<p>alternatives would be required, and the work plan should then address the procedures for such an evaluation. If prescribed burning is not being considered to be evaluated as a part of any of the possible remedial alternative for these MRAs, please revise the remarks. Please re-examine the remarks and make appropriate updates to the document.</p> <p>d. p.4, California Fish and Game Code Section 3005, Section 4000 et seq., and Title 14, CCR Section 460. Please refer to comments by the Army concerning the same item in <i>Draft Final Group 2 RI/FS Work Plan</i> by the ESCA RP Team dated February 16, 2009. The “Remarks” include statements that imply that specific remedial alternatives were evaluated as to whether or not these regulations were applicable or relevant and appropriate. However, no specific remedial alternatives were described in this document. Please re-examine and make appropriate revisions to the remarks.</p> <p>Response:</p> <p>a. p.1, National Pollutant Discharge Elimination System (NPDES). The reference has been changed from “40 CFR Parts 122, 123, and 125” to “40 CFR Parts 122, 123, and 124”. The following text has been added to the remarks section: <i>“Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), procedural requirements such as obtaining a permit while conducting MEC investigation/remediation do not apply.”</i></p> <p>b. p.2, The remark regarding the use of fire has been deleted from the table. However, if additional MEC remediation is considered as an alternative for any portion of the Group 3 MRAs, a component of that alternative could involve vegetation cutting/removal. Please see the response to comment c below.</p> <p>c. If additional MEC remediation is considered as an alternative for all or any portion of the Group 3 MRAs, a component of that alternative could involve vegetation cutting/removal. Because areas within the Group 3 MRAs contain large expanses of maritime chaparral and are located within habitat reserve areas, the type of vegetation removal (with consideration given to the aerial extent of the proposed MEC remediation) will require evaluation. The aerial extent of the MEC remediation can not be determined until the Remedial Investigation and Risk Assessment are complete. Because of the uncertainty concerning the aerial extent of the MEC remediation, the potential for conducting prescribed burning may exist and the California Clean Air Act, Health and Safety Code Section 41701 should remain in the list of <i>potential</i></p>

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		<p>ARARs. In response to this comment, the following text has been added to Section 5.9.2.1 Development of Alternatives:</p> <p><i>“For any alternative proposed that includes additional MEC remediation, sufficient detail and analysis of the impacts that activities associated with the additional MEC remediation (such as extent of vegetation removal, excavation depths, etc) will have on flora, fauna, cultural resources, and air quality will be considered. Because additional MEC remediation requires the use of geophysical sensing devices that need to be swept over the ground surface, dense vegetation may inhibit this process and vegetation cutting or removal would likely be a component of any additional MEC remediation alternative. A range of vegetation clearance methods that are potentially applicable at the former Fort Ord were described and evaluated in the Evaluation of Vegetation Clearance Methods Technical Memorandum, Ordnance and Explosives Remedial Investigation/Feasibility Study, Former Fort Ord, California (“Vegetation Clearance Technical Memorandum”; Harding ESE 2002b). Table 12 of the Vegetation Clearance Technical Memorandum presents a matrix of vegetation clearance methods that should be retained for further consideration for the range of different plant communities (or types of vegetation) found at the former Fort Ord. The results of the Vegetation Clearance Technical Memorandum would be used when considering any alternatives that involve additional MEC remediation. If additional MEC remediation is a component of the selected remedy, a specific work plan outlining planned vegetation clearance methods and detailed MEC detection and removal methodologies would be prepared and made available for regulatory agency and public review, in accordance with the AOC.”</i></p> <p>d. p.4, The remarks have been deleted. As part of the FS, an evaluation of the remedial options and the impact on these ARARs will be conducted.</p>
10	Detail/Minor Comment. References.	<p>Comment:</p> <p>Document references that are identified in the body of the work plan do not appear to be consistent with the intended documents listed in Section 7 References. For example, on p.2-3, sifting operations at Range 45 (conducted by Parsons in 2005) is identified, but reference identifies a 2001 document by another contractor. Please review all document references to identify the correct document in each instance.</p>

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		<p>Response:</p> <p>The noted discrepancy between the reference and the document text has been revised as follows:</p> <ul style="list-style-type: none"> • “Range 45 Sifting and Sorting Operations – sifting and sorting in 14-acre area to a depth of 2 feet and Range 45 pad deconstruction from May to October 2005 (<i>Parsons 2007</i>)(USA 2001b)” <p>Additional errors were corrected throughout the document, as follows:</p> <ul style="list-style-type: none"> • Section 2.1.1, the fourth to last bullet: “Range 45 Analog Removal and Digital Geophysical Mapping – Range 45 scraped areas at eight 100-foot by 100-foot grids from October to November 2005 (USA 2001g <i>Parsons 2007</i>)” • Section 2.1.3, the second to last paragraph: “It was reported that six 100-foot by 100-foot grids were omitted from the removal action <i>conducted from June 1997 to April 1998</i> at MRS-14A because of accessibility issues (i.e., steep grade, heavy brush, or deep ravine; USA 2001ba).
11	Detail/Minor Comment. p.2-9, Section 2.2.2 Physical Setting, MOUT Site MRA.	<p>Comment:</p> <p>Second to the last paragraph equates 800 feet to approximately 500 meters. Please check the conversion as this appears to be erroneous.</p> <p>Response:</p> <p>The sixth paragraph of Section 2.2.2 has been revised as follows:</p> <p>“A number of aquatic features (i.e., vernal pools, ponds) are located within 800 feet (approximately 500 <i>less than 300</i> meters) of the MOUT training area and the southern end of Barloy Canyon Road.”</p>

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1	General	<p>Comment:</p> <p>In order to better understand the extent of military training at Former Fort Ord, and the potential contamination from training activities, fundamental questions need to be answered or at least estimated.</p> <p>A story told by a retired sergeant that trained Fort Ord troops: A retired sergeant said he trained soldiers to fire 60mm and 81mm mortars in the northern and northeastern portions of Site 39. He would take out 400 soldiers for bivouac maneuvers (multi day outings in the field). When asked how many rounds each soldier fired in a day, he estimated each man would fire 30 to 60 Mortar rounds. He indicated they were practice mortars. Using a median number of 45 mortars multiplied by 400 soldiers, 18,000 mortars were fired in a day by a single group of trainees. It is understood practice munitions unlike High Explosive (HE) munitions use pyrotechnics for identifying where the rounds hit (spotting)."</p> <p>Note: at the height of training there were 50,000 soldiers at Fort Ord. Estimates are, from 1940-1974 1.5 million troops trained at Fort Ord.</p> <p>a) 1.5 million or more troops trained at Fort Ord. How many millions or billions of pounds of military munitions were used in the training of troops? Any estimates? If not, why not?</p> <p>Response:</p> <p>a) No estimates have been made regarding the total pounds of munitions used during the history of Fort Ord. Estimates of this information would not be relevant to the Group 3 Remedial Investigation/Feasibility Study (RI/FS) Work Plan. A detailed analysis of the types of known or suspected training will be conducted to better understand the extent of military training and munitions use within the Group 3 MRAs. The results will be documented in the Group 3 RI/FS Report. The Army responded to a similar comment received from FOCAG in a previous letter dated August 12, 2008. Please refer to the Army's November 17, 2008 response letter (Administrative Record ESCA-0126).</p>

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2	General	<p>Comment:</p> <p>The Group 3 RI/FS Work Plan, Interim Action Ranges and other parcels are some of the most highly contaminated areas at former Fort Ord. The FORA ESCA RP is based in large part on the creation of a data set based on sampling and removals to a depth of 4 feet. The MMRP is assuming no UXO/OEW will be found below 4 feet. However, it appears deep penetrating UXO/OEW is not being looked for.</p> <p>From early on in the Superfund cleanup of UXO/OEW, the use of quantified science has been absent. The Enron/Arthur Anderson creative accounting style of data collection and manipulation is detrimental to human health and safety and is not in the communities best interest. If protection of human health and safety is the goal, a scientific approach to UXO/OEW cleanup requires the inclusion of all potential exposure scenarios to explosive and residual contamination, and that all aspects of munitions use be quantified. To date, UXO/OEW investigations and removal have been limited to the explosive hazard and soil sampling for a few constituents arbitrarily chose by DOD. CalEPA (DTSC) and US EPA are concurring with this absurd approach.</p> <p>Another dangerous approach to Ordnance and Explosives Site assessments has been, lack of evidence of OE through Archives Searches and Site Walks is sufficient to conclude OE and training devices were not used at suspected training areas. This rational defies common sense. To date, several training areas previously unidentified as UXO/OEW sites, have proven to be highly contaminated with munitions and training devices. Unresolved issues with the Fort Ord MMRP approach exist:</p> <ul style="list-style-type: none"> a) The Army kept extremely poor records. Why isn't a precautionary approach being taken when it comes to potential training areas? (assume it is UXO/OEW contaminated unless proven otherwise rather than assuming it was not used for training based on Archive Search Records and Site Walks) Never assume Fort Ord land is safe. b) Identifying past range use is critical. It is understood range reconfigurations where a common practice. Site 39 historical maps show ranges over tops of ranges, the extent of which is unknown. If wanting to know the extent of range and training areas uses is a goal, compiling a list of all known and suspected munitions and training device constituents and extensive site soil sampling would be very helpful. Is there a list of all constituents associated with munitions and training

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		<p>devices used at the former Fort Ord? If not, why not?</p> <p>c) It is understood a common practice was to cover over former training ranges with earth, out of sight out of mind. Is there a cleanup document that discusses in detail the practice of covering over old ranges and training areas? If not, why not?</p> <p>d) It was a common practice to bury OE/OEW. Is there a cleanup document that discusses in detail the practice of burying OE/OEW? If not, why not?</p> <p>e) The MMRP does not appear to be looking for deeply buried munitions. Why isn't the MMRP looking for UXO/OEW deeper than 4 feet?</p> <p>f) OE/OEW is likely deeply buried in ranges and training areas. The approach the MMRP has taken with OE/OEW is, don't look, don't find. Superfund cleanup as the FOCAG understands it, is a program intended to identify and remove hazardous waste and substances to the greatest extent possible. If OE/OEW and training devices aren't being looked for, they surely won't be found. Is the MMRP doing a cleanup to the greatest extent possible? If not, why not?</p> <p>g) Former uses at Site 39 have been omitted from the record, aerial bombing runs were carried out in the MRA. Why has this significant historical use been omitted from the record? What is the penetration depth of a 100, 250, and 500 lb bomb? Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not?</p> <p>h) It is understood large amounts of Practice and HE munitions were used to train troops the extent of which is unknown. How many troops are estimated to have trained at Ranges 43-48? Any estimates? If not, why not?</p> <p>i) It is understood burning off ranges to remove old munitions was a common practice. The extent of munitions constituents and contamination is unknown. A site where UXO/OEW has been discovered may have been cleared of munitions annually for many years. A ranges used in this manner would likely have significant COCs on-site. Where is the list of known ranges that had this done? Is there a cleanup document that discusses in detail this potential health and safety issue? If not, why not?</p> <p>j) The significant hazards of Practice munitions have not been addressed. It is well documented Practice munitions were extensively used in the training of troops. The FOCAG has discovered these munitions contain highly toxic substances. The FOCAG is unaware of a cleanup document or report that discusses in detail Practice munitions and their constituents. If a document exists addressing practice munitions and their constituents please forward a copy to the FOCAG.</p>

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		<p>k) The FOCAG has discovered a map showing the Interim Action Ranges. Range 44 is identified as a LT antiarmor WP Range. The 1993 ASR indicates White Phosphorous munitions use occurred at Site 39. Is Range 44 a White Phosphorous Range? Is there a cleanup document that discusses in detail these types munitions and where they were used at Fort Ord? If not, why not?</p> <p>l) It is understood incendiary, armor piercing munitions were used at Site 39. Have armor piercing munitions such as Depleted Uranium been discovered at Site 39? Is Depleted Uranium being looked for? Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not? Could you please send the FOCAG a copy of the full scale map that map 1 was generated from?</p> <p>m) Range 43 is identified as a 81 mm and 4.2 in mortar range. Is the MMRP looking beyond 4 feet for deep penetrating ordnance? If not, why not? Could you please send the FOCAG a hard copy and a CD of the full scale map that Map1 was generated from?</p> <p>The 1993 ASR states Range 48 has ordnance at 10 feet and the Impact Area of which the entire IA Ranges are located, has munitions at 7-10 feet. According to listed ordnance used at 43-48, Penetration depths should not exceed 4.1 ft.. A couple of possibilities: 1) these ranges were covered over to reduce hazards from past OE uses, or 2) Ranges 43-48 are a impact area from old artillery ranges located in the North and Eastern portion of Fort Ord, perhaps old Camp Ord. Historical records indicate early Fort Ord was a Artillery training facility. Regardless, there is a high likelihood, explosives and residual hazards remain unaddressed with the IA and adjacent ranges. When will the Army begin a RI/FS that targets artillery OEW?</p> <p>n) Have there been any excavations to investigate whether OE is found at 10 ft in the IA Ranges? If not, why not? Is the era and size of munitions fired from the artillery ranges in map 3 known? Have the firing points and impact areas been looked for and located? If not, why not?</p> <p>o) 4.2 in and 4 in Stokes mortars are identified as being used and found in the IA Ranges. In addition, Live projectiles have been found nearby. It is understood these types WWI mortars and munitions have been found to contain titanium tetrachloride, a CWM. Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not?</p> <p>p) Why aren't the regulators asking and getting answers to these fundamental questions? Its not to late to get it right.</p>

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		<p>Response:</p> <p>a) Subsurface MEC removals have been conducted in the majority of the Group 3 MRAs. A detailed evaluation of the historical site uses, the historical boundaries of MRSs, the adequacy of previous removal actions including removal action depth, the data collected within the Group 3 MRA footprints, and the completeness of the dataset will be conducted in accordance with the procedures described in the Group 3 RI/FS Work Plan. The results of this evaluation will be documented in the Draft Group 3 RI/FS Report and made available to the public.</p> <p>b) The scope of the Group 3 RIFS and this work plan is limited to MEC Explosive Hazard. Investigation of potential contamination issues other than the explosives hazards associated with MEC at the former Fort Ord will continue to be conducted by the Army. The Army responded to similar comments received from FOCAG in a previous letter dated August 12, 2008. Please refer to the Army's November 17, 2008 response letter (Administrative Record ESCA-0126).</p> <p>c - n) Please see response to FOCAG comment 2a. The results of FORA's preliminary review of the Group 3 MRAs and a summary of the expected training and munitions used were provided in the Summary of Existing Data Report (SEDR; Administrative Record No. ESCA-0130).</p> <p>o) Please see response to FOCAG comment 2b.</p> <p>p) FORA coordinates activities with the Army and the regulatory agencies.</p>
3	General	<p>Comment:</p> <p>Most military munitions constituents are known or suspected endocrine disruptors, carcinogens, mutagens, toxicants, etc. The CAG has compiled a list of military munitions constituents found in the types of munitions used at Fort Ord. The list includes the potential negative human health impacts that may result from exposure to each of the constituents. Former Military Training Areas are highly contaminated with hazardous chemicals. If you knew of the potential risk, would you want or allow your children to live on and play in soil possibly contaminated with the Table 1 and Table 2 constituents?</p> <p>a) Has the Fort Ord Cleanup Program prepared a list of Munitions Constituents (MC) for all Military Munitions and Training Devices</p>

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		<p>used at former Fort Ord. If not, why not?</p> <ul style="list-style-type: none"> b) Of the millions or billions of pounds of military munitions used, how many pounds of their constituents were released into the environment? Any estimates? If not, why not? c) Were did the residual contaminates go? d) Could all the contaminates simply disappear? e) Does soil analysis of ranges include every known or suspected OEW/UXO constituent used at Fort Ord? If not, why not? f) Babies and toddlers commonly eat soil and other substances off the ground. Has this risk been analyzed? If not, why not? g) Have Maximum Residual Levels (MRL's) been established for the constituents in the attached Military Munitions Chemicals of Concern Table 1 and Table 2? If not, why not? h) If the extent of residual contamination and MRL's have not been established, how can an acceptable level of cleanup be known for residual or commercial use? i) Is there a screening program in place to monitor for hazardous substances at Fort Ord? If not, why not? Will there be a program to monitor potential negative health impacts of residents living in homes built on former training areas and ranges? If not, why not? j) Perchlorate is known to be a widely used constituent in military munitions used at Fort Ord. Is there testing being conducted to identify the extent of Perchlorate contamination in former training areas and ranges? If not, why not? If yes, the remediation documents don't appear to include any discussion or analysis. k) Synergism and synergistic effects of chemicals are a significant part of Risk Assessment. I don't recall seeing any analysis in the Fort Ord Base Wide RI/FS addressing synergism. Is synergism covered in any Fort Ord Human Health Risk or Environmental Assessments? If not, why not? <p>Response:</p> <p>a - k) The scope of this work plan and the Group 3 RI/FS is limited to MEC Explosive Hazard. Investigation of potential contamination issues other than the explosives hazards associated with MEC at the former Fort Ord will continue to be conducted by the Army. The Army has responded to similar comments received from FOCAG. Please refer to the Army's November 17, 2008 response letter (Administrative Record ESCA-0126) and July 9, 2009 response letter (Administrative Record BW-2508).</p>

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4	General	<p>Comment:</p> <p>The parcels have not been adequately cleared of Ordnance and Explosives Waste (OEW), Unexploded Ordnance (UXO), or identified the extent of Munitions Constituents (MC) contamination. The extent of contamination is unknown.</p> <p>Because the extent of deep penetration ordnance and deep OEW burial pits are unknown, scanning equipment capable of detecting deeply buried metallic anomalies should be used.</p> <p>Thankfully, early in the cleanup process, DOD and the Regulators understood the significant threats from Ammunition and Explosives. A few quotes:</p> <p>"It is necessary to identify and remove ammunition and explosives located from the surface to the applicable depth indicated (Commercial/Residential, Utility Construction Activity: Clearance depth; 10ft. or excavation depth plus 4 feet, whichever is greater)."</p> <p>"Chapter 12, DOD 6055-9 STD (1992), DOD Ammunition and Explosives Safety Standard; DOD real property known to be contaminated with ammunition and explosives that may endanger the general public may not be released from DOD custody until the most stringent efforts have been made to ensure appropriate protection to the public."</p> <p>"The Presidio of Monterey does not intend to transfer by deed any known or suspect ordnance and explosive site on former Fort Ord land, prior to the completion of all required OE related actions, We do, however, intend to transfer by deed areas that may have been identified on training maps, but through the archive search process were not identified as potential ordnance sites, i.e, Machine Gun Proficiency Training Areas, Machine Gun Squares, and Mortar Squares."</p> <p>"Chapter 12 of DOD 6055-9STD requires a cleanup plan be presented to the DDESB for leasing, transferring, or disposing of DOD real property when ammunition and explosives contamination is known or suspected. The DDESB will review the plan for explosives safety considerations. The following matrix is to be used to identify the appropriate clearance depth.</p>

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		<p>The ability to clear to a given depth will depend on the technology and funds available. It is necessary to identify and remove ammunition and explosives located from the surface to the applicable depth indicated.</p> <p>a) UXO/OEW cleanup efficiencies have not advanced as a result of new detection technologies and methods, but rather by changing the rules in order to meet development goals. What happened?</p> <p>Projectiles capable of penetration depths beyond the Shonstedt GA-52CX detection range have been found in the Group 3 parcels. There is good reason to be looking beyond the 4 foot removal depths at Fort Ord.</p> <p>b) To date, what efforts have been made to locate deeply buried ordnance?</p> <p>c) Today, what technology is being deployed to locate deep penetrating ordnance?</p> <p>d) The Schonstedt GA-52CX has been used at Fort Ord for 15 years. Is the RP using the best technologies available?</p> <p>e) Is the GA-52CX the best hand held OE detection technology available? It is understood better overall detection equipment exists. Why isn't it being used?</p> <p>f) Does the EM61-MK2 detect metallic anomaly's as well or better than the GA-52CX or the MK 26?</p> <p>g) It is understood the Forester Ferex MK 26 ordnance locator is used by U.S. Military EOD forces. This magnetometer detects deep penetrating ordnance well beyond the capacity of the 52CX. Is the MK 26 being used at Fort Ord? If not, why not?</p> <p>h) Which of the following is the UXO/OEW cleanup goal; to locate and remove Ordnance and Explosive Waste to the greatest extent possible or to the extent it is financially practical?</p> <p>i) If finding all UXO/OEW items is a goal, would using detection equipment capable of deeper detection capabilities be desired?</p> <p>j) Is UXO/OEW in itself, being looked for beyond 4 feet? If not, why not?</p> <p>Response:</p> <p>The adequacy of equipment used during previous investigation and removal actions within the Group 3 MRAs will be evaluated as part of the Group 3 RI/FS, and the results of this evaluation will be documented in the subsequent Draft Group 3 RI/FS Report. Responses to your specific comments are provided below.</p> <p>a) FORA utilizes the best available and appropriate detection technology and</p>

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		<p>methods for munitions detection and response.</p> <p>b) The adequacy of prior removal actions, including the depth of clearance will be evaluated and results will be presented in the Group 3 RI/FS Report. The Group 3 RI/FS Work Plan does not include a plan for field data collection as part of the Remedial Investigation.</p> <p>c) The technology used to detect deep penetrating munitions is the same as that used to detect shallow munitions.</p> <p>d) FORA utilizes the best available and appropriate detection technology and methods for munitions detection and response. Determination of the best available and appropriate detection technology is based on geology, topography, munitions characteristics, and resource requirements (DOD 6055.09-STD 2008).</p> <p>e) Please see response to 4d.</p> <p>f) The EM61-MK2 is a digital geophysical instrument that detects ferrous and non-ferrous metal and records data. The GA-52CX is a ferrous metal detector that does not record data. Determinations of the equipment adequacy must include an evaluation of site-specific conditions. Please see response to 4d.</p> <p>g) Please see response to 4d.</p> <p>h) The purpose of the FORA ESCA RP is to complete the munitions response to ensure that the land is suitable for reuse. FORA works with the Army to achieve this goal with the oversight of the regulatory agencies.</p> <p>i) Please see response to 4d.</p> <p>j) Please see response to 4b.</p>
5	General	<p>Comment:</p> <p>Chemical Warfare Materials (CWM) and their use in training areas have not been adequately addressed. These types of training devices outside their packaging are not detectable with magnetometers.</p> <p>On March 10, 1997, 24 ampoules CAIS Chemical Warfare Materials were</p>

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		<p>discovered 2 ft. below ground near 4500 motor pool during ordnance and removal activities at Site OE-13B.</p> <p>On April 14, 1994 during the HFA/CSU OE removal, 2 EOD specialists were overcome by a Hazardous Material and required medical attention at the hospital. Their equipment was confiscated due to concerns of HAZ MAT contamination. Hazardous Material monitoring devices were required for all subsequent OEW removal.</p> <p>The known CWM were unexpectedly found in a Range/Training area that was not previously identified as a potential CWM training area. It may have been a rare event except it is well documented these CWM are commonly found and buried in training areas. According to Fort Ord records, CAIS Sets were used at Fort Ord until 1974. The K951 ampoules (also called vials) are frequently found in burial sites at old WWII training areas.</p> <ul style="list-style-type: none"> a) Early Fort Ord cleanup documents state CWM were thought not to have been used at Fort Ord. we now know that these training devices were used to train troops at Fort Ord the extent of which is unknown. Is there a cleanup document that discusses in detail these types training devices? If not, why not? b) How are these incidents resolved? c) Army certainly saw this as significant concern. How will the public be protected from potential exposure to these chemical agents? d) Why haven't these incidents been included in all training area documents? e) Due to the common practice of discarding these training devices in the field, what is the justification for allowing the transfer, reuse, and development of training areas and training sites (TS) where these devices have been found or many have been used? f) Is there a technology that can identify individual glass vials below the ground surface? g) These CWM materials are contained in glass vials. Has there been any discussions of how this hazard should or will be addressed? h) How can workers be protected from these types of hazards during excavation activities? i) Are there plans to cap (earth fill), military training areas rather than remediate them of UXO/OEW and military constituents? It is evident through limited sampling throughout training sites, most stringent efforts are not being made to find UXO/OEW.

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		<p>Response:</p> <p>a - g) The FORA ESCA RP activities include performing remaining necessary munitions explosive hazard responses in specific portions of the former Fort Ord. The scope of this work plan and the Group 3 RI/FS is limited to MEC Explosive Hazard. Investigation of potential contamination issues other than the explosives hazards associated with MEC at the former Fort Ord will continue to be conducted by the Army. The cited incidents were described in 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; Administrative Record Number FOSET-004J).</p> <p>h) Should a CAIS or potential CWM item be encountered during the FORA ESCA RP activities, field personnel will follow Standard Operating Procedure (SOP) for Unanticipated Chemical Contamination Conditions to protect personnel and report the incident to appropriate agencies. This SOP is found in Appendix D of Volume 2 of the Group 1 RI/FS Work Plan (Administrative Record No. ESCA-0124).</p> <p>i) The FORA ESCA RP has no current plan to cap a munitions response site.</p>
6	General	<p>Comment:</p> <p>Critical Administrative Record (AR) documents that contain pertinent site specific known or suspected uses, and OEW contamination information have been omitted.</p> <p>a) Known OE uses have disappeared from the FORA ESCA RP parcels historical record.</p> <p>b) UXO/OEW discovered during site sampling and removal actions has disappeared from the FORA ESCA RP parcels historical record.</p> <p>c) Why has the SEDR, MMRP, and FORA ESCA RP databases failed to include all OEW items discovered within the Group 3 RI/FS</p> <p>It appears the Administrative Record is being manipulated in a way that misrepresents important facts. The public, now and in the future, has a right to know the full extent of the past military training use of individual parcels, and the full historical record of OEW items found within their boundaries. To omit or alter any part of this historical information misleads the reader into believing the parcel is cleaner and safer than it actually is. By keeping</p>

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		<p>the record straight, the public can decide for themselves if they wish to be exposed to the potential remaining OEW hazards. Remediation by data manipulation will have a disastrous outcome and harm someone.</p> <p>d) How has this critical issue slipped by the FORA officials and the regulators?</p> <p>e) Are the officials aware of what's happening?</p> <p>f) Is this acceptable to the officials and the regulators?</p> <p>g) When someone gets blown up or sick, who will be liable?</p> <p>h) Is this in the best interest of the taxpayers?</p> <p>i) California has strict real estate disclosure laws. How will parcel specific OEW information be known and disclosed?</p> <p>Additionally, these critical documents have not been included in the Fort Ord cleanup AR web site until very late in the process. The public has had no reasonable way of viewing site specific information. The FORA ESCA RP is omitting key documentation that tells a very different story of the extent of OEW/UXO contamination in the Training Areas.</p> <p>j) What steps will be taken to inform the public and future residents of the potential health hazards associated with living over former Training Areas?</p> <p>Response:</p> <p>a - c) The SEDR presented the results of FORA's preliminary review of the data for the Group 3 MRAs available in the Army's administrative record. A detailed evaluation of the historical site uses, the historical boundaries of MRSs, the adequacy of previous removal actions including removal action depth, the data collected within the Group 3 MRA footprints, and the completeness of the dataset will be conducted in accordance with the procedures described in the Group 3 RI/FS Work Plan. The results of this evaluation will be documented in the Draft Group 3 RI/FS Report and made available to the public.</p> <p>d - f) The regulatory agencies are aware that a more detailed analysis of the completeness of the dataset and the data quality will be conducted as part of the Group 3 RI/FS.</p> <p>g - h) As the lead agency under CERCLA, the Army retains ultimate responsibility for the cleanup of the former Fort Ord. The purpose of the</p>

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		<p>FORA ESCA RP is to ensure that the land is suitable for reuse and to minimize the risk of explosive hazard incidents.</p> <p>i - j) Fort Ord property transfer deeds include deed notices. The environmental condition of the Group 3 MRAs was disclosed in the FOSET 5 (Administrative Record Number FOSET-004J), which was made available to the regulatory agencies, the public, FORA, and the property recipients.</p>
7	General	<p>Comment:</p> <p>The Fort Ord Military Munitions Response Program (MMRP) database has lost very important AR documentation needed to make accurate and well informed decisions by the Regulators and the Public.</p> <p>Most training/practice ammunition contains highly toxic, hazardous substances. These munitions and their constituents are a significant health hazard that remain relatively unaddressed. Many of these practice/inert ammunitions have been omitted in the new SEDR database. Withholding this information from new cleanup documents deprives the public of significant, and critical information.</p> <p>Early in the OE cleanup process, ordnance and explosive training range areas were first referred to as "Sites," They then were referred to as "OE" areas, and now "MRS" areas. As the changing of acronyms has progressed, so has the omission of old site data of UXO/OEW items discovered. Hence a "new" record has emerged.</p> <p>There's a new FORA ESCA RP concoction of data referred to as the Summary of Existing Data Report (SEDR). The SEDR which evolved from information supplied from the MMRP database is being relied upon to support the Group 3 RI/FS Work Plan. Site Characterizations, Findings, and Determinations of safety are being based on the compilation of the new data resulting from the omission and manipulation of the old data. This new data is resulting in the sites appearing to be relatively benign. This will undoubtedly result in a finding of "no further action". By creating this fictitious new record, RP parcels are being represented as being safer than they really are.</p> <p>The MMRP database is not being properly maintained as is evident by the omission of large quantities of UXO/OEW discovered in the 3300 acres of</p>

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		<p>the FORA ESCA RP documents.</p> <ul style="list-style-type: none"> a) What Agency or Organization is in charge of the Military Munitions Database, a critical element of the Fort Ord Superfund cleanup? b) Has the administration of the Military Munitions database been privatized? c) Is there oversight of the OE/OEW/MEC data that is entered into and/or omitted from the database? d) What is the protocol for adding, deleting, or changing data in the Military Munitions Database? e) Who is responsible for maintaining the UXO/OEW/MEC AR and ensuring the information is preserved and not tampered with? f) Does the database compile all past discovered Ordnance and Explosives i.e., OE, OEW, UXO, DMM, MEC, MPPEH, MD, etc. into the same OE dataset? g) How could such significant historical information be missed by the FORA ESCA RP officials and the Regulators? h) Is there a public notification and input process of how the database(s) will be maintained? i) Acronyms, synonyms, and descriptions of Ordnance and Explosives (OE), Ordnance and Explosive Waste (OEW) have been changed over the years. Valuable and critical information is being lost. Coincidentally, this appears to correspond with the privatization of Fort Ord Superfund cleanup, the FORA ESCA RP, and the new centralized database. Are the Regulators keeping track of the Fort Ord historical Military Munitions Database and taking steps to prevent this potential travesty? j) Significant OE data for the Group 3 parcels has been lost. Which Regulatory Agency is responsible for oversight that will ensure the historical facts of each parcel are preserved? k) It is understood small arms are considered hazardous waste. Is the ESCA Cleanup Program still required to report types, amounts, and locations of all OEW discovered including small arms ammunition, 50 cal or less, and practice and inert ordnance? If not, why not? l) It is understood small arms tracer ammunition was used for troop training. Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not? <p>Response:</p> <p>The SEDR presented the results of FORA's preliminary review of the data available for the Group 3 MRAs. A detailed evaluation of the historical site uses, the historical boundaries of MRSs, the adequacy of previous removal</p>

Response to Comments

Draft Group 3 Remedial Investigation / Feasibility Study Work Plan, dated February 27, 2009
 Review Comments provided by Lance Houston of the Fort Ord Community Advisory Group
 (FOCAG), dated March 28, 2009

No.	Comment Type / Report Section	Comment/Response
		<p>actions including removal action depth, the data collected within the Group 3 MRA footprints, and the completeness of the dataset will be conducted in accordance with the procedures described in the Group 3 RI/FS Work Plan. The results of this evaluation will be documented in the Draft Group 3 RI/FS Report and made available to the public.</p> <p>a - h) The Fort Ord MMRP Database is maintained by the U.S. Army Corps of Engineers (USACE). The Army responded to similar comments received from FOCAG in a previous letter dated August 12, 2008. Please refer to the Army's November 17, 2008 response letter (Administrative Record ESCA-0126). The Army responds to questions pertaining to operations and maintenance of the Fort Ord MMRP Database. The MEC-related data generated by the FORA ESCA RP Team will be submitted to the Fort Ord MMRP database.</p> <p>i - j) The Regulatory agencies agreed to the definition changes, and the changes are documented. The FORA ESCA RP Team is required to share data with the regulatory agencies.</p> <p>k - l) ESCA RP data will be categorized in a manner that is consistent with the Army's MMRP database. As stated in Attachment 6 of the FOSET 5 (Administrative Record No. FOSET-004J), small arms ammunition (SAA; .50 caliber and smaller) is not considered MEC for the purposes of the Munitions Response Program being conducted for the former Fort Ord.</p>
7	General	<p>Comment:</p> <p>It is understood non-metallic landmines have been found at Fort Ord. Discovery of these types of munitions raise the same questions as with the CWM issue.</p> <p>a) How is this issue being addressed? b) Is there technology that can identify individual non-metallic ordnance below the ground surface? c) Is it a good idea to develop areas were CWM and non metallic landmines may have been used?</p> <p>Response:</p> <p>a - c) The work plan does not include non-metallic land mine detection technology discussion. Based upon the ESCA RP Team's preliminary review of the data presented in the SEDR and the Group 3 RI/FS Work Plan,</p>

Response to Comments

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 Review Comments provided by Lance Houston of the Fort Ord Community Advisory Group
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		it is not anticipated that non-metallic landmines were used in the Group 3 MRAs. The Group 3 RI/FS will evaluate munition types expected in the Group 3 MRAs. The adequacy of the previous removal actions, including the type of detection equipment used and munition types expected, will be evaluated and the results will be documented in the Group 3 RI/FS Report and made available for public review.
8	General	<p>Comment:</p> <p>Additional comments and questions</p> <p>The Group 3 RI/FS Work Plan states: Section 3.1, IA Ranges 43-48 The MMRP database indicates that the majority of the MEC removed from the Interim Action Ranges were located on the surface; however, these data may not include subsurface MEC removed during the Range 45 scraping and sifting operations.</p> <p>The record shows large quantities of UXO/OEW discovered are subsurface</p> <p>a) Subsurface OEW is being diminished. To discover such high quantities of penetrating ordnance on the surface is all the better reason to look harder and deeper for OEW. As with the Group 2 RI/FS comments, is the FORA ESCA RP, SEDR, and MMRP database commingling a good idea? "data may not include subsurface MEC". Who is interpreting the MMRP data. Is this type data collection in the taxpayers best interest? Do the Officials and Regulators concur?</p> <p>b) According to Sec. 3.1, 10,165 UXO items and 196,996 pounds of MD have been discovered, This is a much larger quantity than we were aware of. Would you please forward to the CAG a complete list of the UXO items with dates found, depths, and the grid location information. Additionally, please forward a list of the AR document numbers were the 10,165 UXO items are found. Is there a document that describes the type munitions the 196,996 pounds of MD came from? If so, please provide the AR document number. If not, why not?</p> <p>Response:</p> <p>The second to last paragraph of Section 3.1 has been revised as follows:</p> <p>a) "The MMRP database indicates that the majority of the MEC removed from the Interim Action Ranges MRA was located on the surface.;</p> <p>b) However, these data may not include subsurface MEC removed during the</p>

Response to Comments

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Review Comments provided by Lance Houston of the Fort Ord Community Advisory Group
(FOCAG), dated March 28, 2009

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		<p>Range 45 scraping and sifting operations. <i>the nature of the scraping and sifting operations was such that it was not possible to track the depth of the MEC items recovered. Therefore, a depth may not have been recorded in the database for the MEC items removed during the Range 45 scraping and sifting operations.”</i></p> <p>b) A more detailed analysis of the completeness of the dataset and the data quality will be conducted as part of the Group 3 RI/FS and the results will be documented in the Group 3 RI/FS Report.</p>

Response to Comments

Draft Group 3 Remedial Investigation / Feasibility Study Work Plan, dated February 27, 2009
Review Comments provided by Lance Houston of the Fort Ord Community Advisory Group
(FOCAG), dated March 28, 2009

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Response to Comments

Draft Group 3 Remedial Investigation / Feasibility Study Work Plan, dated February 27, 2009
 Review Comments provided by LeVonne Stone of the Fort Ord Environmental Justice Network,
 dated March 19, 2009

No.	Comment Type / Report Section	Comment/Response
1	Section 2.3.1, Page 2-11	<p>Comment:</p> <p>Is DRO/Monterey MRA open to recreational users? What is the difference between a recreational user and a trespasser? The use of the word “reportedly” in the second paragraph implies that FORA is not certain whether or not the property is being used for hiking and mountain biking but suspects it is happening. If the public is not permitted to use DRO/Monterey MRA yet, then FORA needs to enact some sort of land use controls to ensure that the public use is prohibited until development and transfer occurs.</p> <p>Response:</p> <p>Access corridors are the only approved public use areas through the ESCA parcels to access trails within the Bureau of Land Management’s (BLM’s) trail network. Trail markers have been installed to indicate approved access corridors. Public use may be restricted along the access corridors if remediation work on the ESCA parcels requires the implementation of an exclusion zone. Recreational users in restricted areas are now considered trespassers.</p> <p>If trespassers are encountered by the FORA ESCA RP Team, the trespassers will be stopped before entering an exclusion zone and directed to the nearest approved access corridor. Information on the ESCA RP and approved access points will be provided, if requested. Should trespassers not promptly return to an approved access corridor, the ESCA RP Team will record the incident and report it to FORA. Local authorities will be notified, as necessary.</p>
2		<p>Comment:</p> <p>We reiterate our emphasis on establishing community relations in both English and Spanish. The greater Fort Ord area is heavily populated with community members of Hispanic descent and in order to truly reach out, FORA must ensure that all community members have access to information about remediation activities. The Community Relations Approach and Implementation of Community Relations Activities (page 4-10) do not contain any mention of Spanish-speaking community members. The RI/FS should be revised to include the plans to reach this subpopulation.</p> <p>Response:</p> <p>FORA provides Spanish translations upon request. A Spanish language introduction is provided on the FORA ESCA RP Hotline. Spanish speaking citizens can talk directly with a member of the FORA staff fluent in Spanish.</p>

Response to Comments

Draft Group 3 Remedial Investigation / Feasibility Study Work Plan, dated February 27, 2009
 Review Comments provided by LeVonne Stone of the Fort Ord Environmental Justice Network,
 dated March 19, 2009

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		FORA is currently working on providing information for Spanish speakers on the FORA ESCA RP website. FORA also works directly with the League of United Latin American Citizens who serve the Spanish speaking population along the Monterey Bay Peninsula.
3	Figure 6, Del Rey Oaks/Monterey MRA	<p>Comment:</p> <p>Figure 6, Del Rey Oaks/Monterey MRA, depicts only one Entry Forbidden sign, located on S. Boundary Road, throughout the entire site. There should be another Entry Forbidden sign at the gate also depicted on the figure. For the safety of neighborhood patrons, additional signs should be placed along the MRA border that directly abuts the developed area and the parking lot located between S. Boundary Road and Canyon Del Rey Boulevard (shown on the same figure). Given higher public traffic in this area, the public should be made aware of the boundary and signaled not to enter Fort Ord property that still poses a human health risk.</p> <p>Response:</p> <p>The gates shown on Figure 6 provide access to former Fort Ord property owned by the City of Del Rey Oaks. FORA will not place signs on access gates to property that is not part of the ESCA. A fence currently exists between the developed area and the parking lot located between South Boundary Road and Canyon Del Rey Oaks Boulevard signaling that the area should not be entered.</p>

Response to Comments

Draft Final Group 3 Remedial Investigation / Feasibility Study Work Plan, dated July 20, 2009
 Review Comments provided by LeVonne Stone of the Fort Ord Environmental Justice Network,
 dated August 19, 2009

No.	Comment Type / Report Section	Comment/Response
1	Specific Comment, Page 2-3, Bullet 11	<p>Comment:</p> <p>Page 2-3, bullet 11 indicates that subsurface removal was not completed. Obviously subsurface removal in this area has to be completed and the FS will have to take this incomplete work into account. Please add methods and approach for ensuring the debris, MEC, MD, etc. from the area(s) indicated are sufficiently characterized so that the risks to human health can be understood and addressed in the FS.</p> <p>Response:</p> <p>The Group 3 RI/FS report will evaluate the adequacy of previous removal actions including the lateral extent and depth of the removal actions. The purpose of the Group 3 RI/FS Work Plan is to document that the available data are of sufficient quantity to characterize the Group 3 MRAs, as presented in Section 3.0 (Initial Evaluation) of the work plan, and that it is appropriate to proceed to an RI/FS report. The results of this evaluation will be documented in the Group 3 RI/FS report and made available to the public. The results of the detailed evaluation will be used to make a recommendation on what further activities, if any, are required in the Group 3 MRAs.</p>
2	Specific Comment, Page 2-5, Section 2.1.3	<p>Comment:</p> <p>Page 2-5, section 2.1.3 indicates under MRS 14A that there was a 1 foot removal action from 384 grids. Why was removal not completed to 4 feet, as in other areas?</p> <p>Response:</p> <p>USA's After Action Report (Fort Ord Administrative Record No. OE-0296C) describes the results of the removal action within MRS-14A (located outside the boundary of the former impact area). As stated in the After Action Report, MRS-14A was identified as a natural resource management area (i.e., low-intensity use). The Land Disposal Site Plan of 1994 (Fort Ord Administrative Record No. OE-0142) stated that remediation to a depth of 1 foot was required in land parcels to be used as nature preserves or other low-intensity uses, such as those planned for MRS-14A.</p>
3	Specific Comment, Page 2-6, Section 2.1.3	<p>Comment:</p> <p>Page 2-6, section 2.1.3, MRS 47, the RI/FS states that removal action was not carried out on 6 grids of 100 x 100 feet because of terrain difficulties. This is not a sufficient cause for ceasing investigations. Will the public be barred</p>

Response to Comments

Draft Final Group 3 Remedial Investigation / Feasibility Study Work Plan, dated July 20, 2009
 Review Comments provided by LeVonne Stone of the Fort Ord Environmental Justice Network,
 dated August 19, 2009

No.	Comment Type / Report Section	Comment/Response
		<p>from this area? Is it certain that this area will never be used by humans? FORA and its contractors cannot guarantee the usage patterns of Group 3. Clearly, the RI/FS will have to address this problem and investigate the nature of what was identified there in order to ensure safety for future land usage.</p> <p>Response:</p> <p>The purpose of the Group 3 RI/FS Work Plan is to document that the available data are of sufficient quantity to characterize the Group 3 MRAs, as presented in Section 3.0 (Initial Evaluation) of the Group 3 RI/FS Work Plan, and that it is appropriate to proceed to an RI/FS report. As part of the Group 3 RI/FS report, a detailed evaluation of the historical site uses, the historical boundaries of munitions response sites (MRSs), the adequacy of previous removal actions including removal action boundaries and depth, the data collected within the Group 3 MRA footprints, and the completeness of the dataset will be conducted. The results of this evaluation will be documented in the Group 3 RI/FS report and made available to the public. The results of the detailed evaluation will be used to make a recommendation on what further activities, if any, are required in the Group 3 MRAs.</p>
4	Specific Comment, Page 3-2, Section 3.1	<p>Comment:</p> <p>Page 3-2, section 3.1, next to last paragraph of the page indicates that the information on depth may not have been complete. It is not clear how the RI/FS will deal with this type of incomplete information.</p> <p>Response:</p> <p>The data were collected during the scraping, sifting, and sorting operations. It is known that the data were collected in the top 2 feet of soil. The RI will evaluate the usability of the data for the completion of the risk assessment and FS, considering the absence of depth information.</p>
5	Specific Comment, Page 4-1, Section 4.1	<p>Comment:</p> <p>Page 4-1, section 4.1 states that the Army has conducted field investigations and removals, the data are in the SEDR and no further field work is planned. As indicated above, this conclusion may be premature because the Army's information is incomplete or cannot be verified.</p>

Response to Comments

Draft Final Group 3 Remedial Investigation / Feasibility Study Work Plan, dated July 20, 2009
 Review Comments provided by LeVonne Stone of the Fort Ord Environmental Justice Network,
 dated August 19, 2009

No.	Comment Type / Report Section	Comment/Response
		<p>Response:</p> <p>To clarify, the section does not indicate that no further fieldwork will be conducted in the Group 3 MRAs. This section states that the initial evaluation conducted as part of the SEDR concluded that additional data collection prior to beginning the RI/FS was not required. The Group 3 RI/FS will evaluate a range of applicable remedial alternatives for the Group 3 MRAs including additional MEC remediation.</p>
6	Specific Comment, Page 5-1, Section 5.3	<p>Comment:</p> <p>Page 5-1, section 5.3 repeats the statement that no further field work is planned and FORA needs to prepare for the finding that its incomplete information does not permit adequate analysis.</p> <p>Response:</p> <p>See the response to Specific Comment 5 above.</p>
7	Specific Comment, Page 5-5, Section 5.9.2.1	<p>Comment:</p> <p>Page 5-5, Section 5.9.2.1 In developing alternatives in the FS, the work plan should anticipate that clearing vegetation will be conducted manually, not with burning. Also, the alternatives need to anticipate the public's input and concerns and prioritize community health and quality of life.</p> <p>Response:</p> <p>The Group 3 MRAs contain habitat reserve areas. Burning is retained as a vegetation removal component of any wide-scale remedial action evaluated as part of the Group 3 RI/FS that may impact the sensitive plant communities found in the habitat reserve areas of the Group 3 MRAs. The Group 3 RI/FS Work Plan describes the procedures that will be used to complete the Group 3 RI/FS report. A detailed analysis of the Group 3 MRAs will be conducted as part of the RI/FS.</p> <p>As described in the Group 3 RI/FS Work Plan, the FS will be conducted in accordance with the nine CERCLA evaluation criteria, which include consideration of the overall protection of human health and the environment and the state and community acceptance of an alternative.</p>

Response to Comments

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Review Comments provided by LeVonne Stone of the Fort Ord Environmental Justice Network,
dated August 19, 2009

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Response to Comments

Draft Final Group 3 Remedial Investigation / Feasibility Study Work Plan, dated July 20, 2009
 Review Comments provided by Lance Houston of the Fort Ord Community Advisory Group,
 dated August 20, 2009

No.	Comment Type / Report Section	Comment/Response
1	General	<p>Comment:</p> <p>FORA ESCA RP responses to the Draft Group 3 RI/FS are laughable in that they are deficient and lack substantive content.</p> <p>Response:</p> <p>FOCAG comments provided on the Draft Group 3 RI/FS Work Plan that were specific to the document were addressed in the response to comments presented in the draft final version dated July 20, 2009. The purpose of the Group 3 RI/FS Work Plan is to document that the available data are of sufficient quantity to characterize the Group 3 MRAs, as presented in Section 3.0 (Initial Evaluation) of the work plan, and that it is appropriate to proceed to an RI/FS report.</p> <p>A detailed evaluation of the historical site uses, the historical boundaries of designated MRSs, the types of known or suspected munitions used, the adequacy of previous removal actions including removal action depth, the data collected, and the completeness of the datasets for the Group 3 MRAs will be conducted as part of the RI/FS report in accordance with the procedures described in this work plan. This evaluation will be supported with maps detailing historical information, such as ranges and range safety fans, and the distribution of MEC found during previous investigations and removal actions. The Group 3 RI/FS Work Plan further states that a data quality review will be performed as part of the RI/FS report to evaluate the usability of the data for the purposes of a risk assessment and a FS in accordance with the procedures described in this work plan.</p> <p>The results of these evaluations will be documented in the Group 3 RI/FS report. The public will have the opportunity to provide comments on the Group 3 RI/FS report that are specific to MEC characterization, MEC remediation, and MEC explosive hazards.</p> <p>The FORA ESCA RP addresses MEC explosives hazards. Soil and groundwater issues related to munitions constituents are considered an Army-retained condition and will continue to be addressed by the Army. Comments related to residual chemical contamination from munitions constituents should be directed to the Army.</p>

Response to Comments

Draft Final Group 3 Remedial Investigation / Feasibility Study Work Plan, dated July 20, 2009
 Review Comments provided by Lance Houston of the Fort Ord Community Advisory Group,
 dated August 20, 2009

No.	Comment Type / Report Section	Comment/Response
2	General	<p>Comment:</p> <p>Most of the RP responses avoid or evade the FOCAG questions by referring to previous RP response letters that do not directly answer the questions and or refer to cleanup documents of which due to their deficiencies, the outstanding questions were asked. At best, parts of some of the questions are answered but overall leave the questions unanswered.</p> <p>Response:</p> <p>See response to General Comment 1 above.</p>
3	General	<p>Comment:</p> <p>Requested materials (maps and UXO/OEW data), essential to commenting on the Draft Final Group 3 RI/FS Study Work Plan was not received by the FOCAG nor were we notified of the requested materials availability.</p> <p>Response:</p> <p>The information sources used to prepare the Group 3 RI/FS Work Plan, including the Fort Ord Administrative Record numbers for information sources contained on the administrative record, are provided in Section 7.0 of the Group 3 RI/FS Work Plan. The Group 3 RI/FS Work Plan is consistent with EPA guidance for conducting remedial investigations and feasibility studies. A detailed evaluation of previous removal actions including the data collected and the completeness of the datasets for the Group 3 MRAs will be conducted as part of the RI/FS report in accordance with the procedures described in this work plan. This evaluation will be supported with maps detailing historical information, such as ranges and range safety fans, and the distribution of MEC found during previous investigations and removal actions. The results of these evaluations will be documented in the Group 3 RI/FS report, which will be provided to the public for review.</p>
4	General	<p>Comment:</p> <p>The MEC and Ordnance Constituents questions and concerns raised by the FOCAG are inseparable in that Superfund cleanup of OEW as a whole is the issue at hand. The fact that DoD, BRAC, FORA, and the ESCA RP land disposal/transfers are primarily based on explosive hazards and omit the Ordnance Constituents hazards. FORA land planning is being carried out without addressing the equally if not a greater remaining hazard of Ordnance</p>

Response to Comments

Draft Final Group 3 Remedial Investigation / Feasibility Study Work Plan, dated July 20, 2009
 Review Comments provided by Lance Houston of the Fort Ord Community Advisory Group,
 dated August 20, 2009

No.	Comment Type / Report Section	Comment/Response
		<p>Constituents. Unfortunately, the Land Disposal Site Plan 1994 (LDSP), OE-0142, that defines explosive hazard cleanup requirements under the Department of Defense Standard 6055.9. fails to specifically address Ordnance Constituents. However, The LDSP states; "... remediation of areas containing OEW waste." "...95% of all OEW will be removed...". It is the CAG's understanding that Ordnance Constituents are considered Ordnance and Explosives Waste (OEW). OEW Constituents should be addressed parallel with FORA Land Planning, Remediation and fully resolved prior to transfer, development and habitation by the public.</p> <p>Response:</p> <p>As indicated in responses to similar comments submitted by the FOCAG, investigation of potential hazardous and toxic wastes (HTW) issues (identified as "ordnance constituent hazards" in the FOCAG's letter dated August 20, 2009) other than explosive hazards associated with MEC have been, and will continue to be conducted by the Army, as required, documented, and approved by the regulatory agencies. The status of the Army's HTW investigations within the Group 3 MRAs was described in the Finding of Suitability for Early Transfer for the ESCA parcels (Fort Ord Administrative Record No. FOSET-004J).</p>
5	General	<p>Comment:</p> <p>The FOCAG has come across a 2007 DoD Munitions, Time Critical Removal Action carried out in New Jersey, Surf City and Ship Button public beaches. The document raises additional significant questions with the Fort Ord munitions detection equipment and adequacy of MEC detection and removal under the Fort Ord RP.</p> <p>The document refers to a GPO study and concludes as follows; The study concluded that Digital Geophysical Mapping (DGM) using an EM-61 towed array was capable of consistently detecting 34 of 36 GPO seed items buried at depths from 0 to 36 inches below the ground surface for a 94.4% detection rate. The Schonstedt Magnetometer detected 20 of 30 GPO seed items to depths of 18 inches below the ground surface a 66.3% detection rate. The Forester Mk 26 Magnetometer detected all GPO seed items buried at 36 inches below the ground surface a 100% detection rate.</p> <p>The document refers to detection of 37 mm projectiles of which the Schonstedt has a very poor detection capability.</p>

Response to Comments

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Review Comments provided by Lance Houston of the Fort Ord Community Advisory Group,
dated August 20, 2009

No.	Comment Type / Report Section	Comment/Response
		<p>Response:</p> <p>As documented in the Group 3 RI/FS Work Plan, the initial evaluation of previous munitions response actions within the Group 3 MRAs indicated that the existing data are of sufficient quality to characterize the MRAs. Additional field data are not required to be collected to complete the remedial investigation portion of the Group 3 RI/FS report. Therefore, an evaluation of the Foerster equipment is not applicable to this document.</p> <p>When fieldwork is appropriate, FORA and the ESCA RP Team will use the best available and appropriate detection technology for conducting investigations at the former Fort Ord, which will be documented in sampling and analysis plans and made available to the public for review.</p>

Response to Comments

Draft Final Group 3 Remedial Investigation / Feasibility Study Work Plan, dated July 20, 2009
Follow-Up Review Comments provided by Lance Houston of the Fort Ord Community Advisory
Group, dated September 29, 2009

No.	Comment Type / Report Section	Comment/Response
1	General	<p>Comment:</p> <p>The Forester MK26 magnetometer appears to be a superior magnetometer for detecting ordnance. What is the justification for not include the Forester MK26 magnetometer in Fort Ord OE Detection Studies and OE Sampling and Removal Actions?</p> <p>Response:</p> <p>Please see response to FOCAG's General Comment 5 above.</p>

Response to Comments

Draft Final Group 3 Remedial Investigation / Feasibility Study Work Plan, dated July 20, 2009
Review Comments provided by Lance Houston of the Fort Ord Community Advisory Group,
dated September 29, 2009

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Response to Comments

Draft Final Group 3 Remedial Investigation / Feasibility Study Work Plan, dated July 20, 2009
 Review Comments provided by Mike Weaver of the Fort Ord Community Advisory Group, dated
 August 20, 2009

	Comment Type / Report Section	Comment/Response
1	General	<p>Comment:</p> <p>In this Draft Final Document the public is asked to respond to FORA, and yet the U.S. Army in your Draft is addressing responses to concerns. It is reiterated that FORA is addressing the threat of unexploded ordnance. However, the Army is responsible for residual chemical contamination of the surface and subsurface. The clean up is being piecemealed. What is the timeline for clean up of residual chemical contamination? Some of the dirtiest and most dangerous property is being transferred, or proposed for transfer, for public uses based on records of decision involving inadequate land use controls. I believe modification of clean up standards and procedures is being done outside the knowledge of the community. Certainly the Federal Facilities Agreement was modified.</p> <p>Response:</p> <p>The Army is responsible for setting the schedule for the remediation of residual chemical contamination (i.e., munitions constituents) at the former Fort Ord. Comments related to the schedule for remediation of residual chemical contamination should be directed to the Army.</p> <p>As stated in Section 4.9 of this work plan, FORA provides the community with information pertaining to the ESCA remediation program in the form of newsletters, fact sheets, public comment meetings, public presentations, workshops, and smaller group meetings. FORA also provides the community with the opportunity to review and comment on technical program documents as required under the EPA Superfund guidance so that the community is knowledgeable on the specifics of the ESCA remediation program.</p>
2	General	<p>Comment:</p> <p>Once again, the amendments to the Federal Facilities Agreement (FFA) required in order to try to implement the Finding of Suitability for Early Transfer (FOSET) and this Environmental Services Cooperative Agreement (ESCA) are illegal because the amendments vest FORA with the authority, indeed the obligation, to carry out the remediation at the parcels covered by the ESCA and FOSET. This contravenes the Superfund Statute, which requires that an interagency agreement call for performance of necessary remediation by the U.S. Department or Agency (the Army) responsible for the contamination at the facility.</p>

Response to Comments

Draft Final Group 3 Remedial Investigation / Feasibility Study Work Plan, dated July 20, 2009
Review Comments provided by Mike Weaver of the Fort Ord Community Advisory Group, dated
August 20, 2009

	Comment Type / Report Section	Comment/Response
		<p>Response:</p> <p>The FOCAG raised a similar issue in the position paper dated January 31, 2008 (Fort Ord Administrative Record No. ESCA-0044). FORA prepared a response to that position paper in a letter to the FOCAG dated March 6, 2008, which is available on the administrative record (Fort Ord Administrative Record No. ESCA-0058). The second paragraph entitled "Federal Facilities Agreement" on page 2 of the letter provides FORA's response to this issue.</p>



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105



April 24, 2009

SCB

Mr. Stan Cook
Fort Ord Reuse Authority
100 12th Street, Building 2880
Marina, CA 93933

Re: EPA Comments on the Draft Group 3 Remedial Investigation / Feasibility Study Work Plan, Interim Action Ranges, Military Operations in Urban Terrain, Laguna Seca parking, and Del Rey Oaks/Monterey Munitions Response Areas, Former Fort Ord, Monterey County, California, Dated February 27, 2009

Dear Stan:

Attached are EPA's comments on the *Draft Group 3 Remedial Investigation / Feasibility Study Work Plan, Interim Action Ranges, Military Operations in Urban Terrain, Laguna Seca parking, and Del Rey Oaks/Monterey Munitions Response Areas, Former Fort Ord, Monterey County, California*, dated February 27, 2009.

If you have any questions, please do not hesitate to call me at (415) 972-3681 or e-mail me at huang.judy@epa.gov.

Sincerely,

Judy C. Huang, P.E.
Remedial Project Manager

cc:

Roman Racca (DTSC)
Site Mitigation/Office of Military Facilities
8800 Cal Center Drive
Sacramento, CA 95826

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Kristie Reimer, AICP
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Monterey, CA 93944-5004

Mr. Thomas Hall (via E-mail)

**REVIEW OF THE
DRAFT GROUP 3
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN
INTERIM ACTION RANGES
MILITARY OPERATIONS IN URBAN TERRAIN
LAGUNA SECA PARKING
AND
DEL REY OAKS/MONTEREY
MUNITIONS RESPONSE AREAS
FORMER FORT ORD, CALIFORNIA
FEBRUARY 27, 2009**

GENERAL COMMENTS

1. The Draft Group 3 Remedial Investigation/Feasibility Study Work Plan, Interim Action Ranges, Military Operations in Urban Terrain, Laguna Seca Parking, and Del Rey Oaks/Monterey Munitions Response Areas, Former Fort Ord, Monterey, California, dated February 27, 2009 (hereinafter referred to as the Draft Group 3 RI/FS WP), contains Section 3.0, Initial Evaluation. Review of the subsections of this section reveals that the total number of MEC items recovered in the respective Munitions Response Areas (MRAs) does not coincide with the number of items assigned a hazard classification in that MRA. While there is likely a logical reason for what appears to be a discrepancy, that reason is not stated in the narrative. Please revise the subsections of Section 3.0 where this disparity occurs to include an explanation for the difference.
2. There are a number of instances where numbered Munitions Response Sites (MRSs) are mentioned in the discussion of the MRAs included in the Draft Group 3 RI/FS WP. The locations of these MRSs are not provided in the related figures found in the Figures Section. Please revise the noted figures to include the identity and the boundaries of each MRS mentioned in the narratives associated with each specific MRA.

SPECIFIC COMMENTS

1. **Glossary, Page ix:** The definition of the term “Material Potentially Presenting and Explosive Hazard (MPPEH)” does not coincide with that found in Department of Defense Ammunition and Explosives Safety Standards (DoD 6055.09-STD, February 29, 2008 with Change 1, March 24, 2009). That definition reads as follows:

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 potentially contains 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 with 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.

The original definition has been modified somewhat by the insertion of the phrase “prior to determination of its explosives safety status.” This was done to accommodate two new definitions found in DoD 6055.09-STD that read as follows:

Material Documented as Safe (MDAS): 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.

Please revise the definition of MPPEH to read consistent with the official definition found in DoD 6055.09-STD. Also, please take note of the two additional definitions that will likely be used in future actions documenting the status of items initially classified as MPPEH.

2. **Section 2.1.1, Interim Action Ranges MRA, Page 2-3:** The sixth bullet on this page reads, “Analog removal to depth at 1,261 100-foot by 100-foot grids from December 2003 to July 2005 (Parsons 2007).” This bullet does not specify the portion of the MRA (i.e., which range or ranges) where the 1,261 grids were located. Please revise the cited bullet to provide the missing information noted above.
3. **Section 2.1.1, Laguna Seca Parking MRA, Page 2-5:** The last paragraph on this page states that, “It was reported that six 100-foot by 100-foot grids were omitted from the removal action at MRS-14A because of accessibility issues (i.e., steep grade, heavy brush, or deep ravine; USA 2001b).” As there are two removal actions listed in the MRS-14A subsection that precede the cited paragraph, it is unclear as to which removal the six grids were associated. Please revise the noted paragraph to include the identity of the removal (or removals) that omitted the six grids.
4. **Section 3.2, MOUT Site MRA Evaluation, Page 3-3 and 3-4:** The last sentence on page 3-3, which extends onto page 3-4, contains a statement that reads, “...and high concentrations of subcaliber artillery simulators were encountered...” It is unclear as to what exactly is meant by the phrase “subcaliber artillery simulators.” Please revise the cited section to include the correct nomenclature of the noted items.



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
FORT ORD OFFICE, ARMY BASE REALIGNMENT AND CLOSURE
P.O. BOX 5008, BUILDING #4463 GIGLING ROAD
MONTEREY, CALIFORNIA 93944-5008

MAR 25 2009

Base Realignment and Closure

Stan Cook
ESCA Remediation Program Manager
Fort Ord Reuse Authority
100 12th Street
Marina, CA 93933

Subject: *Draft Group 3 Remedial Investigation/Feasibility Study (RI/FS) Work Plan, Interim Action Ranges, Military Operations in Urban Terrain (MOUT), Laguna Seca Parking, and Del Rey Oaks (DRO) / Monterey Munitions Response Areas (MRAs)*, dated February 27, 2009, received on March 2, 2009.

Dear Mr. Cook:

Thank you for an opportunity to review and comment on the subject document. The Army's comments are enclosed. Please note our comments are focused on "big picture" issues such as the consistency with documents previously produced under the Army's cleanup program. A copy of this letter will be furnished to U.S. Environmental Protection Agency (Judy Huang) and California Department of Toxic Substances Control (Roman Racca).

Sincerely,

Gail Youngblood
BRAC Environmental Coordinator
Fort Ord Field Office

Enclosure

DRAFT Group 3 Remedial Investigation/Feasibility Study (RI/FS) Work Plan, Interim Action Ranges, Military Operations in Urban Terrain (MOUT), Laguna Seca Parking, and Del Rey Oaks (DRO) / Monterey Munitions Response Areas (MRAs)

February 27, 2009

Army Comments:

1. p.2-11, Section 2.3.1 Current Land Use. This section should describe the current land use at the Laguna Seca Parking MRA.
2. p.2-12, Section 2.3.2 Future Land Use. The majority of the Interim Action Ranges MRA is within the Natural Resource Management Area (NRMA). Several portions of the Group 3 MRAs contain Borderland Interface areas that require specific land management measures. The current and future habitat protection and management requirements are documented in *Installation-wide Multispecies Habitat Management Plan for Fort Ord* dated April 1997 (HMP; Administrative Record #BW-1787). Therefore this section should identify the HMP as the source of future reuse information for portions of the Group 3 MRAs where habitat management requirements apply. Furthermore, we understand that Fort Ord reuse Authority is leading an effort to develop a Habitat Conservation Plan for Fort Ord, which would further clarify the intended future activities in the habitat reserve areas. If relevant information is available, it should be included in this section.
3. Section 2.2 Physical Setting. Information regarding the presence of special status species and their habitat, HMP land use designations (e.g. NRMA, Borderland Interface), and associated habitat management requirements should be described under this section.
4. p.3-1, Section 3.1 Interim Action MRA Evaluation. The first paragraph includes this sentence: "The Army's removal actions were completed over a majority of the footprint of the MRA, except for approximately 227 acres designated by the Army as SCAs (special case areas) or non-completed areas." Please note that the approximately 227 acres of SCAs and non-completed areas are distributed throughout the footprint of the munitions response site (MRS) Ranges-43-48, not necessarily within the Interim Action Ranges MRA. In addition, this work was conducted as an interim remedial action in accordance with *Record of Decision, Interim Action For OE at Ranges 43-48, Range 30A, and Site OE-16*, September 2002 (Interim Action ROD; Administrative Record #OE-0414). Please consider modifying the sentence to avoid potential confusion by some readers.
5. p.3-1, Section 3.1 Interim Action Ranges MRA Evaluation. Additionally, this work plan should recognize that the Interim Action Ranges MRA holds a different regulatory status than other portions of the Group 3 MRAs, in that an interim remedy has been selected on the basis of the Interim Action ROD. This information is highly relevant for the process for planning the eventual site closeout for this MRA.
6. p.3-2, Section 3.1 Interim Action Ranges MRA Evaluation. Second to the last paragraph suggests that the Army's Military Munitions Response Program (MMRP) database might not include information concerning subsurface munitions and explosives of concern (MEC) that were recovered during the Range 45 scraping and sifting operations. All MEC items recovered during the sifting operations at Range 45 are reported in *Final MRS-Ranges 43-48 Interim Action*

Technical Information Paper dated January 26, 2007 (Administrative Record #OE-0590L), and information about these items are available in the MMRP database.

7. p.4-7, Section 4.7.1 Initial Identification of Potential Applicable or Relevant and Appropriate Requirements (ARARs). Please note that the Interim Action ROD identified the ARARs that relate to the interim remedial action that was selected for MRS-Ranges 43-48, including the Interim Action Ranges MRA.
8. p.4-10. Section 4.9.3 Implementation of Community Relations Activities.
 - First bullet, we recommend referencing the new Environmental Services Cooperative Agreement (ESCA) Remediation Program (RP) website fora-esca-rp.com.
 - Second bullet, there is no regulatory requirement for "hearings" under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or the National Contingency Plan (NCP) concerning the Group 3 MR RI/FS. The term used in the NCP is "public meeting" and should be used instead of "community workshops and hearings" to avoid potential confusion.
 - Fifth bullet, fact sheets developed by FORA ESCA RP are not posted on the Army's cleanup website, www.fortordcleanup.com. Our website provides a hyperlink to the FORA ESCA RP website at fora-esca-rp.com.
9. Table 1 Potential ARARs.
 - a. p.1, National Pollutant Discharge Elimination System (NPDES), 40CFR Parts 122, 123 and 125 and p.3 Porter Cologne Water Quality Control Act, California Water Code, Division 7, Section 13200. Please refer to comments by the Army and U.S. Environmental Protection Agency concerning the same item in *Draft Final Group 2 RI/FS Work Plan* by the ESCA RP Team dated February 16, 2009. The identification of these specific sections of the Clean Water Act and California Water Quality Control Act compel further evaluation. The Army will further discuss this item with EPA and the State of California. Additionally, the "Remarks" indicate that obtaining NPDES and/or state Waste Discharge Requirements (permits) may be required. Please delete the remarks since procedural requirements such as obtaining permits do not become ARARs for onsite remedial actions.
 - b. p.2, California Fish and Game Code Section 4800 et seq. Please refer to comments by the Army concerning the same item in *Draft Final Group 2 RI/FS Work Plan* by the ESCA RP Team dated February 16, 2009. The "Remarks" include a statement: "In fact, the use of fire to set back plant community succession will result in an improvement to wildlife habitat that will benefit mountain lions." This statement implies that prescribed burning is being considered as part of possible remedial alternative(s) for the Group 3 MRAs. If this is the case, evaluation of vegetation clearance alternatives would be required, and the work plan should then address the procedures for such an evaluation. If prescribed burning is not being considered to be evaluated as a part of any of the possible remedial alternative for these MRAs, please revise the remarks. Please re-examine the remarks and make appropriate updates to the document.
 - c. p.4, California Clean Air Act, Health and Safety Code Section 41701. Please refer to comments by the Army concerning the same item in *Draft Final Group 2 RI/FS Work Plan* by the ESCA RP Team dated February 16, 2009. The "Remarks" include statements that imply that prescribed burning is being considered as part of possible remedial

alternative(s) for the Group 3 MRAs. If this is the case, evaluation of vegetation clearance alternatives would be required, and the work plan should then address the procedures for such an evaluation. If prescribed burning is not being considered to be evaluated as a part of any of the possible remedial alternative for these MRAs, please revise the remarks. Please re-examine the remarks and make appropriate updates to the document.

- d. p.4, California Fish and Game Code Section 3005, Section 4000 et seq., and Title 14, CCR Section 460. Please refer to comments by the Army concerning the same item in *Draft Final Group 2 RI/FS Work Plan* by the ESCA RP Team dated February 16, 2009. The "Remarks" include statements that imply that specific remedial alternatives were evaluated as to whether or not these regulations were applicable or relevant and appropriate. However, no specific remedial alternatives were described in this document. Please re-examine and make appropriate revisions to the remarks.

Detail/minor comments:

10. References. Document references that are identified in the body of the work plan do not appear to be consistent with the intended documents listed in Section 7 References. For example, on p.2-3, sifting operations at Range 45 (conducted by Parsons in 2005) is identified, but reference identifies a 2001 document by another contractor. Please review all document references to identify the correct document in each instance.
11. p.2-9, Section 2.2.2 Physical Setting, MOUT Site MRA. Second to the last paragraph equates 800 feet to approximately 500 meters. Please check the conversion as this appears to be erroneous.

Fort Ord Community Advisory Group (FOCAG)
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March 28, 2009

FOR THE ADMINISTRATIVE RECORD
Please distribute to all FORA Board Members
Letter Pages 15 Attachments and Maps 182 Pages

Fort Ord Reuse Authority (FORA)
100 12th St., Building 2880
Marina, CA 93933
FORA ESCA Program Manager
c/o Stan Cook

RE: Fort Ord CAG Comments: FORA ESCA Remediation Program Draft Group 3
RI/FS Study Work Plan; Interim Action Ranges, Military Operations in Urban
Terrain, Laguna Seca Parking, and Del Rey Oaks / Monterey Munitions
Response Areas, Doc. Control Number: 09595-09-079-001

Concerns: Military Munitions Residual Contamination, OE/UXO/OEW/MEC Detection,
OE/UXO/OEW/MEC Clearance Depths, Administrative Record Keeping,
Military Munitions Database, Omissions of Pertinent Historical Site
Documentation and Information, Compliance with Cleanup Standards

The "Fort Ord Community Advisory Group is a public interest group formed to review, comment and advise on the remediation (cleanup) of the Fort Ord Army Base, Superfund Site, to ensure that human health, safety and the environment are protected to the greatest extent possible." - Mission Statement.

Dear Mr. Cook;

There are a wide range of concerns and issues that have been raised by the Fort Ord CAG over the years, most of which remain unaddressed and unanswered.¹ In a recent CAG letter sent to FORA and the Regulators raising old and new concerns, the Army responded instead, on behalf of FORA and the Regulators. The public has often not been privy to the decision making process.² A great deal of time and taxpayer money is being spent to avoid answering our questions by referring us to documents that do not answer our specific questions and concerns. It would be helpful in the future to 1) answer the questions, 2) give the name and AR number of the document the answer is found in, and 3) give the page or section number and paragraph that the answer came from.

As is evident from OE Sampling and Removal Actions, extensive Troop Training and Munitions use occurred throughout areas that were not previously identified as Training Areas. This drives home the point that Fort Ord trained several million troops over a

¹ Attachment 1: FOCAG 8-12-08 letter to FORA, DTSC, US EPA

² Attachment 15: email; Regulators and Developer discussing Superfund UXO/OEW cleanup policy

period of 77 years, kept extremely poor records, used unknown millions of pounds/tons of munitions, and that these are found in unexpected places. Areas East of General Jim Moore Blvd. and Eighth St. are highly contaminated with military munitions the extent of which is unknown.^{3 4}

The Military Munitions Response Program (MMRP) database information the FORA ESCA RP is relying on is a far cry from what the historical record shows. The MMRP is arbitrarily omitting significant information from the Group 3 RI/FS. In doing so, a new record is being created that gives the appearance the land is cleaner than it really is.⁵

Critical documents (The Fort Ord Projectile Penetration Study) used for assessing potential explosive hazards associated with excavation activities and required remediation depths contains erroneous Site specific ordnance discovered information.⁶ What type penetration ordnance is being used for the evaluations of the Group 3 RI/FS parcels?

A new scheme is unfolding. The Insufficient Data category (ISD) is a scary one. Has money spent on past contractors been for nothing because they didn't know how to identify the ordnance they were finding?⁷ The FORA ESCA RP is arbitrarily throwing whatever munitions they want into the ISD category. There is no supporting documentation or explanation other than, because they say so.

Critical Administrative Record (AR) documents that contain pertinent Site specific information of known or suspected OE uses and depths that OEW contamination may be found have been omitted from the Group 3 RI/FS Work Plan.⁸ By doing so, bogus claims of site specific conditions found in the "new" SEDR database cannot be refuted. Findings for suitability to transfer the parcels are being made based on this manipulation of data rather than data reflecting the actual site specific conditions, and potential remaining health hazards. The FORA ESCA RP is becoming what many of us feared, a dumbing-down of the extent of, and the danger of conditions existing on this former Army base. FORA political decisions based on real estate desires are not effective in protecting the community and future residents health and safety.

In addition, a great hazard remains largely unaddressed. Residual contamination from military Munitions Constituents (MC) exists. The Fort Ord ESCA Cleanup Program has failed to initiate a comprehensive MC sampling plan. To date, we are unaware of a list of MC for all military munitions and Training Devices used at former Fort Ord. If the list exists, please forward a copy to the CAG. Some 3300 acres are slated for turnover to the public without addressing this significant threat to human health.

³ Attachment 3: Excerpts, training areas and range configurations are unknown: OE-0005A: "Site 16 Rocket moving target range...only discovered 18 months ago, this area was saturated with 2.36"rockets both HEAT and practice.... 400-500 were HEAT warheads."

⁴ Map 2: CSU Footprint, previously unidentified Training Areas highly contaminated with Ordnance and Explosive Waste (OEW) live and inert ammunition.

⁵ Attachment 4: California Real Estate Disclosure Law; requires full disclosure of hazardous waste

⁶ Attachment 14: penetrating ordnance Group 3 parcels; projectiles; 22mm, 40mm, 37mm, 57mm, 60mm, 75mm, 81mm, 84mm, 4.2in mortar, 105mm, 155mm, 8 inch naval rounds

⁷ Attachment 11: EOD Specialist Résumé, 27 years experience UXO identification and removal

⁸ Attachment 5: IA Ranges 43-48 White Phosphorous (WP) Range, 1993 ASR munitions 7-10 feet deep.

1) In order to better understand the extent of military training at former Fort Ord, and the potential contamination from training activities, fundamental questions need to be answered or at least estimated.

A story told by a retired sergeant that trained Fort Ord troops:

A retired sergeant said he trained soldiers to fire 60mm and 81mm mortars in the northern and northeastern portions of Site 39. He would take out 400 soldiers for bivouac maneuvers (multi day outings in the field). When asked how many rounds each soldier fired in a day, he estimated each man would fire 30 to 60 Mortar rounds. He indicated they were practice mortars. Using a median number of 45 mortars multiplied by 400 soldiers, 18,000 mortars were fired in a day by a single group of trainees. It is understood practice munitions unlike High Explosive (HE) munitions use pyrotechnics for identifying where the rounds hit (spotting).^{9 10}

Note: at the height of training there were 50,000 soldiers at Fort Ord. Estimates are, from 1940-1974 1.5 million troops trained at Fort Ord.¹¹

a) Several million troops trained at Fort Ord. How many millions or billions of pounds of military munitions were used in the training of troops? Any estimates? If not, why not?

Detailed Issues, Concerns, and Questions:

2) The Group 3 RI/FS Work Plan, Interim Action Ranges and other parcels are some of the most highly contaminated areas at former Fort Ord. The FORA ESCA RP is based in large part on the creation of a data set based on sampling and removals to a depth of 4 feet. The MMRP is assuming no UXO/OEW will be found below 4 feet. However, it appears deep penetrating UXO/OEW is not being looked for.

From early on in the Superfund cleanup of UXO/OEW, the use of quantified science has been absent. The Enron/Arthur Anderson creative accounting style of data collection and manipulation is detrimental to human health and safety and is **not** in the communities best interest. If protection of human health and safety is the goal, a scientific approach to UXO/OEW cleanup requires the inclusion of all potential exposure scenarios to explosive and residual contamination, and that **all** aspects of munitions use be quantified. To date UXO/OEW investigations and removals have been limited to the explosive hazard and soil sampling for a few constituents arbitrarily chosen by DOD. Cal EPA (DTSC) and US EPA are concurring with this absurd approach.

Another dangerous approach to Ordnance and Explosives Site assessments has been, lack of evidence of OE use through Archive Searches and Site Walks is sufficient to conclude OE and training devices were not used at suspected training areas.¹² This rational defies

⁹ Attachment 9: Practice Bombs, toxic hazards of practice ammunition

¹⁰ Attachment 6: Pyrotechnic Devices, Military Munitions (Chemistry) Chapter 10

¹¹ Attachment 19: Fort Ord History

¹² Attachment 21: Article; Buried munitions in residential development, deed restriction was lifted

commonsense. To date, several training areas previously unidentified as UXO/OEW sites, have proven to be highly contaminated with munitions and training devices. Unresolved issues with the Fort Ord MMRP approach exist:

- a) The Army kept extremely poor records. Why isn't a precautionary approach being taken when it comes to potential training areas?(assume it is UXO/OEW contaminated unless proven otherwise rather than assuming it was not used for training based on Archive Search Records and Site Walks) Never assume Fort Ord land is safe.¹³
- b) Identifying past range uses is critical. It is understood range reconfigurations where a common practice.¹⁴ Site 39 historical maps show ranges over tops of ranges, the extent of which is unknown. If wanting to know the extent of range and training area uses is a goal, compiling a list of all known and suspected munitions and training device constituents and extensive site soil sampling would be very helpful. Is there a list of all constituents associated with munitions and training devices used at former Fort Ord?¹⁵ If not, why not?
- c) It is understood a common practice was to cover over former training ranges with earth, out of sight out of mind.¹⁶ Is there a cleanup document that discusses in detail the practice of covering over old ranges and training areas? If not, why not?
- d) It was a common practice to bury OE/OEW.¹⁷ Is there a cleanup document that discusses in detail the practice of burying OE/OEW? If not, why not?
- e) The MMRP does not appear to be looking for deeply buried munitions. Why isn't the MMRP looking for UXO/OEW deeper than 4 feet?
- f) OE/OEW is likely deeply buried in ranges and training areas. The approach the MMRP has taken with OE/OEW is, don't look, don't find. Superfund cleanup as the FOCAG understands it, is a program intended to identify and remove hazardous waste and substances to the greatest extent possible. If OE/OEW and training devices aren't being looked for, they surely won't be found. Is the MMRP doing a cleanup to the greatest extent possible? If not, why not?
- g) Former uses at Site 39 have been omitted from the record, aerial bombing runs were carried out in the MRA. Why has this significant historical use been omitted from the record?¹⁸ What is the penetration depth of a 100, 250, and 500 lb bomb? Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not?

¹³ Attachment 16: The Precautionary Principle; 1998 Wingspread Statement

¹⁴ Attachment 3: Excerpt, Range 48; 40mm, 60mm, 81mm, 4.2 in, and 4 in mortars found 10 feet deep

¹⁵ Attachment 10: DOD to identify contamination from over 200 military Munitions Constituents (MC)

¹⁶ Attachment 3: Excerpt, Site 13B sink hole Practice Mortar Range under 30 feet of fill

¹⁷ Attachment 21: Article Buried munitions. Deeply buried ordnance is not being looked for.

¹⁸ Attachment 3: Excerpts, Bombing runs where carried out at Fort Ord. A live 250 lb. bomb found in front of Ranges 41-43. A 100lb. Found at CSUMP parcel Site 8.

- h) It is understood large amounts of Practice and HE munitions were used to train troops the extent of which is unknown. How many troops are estimated to have trained at Ranges 43-48? Any estimates? If not, why not?
- i) It is understood burning off ranges to remove old munitions was a common practice. The extent of munitions constituents contamination is unknown. A site were UXO/OEW has been discovered may have been cleared of munitions annually for many years. A range used in this manner would likely have significant COC's on-site. Where is the list of known ranges that had this done? Is there a cleanup document that discusses in detail this potential health and safety issue? If not, why not?
- j) The significant hazards of Practice munitions have not been addressed. It is well documented Practice munitions were extensively used in the training of troops. The FOCAG has discovered these munitions contain highly toxic substances. The FOCAG is unaware of a cleanup document or report that discusses in detail Practice munitions and their constituents. If a document exists addressing practice munitions and their constituents please forward a copy to the FOCAG.
- k) The FOCAG has discovered a map showing the Interim Action Ranges. Range 44 is identified as a LT antiarmor WP Range.^{19 20} The 1993 ASR indicates White Phosphorous munitions use occurred at Site 39. Is Range 44 a White Phosphorous Range? Is there a cleanup document that discusses in detail these types munitions and where they were used at Fort Ord? If not, why not?
- l) It is understood incendiary, armor piercing munitions were used at Site 39.²¹ Have armor piercing munitions such as Depleted Uranium been discovered at Site 39? ²² Is Depleted Uranium being looked for? Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not? Could you please send the FOCAG a copy of the full scale map that map1 was generated from?
- m) Range 43 is identified as a 81mm and 4.2 in mortar range.²³ Is the he MMRP looking beyond 4 feet for deep penetrating ordnance? If not, why not? Could you please send the FOCAG a hard copy and a CD of the full scale map that Map1 was generated from?

The 1993 ASR states Range 48 has ordnance at 10 feet and the Impact Area of which the entire IA Ranges are located, has munitions at 7-10 feet.²⁴ According to listed ordnance used at 43-48,²⁵ Penetration depths should not exceed 4.1 ft.. A

¹⁹ Attachment 3: Excerpts, types munitions used at Site 39

²⁰ Attachment 16: White Phosphorous is highly toxic

²¹ Map 1: shows Range 44 as White Phosphorous (WP) Range (must enlarge map to see)

²² Attachment 2: DOD document indicating Spent Uranium anti tank munitions use at former Fort Ord

²³ Map 1: shows Range 43 as a 81mm, 4.2 mortar range (must enlarge map to see)

²⁴ Attachment 3: Excerpts, depths OE is expected to be found Ranges 43-48 and the MRA/impact area.

²⁵ Attachment 3: Excerpts, list of OE expected to be found at Site 39, Ranges 43-48

couple of possibilities. 1) these ranges were covered over to reduce hazards from past OE use, or 2) Ranges 43-48 are a impact area from old artillery ranges located in the North and Eastern portion of Fort Ord,²⁶ perhaps old Camp Ord. Historical records indicate early Fort Ord was a Artillery training facility. Regardless, there is a high likelihood, explosive and residual hazards remain unaddressed with the IA and adjacent ranges. When will the Army begin a RI/FS that targets artillery OEW?

- n) Have there been any excavations to investigate whether OE is found at 10 ft. in the IA Ranges? If not, why not? Is the era and size of munitions fired from the artillery ranges in map 3 known? Have the firing points and impact areas been looked for and located? If not, why not?
- o) 4.2 in. and 4 in. Stokes mortars are identified as being used and found in the IA Ranges.²⁷ In addition, Livens projectiles have been found nearby. It is understood these types WW I mortars and munitions have been found to contain titanium tetrachloride, a CWM. Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not?
- p) Why aren't the Regulators asking and getting answers to these fundamental questions? Its not to late to get it right.

3) Most military munitions constituents are known or suspected endocrine disruptors, carcinogens, mutagens, toxicants, etc.. The CAG has compiled a list of military munitions constituents found in the types of munitions used at Fort Ord. The list includes the potential negative human health impacts that may result from exposure to each of the constituents. Former Military Training Areas are highly contaminated with hazardous chemicals.²⁸ If you knew of the potential risk, would you want or allow your children to live on and play in soil possibly contaminated with the Table 1 and Table 2 constituents?

- a) Has the Fort Ord Cleanup Program prepared a list of Munitions Constituents (MC) for all Military Munitions and Training Devices used at former Fort Ord. If not, Why not?
- b) Of the millions or billions of pounds of military munitions used, how many pounds of their constituents were released into the environment? Any estimates? If not, why not?
- c) Were did the residual contaminates go?
- d) Could all the contaminates simply disappear?
- e) Does soil analysis of ranges include every known or suspected OEW/UXO constituent used at Fort Ord? If not, why not?

²⁶ Map 3: Shows 2 old artillery range fans extending into MRA

²⁷ Attachment 3: Excerpts, list of OE expected to be found at Site 39, Ranges 43-48. Add new items

²⁸ Attachment 7: military munitions constituents and health hazards Table 1 and Table 2 constituents

- f) Babies and toddlers commonly eat soil and other substances off the ground. Has this risk been analyzed? If not, why not?
 - g) Have Maximum Residual Levels (MRL's) been established for the constituents in the attached Military Munitions Chemicals Of Concern Table 1 and 2? If not, why not?
 - h) If the extent of residual contamination and MRL's have not been established, how can an acceptable level of cleanup be known for residential or commercial use?
 - i) Is there a screening program in place to monitor for hazardous substances at Fort Ord? If not, why not? Will there be a program to monitor potential negative health impacts of residents living in homes built on former training areas and ranges? If not, why not?
 - j) Perchlorate is known to be a widely used constituent in military munitions used at Fort Ord . Is there testing being conducted to identify the extent of Perchlorate contamination in former training areas and ranges? If not, why not? If yes, the remediation documents don't appear to include any discussion or analysis.²⁹
 - k) Synergism and synergistic effects of chemicals should be part of Risk Assessment. I don't recall seeing any analysis in the Fort Ord Base Wide RI/FS addressing synergism. Is synergism covered in any Fort Ord Human Health Risk or Environmental Assessments? If not, why not?
- 4) The parcels have not been adequately cleared of Ordnance and Explosives Waste (OEW), Unexploded Ordnance (UXO), or identified the extent of Munitions Constituents (MC) contamination. The extent of contamination is unknown.

Because the extent of deep penetration ordnance and deep OEW burial pits are unknown, scanning equipment capable of detecting deeply buried metallic anomalies should be used.³⁰

Thankfully, early in the cleanup process, DOD and the Regulators understood the significant threats from Ammunition and Explosives. A few quotes:

"It is necessary to identify and remove ammunition and explosives located from the surface to the applicable depth indicated (Commercial/Residential, Utility Construction Activity: Clearance depth; 10 ft. or excavation depth plus 4 feet, whichever is greater)"³¹

"Chapter 12, DOD 6055-9 STD (1992), DOD Ammunition and Explosives

²⁹ Attachment 17: Perchlorate summary DOD 16-106 ppb Fort Ord Site 39

³⁰ Attachment 14: Fort Ord Ordnance Penetration Table and Range Penetration Analysis

³¹ Attachment 12: DDESB OEW site remediation depth for intended use

Safety Standard; DOD real property known to be contaminated with ammunition and explosives that may endanger the general public may not be released from DOD custody until the most stringent efforts have been made to ensure appropriate protection to the public.”³²

“ The Presidio of Monterey does not intend to transfer by deed any known or suspect ordnance and explosive site on former Fort Ord land, prior to the completion of all required OE related actions. We do, however, intend to transfer by deed areas that may have been identified on training maps , but through the archive search process were not identified as potential ordnance sites, i.e. Machine Gun Proficiency Training Areas, Machine Gun Squares, and Mortar Squares.” ³³

“Chapter 12 of DOD 6055-9STD requires a cleanup plan be presented to the DDESB for leasing, transferring, or disposing of DOD real property when ammunition and explosives contamination is known or suspected. The DDESB will review the plan for explosives safety considerations. The following matrix is to be used to identify the appropriate clearance depth. The ability to clear to a given depth will depend on the technology and funds available. It is necessary to identify and remove ammunition and explosives located from the surface to the applicable depth indicated.”³⁴

- a) UXO/OEW cleanup efficiencies have not advanced as a result of new detection technologies and methods, but rather by changing of the rules in order to meet development goals. What happened?

Projectiles capable of penetration depths beyond the Shonstedt GA-52CX detection range have been found in the Group 3 parcels.³⁵ There is good reason to be looking beyond the 4 foot removal depths at Fort Ord.³⁶

- b) To date, what efforts have been made to locate deeply buried ordnance?
- c) Today, what technology is being deployed to locate deep penetrating ordnance?
- d) The Shonstedt GA-52CX has been used at Fort Ord for 15 years. Is the RP using the best technologies available?
- e) Is the GA-52CX the best hand held OE detection technology available?³⁷ It is understood better overall detection equipment exists. Why isn't it being used?

³² Attachment 3: Excerpts, OE-0122 found in HFA/CSU After Action Report

³³ Attachment 5: DOD letter; no known or suspect OE land to transfer by deed prior to completion of all required OE related actions.

³⁴ Attachment 14: Penetration Analysis Table; Range/site design UXO wrong. Deep penetrating ordnance found CSUMB footprint and 13B

³⁵ Map 3: Two artillery Range fans extend into the MRA. Deep penetrating ordnance should be looked for.

³⁶ Attachment 14: Ordnance penetration Table and Penetration Analysis Table

³⁷ Attachment 5: OE-0036 1996 Evaluation and Comparison of UXO Detectors. Better overall detector

- f) Does the EM61-MK2 detect metallic anomaly's as well or better than the GA-52CX or the MK 26?
- g) It is understood the Forester Ferex MK 26 ordnance locator is used by U.S. Military EOD forces. This magnetometer detects deep penetrating ordnance well beyond the capacity of the 52CX. Is the MK 26 being used at Fort Ord? If not, why not?^{38 39}
- h) Which of the following is the UXO/OEW cleanup goal; to locate and remove Ordnance and Explosive Waste to the greatest extent possible or to the extent it is financially practical?
- i) If finding all UXO/OEW items is a goal, would using detection equipment capable of deeper detection capabilities be desired?
- j) Is UXO/OEW in itself , being looked for beyond 4 feet ? If not, why not?

The practice of characterizing former Fort Ord land through the archive search process and visually looking around while walking down bunny trails to identify potential training areas should be abolished. It is abundantly clear, areas not suspected of training activities have turned out to be highly contaminated with dangerous training items, and that dangerous training items show up in the most unexpected places.

5) Chemical Warfare Materials (CWM) and their use in training areas have not been adequately addressed. These types of training devices outside their packaging are not detectable with magnetometers.

On March 10, 1997, 24 ampoules CAIS Chemical Warfare Materials were discovered 2 ft. below ground near 4500 motor pool during ordnance and removal activities at Site OE-13B⁴⁰

On April 14, 1994 during the HFA/CSU OE removal, 2 EOD specialists were overcome by a Hazardous Material and required medical attention at the hospital. Their equipment was confiscated due to concerns of HAZ MAT contamination. Hazardous Material monitoring devices were required for all subsequent OEW removal.

The known CWM were unexpectedly found in a Range/Training area that was not previously identified as a potential CWM training area. It may have been a rare event except it is well documented these CWM are commonly found and buried in training areas. According to Fort Ord records, CAIS Sets were used at Fort Ord until 1974. The K951 ampoules (also called vials) are frequently found in burial

³⁸ Attachment 13: DTSC letter to Army, 3.5" Rocket found after Army declared site safe for unrestricted use

³⁹ Attachment 3: Excerpts, Forester Ferex MK 26 ordnance locator, detects ordnance up to 19 feet deep

⁴⁰ Attachment 5: OE-0265D, OE-0265E; CAIS CWM found during OEW clearance activities 13B

sites at old WWII training areas.⁴¹

- a) Early Fort Ord cleanup documents state CWM were thought not to have been used at Fort Ord. We now know that these training devices were used to train troops at Fort Ord the extent of which is unknown. Is there a cleanup document that discusses in detail these types training devices? If not, why not?
 - b) How were these incidents resolved?
 - c) Army certainly saw this as significant concern. How will the public be protected from potential exposure to these chemical agents?
 - d) Why haven't these incidents been included in all training area documents?
 - e) Due to the common practice of discarding these training devices in the field, what is the justification for allowing the transfer, reuse, and development of training areas and training sites (TS) where these devices have been found or may have been used?
 - f) Is there technology that can identify individual glass vials below the ground surface?
 - g) These CWM materials are contained in glass vials. Has there been any discussions of how this hazard should or will be addressed?
 - h) How can workers be protected from these types of hazards during excavation activities?
 - i) Are there plans to cap (earth fill), military training areas rather than remediate them of UXO/OEW and military constituents? It is evident through limited sampling throughout training sites, most stringent efforts are not being made to find UXO/OEW.
- 6) Critical Administrative Record (AR) documents that contain pertinent site specific known or suspected uses, and OEW contamination information have been omitted.⁴²
- a) Known OE uses have not been included the FORA ESCA RP parcels documents^{43 44}
 - b) UXO/OEW discovered during site sampling and removal actions has disappeared from the FORA ESCA RP parcels historical record.⁴⁵

⁴¹ Attachment 3: Excerpts OE-0202, OE-0265D, OE-0265E

⁴² Attachment 5: Omitted AR documents and dates made available on Fort Ord Cleanup web site

⁴³ Attachment 3: Excerpts, bombing runs were carried out at the MRA the extent of which is unknown

⁴⁴ Attachment 3: Excerpts, Site 15 Range 48, White Phosphorous munitions used in the MRA

⁴⁵ Attachment 3: Excerpts, Attachment 3: Excerpts; sinkhole practice mortar range Site 13B, area backfilled with up to 30' feet of fill during 4400/4500 Block Motor pool construction. The was Range covered over.

- c) Why has the SEDR, MMRP, and FORA ESCA RP databases failed to include all OEW items discovered within the Group 3 RI/FS

It appears the Administrative Record is being manipulated in a way that misrepresents important facts. The public, now and in the future, has a right to know the full extent of the past military training use of individual parcels, and the full historical record of OEW items found within their boundaries. To omit or alter any part of this historical information misleads the reader into believing the parcel is cleaner and safer than it actually is. By keeping the record straight, the public can decide for themselves if they wish to be exposed to the potential remaining OEW hazards. Remediation by data manipulation will have a disastrous outcome and harm someone.

- d) How has this critical issue slipped by the FORA officials and the regulators?
- e) Are the officials aware of what's happening?
- f) Is this acceptable to the officials and the regulators?
- g) When someone gets blown up or sick, who will be liable?
- h) Is this in the best interest of the taxpayers?
- i) California has strict real estate disclosure laws. How will parcel specific OEW information be known and disclosed?⁴⁶

Additionally, these critical documents have not been included in the Fort Ord cleanup AR web site until very late in the process. The public has had no reasonable way of viewing site specific information. The FORA ESCA RP is omitting key documentation that tells a very different story of the extent of OEW/UXO contamination in the Training Areas.⁴⁷

- j) What steps will be taken to inform the public and future residents of the potential health hazards associated with living over former Training Areas?
- 7) The Fort Ord Military Munitions Response Program (MMRP) database has lost very important AR documentation needed to make accurate and well informed decisions by the Regulators and the Public.

Most training/practice ammunition contains highly toxic, hazardous substances. These munitions, and their constituents are a significant health hazard that remain relatively unaddressed. Many of these practice/inert ammunitions have been

⁴⁶ Attachment 4: California Real Estate Disclosure Law; requires full disclosure of hazardous waste

⁴⁷ Attachment 5: Omitted AR documents and dates made available on Fort Ord Cleanup web site

omitted in the new SEDR database. Withholding this information from new cleanup documents deprives the public of significant, and critical information.^{48 49}

Early in the OE cleanup process, ordnance and explosive training range areas were first referred to as "Sites". They then were referred to as "OE" areas, and now "MRS" areas. As the changing of acronyms has progressed, so has the omission of old site data of UXO/OEW items discovered. Hence a "new" record has emerged.

There's a new FORA ESCA RP concoction of data referred to as the Summary of Existing Data Report (SEDR). The SEDR which evolved from information supplied from the MMRP database is being relied upon to support the Group 3 RI/FS Work Plan. Site Characterizations, Findings, and Determinations of safety are being based on the compilation of the new data resulting from the omission and manipulation of the old data. This new data is resulting in the sites appearing to be relatively benign. This will undoubtedly result in a finding of "no further action". By creating this fictitious new record, RP parcels are being represented as being safer than they really are.

The MMRP database is not being properly maintained as is evident by the omission of large quantities of UXO/OEW discovered in the 3300 acres of the FORA ESCA RP documents.⁵⁰

- a) What Agency or Organization is in charge of the Military Munitions Database, a critical element of the Fort Ord Superfund cleanup?
- b) Has the administration of the Military Munitions Database been privatized?
- c) Is there oversight of the OE/OEW/MEC data that is entered into and/or omitted from the database?
- d) What is the protocol for adding, deleting, or changing data in the Military Munitions Database?
- e) Who is responsible for maintaining the UXO/OEW/MEC AR and ensuring the information is preserved and not tampered with.
- f) Does the database compile all past discovered Ordnance and Explosives i.e., OE, OEW, UXO, DMM, MEC, MD etc. into the same OE dataset?
- g) How could such significant historical site information be missed by the FORA ESCA RP officials and the Regulators?
- h) Is there a public notification and input process of how the database(s) will be maintained?

⁴⁸ Map 2: Lists of OEW items found Site 13B and CSUMB footprint.

⁴⁹ Attachment 9: Practice Bombs, toxic hazards of practice ammunition, widely used at Fort Ord

⁵⁰ Map 2: Lists of OEW items found Site 13B and CSUMB footprint.

- i) Acronyms, synonyms and descriptions of Ordnance and Explosives (OE), Ordnance and Explosives Waste (OEW) have been changed over the years. As a result, valuable and critical information is being lost. Coincidentally, this appears to corresponded with the privatization of Fort Ord Superfund cleanup, the FORA ESCA RP, and the new centralized database. Are the Regulators keeping track of the Fort Ord historical Military Munitions Database and taking steps to prevent this potential travesty?
 - j) Significant OE data for the Group 3 parcels has been lost . Which regulatory Agency is responsible for oversight that will ensure the historical facts of each parcel are preserved?
 - k) It is understood small arms are considered hazardous waste. Is the ESCA Cleanup Program still required to report types, amounts, and locations of all OEW discovered including Small Arms ammunition, 50 cal. or less, and practice and inert ordnance?⁵¹ If not, why not?
 - l) It is understood small arms tracer ammunition was used for troop training. Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not?
- 7) It is understood non-metallic landmines have been found at Fort Ord. Discovery of these types of munitions raise the same questions as with the CWM issue.
- a) How is this issue being addressed?
 - b) Is there technology that can identify individual non-metallic ordnance below the ground surface?
 - c) Is it safe to develop areas were CWM and non-metallic landmines may have been used? If so, how so?
- 8) Additional comments and questions

The Group 3 RI/FS Work Plan states: Section 3.1, IA Ranges 43-48
The MMRP database indicates that the majority of the MEC removed from the Interim Action Ranges MRA were located on the surface; however, these data may not include subsurface MEC removed during the Range 45 scraping and sifting operations.

The record shows large quantities of UXO/OEW discovered are subsurface^{52 53}

- a) Subsurface OEW is being diminished. To discover such high quantities of penetrating ordnance on the surface is all the better reason to look harder and deeper for OEW. As with the Group 2 RI/FS comments, is the FORA ESCA RP,

⁵¹ Attachment 5: DTSC letter stating State of California and US EPA position on OEW

⁵² Attachment 20: List of UXO/OEW found prior to 2002, large quantity subsurface

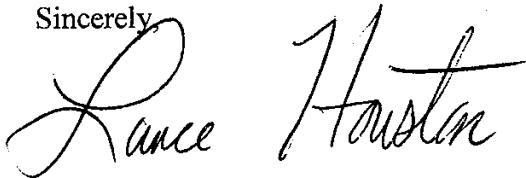
⁵³ Attachment 3: Excerpt, Range 48; 40mm, 60mm, 81mm, 4.2 in, and 4 in mortars found 10 feet deep.

SEDR, and MMRP database commingling a good idea? "data may not include subsurface MEC". Who is interpreting the MMRP data. Is this type data collection in the taxpayers best interest. Do the Officials and Regulators concur?

- b) According to Sec.3.1, 10,165 UXO items and 196,996 pounds of MD have been discovered, This is a much larger quantity than we were aware of. Would you please forward to the CAG a complete list of the UXO items with dates found, depths and the grid location information. Additionally please forward a list of the AR document numbers were the 10,165 UXO items are found. Is there a document that describes the type munitions the 196,996 pounds of MD came from? If so, please provide the AR document number. If not, why not?

We look forward to your substantive response to these serious issues and questions. Please include the entirety of this letter and attachments in the final document.

Sincerely,

A handwritten signature in black ink that reads "Lance Houston". The signature is fluid and cursive, with the first name "Lance" and last name "Houston" clearly legible.

Lance Houston, for the FOCAG

Cc.
California DTSC
U.S. EPA
Monterey County Planning Department
California State University Monterey Bay

ATTACHMENTS:

- 1 FOCAG 8-12-09 Position Paper; Environmental Contamination Fort Ord, CA
- 2 DOD document indicating Spent Uranium munitions use at former Fort Ord
- 3 Excerpts Fort Ord UXO/OEW cleanup documents
- 4 California Real Estate Disclosure
- 5 Omitted Documentation and dates posted to Fort Ord Cleanup web site
- 6 Pyrotechnic Devices: uses and constituents
- 7 Military Munitions Constituents (MC) Table 1 and Table 2

- 8 Explosives and Propellants: uses and constituents
- 9 Toxic Hazards of Practice Ammunition
- 10 GAO: DOD to identify contamination from over 200 military Munitions Constituents
- 11 EOD Specialist résumé; 27 years experience OE detection and removal
- 12 UXO Site Remediation Depths
- 13 DTSC letter to Army OEW cleanup concerns
- 14 Fort Ord Ordnance Penetration Table and Range Penetration Analysis
- 15 email, regulators and developer discussing cleanup policy
- 16 White Phosphorous (WP) Profiles
- 17 Perchlorate summary Fort Ord, CA DOD 16-106 ppb Site 39
- 18 1998 Wingspread Statement, Precautionary Principal
- 19 Fort Ord History
- 20 Ranges 43-48 list of UXO/OEW found, many subsurface
- 21 Article: Buried ordnance has residents wondering if their yards hold hidden danger

MAPS

- 1 Ranges 43-48, shows Range 44 Lt. anti-armor WP Range
- 2 Ordnance and explosives Training Sites CSUMB Parcel and UXO/OEW items found
- 3 1994 ASR map shows Artillery range fans extending into Multi Range Area (MRA)
- 4 1994 ASR maps

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- 15 email, regulators and developer discussing cleanup policy
- 16 White Phosphorous (WP) widely used munitions constituent
- 17 Perchlorate summary DOD 16-106 ppb, Fort Ord Site 39
- 18 1998 Wingspread Statement, Precautionary Principal
- 19 Fort Ord History
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- 4 1994 ASR maps

ATTACHMENT 1

FOCAG 8-12-08 Position Paper; Environmental Contamination Fort Ord, CA

Fort Ord Community Advisory Group (FOCAG)
PO Box 2173
Monterey, CA 93942
Email: focag@fortordcag.org
Website: www.fortordcag.org

August 12, 2008

Fort Ord Reuse Authority (FORA)
100 12th St., Building 2880
Marina, CA 93933
c/o FORA Board Members

FINAL
FOR THE ADMINISTRATIVE RECORD
Please distribute to all FORA Board Members
Position Paper 6 pp. Attachments 75 pp.

RE: FOCAG Position Paper; Environmental Contamination; Remediation and
Development of Military Munitions Training Areas at Former Fort Ord: Request
for a revised Base Wide EIR

To whom it may concern;

*The "Fort Ord Community Advisory Group is a public interest group formed
to review, comment and advise on the remediation (cleanup) of the Fort Ord
Army Base, Superfund Site, to ensure that human health, safety and the
environment are protected to the greatest extent possible." - Mission Statement.*

The intent of this document is to inform the public and the decision makers of the potential
danger of hazardous waste to human health. The FOCAG simply does not want to see
anyone harmed. FORA has approved plans to allow local jurisdictions to develop
residential housing and commercial space on many former military munitions training
areas including Site 39 despite the clear history of people being harmed by such activities.
Allowing people to live on top of former Military Munitions Training Areas is a recipe for
disaster. There is new and significant information that justifies a new EIR.

Many environmental contaminants at levels of a few parts per billion can have lifelong
adverse human health effects. Most military munitions constituents are known or *suspected*
endocrine disruptors, carcinogens, mutagens, toxicants, etc.. Attached is a list of military
munitions constituents found in the types of munitions used at Fort Ord and Site 39. The
list includes the potential negative human health impacts that may result from exposure to
each of the constituents. Former Military Training Areas are highly contaminated with
hazardous chemicals.(1) If you knew of the potential risk, would you allow your children
to live on and play in soil contaminated with the Table 1 constituents?

The extent of contamination at former Fort Ord from military munitions training and
disposal is unknown. Fort Ord was used by the U.S. Army for weapons testing. Site 39 has
been described as the grand dad of all U.S. Military Munitions Training Sites.

Contamination is likely worse than suspected. Historically, dangerous military munitions
and constituents show up in the most unlikely places. No square inch of Fort Ord can be
assumed to be free or safe from dangerous ordnance and chemicals. The Seaside, Del Rey

Oaks, and Monterey County parcels within Historical Site 39 have been designated for residential and commercial development despite the clear threat to human health. Tens of thousands of pounds of OEW/UXO have been removed from these parcels yet the Army and FORA still refuse to acknowledge the fact that these Parcels were used for ordnance training. In the 1995 RI/FS Site 39, onsite receptor analysis for residential and commercial use was not included because these uses were not expected. "Available future land use plans indicate that the site is not expected to be developed for residential, industrial, or commercial use." (1995 RI/FS Vol. III Baseline Risk Assessment For Site 39) Site 39 was expected to be off limits to development because of the known threats to human health and safety from military munitions. Site 39 should have been categorized as one Range due to the clear evidence of military munitions being used thorough the entire Historical Site 39, wall to wall.

Historical Range maps indicate that over the years as ranges were decommissioned, new ranges were opened. It appears that over time there are literally layers and overlaps of ranges the extent of which is unknown.(2)

"Site 39 was used Since the early 1900s for ordinance training activities. As a result, OEW, including UXO, is present at the site. OEW is defined as bombs and war heads; guided and unguided ballistic missiles; artillery, mortar, and rocket ammunition; small arms ammunition; anti-personnel and anti-tank mines; demolition charges; pyrotechnics; grenades; torpedoes and depth charges; containerized or uncontainerized high explosives and propellants; nuclear materials; chemicals and radiological agents; and all similar or related items designed to cause damage to personnel or materials. Oil in which explosive compounds are detected will be considered OEW if the concentration is sufficient to present an imminent hazard. UXO is a subset of OEW and consists of unexploded bombs, warheads, artillery shells, mortar rounds, and chemical weapons. Components or ordnance items (e.g., boosters, bursters, fuzes, igniter tubes) are also included in the UXO definition. Nonuclear materials, chemical agents, or biological agents have been found or reported to have been used at the site." (1995 RI/FS Site 39)(3)

A partial list of military munitions, live and inert, found within the Seaside1-4, Del Rey Oaks, and Monterey County parcels include but is not limited to the following; "fragment hand grenades MKII , smoke hand grenades M18, hand grenade M10, 4inch trench mortars MK1, 4.2 inch mortars, 4inch trench mortars FM, 4inch trench ordnance components, blasting caps M6, blasting caps M7, hand grenade fuzes M228, 75mm Shrapnel MK1, 37mm LE MK1 , 75mm HE MK1, Livens projector FM, surface trip flare M49, 3.5inch rocket M29, 35mm Rockets M73, 3inch Hotchkiss projector, activator mine AT M1, mine AT M1, primer igniter tube M57, cartridge ignition M2, signal illumination M125, mine fuze M6A1, rifle grenade M22, 57mm projector HE M306, flash artillery M110, projectile PD M503ch mortars HC, 3inch trench mortars MK1, 81mm mortar HE M43, 4.2 inch mortars, 40mmprojector M781." (USACE documents)

Seaside Parcels; "The teams dug up and removed 43,695 specific anomalies, weighing nearly 50,000 pounds, and consisting of debris and munitions from the areas. Most of the material was range debris, totaling 46,745 lbs; 2963 lbs were munitions debris, and 292 items were identified as munitions. 52 of these munitions and explosives were too deteriorated and unsafe to remove from the site. These unsafe items were blown in place.

These items included Stokes mortars and 4.2 inch mortars, plus Livens projectiles. These items were scrutinized carefully, and when the contents could not be confirmed, the contractors called in the Army special unit that deals with chemical warfare materials (CWM). This unit examined the three types of Munitions and Explosives of Concern for chemical weapons materials and found titanium tetrachloride in all of them. Titanium tetrachloride was used during WW I as a smoke agent in projectiles that were fired at enemy lines to obscure sight lines and decrease visibility.” (Dr. Peter L. Defer Comments Draft MRS-SEA 1-4 Time Critical Removal Action 2004)(4)

Environmental contamination is now directly linked to adverse human health effects. Illness in the U.S. has reached epidemic levels likely due to lax regulation, oversight, and enforcement of environmental laws in place to protect human health, safety and the environment. Nationally, conservatively, 1 in 150 children has Autism. Asthma, Alzheimer’s Disease, Diabetes, Immune System Disorders, Dementia, Cancers, Organ Diseases to list a few are at epidemic levels. Today, the U.S. public is sicker than ever before. It is time to seriously consider the cause of illness rather than treating the symptoms. What part is environmental contamination playing in this unprecedented epidemic?

Studies now show the unborn fetus, nursing mothers, infants, and children are especially vulnerable to extremely low levels of environmental contamination.

“The periods of embryonic, foetal and infant development are remarkably susceptible to environmental hazards. Toxic exposures to chemical pollutants during these windows of increased susceptibility can cause disease and disability in infants, children and across the entire span of human life. Among the effects of toxic exposures recognized in the past have been spontaneous abortion, congenital malformations, lowered birthweight and other adverse effects. These outcomes may be readily apparent. However, even subtle changes caused by chemical exposures during early development may lead to important functional deficits and increased risks of disease later in life. The timing of exposure during early life has therefore become a crucial factor to be considered in toxicological assessments.” (2007 Faroes Statement)(5)(6)

In addition to munitions constituents, it is understood pesticide use was wide spread throughout military bases and in training areas. Did the Base Wide RI/FS address this serious contaminate?

The FOCAG has regularly raised questions, concerns, and objections to Army’s and FORA’s Remediation Plans to no avail. The FOCAG’s concerns have been ignored by Army, FORA and the Regulatory Agencies. To date, there has been no meaningful change of course or willingness to adopt the FOCAG’s recommendations. FORA, EPA, and DTSC failed to respond to the FOCAG 3-11-08 FORA ESCA RP Letter.(7) Officials have allowed CERCLA to be waived and are responsible for the abomination of law.

There is a history of slicing up OEW/UXO Site Remediation into pie pieces and placing the pieces of information into multiple documents. Anyone looking at a single document is only given a partial picture of the extent of the potential contamination within a Site or Parcel. This makes it virtually impossible for the decision makers and the public to be fully

informed. In order to make sound decisions, full disclosure of all aspects of remediation and potential contamination should be compiled in a single document for each Site or Parcel.

For Example; the Seaside Parcels 1-4 are now referred to as former small arms ranges. Soil sampling for residual contaminants has been limited to Lead, Antimony, and Copper. According to the 1995 RI/FS Ranges 22, 23, 24 are shown to have included the use of 40mm grenades, hand grenades, rifle launched smoke grenades, and other ordnance.(8) It is understood Old Range 22 which runs parallel with Gen. Jim Moore Rd. was a Ordnance Range. Ordnance with an array of constituents has been discovered and removed throughout these parcels yet testing for their constituents is not part of the soil analysis. This is a major omission of critical information. This information would have been a significant factor in the selection of the Site remedy and remedial action chosen for the Sites. The City of Seaside plans to build **1500** homes and commercial space on these Sites. Historical maps indicate these areas within historical Site 39, were military ordnance training areas prior to small arms ranges. The extensive discovery of OEW/UXO on the Seaside parcels right down to General Jim Moore Rd. supports the 1995 RI/FS suspected uses as military ordnance training areas. The fact is Seaside Parcels 1-4 are former military ordnance and small arms ranges. The unwillingness to acknowledge military ordnance training occurred within the Seaside Parcels is a significant omission. The argument has been "there's no evidence this area was used for ordnance training". The fact is the entire Site 39, boundary to boundary is one big enmeshment of Training Areas and Ranges.

Additionally, it appears when a new cleanup document is released, often, previously discovered and removed OEW/UXO items have been omitted. It concerns the public that the breadth of contamination may be diminished thru data manipulation. By omitting critical information the reader could get the impression the land is cleaner and safer than it really is. If the reader is given the full extent of discovered munitions, the potential contamination from their use, and the potential health risks resulting from exposure to the contamination, the wisdom of residential and commercial use would be questionable.

There should be a maintained file with a set of data that compiles all the Site specific remedial actions and findings and is updated regularly upon receipt of new information. All documents should have a running tally of all the previously discovered and removed OEW/UXO items including their constituents. It would be helpful for A reader to be able to know the total number and poundage of OEW/UXO items found to date.

There are very serious unanswered questions with the remediation and development of former Fort Ord military training areas.

1) Millions of troops trained at Fort Ord. How many millions or billions of pounds of military munitions were used in the training of troops? Any estimates? If not, why not?

2) Of the millions or billions of pounds of military munitions used, how many pounds of their constituents were released into the environment? Any estimates? If not, why not?

3) Were did the residual contaminants go?

- 4) Could all the contaminants simply disappear?
- 5) How many gallons of pesticides are suspected to have been used at Fort Ord?
- 6) Was the use of pesticides in training areas a common practice?
- 7) What types/names of pesticides were used at Fort Ord?
- 8) Is there testing for pesticides? If not, why not?
- 9) Does Soil analysis of ranges include every known or suspected OEW/UXO constituent used at Fort Ord? If not, why not?
- 10) Babies and toddlers commonly eat soil and other substances off the ground. Has this phenomena been analyzed? If not, why not?
- 11) Have Maximum Residual Levels (MRL's) been established for the constituents in the attached Military Munitions Chemicals Of Concern Table 1? If not, why not?
- 12) If the extent of residual contamination and MRL's have not been established, how can an acceptable level of cleanup be know for residential or commercial use?
- 13) Is there a screening program in place to monitor for hazardous substances at Fort Ord? If not, why not? Will there be a program to monitor potential negative health impacts of residents living in homes built on former training areas and ranges? If not, why not?
- 14) Perchlorate is known to be a widely used constituent in military munitions used at Fort Ord . Is there testing being conducted to identify the extent of Perchlorate contamination in former training areas and ranges? If not, why not? If yes, the remediation documents don't appear to include any discussion or analysis.(9)
- 15) Synergism and synergistic effects of chemicals are a very important part of Risk Assessment.(10) I don't recall seeing any analysis in the Fort Ord Base Wide RI/FS addressing synergism. Is synergism covered in any Fort Ord Human Health Risk or Environmental Assessments? If not, why not?
- 16) Is there endocrine disruption screening being conducted at former Fort Ord? If not, why not?(11)

If a single person becomes ill or dies, as a result of ambitious economic development interests, the publics trust will have been breached. Under no circumstance should peoples health be compromised for a profit. Nothing is more important than a persons well being. With so many unanswered questions, and in light of new and significant information on health hazards of environmental contamination, former military munitions training areas and ranges should be prohibited from being developed. Residential housing, commercial and other public uses should not be allowed due to the high probability of adverse health effects from exposure to military munitions OEW/UXO and residual contamination.

The Fort Ord Base Wide EIR is outdated. It is in the public's best interest to begin the new EIR process. Again we ask, when will the Scoping Session for a revised Base Wide EIR be held?

Please Provide a detailed written response to this paper and the 3-11-08 paper within 15 working days and send a copy to all FOCAG Members and the Regulators.

Sincerely,

Lance Houston
Fort Ord Community Advisory Group

Attachments; available at http://fortordcag.org/Superfund/CleanUp/StatusStats/8_12_08_FOCAG_position_paper_attachments_1_12.PDF

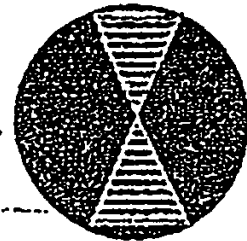
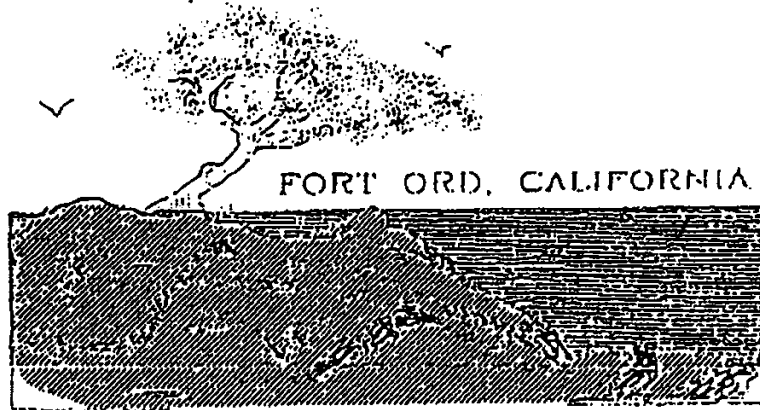
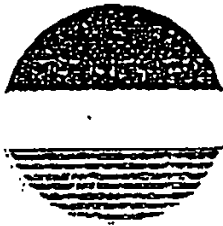
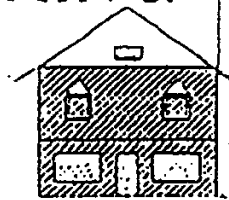
- 1) Table1: Military Munitions OEW/UXO, 103 Contaminates of Concern (COC's)
- 2) Archive Search Report ASR; Site 39: 12 Range Maps
- 3) Site 39 Military Munitions; Types and Functions
- 4) Dr. Peter L. Defer comments; TCRA MRA SEA.1-4 Sept. 21, 2004
- 5) The Faroes Statement 2007
www.ncrlc.com/1-pfd-files/faroes_statement.pdf
- 6) Neurodevelopmental Disorders in Children
<http://environmentalchemistry.com/yogi/environmental/200804childrenautismadhd.html>
- 7) FOCAG Position Letter 3-11-08; FORA ESCA Remediation Program
www.fortordcag.org/PrivateCleanup/3_13_08_FORA_ESCA_RP_Letter_final.pdf
- 8) Fort Ord; Site 39 Training Ranges
- 9) GAO 2005 Report; Perchlorate A System to Track Sampling and Cleanup / Fort Ord
www.gao.gov/cgi-bin/getrpt?GAO-05-462
- 10) Synergism; Potential Synergistic effects of chemicals
www.ccohs.ca/oshanswers/chemicals/synergism.html
- 11) Endocrine-Disrupting Chemicals Threaten Animal--and Human Reproduction
www.checcnet.org/HealthHouse/education/articles-detail.asp?Main_ID=489
- 12) Civil War cannonball kills Virginia relic collector / ordnance can kill 150 years later
<http://www.newsweek.com/id/135153?tid=relatedcl>
- 13) 1999 EPA Position Paper Range Rule - FOCAG Position Letter 3-13-08 attachments
www.epa.gov/fedfac/documents/uxomemo.htm
- 14) 1998 Wingspread statement - FOCAG Position Letter 3-13-08 attachments
www.rachel.org/library/getfile.cfm?ID=189

Cc. Roman Rocca, Cal DTSC
Viola Cooper, U.S. EPA, Region 9
Michael Weaver, FOCAG
Bruce Becker, FOCAG Web Smith
Debra Michelson, FORA Founder
David Dilworth, HOPE, FOCAG
Vienna Merrit Moore, FOCAG

ATTACHMENT 2

**DOD document indicating Spent Uranium
munitions use at former Fort Ord**

DIRECTORATE OF ENGINEERING AND HOUSING



COMMENTS:

ATTACHED YOU WILL FIND:

① DTSC comments on Site 7 + DEWINFO PAPER

② EPA comments on Site 5

③ EPA comments on Site B. +
Some Dep Comments...

SIGNATURE:

TX. Melissa

DATE: 15 MAR

1093

Page 1 of 11 pages

FROM:

CDR, 7th Inf Div & Ft Ord
ATTN: AFZW-DE
Fort Ord, CA 93941-5777
Bldg. 4099

PHONE NUMBERS:

AVN: 929-
COM: (408) 242-
FAX: AVN 929-8928
(408) 242-8928

AUTHORIZED RELEASER'S SIGNATURE:

TO:

GRANT
OHLEND, HLA

PHONE NUMBER:

SENDER:

MELISSA HUEBASCO
WESTON / Ft. ORD.

Ordnance and Explosive Waste at Fort Ord

DRAFT

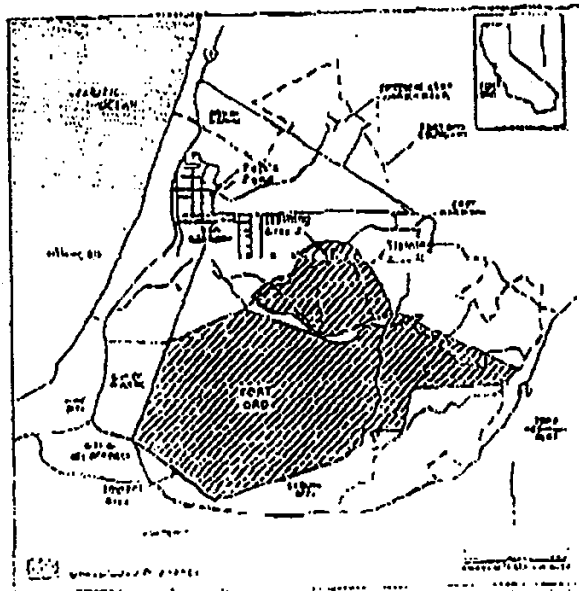


Define "ordnance."

Since being established in 1917, Fort Ord has primarily served as a training and staging facility for infantry troops. Many areas of the base have been used for ordnance training exercises. Artillery shells, hand grenades, and anti-tank weapons have been used at Fort Ord since the beginning of the Army's tenancy, and there are indications that naval forces used parts of Fort Ord as an impact area for offshore firing as early as 1917.

Fort Ord was listed as a Superfund site in 1990. As part of the Superfund cleanup program, the Army is conducting site characterization and remedial investigation studies at the base to evaluate soil and groundwater contamination resulting from storage, disposal, or unauthorized releases of hazardous wastes. Unexploded ordnance (UXO) and ordnance and explosive waste (OEW) contain nitrogen compounds, explosive compounds, plasticizers, metals, and petroleum compounds that may have contributed to surface and subsurface contamination. Areas containing UXO and OEW are being evaluated as part of the ongoing basewide investigations.

State that clean up will be used for training



ORDNANCE DEFINITIONS

OEW: Ordnance and Explosive Waste

OEW is anything related to munitions designed to cause damage to personnel or material through explosion, fire, or toxic effects. OEW includes: (1) unexploded ordnance (UXO); (2) small arms ammunition; (3) artillery shells; (4) mortar rounds; (5) rocket motors; (6) pyrotechnics; (7) grenades; (8) containers; (9) explosives and propellants; and (10) all similar devices or components, explosive in nature or otherwise designed to cause damage to personnel or material. Soil with explosive constituents are considered to be OEW if the concentration is sufficient to be reactive and present an imminent safety hazard.

UXO: Unexploded Ordnance

An item of ordnance that has failed to function as designed, in has been abandoned or discarded and is incapable of exploding and causing injury to personnel or material.

UXO Specialists

A number of UXO specialists are located at Fort Ord. The UXO specialists are located at the UXO School in Indian Head, Maryland. The UXO specialists have more than 3 years of experience in UXO work. Add what they do.

Where are UXO and/or OEW Expected?

An 8,000-acre impact range area is present in the south-central portion of Fort Ord. The highest density of UXO and OEW is expected in the central portion of the impact area, with lower densities in the northern and eastern portions (see map at left). UXO and OEW in and near the impact ranges include items such as grenades and anti armor ammunition, mines, artillery and mortar rounds, rockets, and explosives. The impact and training areas are off limits to the general public. Potential cleanup and reuse of the impact and training areas will be carefully evaluated by the Corps of Engineers Center of Expertise for OEW (Montville Division).

There are several old dumpsites at Fort Ord that may contain UXO and/or OEW. All potential dumpsites and range areas are carefully checked for UXO by the investigative divisions.

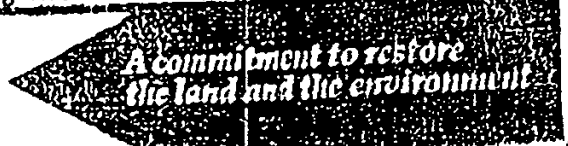
by when?

What about the beach ranges? Were could potentially be buried there?

explore the ranges



Information Paper #4
 The Army's Environmental Cleanup at Fort Ord

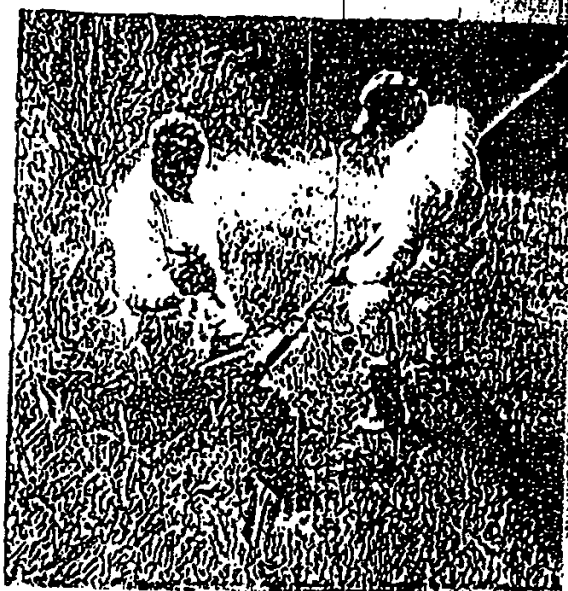


be buried there.

UXO CLEARANCE FOR SITE INVESTIGATIONS

Before any investigative activities begin in an area suspected of containing UXO, UXO specialists are called in to clear and mark pathways to ensure the safe travel of field workers to and from sampling sites. Additionally, the specialists conduct subsurface testing of drill sites to clear the area of UXO for the safety of drill crews and equipment. Clearance procedures are as follows:

- A military-approved ordinance locator is used by a UXO specialist to search the area for objects containing iron to a depth of 3 feet.
- A second UXO specialist then uses a metal detector to search for hidden non-iron hazards to a depth of 1 foot.
- The specialist marks each object for visual reference. A 15-foot-wide safety route is established by the team.
- Wooden stakes and flagging are placed to form the boundary markers for the safe entry/exit route.
- Soil borings are tested with an ordinance locator by the UXO specialist every two feet during drilling to ensure that equipment and personnel do not encounter UXO or other metal objects.



you might want to re-title this

Specify who this alert is for. e.g. base personnel, visitors, employees, etc.

Because Fort Ord has been used as a training facility since the early 1900s, the potential exists for UXO and OSW to be found anywhere on base. If you see an object that resembles a Christmas tree ornament, golf ball, rocket, bomb, or piece of any of these - DON'T PICK IT UP! Report suspicious items to Range Control at (408) . . .

Questions?

For more information on UXO/OSW or general information about the environmental cleanup at Fort Ord, call the Community Relations Coordinator at (408) 242-2030. The Community Relations Hotline at (800) 491-2250, or write to the address below.

Name of Coordinator

February 1993

Information Paper produced for the Army by Harding Lawson Associates

U. S. Army, Fort Ord, Environmental Office
 HQ 7th INF. DIV. (L) & Fort Ord
 DIR ENG & HOUSING
 Attn: AFZW-DE-PDR
 Fort Ord, California 93941-0777

① Do you want to include anything about spent uranium & anti-tank munitions? Or mustard gas kits?

~~② This fact sheet needs to state who the intended audience is~~

② This fact sheet needs to state who the intended audience is e.g. surrounding community, visitors, employees, etc.

ATTACHMENT 3

Excerpts

Issues Relevant to Group 3 RI/FS Work Plan

Issues Relevant Fort Ord training areas

Section 2

OE-0202 Site 13B CAIS chemicals 1997 pp ii

The FFO, which consists of approximately 28,000 acres, is located along the Pacific Ocean in northern Monterey County, California. FFO is near the cities of Marina, Del Rey Oaks, Seaside, Sand City, and Monterey, California. The land for Fort Ord was purchased in 1917 and was comprised of several camps. The installation was used as an infantry training center. During World War II, troops assigned to Edgewood Arsenal, Maryland, trained and conducted experiments at Fort Ord. CAIS were used at Fort Ord prior to 1974 for field training of troops.

On March 10, 1997, during the OE removal action on Site 13B, Army contractor personnel discovered two cans of buried CAIS. A total of 24 glass ampoules were recovered intact and were identified as items from a K951 CAIS. The K951 set originally contained glass ampoules containing 1.4 ounce solutions of 5 percent mustard (HD) in chloroform, 5 percent Lewisite (L) in chloroform, 50 percent chloropicrin (PS) in chloroform and phosgene (CG). The specific contents of the individual ampoules were not identified because some of the cardboard mailing tubes, which contained the labeling of the contents, had decomposed. The K951 kit could contain any of the four types of agent or industrial chemical. The recovered items were overpacked in two single round containers (SRC) by the TEU and stored in explosive storage location (ESL) 768 located in the former ammunition supply point (ASP).

OE-0265D Memorandum For The Record Chemical Agent Identification Sets (CAIS)

The K951 ampoules (also called vials) are frequently found in burial sites at old WWII training areas. They are sometimes found loose, sometimes found in their original steel cylinders (also called "pigs") (see figure 13), and are sometimes found in drums, cans, or other disposal containers. When found loose, the agent type cannot be readily identified without sophisticated spectrographic equipment, and a worst case assumption of phosgene should be made by field personnel.

OE-0265E CAIS 13B 4500 motor pool

As you know, CAIS ampoules were discovered during the course of routine Ordnance and Explosives (OE) removal activities at OE site 13B on March 10, 1997. The ampoules were recovered intact and no personnel were exposed. The ampoules were discovered about 2 feet deep in an oak woodland area about 100 meters south-east of the 4500 area motor pool complex. OE removal work at this site immediately ceased on March 10, 1997 when the ampoules were discovered. A map depicting the location where the ampoules were discovered is provided at enclosure 1. The site was secured in accordance with Army Regulation 50-6 Nuclear and Chemical Weapons and Materiel. Chemical Surety. Guards were posted at the area until the ampoules were transported to the Ammo Supply Point (ASP). The area is cordoned off and posted with yellow "CAUTION" tape and signs.

OE-0005A Site 4C CSUMB Foot Print See HAZ MAT below area of 4C

6.2.4. Site 4. CBR Training areas. (vicinity FR 091552, FR 082557, and 096568).

Discussion: These facilities appear on 1957 and 1958 maps. Currently there is a gas chamber where soldiers test their masks for leaks at FR 091552. Tear gas agents like powdered or encapsulated CS and CN are used in these chambers. A U.S. Chemical Systems Laboratory document from 1983 states that classroom training took place in Building 2820. As part of this training, minute quantities of mustard gas were used for familiarization. These were probably part of the Chemical Agent Identification Sets, four of which, according to the document, were transferred to Edgewood Arsenal.

Recommendations: It is possible that powdered tear gas agent was dumped in the area or used capsules were discarded here. A walk through of the area only produced signs of pyrotechnic use and a suspect washout area. Recommend that the area be checked for residue; also groundwater and soil sampling should be considered.

6.2.12. Site 15. Impact Area. (inland impact area).

Discussion: This enormous tract of land has been used for a wide variety of weapons firing. It is heavily contaminated with conventional ordnance, and will be manpower intensive to do a surface clearance. Large areas will have to be burned off just to clear the surface. The following pages outline all known weapons and munitions that were fired or used on each range in the impact area.

Range #	Ordnance Found or Utilized
18	Small arms: 5.56mm, 7.62mm & .30 cal
19	Small arms: 5.56mm, 7.62mm & .30 cal
21	Small arms: 5.56mm, 7.62mm & .30 cal, 3.5" Rkt
22	Small arms: 5.56mm, 7.62mm, .30 cal & .50 cal, 106 RR
23	Small arms, 40mm HE (M203), M18A1 Mine (Claymore)
23M	Dragon missiles (practice and HEAT), 4.2" Mortar
24	Small arms, 40mm Prac, 35mm Subcal
25	Small arms, 37mm Gun
26	Small arms, 2.36" Rkt, 3.5" Rkt, 37mm Gun, Mortars
27	Small arms
27A	Small arms, 37mm Gun, 20mm
28	Small arms, 40mm Prac, 60mm & 81mm Smoke
29	Small arms (machine gun), 20mm
30	Small arms up to .50 cal, Demolition charges, 20mm
30A	40mm HE (Mk19), 40mm HEDP, Smoke (M203)
31	Small arms; M72 LAW; Dragon; Hand grenades; Claymore; 75, 105, 155 How; 40mm HE; Mortars; 7" & 8" Naval
32	57, 75, 106mm RR HEAT; 37mm Gun; Mortars; 40mm AAA

Note: Beach ranges are ranges 1 - 17 (listed as site #22).

Range #	Ordinance Found or Utilized
33	Demolition charges, 3.5" Rkt, 81mm Mortar, Bangalore
34	Mortars, Rifle grenades
35	40mm (linked, from helicopter), 3.5" Rkt, Mortars
35A	Small arms, TNT, 3.5" Prac
36	Hand grenades (frag), Claymores
37	2.36" & 3.5" Rkts, Rifle grenades, 57 & 75mm RR
38	Small arms, Rifle grenades
39	Small arms
40	3.5" Rkt, 60mm Mortar, Claymores
41	84mm AT-4 HEAT, 60mm Mortar
42	60, 81, 4.2" Mortars; 106mm RR, 250lb Bombs
43	60 & 81mm Mortars, 40mm HE (M203), Hand grenades (frag), Bangalore, M72 LAW, Dragon
44	M72 LAW, 90mm RR, 84mm AT-4, 35mm Subcal, M202 Flash, Dragon
45	40mm HE (M203), M202 Flash, 60mm Mortars (found deep)
46	Small arms, 40mm Prac
47	40mm (M203)
48	40mm HEDP (M203); M202 Flash; 60, 81, 4.2" & 4" Stokes Mortars (found 10' deep); pyrotechnics, 90mm RR

Mortars and howitzers have fired high explosive, white phosphorus, and illumination rounds. It is doubtful that toxic chemical munitions were ever fired, but cannot be discounted.

An M57A1 250 lb. GP bomb was found in front of Ranges 41-43, FR 087522. The bomb was low ordered. (See EOD Incident Report, Appendix C-3).

Concrete-filled 500 lb. bombs (6 to 8) have been found near Range 31, FR 092506. Final count could not be verified.

It should be noted that 37mm projectiles have been found just inside the reservation boundary to the northeast of Laguna Seca (at Wolf Hill).

Recommendations: It is apparent that ranges used for one type of weapon today may have been used for several different weapons in the past. Some areas are so heavily saturated with UXO that it could be said with some certainty that they would never be cleared of all hazards. Any efforts to develop this impact area will be met with numerous munitions that are extremely dangerous in the dud-fired state.

A surface clearance alone will be done at great expense of manpower, funding, and risk of personal injury. Large areas will need to be burned off to enable clearing personnel to spot the surface ordnance. A subsurface clearance, of course, will require an even greater expense. Some of the munitions are at the 7-10' level.

Recommend that range clearances be programmed out in such a manner that the necessary resources are available, and that land-use restrictions be imposed to reduce the risk of personal injury.

OE-0012 Chapter 2 CSUMB HAZ MAT Incident

OEWS SEARCH AND REMOVAL OPERATIONS

On April 14, 1994, while investigating a burial site for OEW, two UXO personnel uncovered a chemical substance that made them nauseous. The HFA QC/Site Safety Officer and the CEHND Safety Representative immediately responded to the site.

OEWS SEARCH AND REMOVAL STAND DOWN (HTRW INCIDENT)

OEW intrusive operations were halted on April 14, 1994, due to the hazardous materials incident, pending results of an investigation and chemical analysis, and approval of changes to the SSHP. HFA personnel were reassigned to grubbing and removing brush and collecting and removing non-OEW scrap from the CSU Footprint. All local laborers were released until further notice.

OEWS SEARCH AND REMOVAL OPERATIONS RESUMED

Intrusive operations were resumed in the CSU Footprint on May 3, 1994. Local laborers previously used for brush removal and grubbing were not rehired due to the requirement that all personnel working site had to have the 40 hour HTRW certification. Instead, clearing and grubbing operations were completed by OEW teams as they progressed in their respective areas.

OE-0005A 1993 ASR appendix E Chemical Warfare Agents

- Spoke with Staff Sergeant Davis, Operations NCO at the 87th Ord Det (EOD). He had been the team leader on the suspect chemical incident involving the unknown drum. He stated that UXB International discovered the drum while digging a ditch. One of their personnel recognized the drum as having reinforcing bands much like some of the chemical agent storage containers. The location was at Fifth and Eighth streets. The barrel was empty, but later testing indicated traces of mustard.

- SSG Davis also knew of chemical agent training kits (containing a 10% solution HD) which had been buried along Imjin Road. He mentioned a report he had received from Forces Command EOD referencing these kits. I asked him to send me a copy of the report.

OE-0005A 1993 ASR appendix E

- Mr. Stickler recalled no knowledge of toxic chemical training or use of chemical filled munitions. However, he confirmed the use of 4" stokes mortars on Range 48 and did not discount the possibility of having fired or disposed of chemical munitions (Range 49, FR 09445470, was an old demolition area where a wide variety of munitions were disposed of).

- Other comments made by Durham/Stickler:

- An M57A1 250 lb. general purpose bomb (HE filled) was disposed of in place by the 87th EOD on 28 Apr 93. This bomb was in the impact area. Mr. Durham gave me a copy of the incident sheet.

- Bombing runs were made out of Salinas Army Airfield during WWII. This airfield was shut down shortly after the war ended.

The 250lb bomb was found in front of Ranges 41-43 impact area

Del Rey Oaks

- According to Mr. Stickler, "Ranges 26-31 will be a real bone of contention, because developers assume that since it is listed as a small arms range, it must be clean". He stated that it is contaminated with 37mm anti-aircraft and 75mm howitzer rounds.

6.5.4 Mr. Jerry Stratton

Mr. Stratton was formerly with the Director of Plans, Training, and Mobilization at Fort Ord. He stated that the Navy had boats fire into the inland Impact Area from Monterey Bay a long time ago (WWII era) before base housing was built, and aerial bomb drops were conducted into the Impact Area. He also stated that the inland Impact Area is essentially the same since WWII, not larger or smaller now than before and statically defined over time.

OE-0005A CSU Foot Print

6.2.15. Site 18. 100lb. Bomb. (vicinity FR 090567, in the confidence course area).

DISCUSSION: In the 1970's this area was a minefield practice area used to teach Trainees methods for locating landmines (mine and booby-trap area #1; see 6.2.6.). Currently there is an obstacle course in the area. A map made by a Sergeant Beardsley, an EOD NCO stationed at Fort Ord for many years, shows a 100lb. bomb found in this area. There are two theories as to how it may have gotten here:

- a. It was accidentally jettisoned during bombing practice, or because of aircraft malfunction. The South Parade Ground was used as an airfield in the past. If so, an aircraft approaching from the east could have ejected a bomb in this area. A 1949 aerial photo of the area shows that it was certainly not a bombing range.

- b. The bomb was an EOD training aid left in place and forgotten. Mr. Durham stated that the area once contained aircraft fuselages for emergency and EOD training.

RECOMMENDATION: The sweep of mine and booby-trap area #1 should be widened to include the confidence course area. It is not known whether the bomb was an HE-filled munition or inert, nor is it known if the bomb was armed. Any deep ordnance must be excavated with care.

OE-0029 EE/CA 1 1997 Sec. 4.2.1.4

Sweep efficiencies used in the Draft Final Phase 1 EE/CA were developed by a panel of experts based on their experience and judgment with a variety of instruments. Those efficiencies were estimated by them to greater than 92 percent for detection of surface OE and in the surface to 1 foot below ground surface (bgs) interval. Sweep efficiencies decreased to about 76 percent for the interval between 1 and 2 feet, and to less than 35 percent below 2 feet. Expected exposures were calculated based on these sweep efficiencies.

The revised sweep efficiencies are 99 percent for the depth interval from surface to two feet bgs, decreasing to 94 percent in the 2- to 4-foot bgs interval, and to 76 percent in the 4- to 6-foot bgs interval. Expected exposures calculated with these sweep efficiencies, more indicative of actual performance at former Fort Ord, are significantly less.

OE-0122 Pg. 3 DOD 6055.9STD

under Chapter 12, DOD 6055.9-STD, DOD Ammunition and Explosives Safety Standards. DOD real property known to be contaminated with ammunition and explosives that may endanger the general public may not be released from DOD custody until the most stringent efforts have been made to ensure appropriate protection to the public.

OE-0122 Pg. 7 Hazardous Material Site

12.1 This area is part of the future California State University wildlife area that was left uncleared by the previous contractor due to a hazardous material incident that halted all intrusive work. An environmental company (HLA Inc.) was contracted to remediate and conduct soil sampling of the site.

SOW OE-0012

1.1.1 This action is also being completed under Chapter 12, DOD 6055.9-STD, DOD Ammunition and Explosives Safety Standards. DOD real property that is known to be contaminated with ammunition and explosives that may endanger the general public may not be released from DOD custody until the most stringent efforts have been made to ensure appropriate protection of the public.

Old Magnetometer GA-52C and GA-72CX used for sites prior to October 1994

OE-0121 SITE CSU

12.3 This site is 69.8 acres and has 315 total 100 foot square grids, of which 100 percent (315 grids) were cleared to a depth of four feet. 100,624 OE items were recovered, 98,621 of which were small arms. Many hazardous UXO items were found, these were destroyed at demo range 36A or in place. The clearance was completed on July 27, 1995.

OE-0122 SITE HFA/CSU Area cleared April 25, 1995

12.3 This site contains 5.73 acres and has 25 total 100 foot square grids, of which 100 percent (25 grids) were cleared to a depth of four feet. 781 OE items were recovered 542 of which were small arms. The clearance was completed on June 20, 1995. This included the satisfactory QC and QA inspections.

OE-0012 CSU footprint Chapter 2 Section 12.3

A total of, 163,929 OEW, were located and disposed of during this Removal Action [see Table 2-5]. Of this total, 110,600 rounds, were small arms ammunition [Table 2-6], and 13 UXO were detonated in place [see Table 2-7].

Section 12.4

Grid sheets are provided that indicate each grid containing OEW, the grids where OEW was located in the CSUMB, and the UXO team that cleared each grid. Individual Grid sheets are not provided for grids that did not contain OEW or did not contain an anomaly requiring excavation with a backhoe [see Appendix G].

OE-0002 TCRA 13B buried under 30 feet of fill

Sinkhole Practice Mortar Range SITE 13B

The Sinkhole Practice Mortar Range was identified from a map dated July 15, 1957. It is east of the 4400/4500 block motor pool, east block, and south of Inter-Garrison Road

(Plate 1). It is believed that this area was used for firing practice mortars and training troops in nonfiring drills (dry-fire). HLA conducted a site tour on November 2, 1993, and found no evidence of ordnance use. In a subsequent discussion, Roy Durham stated that he knew of no mortar practice in that area. However, he also stated that as much as 30 feet of fill was later placed in this area during the construction of the 4400/4500 block motor pools.

OE-0002 Interim summary report 13B Approx. 1 kilometer square = 247

2.6.10 SITE 13B

- 2.6.10.1 This site is identified as a mortar range in the archives search report. The site is approximately one kilometer square. One hundred sample grids were placed in this site, and fifty-seven grids were sampled before the site was declared contaminated on 31 January 1994.

OE-0005A

Note: 1 square kilometer = 247 acres

ATTACHMENT 4

California Real Estate Disclosure

Residential Disclosure Law

THE RESIDENTIAL DISCLOSURE LAW

A Brief Explanation

SELLER OR AGENT FOR THE SELLER MUST DISCLOSE-IT'S THE LAW!

Under California Law, the seller of real property - or the agent for the seller - must disclose "accurate information of material fact" telling whether historical evidence indicates that an event of natural origin is likely to affect the desirability and value of the property, even if the property is listed "as is".

This report contains information about the Risk Elements which is derived from specified Public Records. The information provided in this report may be material in determining the condition of the Property as well as potential limitations or restrictions on development and maintenance of the Property. A number of California statutes apply to all real property within the State; however, California Civil Code Section 1102 (commonly known as the "Residential Disclosure Law") mandates the specific form of disclosures in relation to residential real property.

AFFECTED PROPERTY:

The Residential Disclosure Law specifically governs the form of disclosures as they apply to "residential property" which is defined as real property containing not more than 4 dwelling units. Certain residential real property is excluded from the Residential Disclosure Law such as probate sales, sales by a lender after foreclosure, etc. (See Civil Code Section 1102.2.)

INCLUDED TRANSACTIONS:

The Residential Disclosure Law mandates certain disclosures to a party who is acquiring an interest in residential real property whether by sale, exchange, installment land contract, lease with option to purchase, option to purchase, or ground lease coupled with the improvements.

OTHER LAWS:

The Residential Disclosure Law does *not* limit or abridge any obligation of disclosure created by other provisions of the law or which may exist in order to avoid fraud, misrepresentation, or deceit in the transaction.

STATUTORY FORMS - The Residential Law requires:

that a statutory form entitled "*Natural Hazard Disclosure Statement*" can be completed and executed by the seller, buyer and their respective agents

with respect to certain specified disclosures including Special Flood Hazard Areas, Areas of Potential Flooding - Dam Inundation, Very High Hazard Severity Zones, Wildland - State Responsibility Areas, Earthquake Fault Zones, and Seismic Hazard Zones ("Natural Hazard Zones") and that a statutory form entitled "*Local Option Real Estate Transfer Disclosure Statement*" be completed and executed by the seller, buyer and their respective agents with respect to certain disclosures if and when mandated by local ordinance.

RULES REGARDING DETERMINATIONS:

The Residential Disclosure Law stipulates that if the map or accompanying information for a specific Natural Hazard Zone is not of sufficient accuracy or scale that a reasonable person can determine a property is located within one of these natural hazard areas, the seller or seller's agent must mark "Yes" on the Natural Hazard Disclosure Statement. The seller or seller's agent may mark "No" on the Natural Hazard Disclosure Statement if he or she attaches a report that verifies the property is not in the hazard zone.

MAP SOURCES:

Recipient(s) should be aware that natural hazard maps available from state and local agencies may have been produced years or decades ago. For more information on the production and review dates of given maps, please contact your local authorities.

NO WAIVERS:

Waiver of the requirements of the Residential Disclosure Act is void as against public policy.

MORE INFORMATION:

Copies of the applicable statutes may be obtained at your local law library or from <http://www.leginfo.ca.gov/calaw.html>.

ATTACHMENT 5

**Omitted Documents and
dates made available on web**

Omitted Documents and dates made available on web

Administrative Record Documents Containing OEW Information Pertinent to the Group 3
RI/FS Work Plan.

Available at: www.fortordcleanup.com/adminrec/arsearchresults.asp

Search by Record Numbers:

OE-0010 1994 Archive Search Report ASR; Nov. Supplement 1, Map 3
2005-2008

OE-0029 1997 Engineering evaluation/Cost Analysis Phase I; Table 2.3-1
2005-2008

OE-0036 1996 Evaluation and Comparison of UXO Detectors; using best detectors?
2008

OE-0085 1997 Army, no transfer by deed until ordnance and explosives cleanup complete
2004

OE-O142 1994 Land Disposal Site Plan Appendix C; Required Remediation depths
2005

OE-0202 1997 Draft Non-Stockpile Chemical Material Former Fort Ord
2008

OE-0265D 1997 Memorandum Chemical Agent Identification Sets(CAIS) Former Fort Ord
2007

OE-0265E 1997 DOD letter to DTSC; CAIS sets found at Former Fort Ord
2007

OE-0244 1999 DTSC letter to Army; Cleanup issues need to be addressed
2005

OE-0332JJ 2002 Interim Action Ordnance and Explosives RI/FS For Ranges 43-48
2003

BW-0351 1993 Directorate of Engineering and Housing; correspondence DOD to
Contractor HLA, Anti Tank munitions - Spent Uranium
2006

ATTACHMENT 6

Pyrotechnic Devices

Perhaps the most widely use munitions

These Munitions are widely used in the training of US Military troops.

Pyrotechnics are used to send signals, to illuminate areas of interest, to simulate other weapons during training, and as ignition elements for certain weapons.(1)

Pyrotechnic Devices

Military Explosives (Chemistry) 30 September 1984

UNITED STATES PYROTECHNICS; CHAPTER 10

All pyrotechnic compositions contain oxidizers and fuels. Additional ingredients present in most compositions include binding agents, retardants, and waterproofing agents. Ingredients such as smoke dyes and color intensifiers are present in the appropriate types of compositions.

Oxidizers: are substances in which an oxidizing agent is liberated at the high temperatures of the chemical reaction involved.

Fuels: include finely powdered aluminum, magnesium, metal hydrides, red phosphorus, sulfur, charcoal, boron, silicon, and suicides. The most frequently used are powdered aluminum and magnesium.

Binding agents: include resins, waxes, plastics, and oils. These materials make the finely divided particles adhere to each other when compressed into pyrotechnic items.

Retardants are materials that are used to reduce the burning rate of the fuel-oxidizing agent mixture, with a minimum effect on the color intensity of the composition.

Waterproofing agents are necessary in many pyrotechnic compositions because of the susceptibility of metallic magnesium to reaction with moisture, the reactivity of metallic aluminum with certain compounds in the presence of moisture, and the hygroscopicity of nitrates and peroxides.

Color intensifiers:

- hexachloroethane (C₂Cl₆)
- hexachlorobenzene (C₆Cl₆)
- polyvinyl chloride
- dechlorane (C₁₀Cl₁₂).

Smoke dyes are azo and anthraquinone dyes. These dyes provide the color in smokes used for signaling, marking, and spotting.

Flares and Signals The illumination provided by a flare is produced by both the thermal radiation from the product oxide particles and the spectral emission from excited metals.

Infrared Flare Formulas:

Silicon
Potassium nitrate (KNO₃)
Cesium Nitrate (CsNO₃)
Rubidium Nitrate (RbNO₃)
Hexamethylene
tetramine
Epoxy resin

Red-Green Flare System:

Barium nitrate
Strontium nitrate 13
Potassium perchlorate
Magnesium
Dechlorane
Polyvinyl acetate resin

Signal flares are smaller and faster burning than illuminating flares. Various metals are added these compositions to control the color of the flame.

Colored and White Smoke The pyrotechnic generation of smoke is almost exclusively a military device for screening and signaling. Screening smokes are generally white because black smokes are rarely sufficiently dense. Signal smokes, on the other hand, are colored so as to assure contrast and be distinct in the presence of clouds and ordinary smoke.

Venturi thermal generator type. The smoke producing material and the pyrotechnic fuel block required to volatilize the smoke material are in separate compartments. The smoke producing material is atomized and vaporized in the venturi nozzle by the hot gases formed by the burning of the fuel block.

Burning type. Burning type smoke compositions are intimate mixtures of chemicals. Smoke is produced from these mixtures by either of two methods. In the first method, a product of combustion forms the smoke or the product reacts with constituents of the atmosphere to form a smoke. In the second method, the heat of combustion of the pyrotechnic serves to volatilize a component of the mixture which then condenses to form the smoke. White phosphorus, either in bulk or in solution, is one example of the burning type of smoke generator.

Explosive dissemination type. The smoke producing material is pulverized or atomized and then vaporized, or a preground solid is dispersed by the explosion of a bursting charge. The explosive dissemination smoke generator may contain metallic chlorides which upon dispersal, hydrolyze in air. Examples are titanium, silicon, and stannic tetrachloride.

Smoke Agent Mixtures:

White phosphorus
Sulfur trioxide
FS agent

HC mixture
FM agent
Crude oil

The preferred method of dispersing colored smokes involves the vaporization and condensation of a colored organic volatile dye. These dyes are mixed to the extent of about 50 percent with a fuel such as lactose (20 percent) and an oxidizer (30 percent) for which potassium chlorate is preferred.

Tracers and Fumers The principal small arms application of military pyrotechnics is in tracer munitions where they serve as incendiaries, spotters, and as fire control. Two types of tracers are used. The difference between the two types is the method of tracking. The more frequently used tracer uses the light produced by the burning tracer composition for tracking. Smoke tracers leave a trail of colored smoke for tracking. Red is the flame color most often employed in tracers.

Igniter and Tracer Compositions

Strontium peroxide
Magnesium
1-136 Igniter
Calcium resinate
Barium peroxide
Zinc stearate
Toluidine red (identifier)
Strontium nitrate
Strontium oxalate
Potassium perchlorate
Polyvinyl chloride

Incendiaries Two types of incendiaries are commonly used. The traditional type is a bomb containing a flammable material. These materials include thermite (a mixture of aluminum and rust), phosphorus, and napalm. In addition, the case of the bomb may be constructed of a material such as magnesium that will burn at a high temperature once ignited. Depleted uranium is used extensively in pyrotechnics which have armor piercing capabilities.

Depleted uranium deficient in the more radioactive isotope U235, is the waste product of the uranium enrichment process. The depleted uranium is formed into projectiles that can penetrate armor because of their high density and mechanical properties. The impact of the projectile causes the uranium to form many pyrophoric fragments which can ignite fuel and munition items.

Pyrophoric Metals

U	Uranium
Th	Thorium
Zr	Zirconium
Hf	Hafnium
Ce	Cerium
La	Lanthanum

Pr	Praseodymium
Nd	Neodymium
Sm	Samarium
Y	Yttrium
Ti	Titanium

Delays and Fuses Delay compositions are mixtures of oxidants and powdered metals which produce very little gas during combustion.

Photoflash Compositions Photoflash compositions are the single most hazardous class of pyrotechnic mixtures. The particle size of the ingredients is so small that burning resembles an explosion. The various photoflash devices are similar, differing principally in size and the amount of delay.

Colored smokes:

- Yellow: Auramine hydrochloride
- Green: 1,4-Di-p-toluidinoanthraquinone with auramine hydrochloride
- Red: 1-Methylantraquinone
- Blue: Not suitable for signaling because of excessive light scatter.

Currently used dyes:

- Orange: 1-(4-Phenylazo)-2-naphthol
- Yellow: N, N-Dimethyl-p-phenylazoaniline
- Blue: 1,4-Diamylaminoanthraquinone

Black Powders Used in Pyrotechnics

- Potassium nitrate
- Sodium nitrate
- Charcoal
- Coal (semibituminous)
- Sulfur

Ignition Mixtures Components

- Aluminum (powdered)
- Ammonium dichromate
- Asphaltum
- Barium chromate
- Barium peroxide
- Boron (amorphous)
- Calcium resinate
- Charcoal
- Diatomaceous earth (See also superfloss)
- Specular Hematite / Barshot (Fe₂O₃) (Red) CAS 14808-60-7 / 14464-46-1
- Magnetite/Black Iron Oxide (Fe₃O₄) Powder from READE (Black)
- Potassium nitrate
- Potassium perchlorate
- Laminac
- Magnesium (powdered)

Sodium nitrate
Nitrocellulose
Parlon (chlorinated rubber)
Pb02 -
Paleo Bond Adhesive Pb304
Sr peroxide
Sugar
Superfloss
Titanium
Toluidine red toner
Vegetable oil
Vistanex (polyisobutylene)
Zinc Stearate
Zirconium

References:

- 1) Handbook on the Management of Ordnance and Explosives at Closed, Transferring, and Transferred Ranges and Other Sites; December 2001
www.epa.gov/fedfac/pdf/IFUXOCTTHandbook.pdf

US EPA 2002: Handbook on the Management of Ordnance and Explosives at Closed, Transferring, and Transferred Ranges and Other Sites

Chemicals Found in

Pyrotechnics

Aluminum
Barium
Chromium
Hexachlorobenzene
Hexachloroethane
Iron
Magnesium
Manganese
Titanium
Tungsten
Zirconium
Boron
Carbon
Silicon
Sulfur
White Phosphorus
Zinc
Chlorates
Chromates
Dichromates
Halocarbons
Iodates
Nitrates
Oxides
Perchlorates

ATTACHMENT 7

Table 1 and Table 2

Military Munitions Constituents And their Potential Health Hazards

Fort Ord Training Areas Constituents

Munitions Contaminates not being looked for on all FORA ESCA RP Parcels

Table 1: Military Munitions UXO/OEW Contaminates of Concern (COC's) Potential Soil Contaminants at Fort Ord, California

Compound	CAS No.	Recognized/Suspected Human Health Hazards
1) Bis(2-chloroethyl)ether	111-44-4	Recognized: Carcinogen P65 Suspected: Neurotoxicant HAZMAP, Respiratory Toxicant EPA-HEN, Skin or Sense Organ Toxicant EPA-HEN
2) 4-Chlorophenyl phenyl ether	7005-72-3	Listed: Hazardous Substances (Superfund) Priority Pollutants (Clean Water Act)
3) 2-Nitrophenol	88-75-5	Suspected: Cardiovascular or Blood Toxicant HAZMAP, Neurotoxicant EPA-SARA
4) 1,3-Dichlorobenzene	541-73-1	Suspected: Cardiovascular or Blood Toxicant NJ-FS, Gastrointestinal or Liver Toxicant NJ-FS, Kidney Toxicant NJ-FS, Respiratory Toxicant NJ-FS
5) Fluorene	86-73-7	Suspected: Gastrointestinal or Liver Toxicant ATSDR
6) 2,4-Dimethylphenol	105-67-9	Suspected: Cardiovascular or Blood Toxicant IRIS, Kidney Toxicant NJ-FS, Gastrointestinal or Liver Toxicant NJ-FS, Skin or Sense Organ Toxicant NJ-FS
7) 1,2-Dichlorobenzene	95-50-1	Suspected: Endocrine Toxicant RTECS, Gastrointestinal or Liver Toxicant RTECS, Immunotoxicant HAZMAP, Neurotoxicant DAN HAZMAP, Skin or Sense Organ Toxicant HAZMAP
8) Azobenzene	103-33-3	Recognized: Carcinogen P65
9) 2,4-Dichlorophenol	120-83-2	Suspected: Cardiovascular or Blood Toxicant LADO RTECS, Endocrine Toxicant JNHS KEIT, Immunotoxicant ATSDR
10) 1,4-Dichlorobenzene	106-46-7	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant LADO RTECS, Developmental Toxicant ATSDR JANK, Gastrointestinal or Liver Toxicant ATSDR EPA-HEN, OEHA-CREL RTECS, Kidney Toxicant KLA OEHA-CREL RTECS, Neurotoxicant DAN EPA-HEN, OEHA-CREL RTECS, Respiratory Toxicant OEHA-CREL RTECS, Skin or Sense Organ Toxicant EPA-HEN LU RTECS
11) Hexachlorobenzene	118-74-1	Recognized: Carcinogen P65, Developmental Toxicant P65, Suspected: Cardiovascular or Blood Toxicant LADO RTECS, Endocrine Toxicant BKH BRUC IL-EPA JNHS KEIT RTECS, Gastrointestinal or Liver Toxicant EPA-HEN OEHA-CREL RTECS ZIMM, Immunotoxicant IPCS, Kidney Toxicant RTECS, Neurotoxicant EPA-SARA, Reproductive Toxicant ATSDR EPA-SARA FRAZIER, Skin or Sense Organ Toxicant EPA-HEN
12) 4-Chloro-3-Methylphenol	59-50-7	Suspected: Immunotoxicant NAP

Table 1: Military Munitions UXO/OEW Contaminates of Concern (COC's) Potential Soil Contaminants at Fort Ord, California

13) Bis(2-chloroisopropyl)ether	39638-32-9	Suspected: Carcinogen SCDM
14) Phenanthrene	85-01-8	Suspected: Respiratory Toxicant NTP-HS, Skin or Sense Organ Toxicant NTP-HS
15) 2,4,6-Trichlorophenol	88-06-2	Recognized: Carcinogen P65, Suspected: Gastrointestinal or Liver Toxicant RTECS, Respiratory Toxicant EPA-HEN
16) Uranium	7440-61-1	Recognized: Carcinogen P65-MC, Suspected: Cardiovascular or Blood Toxicant EPA-HEN Kidney Toxicant ATSDR HAZMAP LAND MERCK, Neurotoxicant DAN, Reproductive Toxicant FRAZIER, Respiratory Toxicant EPA-HEN NEME
17) Anthracene	120-12-7	Suspected: Endocrine Toxicant KEIT, Gastrointestinal or Liver Toxicant ATSDR RTECS, Skin or Sense Organ Toxicant KLA A TIMB
18) 2,4-Dinitrophenol	51-28-5	Suspected: Cardiovascular or Blood Toxicant EPA-HEN RTECS, Developmental Toxicant EPA-SARA, Gastrointestinal or Liver Toxicant EPA-HEN, Neurotoxicant EPA-HEN RTECS, Reproductive Toxicant EPA-SARA, Skin or Sense Organ Toxicant EPA-HEN LU
19) Hexachloroethane	67-72-1	Recognized: Carcinogen P65, Suspected: Developmental Toxicant EPA-SARA, Gastrointestinal or Liver Toxicant ATSDR EPA-HEN OEHHHA-CREL RTECS, Kidney Toxicant OEHHHA-CREL RTECS, Neurotoxicant ATSDR EPA-HEN OEHHHA-CREL,
20) Dibutyl phthalate	84-74-2	Suspected: Developmental Toxicant ATSDR CERHR EPA-SARA JANK NTP-R P65-CAND, Endocrine Toxicant BKH JNHS KEIT WWF, Gastrointestinal or Liver Toxicant RTECS, Immunotoxicant HAZMAP, Kidney Toxicant RTECS, Neurotoxicant DAN RTECS, Reproductive Toxicant EPA-SARA NTP-R P65-CAND, Skin or Sense Organ Toxicant HAZMAP
21) 4-Nitrophenol	100-02-7	Suspected: Cardiovascular or Blood Toxicant HAZMAP, Neurotoxicant EPA-HEN EPA-SARA RTECS, Skin or Sense Organ Toxicant EPA-HEN RTECS
22) Nitrobenzene	98-95-3	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant EPA-HEN HAZMAP MALA RTECS, Kidney Toxicant MERCK, Neurotoxicant EPA-HEN RTECS, Reproductive Toxicant EPA-SARA, Respiratory Toxicant OEHHHA-CREL RTECS, Skin or Sense Organ Toxicant HAZMAP
23) Fluoranthene	206-44-0	Suspected: Gastrointestinal or Liver Toxicant ATSDR
24) 2-Methyl-4,6-Dinitrophenol	534-52-1	Suspected: Cardiovascular or Blood Toxicant EPA-HEN HAZMAP RTECS, Gastrointestinal or Liver Toxicant EPA-HEN RTECS, Kidney Toxicant HAZMAP, Neurotoxicant ATSDR DAN EPA-HEN RTECS, Respiratory Toxicant EPA-HEN, Skin or Sense Organ Toxicant EPA-HEN

Table 1: Military Munitions UXO/OEW Contaminates of Concern (COC's) Potential Soil Contaminants at Fort Ord, California

25) Isophorone	78-59-1	Suspected: Carcinogen EPA-HEN IRIS OPP-CAN SCDM, Developmental Toxicant OEHHHA-CREL Gastrointestinal or Liver Toxicant ATSDR OEHHHA-CREL, Kidney Toxicant RTECS, Neurotoxicant EPA-HEN HAZMAP, Respiratory Toxicant EPA-HEN RTECS, Skin or Sense Organ Toxicant EPA-HEN HAZMAP RTECS
26) Pyrene	129-00-0	Suspected: Neurotoxicant RTECS, Skin or Sense Organ Toxicant RTECS
27) Pentachlorophenol	87-86-5	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant EPA-HEN LADO RTECS, Developmental Toxicant ATSDR EPA-SARA OEHHHA-CREL, Endocrine Toxicant ATSDR BRUC IL-EPA JNHS KEIT RTECS WWF, Gastrointestinal or Liver Toxicant EPA-HEN OEHHHA-CREL RTECS, Immunotoxicant EPA-HEN, Kidney Toxicant EPA-HEN OEHHHA-CREL, Neurotoxicant DAN EPA-HEN RTECS, Reproductive Toxicant ATSDR EPA-SARA, Respiratory Toxicant RTECS, Skin or Sense Organ Toxicant EPA-HEN HAZMAP RTECS
28) Bis(2-chloroethoxy)methane	111-91-1	Suspected: Skin or Sense Organ Toxicant NTP-HS
29) Butylbenzyl phthalate	85-68-7	Suspected: Carcinogen IRIS, Developmental Toxicant CERHR P65-CAND, Endocrine Toxicant BKH JNHS KEIT WWF, Neurotoxicant RTECS, Reproductive Toxicant CERHR
30) 1,2,4-Trichlorobenzene	120-82-1	Suspected: Carcinogen OEHHHA-TCD P65-CAND, Developmental Toxicant EPA-SARA, Neurotoxicant DAN HAZMAP RTECS
31) 3,3'-D Dichlorobenzidine	91-94-1	Recognized: Carcinogen P65, Suspected: Gastrointestinal or Liver Toxicant EPA-HEN RTECS Immunotoxicant EEC HAZMAP, Kidney Toxicant RTECS, Neurotoxicant EPA-HEN, Respiratory Toxicant EPA-HEN, Skin or Sense Organ Toxicant EEC HAZMAP
32) Naphthalene	91-20-3	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant EPA-HEN HAZMAP LADO MALA, Developmental Toxicant EPA-HEN EPA-SARA, Gastrointestinal or Liver Toxicant EPA-HEN, Neurotoxicant ATSDR DAN EPA-HEN RTECS, Respiratory Toxicant ATSDR FOTH OEHHHA-CREL, Skin or Sense Organ Toxicant EPA-HEN LU RTECS
33) Benzo(a)anthracene	56-55-3	Recognized: Carcinogen P65
34) Hexachlorobutadiene	87-68-3	Suspected: Carcinogen EPA-HEN IRIS P65-CAND SCDM, Cardiovascular or Blood Toxicant RTECS, Developmental Toxicant EPA-SARA JANK, Endocrine Toxicant RTECS, Gastrointestinal or Liver Toxicant OEHHHA-CREL RTECS, Kidney Toxicant ATSDR HAZMAP KLAH OEHHHA-CREL RTECS STAC, Neurotoxicant DAN, Reproductive Toxicant EPA-SARA
35) Chrysene	218-01-9	Recognized: Carcinogen P65

Table 1: Military Munitions UXO/OEW Contaminates of Concern (COC's) Potential Soil Contaminants at Fort Ord, California

36) 2-Chloronaphthalene	91-58-7	Listed: Hazardous Constituents (Resource Conservation and Recovery Act), Hazardous Substances (Superfund), Priority Pollutants (Clean Water Act), Lacks at least some of the data required for safety assessment
37) Bis(2-ethylhexyl)phthalate	117-81-7	Recognized: Carcinogen P65, Developmental Toxicant P65, Reproductive Toxicant P65 Suspected: Endocrine Toxicant BKH BRUC IL-EPA JNHS KEIT WWF, Gastrointestinal or Liver Toxicant EPA-HEN OEHA-CREL RTECS, Respiratory Toxicant OEHA-CREL RTECS Skin or Sense Organ Toxicant RTECS
38) Dimethyl phthalate	131-11-3	Suspected: Immunotoxicant HAZMAP, Neurotoxicant DAN RTECS, Respiratory Toxicant EPA-HEN, Skin or Sense Organ Toxicant EPA-HEN HAZMAP
39) Di-n-octyl phthalate	117-84-0	Suspected: Endocrine Toxicant BRUC JNHS, Gastrointestinal or Liver Toxicant ATSDR
40) 2,6-Dinitrotoluene	606-20-2	Recognized: Carcinogen P65, Reproductive Toxicant P65, Suspected: Cardiovascular or Blood Toxicant ATSDR RTECS, Neurotoxicant EPA-SARA
41) Benzo(b)fluoranthene	205-99-2	Recognized: Carcinogen P65
42) Acenaphthylene	208-96-8	Suspected: Respiratory Toxicant RTECS
43) Benzo(k)fluoranthene	207-08-9	Recognized: Carcinogen P65
44) Acenaphthene	83-32-9	Suspected: Gastrointestinal or Liver Toxicant ATSDR
45) Benzo(a)pyrene	50-32-8	Recognized: Carcinogen P65, Suspected: Developmental Toxicant JANK P65-PEND, Endocrine Toxicant KEIT WWF, Gastrointestinal or Liver Toxicant RTECS, Immunotoxicant IPCS, Respiratory Toxicant EPA-HEN FOTH RTECS, Skin or Sense Organ Toxicant LADO RTECS
46) 2,4-Dinitrotoluene	121-14-2	Recognized: Carcinogen P65, Reproductive Toxicant P65, Suspected: Cardiovascular or Blood Toxicant ATSDR EPA-HEN RTECS, Gastrointestinal or Liver Toxicant OEHA-CREL, Neurotoxicant ATSDR EPA-HEN EPA-SARA OEHA-CREL RTECS
47) Ideno(1,2,3-cd)pyrene	193-39-5	Suspected: Carcinogen EPA-IRIS, Developmental, Reproductive, Endocrine, Genotoxicity,
48) Diethyl phthalate	84-66-2	Suspected: Endocrine Toxicant JNHS WWF, Gastrointestinal or Liver Toxicant ATSDR RTECS, Immunotoxicant HAZMAP, Neurotoxicant RTECS, Reproductive Toxicant ATSDR, Respiratory Toxicant RTECS, Skin or Sense Organ Toxicant HAZMAP RTECS

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Table 1: Military Munitions UXO/OEW Contaminates of Concern (COC's) Potential Soil Contaminants at Fort Ord, California

49) Dibenzo(a,h)anthracene	53-70-3	Recognized: Carcinogen P65, Suspected: Skin or Sense Organ Toxicant LADO
50) Benzidine	92-87-5	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant HAZMAP, Gastrointestinal or Liver Toxicant OEHHA-CREL RTECS, Immunotoxicant IPCS, Kidney Toxicant EPA-HEN KLAA RTECS, Neurotoxicant OEHHA-CREL
51) Benzo(g,h,i)perylene	191-24-2	Listed: Hazardous Constituents (Resource Conservation and Recovery Act), Hazardous Substances (Superfund), Priority Pollutants (Clean Water Act), Lacks at least some of the data required for safety assessment
52) 4-Bromophenyl phenyl ether	101-55-3	Listed: Hazardous Constituents (Resource Conservation and Recovery Act), Hazardous Substances (Superfund), Priority Pollutants (Clean Water Act), Lacks at least some of the data required for safety assessment
53) N-Nitrosodiphenylamine	86-30-6	Recognized: Carcinogen P65, Suspected: Kidney Toxicant RTECS, Respiratory Toxicant RTECS
54) N-Nitrosodimethylamine	62-75-9	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant EPA-HEN KLAA RTECS, Developmental Toxicant JANCK, Gastrointestinal or Liver Toxicant DOSS EPA-HEN HAZMAP LADO MALA RTECS ZIMM, Immunotoxicant IPCS, Neurotoxicant RTECS, Respiratory Toxicant RTECS, Skin or Sense Organ Toxicant RTECS
55) Phenol	108-95-2	Suspected: Cardiovascular or Blood Toxicant EPA-HEN HAZMAP OEHHA-CREL RTECS, Developmental Toxicant EPA-SARA JANCK, Gastrointestinal or Liver Toxicant EPA-HEN OEHHA-CREL, Kidney Toxicant OEHHA-CREL, Neurotoxicant DAN EPA-HEN OEHHA-CREL, RTECS, Reproductive Toxicant FRAZIER P65-CAND, Respiratory Toxicant EPA-HEN OEHHA-AREL RTECS, Skin or Sense Organ Toxicant EPA-HEN HAZMAP KLAA OEHHA-AREL RTECS
56) Hexachlorocyclopentadiene	77-47-4	Suspected: Developmental Toxicant EPA-SARA, Gastrointestinal or Liver Toxicant RTECS, Kidney Toxicant ATSDR RTECS, Neurotoxicant EPA-SARA, Reproductive Toxicant EPA-SARA, Respiratory Toxicant ATSDR EPA-HEN HAZMAP OEHHA-CREL RTECS, Skin or Sense Organ Toxicant EPA-HEN HAZMAP
57) 2-Chlorophenol	95-57-8	Suspected: Neurotoxicant RTECS, Skin or Sense Organ Toxicant RTECS
58) 1-Methylnaphthalene	90-12-0	Suspected: Respiratory Toxicant ATSDR
59) Acetophenone	98-86-2	Suspected: Skin or Sense Organ Toxicant EPA-HEN

Table 1: Military Munitions UXO/OEW Contaminates of Concern (COC's) Potential Soil Contaminants at Fort Ord, California

60) Diphenylamine	122-39-4	Suspected: Cardiovascular or Blood Toxicant HAZMAP, Gastrointestinal or Liver Toxicant EPA-TRI, Immunotoxicant HAZMAP, Kidney Toxicant EPA-TRI, Neurotoxicant DAN RTECS, Respiratory Toxicant RTECS,
61) 2-Aminonaphthalene	91-59-8	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant HAZMAP, Gastrointestinal or Liver Toxicant RTECS, Kidney Toxicant RTECS
62) 1-Nitropyrene	5522-43-0	Recognized: Carcinogen P65
63) 2,5-Diphenyloxazole (Biphenyl)	92-52-4	Suspected: Cardiovascular or Blood Toxicant RTECS, Developmental Toxicant EPA-SARA, Gastrointestinal or Liver Toxicant EPA-HEN HAZMAP RTECS, Kidney Toxicant EPA-HEN MERCK, Neurotoxicant EPA-HEN HAZMAP RTECS, Respiratory Toxicant RTECS, Skin or Sense Organ Toxicant EPA-HEN
64) 2-Nitronaphthalene	581-89-5	Suspected: Cardiovascular or Blood Toxicant HAZMAP, Gastrointestinal or Liver Toxicant RTECS, Kidney Toxicant RTECS
65) Triethylaluminum	97-93-8	6 of 8 basic tests to identify chemical hazards have not been conducted on this chemical or are not publicly available according to US EPA's 1998 hazard data availability study.
66) 2 Methylnaphthalene	91-57-6	Suspected: Respiratory Toxicant ATSDR FOTH
67) 2-Methylphenol (o-Crestol)	95-48-7	Suspected: Carcinogen IRIS, Cardiovascular or Blood Toxicant OEHHA-CREL, Endocrine Toxicant RTECS, Gastrointestinal or Liver Toxicant RTECS, Neurotoxicant ATSDR DAN EPA-SARA RTECS, Respiratory Toxicant EPA-HEN, Skin or Sense Organ Toxicant EPA-HEN RTECS
68) 3-Methylphenol (m-Crestol)	108-39-4	Suspected: Carcinogen IRIS OPP-CAN, Cardiovascular or Blood Toxicant OEHHA-CREL, Gastrointestinal or Liver Toxicant RTECS, Kidney Toxicant RTECS, Neurotoxicant DAN RTECS, Respiratory Toxicant ATSDR EPA-HEN, Skin or Sense Organ Toxicant EPA-HEN RTECS
69) 4-Methylphenol (p-Crestol)	106-44-5	Suspected: Carcinogen IRIS, Cardiovascular or Blood Toxicant OEHHA-CREL, Gastrointestinal or Liver Toxicant RTECS, Kidney Toxicant RTECS, Neurotoxicant ATSDR DAN RTECS, Respiratory Toxicant EPA-HEN, Skin or Sense Organ Toxicant EPA-HEN LADO RTECS
70) 2,4,5-Trichlorophenol	95-95-4	Suspected: Cardiovascular or Blood Toxicant LADO, Respiratory Toxicant EPA-HEN, Skin or Sense Organ Toxicant EPA-HEN
71) HMX	2691-41-0	Suspected: Gastrointestinal or Liver Toxicant ATSDR, Neurotoxicant ATSDR RTECS

Table 1: Military Munitions UXO/OEW Contaminates of Concern (COC's) Potential Soil Contaminants at Fort Ord, California

72) RDX	121-82-4	Suspected: Carcinogen IRIS SCDM, Gastrointestinal or Liver Toxicant RTECS, Neurotoxicant ATSDR HAZMAP RTECS, Reproductive Toxicant ATSDR
73) 2,4,6-Trinitrotoluene (TNT)	118-96-7	Suspected: Carcinogen IRIS SCDM, Cardiovascular or Blood Toxicant HAZMAP LADO MALA RTECS STAC, Gastrointestinal or Liver Toxicant ATSDR DIPA HAZMAP LADO RTECS ZIMM, Neurotoxicant RTECS, Respiratory Toxicant RTECS, Skin or Sense Organ Toxicant LU
74) 1,3,5-Trinitrobenzene	99-35-4	Suspected: Cardiovascular or Blood Toxicant RTECS, Neurotoxicant RTECS, Respiratory Toxicant RTECS
75) 2-Amino-4,6-Dinitrotoluene (2ADNT)	35572-78-2	Recognized: Carcinogens
76) 4-Amino-2,6-Dinitrotoluene (4ADNT)	19406-51-0	Recognized: Carcinogens
77) 1,3-Dinitrobenzene	99-65-0	Recognized: Reproductive Toxicant P65, Suspected: Cardiovascular or Blood Toxicant ATSDR HAZMAP RTECS, Gastrointestinal or Liver Toxicant DIPA MALA, Neurotoxicant DAN RTECS, Respiratory Toxicant RTECS
78) Nitroglycerin	55-63-0	Suspected: Carcinogen ORD-SF, Cardiovascular or Blood Toxicant HAZMAP KRIS LADO RTECS Gastrointestinal or Liver Toxicant RTECS, Immunotoxicant HAZMAP, Kidney Toxicant MERCK, Neurotoxicant DAN RTECS, Respiratory Toxicant RTECS, Skin or Sense Organ Toxicant HAZMAP
79) Dioxin (TCDD)	1746-01-6	Recognized: Carcinogen P65, Developmental Toxicant P65, Suspected: Cardiovascular or Blood Toxicant ATSDR EPA-HEN LADO OEHHA-CREL RTECS, Endocrine Toxicant BKH BRUC IL-EPA JUNIHS KEIT OEHHA-CREL RTECS WWF, Gastrointestinal or Liver Toxicant EPA-HEN LADO OEHHA-CREL RTECS ZIMM, Immunotoxicant ATSDR NAP, Kidney Toxicant MERCK RTECS, Neurotoxicant STAC, Reproductive Toxicant OEHHA-CREL, Respiratory Toxicant OEHHA-CREL RTECS, Skin or Sense Organ Toxicant EPA-HEN HAZMAP KLAA RTECS
80) Furan	110-00-9	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant RTECS, Gastrointestinal or Liver Toxicant RTECS, Kidney Toxicant RTECS, Respiratory Toxicant RTECS
Other Constituents, Flash Composition, Smoke Charge, Pyrotechnics		
81) Potassium Perchlorate	7778-74-7	Suspected: Cardiovascular or Blood Toxicant MALA
82) Flaked Aluminum (Aluminum)	7429-90-5	Suspected: Cardiovascular or Blood Toxicant LADO, Neurotoxicant ATSDR DAN KLAA LU, Reproductive Toxicant FRAZIER, Respiratory Toxicant KLAA LU NEME

Table 1: Military Munitions UXO/OEW Contaminates of Concern (COC's) Potential Soil Contaminants at Fort Ord, California

83) Sulfur	7704-34-9	Listed: Registered Pesticides (Federal Insecticide, Fungicide, and Rodenticide Act) Air Contaminants (California Occupational and Safety Health Act) Lacks at least some of the data required for safety assessment
84) Pentaerythritol tetranitrate (PETN)	78-11-5	Suspected: Cardiovascular or Blood Toxicant HAZMAP, Skin or Sense Organ Toxicant RTECS
85) Magnesium Powder (Magnesium)	7439-95-4	Suspected: Respiratory Toxicant NEME
86) Sodium Nitrate	7631-99-4	Suspected: Cardiovascular or Blood Toxicant RTECS, Respiratory Toxicant RTECS
87) Barium Nitrate	10022-31-8	Suspected: Carcinogen, A poison via ingestion subcutaneous, parenteral, and intravenous routes (Toxnet)
88) Phosphorus, white	7723-14-0	Suspected: Cardiovascular or Blood Toxicant EPA-HEN RTECS, Gastrointestinal or Liver Toxicant DIPA DOSS EPA-HEN LADO MALA RTECS ZIMM, Kidney Toxicant EPA-HEN HAZMAP, Musculoskeletal Toxicant EPA-HEN, Neurotoxicant EPA-HEN RTECS, Reproductive Toxicant ATSDR EPA-SARA OEHA-CREL, Respiratory Toxicant ATSDR EPA-HEN HAZMAP RTECS, Skin or Sense Organ Toxicant HAZMAP KLAA RTECS
89) Polyvinyl Chloride	9002-86-2	Suspected: Gastrointestinal or Liver Toxicant DIPA, Respiratory Toxicant HAZMAP
90) Titanium Tetrachloride	7550-45-0	Suspected: Respiratory Toxicant ATSDR EPA-HEN HAZMAP, Skin or Sense Organ Toxicant EPA-HEN HAZMAP
Metals:		
91) Copper	7440-50-8	Suspected: Cardiovascular or Blood Toxicant HAZMAP KLAA, Developmental Toxicant EPA-SARA, Gastrointestinal or Liver Toxicant ATSDR DOSS KLAA RTECS ZIMM, Kidney Toxicant MERCK, Reproductive Toxicant EPA-SARA FRAZIER, Respiratory Toxicant NEME OEHA-AREL OEHA-CREL
92) Barium	7440-39-3	Suspected: Developmental Toxicant EPA-SARA, Neurotoxicant DAN, Reproductive Toxicant FRAZIER, Respiratory Toxicant NEME

Table 1: Military Munitions UXO/OEW Contaminates of Concern (COC's) Potential Soil Contaminants at Fort Ord, California

93) Cadmium	7440-43-9	Recognized: Carcinogen P65, Developmental Toxicant P65, Reproductive Toxicant P65, Suspected: Cardiovascular or Blood Toxicant BENO KLAA LADO RTECS, Endocrine Toxicant IL-EPA KEIT WWF, Immunotoxicant IPCSKidney Toxicant ATSDR EPA-HEN HAZMAP KLAA LAND MERCK OEHHHA-CREL RTECS STAC, Neurotoxicant DAN, Respiratory Toxicant EPA-HEN HAZMAP NEME OEHHHA-CREL RTECS
94) Lead	7439-92-1	Recognized: Carcinogen P65, Developmental Toxicant P65, Reproductive Toxicant P65, Suspected: Cardiovascular or Blood Toxicant BENO EPA-HEN HAZMAP KLAA KRIS LADO MALA STAC, Endocrine Toxicant BRUC IL-EPA KEIT WWF, Gastrointestinal or Liver Toxicant EPA-HEN RTECS STAC, Immunotoxicant IPCS, Kidney Toxicant EPA-HEN HAZMAP KLAA LAND MERCK STAC, Neurotoxicant DAN EPA-HEN EPA-SARA FELD HAZMAP KLAA LU RTECS STAC, Respiratory Toxicant NEME, Skin or Sense Organ Toxicant KLAA
95) Nickel	7440-02-0	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant OEHHHA-CREL, Developmental Toxicant EPA-SARA, Immunotoxicant EEC HAZMAP OEHHHA-AREL SNCI, Kidney Toxicant KLAA, Neurotoxicant FELD, Reproductive Toxicant EPA-SARA FRAZIER JANK, Respiratory Toxicant ATSDR EPA-HEN HAZMAP KLAA LU NEME OEHHHA-AREL OEHHHA-CREL RTECS, Skin or Sense Organ Toxicant EEC EPA-HEN HARV HAZMAP KLAA LADO TIMB
96) Aluminum	7429-90-5	Suspected: Cardiovascular or Blood Toxicant LADO, Neurotoxicant ATSDR DAN KLAA LU, Reproductive Toxicant FRAZIER, Respiratory Toxicant KLAA LU NEME
97) Chromium	7440-47-3	Suspected: Carcinogen HAZMAP SCDM, Gastrointestinal or Liver Toxicant CARB TAC, Immunotoxicant HAZMAP, Kidney Toxicant HAZMAP KLAA MERCK, Reproductive Toxicant FRAZIER, Respiratory Toxicant HAZMAP NEME, Skin or Sense Organ Toxicant HAZMAP KLAA LADO TIMB
98) Potassium	7440-09-7	Lacks at least some of the data required for safety assessment
99) Calcium	7440-70-2	Air Contaminants (California Occupational and Safety Health Act) Lacks at least some of the data required for safety assessment
100) Mercury	7439-97-6	Recognized: Developmental Toxicant P65, Suspected: Cardiovascular or Blood Toxicant KLAA, Endocrine Toxicant IL-EPA KEIT WWF, Gastrointestinal or Liver Toxicant RTECS STAC, Immunotoxicant HAZMAP SNCI, Kidney Toxicant HAZMAP KLAA LAND MERCK STAC, Neurotoxicant ATSDR DAN EPA-HEN EPA-SARA FELD HAZMAP KLAA OEHHHA-CREL RTECS STAC, Reproductive Toxicant EPA-SARA FRAZIER HAZMAP OEHHHA-AREL, Respiratory Toxicant HAZMAP NEME, Skin or Sense Organ Toxicant HAZMAP KLAA RTECS
101) Zinc	7440-66-6	Suspected: Cardiovascular or Blood Toxicant ATSDR, Developmental Toxicant EPA-SARA, Immunotoxicant OEHHHA-CREL, Reproductive Toxicant EPA-SARA, Respiratory Toxicant NEME OEHHHA-CREL RTECS, Skin or Sense Organ Toxicant RTECS

Table 1: Military Munitions UXO/OEW Contaminates of Concern (COC's) Potential Soil Contaminants at Fort Ord, California

102) Titanium Metal Powder	7440-32-6	Suspected: Respiratory Toxicant NEME
103) Antimony	7440-36-0	Suspected: Cardiovascular or Blood Toxicant BENO LADO, Neurotoxicant DAN, Reproductive Toxicant EPA-SARA FRAZIER, Respiratory Toxicant EPA-HEN NEME, Skin or Sense Organ Toxicant EPA-HEN
104) Beryllium	7440-41-7	Recognized: Carcinogen P65, Suspected: Cardiovascular or Blood Toxicant KLAA, Gastrointestinal or Liver Toxicant ATSDR DOSS LADO MALA, Immunotoxicant EEC OEHHA-CREL, Kidney Toxicant LAND, Reproductive Toxicant FRAZIER, Respiratory Toxicant EPA-HEN HAZMAP KLAA LU NEME OEHHA-CREL, Skin or Sense Organ Toxicant EEC
105) Cadmium	7440-43-9	Recognized: Carcinogen P65, Developmental Toxicant P65, Reproductive Toxicant P65, Suspected: Cardiovascular or Blood Toxicant BENO KLAA LADO RTECS, Endocrine Toxicant IL-EPA KEIT WWF, Immunotoxicant IPCS, Kidney Toxicant ATSDR EPA-HEN HAZMAP KLAA LAND MERCK OEHHA CREL RTECS STAC, Neurotoxicant DAN, Respiratory Toxicant EPA-HEN HAZMAP NEME OEHHA-CREL RTECS

Most Table 1 Constituents compiled from 1994 Basewide RI/FS Vol. II Table 12

Human Health Hazard Information source: Scorecard Database <http://www.scorecard.org/chemical-profiles/index.tcl>

Cancer References: www.scorecard.org/health-effects/references.tcl?short_hazard_name=cancer
 Developmental Toxicity References: www.scorecard.org/health-effects/references.tcl?short_hazard_name=endo
 Endocrine Toxicity References: www.scorecard.org/health-effects/references.tcl?short_hazard_name=endo
 Gastrointestinal or Liver Toxicity References: www.scorecard.org/health-effects/references.tcl?short_hazard_name=liver
 Immunotoxicity References: www.scorecard.org/health-effects/references.tcl?short_hazard_name=immun
 Kidney Toxicity References: www.scorecard.org/health-effects/references.tcl?short_hazard_name=kidn
 Neurotoxicity References: www.scorecard.org/health-effects/references.tcl?short_hazard_name=neuro
 Reproductive Toxicity References: www.scorecard.org/health-effects/references.tcl?short_hazard_name=repro
 Skin or Sense Organ Toxicity References: www.scorecard.org/health-effects/references.tcl?short_hazard_name=skin
 Respiratory Toxicants: www.scorecard.org/health-effects/explanation.tcl?short_hazard_name=resp
 Cardiovascular or Blood Toxicity References: www.scorecard.org/health-effects/references.tcl?short_hazard_name=cardio
 Musculoskeletal Toxicity References: www.scorecard.org/health-effects/references.tcl?short_hazard_name=musc

Table 2: Military Munitions UXO/OEW Contaminates of Concern (COC's) Potential Soil Contaminants Fort Ord, California

Compound	CAS No.	Recognized/Suspected Human Health Hazards
1) Lead Azide	13424-46-9	Suspected: Carcinogen P65
2) Mercury Fulminate	628-86-4	Recognized: Developmental Toxicant P65-MC
3) Diazodinitrophenol (DDNP)	87-31-0	No Health data found
4) Lead Styphnate	15245-44-0	No Health data found
5) Tetracene (hydrocarbon)?	92-24-0	Suspected: Carcinogen CCRIS
6) Potassium Dinitrobenzofuroxane (KDNBF)	29267-75-2	No Health data found
7) Lead Mononitroresorcinate (LMNR)	51317-24-9	No Health data found
8) Antimony sulfide	1315-04-4	No Health data found
9) Zirconium	7440-67-7	No Health data found
10) Lead dioxide	1309-60-0	Recognized: Carcinogen P65-MC, Developmental Toxicant P65-MC, Reproductive Toxicant P65-MC
11) Gum Arabic	no match	No Health data found
12) Potassium chlorate	3811-04-9	HAZMAP: Methemoglobinemia, Anemia,
13) Lead mononitroresorcinate	51317-24-9	HAZMAP: Neurotoxin, Hepatotoxin, Nephrotoxin, Reproductive Toxin
14) Nitrocellulose (BK2-W)	9004-70-0	HAZMAP: Neurotoxin,
15) Lead thiocyanate	592-87-0	HAZMAP: Neurotoxin, Hepatotoxin, Nephrotoxin, Reproductive Toxin
16) Nitrostarch	?	No Health data found
17) 1,2,4-Butanetriol Trinitrate (BTN)	6659-60-5	HAZMAP DOT listed Hazardous Materials
18) Diethyleneglycol Dinitrate (DEGN)	693-21-0	HAZMAP DOT listed Hazardous Materials, Suspected: Neurotoxicant RTECS, Respiratory Toxicant RTECS
19) Triethylene Glycoldinitrate (TEGN)	111-22-8	No Health data found
20) 1,1,1 Trimethylolethane Trinitrate (TMETN)	3032-55-1	No Health data found
21) Ethylenediamine Dinitrate (EDDN)	20829-66-7	No Health data found
22) Ethylenedinitramine (Halelte)	505-71-5	No Health data found
23) Nitroguanidine (NQ)	556-88-7	Suspected: Respiratory Toxicant RTECS
24) 2,4,6-Trinitrophenylmethylinitramine (Tetryl)	479-45-8	Suspected: Immunotoxicant HAZMAP, Neurotoxicant DAN RTECS, Respiratory Toxicant HAZMAP, Skin or Sense Organ Toxicant HAZMAP RTECS
25) Ammonium Picrate	131-74-8	HAZMAP: Skin Sensitizer, Hepatotoxin
26) Hexamethylene	110-82-7	Suspected: Neurotoxicant DAN HAZMAP RTECS
27) Dechlorane	2385-85-5	Recognized: Carcinogen P65, Suspected: Endocrine Toxicant BKH EPA-SDWA IL-EPA JNHS KEIT RTECS, Gastrointestinal or Liver Toxicant ATSDR RTECS, Kidney Toxicant MERCK
28) Sulfur trioxide	7446-11-9	Suspected: Respiratory Toxicant RTECS, Skin or Sense Organ Toxicant RTECS
29) Calcium resinate	9007-13-0	No Health data found
30) Barium peroxide	1304-29-6	New Jersey Haz. Sub. Fact Sheet: http://nj.gov/health/eoh/rtkweb/documents/fs/0190.pdf

Table 2: Military Munitions UXO/OEW Contaminates of Concern (COC's) Potential Soil Contaminants Fort Ord, California

31) Zinc stearate	557-05-1	Skin, eye, and respiratory tract irritant CAMEO
32) Toluidine red	2425-85-6	No Health data found
33) Strontium nitrate	10042-76-9	NJ-HSFS: Repeated exposure may damage the lungs, heart, liver, and kidneys and affect the nervous system.
34) Strontium oxalate	814-95-9	No Health data found
35) Auramine hydrochloride (yellow)	2465-27-2	Suspected: Carcinogen CPDB, Gastrointestinal or Liver Toxicant RTECS
36) 1,4-Di-p-toluidinoanthraquinone (green)	128-80-3	No Health data found
37) 1-Methylantraquinone (red)	954-07-4	HAZMAP: Possible Carcinogen, Hepatotoxin, Skin Sensitizer
38) 1-(4-Phenylazo)-2-naphthol (orange dye)	?	No Health data found
39) N,N-Dimethyl-p-phenylazoaniline (yel dye)	60-11-7	IARC: Possible Carcinogen, HAZMAP: Hepatotoxin, Skin Sensitizer
40) 1,4-Diamylaminoanthraqdinone (blue dye)	2646-15-3	No Health data found
41) Ammonium dichromate	7789-09-5	Recognized: Carcinogen P65-MC, Suspected: Cardiovascular or Blood Toxicant RTECS, Gastrointestinal or Liver Toxicant RTECS, Immunotoxicant EEC SSCI, Kidney Toxicant RTECS, Skin or Sense Organ Toxicant EEC
42) Asphaltum	8052-42-4	Recognized: Carcinogen P65
43) Barium chromate	10294-40-3	Recognized: Carcinogen P65-MC
44) Boron	7440-42-8	Suspected: Cardiovascular or Blood Toxicant KLAA, Developmental Toxicant ATSDR, Neurotoxicant LU, Respiratory Toxicant LU
45) Potassium nitrate	7757-79-1	HAZMAP: Methemoglobinemia
46) Laminac	?	No Health data found
47) Sodium nitrate	7631-99-4	Suspected: Cardiovascular or Blood Toxicant RTECS, Respiratory Toxicant RTECS
48) Parlon (Chlorinated rubber)	9006-03-5	EPA Pesticide Inert Ingredient
49) Superfloss	7631-86-9	No Health data found
50) Vistanex (polyisobutylene)	9003-27-4	No Health data found
51) Thorium Tu	7440-29-1	Recognized: Carcinogen P65-MC
52) Zirconium Zr	7440-67-7	Suspected: Respiratory Toxicant NEME
53) Hafnium Hf	7440-58-6	No Health data found
54) Cerium Ce	7440-45-1	Suspected: Respiratory Toxicant NEME, Dermatotoxin HAZMAP
55) Lanthanum La	7439-91-0	No Health data found
56) Praseodymium Pr	7440-10-0	No Health data found
57) Neodymium Nd	7440-00-8	No Health data found
58) Samarium Sm	7440-19-9	HAZMAP: Internal Toxicity: High
59) Yttrium Y	7440-65-5	HAZMAP: Hepatotoxin, Fibrogenic
60) Rubidium Nitrate	13126-12-0	No Health data found
61) Cesium Nitrate	7789-18-6	Substance may be toxic to blood central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.
62) Specular Hematite	14808-60-7	No Health data found
63) Magnetite	1309-38-2	No Health data found

Constituents compiled from: Chapter 10 Pyrotechnic Devices: Military Explosives (Chemistry) 30 September 1984

ATTACHMENT 8

Explosives, Propellants, uses and constituents

Military Explosives (Chemistry) 30 September 1984

Explosives, Propellants, Pyrotechnics

Lead Azide: $\text{Pb}(\text{N}_3)_2$, is a salt of hydrazoic acid, HN_3 . The compound is white, has a nitrogen content of 28.86 percent and a molecular weight of 291.26. At the melting point, 245°C to 250°C , decomposition into lead and nitrogen gas occurs. The pure compound has two crystal modifications: an orthorhombic form and a monoclinic form. The orthorhombic form, which is also called the alpha form, has a density of 4.68 grams per cubic centimeter and unit cell dimensions of $a = 11.31$ Angstroms, $b = 16.25$ Angstroms, and $c = 6.63$ Angstroms. The monoclinic form, which is also called the beta form, has a density of 4.87 grams per cubic centimeter and unit cell dimensions of $a = 18.49$ Angstroms, $b = 8.84$ Angstroms, and $c = 5.12$ Angstroms. The compound is usually prepared as colorless, needlelike crystals.

Other Lead Azide Types:

- Dextrinated Lead Azide (DLA)
- Service Lead Azide (SLA)
- Colloidal Lead Azide (CLA)
- Polyvinylalcohol Lead Azide (PVA-LA)
- RD-1333 lead azide
- Dextrinated Colloidal Lead Azide (DCLA)

Mercury Fulminate $\text{Hg}(\text{ONC})_2$, is a salt of fulminic or paracyanic acid. The acid undergoes polymerization very rapidly in both aqueous and ethereal solutions, and so cannot be isolated. The structure of fulminic acid, and thus the salts of this acid, is undetermined. Mercury fulminate has an oxygen balance to CO_2 of -17 percent, an oxygen balance to CO of -5.5 percent, a nitrogen content of 9.85 percent, and a molecular weight of 284.65. When mercury fulminate is crystallized from water, a hydrate, $\text{Hg}(\text{ON: C}) \cdot \frac{1}{2} \text{H}_2\text{O}$, is formed that has a nitrogen content of 9.55 percent and a molecular weight of 293.64. The anhydrous form, which is crystallized from alcohol, is white when pure but normal manufacturing yields a gray product of only 98 to 99 percent purity. The crystals formed are octahedral but are usually truncated. Only the smaller crystals are fully developed. The crystal density is 4.43 grams per cubic centimeter.

Diazodinitrophenol (DDNP) This explosive is also known as 4,5-dinitrobenzene-2-diazo-1-oxide, dinol, diazol and may be referred to as DADNP. The compound is a greenish yellow to brown solid with tabular crystals. DDNP has a crystal density of 1.63 to 1.65 grams per cubic centimeter at 25°C and a molecular weight of 210.108. DDNP is not dead pressed even at a pressure of 896,350 kilopascals (130,000 pounds per square inch).

Lead Styphnate Two forms of lead styphnate are used as primary explosives: basic and normal. Basic lead styphnate has a nitrogen content of six percent and a molecular weight of 705.53.

The compound has two crystal forms: yellow needles with a density of 3.878 grams per cubic centimeter and red prisms with a density of 4.059 grams per cubic centimeter. The apparent density is 1.4 to 1.6 grams per cubic centimeter. Normal lead styphnate has a nitrogen content of nine percent and the monohydrate has a molecular weight of 468.38.

Tetracene is also known as guanyldiazoguanyl tetrazene and 4-guanyl-1 - (nitrosoaminoguanyl)-1tetrazene. The compound is a colorless to pale yellow, fluffy material with needle crystals, an oxygen balance to CO₂ of -57.6 percent, an oxygen balance to CO of -43 percent, a nitrogen content of 74.4 percent, and a molecular weight of 188.15. Tetracene forms a hydrate with three molecules of water. The melting point of the pure compound is between 140°C and 160°C accompanied by decomposition and explosion. The apparent density is only 0.45 grams per cubic centimeter. When compressed at 20,685 kilopascals (3,000 pounds per square inch), the density is 1.05 grams per cubic centimeter. The crystal density is 1.7 grams per cubic centimeter. The compound can be easily dead pressed. Tetracene is practically insoluble in water and ethanol and so can be stored wet with water or a mixture of water and ethanol. The compound is also insoluble in ether, benzene, acetone, carbon tetrachloride, and ethylene dichloride. Tetracene is soluble in dilute nitric acid or strong hydrochloric acid. In a solution with hydrochloric acid, the hydrochloride is precipitated by the addition of ether. Tetracene may then be recovered by treatment with sodium acetate or ammonium hydroxide. The heat of formation is 270 calories per gram and the heat of detonation is 658

Potassium Dinitrobenzofuroxane (KDNBF) is a red crystalline solid with a nitrogen content of 21.21 percent and molecular weight of 264.20. The oxygen balance of the compound to CO₂, H₂O, and K₂O is -42.4 percent. The anhydrous salt has a density of 2.21 grams per cubic centimeter and a melting point, with explosive decomposition, of 210°C. KDNBF is soluble to the extent of 0.245 grams per 100 grams of water at 30°C. Between the temperatures of 50°C to 50°C the specific heat is 0.217 calories per gram per degree centigrade. KDNBF is used in primary compositions.

Lead Mononitroresorcinate (LMNR) has a nitrogen content of 3.89 percent, an NO₂ content of 12.77 percent, a lead content of 57.51 percent, and a molecular weight of 360.30. The compound forms microscopic reddish brown crystals. LMNR has slow burning properties and a low combustion temperature. The compound is used in electric detonators with DLA as the spot charge to initiate a PETN base charge, as an upper charge, and as an ingredient in primary compositions.

Primary Compositions are mixtures of primary explosives, fuels, oxidizers, and other ingredients used to initiate detonation in high explosive charges or ignite propellants and pyrotechnics. The ingredients and the portions of the ingredients for individual priming compositions are determined empirically from the use the composition is intended for. Fuels commonly used in priming compositions are lead thiocyanate, antimony sulfide, and calcium silicide. The last two also serve to

sensitize the composition to friction or percussion. Oxidizing agents include potassium chlorate and barium nitrate. Other ingredients include primary explosives and binders. The major determining factor in ingredient selection is the impetus which is to detonate the priming composition. The types of impetus commonly used are percussion and electrical.

Percussion Priming Compositions FA959, FA982, FA956, Compounds:

- Normal lead styphnate
- Tetracene
- Barium nitrate
- Antimony sulfide
- Powdered zirconium
- Lead dioxide
- PETN
- Aluminum
- Gum Arabic

Stab Detonator Priming Compositions NOL130, PA101, NOL 60, Compounds:

- Lead azide
- Basic lead styphnate
- Tetracene
- Barium nitrate
- Antimony sulfide
- Powdered aluminum

Electric Priming Compositions I, II, III, IV, V, VI, Compounds:

- Potassium chlorate
- Lead mononitroresorcinate
- Nitrocellulose
- Lead thiocynate
- DDNP
- Charcoal
- Nitrostarch
- Titanium
- Aluminum

Aliphatic Nitrate Esters compounds in this class are prepared by O-type nitration in which a nitro group is attached to an oxygen atom of the compound being nitrated.

1,2,4-Butanetriol Trinitrate (BTN) This explosive is also known as a, b, g-trihydroxybutane trinitrate and is sometimes referred to as BTTN. The compound is a light yellow liquid with a density of 1.520 at 20°C, a molecular weight of 241, a melting point of -27°C, an oxygen balance to CO₂ of 17 percent, and a refractive index of 1.4738 at 20°C. The liquid has a viscosity of 62 centipoises at 20°C. 1,2,4- Butanetriol trinitrate is slightly soluble in water, miscible with alcohol, ether, acetone, and a solution of 2 parts ether and 1 part alcohol. BTN has a heat of

formation of 368 calories per gram, a heat of combustion of 2,167 calories per gram, and a heat of detonation of 1,458 calories per gram. This compound is a good gelatinizer for nitrocellulose and can be used as a substitute for nitroglycerin in double-base propellants. Heat, vacuum stability, and volatility tests indicate more stability than nitroglycerin. Impact sensitivity is about the same as for nitroglycerin. Brisance, as measured by the sand test, is about the same: 49 grams crushed versus 51.5 grams for nitroglycerin or 47 grams for TNT. The five second explosion temperature is 230°C versus 220°C for nitroglycerin. BTN can be manufactured by the nitration of 1,2,4-butanetriol with a mixture of nitric and sulfuric acids.

Diethyleneglycol Dinitrate (DEGN) This explosive is also known as dinitrodiglycol or 2,2'-oxybisethanol dinitrate and is sometimes referred to as DEGDN. The compound is a clear, colorless, odorless liquid with a nitrogen content of 14.29 percent, a theoretical maximum density of 1.39 grams per cubic centimeter, an oxygen balance to CO₂ of -41 percent, and a molecular weight of 196. DEGN boils between 160° and 161°C and can, upon cooling, form a stable solid with a melting point of 2°C or remain liquid to a freezing point of -11.2° to 11.40°C. Other characteristics of the liquid are: refractive index at 20°C with sodium light, 1.450; viscosity at 20°C, 8.1 centipoises; vapor pressure at 20°C, 0.0036 torr; vapor pressure at 25°C, 0.00593 torr; vapor pressure at 60°C, 0.130 torr; specific gravity, 1.385. At 60°C DEGN has a volatility of 0.19 milligrams per square centimeter per hour. At constant pressure, the heat of combustion is 2,792 calories per gram. The heat of formation is -99.4 kilocalories per mole. The heat of detonation is 1,161 calories per gram. DEGN is readily soluble in ether, acetone, chloroform, benzene, nitrobenzene, toluene, nitroglycerin, and glacial acetic acid but is insoluble in ethanol, carbon tetrachloride, and carbon disulfide. Solubility in water at 25°C and 60°C is 0.40 and 0.46 gram per 100 grams, respectively. DEGN's chemical reactivity is similar to nitroglycerin's, but is less subject to hydrolysis and is not readily saponified by alcoholic sodium hydroxide. DEGN can be used as an explosive and can be used in propellants as a colloidizing agent for nitrocellulose. Propellants based on DEGN and nitrocellulose develop relatively low temperatures and cause relatively little erosion of guns, but are unduly volatile.

Nitrocellulose (NC) or cellulose nitrate is a mixture of nitrates obtained by nitrating cellulose. Cellulose is a long chain polymer of anhydroglucose units (C₅H₁₀O₅). The number of anhydroglucose units or degree of polymerization (DP) is variable. Cellulose used for preparation of military grades of nitrocellulose have a DP of approximately 1,000 to 1,500. Cellulose threads possess micellar structure and consist of numerous rod-like crystallites oriented with their long axis parallel to the thread axis, thus forming a fiber. Almost pure cellulose is found in the pith of certain plants, in absorbent cotton, and in some filter papers. Pure cellulose is most readily obtained from cotton by treating with a dilute acid or base solution then thoroughly washing with water. At the present time most of the cellulose for nitrocellulose preparation is obtained from coniferous wood, which is 50 to 60 percent cellulose. Another source is straw, which is 30 to 40 percent cellulose. The nitration of cellulose involves replacement of the hydrogen in the

three hydroxyl (OH) groups in the anhydroglucose units with NO₂ groups. A representative formula for the nitrated cellulose may be written as C₆H₇(OH)_x(ONO₂)_y where $x + y = 3$. The mononitrate, $x = 2$ and $y = 1$, has a nitrogen content of 6.76 percent; the dinitrate, $x = 1$ and $y = 2$, has a nitrogen content of 11.11 percent; the trinitrate, $x = 0$ and $y = 3$, has a nitrogen content of 14.14 percent. As a practical matter, however, any desired degree of nitration up to 14.14 percent may be obtained by adjusting the composition of the mixed acid used for nitration, the acid to cellulose ratio, the time of nitration, or the temperature of nitration. In nitrocellulose with less than 14.14 percent nitrogen, the NO₂ groups are distributed randomly along the entire length of the cellulose polymer, so x and y should be regarded as average values over the entire length of the chain. The nitrogen content determines the chemical and physical properties of any particular nitrocellulose. The five grades of nitrocellulose listed below are recognized and used.

Other Nitrocellulose Types:

- Pyroxylin or collodion,
- Pyrocellulose
- Guncotton
- High nitrogen nitrocellulose
- Blended nitrocellulose

Nitroglycerin (NG), glycerol trinitrate, or 1,2,3-propanetriol trinitrate, is a clear, colorless, odorless, oily liquid with a theoretical maximum density of 1.596 grams per cubic centimeter. Nitroglycerin has a sweet, burning taste and a molecular weight of 227.1. Nitroglycerin is soluble in one liter of water to the extent of only 0.173, 0.191, 0.228, and 0.246 gram at 20°, 30°, 50° and 60°C, respectively and is essentially nonhygroscopic when exposed to atmospheric humidity.

Nitrostarch (NS) is a mixture of nitrates obtained by nitrating starch. The general formula for starch is C₆H₁₀O₅. The structure of starch is the same as for nitrocellulose, with the exception that the polymer chains are spiral rather than straight. The starch molecule consists of approximately 1,000 anhydroglucose units. The nitration of starch involves replacement of the hydrogen in the three hydroxyl (OH) groups in the anhydroglucose units with NO₂ groups. A representative formula for the nitrated starch may be written as C₆H₇(OH)_x(ONO₂)_y where $x + y = 3$. The NO₂ groups are distributed randomly along the entire length of the starch molecule, so x and y should be regarded as averages over the entire length of the chain. The following empirical formula can be employed to obtain y as a function of the nitrogen content N : $y = 162N / (1400 - 45N)$

Pentaerythritol Tetranitrate (PETN) is also known as 2,2-bis [(nitrooxy) methyl]-1,3-propanediol dinitrate; penthrite; or nitropenta and may be referred to as TEN. The compound is a white solid with a molecular weight of 316.2. PETN has two polymorphs: one with a tetragonal crystalline structure and the other with an orthorhombic crystalline structure. The phase change between the two

polymorphs occurs at 130°C. The tetragonal crystals have a density of 1.778 grams per cubic centimeter and the orthorhombic crystals have a density of 1.716 grams per cubic centimeter. Normal manufacturing yields tetragonal crystals. The unit cell dimensions of the tetragonal crystals are $a=9.38$ Angstroms, $b=9.38$ Angstroms, and $c=6.71$ Angstroms. The dimensions for the orthorhombic crystals are $a=13.29$ Angstroms, $b=13.49$ Angstroms, $c=6.83$ Angstroms. There are two molecules per cell in the tetragonal form and four molecules per cell in the orthorhombic form. The interatomic distances have been determined as 1.50 Angstroms for the C-C bonds, 1.37 Angstroms for the C-O bonds, 1.36 Angstroms for O-N bonds, and 1.27 Angstroms for N-O bonds. PETN melts at 141.3°C. The boiling point is 160°C under a pressure of 2 torr; 180°C under a pressure of 50 torr. Under atmospheric pressure at temperatures above 210°C, PETN decomposes rapidly and in some cases detonates. The vapor pressure of solid PETN can be found by the empirical equation: $\log p = 16.73 - 7750/T$. PETN is more sensitive to initiation than nitrocellulose, RDX, or tetryl, as judged by the sand test. This is shown, also, by the fact that PETN with 35 percent of water present can be detonated by a No. 6 electric blasting cap, whereas RDX fails to explode if more than 14 percent of water is present. PETN is one of the most sensitive of the standardized military explosives.

Triethylene Glycoldinitrate (TEGN) This explosive is also referred to as TEGDN. The compound is a light yellow, oily liquid with a nitrogen content of 11.67 percent, a molecular weight of 240.20, and an oxygen balance to CO₂ of -66.6 percent. The melting point of the solid is -19°C. Other characteristics of the liquid are: refractive index, 1.4540; viscosity at 20°C, 13.2 centipoises; vapor pressure at 25°C, less than 0.001 torr; volatility at 60°C, 40 milligrams per square centimeter per hour; and density, 1.335 grams per cubic centimeter. At constant pressure, TEGN's heat of combustion is 3428 calories per gram, heat of explosion is 725 kilocalories per kilogram, and heat of formation is -603.7 kilocalories per kilogram. TEGN is very soluble in acetone, ether, and a solution of 2 parts ether and 1 part ethanol. TEGN is soluble in carbon disulfide and slowly soluble in water. The primary use of TEGN is as a gelatinizing agent for nitrocellulose in propellants, but TEGN can also be used as a component in a liquid explosive, a plasticizer in the fabrication of flexible explosive sheets, and as a plasticizer in pyrotechnic flares.

1,1,1 Trimethylolethane Trinitrate (TMETN) This explosive is also known as metriol trinitrate and is sometimes referred to as MTN. The compound is a slightly turbid, viscous oil with a nitrogen content of 16.41 percent and a molecular weight of 255.15. TMETN has a melting point of -3°C and an apparent boiling point of 182°C, but this is merely the temperature at which decomposition becomes vigorous enough to resemble boiling. Other properties of the liquid are a density of 1.47 grams per cubic centimeter at 22°C and a refractive index of 1.4752 at 25°C. TMETN is practically insoluble in water. Less than 0.015 grams dissolved per 100 grams of water at up to 60°C. TMETN is soluble in alcohol and many other organic solvents. At 60°C TMETN's volatility is 24 milligrams per square centimeter. The heat of formation is 422 calories per gram at constant volume and 446 calories per gram at constant pressure. The heat of combustion is 2,642 calories per gram at constant volume with the water being liquid. In an acid bath,

TMETN is hydrolyzed to the extent of 0.018 percent in 10 days at 220°C and 0.115 percent in 5 days at 60°C. TMETN can be used as a flash and erosion reducing additive in propellants and an ingredient of commercial explosives. TMETN alone does not gelatinize nitrocellulose unless the temperature is raised to 100°C, which would be dangerous. But if mixed with only 8 percent of metriol triacetate, gelatinization takes place at 80°C. When TMETN is mixed with nitroglycerin, the mechanical properties of double-base cast propellants are improved. Combinations with triethylene glycol dinitrate are used as plasticizers for nitrocellulose.

Cyclotetramethylenetetranitramine (HMX) is also known as: octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine; 1,3,5,7-tetranitro-1,3,5,7-tetrazacyclooctane; cyclotetramethylene tetranitramine; or octogen. HMX is a white, crystalline solid with a nitrogen content of 37.84 percent, a theoretical maximum density of 1.905 grams per cubic centimeter, a nominal density of 1.89 grams per cubic centimeter, a melting point of 285°C, and a molecular weight of 296.17. There are four polymorphs of HMX: an alpha, beta, gamma, and delta form. Each polymorph has a range of stability and there are differences among them in physical properties such as density, solubility, and refractive index. The most common polymorph is the beta form. The term HMX without an alpha, gamma or delta qualifier refers to the beta form throughout the rest of this text. The crystalline structure of beta HMX is monoclinic with a density of 1.903 grams per cubic centimeter. The unit cell dimensions are $a=6.54$ Angstroms, $b=11.05$ Angstroms, and $c=8.70$ Angstroms. Beta HMX is stable to about 102°C to 104.5°C, when the crystalline structure is converted to the alpha form. The crystals of the alpha form are orthorhombic with a density of 1.82 grams per cubic centimeter. The unit cell dimensions are $a=15.14$ Angstroms, $b=23.89$ Angstroms, $c=5.91$ Angstroms. At approximately 160°C to 164°C the meta stable gamma form exists. The crystals of the gamma form are monoclinic with a density of 1.76 grams per cubic centimeter. The unit cell dimensions are $a=10.95$ Angstroms, $b=7.93$ Angstroms, and $c=14.61$ Angstroms. Above the 160°C to 164°C range to the melting point, the delta form exists. The crystals of the delta form are hexagonal with a density of 1.80 grams per cubic centimeter. The unit cell dimensions are $a=7.71$ Angstroms and $b=32.55$ Angstroms. The polymorphs may also be prepared by precipitation from solution under various conditions. The beta form is precipitated from a solution of HMX in acetic acid, acetone, nitric acid, or nitromethane with very slow cooling. The alpha form is precipitated from the same solution with more rapid cooling and the gamma form is precipitated with even more rapid cooling. The delta form is crystallized from solution such as acetic acid or betachloroethyl phosphate, in which HMX is only slightly soluble. Very rapid chilling of the solution is required.

Cyclotrimethylenetrinitramine (RDX) This explosive is also known as: hexahydro-1,3,5-trinitro-1,3,5-triazine; 1,3,5-trinitro-1,3,5-triazacyclohexane; cyclotrimethylene trinitramine; hexogen; cyclonite; or 1,3,5-trinitrotrimethylene-triamine. The compound is a white solid with a density of 1.806 grams per cubic centimeter, a nitrogen content of 37.84 percent, and a molecular weight of 222.13. RDX has orthorhombic crystals with a wide variety of habits; from needles when precipitated from HNO_3 , to plates when precipitated from acetic acid, to a massive

form when precipitated from nitroethane or acetone. The unit cell dimensions are $a=13.18$ Angstroms, $b = 11.57$ Angstroms, and $c = 10.71$ Angstroms, and there are eight molecules per cell unit. On the Moh's scale RDX has a scratch hardness of 2.5. Other properties of pure RDX include a specific heat as shown in table 8-15 and a heat of combustion at constant pressure of 2,307.2 calories per gram. The heat of formation value is + 14.71 kilocalories per mole. RDX has an extremely low volatility. Pure RDX is used in press loaded projectiles but not in cast loaded projectiles because of extensive decomposition at the melting point. Cast loading is accomplished by blending RDX with a relatively low melting point substance. Compositions in which the RDX particles are coated with wax are called Composition A, in mixtures with TNT, Composition B, and blends with a nonexplosive plasticizer, Composition C. Straight RDX is used as a base charge in detonators and in some blasting caps, and as an oxidizer in specialized gun propellant.

Ethylenediamine Dinitrate (EDDN) This explosive is also designated EDD or EDAD. The compound is composed of white crystals with a specific gravity of 1.595 at 25/40, a nitrogen content of 30.10 percent, an oxygen balance to CO_2 of -25.8 percent, a melting point of 185° to 187°C , and a molecular weight of 186.13. The compound is soluble in water, but insoluble in alcohol or ether. EDDN has a heat of combustion of 374.7 kilocalories per mole at constant pressure, a heat of formation of 156.1 kilocalories per mole, and a heat of explosion of 127.9 to 159.3 kilocalories per mole. Eutectics are formed with ammonium nitrate, but EDDN is immiscible with molten TNT. An aqueous solution of EDDN is distinctly acidic. EDDN has been used to a limited extent as a bursting charge pressed in shells and as a cast charge in eutectic mixtures with ammonium nitrate. Mixtures with wax were used in boosters during World War II by the Germans.

Ethylenedinitramine (Haleite) This compound is also known as N' N'-dinitroethylene diamine; ethylene dinitramine; or 1,2-dinitrodiaminoethane, and is sometimes designated EDNA. The name Haleite is in recognition of the development of this compound as a military explosive by the late Dr. G. C. Hale of Picatinny Arsenal. The compound is white with an orthorhombic crystal structure, a nitrogen content of 37.33 percent, an oxygen balance to CO_2 of -32 percent, an oxygen balance to CO of -10.5 percent, and a molecular weight of 150.10. The density of the crystals vary from 1.66 to 1.77 depending on the solvent from which the crystallization took place.

Nitroguanidine (NQ) This explosive is also known as picrite or guanidinitramine. The compound has a nitrogen content of 53.84 percent, an oxygen balance to CO_2 of -30.8 percent, a theoretical maximum density of 1.81 grams per cubic centimeter, a nominal density of 1.55 to 1.75 grams per cubic centimeter, and a molecular weight of 104.1. The melting point of nitroguanidine varies somewhat with the rate of heating. The pure material melts with decomposition at 232°C , but values from 220°C to 250°C are obtainable with various heating rates. At least two crystalline forms exist for nitroguanidine; alpha and beta.

2, 4,6Trinitrophenylmethylnitramine (Tetryl) This explosive is also known as: 2,4,6tetranitro-N-methyl aniline; N-methyl-N,2,4,6tetranitro-benzenamine; 2,4,6-trinitrophenylmethylnitramine; tetranitromethylamine; or picrylmethylnitramine and is sometimes referred to as pyronite, tetrylit, tetralite, tetralita, or CE. The compound is colorless when freshly prepared and highly purified, but rapidly acquires a yellow color when exposed to light. Tetryl has a nitrogen content of 24.4 percent, an oxygen balance to CO₂ of -47 percent, a nominal density of 1.71 grams per cubic centimeter with a theoretical maximum density of 1.73 grams per cubic centimeter, and a molecular weight of 287.15. The melting point of the pure substance is 129.45°C and of the technical grade, 129°C.

Nitroaromatics. Compounds in this class are prepared by C-type nitration in which a nitrogroup is attached to a carbon atom of the compound being nitrated.

Ammonium Picrate This explosive is also known as ammonium 2,4,6-trinitrophenolate, explosive D, and Dunnite. The compound has a nitrogen content of 22.77 percent, an oxygen balance to CO₂ of -52 percent, a maximum crystal density of 1.717 grams per cubic centimeter, a nominal density of 1.63 grams per cubic centimeter, a melting point with decomposition of about 280°C and a molecular weight of 246. Ammonium picrate exists in a stable form as yellow, monoclinic crystals and a meta stable form as red, orthorhombic crystals. The unit cell dimensions are a = 13.45 Angstroms, b

1,3-Diamino-2,4,6-Trinitrobenzene (DA TB) This explosive is also known as 2,4,6trinitro-1,3-diaminobenzene; 2,4,6-trinitro-7,3benzenediamine trinitro-m-phenylenediamine; or 2,4,6-trinitro-1,3-diaminobenzol and may be referred to as DATNB. The compound is a yellow, crystalline solid with a nitrogen content of 28.81 percent, a melting point of 286°C to 301°C with decomposition, and a molecular weight of 243.14.

1,3,5Triamino-2, 4,6Trinitrobenzene (TA TB) This explosive is also known as 2,4,6trinitro-1,3,5-benzenetriamine and may be referred to as TATNB. TATNB has a nitrogen content of 32.56 percent, an oxygen balance to CO₂ of -55.78 percent, and a molecular weight of 258.18. TATNB is yellow but exposure to sunlight or ultraviolet light causes a green coloration which, with prolonged exposure, turns brown. The compound has a theoretical maximum density of 1.937 grams per cubic centimeter and a nominal density of 1.88 grams per cubic centimeter. An instantaneous hot bar decomposition temperature of 450°C to 451 °C was reported with rapid thermal decomposition above 320°C. The structure of the crystalline lattice of TATNB contains many unusual features. Some of these are the extremely long C-C bonds in the benzene ring, the very short C-N bonds, amino bonds, and the six furcated hydrogen bonds. Evidence of a strong intermolecular interaction, hydrogen bonds, in TATNB is indicated by the lack of an observable melting point and very low solubility. The intermolecular network results in a graphite-like lattice structure with the resulting properties of lubricity and intercalation.

2,4,6-Trinitrotoluene (TNT) This explosive is also known as trotyl, tolit, triton, tritol, trilit, and 1-methyl-2,4,6-trinitrobenzene. TNT has been the most widely used military explosive from World War I to the present time. The advantages of TNT include low cost, safety in handling, fairly high explosive power, good chemical and thermal stability, favorable physical properties, compatibility with other explosives, a low melting point favorable for melt casting operations, and moderate toxicity. There are six possible ring nitrated TNT isomers. The alpha isomer, which is the one of military interest is symmetrical and will be referred to as TNT. The other five meta isomers will be identified by the Greek letters beta through eta excluding zeta. TNT is a yellow, crystalline compound with a nitrogen content of 18.5 percent, an oxygen balance to CO₂ of -73.9 percent, a molecular weight of 227.13, and a melting point of 80°C to 81°C. TNT shows no deterioration after 20 years storage in a magazine.

Impurities Present in TNT

- 2,4,5-Trinitrotoluene
- 2,3,4-Trinitrotoluene
- 2,3,6-Trinitrotoluene
- 2,3,5-Trinitrotoluene
- 3,4,5-Trinitrotoluene
- 2,6-Dinitrotoluene
- 2,4-Dinitrotoluene
- 2,3-Dinitrotoluene
- 2,5-Dinitrotoluene
- 3,4-Dinitrotoluene
- 3,5-Dinitrotoluene
- 1,3-Dinitrobenzene
- 1,3,5-Trinitrobenzene
- 2,4,6-Trinitrobenzyl alcohol
- 2,4,6-Trinitrobenzaldehyde
- 2,4,6-Trinitrobenzoic acid
- Alpha-nitrato-2,4,6-trinitrotoluene
- Tetranitromethane
- 2,2'-Dicarboxy-3,3',5,5'-tetranitroazoxybenzene (white compound)
- 2,2',4,4',6,6'-Hexanitrobibenzyl (HNBB)
- 3-Methyl-2',4,4',6,6'-pentanitrodiphenylmethane(MPDM)
- 3,3',5,5'-Tetranitroazoxybenzene

Compositions are explosives in which two or more explosive compounds are mixed to produce an explosive with more suitable characteristics for a particular application. Generally, the characteristics of the composition are intermediate between the characteristics of the individual explosive ingredients. For example, the addition of TNT to RDX reduces brisance somewhat but considerably improves sensitivity. The composition explosives are categorized by the number of ingredients contained in the mixture.

Binary Mixtures

Amatols are binary mixtures of ammonium nitrate and TNT. The percentages of ammonium nitrate and TNT are reflected in the nomenclature for each mixture, for example, 80/20 amatol consists of 80 percent ammonium nitrate and 20 percent TNT. Ammonium nitrate is insoluble in TNT. The chemical and physical properties of the constituents determine the properties of the amatol. The mixture begins to melt at TNT's melting point but the ammonium nitrate, which has a higher melting point, remains solid.

Composition A explosives consist of a series of formulations of RDX and a desensitizer. Compositions A and A2 contain the same percentages of materials as composition A3 but the type of wax used and the granulation requirements for the RDX are different. Composition A contains beeswax, while composition A2 contains a synthetic wax. Compositions A and A2 are no longer used. All of the composition A explosives are press loaded. The density of composition A3 is 1.47 and 1.65 grams per cubic centimeter when pressed to 20,685 kilopascals (3,000 pounds per square inch) and 82,740 kilopascals (12,000 pounds per square inch), respectively.

Composition B type explosives are mixtures of RDX and TNT. Composition B refers to mixtures of approximately 60 percent RDX and 40 percent TNT. Other portions of RDX and TNT are called cyclotols.

Composition C During World War II, the British used a plastic demolition explosive that could be shaped by hand and had great shattering power. As standardized by the United States, this explosive was designated as composition C and contained 88.3 percent RDX and 11.7 percent of a nonexplosive oily plasticizer. Included in the plasticizer was 0.6 percent lecithin, which helped to prevent the formation of large crystals of RDX which would increase the sensitivity of the composition.

Ednatols are mixtures of halite (ethylene dinitramine) and TNT. The most used halite/TNT portions are 60/40, 55/45, and 50/50. Ednatols are yellowish, uniform blends with a melting point of 80°C. The eutectic temperature is about 80°C. In an extrudation test at 65°C there was no extrudate. Ednatols are considered satisfactory for bursting charges in ammunition. All of the following data in the discussion of the properties of ednatol refer to the 55/45 mixture. 55/45 Ednatol has an oxygen balance to carbon dioxide of -51 percent and to carbon monoxide of -17 percent. The density of the cast explosive is 1.62 grams per cubic centimeter, which is four percent greater than that of cast TNT or halite pressed under 206,850 kilopascals (30,000 pounds per square inch).

LX-14 is an explosive which consists of 95.5 percent HMX and 4.5 percent estane 5702-F1. The mixture is a white solid with violet spots. LX-14 has a theoretical maximum density of 1.849 grams per cubic centimeter, a nominal density of 1.83 grams per cubic centimeter, and a melting point of greater than 270°C, with decomposition. The heat of formation is 1.50 kilocalories per mole. The calculated heats of detonation are 1.58 kilocalories per gram with liquid water and 1.43 kilocalories per gram with gaseous water. At a density of 1.835 grams per cubic centimeter the detonation velocity is 8,830 meters per second.

Octols are mixtures of HMX and TNT. Octol is used as an oil well formation agent and in fragmentation and shaped charges. In fragmentation tests using a 105 millimeter M1 shell, 15 percent more fragments are produced and the average velocity of the fragments is 100 meters per second faster than with a similar shell loaded with composition B. This improvement is attributed to both the higher rate of detonation of octol and the greater density of octol which permits a greater weight of explosive in the same volume.

Pentolite are castable explosive mixtures containing PETN and TNT. The most commonly used blend consists of 50/50 PETN/TNT. Other blends such as 75/25, 40/60, 30/70, and 10/90 have been occasionally employed but the 50/50 blend is superior in the characteristics of sensitivity to initiation, brisance, and suitability for melt loading. 87 percent TNT and 13 percent PETN form a eutectic with a freezing point of 76.7°C. Cast 50/50 pentolite, therefore, consists of 42.2 percent PETN, and 57.8 percent of the eutectic mixture.

Picratol is a mixture of 52 percent ammonium picrate and 48 percent TNT. Molten TNT has little or no solvent action on ammonium picrate, and consequently, cast picratol consists essentially of a physical mixture of crystals of the two explosives. The density of cast picratol is 1.61 to 1.63. This permit's a weight of charge almost equal to that

Tetrytols are light yellow to buff mixtures of TNT and tetryl. As is the case for tetryl, tetrytols are no longer used by the United States but are still being used by other nations including various NATO allies. Tetrytols resemble tetryl more closely than they resemble TNT. They are more powerful but less sensitive than TNT. Tetrytols can be cast into munitions, which is an advantage over press loading. Table 8-73 compares the physical characteristics of various detritus compositions.

Ternary Mixtures

Amatex 20 The mixture has a nominal density of 1.61 grams per cubic centimeter and is used as a filler in ammunition items.

Amatex 20 consists of:

RDX	40 percent
TNT	40 percent
Ammonium nitrate	20 percent

Ammonal

Ammonals are mixtures containing, as principle ingredients, ammonium nitrate and powdered aluminum incorporated with high explosives such as TNT, DNT, and RDX. Powdered carbon was also used in earlier ammonals. In the ammonals that do not contain carbon, the mixture of ammonium nitrate and high explosive detonates developing a very high temperature which causes volatilization of the aluminum powder. In general, ammonals are fairly insensitive and stable mixtures but are hygroscopic due to the presence of ammonium nitrate. In the presence of

moisture, ammonals react with the same metals as amatols: copper, bronze, lead, and copper plated steel.

(HTA-3) are mixtures of HMX, TNT, and aluminum

Minol-2 are mixtures of TNT, ammonium nitrate, and aluminum.

Torpex is a silvery white solid when cast. The composition of torpex is 41.6 percent RDX, 39.7 percent TNT, 18.0 percent aluminum powder, and 0.7 percent wax.

Quanterary Mixtures

Depth bomb explosive (DBX) is the only explosive covered under quanterary mixtures. DBX consists of:

TNT	40 percent
RDX	21 percent
Ammonium nitrate	21 percent
Aluminum	18 percent

Industrial Explosives

Dynamites Military operations frequently necessitate excavation, demolition, and cratering operations for which the standard high explosives are unsuited. Recourse is made to commercial and special compositions. Commercial blasting explosives, with the exception of black powder, are referred to as dynamites although in some cases they contain no nitroglycerin.

Ammonium nitrate fuel oil explosives (ANFO) When ammonium nitrate is mixed with approximately 5.6 percent of a combustible material such as fuel oil, the heat liberated on detonation is increased by almost three-fold.

Propellants

Military Explosives (Chemistry) 30 September 1984

CHAPTER 9 UNITED STATES PROPELLANTS

Introduction Selection of a propellant for an application is made on the basis of the requirements of that specific application. In general, guns are designed to meet specified performance standards and withstand a specific pressure in the barrel. With a knowledge of the properties of the constituents normally used for propellants, the propellant designer creates a formulation to satisfy the performance standards and limitations of the gun. When ignited, the propellant produces large quantities of hot, gaseous products. Complete combustion or deflagration of the propellant occurs in milliseconds in guns and the pressure produced accelerates the projectile down the barrel.

Single-base propellants M1, M6, M10, and IMR.

Double-base gun propellants M2, M5, M8 and M18.

Triple-base gun propellants contain nitroguanidine as additional energizer which increases the energy content of the formulation without raising the flame temperature.

Composite propellants, used in solid fuel rockets, contain a polymer binder, a fuel, and an oxidizer.

Ball Propellants

Propellants Compounds: M1, M2, M5, M6, M8, M10, M31, M30, IMR, M18

- Nitrocellulose (NC)
- Nitrogen
- Nitroglycerin
- Barium nitrate
- Potassium nitrate
- Potassium sulfate
- Lead carbonate
- Nitroguanidine
- Dinitrotoluene
- Dibutylphthalate
- Diethylphthalate
- Diphenylamine
- Ethyl centralite
- Graphite
- Cryolite
- Ethyl alcohol (residual)

Diphenylamine, $(C_6H_5)_2NH$, is an ammonia derivative in which two of the hydrogens have been replaced by phenyl groups. Each phenyl ring has three hydrogens which can be replaced with nitro groups. Therefore, DPA can be

nitrated to the hexanitrate by absorbing the nitrogen oxides produced during the decomposition of nitrocellulose. DPA is nitrated relatively easily and the reaction is not exothermic. During the decomposition of nitrocellulose, DPA nitrates to the following compounds in succession.

N-nitrosodiphenylamine
2-nitrodiphenylamine
4-nitrodiphenylamine
N-nitroso-2-nitrodiphenylamine
N-nitroso-4-nitrodiphenylamine
4,4', 2,4', 2,2', and 2,4-dinitrodiphenylamines
N-nitroso-4, 4'-dinitrodiphenylamine
N-nitroso-2, 4'-dinitrodiphenylamine
2, 4, 4' and 2, 2', 4-trinitrodiphenylamines
2,2', 4,4'-tetranitrodiphenylamine
2,2', 4,4', 6-pentanitrodiphenylamine
Hexanitrodiphenylamine

The propellant does not start to become unstable until most of the diphenylamine has been converted to hexanitrodiphenylamines. A very accurate test to measure the remaining safe storage life in a propellant lot is to analyze the distribution profile of the nitro DPAs. Only about one percent DPA can be added to a propellant because its nitrated products change the ballistic properties.

Centralite I (which is also called ethyl centralite or symmetrical diethyldiphenylurea), $OC[N-(C_2H_5)(C_6H_5)]_2$, was developed in Germany for use in double base propellants. The compound acts as a stabilizer, gelatinizer, and waterproofing agent. Unlike diphenylamine, centralite can be used in relatively large proportions and some propellant compositions contain as much as eight percent of this material. Like diphenylamine, centralite is nitrated by the products of nitrocellulose decomposition. The following compounds are formed successively, as many as four being present simultaneously, as deterioration of the powder proceeds.

4-nitrocentralite
4,4' dinitrocentralite
N-nitroso-N-ethylaniline
N-nitroso-N-ethyl-4-nitraniline
2,4, dinitro-N-ethyl-aniline

Centralite II (which is also called methyl centralite or symmetrical dimethyl diphenylurea), $OC[N(CH_3)(C_6H_5)]_2$, also has been used as a stabilizer but is not considered to be as effective as the ethyl analogue

Three akardites, or acardites, are used to stabilize propellants. Akardite II is often used in DEGN containing propellants.

ATTACHMENT 9

Toxic Hazards of Practice Ammunition

MILITARY TOXICS PROJECT

Information Sheet

Toxic Hazards of Practice Ammunition

Ammunition includes a variety of devices used to deliver an explosive, chemical, or pyrotechnic charge to a target. Military ammunition includes aerial bombs, mines, torpedoes, rockets, missiles, and a broad spectrum of explosive and non-explosive projectiles.

Ammunition consists of three basic elements: the primer (detonator), the propellant, and the projectile.

Most ammunition also has a casing, or cartridge, that encapsulates the primer and propellant and often grips some portion of the projectile.

The components of small-arms ammunition are typically held together by a cartridge case whereas the larger types of ammunition usually have no cartridge and the propellant is packed in separate combustible bags.

The conventional aerial bomb consists of an explosive or chemical agent in a container, one or more fuze-and-igniter mechanisms, and external fins (for directional stability).

Practice, Inert, and Dummy Ammunition and Bombs

Although the terms "inert", "dummy", and "practice" ammunition are often used interchangeably, the environmental and human health impacts are distinctly different.

According to a Department of Defense policy relevant to munitions, "wholly inert" ammunition has never been employed and has never contained reactive materials; an unused dummy munition is an example of a "wholly inert" ammunition. (It is important to note that once an item is employed as a component of a military munition, it is no longer considered "wholly inert".) Practice ammunition, by comparison, may contain or utilize smoke cartridges, fuzes, primers, igniter charges, propellants, incendiary components, and/or tracers – all of which may contain hazardous components.

Practice bombs are used to simulate the same ballistic properties of service type bombs. They are manufactured as either solid cast metal bodies or thin sheet metal containers. Since practice bombs contain no high explosive filler, a practice bomb signal cartridge (smoke) can be used for visual observation of weapon-target impact.

Practice bombs may also have a pyrotechnic cartridge that produces a flash of light and a puff of white smoke to show the point of bomb impact with the target.

Smoke ammunition contains smoke-producing substances such as chlorosulphonic acid mixture, titanium tetrachloride or white phosphorus; smoke-producing pyrotechnic compositions may contain hexachloroethane or red phosphorus. Smoke ammunition also contains one or more of the following: a propelling charge with primer and igniter charge; a fuze with burster or expelling charge.

Potential Health Effects: Specific Components of Practice Bombs

This is a partial list intended for educational purposes and should not be used for medical diagnosis. The effects of exposure to any hazardous substance depend on the dose, duration, how you were exposed, personal traits and habits, and whether other chemicals are/were present. This report also does not take into account the potential additive and synergistic effects of multiple exposures (exposure to more than one hazardous substance.)

Antimony Sulfide (S3 Sb₂): Antimony is a chemical element that is normally used as an alloy with lead and other metals to increase their hardness, mechanical strength, corrosion resistance, and electrochemical stability. As an alloy, antimony is used in ammunition and cable sheathing.

Antimony compounds are also used as fire retardants, vulcanizing agents, ammunition primers and fireworks. Antimony sulfide is a stable complex of antimony formed in the presence of sulfur. Oral or inhalation exposure to antimony can cause anemia, intestinal disorders (stomach pain, vomiting or diarrhea) and heart problems (altered electrocardiograms).

Barium Nitrate: Barium nitrate is an oxidizing compound found in some incendiary mixtures and single-base propellants. Constitutes as much as 50% of some incendiary mixtures. Poisoning from ingestion can result in gastroenteritis, muscular paralysis, decreased pulse rate, and ventricular fibrillation.

Calcium Resinate: found in some tracer mixtures. Acute exposure through inhalation may irritate the respiratory tract. Symptoms may include coughing, shortness of breath, sore throat and runny nose. If sufficient amounts are inhaled and absorbed, symptoms may resemble those in acute ingestion. Acute skin contact may cause irritation with symptoms of redness, swelling, itching and pain. Acute eye contact may cause irritation with symptoms of redness, swelling, itching, tearing and pain. Acute ingestion may cause gastroenteritis (inflammation of the lining membrane of the stomach and intestines) with abdominal pain, nausea, vomiting and diarrhea. Systemic effects may follow and may include ringing of the ears, dizziness, elevated blood pressure, blurred vision and tremors. Information on health risks associated with long-term exposure not found.

Chlorosulphonic Acid: found in some smoke ammunition. This substance is poisonous. Liquid may cause burns to skin and eyes, and may be fatal if swallowed or inhaled. Chlorosulphonic Acid reacts violently with water, liberating toxic gas. Vapors may be irritating to skin and eyes. Inhalation of vapors may cause severe irritation of the respiratory system. Ingestion may cause severe burning of mouth and stomach. Chronic overexposure may result in lung damage. Decomposition products are: hydrogen chloride, sulfuric acid, oxides of sulfur, and hydrogen.

Dinitrotoluene: constitutes as much as 10% of some single-base propellants; used as a stabilizer in single-base propellants. Also used as a ballistic modifier (homogenizer) for single base propellants. Heart disease has been seen in workers exposed to 2,4- or 2,6-DNT. 2,4- and 2,6-DNT may also affect the nervous system and the blood of exposed workers. One study showed that male workers exposed to 2,4- and 2,6-DNT had reduced levels of sperm, but later studies did not confirm the finding. Exposure to high levels of these compounds in animals regularly show lowered numbers of sperm and reduced fertility. Studies of animals have also shown that a reduction in the numbers of red blood cells, nervous system disorders, and liver and kidney damage can occur. Both 2,4- and 2,6-DNT can cause liver cancer in laboratory rats, and may produce the same effect in humans. The U.S. Environmental Protection Agency has determined that the mixture of 2,4- and 2,6-DNT is a probable human carcinogen. Toxic gases and vapors (such as nitrogen oxides and carbon oxides) may be released in a fire involving dinitrotoluene.

Diphenylamine (DPA) is found in some single-base propellants. DPA is used as a stabilizer in single-based propellants. Since it is incompatible with Nitroglycerin, it is not used in double-base and triple-base propellant compositions. Inhalation of DPA may cause irritation to the mucous membranes. Inhalation of dust may cause systemic poisoning, symptoms may parallel those from ingestion exposure. Exposure through ingestion, skin contact, and inhalation may cause methemoglobinemia. Ingestion may cause anoxia, headache, fatigue, anorexia, cyanosis, vomiting, diarrhea, emaciation, hypothermia, bladder irritation, kidney, heart, and liver damage. Prolonged or repeated exposure from inhalation or skin absorption of liquid may cause damage to the nervous system, liver, kidneys, and bone marrow.

Ethyl Centralite: (Trade name: Carbamite; Synonym: Diphenyl Diethyl Urea) is used as a stabilizer, gelatinizer, and waterproofing agent in propellants. Ethyl Centralite can be used in relatively large proportions (up to 8%) of the propellant composition. Components are Ammonium Nitrate, Paraffin Oil, and Zinc Oxide. Acute exposure to ammonium nitrate can cause eye and skin irritation. Decomposition of ammonium nitrate caused by fire or overheating or the presence of impurities, gives rise to nitrous fumes causing initial irritant effect on the mucous membrane of the lungs. Fumes from decomposition are hazardous. Long-term health effects from chronic exposure are not known.

Hexachloroethane: found in some smoke ammunition. Exposure to high concentrations may cause liver and kidney damage. Hexachloroethane has been identified as a carcinogen or potential carcinogen. Inhalation: Harmful if inhaled. Dust or vapor irritating to the respiratory tract. Skin: Harmful if absorbed through the skin. Eye: Causes eye irritation. Ingestion: Harmful if swallowed. Ingestion of large amounts may cause central nervous system depression based on animal data.

Incendiary Compound IM-23: is composed of 50% potassium perchlorate and 50% magnesium aluminum alloy. The limited database on the toxicology of perchlorate confirms its potential to disrupt thyroid hormone production in mammalian test species, but no robust data exist to evaluate the dose-response for this thyroid effect or to evaluate other potential target tissues or effects. Acute inhalation of magnesium aluminum alloy powder may irritate the respiratory tract. Symptoms may include coughing, shortness of breath, sore throat and runny nose. Exposure to magnesium oxide fume subsequent to burning, welding or molten metal work can result in metal fume fever. Metal fume fever's temporary symptoms include fever, chills, nausea, vomiting and muscle pain. These symptoms usually occur 4-12 hours after exposure and last up to 48 hours. Magnesium oxide fume is a by-product of burning magnesium.

Lead Azide: found in some primers; lead azide is classified as an "explosive A" and is also referred to as "initiating explosive lead styphnate". Lead azide can affect you when breathed in. Skin and eye contact can cause irritation. Exposure can cause headaches, irritability, reduced memory, and disturbed sleep. Lead poisoning can cause poor appetite, colic, upsets stomach, nausea, and muscle cramps. Higher levels can cause muscle and joint pains, weakness, and nerve damage. Lead Azide may cause kidney and brain damage and damage to blood cells causing anemia. It has not been tested for its ability to cause cancer.

Lead Carbonate: found in some single-base propellants. Lead can be absorbed through the respiratory system. Local irritation of bronchia and lungs can occur and, in cases of acute exposure, symptoms such as metallic taste, chest and abdominal pain, and increased lead blood levels may follow. Ingestion: Poison! The symptoms of lead poisoning include abdominal pain and spasms, nausea, vomiting, headache. Acute poisoning can lead to muscle weakness, "lead line" on the gums, metallic taste, definite loss of appetite, insomnia, dizziness, high lead levels in blood and urine with shock, coma and death in extreme cases. Lead and lead compounds may be absorbed through the skin on prolonged exposure; the symptoms of lead poisoning described for ingestion exposure may occur. Lead is a cumulative poison and exposure even to small amounts can raise the body's content to toxic levels.

Lead Styphnate, Basic (Lead hydroxide styphnate, lead hydroxide 2,4,6 trinitroresorcinate): is an initiating explosive. According to Winchester Ammunition ©, Basic Lead Styphnate is highly toxic and is carcinogenic. Routes of absorption are: inhalation, ingestion, and skin and eye contact. Basic lead styphnate may be fatal if inhaled or ingested. Acute inhalation may cause irritation of nose, throat, upper respiratory tract, and lungs. Severe poisoning may impair vision by damaging the optic nerve. Chronic inhalation may cause damage to central and peripheral nerves, blood, kidneys, and the fetus. Male reproductive function may be impaired. Lead has been identified as an animal carcinogen; it may produce cancer in humans. It has been shown to affect fetal development. Lead crosses the placenta and may affect the fetus causing birth defects, mental retardation, behavioral disorders, and death during the first year of childhood. Decomposition of Basic Lead Styphnate produces carbon monoxide, nitrogen oxides, and lead fumes.

Lead Styphnate, Normal (Lead trinitroresorcinate): is an initiating explosive. According to Winchester Ammunition ©, Normal Lead Styphnate is highly toxic and is carcinogenic. Routes of absorption are: inhalation, ingestion, and skin and eye contact. Normal Lead Styphnate may be fatal if inhaled or ingested. Acute inhalation may cause irritation of nose, throat, upper respiratory tract, and lungs. Severe poisoning may impair vision by damaging the optic nerve. Chronic inhalation may cause damage to central and peripheral nerves, blood, kidneys, and the fetus. Male reproductive function may be impaired. Lead has been identified as an animal carcinogen; it may produce cancer in humans. It has been shown to affect fetal development. Lead crosses the placenta and may affect

the fetus causing birth defects, mental retardation, behavioral disorders, and death during the first year of childhood. Decomposition of Normal Lead Styphnate produces carbon monoxide, nitrogen oxides, and lead fumes – all of which are hazardous to human health.

Magnesium Aluminum Alloy: found in some incendiary mixtures. Acute exposure may irritate the respiratory tract. Symptoms may include coughing, shortness of breath, sore throat and runny nose. If sufficient amounts are inhaled and absorbed, symptoms may resemble those in acute ingestion. Skin contact may cause irritation with symptoms of redness, swelling, itching and pain. Ingestion may cause gastroenteritis (inflammation of the lining membrane of the stomach and intestines) with abdominal pain, nausea, vomiting and diarrhea. Systemic effects may follow and may include ringing of the ears, dizziness, elevated blood pressure, blurred vision and tremors. Magnesium oxide fume is a by-product of burning magnesium.

Magnesium Powder: found in some tracer mixtures. Dust may cause irritation to upper respiratory tract. Inhalation of fumes may results in "leukocytosis". Contact may cause irritation of skin, eyes, and mucous membranes. Inhalation may irritate the respiratory tract. Symptoms may include coughing, shortness of breath, sore throat and runny nose. If sufficient amounts are inhaled and absorbed, symptoms may resemble those in acute ingestion. Ingestion may cause gastroenteritis (inflammation of the lining membrane of the stomach and intestines) with abdominal pain, nausea, vomiting and diarrhea. Systemic effects may follow and may include ringing of the ears, dizziness, elevated blood pressure, blurred vision and tremors. Health effects of chronic exposure are unknown.

Mercury fulminate: is a crystalline compound used in primers, percussion caps, blasting caps and other detonators. All forms of mercury can cross the placenta to the fetus, but most of what is known has been learned from experimental animals. Chronic exposure through any route (inhalation, ingestion, or dermal absorption) can produce central nervous system damage. May cause muscle tremors, personality and behavior changes, memory loss, metallic taste, loosening of the teeth, digestive disorders, skin rashes, brain damage and kidney damage. Can cause skin allergies and accumulate in the body. Repeated skin contact can cause the skin to turn gray in color. Not a known reproductive hazard, but related mercury compounds can damage the developing fetus and decrease fertility in males and females. Environmental Toxicity: this substance is expected to significantly bioaccumulate.

Nitrocellulose: Single-base propellants contain approximately 80% nitrocellulose. Limited animal studies have concluded nitrocellulose is not toxic. Data is currently not available regarding potential human toxicity from drinking water and other exposures. Nitrocellulose is the principle ingredient of propellants, smokeless powders, rocket fuel, mortar increments and some explosives.

Polyvinyl Chloride: found in some tracer mixtures. Routes of exposure: inhalation and ingestion. According to the manufacturer, polyvinyl chloride as a resin is relatively inert. Its main hazard is associated with small amounts of unreacted vinyl chloride and other additives in plastic. Inhalation of dust should be avoided. Vinyl chloride, a combustion product of polyvinyl chloride is a known carcinogen and is known to induce the formation of tumors in lungs, thorax, respiratory system, and skin.

Potassium Sulfate: found in some single-base propellants. When burned, produces toxic sulfur dioxide fumes. Acute inhalation may irritate the respiratory tract. Symptoms may include coughing, shortness of breath, sore throat and runny nose. Skin contact may cause irritation with symptoms of redness, swelling, itching and pain. Acute ingestion may cause gastroenteritis (inflammation of the lining membrane of the stomach and intestines) with abdominal pain, nausea, vomiting and diarrhea. Systemic effects may follow and may include ringing of the ears, dizziness, elevated blood pressure, blurred vision and tremors. Effects of chronic exposure are unknown. Decomposition products: oxides of sulfur.

Red Phosphorus (Amorphous Phosphorus): constitutes as much as 50% of some incendiary mixtures. When heated, it emits highly toxic fumes of oxides of phosphorus. Red phosphorus

spotting charges can burn at 2,732 degrees Fahrenheit for one-tenth of a second and produce a 6- to 8- foot flame capable of starting vegetation on fire. Human health risks associated with acute or chronic ingestion are described as minimal.

Strontium Peroxide: found in some tracer mixtures. Routes of exposure include eye contact, skin contact, inhalation, and ingestion. Human effects and symptoms of overexposure from acute inhalation: irritation of the respiratory tract. Symptoms may include coughing, shortness of breath, sore throat, and runny nose. If sufficient amounts are inhaled and absorbed, symptoms may resemble those in acute ingestion. Acute skin contact may cause irritation with symptoms of redness, swelling, itching, and pain. Acute eye contact may cause irritation with symptoms of redness, swelling, itching, tearing, and pain. Acute ingestion may cause gastroenteritis (inflammation of the lining membrane of the stomach and intestines) with abdominal pain, nausea, vomiting, and diarrhea. Systemic effects may follow and may include ringing in the ears, dizziness, elevated blood pressure, blurred vision, and tremors. Effects of chronic exposure are unknown.

Strontium Nitrate: found in some tracer mixtures; constitutes 50% of some tracer mixtures. It is used to produce red in flares, stars and fires. Routes of exposure include eye contact, skin contact, inhalation, and ingestion. Human effects and symptoms of overexposure from acute inhalation: irritation of the respiratory tract. Symptoms may include coughing, shortness of breath, sore throat, and runny nose. If sufficient amounts are inhaled and absorbed, symptoms may resemble those in acute ingestion. Acute skin contact may cause irritation with symptoms of redness, swelling, itching, and pain. Acute eye contact may cause irritation with symptoms of redness, swelling, itching, tearing, and pain. Acute ingestion may cause gastroenteritis (inflammation of the lining membrane of the stomach and intestines) with abdominal pain, nausea, vomiting, and diarrhea. Systemic effects may follow and may include ringing in the ears, dizziness, elevated blood pressure, blurred vision, and tremors. Effects of chronic exposure are unknown.

Titanium Tetrachloride: found in some smoke ammunition; produces fumes in moist air. Acute exposure to titanium tetrachloride lasting seconds or minutes may cause injury to skin or mucous membranes of sufficient severity to threaten life or cause permanent physical impairment. Chronic exposure may cause similar permanent injury.

White Phosphorus: found in some smoke ammunition, emits highly toxic fumes or oxides of phosphorus. White phosphorus is dangerously reactive in air and turns red in sunlight. If combustion occurs in a confined space, it will remove the oxygen and render the air unfit to support life. High concentrations of the vapors evolved by burning it are irritating to the nose, throat, and lungs as well as the skin, eyes, and mucous membranes. If phosphorus is ingested, it can be absorbed from the gastrointestinal tract or through the lungs. The absorption rate of toxic quantities of phosphorus has an acute effect on the liver and is accompanied by vomiting and marked weakness. White phosphorus is especially hazardous to the eyes and can damage them severely; it can also seriously damage teeth and bones.

Zirconium: constitutes as much as 75% of some incendiary mixtures. Routes of exposure include eye contact, skin contact, inhalation, and ingestion. Human effects and symptoms of overexposure from acute inhalation: irritation of the respiratory tract. Symptoms may include coughing, shortness of breath, sore throat, and runny nose. If sufficient amounts are inhaled and absorbed, symptoms may resemble those in acute ingestion. Acute skin contact may cause irritation with symptoms of redness, swelling, itching, and pain. Acute eye contact may cause irritation with symptoms of redness, swelling, itching, tearing, and pain. Acute ingestion may cause gastroenteritis (inflammation of the lining membrane of the stomach and intestines) with abdominal pain, nausea, vomiting, and diarrhea. Systemic effects may follow and may include ringing in the ears, dizziness, elevated blood pressure, blurred vision, and tremors. Effects of chronic exposure are unknown.

Glossary

Acute exposure: Occurring over a short time, usually a few minutes or hours. An acute exposure can result in short-term or long-term health effects. An acute effect happens a short time (up to 1 year) after exposure.

Ammunition is a generic military term that applies to bombs, grenades, rockets, mines, projectiles and other similar weapons.

Bag guns employ propellant charges (grains) packed in silk bags. The use of bags is confined to large guns. The total number of bags is modified according to the weight and desired velocity of the separate projectile. The propellant bags are not attached to the projectile.

Black Powder, also called gunpowder, is a mixture of charcoal or other carbon and either potassium nitrate or sodium nitrate, with or without sulphur. It may be meal, granular, compressed or pelletized. Black powder is no longer used by the military as a propellant.

Bombs are explosive articles that are dropped from aircraft. They may contain a flammable liquid with bursting charge, a photo-flash composition or a bursting charge. The term excludes aerial torpedoes.

Bursters are a small charge of explosive used to open projectiles or other ammunition in order to disperse their contents.

Carcinogen: a substance or agent producing or inciting cancer.

Case guns fire fixed ammunition; the propellant is encased in a metal shell attached to the projectile.

Chronic exposure: Occurring over a long period of time (more than 1 year).

Deterrent: an organic material used to modify the burning characteristics of nitrocellulose. An analysis of deterrent showed that it contains 73.9% dinitrotoluenes (DNT's), 20.6% dibutyl phthalate, 2.2% diphenylamine, and 3.3% benzene and insolubles.

Detonators (Group B explosives) include blasting caps, small arms primers, and fuzes.

Double-base propellants are used in the United States for mortar propellants, small rocket engines, shotgun shells, the 7.62-mm NATO rifle cartridge, recoilless rifles, and the Navy's 5"/54-caliber gun. Double- and triple-based propellants contain nitroglycerin.

Expelling charge is an explosive designed to eject the payload (projectile) without damage. **Fuzes** trigger a detonation or explosion in ammunition. The trigger mechanism may be mechanical, electrical, chemical or hydrostatic.

Gunpowders or smokeless powders are the propellants in use today. This substance is produced by combining nitrocellulose (nitric acid and cotton) with ether and alcohol to produce a low explosive; a small quantity of diphenylamine is added as a stabilizer. Although called smokeless powders, they are neither smokeless nor in powder form, but in granule form. Smokeless powders are classed as either single or multibase (double- or triple-base) powders.

High explosives are not used in practice ammunition; examples of high explosives include TNT, RDX, HMX and picric acid.

Incendiary ammunition contains a flammable solid, liquid or gel including white phosphorus and one or more of the following: a propelling charge with primer and igniter charge; a fuze with burster or expelling charge.

Inert ammunition: See **Wholly inert**.

Initiating explosives (Group A) may contain lead azide, lead styphnate, mercury fulminate, tetracene, cyclonite (RDX), or pentaerythritol tetranitrate (PETN).

Illuminating ammunition is designed to produce an intense light for lighting up an area. Examples include illuminating cartridges, grenades and projectiles; and illuminating and target identification bombs. Illuminating ammunition may also include a burster, expelling charge or propelling charge.

Leukocytosis is a transient increase in the number of white blood cells (leukocytes) in the blood, due to various causes.

Low explosives include black powder, solid propellants, and pyrotechnics.

Methemoglobinemia, commonly referred to as "blue baby syndrome," is a condition that interferes with the blood's ability to carry sufficient oxygen to individual body cells and is often associated with exposure to elevated levels of nitrates in drinking water. However, exposure to other chemicals may also be a principal cause of methemoglobinemia; examples of industrial chemicals include: all isomers of dinitrotoluenes, 2,4,6 trinitrotoluene, m-dinitrobenzene, nitric oxides, and other toxins associated with munitions. Chlorate compounds, nitrobenzene, and nitroglycerin are also reported inducers of methemoglobinemia.

Practice ammunition containing a burster or expelling charge, but does not contain a main bursting charge. Normally it also contains a fuze and a propelling charge (propellant).

Primary explosives are very sensitive to heat, impact or friction and detonates or burn very rapidly. The main primary explosives are mercury fulminate, lead azide and lead styphnate.

Primers are used to ignite an explosive charge. A cap primers is a metal or plastics cap containing a small amount of primary explosive mixture that is readily ignited by impact. Tubular primers have a primer for ignition and a secondary charge of explosive such as black powder.

Projectiles are shells or bullets that are projected from a cannon or other artillery gun, rifle or other small arm. They may be inert, with or without tracer, or may contain a burster or expelling charge or a bursting charge.

Propellants are explosives used for propulsion or for reducing the drag of projectiles. They are classified by such terms as single-base, double-base, and composite.

Proof ammunition containing pyrotechnic substances, used to test the performance or strength of new ammunition, weapon component or assemblies.

Pyrophoric articles contain a substance capable of spontaneous ignition when exposed to air and an explosive substance or component. The term normally excludes articles containing white phosphorus.

Secondary explosives are relatively insensitive (when compared to primary explosives) and are usually initiated by primary explosives

Signal cartridges provide visual observation (smoke) of weapon-target impact. See also: Smoke ammunition.

Single-base propellants: nitrocellulose is the principal explosive present; other substances are added to control burning rates and stability.

Smoke ammunition contains smoke-producing substance such as chlorosulphonic acid mixture, titanium tetrachloride or white phosphorus; or smoke-producing pyrotechnic composition based on

hexachloroethane or red phosphorus. Smoke ammunition also contains one or more of the following: a propelling charge with primer and igniter charge; a fuze with burster or expelling charge.

Smokeless Powder is used almost exclusively as the propellant for gun and rocket ammunition. It is manufactured under uniform conditions and grained to a uniform size in the form of flakes, strips, sheets, balls, cords or perforated cylindrical grains. Some of the more frequently used types of smokeless powder are guncotton, Ballistite, and Cordite N.

Tracers for ammunition contain pyrotechnic substances designed to reveal the path of a projectile. **Triple-base** propellants are double-base propellants with the addition of nitroguanidine. Triple-base propellants are used in tank rounds and are being tested for new long-range artillery rounds. Double- and triple-based propellants contain nitroglycerin.

Wholly inert ammunition has never contained reactive materials; a dummy munition is an example of a wholly inert ammunition. It is important to note that once an item is employed as a component of a military munition, it is no longer considered wholly inert. See also: Practice ammunition.

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Military Toxics Project - "Networking for Environmental Justice"
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ATTACHMENT 10

GAO-04-147 Military Munitions

**DOD needs to address over
200 munitions contaminates**

Safety, Environmental, and Human Health Risks

Military munitions can pose risks to public safety, human health, and the environment. In terms of the explosive hazard, unexploded ordnance poses an immediate safety risk of physical injury to those who encounter it. Military munitions may also pose a health and environmental risk because their use and disposal may release constituents that may contaminate soil, groundwater, and surface water. Ranges contaminated with military munitions, especially those located in ecologically sensitive wetlands and floodplains, may have soil, groundwater, and surface water contamination from any of the over 200 chemical munitions constituents that are associated with the ordnance and their usage. When exposed to some of these constituents, humans potentially face long-term health problems, such as cancer and damage to heart, liver, and kidneys. Of these constituents, there are 20 that are of greatest concern due to their widespread use and potential environmental impact. Table 2 contains a listing of these munitions constituents, and table 3 describes some of the potential health effects of five of them.

Table 2: Munitions Constituents of Greatest Concern

Source: DOD, *Fiscal Year 2002 Defense Environmental Restoration Program Annual Report to Congress*.

While many of these constituents have been an environmental concern to the Department of Defense (DOD) for more than 20 years, the current understanding of the causes, distribution, and potential impact of constituent releases into the environment remains limited. The nature of these impacts, and whether they pose an unacceptable risk to human health and the environment, depend upon the dose, duration, and pathway of exposure, as well as the sensitivity of the exposed populations. However, the link between such constituents and any potential health effects is not always clear and continues to be studied.

Type of munitions constituents

Trinitrotoluene (TNT)
1,3-Dinitrobenzene
Nitrobenzene
2,4-Dinitrotoluene
2-Amino-4,6-Dinitrotoluene
2-Nitrotoluene
2,6-Dinitrotoluene
4-Amino-2,6-Dinitrotoluene
3-Nitrotoluene
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
2,4-Diamino-6-nitrotoluene
4-Nitrotoluene
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
2,6-Diamino-4-nitrotoluene

Methylnitrite
Perchlorate
1,2,3-Propanetriol trinitrate (Nitroglycerine)
Pentaerythritoltetranitrate (PETN)
1,3,5-Trinitrobenzene
N,2,4,6-Tetranitro-N-methylaniline (Tetryl) (White Phosphorus)

Table 3: Potential Effects of the Munitions Constituents Closely Associated with Military Munitions

Source: Environmental Protection Agency, *Handbook on the Management of Ordnance and Explosives at Closed, Transferring, and Transferred Ranges and Other Sites*.

Constituent Potential toxicity/effects

TNT: Possible human carcinogen, targets liver, skin irritations, and cataracts.

RDX: Possible human carcinogen, prostate problems, nervous system problems, nausea and vomiting. Laboratory exposure to animals indicates potential organ damage.

HMX: Animal studies suggest potential liver and central nervous system damage.

Perchlorate: Exposure causes itching, tearing, and pain; ingestion may cause gastroenteritis with abdominal pain, nausea, vomiting, and diarrhea; systemic effects may follow and may include ringing of ears, dizziness, elevated blood pressure, blurred vision, and tremors. Chronic effects may include metabolic disorders of the thyroid.

White Phosphorus: Reproductive effects. Liver, heart, or kidney damage; death; skin burns, irritation of throat and lungs, vomiting, stomach cramps, drowsiness.

ATTACHMENT 11

OE-0142 Résumé EOD Specialist 27 years experience

HUMAN FACTORS APPLICATIONS, INC.
EXPLOSIVE ORDNANCE DISPOSAL DIVISION

NAME: Richard T. Thiel

TITLE: Project Manager

Years of Civilian UXO Experience: 3

CIVILIAN UXO EXPERIENCE

4/90 - present HFA, Inc., Indian Head, Maryland. He was Team Leader/UXO Supervisor for more than 20 projects at Edgewood and Aberdeen Proving Grounds, locating and identifying hundreds of conventional and chemical munitions, including stokes mortars, projectiles, and rifle grenades. He was the QC/Safety Officer for the Level II Artillery Range Clearance at Camp Sarcee, Harvey Barracks, Calgary, Alberta, Canada. 87 UXOs were recovered. He provided UXO support for the first United Nations inspection of nuclear facilities in Baghdad, Iraq. He served as Project Manager for removal and disposal of 53,000 pounds of nitro cellulose at an abandoned DuPont Smokeless Powder Plant.

Project Manager for Rocky Mountain, Black Hills, Tooele, Tooele South, and Ogden delivery orders under this contract.

Years of Military EOD Experience: 27

MILITARY EOD EXPERIENCE

10/87 - 4/90 Served as Enlisted Detailer for EOD Community until retirement.

10/85 - 10/87 EOD Mobile Unit Three, NAB, Coronado, California. Served as Senior Enlisted Advisor to Commanding Officer. Was Senior EOD Technician in Command. Conducted or participated in range clearances at the Naval Gunfire Range, San Clemente Island and Naval Weapons Center, China Lake. Recovered and disposed of all types of Naval projectiles, mortars, and dropped munitions.

11/81 - 9/85 NAVSCOLEOD, Indian Head, Maryland. Senior instructor in Core Division. Also served as Assistant Director of Training.

9/79 - 10/82 EOD Detachment, Coronado, California. Served as Team Chief. Provided EOD support to all Pacific Fleet aircraft carriers. Assisted EOD Detachment, North Island, in range clearances at the Naval Gunfire Range, San Clemente, California. Conducted over 5,000 accident free dives

ATTACHMENT 12

OEW site Remediation Depths

DOD Fort Ord LDSP Table C

And

US EPA, DTSC, CSUMB comments

Required Remediation Depths

US EPA, Cal EPA, CSUMB

OE-0029 EE/CA Phase I, Appendix K, Austreng, J. (Cal EPA) Comments

DTSC understands from our June 12, 1997 meeting with California State University Monterey Bay representative that residential development has been planned within the boundaries of a UXO site. It's also our understanding that Department of Defense Safety Board Requirements for residential areas is clean up of UXO to a depth no less than 10 feet below land surface. Given the UXO clean ups at Fort Ord are generally to a depth of 3 or 4 feet. DTSC is concerned that clean up has not been done at this site to the level required.

OE-0029 EE/CA Phase I, Appendix K, California State University (CSUMB)

The preferred alternative for future CSU property should be a remediation program that 1) eliminates the need for future remedial actions with planned use of the property by the University, 2) does not obligate the University to implement and finance these actions, 3) does not restrict the planned use of the property, and 4) does not transfer a public safety liability to the University. A 10-foot removal over the entire site would be acceptable.

1999 EPA Position Paper Range Rule

1. DDESB 6055.9 Standards for depth of clearance generally are not being followed. [For example, at Fort Ritchie a surface clearance is proposed for a residential area. DDESB 6055.9 Standards (chapter 12) specifies that default depths of clearance to 10 feet should be used unless an alternative is justified and approved by the DDESB based on detailed site-specific information. As no detailed investigations have taken place over the range areas at Fort Ritchie, a default clearance depth of 10 feet should be used (unless bedrock is shallower). Please note that EPA views chapter 12 as critical due to the nature of explosives safety issues. In addition, many other range situations have already been documented to have uncontrolled listed wastes (and/or hazardous substances) and may present an imminent and substantial endangerment to human health and the environment. Other ranges with similar problems include: Savanna Army Depot, Fort Meade, Fort Ord, Badlands Bombing Range, Lowry Bombing Range, Umatilla Army Depot, Camp Bonneville, Jefferson Proving Ground, Nansemond Ordnance Depot, Tooele Army Depot, and NAF Adak.]

OE-0144 EE/CA Phase II

Field data collected at JPG and McKinley Range showed that sweep efficiencies using the Schonstedt GA-52CX magnetometer are 99 percent for the depth interval from surface to 2 feet below ground surface (bgs), decreasing to 94 percent in the 2- to 4-foot bgs interval, and to 71 percent in the 4- to 6-foot bgs interval. These efficiencies are based upon an average probability of detection of 60 percent from the surface to 10 feet bgs. For OE items having a detection limit above 4 feet bgs, the sweep efficiency would be 94 percent or greater and a removal action could be performed with high-confidence.

Great if your not the 1 out of 20

REMEDATION DEPTHS AND LAND USE RESTRICTIONS

1. UXO remediation areas in land parcels to be used as nature preserves or other such low intensity use will be remediated to a depth of one foot prior to release. UXO remediation with high intensity use will be remediated to a depth of four feet prior to release. After release, any change in use of the property beyond that commensurate with the depth remediated shall be coordinated with the Army to ensure further remediation to the depth required by the intended use (see enclosure for remediation depth/use requirements).
2. It is not possible to accurately determine when and where construction will occur at Ft. Ord. Sufficient resources do not exist to remediate all OEW areas to a worst case depth before release. Land use restrictions are the only viable way to insure further remediation within the footprint of future construction.
3. All land use restrictions will accompany the deed in the transfer of properties.

AMMUNITION AND EXPLOSIVES
LAND CLEARANCE PLANNING GUIDANCE

Chapter 12 of DOD 6055.9-STD requires a clearance plan be presented to the DDESB for leasing, transferring, or disposing of DOD real property when ammunition and explosives contamination is known or suspected. The DDESB will review the plan for explosives safety considerations. The following matrix is to be used to identify the appropriate clearance depth. The ability to clear to a given depth will depend on the technology and funds available. It is necessary to identify and remove ammunition and explosives located from the surface to the applicable depth indicated.

CLEARANCE DEPTH (in Feet)

<u>PLANNED END USE</u>	<u>DEPTH</u>
Commercial/Residential Utility Construction Activity	10 ft. or excavation depth plus 4 ft., whichever is greater
Farming, recreation, Vehicle parking	4
Livestock grazing/ Wildlife preserve	0.5 - 1

The land used must be made aware of the increased risk to his/her operation when violations of the land use agreement occur.

Encl.

ATTACHMENT 13

DTSC letter to Army raising concerns with ordnance and explosives cleanup

“Unfortunately, the Army’s position, as expressed by your staff, continues to be that OEW is neither a hazardous substance or a hazardous waste. DTSC and the United States Environmental Protection Agency (U.S. EPA) continue to assert that OEW is a hazardous substance and a hazardous waste and is covered by the FFA. Both agencies agree including the OEW cleanup program under the FFA could resolve a number of regulatory issues. The following OEW need to be addressed pursuant to the FFA.”



Winston H. Hickox
Secretary for
Environmental
Protection

Department of Toxic Substances Control

Edwin F. Lowry, Director
400 P Street, 4th Floor, P.O. Box 806
Sacramento, California 95812-0806



Gray Davis
Governor

July 22, 1999

Colonel Daniel Devlin
Installation Commander
Commander, DFIFC & POM
Attention: ATZP-CDR
Presidio of Monterey, California 93944-5006

Dear Colonel Devlin:

The purpose of this letter is to bring to the Army's attention a number of issues that must be addressed regarding the cleanup program at the former Fort Ord. I am hopeful that the *Strategic Management, Analysis, Requirements and Technology (SMART) Team* the Army has proposed recently will result in some positive resolution on many of these issues. Nonetheless, I feel it is important that the Army, perhaps through this process, take into account several key needs that we have identified below and that these needs not be lost in the process. As you know, the Department of Toxic Substances Control (DTSC) has voiced concerns about the Army's independent investigation and clearance of Ordnance and Explosive Waste (OEW) at the base on several occasions. During the June 21, 1999, Tier 2 Conference Call, we were pleased to hear that your staff agreed to include the OEW cleanup program under the Federal Facilities Agreement (FFA).

Unfortunately, the Army's position, as expressed by your staff, continues to be that OEW is neither a hazardous substance nor a hazardous waste. DTSC and the United States Environmental Protection Agency (U.S. EPA) continue to assert that OEW is a hazardous substance and hazardous waste, and is covered by the FFA. Both agencies agree that including the OEW cleanup program under the FFA could resolve a number of regulatory issues. The following OEW issues need to be addressed pursuant to the FFA:

1. **IMMINENT AND SUBSTANTIAL THREAT TO PUBLIC HEALTH**

The Army must protect the community from currently existing OEW hazards on the former base. Since the base closed, the Army has only provided limited access control to areas where known OEW is located. There have been a number of reports of adolescents

Colonel Daniel Devlin

July 22, 1999

Page 2

and adults accessing these OEW areas and removing military items. A workplan and schedule to provide adequate fencing and 24 hour security of all OEW areas should be submitted to DTSC within thirty days. The plan should show that such security will be in effect within the following thirty days.

2. SURFACE CLEARANCE OF OEW

The Army must make surface clearance of all OEW areas and potential OEW areas a top priority because of the serious threat to humans. The Army currently wants to remove OEW from the surface and at depth at once in any given area. This complete removal approach will take much longer than just clearing the surface first. The workplan and schedule for the OEW investigation and removal effort must be prepared which addresses areas with the highest potential for access and accidental detonation first. This is in conformance with DoD guidance on OEW, which calls for surface clearance as a priority.

3. IN PLACE DETONATION OF OEW

The Army must study alternatives to detonating in place to reduce the disturbance to the surrounding community. OEW that can be safely moved from the point of discovery to a controlled facility, should be. The use of technologies such as blast chambers should also be evaluated.

4. BURNING BRUSH TO PREPARE FOR OEW CLEARANCE

DTSC and the Monterey Bay Unified Air Pollution Control District must agree that the community is properly protected from the effects of burning brush to clear areas for OEW removal. The Army's past attempts to burn areas for OEW removal have caused extensive smoke problems in the surrounding community. While we agree that brush will likely have to be cleared, so that OEW can be found and removed, the Army must study other possible brush removal methods, and/or ways to minimize the smoke nuisance condition created in the surrounding community, if burning must be used.

5. ADEQUACY OF OEW DETECTION AND REMOVAL TECHNIQUES

The Army must protect the public from OEW hazards by using the most effective equipment and field processes to detect OEW and conservatively interpret the results. Recently, during a random confirmation sampling, U.S. EPA found an 18 inch long rocket on a site that the Army had deemed as cleared for unrestricted use and property transfer. The Army will now have to re-sample the entire property to find out how many

more OEW devices were missed. U.S. EPA used a more sensitive instrument to survey only 10 percent of the area. A workplan and schedule must be prepared to investigate and use more advanced technologies for OEW detection.

6. REDEVELOPMENT OF FORT ORD

The communities surrounding Fort Ord are eager to develop portions of Fort Ord as soon as OEW hazards are removed. DTSC opposes residential development in or around OEW areas that have not been thoroughly cleared. Some land may never be cleared enough for any public use, some land will be adequately cleared only for industrial and commercial uses and in some limited, low-risk cases, land may be cleared to a degree to allow residential development. Adequate, enforceable land use controls must be implemented when unrestricted use is not allowed. DTSC's method to assure such control is to enter into and record a land use covenant with the landowner pursuant to California Civil Code section 1471. Since land use controls are a necessary part of the overall remedy, DTSC will be unable to approve property transfers or a final Record of Decision until such a covenant is in place.

7. OEW COMMUNITY PARTICIPATION PROGRAM

A more effective OEW removal action community participation and education program is needed. As the Army implements the items discussed above, the community should be informed and have the opportunity to input into the decision making process before any actions are taken. This is especially critical since the Restoration Advisory Board was disbanded recently. State law, nonetheless, requires an effective public participation program at the base.

8. DTSC APPROVAL OF REMOVAL ACTIONS

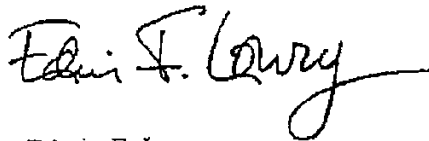
Removal actions need to be approved by DTSC as part of the hazardous substance cleanup process. We believe this can be accomplished by the Army without arguing over authority. Our review and approval will assure substantive compliance with applicable or relevant and appropriate state and federal rules. The Army must commit in the FFA that it will not proceed with removal actions, or finalize documents associated with removal actions, without DTSC approval.

It is important that these issues be resolved promptly. To that end, I have directed that senior management from DTSC be available to meet with you and your staff within the next thirty (30) days to review the State's concerns, and with the goal of settling upon an appropriate course of action.

Colonel Daniel Devlin
July 22, 1999
Page 4

Please have your staff contact Mr. Anthony Landis at (916) 255-3732 to discuss resolution of these issues, or you may contact me directly at (916) 322-0504.

Very truly yours,



Edwin F. Lowry
Director

cc: Secretary Winston H. Hickox
California Environmental Protection Agency
555 Capitol Mall, Suite 525
Sacramento, California 95814

Mr. Lach McClenahan
Site Mitigation
Department of Toxic Substances Control
301 Capitol Mall
Sacramento, California 95814

Mr. Stan Phillippe
Office of Military Facilities
Department of Toxic Substances Control
301 Capitol Mall
Sacramento, California 95814

ATTACHMENT 14

Fort Ord Ordnance Projectile Penetration Table And Fort Ord Munitions Penetration Analysis

Deep penetrating ordnance has been found. Remediation depths not being adhered to

The Group 3 RI/FS Work Plan states ordnance found on surface. The record shows many subsurface ordnance has been found.

Another instance of the record being manipulated. Another reason why privatizing the cleanup is a terrible idea that if continued will have a disastrous outcome. Developers, insurers, and future homeowners are being misled to believe the land is cleaner than it really is.

Deep penetrating ordnance and most munitions constituents are not being looked for

<u>Study/Report</u>	<u>Site/Range</u>	<u>Ordnance suspected/discovered</u>	<u>Qty</u>
	Ranges 43-48	Projectile 22mm	multiple
		Projectile 37mm	multiple
		Projectile 57mm	multiple
		Projectile 75mm	multiple
		Projectile 84mm	multiple
		60mm Mortar	multiple
		81mm Mortar	multiple
		4.2 in mortar	multiple
		Projectile 105mm	multiple
		Projectile 155mm	multiple
	Laguna Seca Parking	7"- 8" Naval Rounds, Target Area	
		Not being looked for	
Del Rey Oaks / Monterey Munitions Response Areas		Practice Mortars/munitions constituents not being looked for	

Ft. Ord Ordnance Penetration Table

Ordnance Item	Depth of Penetration (ft)			Max. Detection Depth ¹ (ft)
	in Sand	in Loam	in Clay	
14.5 mm Trainer/Spotter, M181-3A1	-0.2	-0.3	-0.4*	-0.3
22 mm Subcal for 81 mm mortar	-1.4*	-1.9*	-2.8*	-0.5
35 mm Subcal M73	-0.5	-0.7	-1.0*	-0.9
37 mm, M63	-3.9*	-5.2*	-7.9*	-0.9
40 mm, M822 (AA)	-2.3*	-3.0*	-4.5*	-1.1
40 mm, M677 (Mk 19)	-0.2	-0.3	-0.4	-1.1
40 mm, M381 (M203/M79)	-0.2	-0.3	-0.4	-1.1
57 mm, M306A1	-2.7*	-3.6*	-5.5*	-1.7
M9 Rifle Grenade	-0.1	-0.2	-0.2	-1.7
60 mm, M49A1 (charge 4)	-1.1	-1.5	-2.3*	-1.9
2.36" Rocket, M6A1	-0.4	-0.5	-0.8	-1.9
66 mm, M72 LAW	-0.9	-1.2	-1.8	-2.1
66 mm TPA, M74	-0.7	-0.9	-1.4	-2.1
75 mm, M48	-4.9*	-6.4*	-9.8*	-2.5
75 mm, M310	-3.9*	-5.1*	-7.8*	-2.5
81 mm, M43A1 (charge 8)	-2.7	-3.5*	-5.4*	-2.8
83 mm SMAW Mk 3	-2.8	-3.6*	-5.6*	-2.9
84 mm, M136 (AT-4)	-2.5	-3.7*	-5.0*	-2.9
3.5" Rocket, M28	-0.8	-1.1	-1.7	-3.2
90 mm, M371A1	-2.0	-2.7	-4.1*	-3.2
25 lb Frag Bomb ²	-2.1	-2.8	-4.3*	-3.2
105 mm, M1 (charge 7)	-7.7*	-10.1*	-15.4*	-4.0
106 mm, M344A1	-6.5*	-8.5*	-13.0*	-4.0
Dragon Rocket	-0.9	-1.1	-1.7	-4.3
106 mm, M344A1	-6.5*	-8.5*	-13*	-4.0
4.2", M3 (max charge)	-4.1	-5.4*	-8.3*	-4.1
155 mm, M107	-14.0*	-18.4*	-28.0*	-6.7
8", M106 (charge 8)	-18.4*	-24.2*	-36.9*	-9.7

¹Maximum detection depth using a magnetometer.

²Maximum depth of penetration assuming a velocity of 500 fps.

*Indicates that maximum penetration depth exceeds maximum detection depth. In such cases it may be necessary to implement institutional controls at a site since a complete ordnance removal cannot be assured.

FT ORD MUNITION PENETRATION ANALYSIS

Range Number	Range Name	Design UXO ¹	Information Source	Maximum Munition Penetration Depth	Maximum Munition Detection Depth
1.	Flame Thrower Range	Landmine	HFA	n/a	-
2.	Pete's Pond	2.36" Rocket	ASR	0.4 ft	1.9 ft
3.	Old Demo Tng Area Range 49	81mm Mortar	HFA	2.7 ft	2.8 ft
4.	CBR Area	35mm Subcal M73	HFA	0.5 ft	0.9 ft
5.	CBR Area	40mm grenade	HFA	0.2 ft	1.1 ft
6.	CBR Area	Rifle Grenade	HFA	0.1 ft	1.7 ft
7.	South of East Garrison	3.5" Rocket	ASR	0.8 ft	3.2 ft
8.	Booby Traps & Landmines	Landmine	HFA	n/a	-
9.	Booby Traps & Landmines	Rifle Grenade	HFA	0.1 ft	1.7 ft
10.	Booby Traps & Landmines	Rifle Grenade	HFA	0.1 ft	1.7 ft
11.	Booby Traps & Landmines	57mm RR Ctg Case	HFA	surface	-
12.	Leary Hill & Elliot Hill Region	81mm Mortar	UXB/CMS	3.5 ft	2.8 ft
13.	Demolition Training Area	Hand Grenade	HFA	surface	-
14.	Picnic Canyon	40mm AA Projectile	ASR	2.3 ft	1.1 ft
15.	Practice Mortar Range	81mm Mortar, Practice	ASR	2.7 ft	2.8 ft
16.	Practice Mortar Range	Landmine	HFA	n/a	-
17.	Pilaritos Canyon & Lookout Ridge	8" Naval Projectile	ASR	18.4 ft	9.7 ft
18.	14 SE	Rifle Grenade	UXB	0.2 ft	1.7 ft
19.	2.36" Rocket Moving Target Range	2.36" Rocket	ASR	0.4 ft	1.9 ft
20.	Anti-Tank Practice Mine Area	Landmine	ASR	n/a	-
21.	100lb Bomb	concrete fill/unfuzed	HFA	surface	-
22.	Rifle Grenade Range	Rifle Grenade	HFA	0.1 ft	1.7 ft
23.	Recoilless Rifle Training Range	None	ASR, HFA	n/a	-
24.	Mudhen Lake	Rifle Grenade	UXB	0.2 ft	1.7 ft
25.	Beach Ranges Trainfire Ranges	60mm Mortar	HFA	1.1 ft	1.9 ft
26.	Demolition Area	M49 Tripflare	SASR	surface	-
27.	Practice Rifle Grenade Range	Rifle Grenade	SASR	0.1 ft	1.7 ft
28.	Practice Rifle Grenade Range	None	SASR	n/a	-
29.	Live Grenade Range	None	SASR	n/a	-
30.	Booby Traps	None	SASR	n/a	-
31.	Practice Rifle Grenade Range	None	SASR	n/a	-
32.	Firing Point	None	ASR, SASR	n/a	-
33.	Hilltop within P-5	Booby Trap Simulator	SASR	surface	-
34.	MOUT Site	Simulators	Bayuga	surface	-
35.	Laguna Seca Bus Turn Around	Rifle Grenade	UXB	0.2 ft	1.7 ft

Aug 19, 1997
rev 2

	Range Number	Range Name	Design UXO ¹	Information Source	Maximum Munition Penetration Depth	Maximum Munition Detection Depth
36.	LS OS	Laguna Seca Open Spaces	None		n/a	-
37.	LS T11	Laguna Seca Turn 11	75mm Projectile	UXB	5.1 ft	2.5 ft
38.	CSU Footprint	CSU Footprint	Rifle Grenade	HFA	0.1 ft	1.7 ft
39.	OWR 1	Oil Well Road 1	Signal, Illumination	UXB	surface	-
40.	OWR 2	Oil Well Road 2	Smoke Grenade	UXB	surface	-
41.	OWR 3	Oil Well Road 3	81mm Mortar	UXB	3.5 ft	2.8 ft
42.	TS24	Training Site 24	Rifle Grenade	UXB	0.1 ft	1.7 ft
43.	TS25	Training Site 25	Signal, Illumination	UXB	surface	-
44.	FRC	Range Control	Signal, Illumination	UXB	surface	-
45.	LOR 2	Lookout Ridge II	22mm subcal	HFA, UXB	1.9 ft	0.5 ft
46.		Wolf Hill	75mm Projectile	UXB	5.1 ft	2.5 ft
47.		Fritzsche AAF	2.36" Rocket	UXB	0.4 ft	1.9 ft

NOTES:

1. "Design UXO" is the deepest penetrating UXO found by on-site investigators or previous studies. However, the Design UXO used for this analysis may not be used as the Design UXO in the EE/CA if it is determined that the item was placed on the site, rather than fired, and represents a unique event.
2. This site contained a 220 lb Fragmentation Bomb which was inert and was most likely a training aid; therefore, the landmine was used for the deepest UXO.
3. This bomb contained no hazards and was most likely a training aid; therefore, the landmine is used for the deepest UXO.
4. Only one set of fins from the 60mm mortar were found. If this area were actually a mortar range more residue should have been found.

ATTACHMENT 15

**Email: Regulators and Developer
discussing cleanup policy**

compliant with CERCLA?

Quote from developer;

“However, I was told by Army today that someone at your office is talking about scanning, which our people take to mean scanning over the earth, when you find metal, you dig it up and clean up the area. I hope I or Rick misunderstood that.”

Are we to believe, if the developer discovers ordnance, they will disclose its discovery to regulators and the public? Another example of the failure of privatizing Superfund cleanup. The fox is guarding the hen house with the blessing of the regulators.

From: <Johnson.Kathleen@epamail.epa.gov>
To: <Chesnutt.John@epamail.epa.gov>, <Trombadore.Claire@epamail.epa.gov>, <S...
Date: 11/21/2006 9:01 AM
Subject: Fw: DRO

Kathleen H. Johnson
Chief, Federal Facility and Site Cleanup Branch
Superfund Division
U.S. EPA Region IX
75 Hawthorne Street, SFD - 8
San Francisco, CA 94105
johnson.kathleen@epa.gov
415/972-3873

----- Forwarded by Kathleen Johnson/R9/USEPA/US on 11/21/2006 08:50 AM -----

Keith
Takata/R9/USEPA/
US

To

11/17/2006 12:26 PM Kathleen Johnson, John Chesnutt,
Claire Trombadore/R9/USEPA/US@EPA
cc

Subject
Fw: DRO

I haven't read this yet, but here it is. Let's discuss next week before I respond.

From Keith Takata
Email: takata.keith@epa.gov
Phone: 415-947-8709
Fax: 415-947-3528

----- Forwarded by Keith Takata/R9/USEPA/US on 11/17/2006 12:24 PM -----

Ray Clark
<rayclark@clarkg
roupllc.com>

To

Keith Takata/R9/USEPA/US@EPA

11/17/2006 10:32
AM

cc

Subject

Re: DRO

Please respond
to
Ray Clark
<rayclark@clarkg
roupllc.com>

Keith,

To help prepare for the potential meeting, it would be helpful if we could all get on the same page with respect to the vocabulary that we are using for this site.

From the developer's perspective, we are anticipating implementing the MEC clearance protocol for planned residential sub-areas. The protocol was negotiated with DTSC, and we understand is technically accepted by EPA. It includes a new scan, and then removal of MEC-impacted soils, and then another scan to confirm that enough was removed, and if more MEC is discovered then the process has to be repeated until we have a "clean" scan of all residential areas of the site. (There is no "sifting" process - this was infeasible for various reasons.)

This protocol would be implemented as the first phase of the mass grading program - a program that will not begin until the whole of the development project is reviewed and approved under CEQA. Our team understood and agreed that this protocol would be endorsed by DTSC and commented on by EPA, before the Army amended the CRUP and authorized residential uses on cleared areas. The CRUP amendment would follow completion of the work, but DTSC/EPA acceptance of the protocol is needed now for a CEQA and public review process that has long been scheduled to start next week - a process now in limbo based on the current confusion.

We also understood that eventually the Army would complete a ROD, and that this would occur in tandem with de-listing this area or the whole of the base from the NPL. The ROD process was not required by the FOSET or CRUP to occur in tandem with DTSC's acceptance (and EPA's comment role) on the residential clearance protocol. We continue to believe this approach will satisfy everyone's needs, and no deviation from this approach (including an Army ROD) is required nor does it seem appropriate.

From the Army, however, we understand that a compromise position may be available that would work for everyone: the Army is willing to do a ROD that

approves the protocol now as the required activity that must be completed before the Army modifies the CRUP. We can potentially accept this compromise approach, and would like to work with the City and other interested parties to encourage everyone to accept it.

Any process that requires the protocol to be implemented now, or before the ROD is issued, would postpone the final remedial requirements to after implementation of the protocol and jeopardizes the project. This would be unacceptable for the financing of the project and the developer would find unacceptable. Both the procedural pre-requisites to undertaking this activity under state law, including most importantly CEQA's prohibition on piecemealing projects, and the financial costs of implementing this protocol with no assurance that it will - finally - be the accepted "final" remedial activities required by EPA or DTSC for the residential reuse of this site, make this "protocol-first, then ROD" approach unacceptable.

Because there have been so many terms used - "scan", "lift and sift", "protocol", "remediation grading", "scan as part of feasibility study", etc.

- we are no longer clear on what EPA is asking for. We are hopeful that either the original approach, or the approach suggested by the Army of using a ROD to require protocol implementation prior to CRUP amendment, will be acceptable to EPA.

Finally, we are anxious to assure that this process debate does not interfere with the progress made by all parties: My understanding from talking to numerous parties is that the protocol is technically sound and our team has been assured as much by DTSC and has been endorsed by EPA as well, there is a willing developer who upon completion of the required CEQA process for the whole of the redevelopment project (including protocol implementation for residential sub-areas) will pay for the implementation of the protocol to assure that residential redevelopment is a safe and appropriate use. Surely there is a process solution that will avoid another train wreck for Del Ray Oaks.

Keith, what hangs in the balance here is much needed affordable housing and the redevelopment of Ord. I think your leadership in this meeting is essential and as I said before, I would like to focus on outcomes, rather than process. The developer is dedicated to ensuring human health and safety and that's what we ought to be focused on. I think you can help us get there. I know the Army was very receptive to finding a win/win solution and even putting some more resources into making it happen. You know that I have always worked in this manner and I know you have as well. I am looking forward to working with you to help the folks in Del Rey Oaks.

Regards,

Ray

<Takata.Keith@epamail.epa.gov> wrote:

Ray, Kathleen will organize a meeting at her level which will include DTSC, the Army, DRO, and the developer in the next month. I think this meeting will go a long way in clearing up any misconceptions and who said what confusion. We should use that meeting to identify what we agree on and what needs to be elevated to a higher level. If we have to meet, Dec 18 works for me but it may be too close to the holidays for some people.

Keith

Keith Takata
US EPA, Region 9, Superfund
takata.Keith@epa.gov
415-947-8709

----- Original Message -----

From: Ray Clark [rayclark@clarkgroupllc.com]
Sent: 11/14/2006 04:26 PM
To: Keith Takata
Subject: DRO

Keith,

Thanks so much for taking the time to talk with me today. I think we are on the right track to making the DRO property work. Kathleen has been helpful as has Rick Newsome at the Army. The important point is that we meld all the documentation in a parallel process as Kathleen has suggested and we get a ROD as soon as possible and then move toward clean up. The developer is willing to do the work necessary and is not complaining about getting it right. And as you and Kathleen said, we ought to be able to get this done quickly. However, I was told by Army today that someone at your office is talking about scanning, which our people take to mean scanning over the earth, when you find metal, you dig it up and clean up the area. I hope I or Rick misunderstood that.

I do think this will take your leadership Keith. I believe that Rick Newsome is willing to invest some leadership and effort into it as well. I suggest that we pick a date (Dec 18th as an arbitrary start) and sit around a table focused on principles and outcomes, not process.

Thanks for all your help and advice.

Ray

ATTACHMENT 16

White Phosphorous Profiles

Phosphorous, White

- 1) EPA Phosphorus Hazard Summary 1992-2000
- 2) WHITE PHOSPHORUS Toxicological Profile
- 3) Scorecard PHOSPHORUS
- 4) EPA White phosphorus IRIS Summaries -Toxicological Reviews
- 5) White Phosphorus Sourcewatch

(1)

Phosphorus 7723-14-0

Technology Transfer Network Air Toxics Web Site
<http://www.epa.gov/ttn/atw/hlthef/whitepho.html>

Hazard Summary-Created in April 1992; Revised in January 2000

White phosphorus is used in the manufacture of munitions, pyrotechnics, explosives, smoke bombs, in artificial fertilizers, and rodenticides. White phosphorus is extremely toxic to humans, while other forms of phosphorus are much less toxic. Acute (short-term) oral exposure to high levels of white phosphorus in humans is characterized by three stages: the first stage consists of gastrointestinal effects; the second stage is symptom-free and lasts about two days; the third stage consists of a rapid decline in condition with gastrointestinal effects, plus severe effects on the kidneys, liver, cardiovascular system, and central nervous system (CNS). Inhalation exposure has resulted in respiratory tract irritation and coughing in humans. Chronic (long-term) exposure to white phosphorus in humans results in necrosis of the jaw, termed "phossy jaw." EPA has classified white phosphorus as a Group D, not classifiable as to human carcinogenicity.

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS), which contains information on oral chronic toxicity and the RfD, and the Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profile for White Phosphorus.

Uses

- Most phosphorus is used in the production of phosphoric acid and phosphates, which are used in the fertilizers industry. (4)
- White phosphorus is used in the manufacture of munitions, pyrotechnics, explosives, smoke bombs, in artificial fertilizers, rodenticides, phosphor bronze alloy, semiconductors, electroluminescent coating, and chemicals. (1,4)

Sources and Potential Exposure

- Occupational exposure to white phosphorus may occur for workers in the munitions and other industries. (1)
- Exposure may also occur during the military use of white phosphorus-containing munitions. (4)

Assessing Personal Exposure

- No information is available on the assessment of personal exposure to white phosphorus.

Health Hazard Information

Acute Effects:

- Acute oral exposure to high levels of white phosphorus in humans is characterized by three stages: the first stage consists of gastrointestinal effects; the second stage is symptom-free and lasts about 2 days; the third stage consists of a rapid decline in condition with severe gastrointestinal (vomiting, abdominal cramps and pain), kidney, liver, cardiovascular, and CNS effects. (1,2,4)
- Acute inhalation exposure has resulted in respiratory tract irritation and coughing in humans. (4)
- Respiratory, liver, and kidney effects have been reported in animals acutely exposed to white phosphorus smoke via inhalation. (4)
- Dermal exposure to white phosphorus in humans may result in severe burns, which are necrotic, yellowish, fluorescent under ultraviolet light, and have a garlic-like odor. (1)
- Acute animal tests in rats and mice have shown white phosphorus to have extreme acute toxicity from oral exposure. (3)

Chronic Effects (Noncancer):

- Chronic exposure to white phosphorus in humans results in necrosis of the jaw, termed "phossy jaw." Progressive symptoms begin as a local inflammation or irritation and proceed to swelling, ulceration, and destruction of the jawbone with perforation to the sinus or nasal cavities and externally to the cheek. (1,2,4,5,9)
- In one occupational study, anemia and leukopenia were observed. (4)
- Animal studies have reported effects on the blood from inhalation exposure to white phosphorus. (2)
- The Reference Dose (RfD) for white phosphorus is 0.00002 milligrams per kilogram body weight per day (mg/kg/d) based on reproductive effects (parturition mortality and forelimb hair loss in rats). The RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious noncancer effects during a lifetime. It is not a direct estimator of risk but rather a reference point to gauge the potential effects. At exposures increasingly greater than the RfD, the potential for adverse health effects increases. Lifetime exposure above the RfD does not imply that an adverse health effect would necessarily occur. (5)
- EPA has low confidence on the study on which the RfD was based because it does not provide unequivocal evidence of an adverse effect at the doses tested and lacked adequate assessment of developmental indices; low confidence in the database because studies indicate significant white phosphorus-related body weight and/or bone changes, but they have design deficiencies that lower the confidence in the reported observations; and, consequently, low confidence in the RfD. (5)
- EPA has not established a Reference Concentration (RfC) for white phosphorus. (5)
- The California Environmental Protection Agency (CalEPA) has calculated an inhalation reference exposure level of 0.00007 milligrams per cubic meter (mg/m³) based on a route to route extrapolation of EPA's RfD. The CalEPA reference exposure level is a concentration at or below which adverse health effects are not likely to occur. (9)

- ATSDR has calculated an acute inhalation minimal risk level (MRL) of 0.02 mg/m³ for white phosphorus smoke based on respiratory effects in humans. The MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse noncancer health effects over a specified duration of exposure. (4)

Reproductive/Developmental Effects:

- No information is available on the reproductive or developmental effects of white phosphorus in humans.
- An animal study reported a high maternal mortality rate from oral exposure to white phosphorus. (5)

Cancer Risk:

- No information is available on the carcinogenic effects of white phosphorus in humans or animals. (5)
- EPA has classified white phosphorus as a Group D, not classifiable as to human carcinogenicity. (5)

Physical Properties

- White or yellow white phosphorus is either a yellow or colorless, volatile crystalline solid that darkens when exposed to light and ignites in air to form white fumes and greenish light. (1)
- The chemical symbol for white phosphorus is P; the vapor has the formula P₄ and the molecular weight is 124.0 g/mol. (2)
- White phosphorus has a garlic-like odor. (4)
- The vapor pressure for white phosphorus is 0.026 mm Hg at 20 °C and the log octanol water partition coefficient (log Kow) is 3.08. (2,4)

Conversion Factors:

To convert concentrations in air (at 25 °C) from ppm to mg/m³: $mg/m^3 = (ppm) \times (molecular\ weight\ of\ the\ compound)/(24.45)$. For white phosphorus: 1 ppm = 5.1 mg/m³.

Health Data from Inhalation Exposure

CACGIH TLV--American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.

NIOSH IDLH -- National Institute of Occupational Safety and Health's immediately dangerous to life or health concentration; NIOSH recommended exposure limit to ensure that a worker can escape from an exposure condition that is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from the environment.

NIOSH REL--NIOSH's recommended exposure limit; NIOSH-recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.

OSHA PEL--Occupational Safety and Health Administration's permissible exposure limit expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects averaged over a normal 8-h workday or a 40-h workweek.

The health and regulatory values cited in this factsheet were obtained in December 1999.

^a Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

^b Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice. OSHA numbers are regulatory, whereas NIOSH and ACGIH numbers are advisory.

References

- 1) M. Sittig. *Handbook of Toxic and Hazardous Chemicals and Carcinogens*. 2nd ed. Noyes Publications, Park Ridge, NJ. 1985.
- 2) U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
- 3) U.S. Department of Health and Human Services. Registry of Toxic Effects of Chemical Substances (RTECS, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
- 4) Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for White Phosphorus*. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 1997.
- 5) U.S. Environmental Protection Agency. *Integrated Risk Information System (IRIS) on White Phosphorus*. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. 1999.
- 6) American Conference of Governmental Industrial Hygienists (ACGIH). *1999 TLVs and BEIs. Threshold Limit Values for Chemical Substances and Physical Agents. Biological Exposure Indices*. Cincinnati, OH. 1999.
- 7) National Institute for Occupational Safety and Health (NIOSH). *Pocket Guide to Chemical Hazards*. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention. Cincinnati, OH. 1997.
- 8) Occupational Safety and Health Administration (OSHA). Occupational Safety and Health Standards, Toxic and Hazardous Substances. *Code of Federal Regulations* 29 CFR 1910.1000. 1998.
- 9) California Environmental Protection Agency (CalEPA). *Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels. Draft for Public Comment*. Office of Environmental Health Hazard Assessment, Berkeley, CA. 1997.

(2)
WHITE PHOSPHORUS
ATSDR Toxicological Profile
<http://www.atsdr.cdc.gov/toxprofiles/tp103-c5.pdf>

5.2.3 Soil

The field use of WP/F and red phosphorus/butyl rubber smoke/obscurant releases elemental phosphorus into soil primarily as unburnt phosphorus in munitions (Berkowitz et al. 1981; Van Voris et al. 1987). During the deployment of ammunition, a significant amount of phosphorus may remain unoxidized in the form of unburnt elemental phosphorus.

5.3.1 Transport and Partitioning

Elemental phosphorus particles with diameters ranging from 0.015 to 3.0 mm were isolated from pond sediment samples of Eagle River Flats in Alaska (Bird 1991). The estimated soil sorption coefficient (K_{oc}) value of 3.05 (see Table 3-2) indicates that both the water-soluble and colloidal forms of white phosphorus in the water phase may sorb moderately to particulate matter in water (Spanggord et al. 1985; Swann et al. 1983). The particle-sorbed phosphorus is eventually transported to the sediment. Volatilization from water to air is another mode of transport of white phosphorus.

5.3.2.1 Air

WP/F reacted rapidly in air with an estimated half-life of ≈ 5 minutes (Spanggord et al. 1985). However, the deployment of the military smoke/obscurant in the field may produce an estimated 10% of unburnt phosphorus (Spanggord et al. 1985).

5.6 POPULATIONS WITH POTENTIALLY HIGH EXPOSURES

The general population that lives near elemental phosphorus production sites, white phosphorus user sites (e.g., Pine Bluff Arsenal in Arkansas), artillery training sites (e.g., Eagle River Flats, Anchorage, Alaska), and dumpsites that contain elemental phosphorus may be exposed to elemental phosphorus at levels higher than the control population. The exposure could occur from inhalation of contaminated air, consumption of contaminated fish or game birds, and skin exposure from bathing in contaminated water. Additionally, children living near phosphorus-containing hazardous waste sites may be exposed to elemental phosphorus by dirt ingestion and/or skin contact while playing at unrestricted dumpsites. People who live near accidental spill sites (e.g., spill in Miamisburg, Ohio) are a likely population with potentially high exposures. However, reports providing evidence of these exposures were not located. As discussed in Section 5.5, people who work in user sites and possibly production sites, waste disposal sites, and military personnel using phosphorus-containing ammunitions are likely populations with potentially high exposures.

5.7 ADEQUACY OF THE DATABASE

Section 104(l)(5) of CERCLA, as amended, directs the Administrator of ATSDR (in consultation with the Administrator of EPA and agencies and programs of the Public Health Service) to assess whether adequate information on the health effects of white phosphorus is available. Where adequate information is not available, ATSDR, in conjunction with the NTP, is required to assure the initiation of a program of

research designed to determine the health effects (and techniques for developing methods to determine such health effects) of white phosphorus.

The following categories of possible data needs have been identified by a joint team of scientists from ATSDR, NTP, and EPA. They are defined as substance-specific informational needs that if met would reduce the uncertainties of human health assessment. This definition should not be interpreted to mean that all data needs discussed in this section must be filled. In the future, the identified data needs will be evaluated and prioritized, and a substance-specific research agenda will be proposed.

5.7.1 Identification of Data Needs

Physical and Chemical Properties. Data such as $\log K_{ow}$, $\log K_{oc}$ and the Henry's law constant needed for estimating the environmental transport of elemental phosphorus are available (see Table 3-2). However, an experimentally determined and reliable $\log K_{oc}$ value for elemental phosphorus would be helpful.

Production, Import/Export, Use, Release, and Disposal. Although the current production capacity of elemental phosphorus in the United States is available (SRI 1992), the amount of elemental phosphorus actually produced is not known. The future trend for the demand of elemental phosphorus is expected to decrease by 1-2% in this decade (CMR 1991). Although some fluctuation has been observed, the export of elemental phosphorus remained constant at 5% of production during the past couple of decades (CMR 1991, 1985, 1981, 1978). The import of elemental phosphorus is expected to be low because the production capacity in the United States is higher than the demand (CMR 1991); but recent import data were not located in the literature.

The uses of elemental phosphorus in the United States are known (CMR 1991; EPA 1991; Van Wazer 1982). There is no evidence that elemental phosphorus is used in any consumer products other than rat poisons. Fish and game birds collected from the vicinity of production and user locations may contain elemental phosphorus (Addison et al. 1972b; Pearson et al. 1976; Racine et al. 1992a, 1992b). There is evidence that significant exposures could occur in workplaces where elemental phosphorus is handled (Berkowitz et al. 1981). Monitoring data indicate that significant quantities of elemental phosphorus can be found in sediment and in certain game birds near use sites (Pearson et al. 1976; Racine et al. 1992a, 1992b; Spanggord et al. 1985). Although some of the disposal methods used for elemental phosphorus are known (Berkowitz et al. 1981; HSDB 1993; Uhrmacher et al. 1985), the efficiency of these methods for the destruction of elemental phosphorus is not known. Information about the amounts of elemental phosphorus disposed of by each method is not known. EPA does regulate the disposal of elemental phosphorus-containing wastes in water and soil (EPA 1992a, 1992b).

According to the Emergency Planning and Community Right-to-Know Act of 1986, 42 U.S.C. Section 11023, industries are required to submit substance release and off-site transfer information to the EPA. The Toxics Release Inventory (TRI), which contains this information for 1993, became available in May of 1995. This database will be updated yearly and should provide a list of industrial production facilities and emissions.

Environmental Fate. Elemental phosphorus partitions from water to sediment (Berkowitz et al. 1981) transporting elemental phosphorus to sediment. Volatilization from water and soil transports small amounts of elemental phosphorus to air (Spanggord et al. 1985; Wamock 1972). Elemental phosphorus quickly oxidizes and hydrolyzes in air and in aerobic zones of water and soil to produce mainly oxides and acids of phosphorus, except when covered by a protective coating of phosphorus oxides (Bohn et al. 1970; Bullock

and Newlands 1969; EPA 1991; Lai and Rosenblatt 1977a; Rodriguez et al. 1972; Spanggord et al. 1985; Zitko et al. 1970). However, elemental phosphorus reaching the anaerobic zones of sediment and soil may persist for periods of 10-10,000 years (Richardson 1992; Spanggord et al. 1985). Therefore, anaerobic zones of soil and sediment may act as a sink for elemental phosphorus.

Bioavailability from Environmental Media. The bioavailability of elemental phosphorus following inhalation, oral, and dermal contact is poorly understood (see Section 2.3). The estimated log K_{oc} for elemental phosphorus is 3.05 (See Table 3-2). Therefore, elemental phosphorus is moderately sorbed to aerosol particles in air, to sediment in water, and to soil. However, due to its high reactivity, elemental phosphorus may not be found in aerobic zones of soil and water, unless the element is protected from oxidation by unreactive oxide coating (Berkowitz et al. 1981). Its bioavailability in the sorbed state from inhaled air, ingested soil, and dermal contact with soil and water may be lower than the free form of the element under identical conditions.

Food Chain Bioaccumulation. Elemental phosphorus moderately bioconcentrates in aquatic organisms (Bentley et al. 1978; Fletcher 1971; Maddock and Taylor 1976). The biomagnification potential for elemental phosphorus in predators resulting from consumption of contaminated prey organisms has not been studied systematically. However, high concentrations of elemental phosphorus have been found in tissues of certain kinds of bottom-feeding waterfowls (Bird 1991; Racine et al. 1992a, 1992b). Elemental phosphorus has also been found in a dead bald eagle collected in the vicinity of Eagle River Flats (Bird 1991).

Exposure Levels in Environmental Media. With the exception of occupational air, monitoring data on the concentrations of elemental phosphorus in nonoccupational air, drinking water, and total diet were not located. The estimated value for the total human intake of elemental phosphorus from various environmental media is not available.

Reliable monitoring data for the levels of white phosphorus in contaminated media at hazardous waste sites are needed so that the information obtained on levels of white phosphorus in the environment can be used in combination with the known body burden of white phosphorus to assess the potential risk of adverse health effects in populations living in the vicinity of hazardous waste sites. **Exposure Levels in Humans.** Data regarding the levels of elemental phosphorus in human tissues such as, blood, urine, fat, and breast milk, were not located in the literature. Such data, especially for occupationally exposed populations and populations surrounding hazardous waste sites, could be important. This information is necessary for assessing the need to conduct health studies on these populations.

Exposure Registries. No exposure registries for white phosphorus were located. This substance is not currently one of the compounds for which a subregistry has been established in the National Exposure Registry. The substance will be considered in the future when chemical selection is made for sub registries to be established. The information that is amassed in the National Exposure Registry facilitates the epidemiological research needed to assess adverse health outcomes that may be related to exposure to this substance.

5.7.2 On-going Studies

No on-going studies were located.

(3)

PHOSPHORUS

<http://www.scorecard.org/chemical-profiles/html/phosphorus.html>

Phosphorus is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 7723-14-0

Molecular Formula: P

Phosphorus exists in three main allotropic forms: white, black, and red. When melted, the same liquid is obtained from these forms. Phosphorus atoms exist as symmetrical, tetrahedral P₄ molecules as liquid and vapor below 800 °C; molecules dissociate to P₂ above 800 °C.

Black phosphorus is polymorphic, occurring in orthorhombic crystalline form or at higher pressures in the rhombohedral form. The black solid resembles graphite and is obtained by heating white phosphorus under high pressure. It is very stable and insoluble in most solvents.

White phosphorus is a colorless to yellow, transparent, crystalline solid which darkens on exposure to light. The yellow coloring results from impurities. It has a waxy appearance, high electrical resistivity, is insoluble in water and alcohol, but is soluble in carbon disulfide, some organic solvents, and oils, and has phosphorescent properties at room temperature. There are two allotropic forms (alpha and beta). When exposed to air, phosphorus emits white fumes and can spontaneously ignite. Therefore, it should be stored under water. White phosphorus can form compounds with halogens, sulfur, metals, nitric acid, and alkali hydroxides.

Red phosphorus occurs as a violet-red amorphous powder and exhibits polymorphism. It is less reactive than white phosphorus, although it is flammable at 500 °C, has high electrical resistivity, is insoluble in most solvents, and the properties of red phosphorus are intermediate between white and black. Red phosphorus is obtained by heating white phosphorus at 240 °C with a catalyst (Merck, 1989; Sax, 1987).

Physical Properties of Phosphorus

Synonyms:	black phosphorus = none white phosphorus = yellow phosphorus; Bonide Blue Death Rat Killer; Rat-Nip red phosphorus = phosphorus, amorphous, red
Molecular Weight:	30.97376
Boiling Point:	280 °C
Melting Point:	44.1 °C (white) 590 °C (black/red)

Vapor Pressure:	1 mm Hg at 43 atm (white)
Vapor Density:	4.42 (white) (water = 1) 4.77 (red) (water = 1)
Density/Specific Gravity at 20/4 °C:	1.88 (white) (water = 1) 2.70 (black) 2.34 (red)
Conversion Factor:	1 ppm = 1.27 mg/m ³

Source: (Merck, 1989; Sax, 1989; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

A. Sources

White phosphorus is used in rodenticides, smoke screens, tracer bullets, fertilizers, and gas analysis. Red phosphorus is used to manufacture phosphoric acid and other phosphorus compounds, phosphor bronzes, and metallic phosphides, and as an additive to semiconductors, electroluminescent coatings, safety matches, and fertilizers (Merck, 1989). Phosphorous is registered as a vertebrate control agent. It is used for the control of rodents, where they have become a pest problem. The licensing and regulation of pesticides for sale and use in California are the responsibility of the Department of Pesticide Regulation (DPR). Information presented in this fact sheet regarding the permitted pesticidal uses of phosphorous has been collected from pesticide labels registered for use in California and from DPR's pesticide databases. This information reflects pesticide use and permitted uses in California as of October 15, 1996. For further information regarding the pesticidal uses of this compound, please contact the Pesticide Registration Branch of DPR (DPR, 1996).

The primary stationary sources that have reported emissions of phosphorus and phosphorus compounds in California are electrical services, crude petroleum and natural gas extraction, and electrical, gas and sanitary services (ARB, 1997b).

B. Emissions

The total emissions from stationary sources in California are estimated to be at least 41,000 pounds per year phosphorus and at least 56,000 pounds per year for phosphorus compounds, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

Phosphorus is a constituent of the earth's crust at about 0.12 percent. It doesn't occur free in nature, but is found in the form of phosphates in different minerals such as chlorapatite, fluorapatite, vivianite, wavellite, and phosphorite. Phosphorite nodules on the ocean floor and fertile soil contain phosphorus. Phosphorus is found in small amounts in granite. It is an essential element for protoplasm, bone, and nervous tissue (Merck, 1989; Sax, 1987).

AMBIENT CONCENTRATIONS

Phosphorus is routinely monitored by the statewide Air Resources Board air toxics network. The network's mean concentration of phosphorus from January 1996 through December 1996 is estimated to be 55.9 nanograms per cubic meter or 0.04 parts per billion (ARB, 1997c).

INDOOR SOURCES AND CONCENTRATIONS

In a field study conducted in southern California, investigators collected particles (PM10) inside 178 homes and analyzed the particle samples for selected elements, including phosphorus. Two consecutive 12-hour samples were collected inside and immediately outside each home. Phosphorus was present in measurable amounts in less than 30 percent of the indoor or outdoor samples (Pellizzari et al., 1992).

ATMOSPHERIC PERSISTENCE

Phosphorus will exist in the particle phase in the atmosphere, and hence is subject to wet and dry deposition. The average half-life and lifetime for particles in the troposphere is estimated to be about 3.5 to 10 days and 5 to 15 days, respectively (Balkanski et al., 1993; Atkinson, 1995).

AB 2588 RISK ASSESSMENT INFORMATION

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics "Hot Spots" Program (AB 2588). Of the risk assessments reviewed as of December 1996, for non-cancer health effects, phosphorus contributed to the total hazard index in 6 of the approximately 89 risk assessments reporting a total chronic hazard index greater than 1 (OEHHA, 1996b).

HEALTH EFFECTS
Probable routes of human exposure to phosphorus are inhalation, ingestion, and dermal contact (Sittig, 1991).

Non-Cancer: Phosphorus is extremely toxic to humans and short-term exposure may be fatal. Acute overexposure may adversely affect the liver, kidney, cardiovascular, and gastrointestinal systems (U.S. EPA, 1994a). Yellow phosphorus fumes are highly irritating to the respiratory tract and also cause severe eye irritation. On contact with the skin it may ignite and produce severe skin burns with blistering. Red phosphorus irritates the eyes (Sittig, 1991). Long-term exposure to white phosphorus may result in necrosis of the jaw, known as "phossy jaw" (U.S. EPA, 1994a).

A chronic non-cancer Reference Exposure Level (REL) of 7.0×10^{-2} micrograms per cubic meter is listed for white phosphorus in the California Air Pollution Control Officers Association Air Toxics "Hot Spots" Program, Revised 1992 Risk Assessment Guidelines. The toxicological endpoint considered for chronic toxicity is the reproductive system including teratogenic and developmental effects (CAPCOA, 1993). The United States Environmental Protection Agency (U.S. EPA) has established an oral Reference Dose (RfD) of 2×10^{-5} milligrams per kilogram per day for white phosphorus based on parturition mortality and forelimb hair loss in rats. The U.S. EPA estimates that consumption of this dose or less, over a lifetime, would not likely result in the occurrence of chronic, non-cancer effects. The Reference Concentration (RfC) for white phosphorus is under review by the U.S. EPA (U.S. EPA, 1994a).

No information is available on adverse reproductive or developmental effects in humans. A high maternal mortality rate was reported from oral exposure to white phosphorus in an animal study (U.S. EPA, 1994a).

Cancer: No information is available regarding the carcinogenic effects of white phosphorus in humans or animals. The U.S. EPA has classified white phosphorus in Group D: Not classifiable as to human carcinogenicity (U.S. EPA, 1994a). The International Agency for Research on Cancer has not classified phosphorus as to its carcinogenicity (IARC, 1987a).

White phosphorus (CASRN 7723-14-0)

<http://www.epa.gov/iris/subst/0460.htm>

IRIS Summaries/Toxicological Reviews

- 0460
- **White phosphorus; CASRN 7723-14-0**
- Health assessment information on a chemical substance is included in IRIS only after a comprehensive review of chronic toxicity data by U.S. EPA health scientists from several Program Offices and the Office of Research and Development. The summaries presented in Sections I and II represent a consensus reached in the review process. Background information and explanations of the methods used to derive the values given in IRIS are provided in the Background Documents.

STATUS OF DATA FOR White phosphorus

File First On-Line 08/01/1990:

Category (section)	Status	Last Revised
Oral RfD Assessment (I.A.)	on-line	02/01/1993
Inhalation RfC Assessment (I.B.)	no data	11/01/1993
Carcinogenicity Assessment (II.)	on-line	02/01/1993

I. Chronic Health Hazard Assessments for Noncarcinogenic Effects

I.A. Reference Dose for Chronic Oral Exposure (RfD)

Substance Name — White phosphorus

CASRN — 7723-14-0

Last Revised — 02/01/1993

The oral Reference Dose (RfD) is based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis. It is expressed in units of mg/kg-day. In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Please refer to the Background Document for an elaboration of these concepts. RfDs can also be derived for the noncarcinogenic health effects of substances that are also carcinogens. Therefore, it is essential to refer to other sources of information concerning the carcinogenicity of this substance. If the U.S. EPA has evaluated this substance for potential human carcinogenicity, a summary of that evaluation will be contained in Section II of this file.

I.A.1. Oral RfD Summary:

Critical Effect	Experimental Doses*	UF	MF	RfD
Parturition mortality;	NOAEL: 0.015 mg/kg/day	100		2E-5
forelimb hair loss	LOAEL: 0.075 mg/kg/day	0	1	mg/kg/day
Reproductive Rat Study				
Condray, 1985				

*Conversion Factors: None

I.A.2. Principal and Supporting Studies (Oral RfD)

Condray, J.R. 1985. Elemental yellow phosphorus one-generation reproduction study in rats. IR-82-215; IRD No. 401-189. Monsanto Company, St. Louis, MO.

Elemental yellow (white) phosphorus in corn oil was administered orally by gavage to groups of 15 males and 30 female Sprague-Dawley rats at doses of 0, 0.005, 0.015, or 0.075 mg/kg/day beginning at 80 days prior to mating and continuing through weaning of two complete reproductive cycles. A mortality rate of 53%, reported in the high-dose females, was attributed to difficulty during parturition, with 13 of 16 deaths occurring on days 21 or 22 of gestation. No specific cause was determined but this finding is uncommon during rat reproduction studies and may be attributed to white phosphorus administration. Hair loss was evident on the forelimbs of this group. A slight but not significant decrease in mean number of viable pups in the F1a litter was reported with a concomitant increase in mean number of dead pups. A similar trend was observed in the F1b litter. All other findings were comparable to controls.

Mean body weight of the high dose males was lower than controls beginning at 15 weeks of treatment, while body weights of the males receiving the two remaining test doses were slightly, but not significantly, lower than controls throughout the study. The NOAEL was 0.015 mg/kg/day and the LOAEL was 0.075 mg/kg/day for effects of white phosphorus on parturition.

White phosphorus was incorporated into the diets of young female albino rats (6 to 10/group) and fed at median doses of 0.0032, 0.018, or 0.072 mg/kg/day for 22 weeks and to 10 older male rats at a median dose of 0.0027 mg/kg/day for 25 weeks (Sollmann, 1925). Half of the animals from each female rat group were removed from the test diet during the later part of the experiment and they were observed in the same manner as the animals that continued to receive the test diet. A zero dose concurrent control group was not included in the experiment; however, the results from this study were compared to "normal growth curves" determined by the author and others in 13 previous investigations using a total of 72 rats.

The 0.072 mg/kg/day group (i.e., the high-dose group) exhibited 30% (3/10) mortality and a marked and progressive weight loss. Upon termination of the experiment the final weight of the animals was 41% below normal. No recovery was evident when the test diet was removed from a part of the test group after 10 weeks, but the progressive weight loss was checked. There was 50% (3/6) mortality for the 0.018 mg/kg/day group and growth was below normal resulting in a final weight 15% less than normal. When the test diet was removed from several animals in this dose group their growth returned to normal. There

was a check in growth at 15 weeks and an overall mortality of 33% (2/6) for the 0.0032 mg/kg/day animals. There was no definite growth effect prior to 15 weeks. When animals from this group were removed from the diet their weights increased to levels greater than normal.

The male rats that received 0.0027 mg/kg/day demonstrated greater weight gain than normal while remaining on the test diet. They had a 10% (1/10) mortality; however, no other treatment related effects or toxicity signs were reported. The median dose of 0.0027 was considered the NOAEL from this study based upon body weight gain.

White phosphorous was administered daily to young rabbits (15-17) by oral insertion of a tablet containing 0.6 mg white phosphorus (equivalent to approximately 0.3 mg/kg/day for a 2 kg rabbit) for a period of 13 to 117 days (Adams and Sarnat, 1940). Fourteen young rats received white phosphorus in cod liver oil in the diet at a concentration of 0.01% for 22 to 57 days (equivalent mg/kg/day doses could not be estimated from available data). Treated rabbits exhibited a decrease in weight gain as well as in the average daily growth of the tibial diaphysis (0.27 mm vs 0.36 mm in controls). A retardation of the normal tubulation process was reported when white phosphorus was administered to rats for 4 weeks or longer. Histological examination of rabbit long bones revealed a narrowing of the epiphyseal cartilage plate, reduction in number of cartilage cells/column, increased density in metaphyseal zone along with a greater number of trabeculae containing increased amounts of calcified cartilage matrix. In some cases, the hemopoietic marrow of the bone was replaced with loose fibrous tissue. Examination of the teeth revealed zones of abnormal dentin corresponding to periods of white phosphorus ingestion, but changes were considered non-specific.

A solution of white phosphorus in peanut oil was incorporated into stock diets and fed to groups of domestic male and female rats (6/group) at doses of 0, 0.2, 0.4, 0.8, and 1.6 mg/kg/day over their lifetime (approximately 420 days average duration) (Fleming et al., 1942). While mortality decreased with decreasing dose of white phosphorus, background mortality of controls was reported to be higher than in groups receiving the lower doses of white phosphorus. Retardation of weight gain was reported and those animals fed the larger doses also exhibited a definite loss of appetite. All treated animals showed changes in the bone consisting of a thickening of the epiphyseal line and extension of the trabeculae into the shaft. No other changes related to ingestion of white phosphorus were seen. A NOAEL/LOAEL could not be determined.

I.A.3. Uncertainty and Modifying Factors (Oral RfD)

UF — This uncertainty factor includes a factor of 10 for interspecies diversity, 10 for intraspecies diversity, and 10 for incomplete reproductive/ developmental data and a less than adequate lifetime study.

MF — None

I.A.4. Additional Studies/Comments (Oral RfD)

In humans, white phosphorus toxicity is associated with its use in matches during the 1830s and later in fireworks and rodent poisons. The reported acute effects of white phosphorus are conflicting; however, chronic effects of white phosphorus on the bone are

widely known. Acute effects have been reported from cases of accidental or intentional (suicidal) ingestion sometimes in combination with other substances such as alcohol. The reports indicate that acute ingestion affects the liver, kidney, hematopoietic system, brain, intestines, circulatory system and the myocardium resulting in electrocardiographic changes (Davidson et al., 1987). Deaths usually occurred within the first 24 hours. A minimum lethal dose of 1 mg/kg has been reported, and in a child, death has occurred after the consumption of as little as 3 mg (Brewer and Haggerty, 1958; Dacre and Rosenblatt, 1974; Davidson et al., 1987). The white phosphorus doses reported in the acute poisoning cases were estimated, therefore exact dose-response relationships cannot be determined. Chronic exposure to white phosphorus in man has been associated with a progressive necrotic disease of the jaw bones known as "phossy jaw" (Davidson et al., 1987). Cases of this disease have been observed among workers in the phosphorus match industry (white phosphorus is no longer used for this purpose), firecracker manufacture, and white phosphorus production. The disease often takes years to develop and its pathogenesis currently is uncertain. The most widely held theory is that the phosphorus enters the jaw directly, reacts with the mouth flora, and subsequent infection develops followed by the disease. Even though several investigators report the occurrence of this disease in workers, dose information either is lacking entirely or a surrogate exposure measure, i.e., exposure time, is reported.

I.A.5. Confidence in the Oral RfD

Study — Low

Database — Low

RfD — Low

On its merits an RfD based on the Condray (1985) study has low confidence. The study does not provide unequivocal evidence of an adverse effect from white phosphorus exposure at the doses tested. The mortality in female rats during parturition was considered by the author to be related to white phosphorus exposure. However, the exact nature of the deaths was not examined as to conclusively implicate white phosphorus. The study also lacked adequate assessment of developmental indices.

The supporting studies indicate significant white phosphorus-related body weight and/or bone changes, but they have design deficiencies that lower the confidence in the reported observations. The investigation by Sollmann (1925) did not use concurrent controls, treatment groups differed by sex, and judging from the initial weight at the beginning of the study, the test animals appeared to be from different age groups. The studies by Adams and Sarnat (1940) and Fleming et al. (1942) both suggest white phosphorus-induced bone growth retardation; however, the numbers of animals in the dose groups were small and in some cases the exact dose of the test compound administered could not be determined.

I.A.6. EPA Documentation and Review of the Oral RfD

Source Document — This assessment is not presented in any existing U.S. EPA document.

Other EPA Documentation — None

Agency Work Group Review — 05/17/1990

Verification Date — 05/17/1990

Screening-Level Literature Review Findings — A screening-level review conducted by an EPA contractor of the more recent toxicology literature pertinent to the RfD for white

phosphorus conducted in August 2003 did not identify any critical new studies. IRIS users who know of important new studies may provide that information to the IRIS Hotline at hotline.iris@epa.gov or 202-566-1676.

__I.A.7. EPA Contacts (Oral RfD)

Please contact the IRIS Hotline for all questions concerning this assessment or IRIS, in general, at (202)566-1676 (phone), (202)566-1749 (FAX) or hotline.iris@epa.gov (internet address).

__I.B. Reference Concentration for Chronic Inhalation Exposure (RfC)

Substance Name — White phosphorus

CASRN — 7723-14-0

Not available at this time.

__II. Carcinogenicity Assessment for Lifetime Exposure

Substance Name — White phosphorus

CASRN — 7723-14-0

Last Revised — 02/01/1993

Section II provides information on three aspects of the carcinogenic assessment for the substance in question; the weight-of-evidence judgment of the likelihood that the substance is a human carcinogen, and quantitative estimates of risk from oral exposure and from inhalation exposure. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. The rationale and methods used to develop the carcinogenicity information in IRIS are described in The Risk Assessment Guidelines of 1986 (EPA/600/8-87/045) and in the IRIS Background Document. IRIS summaries developed since the publication of EPA's more recent Proposed Guidelines for Carcinogen Risk Assessment also utilize those Guidelines where indicated (Federal Register 61(79):17960-18011, April 23, 1996). Users are referred to Section I of this IRIS file for information on long-term toxic effects other than carcinogenicity.

__II.A. Evidence for Human Carcinogenicity

__II.A.1. Weight-of-Evidence Characterization

Classification — D; not classifiable as to human carcinogenicity

Basis — Based on no data in humans or animals

__II.A.2. Human Carcinogenicity Data

None.

__II.A.3. Animal Carcinogenicity Data

None.

II.A.4. Supporting Data for Carcinogenicity

Groups of 6 to 10 male and female rats received subcutaneous injections of elemental phosphorus in vegetable oil solutions at 0.5-3.2 mg/kg/day in two injections/week for life. A control group received injections of oil alone (Fleming et al., 1942). The range of the average group survival was 3.2 to 610 days. No evidence of treatment-related lesions was noted. This study, however, was not designed as a carcinogenicity bioassay, and is further limited by the use of a small number of animals. In addition, the maximum tolerated dose was not achieved.

Mutagenicity testing with several strains of *Salmonella typhimurium* did not result in a significant increase in the number of revertant colonies with or without metabolic activation (Ellis et al., 1978).

II.B. Quantitative Estimate of Carcinogenic Risk from Oral Exposure

None.

II.C. Quantitative Estimate of Carcinogenic Risk from Inhalation Exposure

None.

II.D. EPA Documentation, Review, and Contacts (Carcinogenicity Assessment)

II.D.1. EPA Documentation

Source Document — U.S. EPA, 1990

The 1990 Health Advisory for White Phosphorus has received Agency Review.

II.D.2. EPA Review (Carcinogenicity Assessment)

Agency Work Group Review — 06/15/1990

Verification Date — 06/15/1990

Screening-Level Literature Review Findings — A screening-level review conducted by an EPA contractor of the more recent toxicology literature pertinent to the cancer assessment for white phosphorus conducted in August 2003 did not identify any critical new studies. IRIS users who know of important new studies may provide that information to the IRIS Hotline at hotline.iris@epa.gov or 202-566-1676.

II.D.3. EPA Contacts (Carcinogenicity Assessment)

Please contact the IRIS Hotline for all questions concerning this assessment or IRIS, in general, at (202)566-1676 (phone), (202)566-1749 (FAX) or hotline.iris@epa.gov (internet address).

III. [reserved]

IV. [reserved]

V. [reserved]

VI. Bibliography

Substance Name — White phosphorus

CASRN — 7723-14-0

Last Revised — 07/01/1993

VI.A. Oral RfD References

Adams, C.O. and B.G. Sarnat. 1940. Effects of yellow phosphorus and arsenic trioxide on growing bones and growing teeth. Arch. Pathol. 30: 1192-1201.

Brewer, E. and R.J. Haggerty. 1958. Toxic Hazards * Rat Poisons. II - Phosphorus. N. Eng. J. Med. 258(3): 147-148.

Condray, J.R. 1985. Elemental yellow phosphorus one-generation reproduction study in rats. IR-82-215; IRD No. 401-189. Monsanto Company, St. Louis, MO.

Dacre, J.C. and D.H. Rosenblatt. 1974. Mammalian toxicology and toxicity to aquatic organisms of four important types of waterborne munitions pollutants - An extensive literature evaluation. Technical Report No. 7403. U.S. Army Medical Bioengineering Research and Development Laboratory, Aberdeen Proving Ground, Ft. Detrick, Frederick, MD. NTIS AD778-725.

Davidson, K.A., P.S. Hovatter and C.F. Sigmon. 1987. Water quality criteria for white phosphorus. Final Report ORNL - 6336. Oak Ridge National Laboratory. AD-A186613.

Fleming, R.B.L., J.W. Miller and V.R. Swayne, Jr. 1942. Some recent observations on phosphorus toxicology. J. Ind. Hyg. Toxicol. 24(6): 154-158.

Sollmann, T. 1925. Studies of chronic intoxications on albino rats. VIII. Yellow phosphorus. J. Pharmacol. Exp. Therap. 24: 119-122.

VI.B. Inhalation RfC References

None

VI.C. Carcinogenicity Assessment References

Ellis, H.V., III, J.R. Hodgson, S.W. Hwang, et al. 1978. Mammalian toxicity of munitions compounds Phase I: Acute oral toxicity, primary skin and eye irritation, dermal sensitization, disposition and metabolism, and Ames tests of additional compounds.

Progress report No. 6, prepared by Midwest Research Institute and submitted to U.S. Army Medical Bioengineering Research and Development Laboratory, Environmental Protection Research Division, Fort Detrick, Frederick, MD. December 8, 1978.

Fleming, R.B.L., J.W. Miller and V.R. Swayne, Jr. 1942. Some recent observations on phosphorus toxicology. J. Ind. Hyg. Toxicol. 24(6): 154-158.

U.S. EPA. 1990. Health Advisory for White Phosphorus. Office of Drinking Water, Washington, DC. (Draft)

VII. Revision History

Substance Name — White phosphorus

CASRN — 7723-14-0

Date	Section	Description
08/01/1990	I.A.	Oral RfD summary on-line
08/01/1990	VI.	Bibliography on-line
12/01/1990	II.	Carcinogen assessment on-line
12/01/1990	VI.C.	Carcinogen assessment references added
01/01/1992	IV.	Regulatory Action section on-line
02/01/1993	I.A.7.	Primary contact changed
02/01/1993	II.D.3.	Primary contact changed
07/01/1993	VI.C.	References alphabetized correctly
11/01/1993	I.B.	Inhalation RfC now under review
08/01/1995	I.B.	EPA's RfD/RfC and CRAVE workgroups were discontinued in May, 1995. Chemical substance reviews that were not completed by September 1995 were taken out of IRIS review. The IRIS Pilot Program replaced the workgroup functions beginning in September, 1995.
04/01/1997	III., IV., V.	Drinking Water Health Advisories, EPA Regulatory Actions, and Supplementary Data were removed from IRIS on or before April 1997. IRIS users were directed to the appropriate EPA Program Offices for this information.
10/28/2003	I.A.6, II.D.2	Screening-Level Literature Review Findings message has been added.

VIII. Synonyms

Substance Name — White phosphorus

CASRN — 7723-14-0

Last Revised — 08/01/1990

- 7723-14-0
- BONIDE BLUE DEATH RAT KILLER
- CASWELL NO. 663
- COMMON SENSE COCKROACH AND RAT PREPARATIONS
- EPA PESTICIDE CHEMICAL CODE 066502
- EXOLIT LPKN 275
- EXOLIT VPK-N 361
- FOSFORO BIANCO [ITALIAN]
- FOSFORO BLANCO [SPANISH]
- FOSFORO [SPANISH]
- GELBER PHOSPHOR [GERMAN]
- HSDB 1169

- PHOSPHORE BLANC [FRENCH]
- PHOSPHORE BLANC [FRENCH]
- PHOSPHORE [FRENCH]
- PHOSPHOROUS (WHITE)
- PHOSPHORUS
- PHOSPHORUS-31
- PHOSPHORUS (RED)
- PHOSPHORUS, RED
- PHOSPHORUS WHITE
- PHOSPHORUS, WHITE
- RAT-NIP
- RED PHOSPHORUS
- TETRAFOSFOR [DUTCH]
- TETRAPHOSPHOR [GERMAN]
- UN 1338
- UN 1381
- UN 2447
- WEISS PHOSPHOR [GERMAN]
- WHITE PHOSPHORUS
- YELLOW PHOSPHORUS

White Phosphorus

http://www.sourcewatch.org/index.php?title=White_Phosphorus

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 - [4.1.1 Related Links](#)
 - [4.2 Unexploded Ordnance \(UXO\)](#)
- [5 Toxicology](#)
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- [7 SourceWatch Resources](#)
- [8 External Links](#)

Storage and Shipment

- "White phosphorus (P4) is the elemental form of phosphorus used in smoke munitions. It has a high vapor pressure and will readily sublime when exposed to air. At room temperature, autoignition will occur and the material will burn violently. In the absence of air, P4 is quite stable. White phosphorus is normally stored under water for this reason. Cool, saturated soils with no open pore spaces are also very effective in preventing the sublimation and ignition of P4." [1]
- "Explosive Safety Quantity Distance (ESQD) requirements apply to the concentration of ammunition, explosives, and other hazardous materials at Naval Shore Establishments for development; manufacturing; test and maintenance; storage, loading and off-loading of vehicles, railcars and aircraft; disposal; and all related handling incidents. ... Group H, one of twelve travel and storage categories for ammunition and explosives, includes "explosives and white phosphorus or other pyrophoric material, ... Ammunition in this group contains filler, which is spontaneously flammable when exposed to the atmosphere. Examples of these items are white phosphorus (WP), white phosphorus plasticized (PWP), or other ammunition containing pyrophoric material." Group H materials may only be stored or shipped with Group S materials, which are those which present "no significant hazard." [2]

White Phosphorus Not Banned

"[U]se of white phosphorus is not specifically banned by any treaty, however protocol III of the 1980 [Geneva convention](#) prohibits the use of incendiary weapons against civilian populations or by air attack against military forces that are located within concentrations of civilians. The United States is among the nations that have not signed this protocol." [3]

Military Availability

A warehouse fire which began on June 6, 2005, and burned for 17 hours, at the Pine Bluff Arsenal, Arkansas, "the Army's sole supplier of white phosphorus ammunition in the Western Hemisphere," was believed by investigators to have been "triggered by a leaking container of white phosphorus. ... The blaze destroyed a warehouse that held more than 7,500 containers of white phosphorus, which is used in incendiary devices and in smoke screenings and signals for 155 millimeter shells." [4]

White Phosphorus at War

"White phosphorus is both a smoke producer and a particularly nasty incendiary agent, known as WP. Its white smoke has the highest total obscuring power (TOP) of any smoke. It was widely used in World War I in grenades and trench mortar rounds to screen troop movements. Most military smokes are now of other types, often colored with dyes. **The 4.2-in. 'Chemical' mortar of World War II was developed to throw white phosphorus shells, as well as whatever other chemical or biological agents might be required, but was later also found valuable as a general heavy mortar.** This was a simple, light, portable weapon of great power, equivalent to a 105 mm howitzer, but of lesser range. It consisted of a tube about 5 ft long, a steel baseplate, and a bipod support with screws for elevation and traverse. The cylindrical round was simply dropped down the tube, and it sailed away on a high trajectory. **The phosphorus sticks to whatever it hits, burns, and if what it has hit is combustible, sets it on fire. White phosphorus burns quickly and coolly and so is not a very effective incendiary agent. It is generally mixed with rubber or polystyrene to slow down the burning. Water will put out white phosphorus temporarily, but as soon as the phosphorus has access to air, it will start burning again. White phosphorus wounds are very unpleasant, since the phosphorus must be thoroughly washed out with a nonpolar solvent that is also noninflammable, for obvious reasons, before the burn can be treated.** Carbon tetrachloride would be suitable, but it is dangerous because of the cancer hazard." --Dr. James B. Calvert, University of Denver, last revised March 6, 2004. (emphasis added)

During the Vietnam War, the "White Phosphorus (WP), M110, was also used as a marker round. It could be fitted with PD, VT, and MT fuzes. **When the situation called for it, white phosphorus became a devastating weapon against personnel.** The thick white smoke could be used as a screen to mask movement by troops in the field." --1/92 Field Artillery Association - Vietnam. (emphasis added)

White Phosphorus "Climate" in Iraq

Average temperatures in Iraq range from more than 120°F (48°C) in July and August "to below freezing in January. ... Roughly 90% of the annual rainfall occurs between November and April, most of it in the winter months from December through March. The remaining six months, particularly the hottest ones of June, July, and August, at approximately 102°F (32°C), are dry." [5]

The autoignition temperature for white phosphorus is 93°F (34°C). [6]

"It is commonly believed that white phosphorus ignites spontaneously on contact with air at room temperature. This is not quite true; the autoignition temperature is actually about 30°C in humid air, and slightly higher in dry air. ... At any rate, the slightest degree of friction will easily ignite it, and it is practically guaranteed to be ignited by a burster charge, so for all intents and purposes it is pyrophoric," according to the Wikipedia. "As an incendiary, it is most effective against highly flammable targets like very dry vegetation or petrol, oils and lubricants. However a WP fire does have the special difficulty that if extinguished with water, even to the point of being quite cold, it may reignite later when it dries out and exposes the WP to the air again."

"Burns to persons struck by particles of burning WP are usually much less extensive than napalm or metal incendiary burns, but are complicated by the toxicity of phosphorus, the release of phosphoric acid into the wounds, and the possibility of small particles continuing to smoulder for some time if undetected," the Wikipedia informs.

Related Links

- Jason E. Levy, "TTPs for the 60mm mortar section," *Infantry Magazine*, May-June 2004.
- "U.S. Army publication confirms United States used incendiary weapon in Falluja," *The Raw Story*, November 10, 2005.

Unexploded Ordnance (UXO)

- Rockets: "The warhead section of the rocket is the portion that produces the intended effect; it can be filled with explosives, toxic chemicals, white phosphorus, submunitions, riot-control agent, or illumination flares." --US Army Corps of Engineers.
- Mortars: "Mortars range from approximately 1 inch to 11 inches in diameter and can be filled with explosives, toxic chemicals, white phosphorus, or illumination flares. Mortars generally have thinner metal casing than projectiles, but use the same types of fuzing and stabilization." --US Army Corps of Engineers.

Toxicology

- Toxicological Profile for White Phosphorous, ATSDR, Centers for Disease Control, September 1997.

Documents

- 49CFR173.59. Chapter I: Research and Special Programs Administration, Department of Transportation, U.S. Government Printing Office, Revised as of October 1, 2002 (pp. 450-456). Part 73: Shippers. General Requirements for Shipments and Packagings. Definitions, Classification and Packaging for Class 1.

SourceWatch Resources

- United States used weapons of mass destruction in Iraq

External links

- ["About Unexploded Ordnance," U.S. Army, Jefferson Proving Ground.](#)
- ["US Army Battle Book -- System and Weapon Data" US Army Command and General Staff College.](#)
- Seth Ackerman, ["Now It's a Chemical Weapon, Now It's Not: White Phosphorus and the Siege of Fallujah", *Extra!*, March/April 2006.](#)
- ["Israel admits phosphorus bombing," BBC, October 22, 2006.](#)

ATTACHMENT 17

Perchlorate summary DOD 16-106 ppb Fort Ord Site 39

Perchlorate Summaries



Fort Ord, CA

Facility & Location

Fort Ord is located near Monterey Bay in central California, approximately 80 miles south of San Francisco. Since 1917, the installation has served primarily as training and staging facility for infantry troops. In 1940, the 7th Infantry Division (ID) was activated, then 4th, 5th and 6th Divisions as well. In 1957, Fort Ord became a United States Army Infantry Training Center. In 1974, the 7th ID was reactivated at Fort Ord. In 1983, the 7th ID was converted to a light division, operating without heavy tanks or armor. Fort Ord was selected in 1991 for closure under the Base Realignment and Closure (BRAC) process. Troops were reassigned in 1994 when the post formally closed. Although Army personnel still operate a small portion of the post, active Army divisions are not stationed at Fort Ord.

EPA identified Fort Ord as a Superfund site in 1990 due to groundwater contamination. A Multi-Range Area (MRA) located in the south-central portion of Fort Ord is expected to have the highest density of munitions and explosives of concern such as artillery and mortar, containerized and uncontainerized explosives and propellants.

Media Sampled

The Army has tested soil at Fort Ord for perchlorate.

Soil -- The Army tested 442 samples from the Site 39 - Multi-Range Area. Of these, 41 samples detected perchlorate ranging from 13 ppb to 106 ppb. The Army also tested ten soil samples from Site 39-Range 36A. Perchlorate was not detected in any of these samples.

Appropriate Action

Not applicable

POC Information

Malcolm Garg, Army Cleanup Programs, Emergent Contaminant Issues

malcolm.garg@us.army.mil

Created: 01-MAR-08

Updated: (null)

ATTACHMENT 18

1998 Wingspread Statement, Precautionary Principal

The Wingspread Statement on the Precautionary Principle

January 1998

The release and use of toxic substances, the exploitation of resources, and physical alterations of the environment have had substantial unintended consequences affecting human health and the environment. Some of these concerns are high rates of learning deficiencies, asthma, cancer, birth defects and species extinctions; along with global climate change, stratospheric ozone depletion and worldwide contamination with toxic substances and nuclear materials.

We believe existing environmental regulations and other decisions, particularly those based on risk assessment, have failed to protect adequately human health and the environment - the larger system of which humans are but a part.

We believe there is compelling evidence that damage to humans and the worldwide environment is of such magnitude and seriousness that new principles for conducting human activities are necessary.

While we realize that human activities may involve hazards, people must proceed more carefully than has been the case in recent history. Corporations, government entities, organizations, communities, scientists and other individuals must adopt a precautionary approach to all human endeavors.

Therefore, it is necessary to implement the Precautionary Principle: When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.

In this context the proponent of an activity, rather than the public, should bear the burden of proof.

The process of applying the Precautionary Principle must be open, informed and democratic and must include potentially affected parties. It must also involve an examination of the full range of alternatives, including no action.

Participants: Dr. Nicholas Ashford, M.I.T.; Katherine Barrett, Univ. of British Columbia; Anita Bernstein, Chicago-Kent College of Law; Dr. Robert Costanza, Univ. of Maryland; Pat Costner, Greenpeace; Dr. Carl Cranor, Univ. of California, Riverside; Dr. Peter deFur, Virginia Commonwealth Univ.; Gordon Durnil, Attorney; Dr. Kenneth Geiser, Toxics Use Reduction Inst., Univ. of Mass., Lowell; Dr. Andrew Jordan, Centre for Social and Economic Research on; the Global Environment, Univ. Of East Anglia; Andrew King, United Steelworkers of America, Canadian Office; Dr. Frederick Kirschenmann, Farmer; Stephen Lester, Center for Health, Environment and Justice; Sue Maret, Union Inst.; Dr. Michael M'Gonigle, Univ. of Victoria, British Columbia; Dr. Peter Montague, Environmental Research Foundation; Dr. John Peterson Myers, W. Alton Jones Foundation; Dr. Mary O'Brien, Environmental Consultant; Dr. David

Ozonoff, Boston Univ.; Carolyn Raffensperger, Science and Environmental Health Network; Dr. Philip Regal, Univ. of Minnesota; Hon. Pamela Resor, Massachusetts House of Representatives; Florence Robinson, Louisiana Environmental Network; Dr. Ted Schettler, Physicians for Social Responsibility; Ted Smith, Silicon Valley Toxics Coalition; Dr. Klaus-Richard Sperling, Alfred-Wegener- Institut, Hamburg; Dr. Sandra Steingraber, Author; Diane Takvorian, Environmental Health Coalition; Joel Tickner, Univ. of Mass., Lowell; Dr. Konrad von Moltke, Dartmouth College; Dr. Bo Wahlstrom, KEMI (National Chemical Inspectorate), Sweden; Jackie Warledo, Indigenous Environmental Network;

ATTACHMENT 19

Fort Ord History

Fort Ord

<http://nimst.tripod.com/cgi-bin/FtOrd.html>

HISTORY

What remains of Fort Ord, is located on the historically rich Monterey Bay Peninsula in central California. In it's hey-day, Fort Ord covered over 28,600 acres. The local topography made it ideal as an infantry training center. This would become it's primary mission. It began during the Mexican-American War in 1846. Com John D. Sloat claimed the Monterey area along with the rest of California for the United States. From 1852 to 1898 the fort was in disuse. While visiting the area in 1879. Writer Robert Lewis Stevenson wrote, "The beaches are white with weathered whale bones." The inland area was mission property. This would become the extensive training areas of Fort Ord. In 1917 the US Army purchased from a Mr. David Jacks the title to what is known today as the East Garrison. As it developed Fort Ord was considered one of the nation's permanent Army posts.

It is bordered on the North by the city of Marina and on the South by Sand City. It's just a few minutes from Seaside, Monterey, Pacific Grove and beautiful Carmel. The agricultural community of Salinas is 14 miles to the East. San Francisco is 115 miles further to the North and Los Angeles is 340 miles to the South.

The post was named after Major General Edward Cresap Ord. General Ord's fame in the history books includes some information on being an Indian fighter. In 1847 He was a lieutenant with Maj Gen J C Fremont's Army when the present site of the nearby Presidio of Monterey was brought into existence. But His actions as a Civil War commander established His military career. He distinguished himself during the Civil War in the Battle of Iuka, Mississippi, operations against Petersburg, Virginia, and the capture of Fort Harrison, Virginia. General Ord is buried at the Arlington National Cemetery.

Army troops occupied the fort for a few months at the end of the Civil War when it was known as Ord Barracks. From 1865 to 1902 the post was inactive. It was not until after the Spanish-American War, {Remember The Maine} that a force of significant size would garrison the fort once again. The 15th Infantry Regiment and the 9th "Buffalo Soldiers" Cavalry returning from duty in the Philippines were assigned to the fort in 1902. Some small refinements were made to the fort during that period. But Fort Ord's true origin of development dates back to the year 1917. In August of that year the US government purchased 15,000 acres next to the area known today as the East Garrison, for the amount of 160,000 dollars. At that time the property was known as the Gigling Military Reservation. The name Gigling originated from a German family that had once held title to the property in that general area. So the fort's official title became Camp Gigling. Between the end of World War I and pre-World War II. Camp Gigling was primarily used as a maneuver area for the 11th "Black Horse" Cavalry and a artillery target range for the 76th Field Artillery. Both units were stationed at the Presidio of Monterey. During the summertime the 30th Infantry Regiment came down from the Presidio of San Francisco to use the reservation for maneuvers as did other Reserve and National Guard units.

By 1933 when the reservation's name was changed to Camp Ord. It's landscaping was brush covered and almost impenetrable in many places. A simple dirt and gravel road

connected the East Garrison and Gigling railroad spur located on Highway #1. There was a water well, a caretaker's house in the center of the reservation and a few bivouac sites. But other than these limited improvements. No additional changes were made at Camp Ord until 1938.

The major changes of 1938 marked the excelled growth of the post. Colonel Homer M. Groninger, who was promoted to Major General at a later date, was in charge of the work and renovation. Utilizing the benefits of President Franklin D. Roosevelt's/ Works Projects Administration program. Col. Groninger supervised the expansion of the post into a large camp about a mile from the Gigling railroad spur and saw to it that the dense brush areas were cleared for future construction. Col. Groninger was working with an original WPA appropriation of \$800,000. That amount would grow to over \$6,000,000 for additional construction at the post.

On Jan 4th 1940 the first joint Army and Navy maneuvers were held at the fort. A total of 10,000 troops and 1000 vehicles, boats, and horses took part in the maneuvers. Later in 1940 Col. Groninger gave instructions to build the first wooden barracks and mess halls. He included the tent city slabs in the East Garrison. The wooden barracks were suppose to be temporary. Not to last much longer than 5 years. The construction was so well done. They are still there today. The 7th Infantry Division was re-activated on the 1st of July that year. War was becoming a real threat. As a result Congress approved a peace time draft. As fall approached Camp Ord was filling up with new recruits. The plans for a million dollar Soldiers Service Recreation Complex was the result of this large population growth and was beginning to take shape. Its frame work was the brain child of the 7th Infantry's divisional commander, General Joseph W. Stilwell. His nickname was "Vinegar Joe," because of His strong personality. It was His belief that the soldiers should have someplace to go and relax. "This project was started on the basis that it was high time to stop talking about suitable recreational facilities for enlisted men....and doing something about it." Gen Stilwell picked the site and the engineers to construct the buildings. The first to be constructed in the complex was the Soldiers' Club. It was designed by 1LT Savo Stoshitch, 13th Engineers and 2LT Orville W. Pierce 74th Field Artillery. With multiple donations from US soldiers and some additional WPA grants. The building was finally completed in September 1943. It would turn out that the \$500,000 enlisted men's club was the only building to be completed in the proposed post recreation complex which originally called for a gymnasium, stadium, NCO's Club, tennis courts and athletic fields, as well as a chapel. When it first opened it's doors. It was known as the Soldiers' Club. Later the club's name was properly changed to, "Stilwell Hall." Fort Ord held a special place in Gen Stilwell's heart. He delegated that his ashes be scattered along the scenic Monterey Peninsula beaches.

Growth of the Camp's boundaries continued in 1940 to the size of 20,000 areas. In the fall of that same year, Camp Ord became known as Fort Ord. It was also established as a permanent Army installation. More than \$12,000,000 worth of improvements were contracted by the end of 1941. The continued growth of Fort Ord's Main Garrison took place over the next twenty years, between 1940 and the 1960s. The construction started in the northwest corner of the post and then it expanded southward and then finally eastward. When World War II broke out. Ft Ord became a jumping off point for other training areas

like, Camp Roberts, and Fort Hunter Liggett. Fort Ord was also a staging area for many famous fighting divisions and units. Fort Ord's honorable alumni included the 3rd Inf Div,

6th Inf Div, 7th Inf Div, 27th Inf Bde, 32nd Inf Div, 35th Inf Div, and 43rd Inf Div. The 738th Field Artillery Battalion was activated at Fort Ord on June 25, 1943. They were assigned to Gen George S. Patton's 3rd Army. Other units that were not well known. But just as important to the war effort. Were the 2nd Engineer, the 3rd Engineer and the 4th Engineer. As well as the 593rd Amphibian and the 533rd Amphibian, These five engineer and amphibias groups had trained at Fort Ord before being shipped to the pacific theater. World War II demanded new innovative tactical training with weapons, artillery, air defense and amphibius landings. The concept of combat readiness training was first introduced at Fort Ord. In 1942 the WACs was formed to handle the administrative and non combat duties. After the D-Day invasion many German soldiers were taken prisoner and were interned at the fort's east garrison. The POWs were used to make improvements around Fort Ord. So American troops could concentrate on their training for overseas duty. The largest congregation of troops at any one time was totaled at 50,000. But the average population of soldiers was closer to 35,000.

Once the allies defeated the axis and World War II came to its conclusion. Fort Ord took on a much slower pace. 1946 was the year that Fort Ord officially became a training facility for basic combat and advance infantry training. This would be it's main objective for the next 30 years. In 1947 it became home to the 4th Replacement Training Center. Then on July 15, 1947 the 4th Infantry Division was reactivated and took up residence at the fort. The 4th Inf became responsible for the training of troops who were headed for the Korean conflict which began in June 1950. The 4th Infantry Division moved to Fort Benning, GA on September 22, 1950. It was replace by the 6th Infantry Division who took over the mission of training troops for assignment in Korea. The 6th infantry continued this task until January 1956. There was continued growth at Fort Ord. The concrete barracks were constructed on 'The Hill.' The airfield was built. The 5th Division being reassigned from Germany moved in until it was deactivated on June 5, 1957. It was re-activated during the 1960s to fight in southeast asia. Civilian employees were hired during the 1950s. Many of them ex-military personnel. This created a housing demand that resulted in the creation of the cities Marina, Sand City and Seaside.

It was sometime during the 1950s that the US 6th Army took up quarters at the fort. {I've been informed by veterans via email. That the patch was worn as early as 1952.} Fort Ord became known as the United States main Army Infantry Training Center. It's activity increased with the training of troops headed for southeast asia. During the Vietnam conflict it became the major training center in the nation. In 1964 a Drill Sergeant School was opened. It once again was home to basic combat, advanced infantry, and basic unit training for over half a million soldiers. It was the highest overall training of combat ready troops in the fort's history. In 1973 the last American troops departed Vietnam. Another training era had ended. The total number of soldiers trained at Fort Ord from 1940 to 1975 is estimated at 1.5 million.

The defense department first considered an all volunteer Army in 1971 with Project VOLAR. The WACs were abolished. Women were allowed the same advantages as men. It was Oct 25, 1974, when the 7th Infantry Division (Light) occupied Fort Ord. Light infantry troops

operate without heavy tanks, armor, or artillery. The fort officially curtailed all training archives in 1976. In 1985 the 7th IDL became the Army's premier light infantry division. The Cold War ended in 1989. During 1988 'The Base Realignment and Closure Act' had already been passed. Fort Ord was being considered as 'Property In Excess.' In 1989 the 7th IDL was deployed to Panama to restore order and captured dictator Manuel Noriega. In 1990 the 7th IDL joined the coalition troops sent to the middle east to defeat Iraq during Desert Storm. One of their last deployments was to the 1992 Los Angeles riots. Two years later on 15 Jun 1994. The 7th Infantry Division Light was deactivated. In September of 1994 Fort Ord closed it's gates and became part of US military history. 121 military bases have closed since the passing of the 1988 B.R.& C. Act.

ATTACHMENT 20

Ranges 43-48 2002 list of UXO/OEW found, many subsurface

**Table 2. Ranges 43 through 48, UXO and OE Scrap Discovered During Investigations
Interim Action Ordnance and Explosives Remedial Investigation/Feasibility Study
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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
MRA Grid Sampling					
OE-15B	G 14	-12	1	MISSILE, GUIDED, HEAT, M222 (DRAGON) LIVE	UXO
OE-15B	G 14	-12	1	PROJECTILE, 81mm, MORTAR, SMOKE, WP, M57 LIVE	UXO
OE-15A	G 02 RNG 46	-3	18	ROCKET, PRACTICE, 3.5 INCH, M29A2 EXPENDED	OE Scrap
OE-15A	G 02 RNG 46	-4	21	ROCKET, PRACTICE, 3.5 INCH, M29A2 EXPENDED	OE Scrap
OE-15A	G 02 RNG 46	-4	23	ROCKET, PRACTICE, 3.5 INCH, M29A2 EXPENDED	OE Scrap
OE-15A	G 02 RNG 46	-4	14	ROCKET, PRACTICE, 3.5 INCH, M29A2 EXPENDED	OE Scrap
OE-15A	G 02 RNG 46	-2	10	ROCKET, PRACTICE, 3.5 INCH, M29A2 EXPENDED	OE Scrap
OE-15A	G 01 RNG 46	-5	61	PROJECTILE, 40mm, PRACTICE, M382 EXPENDED	OE Scrap
Road Clearance					
OE-15	MAVERICK ROAD 55-57	-12	2	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1 LIVE	UXO
OE-15	MAVERICK ROAD 57-59	-4	1	PROJECTILE, 57mm, HE, M306 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 55-57	0	2	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 35-37	0	14	ROCKET, 3.5 INCH, PRACTICE, M29A2 EXPENDED	OE Scrap
OE-15	MAVERICK ROAD 35-37	-12	1	ROCKET, 3.5 INCH, PRACTICE, M29A2 EXPENDED	OE Scrap
OE-15	MAVERICK ROAD 55-57	-6	2	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1 LIVE	UXO
OE-15	MAVERICK ROAD 27-29	0	37	ROCKET, 3.5 INCH, PRACTICE, M29A2 EXPENDED	OE Scrap
OE-15	MAVERICK ROAD 29-31	0	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 29-31	0	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 LIVE	UXO
OE-15	MAVERICK ROAD 27-39	0	2	FUZE, ROCKET, M404 LIVE	UXO
OE-15	MAVERICK ROAD 89-91	-2	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 37-39	-12	1	ROCKET, 3.5 INCH, PRACTICE, M29A2 EXPENDED	OE Scrap
OE-15	MAVERICK ROAD 49-51	-12	6	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1 LIVE	UXO
OE-15	MAVERICK ROAD 27-29	-8	1	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 79-81	-12	1	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 75-77	-18	1	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 51-53	-12	3	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1 LIVE	UXO
OE-15	MAVERICK ROAD 57-59	-4	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 57-59	-12	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 35-37	-8	1	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 49-51	-6	3	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 51-53	-12	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1 LIVE	UXO
OE-15	MAVERICK ROAD 49-51	-12	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1 EXPENDED	OE Scrap
OE-15	MAVERICK ROAD 67-69	-12	3	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1 LIVE	UXO
OE-15	MAVERICK ROAD 49-49	-12	2	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 47-49	-24	1	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 35-37	-4	1	PROJECTILE, 4.2 INCH, MORTAR, HE, M3A1 & M3 LIVE	UXO
OE-15	MAVERICK ROAD 83-85	-6	1	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 51-53	-12	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1 EXPENDED	OE Scrap

**Table 2. Ranges 43 through 48, UXO and OE Scrap Discovered During Investigations
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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
OE-15	MAVERICK ROAD 49-49	0	1	PROJECTILE, 84mm, HEAT, M136 (AT4) LIVE	UXO
OE-15	MAVERICK ROAD 45-47	-6	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 75-77	-12	2	PROJECTILE, 60mm, MORTAR, TARGET PRACTICE, M50A3 LIVE	UXO
OE-15	MAVERICK ROAD 83-85	-12	1	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 73-75	-12	1	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 73-75	-18	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 79-81	-18	1	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 87-89	-10	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 35-37	-6	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 87-89	-8	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15	MAVERICK ROAD 91-93	-6	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15	MAVERICK ROAD 35-37	-6	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1 LIVE	UXO
OE-15	MAVERICK ROAD 35-37	-17	1	PROJECTILE, 4.2 INCH, MORTAR, HE, M3A1 & M3 LIVE	UXO
OE-15	MAVERICK ROAD 45-47	-6	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 51-53	-6	4	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1 LIVE	UXO
OE-15	MAVERICK ROAD 73-75	-18	4	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 53-55	-6	4	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1 LIVE	UXO
OE-15	MAVERICK ROAD 47-49	0	1	MINE, ANTI-PERSONNEL, M-18A1, CLAYMORE LIVE	UXO
OE-15	MAVERICK ROAD 73-75	-24	22	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1 LIVE	UXO
OE-15	MAVERICK ROAD 73-75	-18	1	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 75-77	-6	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 35-37	-12	1	PROJECTILE, 81mm, MORTAR, HE, M362 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 73-75	-24	14	PROJECTILE, 60mm, MORTAR, TARGET PRACTICE, M50A3 LIVE	UXO
OE-15	MAVERICK ROAD 35-37	-12	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 73-75	-12	1	PROJECTILE, 75mm, HE, M48 LIVE	UXO
OE-15	MAVERICK ROAD 73-75	-6	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 73-75	-6	17	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15	MAVERICK ROAD 77-79	-9	2	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 77-79	-2	1	PROJECTILE, 81mm, MORTAR, HE, M362 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 61-63	-12	2	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 75-77	-6	2	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 35-37	-8	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 75-77	-24	1	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 77-79	-12	1	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 77-79	-6	1	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 79-81	-8	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 75-77	-6	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 77-79	-1	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 89-91	-12	1	PROJECTILE, 57mm, HE, M306 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 57-59	-13	1	PROJECTILE, 105mm, ILLUMINATING, M314 SERIES EXPENDED	OE Scrap
OE-15	MAVERICK ROAD 91-93	-12	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 63-65	-6	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 77-79	-6	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15	MAVERICK ROAD 73-75	-6	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1 LIVE	UXO

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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
OE-15	MAVERICK ROAD 69-71	-6	3	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1	EXPENDED
OE-15	MAVERICK ROAD 69-71	-6	3	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	EXPENDED
OE-15	MAVERICK ROAD 69-71	-6	4	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1	EXPENDED
OE-15	MAVERICK ROAD 61-63	-12	2	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43A1	LIVE

Fuel Break Clearance, MOCO 2

OE-15 EDCBND	EDC 02 (MOCO 02)	-12	1	FUZE, PROJECTILE, COMBINATION, M1907	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 03 (MOCO 02)	-12	1	FUZE, PROJECTILE, POINT DETONATING, M51	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 03 (MOCO 02)	-24	1	FUZE, PROJECTILE, POINT DETONATING, M51	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 09 (MOCO 02)	-6	1	GRENAD, HAND, PRACTICE, DELAY, M30	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 09 (MOCO 02)	-4	1	PROJECTILE, 37mm, TP, M63, MOD 1	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 09 (MOCO 02)	-10	3	PROJECTILE, 60mm, MORTAR, ILLUMINATING, M721	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 09 (MOCO 02)	-8	1	SIGNALS, ILLUMINATION, GROUND, RED, M187; WHITE, M188; GREEN, M189; AMBER, M190	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-8	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-8	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-8	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-8	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-10	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-10	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-10	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	LIVE	UXO
OE-15 EDCBND	EDC 12 (MOCO 02)	-10	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-8	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-8	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-8	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-10	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	LIVE	UXO
OE-15 EDCBND	EDC 12 (MOCO 02)	-10	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-10	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-10	1	PROJECTILE, 60mm, MORTAR, ILLUMINATING, M721	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-8	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-8	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	LIVE	UXO
OE-15 EDCBND	EDC 12 (MOCO 02)	-10	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-8	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	LIVE	UXO
OE-15 EDCBND	EDC 12 (MOCO 02)	-8	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-10	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	LIVE	UXO
OE-15 EDCBND	EDC 12 (MOCO 02)	-10	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-12	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 12 (MOCO 02)	-8	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	LIVE	UXO
OE-15 EDCBND	EDC 12 (MOCO 02)	-10	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 EDCBND	EDC 14 (MOCO 02)	-6	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73	LIVE	UXO
OE-15 EDCBND	EDC 14 (MOCO 02)	-3	1	SIGNALS, ILLUMINATION, GROUND, CLUSTERS, GREEN STAR, M125A1, RED STAR, M158, WHITE STAR, M159	UXO	UXO
OE-15 EDCBND	EDC 14 (MOCO 02)	-8	1	PROJECTILE, 40mm, HE, M381	LIVE	UXO
OE-15 EDCBND	EDC 14 (MOCO 02)	-6	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73	EXPENDED	OE Scrap

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Interim Action Ordnance and Explosives Remedial Investigation/Feasibility Study
Former Fort Ord, California
Working Draft 10/4/01**

Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
OE-15 EDCBND	EDC 14 (MOCO 02)	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 EXPENDED	OE Scrap
OE-15 EDCBND	FB 02 (MOCO 02)	-1	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 02 (MOCO 02)	-1	1	ROCKET, INCENDIARY, 66mm, TPA, M74 (FUZE & TAIL ONLY) LIVE	UXO
OE-15 EDCBND	FB 02 (MOCO 02)			2 LBS, PROJECTILE, 40mm, HE, M381 (FRAGMENTS) EXPENDED	OE Scrap
OE-15 EDCBND	FB 02 (MOCO 02)	-4	1	PROJECTILE, 155mm, SMOKE, BE, M116 SERIES, HC AND COLORED LIVE	UXO
OE-15 EDCBND	FB 02 (MOCO 02)	-6	2	PROJECTILE, 155mm, SMOKE, BE, M116 SERIES, HC AND COLORED (CANDLE ONLY) LIVE	UXO
OE-15 EDCBND	FB 02 (MOCO 02)	-30	1	PROJECTILE, 105mm, ILLUMINATING, M314 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 03 (MOCO 02)	0	2	ROCKET, 66mm, INCENDIARY, TPA, M74 LIVE	UXO
OE-15 EDCBND	FB 03 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 03 (MOCO 02)	0	1	PROJECTILE, 40mm, HE, M386, (FRAGMENT BALL) LIVE	UXO
OE-15 EDCBND	FB 03 (MOCO 02)	0	1	ROCKET, 66mm, INCENDIARY, TPA, M74 LIVE	UXO
OE-15 EDCBND	FB 03 (MOCO 02)	-2	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 03 (MOCO 02)	0	1	ROCKET, 66mm, INCENDIARY, TPA, M74 LIVE	UXO
OE-15 EDCBND	FB 03 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 04 (MOCO 02)	0	1	PROJECTILE, 84mm, HEAT, M136 (AT4) LIVE	UXO
OE-15 EDCBND	FB 04 (MOCO 02)	0	1	ROCKET, 66mm, INCENDIARY, TPA, M74 LIVE	UXO
OE-15 EDCBND	FB 04 (MOCO 02)	0	1	PROJECTILE, 84mm, HEAT, M136 (AT4) LIVE	UXO
OE-15 EDCBND	FB 04 (MOCO 02)	0	1	PROJECTILE, 84mm, HEAT, M136 (AT4) LIVE	UXO
OE-15 EDCBND	FB 04 (MOCO 02)	0	1	PROJECTILE, 84mm, HEAT, M136 (AT4) LIVE	UXO
OE-15 EDCBND	FB 04 (MOCO 02)	0	1	PROJECTILE, 84mm, HEAT, M136 (AT4) LIVE	UXO
OE-15 EDCBND	FB 04 (MOCO 02)	-36	1	PROJECTILE, 105mm, ILLUMINATING, M314 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 04 (MOCO 02)	0	1	PROJECTILE, 84mm, HEAT, M136 (AT4) LIVE	UXO
OE-15 EDCBND	FB 04 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 04 (MOCO 02)	0	1	ROCKET, 66mm, HEAT, M72, M72A1, M72A2 & M72A3 LIVE	UXO
OE-15 EDCBND	FB 04 (MOCO 02)	0	2	ROCKET, 66mm, INCENDIARY, TPA, M74 LIVE	UXO
OE-15 EDCBND	FB 04 (MOCO 02)	-24	1	PROJECTILE, 105mm, SMOKE H.C., BE, M84 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 04 (MOCO 02)	-36	1	PROJECTILE, 105mm, SMOKE H.C., BE, M84 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 04 (MOCO 02)	-3	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 04 (MOCO 02)	-32	1	PROJECTILE, 105mm, SMOKE H.C., BE, M84 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 04 (MOCO 02)	-36	1	PROJECTILE, 155mm, SMOKE, BE, M116 SERIES, HC AND COLORED EXPENDED	OE Scrap
OE-15 EDCBND	FB 04 (MOCO 02)	-30	1	PROJECTILE, 105mm, SMOKE H.C., BE, M84 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 04 (MOCO 02)	-30	1	PROJECTILE, 75mm, SHRAPNEL, MK1 EXPENDED	OE Scrap
OE-15 EDCBND	FB 04 (MOCO 02)	-30	1	PROJECTILE, 155mm, SMOKE, BE, M116 SERIES, HC AND COLORED EXPENDED	OE Scrap
OE-15 EDCBND	FB 04 (MOCO 02)	-12	3	PROJECTILE, 155mm, SMOKE, BE, M116 SERIES, HC AND COLORED EXPENDED	OE Scrap
OE-15 EDCBND	FB 04 (MOCO 02)	-30	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 04 (MOCO 02)	-30	9	PROJECTILE, 105mm, SMOKE H.C., BE, M84 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 04 (MOCO 02)	-18	3	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 04 (MOCO 02)	-12	2	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 04 (MOCO 02)	-30	14	PROJECTILE, 155mm, SMOKE, BE, M116 SERIES, HC AND COLORED EXPENDED	OE Scrap
OE-15 EDCBND	FB 05 (MOCO 02)	-1	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 05 (MOCO 02)	-24	1	PROJECTILE, 105mm, SMOKE H.C., BE, M84 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 05 (MOCO 02)	-1	1	ROCKET, 66mm, HEAT, M72, M72A1, M72A2 & M72A3 LIVE	UXO
OE-15 EDCBND	FB 05 (MOCO 02)	-1	10	MISSILE, GUIDED, HEAT, M222 (DRAGON) (ROCKET MOTORS) LIVE	UXO
OE-15 EDCBND	FB 05 (MOCO 02)	-5	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 LIVE	UXO
OE-15 EDCBND	FB 05 (MOCO 02)	-1	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO

**Table 2. Ranges 43 through 48, UXO and OE Scrap Discovered During Investigations
Interim Action Ordnance and Explosives Remedial Investigation/Feasibility Study
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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
OE-15 EDCBND	FB 05 (MOCO 02)	-1	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 05 (MOCO 02)	-1	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 05 (MOCO 02)	-1	1	ROCKET, 66mm, INCENDIARY, TPA, M74 LIVE	UXO
OE-15 EDCBND	FB 05 (MOCO 02)	-1	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 05 (MOCO 02)	-1	1	ROCKET, INCENDIARY, 66mm, TPA, M74 LIVE	UXO
OE-15 EDCBND	FB 05 (MOCO 02)	-1	1	ROCKET, 66mm, INCENDIARY, TPA, M74 LIVE	UXO
OE-15 EDCBND	FB 05 (MOCO 02)	-1	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 05 (MOCO 02)	-3	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 LIVE	UXO
OE-15 EDCBND	FB 05 (MOCO 02)	-2	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-2	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-36	1	PROJECTILE, 105mm, SMOKE H.C., BE, M84 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 06 (MOCO 02)	-3	4	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-5	4	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-5	5	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-4	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-38	1	PROJECTILE, 105mm, SMOKE H.C., BE, M84 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 06 (MOCO 02)	-4	5	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	0	1	ROCKET, 66mm, INCENDIARY, TPA, M74 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-3	1	ROCKET, 66mm, HEAT, M72, M72A1, M72A2 & M72A3 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	0	16	ROCKET, 66mm, INCENDIARY, TPA, M74 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	0	1	ROCKET, 66mm, HEAT, M72, M72A1, M72A2 & M72A3 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	0	10	MISSILE, GUIDED, HEAT, M222 (DRAGON) (ROCKET MOTORS) LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	0	1	ROCKET, 66mm, INCENDIARY, TPA, M74 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-5	5	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-2	1	PROJECTILE, 40mm, PRACTICE, M781 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-7	13	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-6	7	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-6	5	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-5	7	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-2	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-6	5	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	0	7	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-4	4	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-2	1	PROJECTILE, 40mm, PRACTICE, M781 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-2	1	PROJECTILE, 40mm, PRACTICE, M781 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-4	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-4	5	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-4	5	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-4	7	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-5	7	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-3	8	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-4	9	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-8	5	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-5	6	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO

**Table 2. Ranges 43 through 48, UXO and OE Scrap Discovered During Investigations
Interim Action Ordnance and Explosives Remedial Investigation/Feasibility Study
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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
OE-15 EDCBND	FB 06 (MOCO 02)	-6	7	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-5	3	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-3	5	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-6	7	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-4	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	0	1	ROCKET, 66mm, HEAT, M72, M72A1, M72A2 & M72A3 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	0	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-2	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-6	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-5	5	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-4	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	0	2	ROCKET, 66mm, INCENDIARY, TPA, M74 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-12	14	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	0	1	PROJECTILE, 40mm, HE, M386 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	0	7	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	0	11	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-4	2	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 LIVE	UXO
OE-15 EDCBND	FB 06 (MOCO 02)	-7	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-3	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 07 (MOCO 02)	-11	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-6	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-13	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-23	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-6	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-17	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-8	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-11	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-5	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-5	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-17	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-9	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-6	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-6	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-19	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-7	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-7	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-11	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-23	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)			10 LBS, FRAGMENTS, UNKNOWN EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-6	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-6	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-23	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 07 (MOCO 02)	-9	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap

**Table 2. Ranges 43 through 48, UXO and OE Scrap Discovered During Investigations
Interim Action Ordnance and Explosives Remedial Investigation/Feasibility Study
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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
OE-15 EDCBND	FB 07 (MOCO 02)	-18	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-26	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-6	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-7	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-18	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-6	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-5	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-30	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-6	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-5	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-11	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-11	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-3	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 07 (MOCO 02)	-16	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 08 (MOCO 02)	-7	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 08 (MOCO 02)	-3	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 08 (MOCO 02)	-12	1	PROJECTILE, 81mm, MORTAR, ILLUMINATING, M301 SERIES LIVE	UXO
OE-15 EDCBND	FB 08 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 08 (MOCO 02)	-18	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 08 (MOCO 02)	-7	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 08 (MOCO 02)	-9	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 08 (MOCO 02)	0	1	PROJECTILE, 84mm, HEAT, M136 (AT4) LIVE	UXO
OE-15 EDCBND	FB 08 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 08 (MOCO 02)	-6	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 08 (MOCO 02)	-6	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 08 (MOCO 02)	-30	1	PROJECTILE, 105mm, ILLUMINATING, M314 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 08 (MOCO 02)	-17	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 08 (MOCO 02)	-7	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 08 (MOCO 02)	-11	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 08 (MOCO 02)	-23	1	FUZE, PROJECTILE, BASE DETONATING, PRACTICE, M58 EXPENDED	OE Scrap
OE-15 EDCBND	FB 08 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 08 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 08 (MOCO 02)	-11	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB 09 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 09 (MOCO 02)	-15	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 09 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 09 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 09 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 09 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 09 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 09 (MOCO 02)	-12	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 09 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 09 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15 EDCBND	FB 09 (MOCO 02)	0	1	PROJECTILE, 40mm, HEDP, M430 LIVE	UXO

**Table 2. Ranges 43 through 48, UXO and OE Scrap Discovered During Investigations
Interim Action Ordnance and Explosives Remedial Investigation/Feasibility Study
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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
OE-15 EDCBND	FB 09 (MOCO 02)	-30	1	PROJECTILE, 105mm, ILLUMINATING, M314 SERIES EXPENDED	
OE-15 EDCBND	FB 09 (MOCO 02)	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	OE Scrap
OE-15 EDCBND	FB 09 (MOCO 02)	0	1	ROCKET, 66mm, HEAT, M72, M72A1, M72A2 & M72A3 LIVE	UXO
OE-15 EDCBND	FB 10 (MOCO 02)	-12	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 EXPENDED	UXO
OE-15 EDCBND	FB 10 (MOCO 02)	-8	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 EXPENDED	OE Scrap
OE-15 EDCBND	FB 10 (MOCO 02)	-7	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 10 (MOCO 02)	-7	1	PROJECTILE, 60mm, MORTAR, ILLUMINATING, M721 EXPENDED	OE Scrap
OE-15 EDCBND	FB 10 (MOCO 02)	-7	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 10 (MOCO 02)	-11	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB 10 (MOCO 02)	-11	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 EXPENDED	OE Scrap
OE-15 EDCBND	FB 10 (MOCO 02)	-8	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 EXPENDED	OE Scrap
OE-15 EDCBND	FB 11 (MOCO 02)	-11	1	PROJECTILE, 40mm, PRACTICE, M382 EXPENDED	OE Scrap
OE-15 EDCBND	FB 11 (MOCO 02)	-5	1	PROJECTILE, 60mm, MORTAR, ILLUMINATING, M721 EXPENDED	OE Scrap
OE-15 EDCBND	FB 11 (MOCO 02)	-10	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 EXPENDED	OE Scrap
OE-15 EDCBND	FB 11 (MOCO 02)	-9	1	PROJECTILE, 40mm, PRACTICE, 918 EXPENDED	OE Scrap
OE-15 EDCBND	FB 11 (MOCO 02)	-12	1	PROJECTILE, 60mm, MORTAR, ILLUMINATING, M721 EXPENDED	OE Scrap
OE-15 EDCBND	FB 11 (MOCO 02)	-12	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 EXPENDED	OE Scrap
OE-15 EDCBND	FB 11 (MOCO 02)	-12	1	PROJECTILE, 60mm, MORTAR, ILLUMINATING, M721 EXPENDED	OE Scrap
OE-15 EDCBND	FB 12 (MOCO 02)	0	1	PROJECTILE, 60mm, MORTAR, TARGET PRACTICE, M50A3 EXPENDED	OE Scrap
OE-15 EDCBND	FB 12 (MOCO 02)	-19	1	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES (FRAGMENTS) EXPENDED	OE Scrap
OE-15 EDCBND	FB 12 (MOCO 02)	-7	1	SIGNALS, ILLUMINATION, GROUND, CLUSTERS, GREEN STAR, M125A1, RED STAR, M158, WHITE STAR, M159 EXPENDED	OE Scrap
OE-15 EDCBND	FB E11 (MOCO 02)	-7	1	PROJECTILE, 60mm, MORTAR, TRAINING, M69 EXPENDED	OE Scrap
Fuel Break Clearance, Seaside 4					
OE-15 EDCBND	SS04 22	-4	1	MINE, ANTITANK, PRACTICE, M12 SERIES LIVE	
OE-15 EDCBND	SS04 23	-6	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15 EDCBND	SS04 23	-2	1	RAW PYROTECHNIC MIXTURE LIVE	UXO
OE-15 EDCBND	SS04 24	-8	1	MINE, ANTIPERSONNEL, M2A4 SERIES EXPENDED	UXO
OE-15 EDCBND	SS04 24	-6	1	CARTRIDGE, IGNITION, M2 SERIES LIVE	OE Scrap
OE-15 EDCBND	SS04 24	-12	1	ROCKET, 3.5 INCH, PRACTICE, M29A2 (ROCKET MOTOR) EXPENDED	UXO
OE-15 EDCBND	SS04 25	-40	1	CARTRIDGE CASE, 57mm, M301A1 EXPENDED	OE Scrap
OE-15 EDCBND	SS04 26	-6	1	PROJECTILE, 57mm, HE, M306 SERIES LIVE	UXO
OE-15 EDCBND	SS04 26	-24	1	GRENADE, RIFLE, AT, PRACTICE, M9 EXPENDED	UXO
2001 Fuel Break Data					
Maverick Rd.	MR016	0	6	ROCKET MOTOR, 3.5 INCH	
Maverick Rd.	MR016	0	1	ROCKET MOTOR, 3.5 INCH	OE Scrap
Maverick Rd.	MR037	0		PROJECTILE, 75mm, HE, M48 SERIES (FRAGMENTS)	OE Scrap
Maverick Rd.	MR037	0		PROJECTILE, 81mm, MORTAR, SMOKE, WP, M37 SERIES (FRAGMENTS)	OE Scrap
Maverick Rd.	MR036	0	2	MISSILE, GUIDED, HEAT, M222 SERIES (DRAGON) (ROCKET MOTOR)	OE Scrap
Maverick Rd.	MR036	0	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap

**Table 2. Ranges 43 through 48, UXO and OE Scrap Discovered During Investigations
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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
Maverick Rd.	MR036	0	1	PROJECTILE, 60mm, MORTAR, TARGET PRACTICE, M50 SERIES	UXO
Maverick Rd.	MR035	0	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43 SERIES	OE Scrap
Maverick Rd.	MR033	0	1	PROJECTILE, 84mm, PRACTICE, FY 552	OE Scrap
Maverick Rd.	MR029	0	1	PROJECTILE, 105mm, SMOKE, HC, BE, M84 SERIES	OE Scrap
Maverick Rd.	MR027	0	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43 SERIES	UXO
Maverick Rd.	MR026	0	1	PROJECTILE, 84mm, HEAT, M136 (AT4)	UXO
Maverick Rd.	MR020	0	1	SIGNAL, ILLUMINATION, HAND, FIRED, COMET, 1260	OE Scrap
Maverick Rd.	MR019	0	1	ROCKET, 3.5 INCH, PRACTICE, M29A2	OE Scrap
Maverick Rd.	MR019	0	1	SIGNAL, ILLUMINATION, HAND, FIRED, COMET, 1260	OE Scrap
Maverick Rd.	MR018	0	2	ROCKET MOTOR, 3.5 INCH	OE Scrap
Maverick Rd.	MR018	0	1	ROCKET, 66mm, HEAT, M72 SERIES (MOTOR ONLY)	OE Scrap
Maverick Rd.	MR045	0	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Maverick Rd.	MR045	0	0	PROJECTILE, 75mm, HE, M48 SERIES (FRAGMENTS)	OE Scrap
Maverick Rd.	MR045	0	2	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Maverick Rd.	MR042	0	1	FUZE, PROJECTILE, POINT DETONATING, M524 SERIES	OE Scrap
Maverick Rd.	MR042	0	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Maverick Rd.	MR041	0	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Maverick Rd.	MR040	0	3	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Maverick Rd.	MR040	0	2	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Maverick Rd.	MR039	0	6	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Maverick Rd.	MR039	0	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Maverick Rd.	MR038	0	4	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Maverick Rd.	MR038	0	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Maverick Rd.	MR038	0	2	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Maverick Rd.	MR037	0	52	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43 SERIES	OE Scrap
Maverick Rd.	MR037	0	10	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Maverick Rd.	MR037	0	1	ROCKET MOTOR, 3.5 INCH	OE Scrap
Maverick Rd.	MR017	0	3	ROCKET MOTOR, 3.5 INCH	OE Scrap
Maverick Rd.	MR017	-2	12	ROCKET, 66mm, HEAT, M72 SERIES (MOTOR ONLY)	OE Scrap
Maverick Rd.	MR037	0	58	PROJECTILE, 60mm, MORTAR, TARGET PRACTICE, M50 SERIES	OE Scrap
Maverick Rd.	MR036	0	1	PROJECTILE, 57mm, HE, M306 SERIES (NO FUZE)	UXO
Maverick Rd.	MR017	0	2	ROCKET, 66mm, HEAT, M72 SERIES (MOTOR ONLY)	OE Scrap
Maverick Rd.	MR017	0	1	ROCKET, 66mm, HEAT, M72 SERIES (MOTOR ONLY)	OE Scrap
Maverick Rd.	MR017	0	1	ROCKET, 3.5 INCH, PRACTICE, M29A2 (WARHEAD ONLY)	OE Scrap
Maverick Rd.	MR017	0	1	ROCKET MOTOR, 3.5 INCH	OE Scrap
Maverick Rd.	MR017	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 SERIES	OE Scrap
Maverick Rd.	MR017	0	6	ROCKET, 66mm, HEAT, M72 SERIES (MOTOR ONLY)	OE Scrap
Maverick Rd.	MR017	0	1	SIGNAL, ILLUMINATION, GROUND, PARACHUTE, WHITE STAR, M127A1	OE Scrap
Maverick Rd.	MR017	0	1	SIGNAL, ILLUMINATION, HAND, FIRED, COMET, 1260	OE Scrap
Maverick Rd.	MR015	0	2	ROCKET MOTOR, 3.5 INCH	OE Scrap
Maverick Rd.	MR015	0	1	ROCKET, 66mm, HEAT, M72 SERIES (MOTOR ONLY)	OE Scrap
Maverick Rd.	MR015	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 SERIES	OE Scrap
Maverick Rd.	MR015	0	3	ROCKET MOTOR, 3.5 INCH	OE Scrap
Maverick Rd.	MR015	0	2	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 SERIES	OE Scrap

**Table 2. Ranges 43 through 48, UXO and OE Scrap Discovered During Investigations
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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
Maverick Rd.	MR014	0	3	ROCKET MOTOR, 3.5 INCH	OE Scrap
Maverick Rd.	MR014	0	4	ROCKET MOTOR, 3.5 INCH	OE Scrap
Maverick Rd.	MR014	0	2	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 SERIES	UXO
Maverick Rd.	MR047	0	1	PROJECTILE, 81mm, MORTAR, HE, M43A1	OE Scrap
Maverick Rd.	MR013	0	10	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 SERIES	OE Scrap
Maverick Rd.	MR013	0	3	ROCKET, 2.36 INCH, PRACTICE, M7 SERIES (MOTOR ONLY)	OE Scrap
Maverick Rd.	MR013	0	2	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 SERIES	OE Scrap
Maverick Rd.	MR013	0	2	ROCKET, 66mm, HEAT, M72 SERIES (MOTOR ONLY)	OE Scrap
Maverick Rd.	MR013	0	1	ROCKET MOTOR, 3.5 INCH	OE Scrap
Maverick Rd.	MR013	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 SERIES	OE Scrap
Maverick Rd.	MR013	0	1	ROCKET, 2.36 INCH, PRACTICE, M7 SERIES (MOTOR ONLY)	OE Scrap
Pipeline Rd.	PR024L	-12	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43 SERIES	UXO
Pipeline Rd.	PR024L	-8	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR022L	-6	1	PROJECTILE, 81mm, MORTAR, HE, M43A1	UXO
Pipeline Rd.	PR022L	-18	1	PROJECTILE, 81mm, MORTAR, HE, M43A1 (W/O FUZE)	UXO
Pipeline Rd.	PR022L	-24	1	PROJECTILE, 81mm, MORTAR, HE, M43A1 (W/O FUZE)	UXO
Pipeline Rd.	PR022L	-12	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43 SERIES	UXO
Pipeline Rd.	PR022L	-18	1	PROJECTILE, 81mm, MORTAR, HE, M43A1 (W/O FUZE)	UXO
Pipeline Rd.	PR022L	-18	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43 SERIES	UXO
Pipeline Rd.	PR024L	-18	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43 SERIES	UXO
Pipeline Rd.	PR023L	-14	1	PROJECTILE, 81mm, MORTAR, HE, M43A1	UXO
Pipeline Rd.	PR023L	-14	1	PROJECTILE, 81mm, MORTAR, HE, M43A1	UXO
Pipeline Rd.	PR023L	-8	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR023L	-10	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR023L	-8	2	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR023L	-6	2	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR023L	-6	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR023L	-6	2	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR023L	-8	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR023L	-10	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR021	-14	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43 SERIES	UXO
Pipeline Rd.	PR021	-8	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR021	-8	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR021	-10	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR021	-8	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR024L	-8	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR018	-4	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Pipeline Rd.	PR014	-7	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Pipeline Rd.	PR013	-5	1	PROJECTILE, 57mm, HE, M306 SERIES	UXO
Pipeline Rd.	PR013	-6	1	PROJECTILE, 57mm, HE, M306 SERIES	UXO
Pipeline Rd.	PR019	-6	1	PROJECTILE, 57mm, HE, M306 SERIES	UXO
Pipeline Rd.	PR019	-2	1	FUZE, PROJECTILE, POWDER, TRAIN, TIME, M84A1	OE Scrap
Pipeline Rd.	PR012	-18	1	PROJECTILE, 155mm, SMOKE, HC, M116A1	OE Scrap
Pipeline Rd.	PR009	-8	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap

**Table 2. Ranges 43 through 48, UXO and OE Scrap Discovered During Investigations
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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
Pipeline Rd.	PR007	-2	1	FUZE, PROJECTILE, POINT DETONATING, M524 SERIES	OE Scrap
Pipeline Rd.	PR008	-6	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Pipeline Rd.	PR008	-2	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Pipeline Rd.	PR006	-4	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Pipeline Rd.	PR006	-6	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Pipeline Rd.	PR005	-2	1	FUZE, PROJECTILE, POINT DETONATING, M524 SERIES	OE Scrap
Pipeline Rd.	PR003	-4	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Pipeline Rd.	PR003	-4	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Pipeline Rd.	PR041L	-8	1	FUZE, PROJECTILE, POWDER, TRAIN, TIME, M84A1	OE Scrap
Pipeline Rd.	PR002	-12	1	PROJECTILE, 57mm, HE, M306 SERIES	UXO
Pipeline Rd.	PR001	-9	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Pipeline Rd.	PR001	0	1	FUZE, PROJECTILE, POINT DETONATING, M524 SERIES	OE Scrap
Pipeline Rd.	PR001	-14	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Pipeline Rd.	PR003	-2	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Pipeline Rd.	PR025L	-6	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR025L	-8	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR026L	-8	1	PROJECTILE, 81mm, MORTAR, ILLUMINATION, M301 SERIES (FINS ONLY)	OE Scrap
Pipeline Rd.	PR026L	-8	1	PROJECTILE, 81mm, MORTAR, ILLUMINATION, M301 SERIES	OE Scrap
Pipeline Rd.	PR026L	-6	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR028L	-10	1	PROJECTILE, 37mm, LE, MK I	UXO
Pipeline Rd.	PR027L	-12	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Pipeline Rd.	PR027L	-8	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR022L	-18	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43 SERIES	UXO
Pipeline Rd.	PR021	-20	1	PROJECTILE, 81mm, MORTAR, HE, M374 SERIES	UXO
Pipeline Rd.	PR021	-24	1	PROJECTILE, 81mm, MORTAR, HE, M374 SERIES	UXO
Pipeline Rd.	PR024L	-10	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR024L	-12	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR024L	-10	2	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR024L	-8	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR024L	-6	2	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PR024L	-8	1	PROJECTILE, 81mm, MORTAR, HE (FINS ONLY)	OE Scrap
Pipeline Rd.	PE002	0	3	PROJECTILE, 84mm, PRACTICE, FY 552	OE Scrap
Pipeline Rd.	PE002	0		PROJECTILE, 75mm, HE, M48 SERIES (FRAGMENTS)	OE Scrap
Pipeline Rd.	PE002	0		PROJECTILE, 81mm, MORTAR, SMOKE, WP, M57 SERIES (FRAGMENTS)	OE Scrap
Pipeline Rd.	PE002	0	1	ROCKET, 3.5 INCH, PRACTICE, M29A2	OE Scrap
Pipeline Rd.	PE002	0	1	PROJECTILE, 81mm, MORTAR, ILLUMINATION, M301 SERIES	OE Scrap
Pipeline Rd.	PE003	0	2	FUZE, PROJECTILE, POINT DETONATING, M524 SERIES	OE Scrap
Pipeline Rd.	PE005	0	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	OE Scrap
Pipeline Rd.	PE008	0	1	PROJECTILE, 60mm, MORTAR, ILLUMINATION, M83 SERIES	OE Scrap
Pipeline Rd.	PE008	0	1	PROJECTILE, 155mm, SMOKE, HC, M116A1	OE Scrap
Pipeline Rd.	PE008	0	1	PROJECTILE, 57mm, HE, M306 SERIES	UXO
Pipeline Rd.	PE015	0	1	PROJECTILE, 60mm, MORTAR, TARGET PRACTICE, M50 SERIES	UXO
Pipeline Rd.	PE015	0	1	PROJECTILE, 60mm, MORTAR, ILLUMINATION, M83 SERIES	OE Scrap
Pipeline Rd.	PE016	0	1	PROJECTILE, 60mm, MORTAR, ILLUMINATION, M83 SERIES	OE Scrap

**Table 2. Ranges 43 through 48, UXO and OE Scrap Discovered During Investigations
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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
Pipeline Rd.	PE016	0		PROJECTILE, 75mm, HE, M48 SERIES (FRAGMENTS)	
Pipeline Rd.	PE017	0	1	PROJECTILE, 57mm, TPT, M70 SERIES	OE Scrap
Pipeline Rd.	PE017	0	1	PROJECTILE, 60mm, MORTAR, ILLUMINATION, M83 SERIES	OE Scrap
Pipeline Rd.	PE018	0	1	PROJECTILE, 57mm, HE, M306 SERIES	OE Scrap
Pipeline Rd.	PE019	0	3	PROJECTILE, 81mm, MORTAR, ILLUMINATION, M301 SERIES	UXO
Pipeline Rd.	PE019	0	1	PROJECTILE, 81mm, MORTAR, ILLUMINATION, M301 SERIES	OE Scrap
Pipeline Rd.	PE019	0	1	PROJECTILE, 60mm, MORTAR, ILLUMINATION, M83 SERIES	OE Scrap
Pipeline Rd.	PE020	0	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43 SERIES	OE Scrap
Pipeline Rd.	PE021	-1	1	PROJECTILE, 81mm, MORTAR, HE, M362 SERIES	OE Scrap
Pipeline Rd.	PE022	-1	1	PROJECTILE, 81mm, MORTAR, HE, M374 SERIES	UXO
Pipeline Rd.	PE022	0	2	PROJECTILE, 81mm, MORTAR, ILLUMINATION, M301 SERIES	UXO
Pipeline Rd.	PE022	0	3	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43 SERIES	OE Scrap
Pipeline Rd.	PE022	0	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43 SERIES	UXO
Pipeline Rd.	PE024	0	2	PROJECTILE, 81mm, MORTAR, ILLUMINATION, M301 SERIES	OE Scrap
Pipeline Rd.	PE025	0	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43 SERIES	OE Scrap
Pipeline Rd.	PE025	0	1	PROJECTILE, 81mm, MORTAR, TARGET PRACTICE, M43 SERIES	OE Scrap
Pipeline Rd.	PE027	0	1	PROJECTILE, 60mm, MORTAR, ILLUMINATION, M83 SERIES	OE Scrap
Pipeline Rd.	PE027	0	1	PROJECTILE, 155mm, SMOKE, HC, M116A1	OE Scrap
Pipeline Rd.	PE027	0	1	PROJECTILE, 105mm, SMOKE, HC, BE, M84 SERIES	OE Scrap
Pipeline Rd.	PE027	0	1	PROJECTILE, 105mm, HE, M1 SERIES (FRAGMENTS)	OE Scrap
Pipeline Rd.	PE027	0	3	PROJECTILE, 75mm, SHRAPNEL, MK 1	UXO
Pipeline Rd.	PE027	0	1	PROJECTILE, 60mm, MORTAR, ILLUMINATION, M83 SERIES	OE Scrap
Pipeline Rd.	PE028	0	1	PROJECTILE, 40mm, GROUND MARKER, GREEN SMOKE, M715 SERIES	OE Scrap
Pipeline Rd.	PE030	0	1	PROJECTILE, 81mm, MORTAR, ILLUMINATION, M301 SERIES	OE Scrap
Pipeline Rd.	PE031	0	1	PROJECTILE, 40mm, PRACTICE, M781 SERIES	OE Scrap
Pipeline Rd.	PE033	0	1	PROJECTILE, 81mm, MORTAR, ILLUMINATION, M301 SERIES	UXO
Pipeline Rd.	PE040	0	1	PROJECTILE, 75mm, HE, M48 SERIES	OE Scrap
Pipeline Rd.	PE041	0	1	PROJECTILE, 81mm, MORTAR, ILLUMINATION, M301 SERIES	UXO
Pipeline Rd.	PE041	0	1	PROJECTILE, 60mm, MORTAR, ILLUMINATION, M83 SERIES	OE Scrap
Pipeline Rd.	PE043	0	2	PROJECTILE, 60mm, MORTAR, ILLUMINATION, M83 SERIES	OE Scrap
Pipeline Rd.	PE045	-1	1	PROJECTILE, 155mm, SMOKE, HC, M116A1	OE Scrap
Pipeline Rd.	PE046	0	1	PROJECTILE, 60mm, MORTAR, ILLUMINATION, M83 SERIES	OE Scrap

Site Specific Grid Sampling, MOCO 2

OE-15 MOCO 02	G 02	-1	1	SIGNALS, ILLUMINATION, GROUND, PARACHUTE, GREEN STAR, M19A2	EXPENDED	
OE-15 MOCO 02	G 03	-6	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	EXPENDED	OE Scrap
OE-15 MOCO 02	G 03	-12	1	FUZE, PROJECTILE, COMBINATION, M1907	LIVE	OE Scrap
OE-15 MOCO 02	G 04	-3	1	FUZE, PROJECTILE, COMBINATION, M1907	EXPENDED	UXO
OE-15 MOCO 02	G 04	-6	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	EXPENDED	OE Scrap
OE-15 MOCO 02	G 04	-10	1	FUZE, PROJECTILE, COMBINATION, M1907	LIVE	OE Scrap
OE-15 MOCO 02	G 05	-8	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	EXPENDED	UXO
OE-15 MOCO 02	G 07	-3	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED	OE Scrap
OE-15 MOCO 02	G 07	-12	1	FLARE, PARACHUTE, TRIP, M48	EXPENDED	OE Scrap

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Site Number	Grid Number	Depth (Inches)	QTY	Ordinance	Status
OE-15 MOCO 02	G 07	-3	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	LIVE UXO
OE-15 MOCO 02	G 07	-3	1	FUZE, GRENADE, HAND, PRACTICE, M228	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-3	1	FUZE, GRENADE, HAND, PRACTICE, M228	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	LIVE UXO
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	LIVE UXO
OE-15 MOCO 02	G 07	-3	1	FUZE, GRENADE, HAND, PRACTICE, M228	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-3	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-3	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-3	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-3	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	LIVE UXO
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-3	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	0	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	LIVE UXO
OE-15 MOCO 02	G 07	-3	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-12	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	LIVE UXO
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-6	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 07	-4	1	PROJECTILE, 14.5mm, SUBCALIBER, PRACTICE, M183A1	LIVE UXO
OE-15 MOCO 02	G 07	-3	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744	EXPENDED OE Scrap
OE-15 MOCO 02	G 08	0		FRAGMENTS, UNKNOWN	EXPENDED OE Scrap
OE-15 MOCO 02	G 08	-4	1	GRENADE, HAND, PRACTICE, MK 2	EXPENDED OE Scrap
OE-15 MOCO 02	G 08	-8	1	PROJECTILE, 75mm, SHRAPNEL, MK 1	EXPENDED OE Scrap
OE-15 MOCO 02	G 09	-10	1	SIGNALS, ILLUMINATION, GROUND, PARACHUTE, GREEN STAR, M19A2	EXPENDED OE Scrap
OE-15 MOCO 02	G 09	0		PROJECTILE, 105mm, HE, M444 (FRAGMENTS)	EXPENDED OE Scrap
OE-15 MOCO 02	G 09	-12	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	EXPENDED OE Scrap
OE-15 MOCO 02	G 09	0	1	DETONATING CORD	LIVE UXO
OE-15 MOCO 02	G 09	-3	1	MINE, ANTIPERSONNEL, M16 SERIES, INERT	EXPENDED OE Scrap
OE-15 MOCO 02	G 10	0		FRAGMENTS, UNKNOWN	EXPENDED OE Scrap
OE-15 MOCO 02	G 11	-4	1	FUZE, GRENADE, HAND, M205 SERIES	EXPENDED OE Scrap
OE-15 MOCO 02	G 11	-3	1	FUZE, GRENADE, HAND, M205 SERIES	LIVE UXO
OE-15 MOCO 02	G 11	0		FRAGMENTS, UNKNOWN	EXPENDED OE Scrap
OE-15 MOCO 02	G 11	-4	2	FUZE, GRENADE, HAND, M205 SERIES	EXPENDED OE Scrap
OE-15 MOCO 02	G 11	0		PROJECTILE, 75mm, HE, M48 (FRAGMENTS)	EXPENDED OE Scrap
OE-15 MOCO 02	G 11	-8	1	GRENADE, HAND, PRACTICE, MK 2	EXPENDED OE Scrap

**Table 2. Ranges 43 through 48, UXO and OE Scrap Discovered During Investigations
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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
OE-15 MOCO 02	G 11	-2	1	FUZE, GRENADE, HAND, M205 SERIES EXPENDED	OE Scrap
OE-15 MOCO 02	G 12	0		FRAGMENTS, UNKNOWN EXPENDED	OE Scrap
OE-15 MOCO 02	G 12	-24	1	CAP, BLASTING, ELECTRIC, M6 LIVE	UXO
OE-15 MOCO 02	G 12	-6	1	FUZE, GRENADE, HAND, M205 SERIES EXPENDED	OE Scrap
OE-15 MOCO 02	G 12	-6	1	FUZE, GRENADE, HAND, PRACTICE, M228 EXPENDED	OE Scrap
OE-15 MOCO 02	G 12	-3	1	FUZE, GRENADE, HAND, PRACTICE, M228 EXPENDED	OE Scrap
OE-15 MOCO 02	G 12	-3	1	FUZE, GRENADE, HAND, PRACTICE, M228 EXPENDED	OE Scrap
OE-15 MOCO 02	G 12	-24	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES LIVE	UXO
OE-15 MOCO 02	G 12	-6	1	GRENADE, HAND, PRACTICE, MK 2 EXPENDED	OE Scrap
OE-15 MOCO 02	G 12	-24	1	PROJECTILE, 75mm, SHRAPNEL, MK 1 LIVE	UXO
OE-15 MOCO 02	G 13	-3	1	GRENADE, HAND, ILLUMINATING, MK 1 EXPENDED	OE Scrap
OE-15 MOCO 02	G 13	-6	1	SIGNALS, ILLUMINATION, GROUND, CLUSTERS, GREEN STAR, M125A1, RED STAR, M158, WHITE STAR, M159	OE Scrap
OE-15 MOCO 02	G 13	-6	1	GRENADE, HAND, ILLUMINATING, MK 1 LIVE	UXO
OE-15 MOCO 02	G 13	-6	1	GRENADE, HAND, ILLUMINATING, MK 1 EXPENDED	OE Scrap
OE-15 MOCO 02	G 13	-12	1	GRENADE, HAND, SMOKE, COMMERCIAL LIVE	UXO
OE-15 MOCO 02	G 13	-3	1	FUZE, GRENADE, HAND, PRACTICE, M228 EXPENDED	OE Scrap
OE-15 MOCO 02	G 13	-12	1	GRENADE, HAND, ILLUMINATION, MK 1 EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-3	1	FUZE, GRENADE, HAND, PRACTICE, M228 EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-8	1	GRENADE, HAND, PRACTICE, MK 2 EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-2	1	GRENADE, HAND, PRACTICE, MK 2 EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-6	1	GRENADE, HAND, PRACTICE, MK 2 EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-8	1	FUZE, GRENADE, HAND, M205 SERIES EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	0		FRAGMENTS, UNKNOWN EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-4	2	FUZE, GRENADE, HAND, M205 SERIES EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-3	1	FUZE, GRENADE, HAND, M205 SERIES LIVE	UXO
OE-15 MOCO 02	G 14	-6	4	FUZE, GRENADE, HAND, PRACTICE, M228 EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-12	2	GRENADE, HAND, PRACTICE, MK 2 EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-1	1	FUZE, GRENADE, HAND, PRACTICE, M228 EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-1	1	FUZE, GRENADE, HAND, PRACTICE, M228 EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-10	1	GRENADE, HAND, PRACTICE, MK 2 EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-6	1	GRENADE, HAND, PRACTICE, MK 2 EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-1	1	FUZE, GRENADE, HAND, PRACTICE, M228 EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-1	1	FUZE, GRENADE, HAND, M205 SERIES EXPENDED	OE Scrap
OE-15 MOCO 02	G 14	-2	1	FUZE, GRENADE, HAND, M205 SERIES EXPENDED	OE Scrap
OE-15 MOCO 02	G 15	0		PROJECTILE, 81mm, MORTAR, HE, M43 SERIES (FRAGMENTS) EXPENDED	OE Scrap
OE-15 MOCO 02	G 15	-10	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 MOCO 02	G 15	-3	1	FUZE, GRENADE, HAND, M205 SERIES EXPENDED	OE Scrap
OE-15 MOCO 02	G 15	-6	1	GRENADE, HAND, PRACTICE, MK 2 EXPENDED	OE Scrap
OE-15 MOCO 02	G 15	-8	1	FUZE, GRENADE, HAND, M204 EXPENDED	OE Scrap
OE-15 MOCO 02	G 16	0		FRAGMENTS, UNKNOWN EXPENDED	OE Scrap
OE-15 MOCO 02	G 16	-6	1	FLARE, SURFACE, TRIP, M49 LIVE	UXO
OE-15 MOCO 02	G 17	0		FRAGMENTS, UNKNOWN EXPENDED	OE Scrap
OE-15 MOCO 02	G 17	0		FRAGMENTS, UNKNOWN EXPENDED	OE Scrap
OE-15 MOCO 02	G 18	-24	1	ROCKET, 2.36 INCH, PRACTICE, M7 SERIES EXPENDED	OE Scrap

**Table 2. Ranges 43 through 48, UXO and OE Scrap Discovered During Investigations
Interim Action Ordnance and Explosives Remedial Investigation/Feasibility Study
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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
OE-15 MOCO 02	G 18	-24	4	ROCKET, 2.36 INCH, PRACTICE, M7 SERIES	EXPENDED OE Scrap
OE-15 MOCO 02	G 18	-1	1	GRENADE, HAND, PRACTICE, MK 2	EXPENDED OE Scrap
OE-15 MOCO 02	G 19	-6	1	FUZE, GRENADE, HAND, PRACTICE, M228	EXPENDED OE Scrap
OE-15 MOCO 02	G 19	0		FRAGMENTS, UNKNOWN	EXPENDED OE Scrap
OE-15 MOCO 02	G 20	-16	1	GRENADE, HAND, PRACTICE, MK 2	EXPENDED OE Scrap
OE-15 MOCO 02	G 20	0		FRAGMENTS, UNKNOWN	EXPENDED OE Scrap
OE-15 MOCO 02	G 20	-2	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73	EXPENDED OE Scrap
OE-15 MOCO 02	G 20	-4	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	EXPENDED OE Scrap
OE-15 MOCO 02	G 21	0		FRAGMENTS, UNKNOWN	EXPENDED OE Scrap
OE-15 MOCO 02	G 22	-12	1	GRENADE, HAND, PRACTICE, MK 2	EXPENDED OE Scrap
OE-15 MOCO 02	G 22	-12	1	PRIMER, IGNITER TUBE, M5	LIVE UXO
OE-15 MOCO 02	G 22	-12	2	PRIMER, IGNITER TUBE, M57	LIVE UXO
OE-15 MOCO 02	G 22	-4	1	GRENADE, HAND, PRACTICE, MK 2	LIVE UXO
OE-15 MOCO 02	G 23	0		PROJECTILE, 81mm, MORTAR, HE, M43 SERIES (FRAGMENTS)	EXPENDED OE Scrap
OE-15 MOCO 02	G 23	-6	1	PROJECTILE, 60mm, MORTAR, ILLUMINATING, M83 SERIES (PRIMER)	LIVE UXO
OE-15 MOCO 02	G 23	0		PROJECTILE, 60mm, MORTAR, ILLUMINATING, M83 SERIES (FRAGMENTS)	EXPENDED OE Scrap
OE-15 MOCO 02	G 24	-10	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	EXPENDED OE Scrap
OE-15 MOCO 02	G 24	0		FRAGMENTS, UNKNOWN	EXPENDED OE Scrap
OE-15 MOCO 02	G 24	0		PROJECTILE, 37mm, LE, MK 1 (FRAGMENTS)	EXPENDED OE Scrap
OE-15 MOCO 02	G 24	0		PROJECTILE, 81mm, MORTAR, HE, M43 SERIES (FRAGMENTS)	EXPENDED OE Scrap
OE-15 MOCO 02	G 24	-6	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES	EXPENDED OE Scrap
OE-15 MOCO 02	G 24	0		PROJECTILE, 37mm, LE, MK 1 (FRAGMENTS)	EXPENDED OE Scrap
OE-15 MOCO 02	G 24	0		PROJECTILE, 81mm, MORTAR, HE, M43 SERIES (FRAGMENTS)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-6	2	PROJECTILE, 105mm, HE, M1 (FRAGMENTS)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-6	2	PROJECTILE, 105mm, HE, M1 (FRAGMENTS)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	0		FRAGMENTS, UNKNOWN	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-6	2	PROJECTILE, 37mm, LE, MK 1 (FRAGMENTS)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-4	1	PROJECTILE, 105mm, HE, M1 (FRAGMENT)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-3	1	PROJECTILE, 37mm, LE, MK 1 (FRAGMENT)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-5	2	PROJECTILE, 37mm, LE, MK 1 (FRAGMENTS)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-4	1	PROJECTILE, 37mm, LE, MK 1 (FRAGMENT)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-3	1	PROJECTILE, 37mm, LE, MK 1 (FRAGMENT)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-4	1	PROJECTILE, 37mm, LE, MK 1 (FRAGMENT)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-4	1	PROJECTILE, 75mm, SHRAPNEL, MK 1 (SCRAP)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-2	1	PROJECTILE, 37mm, LE, MK 1 (FRAGMENT)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-3	1	PROJECTILE, 37mm, LE, MK 1 (FRAGMENT)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-3	1	PROJECTILE, 37mm, LE, MK 1 (FRAGMENT)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-4	1	PROJECTILE, 37mm, LE, MK 1 (FRAGMENT)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-6	1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES (FRAGMENT)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-4	1	PROJECTILE, 37mm, LE, MK 1 (FRAGMENT)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-4	1	PROJECTILE, 37mm, LE, MK 1 (FRAGMENT)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-3	1	PROJECTILE, 37mm, LE, MK 1 (FRAGMENT)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-4	1	PROJECTILE, 37mm, LE, MK 1 (FRAGMENT)	EXPENDED OE Scrap
OE-15 MOCO 02	G 25	-3	1	PROJECTILE, 37mm, LE, MK 1 (FRAGMENT)	EXPENDED OE Scrap

**Table 2. Ranges 43 through 48, UXO and OE Scrap Discovered During Investigations
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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
OE-15 MOCO 02	G 25	-4	1	PROJECTILE, 37mm, LE, MK I (FRAGMENT) EXPENDED	
OE-15 MOCO 02	G 26	0		FRAGMENTS, UNKNOWN EXPENDED	OE Scrap
OE-15 MOCO 02	G 26	-3	1	FUZE, GRENADE, HAND, M206A1 EXPENDED	OE Scrap
OE-15 MOCO 02	G 26	-6	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 MOCO 02	G 26	0		PROJECTILE, 155mm, HE, M107 (NORMAL & DEEP CAVITY) (FRAGMENTS) EXPENDED	OE Scrap
OE-15 MOCO 02	G 26	-3	1	FUZE, GRENADE, HAND, M206A1 EXPENDED	OE Scrap
OE-15 MOCO 02	G 26	-2	1	FUZE, GRENADE, HAND, M206A1 EXPENDED	OE Scrap
OE-15 MOCO 02	G 26	-6	1	GRENADE, HAND, SMOKE, COLORED, M48 EXPENDED	OE Scrap
OE-15 MOCO 02	G 26	-4	1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES EXPENDED	OE Scrap
OE-15 MOCO 02	G 26	0	1	CARTRIDGE, 40mm, PRACTICE, M212 LIVE	OE Scrap
OE-15 MOCO 02	G 26	0	1	CARTRIDGE, 40mm, PRACTICE, M212 LIVE	UXO
Site Specific Sampling, Seaside 4					
OE-15 SEA 04	17 X	-3	4	CARTRIDGE, IGNITION, M2 SERIES LIVE	
OE-15 SEA 04	17 X	-1	1	FIRING, DEVICE, PRESSURE, M1A1 EXPENDED	OE Scrap
OE-15 SEA 04	17 X	-24	1	ROCKET, 2.36 INCH, PRACTICE, M7 SERIES EXPENDED	OE Scrap
OE-15 SEA 04	17 X	-12	1	PROJECTILE, 75mm, SHRAPNEL, MK I LIVE	OE Scrap
OE-15 SEA 04	17 X	-2	1	FUZE, GRENADE, HAND, PRACTICE, M228 EXPENDED	UXO
OE-15 SEA 04	17 X	-24	1	GRENADE, RIFLE, AT, PRACTICE, M11 EXPENDED	OE Scrap
OE-15 SEA 04	17 X	-6	1	FUZE, GRENADE, HAND, PRACTICE, M228 EXPENDED	OE Scrap
OE-15 SEA 04	19 AD	-3	1	FUZE, GRENADE, HAND, PRACTICE, M228 EXPENDED	OE Scrap
OE-15 SEA 04	19 AD	-2	1	FUZE, GRENADE, HAND, PRACTICE, M228 EXPENDED	OE Scrap
OE-15 SEA 04	19 AD	0		2 LBS, FRAGMENTS, UNKNOWN EXPENDED	OE Scrap
OE-15 SEA 04	19 W	-6	1	GRENADE, HAND, PRACTICE, DELAY, M30 EXPENDED	OE Scrap
OE-15 SEA 04	21 AI	0		1 LBS, FRAGMENTS, UNKNOWN EXPENDED	OE Scrap
OE-15 SEA 04	22 AP	-1	1	SIGNALS, ILLUMINATION, HAND, FIRED, COMET 1260 (CANADIAN) EXPENDED	OE Scrap
OE-15 SEA 04	24 AJ	-1	1	FUZE, PROJECTILE, COMBINATION, M1907 EXPENDED	OE Scrap
OE-15 SEA 04	24 AJ	-4	1	PROJECTILE, 57mm, HE, M306 SERIES LIVE	OE Scrap
OE-15 SEA 04	24 AJ	-6	1	PROJECTILE, 57mm, HE, M306 SERIES LIVE	UXO
OE-15 SEA 04	24 AM	-6	1	ROCKET, 3.5 INCH, PRACTICE, M29A2 EXPENDED	UXO
OE-15 SEA 04	24 AM	-4	1	GRENADE, HAND, PRACTICE, MK 2 EXPENDED	OE Scrap
OE-15 SEA 04	24 AM	-4	2	ROCKET, 3.5 INCH, PRACTICE, M29A2 EXPENDED	OE Scrap
OE-15 SEA 04	24 AM	-6	1	PROJECTILE, 81mm, MORTAR, ILLUMINATING, M301 SERIES EXPENDED	OE Scrap
OE-15 SEA 04	24 AM	-8	1	PROJECTILE, 81mm, MORTAR, ILLUMINATING, M301 SERIES EXPENDED	OE Scrap
OE-15 SEA 04	24 AM	-2	2	ROCKET, 3.5 INCH, PRACTICE, M29A2 (ROCKET MOTOR) EXPENDED	OE Scrap
OE-15 SEA 04	26 AN	-18	1	GRENADE, HAND, PRACTICE, MK 2 EXPENDED	OE Scrap
OE-15 SEA 04	26 AN	-3	1	FIRING, DEVICE, RELEASE, M1 EXPENDED	OE Scrap
Range 44 Sampling					
OE-15	RNG 44 03 04		1	GRENADE, HAND, INCENDIARY, TH3, AN-M14 LIVE	
OE-15	RNG 44 05 B	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
					UXO

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Site Number	Grid Number	Depth (Inches)	QTY	Ordnance	Status
OE-15	RNG 44 05 B	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 66mm, HEAT, M72, M72A1, M72A2 & M72A3 (FUZE) LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 66mm, HEAT, M72, M72A1, M72A2 & M72A3 LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 66mm, HEAT, M72, M72A1, M72A2 & M72A3 (FUZE) LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 66mm, HEAT, M72, M72A1, M72A2 & M72A3 (FUZE) LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 66mm, HEAT, M72, M72A1, M72A2 & M72A3 (FUZE) LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 44 05 B	0	1	PROJECTILE, 40mm, HE, M386 LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 66mm, HEAT, M72, M72A1, M72A2 & M72A3 LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 66mm, HEAT, M72, M72A1, M72A2 & M72A3 LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 44 05 B	0	10	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 44 05 B	0	8	ROCKET, 66mm, HEAT, M72, LIVE	UXO
OE-15	RNG 44 05 B	0	5	ROCKET, 66mm, HEAT, M72, LIVE	UXO
OE-15	RNG 44 05 B	0	6	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 44 05 B	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
Range 45 Sampling					
OE-15	RNG 45	0	2	PROJECTILE, 40mm, HE, M381 LIVE	UXO
OE-15	RNG 45	0	1	RAW PYROTECHNIC MIXTURE LIVE	UXO
OE-15	RNG 45	0	3	PROJECTILE, 40mm, PARACHUTE, WHITE STAR, M583A1 LIVE	UXO
OE-15	RNG 45	0	3	ROCKET, 66mm, INCENDIARY, TPA, M74 LIVE	UXO
OE-15	RNG 45	0	2	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 45	0	7	PROJECTILE, 40mm, GROUND MARKER GREEN SMOKE M715 LIVE	UXO
OE-15	RNG 45	0	2	PROJECTILE, 40mm, CS, M651 LIVE	UXO
OE-15	RNG 45	0	2	PROJECTILE, 40mm, GROUND, MARKER GREEN SMOKE M715 LIVE	UXO
OE-15	RNG 45	0	4	PROJECTILE, 40mm, GROUND MARKER RED SMOKE, M713 LIVE	UXO
OE-15	RNG 45	0	1	PROJECTILE, 40mm, FUZE LIVE	UXO
OE-15	RNG 45	0	3	PROJECTILE, 40mm, HE, M381 LIVE	UXO
OE-15	RNG 45	0	1	CARTRIDGE, 40mm, PRACTICE, M212 LIVE	UXO
OE-15	RNG 45	0	1	PROJECTILE, 40mm, GROUND MARKER RED SMOKE, M713 LIVE	UXO
OE-15	RNG 45	0	1	RAW PYROTECHNIC MIXTURE LIVE	UXO
OE-15	RNG 45	0	2	PROJECTILE, 40mm, CANOPY, WHITE SMOKE, M680 LIVE	UXO
OE-15	RNG 45	0	5	PROJECTILE, 40mm, GROUND MARKER GREEN SMOKE M715 LIVE	UXO
OE-15	RNG 45	0	2	CARTRIDGE, 40mm, PRACTICE, M212 LIVE	UXO
OE-15	RNG 45	0	3	PROJECTILE, 40mm, HE, M381 LIVE	UXO
OE-15	RNG 45	0	2	PROJECTILE, 40mm, HE, M381 LIVE	UXO
OE-15	RNG 45	0	1	PROJECTILE, 40mm, HEDP, M430 LIVE	UXO
OE-15	RNG 45	0	1	PROJECTILE, 40mm, HEDP, M430 LIVE	UXO

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OE-15	RNG 45	0	1	PROJECTILE, 40mm, HEDP, M430 LIVE	UXO
OE-15	RNG 45	0	1	150 LBS, PROJECTILE, 40mm, HE(SMOKE) DUMMY& PRACTICE (SCRAP) EXPENDED	OE Scrap
OE-15	RNG 45	0	2	PROJECTILE, 40mm, C.S. M651 LIVE	UXO
OE-15	RNG 45	0	4	PROJECTILE, 40mm, GROUND MARKER GREEN SMOKE M715, PARTIAL LIVE	UXO
OE-15	RNG 45	0	1	PROJECTILE, 40mm, HEDP, M433 LIVE	UXO
OE-15	RNG 45	0	2	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 LIVE	UXO
OE-15	RNG 45	0	2	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 45	0	1	PROJECTILE, 40mm, HE, M381 LIVE	UXO
OE-15	RNG 45	0	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 LIVE	UXO
OE-15	RNG 45	0	1	150 LBS, PROJECTILE, 40mm, HE(SMOKE) DUMMY& PRACTICE (SCRAP) EXPENDED	OE Scrap
OE-15	RNG 45	0	1	PROJECTILE, 40mm, HE, M381 LIVE	UXO
OE-15	RNG 45	0	3	PROJECTILE, 40mm, HE, M397 LIVE	UXO
OE-15	RNG 45	0	528	PROJECTILE, 40mm, Practice, M781 EXPENDED	OE Scrap
OE-15	RNG 45	0	1	ROCKET, 66mm, INCENDIARY, TPA, M74, (ROCKET MOTOR AND FUZE ONLY) FUZE LIVE	UXO
OE-15	RNG 45	0	2	PROJECTILE, 40mm, HE, M381 LIVE	UXO
OE-15	RNG 45	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 45	0	1	RAW PYROTECHNIC MIXTURE LIVE	UXO
OE-15	RNG 45	0	4	PROJECTILE, 40mm, GROUND MARKER RED SMOKE, M713 LIVE	UXO
OE-15	RNG 45	0	1	PROJECTILE, 40mm, CS, M651 LIVE	UXO
OE-15	RNG 45	0	1	PROJECTILE, 40mm, HEDP M433 LIVE	UXO
OE-15	RNG 45	0	1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 45	0	1	SIGNALS, ILLUMINATION, GROUND, PARACHUTE, RED STAR, M126A1 LIVE	UXO
OE-15	RNG 45	0	412	PROJECTILE, 40mm, PRACTICE, M781 EXPENDED	OE Scrap
OE-15	RNG 45	0	1	PROJECTILE, 40mm, CS, M651 LIVE	UXO
OE-15	RNG 45	0	612	PROJECTILE, 40mm, PRACTICE, M781 EXPENDED	OE Scrap
OE-15	RNG 45	0	5	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 LIVE	UXO
OE-15	RNG 45	0	3	PROJECTILE, 40mm, HE, M397 LIVE	UXO
OE-15	RNG 45	0	1	PROJECTILE, 40mm, PARACHUTE, WHITE STAR, M583A1 LIVE	UXO
OE-15	RNG 45	0	1	PROJECTILE, 40mm, PARACHUTE, WHITE STAR, M583A1 LIVE	UXO
Range 46 Lead Remediation Removal					
OE-15 SEA 04	26 AP	-14	1	FUZE, PROJECTILE, COMBINATION, M1907 EXPENDED	OE Scrap
OE-15 SEA 04	26 AP	-6	1	GRENADE, HAND, PRACTICE, MK 2 EXPENDED	OE Scrap
OE-15 SEA 04	23 AR	0	1	GRENADE, HAND, SMOKE, HC, AN-M8 LIVE	UXO
Additional Fuel Break Data					
OE-15	MAVERICK ROAD		1	GRENADE, HAND, SMOKE, WP, M15 LIVE	UXO
OE-15	MAVERICK ROAD		3	PROJECTILE, 57mm, HE, M306 SERIES LIVE	UXO
OE-15	MAVERICK ROAD		1	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES LIVE	UXO
OE-15 EDCBND	EDC 12 (MOCO 02)	-10	1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 EXPENDED	OE Scrap
OE-15 EDCBND	FB E06 (MOCO 02)		1	PROJECTILE, 40mm, PRACTICE, M781 LIVE	UXO
OE-15 EDCBND	FB E06 (MOCO 02)		1	GRENADE, HAND, PRACTICE, MK 2 EXPENDED	OE Scrap

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OE-15 EDCBND	FB E06 (MOCO 02)		1	PROJECTILE, 40mm, PRACTICE, M781 LIVE	UXO
OE-15 EDCBND	FB E10 (MOCO 02)		1	FLARE, SURFACE, TRIP, M49A1 LIVE	UXO
OE-15 EDCBND	FB E10 (MOCO 02)		1	PROJECTILE, 22mm, SUB-CALIBER, PRACTICE, M744 LIVE	UXO
OE-15 EDCBND	FB E11 (MOCO 02)		1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB E11 (MOCO 02)		1	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73 EXPENDED	OE Scrap
OE-15 EDCBND	FB E12 (MOCO 02)		1	PROJECTILE, 75mm, SHRAPNEL, MK1 EXPENDED	OE Scrap
OE-15 EDCBND	FB E12 (MOCO 02)		1	FUZE, PROJECTILE, POINT DETONATING, M48 SERIES LIVE	UXO
OE-15 EDCBND	FB E15 (MOCO 02)		1	ROCKET, 2.36 INCH, PRACTICE, M7 SERIES EXPENDED	OE Scrap
OE-15 EDCBND	FB W01 (MOCO 02)		2	PROJECTILE, 40mm, HE, M381 LIVE	UXO
OE-15 EDCBND	FB W02 (MOCO 02)		1	PROJECTILE, 40mm, HE, M381 LIVE	UXO
OE-15 EDCBND	FB W02 (MOCO 02)		1	PROJECTILE, 40mm, HE, M381 (FRAGMENT BALL) LIVE	UXO
OE-15 EDCBND	FB W06 (MOCO 02)			4 LBS, PROJECTILE, 40mm, HE (FRAGMENTS) EXPENDED	OE Scrap
OE-15 EDCBND	FB W07 (MOCO 02)			3 LBS, GRENADE, RIFLE, 40mm, HE (FRAGMENTS) EXPENDED	OE Scrap
Surface Removal, Time Critical Removal Action					
RANGES 43-48		0	1	PROJECTILE, 37mm, PRACTICE, M63	OE Scrap
RANGES 43-48		0	1	PROJECTILE, 37mm, HE, M63	UXO
RANGES 43-48		0	1	PROJECTILE, 37mm, HE, M54	UXO
RANGES 43-48		0	17	PROJECTILE, 60mm, MORTAR, HE, M49 SERIES	UXO
RANGES 43-48		0	72	PROJECTILE, 60mm, MORTAR, PRACTICE, M50 SERIES	OE Scrap
RANGES 43-48		0	1	PROJECTILE, 60mm, MORTAR, ILLUMINATING, M83 SERIES	UXO
RANGES 43-48		0	16	PROJECTILE, 57mm, TP, M306 SERIES	OE Scrap
RANGES 43-48		0	43	PROJECTILE, 57mm, HE, M306 SERIES	UXO
RANGES 43-48		0	1	PROJECTILE, 57mm, HEAT, M307	UXO
RANGES 43-48		0	41	PROJECTILE, 40mm, PRACTICE, M918	UXO
RANGES 43-48		0	6	PROJECTILE, 40mm, PRACTICE, M781	UXO
RANGES 43-48		0	6	PROJECTILE, 40mm, PRACTICE, M407A1	UXO
RANGES 43-48		0	5	PROJECTILE, 40mm, HE, M383	UXO
RANGES 43-48		0	25	PROJECTILE, 40mm, HE, M381	UXO
RANGES 43-48		0	2	PROJECTILE, 40mm, HE, M384	UXO
RANGES 43-48		0	1	PROJECTILE, 40mm, HE, M441	UXO
RANGES 43-48		0	1	PROJECTILE, 40mm, HE, M386	UXO
RANGES 43-48		0	1	PROJECTILE, 40mm, HEDP, M433	UXO
RANGES 43-48		0	1	PROJECTILE, 40mm, SMOKE, M713 SERIES	UXO
RANGES 43-48		0	1	PROJECTILE, 40mm, PARACHUTE, STAR, M662	UXO
RANGES 43-48		0	1	PROJECTILE, 30mm, TP, M788	OE Scrap
RANGES 43-48		0	7	PROJECTILE, 22mm, SUBCALIBER, PRACTICE, M744	UXO
RANGES 43-48		0	1	PROJECTILE, 4.2 INCH, MORTAR, HE, M329 SERIES	UXO
RANGES 43-48		0	1	PROJECTILE, 75mm, HE, M48	UXO
RANGES 43-48		0	4	PROJECTILE, 75mm, HE, M41A1	UXO
RANGES 43-48		0	2	PROJECTILE, 75mm, SHRAPNEL, MK1	UXO
RANGES 43-48		0	14	PROJECTILE, 81mm, MORTAR, PRACTICE, M43 SERIES	OE Scrap
RANGES 43-48		0	3	PROJECTILE, 81mm, MORTAR, HE, M43 SERIES	UXO

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RANGES 43-48		0	1	PROJECTILE, 81mm, MORTAR, HE, M374A3	UXO
RANGES 43-48		0	1	PROJECTILE, 81mm, MORTAR, HE, M362	UXO
RANGES 43-48		0	1	PROJECTILE, 81mm, MORTAR, ILLUMINATING, M301 SERIES	UXO
RANGES 43-48		0	94	PROJECTILE, 84mm, HEAT, M136 SERIES	UXO
RANGES 43-48		0	7	PROJECTILE, 90mm, HEAT, M348	UXO
RANGES 43-48		0	7	PROJECTILE, 90mm, HEAT, M371A1	UXO
RANGES 43-48		0	1	PROJECTILE, 155mm, ILLUMINATING, M485 SERIES	UXO
RANGES 43-48		0	1749	ROCKET, 35mm, PRACTICE, SUBCALIBER, M73	UXO
RANGES 43-48		0	1	ROCKET, 2.36 INCH, PRACTICE, M7	UXO
RANGES 43-48		0	4	ROCKET, 2.36 INCH, ANTTANK, HE, M6	OE Scrap
RANGES 43-48		0	1	ROCKET, 3.5 INCH, PRACTICE, M29 SERIES	OE Scrap
RANGES 43-48		0	165	ROCKET, 66mm, HEAT, M72 SERIES	UXO
RANGES 43-48		0	25	ROCKET, 66mm, INCENDIARY, TPA, M74	UXO
RANGES 43-48		0	5	ROCKET, 66mm, INCENDIARY, TPA, M74	OE Scrap
RANGES 43-48		0	14	ROCKET MOTOR, M222 (DRAGON)	OE Scrap
RANGES 43-48		0	2	ROCKET MOTOR, M222 (DRAGON)	UXO
RANGES 43-48		0	1	ROCKET, 83mm, HEAT, (SMAW)	OE Scrap
RANGES 43-48		0	2	MISSILE, GUIDED, PRACTICE, M231 (DRAGON)	OE Scrap
RANGES 43-48		0	11	MISSILE, GUIDED, PRACTICE, M231 (DRAGON)	UXO
RANGES 43-48		0	1	GRENADE, HAND SMOKE, WP, M15	UXO
RANGES 43-48		0	1	GRENADE, HAND SMOKE, M18 SERIES	UXO
RANGES 43-48		0	2	GRENADE, HAND, ILLUMINATING, MK1	UXO
RANGES 43-48		0	1	FIRING DEVICE, RELEASE, M1	UXO
RANGES 43-48		0	76	FUZE, GRENADE, HAND, M10 SERIES	UXO
RANGES 43-48		0	1	FUZE, BOMB, NOSE, M103	UXO
RANGES 43-48		0	1	SIGNAL, ILLUMINATION, GROUND, SLAP FLARE, M125 SERIES	UXO
RANGES 43-48		0	1	FLARE, SURFACE, TRIP, M49 SERIES	UXO
RANGES 43-48		0	1	SIMULATOR, FLASH, ARTILLERY, M110	UXO

ATTACHMENT 21

Article: Macon Telegraph 08/07/2005

Buried ordnance has residents wondering
if their yards hold hidden danger



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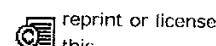
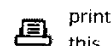
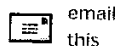
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Tuesday, Aug 09, 2005



Posted on Sun, Aug. 07, 2005

Buried ordnance has residents wondering if their yards hold hidden danger

By S. Heather Duncan TELEGRAPH STAFF WRITER

When Jackie Clark bought land in Twiggs County in 1979, she says, the owner didn't tell her there might be artillery explosives under her house.

Although she later heard an infantry training camp had once been located nearby, she still didn't think the metal objects she found in her yard were anything but lawn-mower parts.

Clark learned five years ago that they were pieces of mortar shells left from Camp Wheeler, where military training occurred in World War II. She obtained a 1949 map showing the Army had put deed restrictions on much of the land that is now her neighborhood, forbidding any digging because so much live ordnance remained.

But somehow those restrictions expired or were removed. An entire neighborhood was built there without new owners being informed that there might be danger.

It's still happening today. More roads and houses are being built behind Redbud Drive, where Clark lives, and in Apple Valley Estates and Wheeler's Landing off Chestney Road in Bibb County.

These are all areas the U.S. Army Corps of Engineers has identified as "high risk" because a recent survey found mortars, rockets, and/or grenades there, either live or in fragments.

No one has been injured since a boy was killed and other boys were injured by a grenade in the 1940s.

But corps officials say some items are only a few inches beneath the soil and could explode if disturbed by activities such as driving an all-terrain vehicle over them.

Developers say they are not telling buyers there could be explosives on the land, because they did not know any live ordnance had been found.

Clark said selling the land without notifying buyers is "so deplorable I think it borders on a crime. The way I was brought up, if you lied by omission, you lied just the same."

The person she bought her land from has since died, but she remains concerned for others.

The corps points out that Camp Wheeler's location was never secret. The Army conducted three ordnance removal operations in the 1940s, monitored through the 1960s and conducted a smaller survey in the early 1990s.

- NASOAR
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A 1987 law made the corps responsible for cleaning up former defense sites contaminated by the military. This led to a six-month survey last fall by contractor EOD Technology.

It identified five areas of the former Camp Wheeler likely to still contain live ordnance. Three are mostly wooded. The other two, both residential, are the top priority ordnance cleanup sites in Georgia, said David Roulo, project manager for the corps in Savannah. They await federal funding.

Clark's Twiggs County neighborhood of Dogwood Road and Redbud Drive is the only residential area where EOD Technology found live ordnance, said Billy Birdwell, communications director for the corps. But fragments of mortars and evidence of small arms fire were found around residential areas on Bibb County's Chestney Road, Apple Valley Road and Crabapple Place, he said, leading the corps to believe unexploded ordnance could be present.

Residents like Clark want to know how previous homeowners and developers avoided informing buyers about the former firing ranges, and what can be done to prevent that from happening to future buyers.

Although Georgia law does not require property sellers to divulge defects that couldn't be uncovered by a reasonable inspection, civil lawsuits have tended to hold the seller liable for not revealing problems with the property, said Macon real estate attorney Wayne Crowley.

Liability is generally greater for sales of residential property than for undeveloped property, he said.

"They never should have let the land be used for residential purposes," said Twiggs County Sheriff Darren Mitchum. He is raising his three children on land next to his parents' home on Dogwood Road, where eight months ago EOD Technology found four live mortars about 30 yards from the back door.

"I don't think anybody would have bought a house here knowing the ground was full of old ordnance," he said.

CURRENT DEVELOPMENT

In Twiggs County, developer A.V. Elliott plans to add 20 more homes in the Marion Estates subdivision, and houses and roads are being built on his land next to the Redbud/Dogwood neighborhood. He said he has not told buyers about the ordnance because he didn't realize any of it was still capable of exploding.

"I have dug ponds and pushed up trees and graded roads in there, and I think it's a moot question," he said. "If it does pose an immediate and present danger, it should be removed regardless of how the land is used."

But corps officials say it's unlikely Congress will allocate enough money to remove ordnance from the wooded areas, so the corps proposes to clear it only from roads and neighborhoods, at a cost of \$3.6 million.

"Our priority is keeping people safe that are there right now, as opposed to people who may live there in a few years," Birdwell said.

Robin Hawn, public relations specialist for EOD Technology, said private landowners can also hire a company to clear their land instead.

And the government could still decide to remove more ordnance later, said Chris Cochrane, technical project manager with the corps' Huntsville, Ala., center. The corps proposes to revisit the issue at least every five years.

Elliott said the government should buy the land back if it doesn't remove ordnance from undeveloped property. He plans to develop much of his wooded land soon.

"Rural land that close to Macon is worth \$15,000 to \$20,000 an acre," he said.

Corps officials said last week that no buybacks are planned.

The corps sent letters to residents of the Dogwood/Redbud neighborhood about the live ordnance found there and warned people against digging. Because only fragments were found in Apple Valley and Wheeler's Landing, those residents were not contacted directly or warned against digging, Birdwell said.

Chuck Sparks, who lives on Dogwood, said at a public meeting last week that he turned up grenades, mortars and what appeared to be burned and buried medical equipment including needles three years ago when he graded land for a subcontractor on Apple Valley subdivision.

He said he was told to rebury the items, which he said could still be in people's yards.

Corps documents about Camp Wheeler say no chemical agents were ever used or thrown away there. However, a corps report about nearby Herbert Smart Field said chemicals from the former air field are suspected to have been buried at Camp Wheeler. Birdwell said no evidence has proven that.

Bonnie Frith, developer of the roads in Apple Valley and all of Wheeler's Landing, said no dangerous items were found during their development, even when 20-foot-deep sewers were dug. A total of more than 600 houses are planned in the two developments.

"We found some hospital masks and stuff like that, but no grenades or anything of that nature," she said. "If (contractors) had found a grenade, it was their responsibility to let me know. ... If I found something dangerous there, I would be all over the Army in a heartbeat."

Stith Short with B-Kay Builders, a contractor adding houses in Apple Valley, said he hasn't heard of any ordnance being found.

Warees Muhammad moved to Wheeler's Landing in May, and a new road is now being cut behind his house. Although the subdivision sign features World War II soldiers carrying machine guns, Muhammad said the developer never mentioned there was an ordnance survey going on. He said the developer should be required to tell buyers if explosives could be present, and expressed concern that his new house could lose value as a result.

Frith said she has not told buyers about the ordnance survey. When the corps never notified her about the survey results, she assumed nothing was found, she said.

BUYING AND SELLING

In the decades following the closure of Camp Wheeler, the government reimbursed some landowners for diminished kaolin value resulting from the ordnance. Most of the nine settlements were for \$600 or \$1,500, although several ranged from \$10,000 to \$22,000, corps records show. Ordnance will not be removed from those areas.

Because the former Camp Wheeler land is now all private property, the government can't require private owners to allow ordnance to be removed or to post signs about the dangers.

The Army's only control over the land's use was to place restrictions on deeds when property was returned to private ownership, Birdwell said. This happened in the five areas where EOD Technology recently found the most ordnance. The areas that became residential were restricted from any digging, and parts of the other three units were restricted from any use at all.

Residents say these restrictions have not shown up in title searches.

Crowley, the real estate attorney with Bush, Crowley, Leverett & Leggett, offered a possible explanation under Georgia law: Until about 1990, any deed restrictions related to the use of land expired 20 years after zoning was adopted in the county.

This could apply in Bibb County, which adopted zoning in 1955. But the first zoning in Twiggs County was adopted in 1995.

If the Army put a disclosure in the title - essentially saying, "This land was a former military firing range" or something similar - that should still show up in property records, Crowley said.

He said his firm usually completes at least a 50-year title search on behalf of clients purchasing property. But some buyers request a more limited search covering a shorter period, Crowley said.

He suggested that buyers who bought title insurance might be eligible for reimbursement if they later learn their title search was not conducted properly. Such insurance, which covers up to the cost of the purchase, pays for a loss due to undiscovered title problems.

Birdwell said it would now be up to local governments to decide any zoning changes or deed restrictions limiting the use of the land or notifying buyers of its contamination.

Glenn Barton, Twiggs County administrator, is researching ways to create a notification system for buyers, checking to see what counties elsewhere have done.

Twiggs County zoning official Michael Land said he would informally alert anyone who comes to his office about land the corps has designated a high-risk area. "I feel we have a moral obligation to make people aware of this," he said.

Vernon Ryle, executive director of the Macon-Bibb County Planning & Zoning Commission, also realized the problem last week and said he's not sure how it can be addressed. Special zoning might not help much, because most property sales don't go through the zoning office. And usually only a property owner can put restrictions on a deed.

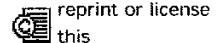
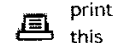
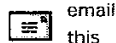
"The only thing I know we could do is put a warning on a subdivision plat," he said. "It's going to be a difficult problem."

Jackie Clark suggested that developers could be required to search for ordnance before being granted a land disturbance permit. These permits are issued by Bibb County. Because Twiggs County does not have this issuing authority, the state Environmental Protection Division is responsible for such permits in Twiggs.

Bibb County engineer Ken Sheets said extra requirements can be added for land disturbance permits in certain areas if the county commission desires.

Bibb County Commission Vice Chairman Sam Hart, who lives near Chestney Road, said the commission probably needs to consider an ordinance forbidding land disturbance in areas where explosives are likely to be present.

To contact Heather Duncan, call 744-4225 or e-mail hduncan@macontel.com.



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MAP 1

Ranges 43-48 Range 44 Lt. anti-armor WP Range

MAP 2

Historical map CSUMB Parcel and UXO/OEW items found

UXO/OEW Items Found Sites 4C, 7, 8, 13B, 18, sampling

UXO/OEW Items Found Site CSU

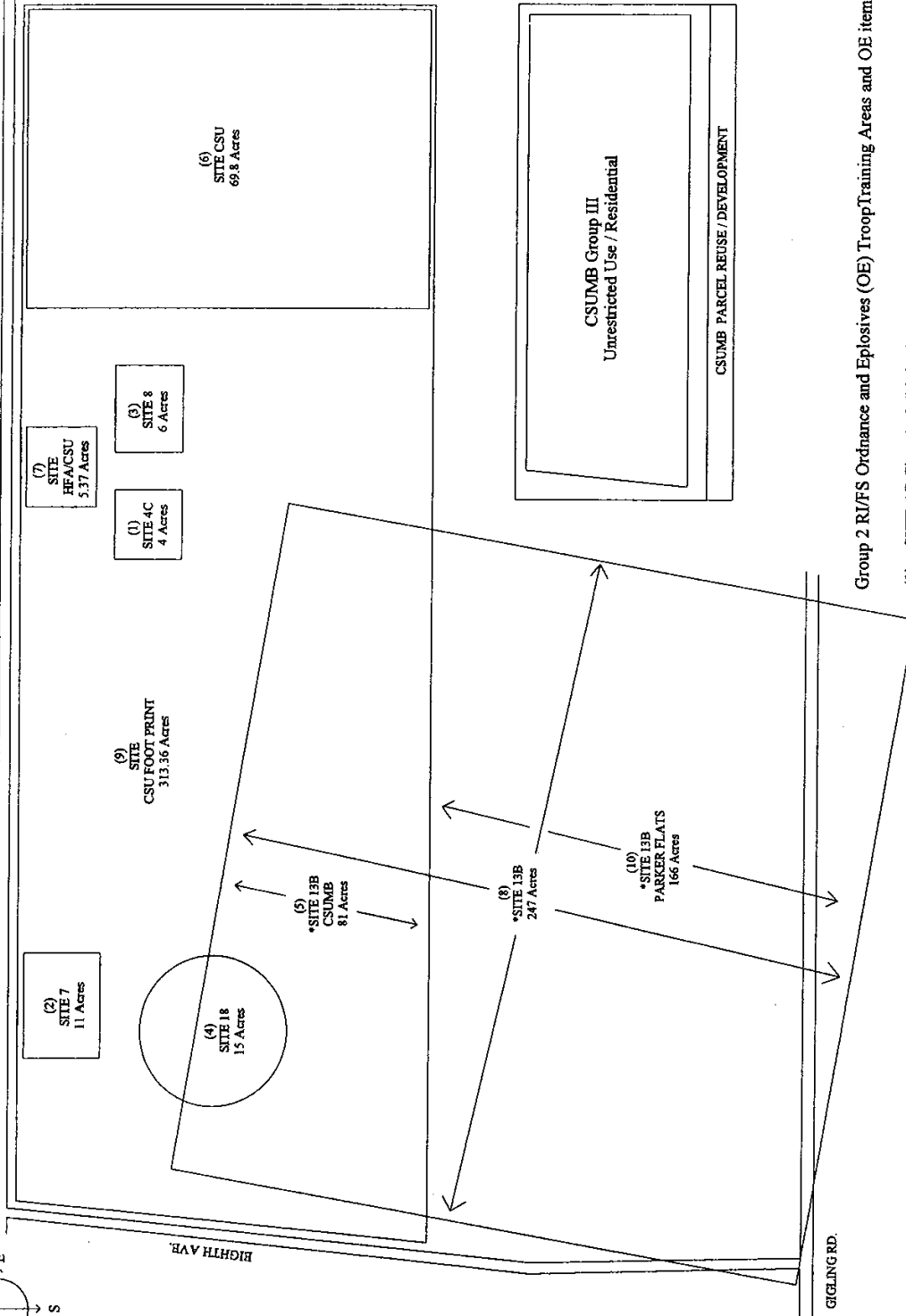
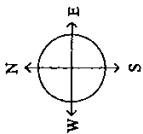
UXO/OEW Items Found Site HFA/CSU

UXO/OEW Items Found Site CSU Foot Print

Total UXO/OEW items found including small arms 274,585

GROUP 2 RI/FS - HISTORICAL ORDNANCE AND EXPLOSIVES (OE) SITES
CSUMB/NORTH COUNTY - SITE 13B PRACTICE MORTAR RANGE - PRE 1998 OE MAPS

INTER GARRISON RD.



Group 2 RI/FS Ordnance and Explosives (OE) Troop Training Areas and OE items Found

1 acre equals 43,560 sq. feet

*13B names: Site 13B, OE-13B, MRS-13B

Pertinent Group 2 RI/FS OE documents in the Administrative Record
OE-0002, OE-0011, OE-0012, OE-0013, OE-0029, OE-0036, OE-0121,
OE-0122, OE-0142, OE-0144, OE-0202, OE-0265C, OE-265D, OE-0265E,
OE-0244, OE-0227A

Search at: www.fortordcleanup.com/adminrec/arsrchresults.asp

Fort Ord Community Advisory Group 2009

- (1) SITE 4C Chemical, Biological, Radiological (CBR) 254 OE items found, sampling
- (2) SITE 7 Mine and Booby-trap, 87 OE items found, sampling
- (3) SITE 8 Mine and Booby-trap, 6,364 OE items found, sampling
- (4) SITE 18 100lb Bomb, Mine and Booby-trap, 149 OE items found, sampling
- (5) SITE 13B Practice Mortar Range, CSUMB portion, 2,397 OE items found, sampling
- (6) SITE CSU, 100,624 OE items found, removal
- (7) SITE HFA/CSU, 781 OE items found, removal
- (8) SITE 13B Practice Mortar Range, Site Boundary
- (9) SITE CSU Footprint, Training Area, 163,929 OE items found, removal
- (10) SITE 13B Practice Mortar Range, Parker Flats portion, 78,765 OE items found, removal

NOTE: OE items include Small Arms

OE Items Found Sites 4C, 7, 8, 13B, 18 sampling OE-0012

These OEW items from sampling only as of March 9, 1994. Sites declared OEW contaminated January 1994.

4C	GRENADERS, RIFLE, SMOKE	4
	DEVICE PYROTECHNIC SIMULATOR	250
7	FLARE, PARACHUTE	1
	MINE, AT, TRAINING, INERT	3
	ACTIVATOR, MINE	46
	FIRING DEVICE, PRESSURE RELEASE	4
	CARTRIDGE, CAL.30, BLANK	10
	CARTRIDGE, 5.56MM	10
	SIMULATOR, GUNFLASH	9
	GRENADE, RIFLE, SMOKE	4
8	CARTRIDGE, CAL. 30, BLANK	162
	CARTRIDGE, CAL. 30, TRACER	200
	CARTRIDGE, CAL.30,BALL	6000
	FUZE, GRENADE, M205A2500	
	GRENADE, RIFLE, M9, HE	2
13B	CARTRIDGE, 5.56MM, LINKED, BLANK	504
	CARTRIDGE, 7.62MM,BLANK	978
	MINE, AT, INERT	27
	MINE, AP, INERT	71
	FUZE, MINE, LIVE	39
	FUZE, GRENADE, LIVE	2
	FIRING DEVICE, PRESSURE	221
	FIRING DEVICES, PULL	120
	GRENADE, SMOKE	8
	GRENADE, SMOKE, M18-SERIES,EXPENDED	8
	FLASH SIMULATOR	2
	FIRING DEVICE, PRESSURE RELEASE	145
	CHARGE, DEMOLITION, BLOCK, TNT, 1/2-LB,INERT	1
	BOMB, FRAG, 220 LB, INERT	1
	FLARE, PARACHUTE	47
	PROJECTILE, SUB-CAL, 25MM, FUNCTIONED.	2
	FLARE, SURFACE, TRIP, M49A1	3
	MORTAR, 60MM, PRACTICE, INERT	5
	MORTAR, 81MM, PRACTICE, INERT	3
	MISC, OEW RELATED MATERIAL	25
	GRENADE, PRACTICE, M26	2
	GRENADE, PRACTICE, M67,FUNCTIONED	1
	HAZMAT BAG - BIO	1
	GRENADE, RIFLE, INERT	1
	GRENADE, SMOKE, RIFLE	1
	PROJECTILE, 37MM, HE, M63 w/M58 FUZE	1 (BIP)
	CAN, AMMUNITION, 30CAL, EMPTY	6
	GRENADE, CN, EMPTY	4
	BRACKET, MOUNTING, FLARE, M49	2
	FUZE, GRENADE, TRAINING.	2
	CARTRIDGE, 105MM, EXPENDED	1
	FLARE, PARA, M48 PRACTICE	13
	MOTOR, 3.5" ROCKET, EXPENDED	1
18	SMOKE, GRENADE	1
	FUZE, MINE, FUNCTIONED	8
	FUZE, MINE, LIVE	7
	MINE, AT, TRAINING, INERT	19
	MINE, AP, TRAINING, INERT	56
	FLARE, PARACHUTE	30
	FIRING DEVICE, PRESSURE RELEASE	28
	PYROTECHNICS, LOOSE	10 LBS

OE Items Found Site CSU OE-0121

Item	Live	Expended/inert	Total
Bomb, HE Fragmentation, 25 lb.	1	0	1
Signal, Illumination, Aircraft, AN-M37 Type	13	66	79
Charge, Propellant, Mortar, M3	1	0	1
Projectile, 37 mm, TP, M63 Mod 1	1	0	1
Base Coupler, Standard	1	0	1
Cap, Blasting, Electric	37	0	37
Charge, Demolition, TNT	95	0	95
Cone, Shaped Charge, HE	1	0	1
Cartridge, 12 Gauge	1	0	1
Cartridge, Caliber 30, Ball	58	0	58
Cartridge, Caliber 30, Blank	38,926	0	38,926
Cartridge, 5.56 mm, Ball	4	0	4
Cartridge, 5.56 mm, Blank	46,976	0	46,976
Cartridge, 60 mm, Illumination, M83	10	8	18
Cartridge, 7.62 mm, Ball	42	0	42
Cartridge, 7.62 mm, Blank	12,614	0	12,614
Squib, Electric	31	0	31
Firing Device, Release, M1	2	0	2
Flare, Trip, Parachute, M48	1	12	13
Signal, Illumination, Ground, M125 Type	328	84	412
Flare, Surface, Trip, M49	9	0	9
Flare, Surface, Trip, M49A1	36	20	56
Fuze, Grenade	28	190	218
Grenade, Hand, Smoke, M18 Type	19	75	94
Grenade, Hand, Riot, CS, M7A3	3	1	4
Grenade, Hand, HC Smoke, AN-M8	5	0	5
Grenade, Hand, Illumination, MK1	20	11	31
Grenade, Hand, Fragmentation, MK2	1	0	1
Grenade, Hand, Practice	3	19	22
Grenade, Rifle, Smoke, M22 Type	27	103	130
Signal, Illumination, Ground, M19A2 Type	6	68	74
Grenade, Rifle, Red Smoke, Streamer, M23	6	0	6
Grenade, Rifle, WP Smoke, M19A1	1	0	1
Mine, AP, Practice, M8	2	0	2
Mine, AT, Practice, Light, M10	1	0	1
Primer, Percussion	13	0	13
Projectile, 37 mm, AP-T, M80	2	1	3
Compound, Pyrotechnic (pounds)	13	0	13
Rocket, Practice, 3.5", M29	0	92	92
Motor, Rocket, 3.5"	0	1	1
Rocket, HE, 3.5", AT, M28	1	2	3
Rocket, Practice, 35 mm, Subcaliber, M73	6	0	6
Simulator, Projectile, Airburst, M74	37	52	89
Simulator, Blast, Electric, M80 Type	1	0	1
Simulator, Launch, AT Rocket/Missile, M22	9	1	10
Simulator, Explosive Booby Trap, M117 Type	1	1	2
Simulator, Projectile, Ground Burst, M115A2	13	0	13
Smoke Pot, HC	2	10	12
Compound, Slag and OEW (pounds)	347	0	347
Firing Device, Combination, M142	1	0	1
Fuze, Mine, Combination, M10A2	1	0	1
Grenade, Hand, Practice, MK2	12	0	12
Compound, Smoke (bag)	13	0	13
Grenade, Hand, WP smoke, M15	2	0	2
Grenade, Hand, Offensive, MK3A2	0	1	1
Grenade, Hand, Incendiary, AN-M14	0	1	1
Tube, Flash, Cartridge Case, Artillery	4	0	4
Site CSU Total	99,788	836	100,624

OE Items Found Site HFA/CSU OE-0122

Item	Live	Expended/inert	Total
Signal, Illumination, Aircraft, AN-M37 Type	1	0	1
Base Coupler, Standard	3	4	7
Cartridge, Caliber 30, Ball	14	0	14
Cartridge, Caliber 30, Blank	303	0	303
Cartridge, 5.56 mm, Ball	40	0	40
Cartridge, 5.56 mm, Blank	99	0	99
Cartridge, 7.62 mm, Ball	1	0	1
Cartridge, 7.62 mm, Blank	85	0	85
Firing Device, Release, M1	1	5	6
Firing Device, Pressure, M1A1	2	31	33
Firing Device, Tension and Release, M3	0	4	4
Firing Device, Release, M5	3	111	114
Flare, Surface, Trip, M49A1	0	1	1
Fuze, Grenade	0	62	62
Grenade, Hand, Smoke, M18 Type	0	5	5
Grenade, Hand, Fragmentation, MK2	1	0	1
Grenade, Hand, Practice	0	3	3
Firing Device, Combination, M142	0	1	1
Grenade, Hand, Practice, MK2	0	1	1
Site HFA/CSU Total	553	228	781

OE Items Found Site CSU Foot Print OE-0002

Part 1: CSU Footprint OEW removal items 28 Feb 94 to 14 April 94.

Note: OEW Items Found are in 2 separate documents OE-0002 and OE-0012

STATUS REPORT; REMOVAL ACTION, CSU PROPERTY**STARTED: 28 FEB 94****AS OF DATE (COB): 14 April 94****GRIDS CLEARED TODAY: 11****TOTAL GRIDS CLEARED: 609 of 1374 = 44% COMPLETED**

<u>OEW ITEMS RECOVERED/DESTROYED</u>	<u>TOTAL</u>
Activator, AT Mine, M1	97
Activator, AT Mine, M1 inert	12
Assembly, Tail, Mortar, 60mm	2
Base coupling with blasting cap	1
Base coupling with percussion primer	278
Base coupling inert	315
Bomb, Frag, 25lb w/M103 Fuze inert	1
Charge, Black Powder, Hand Grenade, MKII	21
Charge, Demolition, TNT, .5 lb	15
<u>Ctg, 7.62mm, Blank</u>	<u>8770</u>
<u>Ctg, 7.62mm, Ball</u>	<u>1870</u>
<u>Ctg, 7.62mm, functioned</u>	<u>1514</u>
<u>Ctg, 5.56mm, Ball</u>	<u>201</u>
<u>Ctg, 5.56, Blank</u>	<u>25288</u>
<u>Ctg, 5.56mm, functioned</u>	<u>3037</u>
<u>Ctg, Cal 30, Ball</u>	<u>9290</u>
<u>Ctg, Cal 30, Blank</u>	<u>15564</u>
<u>Ctg, Cal 30, functioned</u>	<u>9316</u>
<u>Ctg, Cal 50, Ball</u>	<u>2</u>
<u>Ctg, Cal 50, functioned</u>	<u>2</u>
Ctg, 75mm, Signal, expended	3
Ctg, 90mm, Signal, expended	2
Ctg, 106mm RR, live primer	1
Ctg, 106mm RR, expended	7
Ctg, 40mm, Prac, M583A1	2
Ctg, 40mm, Prac, M583A1 inert	2
Element, Delay, HG, Prac, M10	193
Firing Device, PR, M5 with base coupling	1093
Firing Device, M5, functioned	155
Firing Device, PR, M5 w/o base coupling	1394
Firing Device, M2	1094
Firing Device, M3 with base coupling	3750
Firing Device, M3 functioned	678
Firing Device, M1 with base coupling	149
Firing Device, M1 w/o base coupling	1963
Firing Device, M1 functioned	570
Firing Device, M10 functioned	442
Firing Device, M57, elec functioned	1
Flare, Trip, M49	31
Flare, Trip, M49 functioned	10
Flare, Signal, M18A1	7
Flare, Signal, M18A1 functioned	4
Flare, Surface, Trip, Parachute, M48	6
Flare, Surface, trip, parachute, M48, expended.	23
Fuze, Mine, combination, M10 with base coupling	202
Fuze, Mine, M10 functioned	11

Fuze, Grenade, Hand, M10A2	206
Fuze, Grenade, Hand, M10A2, functioned	193
Fuze, Grenade, Hand, M205A2, functioned	181
Fuze, Grenade, Hand, M205A2	158
Fuze, Mine, Practice, M604	378
Fuze, Mine, Practice, M604, functioned	96
Fuze, Trip, M12 (for M49 trip flare)	712
Grenade, Hand, Practice, unfuzed, inert	24
Grenade, Hand, MkII, HE with fuze, w/ safety pin.	1
Grenade, Hand, MKII, HE, fuzed broken off	1
Grenade, Hand, MKII, HE, dud, impinged striker	1
Grenade, Rifle, WP, M19A1	22
Grenade, Rifle, Flare, Parachute,	96
Grenade, Rifle, Flare, functioned	8
Grenade, Rifle, M11, practice, inert	45
Grenade, Hand, CS, M7-series.	24
Grenade, Hand, CS, M7 Series functioned	1
Grenade, Hand, HC Smoke,	9
Grenade, Hand, Smoke, M18-series	44
Grenade, Hand, Smoke, M18-series functioned	12
Grenade, Hand, Illumination, Mk1, hung striker.	1
Grenade, Hand, Illumination, MK1	2
Grenade, Hand, Illumination, MK1 functioned	6
Mine, AT, M12, practice, inert	48
Mine, AP, M8, practice, inert	292
Mine, AT, M6, practice, inert	27
Mine, AT, M20, practice, inert	38
Mine, AT, M10, practice, inert	40
Mine, AT, M7, practice, inert	19
Mine, AT, M19, practice	5
Mine, AP, M4, practice, inert	2
Mine, AP, M2, practice, inert	74
Mine, AP, M14, practice, inert	19
Mine, AT, M16, practice, inert	6
Mine, AP, M18, practice, inert	28
Mortar, 81mm, M43A1 w/fuze	6
Projectile, 20mm, TP-T	1
Projectile, 37mm, inert	1
Projectile, 105mm, w/fuze, unfired, inert.	3
Rocket, 2.36", HEAT, M6, fired	2
Rocket, 2.36", Practice, M7A3, unfired	7
Rocket, 3.5", Practice, unfired	2
Rocket, 3.5", Practice, fired	2
Signal, Smoke, M127A1	2
Signal, Smoke, M62	6
Signal, Smoke, M62, expended	52
Signal, Illumination, expended	9
Signal, Illumination	10
Signal, 40mm, RS, M662	11
Simulator, Blast, M110	17
Simulator, Blast, M115	2
Simulator, Hand Grenade, M116	2
Simulator, Booby Trap, M118	3
Simulator, Booby Trap, M119	2

OE Items Found Site CSU Foot Print**Part 2:** CSU OEW removal items 14 April 94 to 30 June 94.

Removal Action, CSU footprint

OE-0012 ; Table 2-5

Delivery Order 015

18 April 94 to 30 June 94

<u>OEW ITEMS RECOVERED/DISTROYED</u>	<u>TOTAL</u>
Activator, Mine M1	150
Activator, Mine M1 inert	24
Assembly, Tail, Mortar, 60mm	1
Base Coupling	282
Base Coupling inert	763
Charge, Demo, TNT	15
Charge, Demo, TNT inert	4
Charge, Black Powder, Hand Grenade, MKII inert	6
Ctg, 40mm, Practice, M583A1 inert	3
<u>Ctg, 5.56mm, Ball</u>	<u>8</u>
<u>Ctg, 5.56mm, Ball inert</u>	<u>1130</u>
<u>Ctg, 30cal, Ball</u>	<u>3600</u>
<u>Ctg, 30cal, Ball inert</u>	<u>362</u>
<u>Ctg, 5.56mm, Blank</u>	<u>6249</u>
<u>Ctg, 5.56mm, Blank inert</u>	<u>7659</u>
<u>Ctg, 30cal, Blank</u>	<u>19023</u>
<u>Ctg, 30cal, Blank inert</u>	<u>19570</u>
<u>Ctg, 7.62mm, Blank</u>	<u>6036</u>
<u>Ctg, 7.62mm, Blank inert</u>	<u>10775</u>
<u>Ctg, 7.62mm, Ball</u>	<u>745</u>
<u>Ctg, 7.62mm, Ball inert</u>	<u>955</u>
<u>Ctg, 12GA.</u>	<u>3</u>
<u>Ctg, 12GA. Inert</u>	<u>3</u>
Ctg, 90mm, Signal, Expended inert	1
Firing Device, M2	3
Firing Device, M2 inert	1133
Firing Device, M5	750
Firing Device, M5 inert	2287
Firing Device, M10	1
Firing Device, M10 inert	1469
Firing Device, M3	948
Firing Device, M3 inert	2508
Firing Device, M1	32
Firing Device, M1 inert	1157
Firing Device, M57	1
Firing Device, M57 inert	18
Flare, Trip, M49	16
Flare, Trip, M49 inert	75

Flare, Parachute, M48 inert	66
Flare, Signal, M18A1	2
Flare, Signal, M18A1 inert	82
Fuze, Mine, Practice, F117	1
Fuze, Mine, M10	63
Fuze, Mine, M10 inert	26
Fuze, Grenade, M10A2	3
Fuze, Grenade, M10A2 inert	43
Fuze, M12 inert	12
Fuze, Grenade, M205A2	310
Fuze, Grenade, M205A2 inert	746
Fuze, Mine, Practice, M604	340
Fuze, Mine, Practice, M604 inert	91
Grenade, Rifle, M11 inert	7
Grenade, Hand, CS, M7 Series	26
Grenade, Hand, CS, M7 Series inert	4
Grenade, Hand, Illumination, MKI	3
Grenade, Hand, Illumination, MKI	29
Grenade, Hand, Smoke, M18 Series	7
Grenade, Hand, Smoke, M18 Series inert	82
Grenade, Hand, HC Smoke inert	7
Grenade, Rifle, Flare	2
Grenade, Rifle, Flare inert	35
Grenade, Hand, MKII, HE Filled	2
Grenade, Hand, MKII, HE Filled inert	6
Grenade, Hand, Practice, Unfuzed, Inert	4
Grenade, Hand, Practice, Unfuzed, Inert inert	43
Mine, AP, MP14 inert	5
Mine, AP, M4 Practice inert	1
Mine, AP, M18A1 inert	73
Mine, AT, M19, Practice	2
Mine, AP, M2, Practice	33
Mine, AT, M7, Practice inert	23
Mine, AT, M8, Practice inert	4
Mine, AP, M12, Practice	2
Mine, AP, M12, Practice inert	22
Mine, AT, M10, Practice inert	2
Mine, AT, M20, Practice inert	36
Mortar, 81mm Practice inert	2
Projectile, 105mm, w/Fuze inert	2
Rocket, 3.5", Practice, inert	1
Rocket, 2.36", Practice, M7A3 inert	6
Signal, Illumination,	7
Signal, Illumination, inert	44
Signal, 40mm, RS, M662	5
Signal, Smoke, M127A1 inert	22
Simulator, Blast, M110	2
Simulator, Blast, M110 inert	2

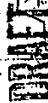
PRIMER PERC, MKIIA	7
PRIMER PERC, MKIIA inert	15
SIMULATOR BOOBYTRAP M119	4
SIMULATOR BOOBYTRAP M119 inert	1
SIMULATOR BOOBYTRAP M118	4
SIMULATOR BLAST ELECTRIC, M80	641
1.1in A.A. Mk2 (Navy)	1
SIMULATOR, BLAST M22 ATWO35	1
Grenade, M33 Practice w/p inert	1
Grenade, M25A2C/S	2
Simulator Airburst M74A1	10
Simulator Airburst M74A1 inert	110
Fuze Hand Grenade M228	3
Fuze Hand Grenade M228 inert	2
Signal Parachute M22A1	2
Signal Parachute M22A1 inert	14
Smoke Pot, HC	10
Mine, Flare M48 inert	60
FUZE MINE M4	1
Signal Smoke M65	1
SIGNAL FLASH/SOUND M74 inert	3
CAPS Blasting	36
Grenade, Rifle M23 Green Smoke	21
Grenade, Rifle M19 Violet Smoke	9
Grenade, Rifle Smoke HC	13
Cartridge 50 Cal M48A (spotter)	1
Smoke Screening (Task Thrown) inert	8

MAP 3

ASR 1994 Two range fans extending into MRA

DRAFT

43-48



MAP 4

OE-0010 ASR 1994

6 Historical maps showing various ranges and training areas

BW-0540

Historical map showing ranges and training areas

DRAFT

List of Historical Maps

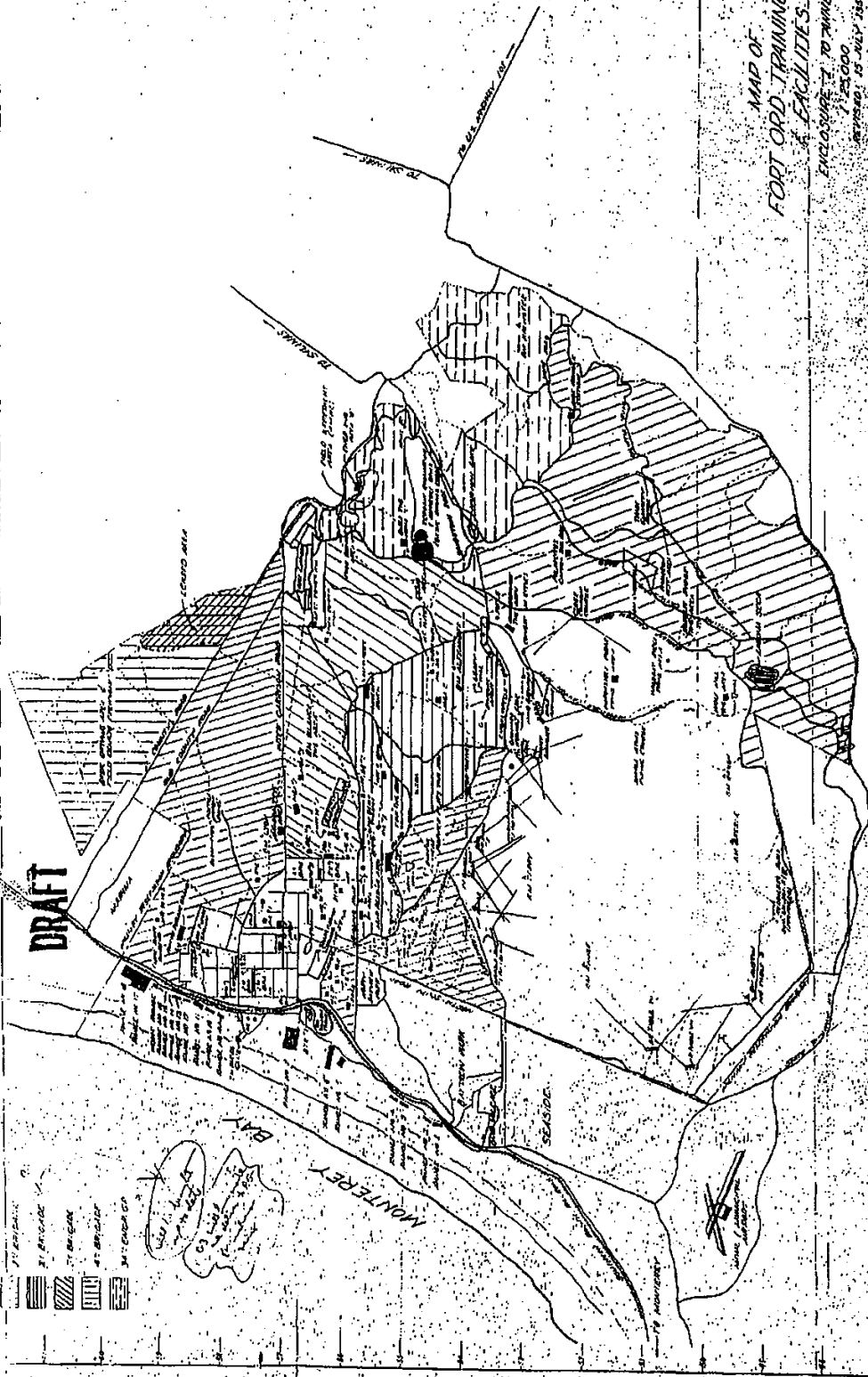
- * Fort Ord Training Areas & Facilities, Enclosure 1 to Annex "H", 15 July 1957
- * Fort Ord Training Areas & Facilities, Inclosure 1 to Annex H, Revised: 10 Jan 1958
- * Map Fort Ord, Incl 1 to App. A, to Annex O, not dated
- * Fort Ord Master Plan Training Facilities Map, March 1968
- * Beardsley Map, not dated
- * Fort Ord Training Areas & Facilities, Inclosure 1 to Annex "O", Revised: 20 Dec 1956
- * Master Plan Fort Ord, Vol. 1, Reservation Boundary & Land Use Map, Sheet No. 2, 5 Apr. 1946

DRAFT

LEGEND:

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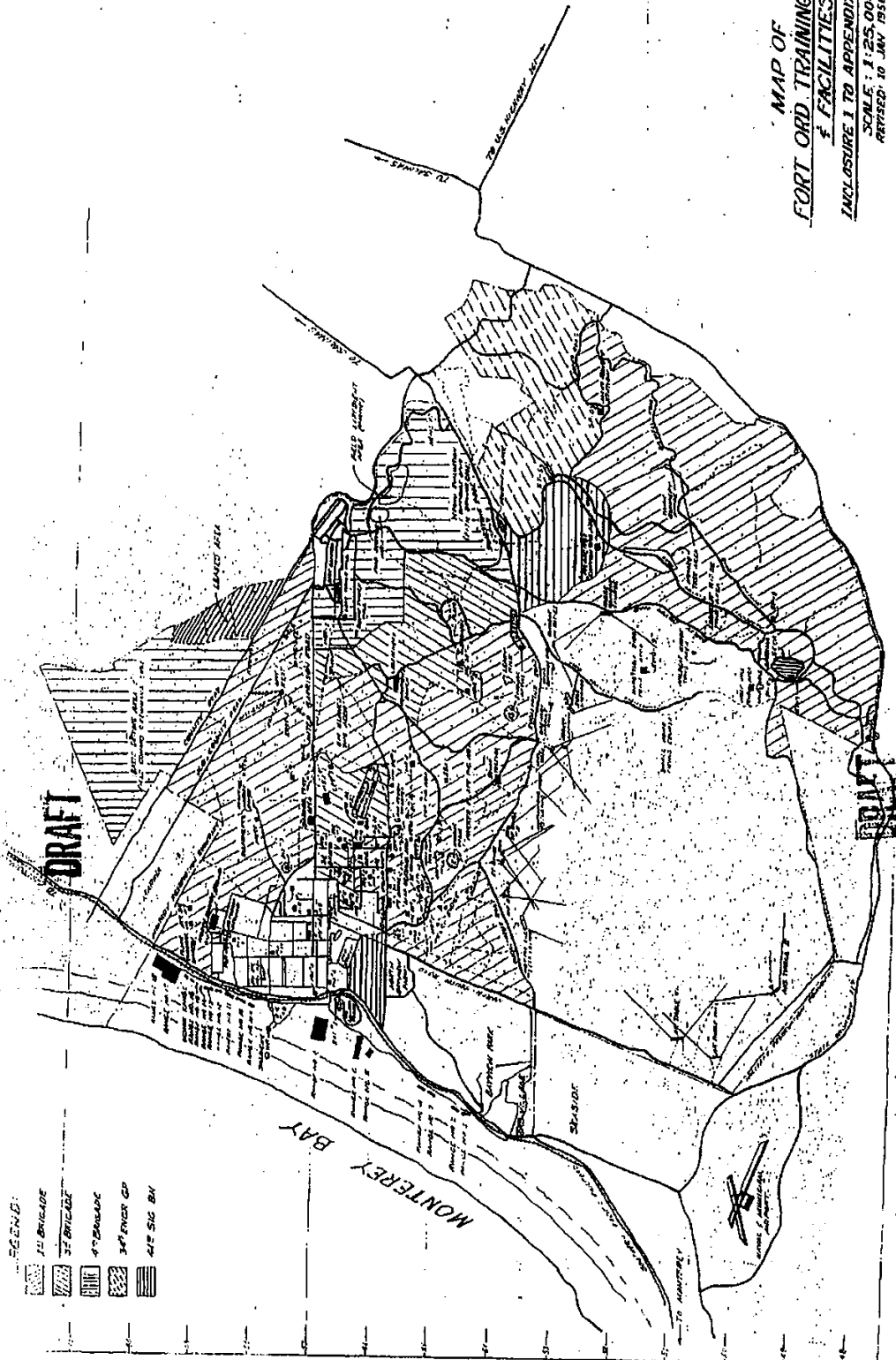
MAP OF
FORT ORD TRAINING AREAS
& FACILITIES

ENCLOSURE TO FORM 34
REVISED: 15 JULY 1957

DRAFT

- LEGEND:
- 1st BRIGADE
 - 2nd BRIGADE
 - 4th BRIGADE
 - 34th INFANTRY GP
 - 41st SIG BN

DRAFT



MAP OF
FORT ORD TRAINING AREAS
& FACILITIES
ENCLOSURE 1 TO APPENDIX 1 TO ANNEX H
SCALE: 1:25,000
REVISED: 10 JAN 1958

GRAPHIC SCALE

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FORT. ORD

TRANS. POLICE MAP

DATE

BY

SCALE

REVISIONS

APPROVED

SIGNED

DATE

BY

SCALE

REVISIONS

APPROVED

SIGNED

DATE

BY

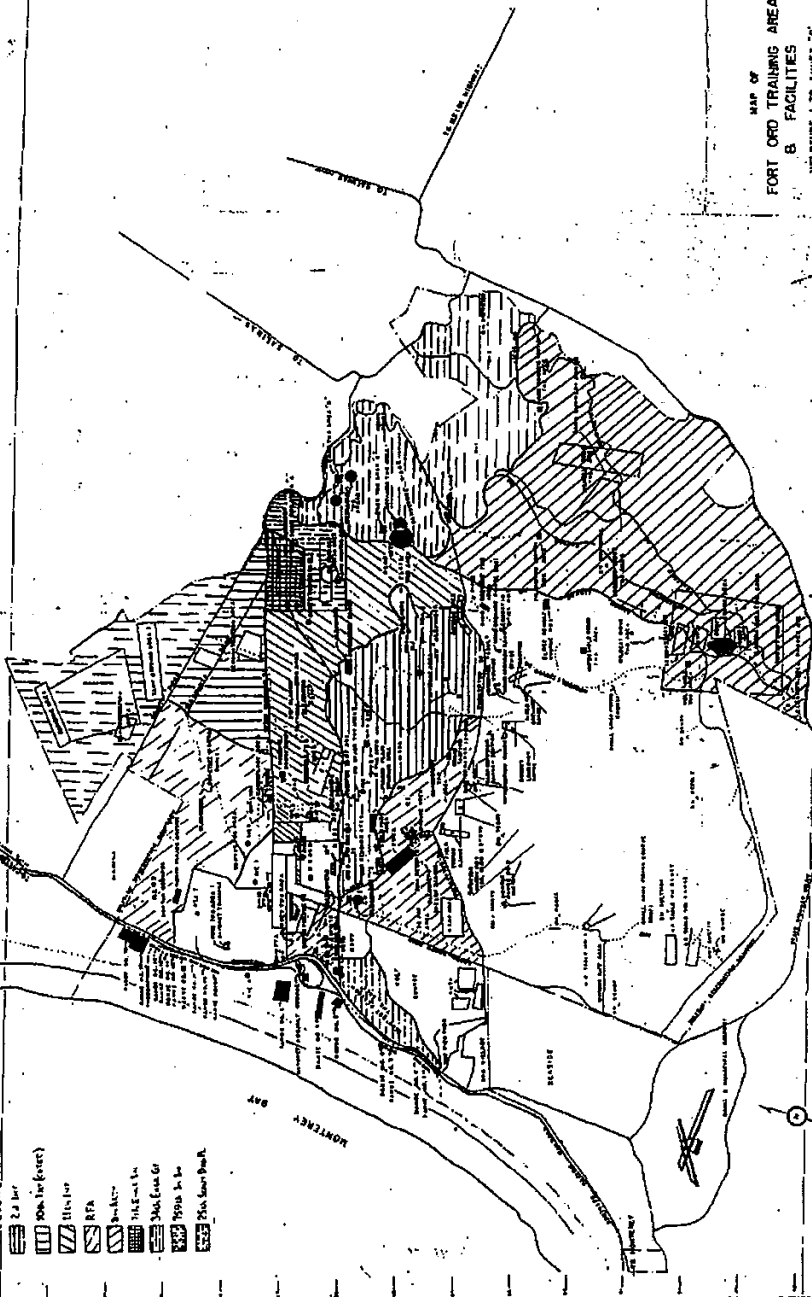
SCALE

REVISIONS

APPROVED

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- Legend
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MAP OF
FORT ORD TRAINING AREAS
& FACILITIES
INCLUDES 1 TO SHEET 10

1:25,000
SHEET 10 OF 10

DRAFT



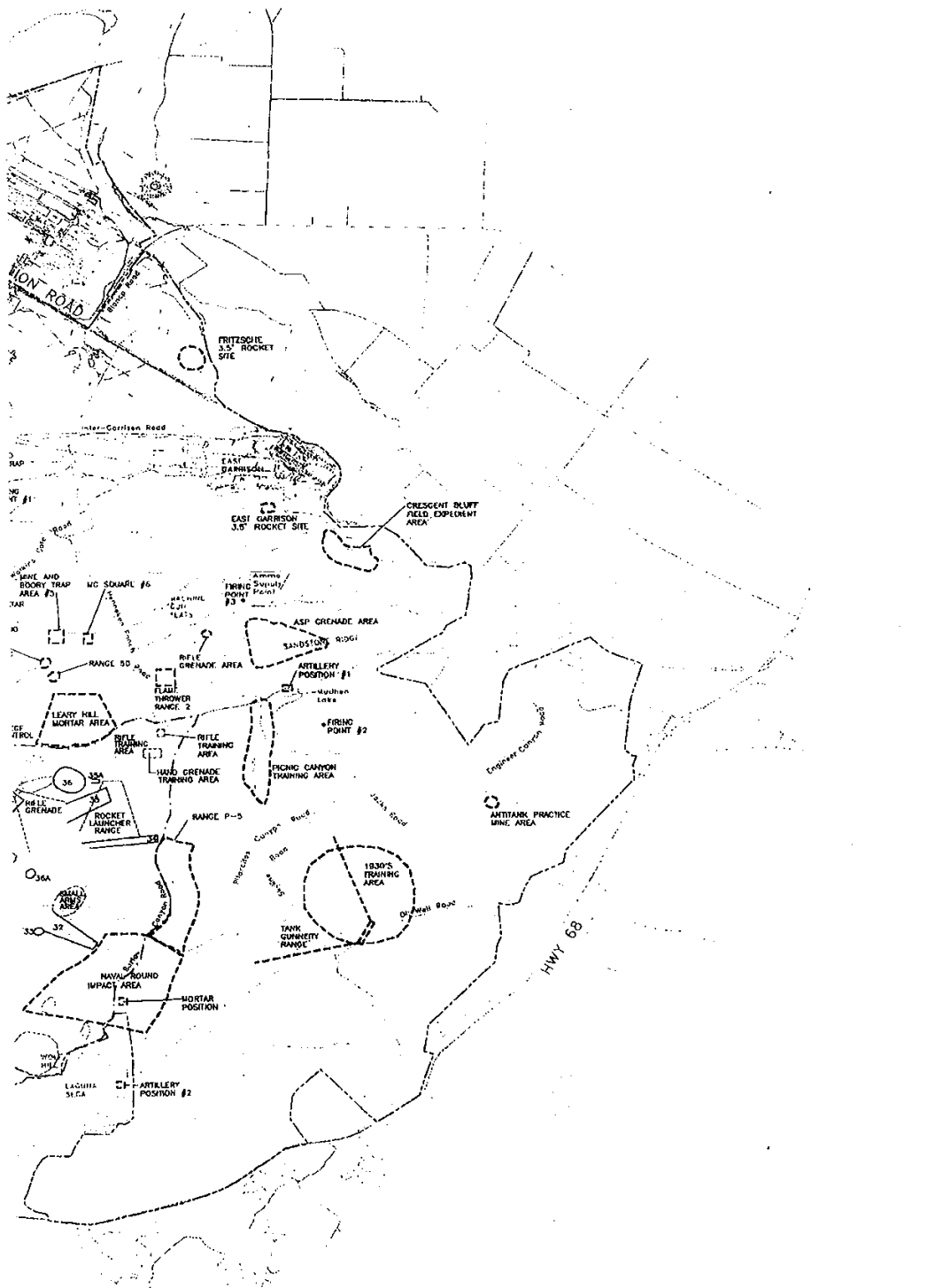
LEGEND

[Symbol]	ARTILLERY IMPACT AREA
[Symbol]	CANTONMENT - PERMANENT
[Symbol]	CANTONMENT - STANDBY
[Symbol]	HOSPITAL AREA
[Symbol]	WAREHOUSE AREA
[Symbol]	MAGAZINE AREA
[Symbol]	SMALL ARMS RANGE
[Symbol]	TRAINING AREA
[Symbol]	FAMILY HOUSING
[Symbol]	OPEN AREA

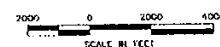
**MASTER PLAN
FORT ORD**
CALIFORNIA

1:25,000 Scale
U.S. ARMY
RESERVATION
LAND USE - 1964
U.S. ENGINEERING CENTER
SAN FRANCISCO, CALIF. 94106

DATE: 1964
BY: [Signature]
CHECKED: [Signature]
APPROVED: [Signature]

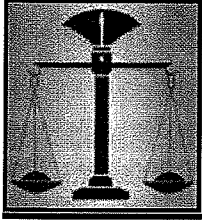


EXPLANATION	
	Fort Ord Boundary
	Inland Range Boundary
	Pond/Permanent Catchment Basin
	Vernal Pool
	FIRING POINT #2
	Study Area
	Approximate Extent of Study Area
	Decommissioned Range
	?=Disturbed Area of Unknown Use
	Inland Range and Number



If this image is not as legible as the original, it is due to the poor quality of the original document.

DEPARTMENT OF THE ARMY Sacramento District Draft Final Data Summary and Work Plan Site 38-Inland Ranges Fort Ord Army Installation Fort Ord, California	CORPS OF ENGINEERS	SITE MAP	DRAWING SHEET 1 OF 1 DIVISION NUMBER DATE: 01/21/84
--	--------------------	----------	--



Fort Ord Environmental Justice Network, Inc.

Mailing address - P.O. Box 361....Marina, CA. 93933

831-582-0803 voice & fax...831-277-5241

www.foejn.org - ejjustice@mbay.net

March 19 2009

Michael Houlemard
Executive Officer, FORA
100 12th street
Marina, CA. 93933

**RE: Draft Group 3 Remedial Investigation/Feasibility Study Work Plan
FORA/ESCA Remediation Program, Former Fort Ord, Monterey County, CA.**

Dear Mr. Houlemard:

Please see attached hard copy, enclosed report submitted by Fort Ord Environmental Justice Network, Inc. for inclusion in the Administrative Records.

Table 1 of your report sites the California Health and Safety Code in three areas. Under Title 22, CCR 66265.382, it states that open burning of hazardous waste is prohibited except for the open burning and open detonation of waste explosives. Waste explosives include waste that has the potential to detonate and bulk military propellants that cannot safely be disposed of through other modes of treatment. Detonation is an explosion in which chemical transformation passes through the material faster than the speed of sound.. Owners or operators choosing to open burn or detonate waste explosives shall do so in accordance with the following table in a manner that does not threaten human health or the environment.

Under the Agreement of Consent, we discussed what FOR A would do concerning approximately 4,000 acres. We were told that FOR A would not burn or detonate anything outside of what the Army has already done. Are we to understand from Table 1 that the California Health and Safety code gives you the right to burn and detonate explosives? Does this mean that FORA will be doing the same type of remediation that the Army is presently doing? Can a meeting be arranged to bring clarification to this workplan.

If you wish to discuss contents of this report further, please contact LeVonne Stone, FOEJN TAG Program Manager at 831-582-0803

Thank You,

LeVonne Stone, Fort Ord Environmental Justice Network, Executive Director/TAG Project Manager

Cc: Viola Cooper, USEPA, Region 9

Fort Ord Reuse Authority (FORA)
Comments on
Draft Group 3 Remedial Investigation/Feasibility Study Work Plan
FORA/ESCA Remediation Program, Former Fort Ord, Monterey County, California

Prepared by
Environmental Stewardship Concepts
On Behalf of
The Fort Ord Environmental Justice Network
22 April 2009

These comments were prepared at the request of the Fort Ord Environmental Justice Network (FOEJN) to provide technical comment to FORA and summarize the report on this aspect of the cleanup for the community. FOEJN represents the affected community in the greater Fort Ord area in the cleanup of contamination and ordnance related waste.

Recommendations:

- Increase Forbidden Entry signage in the Del Rey Oaks/Monterey MRA.
- Revise the Community Relations portion of the FS to include plans for outreach to the Hispanic subpopulation.
- Clarify the permitted and prohibited public activities within the Del Rey Oaks/Monterey MRA during the ongoing remediation.

Document Summary

Group 3 is an area at Ford Ord consisting of Interim Action Ranges Munitions Response Area (MRA), the Military Operations in Urban Terrain (MOUT) Site MRA, the Laguna Seca Parking MRA, and the Del Rey Oak (DRO)/Monterey MRA. This document describes the past cleanup of munitions at these sites through surveying the land for munitions of concern (MEC), determining the risks posed by the MEC, and then assessing alternatives to prevent serious risk to future landholders during and after development.

In order to complete the RI/FS process, certain tasks need to be completed first. This Work Plan outlines these tasks. First, the quality and quantity of data regarding MEC must be evaluated to properly assess the risks that are present. This analysis occurs for each MRA, and simply looks at the previously removed MEC and MD (type and amount) and the removal actions that occurred. Secondly, each MRA is characterized according to its geology, cultural history, and ecological characteristics. Lastly, an exposure pathways assessment is done for the Human Health Risk Assessment. Based on this information, a remediation alternative is recommended. In the case of the Group 3 MRAs, there were no data gaps discovered. For all three sites, the Work Plan states that no further action is required under the ESCA RP (remediation program). The Work Plan also states that there is a human health risk associated with residual (or potentially present) MEC in the MRA. Therefore, they are going to complete documentation for the RI/FS and proceed to the ROD.

There is no mention of burning in this work plan.

General Comments

In general, the RI/FS presents a clear, thought-out work plan that gives attention to citizen input, safety, and efficient cleanup.

Specific Comments

Section 2.3.1, page 2-11: Is DRO/Monterey MRA open to recreational uses? What is the difference between a recreational user and a trespasser? The use of the word "reportedly" in the second paragraph implies that FORA is not certain whether or not the property is being used for hiking and mountain biking but suspects it is happening. If the public is not permitted to use DRO/Monterey MRA yet, then FORA needs to enact some sort of land use controls to ensure that public use is prohibited until development and transfer occurs.

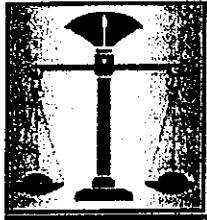
We reiterate our emphasis on establishing community relations in both English and Spanish. The greater Fort Ord area is heavily populated with community members of Hispanic descent and in order to truly reach out, FORA must ensure that all community members have access to information about remediation activities. The Community Relations Approach and Implementation of Community Relations Activities (page 4-10) do not contain any mention of Spanish-speaking community members. The RI/FS should be revised to include the plans to reach this subpopulation.

Figure 6, Del Rey Oaks/Monterey MRA, depicts only one Entry Forbidden sign, located on S. Boundary Road, throughout the entire site. There should be another Entry Forbidden sign at the gate also depicted on the figure. For the safety of neighborhood patrons, additional signs should be placed along the MRA border that directly abuts the developed area and the parking lot located between S. Boundary Road and Canyon Del Rey Boulevard (shown on the same figure). Given higher public traffic in this area, the public should be made aware of the boundary and signaled not to enter Fort Ord property that still poses a human health risk.

Disclaimer

"This document has been funded partly or wholly through the use of U.S EPA Technical Assistance Grant Funds. Its contents do not necessarily reflect the policies, actions or positions of the U.S. Environmental Protection Agency. The Fort Ord Environmental Justice Network Inc. does not speak for nor represent the U.S. Environmental Protection Agency."

Mention of any trade name or commercial product or company does not constitute endorsement by any individual or party that prepared or sponsored this report.



Fort Ord Environmental Justice Network, Inc.
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831-582-0803 voice & fax...831-277-5241

www.foejn.org - ejjustice@mbay.net

August 19, 2009

Michael Houlemard
Executive Officer, FORA
100 12th street
Marina, CA. 93933



RE: DRAFT Final Group 3 Remedial Investigation/Feasibility Study Work Plan

Dear Mr. Houlemard;

Please see attached hard copy, enclosed report submitted by Fort Ord Environmental Justice Network, Inc. for inclusion in the Administrative Records.

In addition this report reflects additional comments from the community.

Fort Ord Environmental Justice Network is concerned that this is a Federal Facility that was placed on the National priorities List. This Facility is a Superfund site that will incur many more years of monitoring and clean-up. Looking at the huge amounts of Unexploded Munitions and debris removed (according to clean-up reports, we feel that most of this is surface, and we may still have a serious depth removal problem, as well as areas that were outside of the Grids. In addition, the burial pits removal should be addressed in the work plan. Also, the problem of disposal need to be addressed in the work plan. Removing of Munitions & Debris along with contaminated soil from one location and disposing of it in another location at the same facility is not addressing the problem. The problem still remains, due to additional problems that will occur where humans and animals will be greatly impacted. Where are the disposal sites for the previous 197, 000 tons of Munitions and Debris, and lead laced soil??

If you wish to discuss contents of this report further, please contact LeVonne Stone, FOEJN TAG Program Manager at 831-582-0803

Thank You,

LeVonne Stone, Fort Ord Environmental Justice Network, Executive Director/
USEPA TAG Project Manager

Cc: Judy Huang, Viola Cooper, Lewis Mitani, Martin Hausladen -USEPA, Region 9
Roma Rocka, Joyce Whiten - CAL/DTSC
Gail Youngblood, Fort Ord Clean-up

FORA ESCA

DRAFT Final Group 3 Remedial Investigation/Feasibility Study Work Plan

**Prepared by
Environmental Stewardship Concepts
On Behalf of
The Fort Ord Environmental Justice Network**

19 August 2009

These comments were prepared at the request of the Fort Ord Environmental Justice Network (FOEJN) to provide technical comments regarding the cleanup of contamination at the former base. FOEJN represents the affected community in the greater Fort Ord area in the cleanup of contamination and ordnance related waste.

Recommendations

- 1) FORA needs to plan on additional field work for verifying the removal work conducted previously by Army contractors**
- 2) Any area not surveyed previously needs to be surveyed and removal actions must be taken**
- 3) Considering that the field investigations have revealed burial pits more than 4 feet deep, the RI/FS needs to account for how it has determined that a 4 foot cleanup depth is sufficient in these Group 3 properties.**

Abbreviations:

UXO = unexploded ordnance
MD = military debris
MEC = munitions and explosives of concern
RI/FS = remedial investigation/feasibility study

Document Summary

This document is the Work Plan for the Remedial Investigation/Feasibility Study for the cleanup of the properties where munitions, debris, UXO, etc. were used and have been found. As such, this report is just the description of the work that the FORA contractors will perform to determine the nature and extent of the munitions problems at these properties. The work will be simply reviewing the documents, reports and data that were already generated by the Army before the properties were transferred to FORA. The review is the Remedial Investigation and the purpose of the Remedial Investigation is to determine the nature and extent of the problem from the munitions.

This work plan describes how the FORA contractors will evaluate a group of properties that have already been investigated by the Army and where munitions, debris, etc. have already been removed. These properties include 4 areas that are approximately on the four corners of the impact area. The areas that are the subject of the Work Plan and **RI/FS are:**

- 1) the parking area at the Laguna Seca racetrack**
- 2) the Army Training site (MOUT)**
- 3) a small area adjacent to Del Rey Oaks**

4) ranges 43-48 where the "prescribed" burn jumped the fire control line in 2003

After this work plan is approved, the work of reviewing data and reports will be done by the contractors. Then, the contractors will generate a report that describes the problem posed by the UXO, munitions, debris, etc. The current plan is to not carry out any more field work at this stage of assessing the nature of the problem. According to this Work Plan, FORA and contractors state that they believe the existing information is sufficient to characterize the threats from the debris, spent munitions and UXO.

The other part of the RI/FS is the consideration of what to do about the munitions and debris left on the properties, called the Feasibility Study (FS). The FS is the document where the contractors research the options about what to do about the munitions and debris, and rank the options. A single option has to be suggested and the agencies have to propose a cleanup plan (called the Proposed Plan).

In these comments, we recommend that FORA and contractors need to take extra precautions to insure that no munitions, debris, UXO, etc. remain at any of these properties. These properties, with others, are at the center of the impact areas, areas where munitions were fired and UXO buried. This general location is the most concentrated area with UXO, munitions and debris, so extra care and precaution are required.

Sections 2 and 3 of the report describe the history of the site and removal work that was completed by the Army before turning the properties over to FORA. The Army contractors pulled thousands of pounds of debris out of these areas. The work plan indicates that the range areas 43-48 yielded almost 197,000 pounds of military debris. The debris also includes substantial amounts of UXO and material that contractors removed from 20 pits. The report documents that the contractors found UXO, shells, smoke devices, grenades, rockets, etc. In short, these areas had huge amounts of all types of munitions and explosives of concern and debris, consistent with the former use of the range areas as documented previously.

According to the Work Plan, there were items discovered deeper than 4 feet. A lot of the material was taken from the surface, but there were sufficient removals beneath the surface to warrant a thorough investigation at depths greater than 4 feet. The Work Plan must address how it will treat pits where munitions are discovered below 4 feet. At what depth is the excavation considered complete?

Sections 4 and 5 explain the approach that the FORA contractors will use in examining the records and data on the remediation work conducted so far at these four property groups. Section 5 specifically lists and outlines the work that will be conducted. No field work is planned for these properties.

Comments

Some were areas not thoroughly investigated, as acknowledged in the Work Plan (Figures 8.3-3 and 8.3-4). Those places that have not been surveyed completely must be geophysically surveyed to ensure that no MD, MEC, or UXO remain. As listed below, the RI/FS Work Plan describes and provides map locations of areas that were either not investigated or the investigation was not completed. These areas need to be surveyed and

removal actions undertaken. The RI/S will need to anticipate that the existing information is not sufficient to accurately account for the risks, and that some field work will be needed.

With so much UXO, debris, MEC, etc., these four Group 3 areas, notably Ranges 43-48, are the most likely places where it is possible that something was missed. In addition, the survey only went to a depth of 4 feet. It is not clear that 4 feet is enough to be sure that any pits or trenches, even individual bombs and rockets, are recovered. How will the RI/FS address the issue of whether the 4 foot depth is sufficient?

These properties are the ones where there is likely something else will turn up unexpectedly. Group 3, therefore, is where extra care needs to be taken that the data are complete. The Work Plan does not mention any contingency plans for what will be done if any problems arise in the review of the reports, data and documents that require further field investigations. The RI/FS needs to make plans for such an option and explain the steps that will be taken to address deficiencies.

Specific Comments:

Page 2-3 , bullet 11 indicates that subsurface removal was not completed. Obviously subsurface removal in this area has to be completed and the FS will have to take this incomplete work into account. Please add methods and approach for ensuring the debris, MEC, MD, etc. from the area(s) indicated are sufficiently characterized so that the risks to human health can be understood and addressed in the FS.

Page 2-5, section 2.1.3 indicates under MRS 14A that there was a 1 foot removal action from 384 grids. Why was removal not completed to 4 feet, as in other areas?

Page 2-6, section 2.1.3, MRS 47, the RI/FS states that removal action was not carried out on 6 grids of 100 x 100 feet because of terrain difficulties. This is not a sufficient cause for ceasing investigations. Will the public be barred from this area? Is it certain that this area will never be used by humans? FORA and its contractors cannot guarantee the usage patterns of Group 3. Clearly, the RI/FS will have to address this problem and investigate the nature of what was identified there in order to ensure safety for future land usage.

Page 3-2, section 3.1, next to last paragraph of the page indicates that the information on depth may not have been complete. It is not clear how the RI/FS will deal with this type of incomplete information.

Page 4-1, section 4.1 states that the Army has conducted field investigations and removals, the data are in the SEDR and no further field work is planned. As indicated above, this conclusion may be premature because the Army's information is incomplete or cannot be verified.

Page 5-1, section 5.3 repeats the statement that no further field work is planned and FORA needs to prepare for finding that its incomplete information does not permit adequate analysis.

Page 5-5, section 5.9.2.1 In developing alternatives in the FS, the work plan should anticipate that clearing vegetation will be conducted manually, not with burning. Also, the

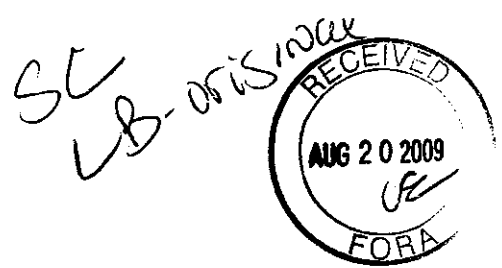
alternatives need to anticipate the public's input and concerns and prioritize community health and quality of life.

Disclaimer

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Mention of any trade name or commercial product or company does not constitute endorsement by any individual or party that prepared or sponsored this report.

Fort Ord Community Advisory Group (FOCAG)
PO Box 969
Seaside, CA 93955
Email: focagemail@yahoo.com
Website: www.fortordcag.org



FOR THE ADMINISTRATIVE RECORD

Please distribute to all FORA Board Members

Letter Pages 3 Attachments 2 Pages

August 20, 2009

Fort Ord Reuse Authority (FORA)
100 12th St., Building 2880
Marina, CA 93933
FORA ESCA Program Manager
c/o Stan Cook

RE: Fort Ord CAG Comments: FORA ESCA Remediation Program Draft Final Group 3 RI/FS Study Work Plan; Interim Action Ranges, Military Operations in Urban Terrain, Laguna Seca Parking, and Del Rey Oaks / Monterey Munitions Response Areas, Doc. Control Number: 09595-09-079-010

Concerns: Military Munitions Residual Contamination, OE/UXO/OEW/MEC Detection, OE/UXO/OEW/MEC Clearance Depths, Administrative Record Keeping, Military Munitions Database, Omissions of Pertinent Historical Site Documentation and Information, Compliance with Cleanup Standards

The "Fort Ord Community Advisory Group is a public interest group formed to review, comment and advise on the remediation (cleanup) of the Fort Ord Army Base, Superfund Site, to ensure that human health, safety and the environment are protected to the greatest extent possible." - Mission Statement.

Dear Mr. Cook;

The FOCAG is resubmitting their comments to the Draft Group 3 RI/FS Study Work Plan, Doc. Control Number: 09595-09-079-001 for the following reasons:

- 1) FORA ESCA RP responses to the Draft Group 3 RI/FS are laughable in that they are deficient and lack substantive content.
- 2) Most of the RP responses avoid or evade the FOCAG questions by referring to previous RP response letters that do not directly answer the questions and or refer to cleanup documents of which due to their deficiencies, the outstanding questions were asked. At best, parts of some of the questions are answered but overall leave the questions unanswered.
- 3) Requested materials (maps and UXO/OEW data), essential to commenting on the Draft Final Group 3 RI/FS Study Work Plan was not received by the FOCAG nor were we notified of the requested materials availability.

5

- 4) The MEC and Ordnance Constituents questions and concerns raised by the FOCAG are inseparable in that Superfund cleanup of OEW as a whole is the issue at hand. The fact that DoD, BRAC, FORA, and the ESCA RP land disposal/transfers are primarily based on explosive hazards and omit the Ordnance Constituents hazards. FORA land planning is being carried out without addressing the equally if not a greater remaining hazard of Ordnance Constituents. Unfortunately, the Land Disposal Site Plan 1994 (LDSP), OE-0142, that defines explosive hazard cleanup requirements under the Department of Defense Standard 6055.9, fails to specifically address Ordnance Constituents. However, The LDSP states; "... remediation of areas containing OEW waste." "...95% of all OEW will be removed...". It is the CAG's understanding that Ordnance Constituents are considered Ordnance and Explosives Waste (OEW). OEW Constituents should be addressed parallel with FORA Land Planning, Remediation and fully resolved prior to transfer, development and habitation by the public.

Additional comment and reference document to MEC detection:

The FOCAG has come across a 2007 DoD Munitions, Time Critical Removal Action carried out in New Jersey, Surf City and Ship Button public beaches. The document raises additional significant questions with the Fort Ord munitions detection equipment and adequacy of MEC detection and removal under the Fort Ord RP.

The document refers to a GPO study and concludes as follows; The study concluded that Digital Geophysical Mapping (DGM) using an EM-61 towed array was capable of consistently detecting 34 of 36 GPO seed items buried at depths from 0 to 36 inches below the ground surface for a 94.4% detection rate. The Schonstedt Magnetometer detected 20 of 30 GPO seed items to depths of 18 inches below the ground surface a 66.3% detection rate. The Forester Mk 26 Magnetometer detected all GPO seed items buried at 36 inches below the ground surface a 100% detection rate.

The document refers to detection of 37 mm projectiles of which the Schonstedt has a very poor detection capability.

The Foerster Ferex is capable of ordnance location to the following depths:

ITEM	DEPTH
Small Arms Round	1 ft
Hand Grenade	2 ft
Anti-Personnel Mine	3 ft
Anti-Tank Mine	4.5 ft
Medium Projectile	10 ft
Small Bomb	15 ft
Large Bomb	19 ft

Although the Foerster Ferex Ordnance Locator will detect disturbances caused by changes in soil conditions, its ability to detect metallic items is not affected by local soil conditions.

We look forward to your substantive response to these serious issues and questions.
Please include the entirety of this letter and attachments in the final document.

Sincerely,

A handwritten signature in black ink that reads "Lance Houston". The signature is written in a cursive, flowing style.

Lance Houston,
FOCAG Member

Cc.
California DTSC
U.S. EPA
Monterey County Planning Department
California State University Monterey Bay

Attachments:

- 1) FOCAG Comments 3-28-09; Draft Group 3 RI/FS Study Work Plan,
Control No: 09595-09-079-001
- 2) DoD TCRA 2007; Surf City and Ship Button public beaches

ATTACHMENT 1

Fort Ord Community Advisory Group (FOCAG)
PO Box 1139
Marina, CA 93933
Email: focagemail@yahoo.com
Website: www.fortordcag.org

March 28, 2009

FOR THE ADMINISTRATIVE RECORD
Please distribute to all FORA Board Members
Letter Pages 15 Attachments and Maps 182 Pages

Fort Ord Reuse Authority (FORA)
100 12th St., Building 2880
Marina, CA 93933
FORA ESCA Program Manager
c/o Stan Cook

RE: Fort Ord CAG Comments: FORA ESCA Remediation Program Draft Group 3
RI/FS Study Work Plan; Interim Action Ranges, Military Operations in Urban
Terrain, Laguna Seca Parking, and Del Rey Oaks / Monterey Munitions
Response Areas, Doc. Control Number: 09595-09-079-001

Concerns: Military Munitions Residual Contamination, OE/UXO/OEW/MEC Detection,
OE/UXO/OEW/MEC Clearance Depths, Administrative Record Keeping,
Military Munitions Database, Omissions of Pertinent Historical Site
Documentation and Information, Compliance with Cleanup Standards

The "Fort Ord Community Advisory Group is a public interest group formed to review, comment and advise on the remediation (cleanup) of the Fort Ord Army Base, Superfund Site, to ensure that human health, safety and the environment are protected to the greatest extent possible." - Mission Statement.

Dear Mr. Cook;

There are a wide range of concerns and issues that have been raised by the Fort Ord CAG over the years, most of which remain unaddressed and unanswered.¹ In a recent CAG letter sent to FORA and the Regulators raising old and new concerns, the Army responded instead, on behalf of FORA and the Regulators. The public has often not been privy to the decision making process.² A great deal of time and taxpayer money is being spent to avoid answering our questions by referring us to documents that do not answer our specific questions and concerns. It would be helpful in the future to 1) answer the questions, 2) give the name and AR number of the document the answer is found in, and 3) give the page or section number and paragraph that the answer came from.

As is evident from OE Sampling and Removal Actions, extensive Troop Training and Munitions use occurred throughout areas that were not previously identified as Training Areas. This drives home the point that Fort Ord trained several million troops over a

¹ Attachment 1: FOCAG 8-12-08 letter to FORA, DTSC, US EPA

² Attachment 15: email; Regulators and Developer discussing Superfund UXO/OEW cleanup policy

period of 77 years, kept extremely poor records, used unknown millions of pounds/tons of munitions, and that these are found in unexpected places. Areas East of General Jim Moore Blvd. and Eighth St. are highly contaminated with military munitions the extent of which is unknown.^{3 4}

The Military Munitions Response Program (MMRP) database information the FORA ESCA RP is relying on is a far cry from what the historical record shows. The MMRP is arbitrarily omitting significant information from the Group 3 RI/FS. In doing so, a new record is being created that gives the appearance the land is cleaner than it really is.⁵

Critical documents (The Fort Ord Projectile Penetration Study) used for assessing potential explosive hazards associated with excavation activities and required remediation depths contains erroneous Site specific ordnance discovered information.⁶ What type penetration ordnance is being used for the evaluations of the Group 3 RI/FS parcels?

A new scheme is unfolding. The Insufficient Data category (ISD) is a scary one. Has money spent on past contractors been for nothing because they didn't know how to identify the ordnance they were finding?⁷ The FORA ESCA RP is arbitrarily throwing whatever munitions they want into the ISD category. There is no supporting documentation or explanation other than, because they say so.

Critical Administrative Record (AR) documents that contain pertinent Site specific information of known or suspected OE uses and depths that OEW contamination may be found have been omitted from the Group 3 RI/FS Work Plan.⁸ By doing so, bogus claims of site specific conditions found in the "new" SEDR database cannot be refuted. Findings for suitability to transfer the parcels are being made based on this manipulation of data rather than data reflecting the actual site specific conditions, and potential remaining health hazards. The FORA ESCA RP is becoming what many of us feared, a dumbing-down of the extent of, and the danger of conditions existing on this former Army base. FORA political decisions based on real estate desires are not effective in protecting the community and future residents health and safety.

In addition, a great hazard remains largely unaddressed. Residual contamination from military Munitions Constituents (MC) exists. The Fort Ord ESCA Cleanup Program has failed to initiate a comprehensive MC sampling plan. To date, we are unaware of a list of MC for all military munitions and Training Devices used at former Fort Ord. If the list exists, please forward a copy to the CAG. Some 3300 acres are slated for turnover to the public without addressing this significant threat to human health.

³ Attachment 3: Excerpts, training areas and range configurations are unknown: OE-0005A: "Site 16 Rocket moving target range...only discovered 18 months ago, this area was saturated with 2.36"rockets both HEAT and practice.... 400-500 were HEAT warheads."

⁴ Map 2: CSU Footprint, previously unidentified Training Areas highly contaminated with Ordnance and Explosive Waste (OEW) live and inert ammunition.

⁵ Attachment 4: California Real Estate Disclosure Law; requires full disclosure of hazardous waste

⁶ Attachment 14: penetrating ordnance Group 3 parcels; projectiles; 22mm, 40mm, 37mm, 57mm, 60mm, 75mm, 81mm, 84mm, 4.2in mortar, 105mm, 155mm, 8 inch naval rounds

⁷ Attachment 11: EOD Specialist Résumé, 27 years experience UXO identification and removal

⁸ Attachment 5: IA Ranges 43-48 White Phosphorous (WP) Range, 1993 ASR munitions 7-10 feet deep.

1) In order to better understand the extent of military training at former Fort Ord, and the potential contamination from training activities, fundamental questions need to be answered or at least estimated.

A story told by a retired sergeant that trained Fort Ord troops:

A retired sergeant said he trained soldiers to fire 60mm and 81mm mortars in the northern and northeastern portions of Site 39. He would take out 400 soldiers for bivouac maneuvers (multi day outings in the field). When asked how many rounds each soldier fired in a day, he estimated each man would fire 30 to 60 Mortar rounds. He indicated they were practice mortars. Using a median number of 45 mortars multiplied by 400 soldiers, 18,000 mortars were fired in a day by a single group of trainees. It is understood practice munitions unlike High Explosive (HE) munitions use pyrotechnics for identifying where the rounds hit (spotting).^{9 10}

Note: at the height of training there were 50,000 soldiers at Fort Ord. Estimates are, from 1940-1974 1.5 million troops trained at Fort Ord.¹¹

a) Several million troops trained at Fort Ord. How many millions or billions of pounds of military munitions were used in the training of troops? Any estimates? If not, why not?

Detailed Issues, Concerns, and Questions:

2) The Group 3 RI/FS Work Plan, Interim Action Ranges and other parcels are some of the most highly contaminated areas at former Fort Ord. The FORA ESCA RP is based in large part on the creation of a data set based on sampling and removals to a depth of 4 feet. The MMRP is assuming no UXO/OEW will be found below 4 feet. However, it appears deep penetrating UXO/OEW is not being looked for.

From early on in the Superfund cleanup of UXO/OEW, the use of quantified science has been absent. The Enron/Arthur Anderson creative accounting style of data collection and manipulation is detrimental to human health and safety and is **not** in the communities best interest. If protection of human health and safety is the goal, a scientific approach to UXO/OEW cleanup requires the inclusion of all potential exposure scenarios to explosive and residual contamination, and that **all** aspects of munitions use be quantified. To date UXO/OEW investigations and removals have been limited to the explosive hazard and soil sampling for a few constituents arbitrarily chosen by DOD. Cal EPA (DTSC) and US EPA are concurring with this absurd approach.

Another dangerous approach to Ordnance and Explosives Site assessments has been, lack of evidence of OE use through Archive Searches and Site Walks is sufficient to conclude OE and training devices were not used at suspected training areas.¹² This rational defies

⁹ Attachment 9: Practice Bombs, toxic hazards of practice ammunition

¹⁰ Attachment 6: Pyrotechnic Devices, Military Munitions (Chemistry) Chapter 10

¹¹ Attachment 19: Fort Ord History

¹² Attachment 21: Article; Buried munitions in residential development, deed restriction was lifted

commonsense. To date, several training areas previously unidentified as UXO/OEW sites, have proven to be highly contaminated with munitions and training devices. Unresolved issues with the Fort Ord MMRP approach exist:

- a) The Army kept extremely poor records. Why isn't a precautionary approach being taken when it comes to potential training areas?(assume it is UXO/OEW contaminated unless proven otherwise rather than assuming it was not used for training based on Archive Search Records and Site Walks) Never assume Fort Ord land is safe.¹³
- b) Identifying past range uses is critical. It is understood range reconfigurations where a common practice.¹⁴ Site 39 historical maps show ranges over tops of ranges, the extent of which is unknown. If wanting to know the extent of range and training area uses is a goal, compiling a list of all known and suspected munitions and training device constituents and extensive site soil sampling would be very helpful. Is there a list of all constituents associated with munitions and training devices used at former Fort Ord?¹⁵ If not, why not?
- c) It is understood a common practice was to cover over former training ranges with earth, out of sight out of mind.¹⁶ Is there a cleanup document that discusses in detail the practice of covering over old ranges and training areas? If not, why not?
- d) It was a common practice to bury OE/OEW.¹⁷ Is there a cleanup document that discusses in detail the practice of burying OE/OEW? If not, why not?
- e) The MMRP does not appear to be looking for deeply buried munitions. Why isn't the MMRP looking for UXO/OEW deeper than 4 feet?
- f) OE/OEW is likely deeply buried in ranges and training areas. The approach the MMRP has taken with OE/OEW is, don't look, don't find. Superfund cleanup as the FOCAG understands it, is a program intended to identify and remove hazardous waste and substances to the greatest extent possible. If OE/OEW and training devices aren't being looked for, they surely won't be found. Is the MMRP doing a cleanup to the greatest extent possible? If not, why not?
- g) Former uses at Site 39 have been omitted from the record, aerial bombing runs were carried out in the MRA. Why has this significant historical use been omitted from the record?¹⁸ What is the penetration depth of a 100, 250, and 500 lb bomb? Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not?

¹³ Attachment 16: The Precautionary Principle; 1998 Wingspread Statement

¹⁴ Attachment 3: Excerpt, Range 48; 40mm, 60mm, 81mm, 4.2 in, and 4 in mortars found 10 feet deep

¹⁵ Attachment 10: DOD to identify contamination from over 200 military Munitions Constituents (MC)

¹⁶ Attachment 3: Excerpt, Site 13B sink hole Practice Mortar Range under 30 feet of fill

¹⁷ Attachment 21: Article Buried munitions. Deeply buried ordnance is not being looked for.

¹⁸ Attachment 3: Excerpts, Bombing runs were carried out at Fort Ord. A live 250 lb. bomb found in front of Ranges 41-43. A 100lb. Found at CSUMP parcel Site 8.

- h) It is understood large amounts of Practice and HE munitions were used to train troops the extent of which is unknown. How many troops are estimated to have trained at Ranges 43-48? Any estimates? If not, why not?
- i) It is understood burning off ranges to remove old munitions was a common practice. The extent of munitions constituents contamination is unknown. A site were UXO/OEW has been discovered may have been cleared of munitions annually for many years. A range used in this manner would likely have significant COC's on-site. Where is the list of known ranges that had this done? Is there a cleanup document that discusses in detail this potential health and safety issue? If not, why not?
- j) The significant hazards of Practice munitions have not been addressed. It is well documented Practice munitions were extensively used in the training of troops. The FOCAG has discovered these munitions contain highly toxic substances. The FOCAG is unaware of a cleanup document or report that discusses in detail Practice munitions and their constituents. If a document exists addressing practice munitions and their constituents please forward a copy to the FOCAG.
- k) The FOCAG has discovered a map showing the Interim Action Ranges. Range 44 is identified as a LT antiarmor WP Range.^{19 20} The 1993 ASR indicates White Phosphorous munitions use occurred at Site 39. Is Range 44 a White Phosphorous Range? Is there a cleanup document that discusses in detail these types munitions and where they were used at Fort Ord? If not, why not?
- l) It is understood incendiary, armor piercing munitions were used at Site 39.²¹ Have armor piercing munitions such as Depleted Uranium been discovered at Site 39? ²² Is Depleted Uranium being looked for? Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not? Could you please send the FOCAG a copy of the full scale map that map1 was generated from?
- m) Range 43 is identified as a 81mm and 4.2 in mortar range.²³ Is the he MMRP looking beyond 4 feet for deep penetrating ordnance? If not, why not? Could you please send the FOCAG a hard copy and a CD of the full scale map that Map1 was generated from?

The 1993 ASR states Range 48 has ordnance at 10 feet and the Impact Area of which the entire IA Ranges are located, has munitions at 7-10 feet.²⁴ According to listed ordnance used at 43-48,²⁵ Penetration depths should not exceed 4.1 ft.. A

¹⁹ Attachment 3: Excerpts, types munitions used at Site 39

²⁰ Attachment 16: White Phosphorous is highly toxic

²¹ Map 1: shows Range 44 as White Phosphorous (WP) Range (must enlarge map to see)

²² Attachment 2: DOD document indicating Spent Uranium anti tank munitions use at former Fort Ord

²³ Map 1: shows Range 43 as a 81mm, 4.2 mortar range (must enlarge map to see)

²⁴ Attachment 3: Excerpts, depths OE is expected to be found Ranges 43-48 and the MRA/impact area.

²⁵ Attachment 3: Excerpts, list of OE expected to be found at Site 39, Ranges 43-48

couple of possibilities. 1) these ranges were covered over to reduce hazards from past OE use, or 2) Ranges 43-48 are a impact area from old artillery ranges located in the North and Eastern portion of Fort Ord,²⁶ perhaps old Camp Ord. Historical records indicate early Fort Ord was a Artillery training facility. Regardless, there is a high likelihood, explosive and residual hazards remain unaddressed with the IA and adjacent ranges. When will the Army begin a RI/FS that targets artillery OEW?

- n) Have there been any excavations to investigate whether OE is found at 10 ft. in the IA Ranges? If not, why not? Is the era and size of munitions fired from the artillery ranges in map 3 known? Have the firing points and impact areas been looked for and located? If not, why not?
- o) 4.2 in. and 4 in. Stokes mortars are identified as being used and found in the IA Ranges.²⁷ In addition, Livens projectiles have been found nearby. It is understood these types WW I mortars and munitions have been found to contain titanium tetrachloride, a CWM. Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not?
- p) Why aren't the Regulators asking and getting answers to these fundamental questions? Its not to late to get it right.

3) Most military munitions constituents are known or suspected endocrine disruptors, carcinogens, mutagens, toxicants, etc.. The CAG has compiled a list of military munitions constituents found in the types of munitions used at Fort Ord. The list includes the potential negative human health impacts that may result from exposure to each of the constituents. Former Military Training Areas are highly contaminated with hazardous chemicals.²⁸ If you knew of the potential risk, would you want or allow your children to live on and play in soil possibly contaminated with the Table 1 and Table 2 constituents?

- a) Has the Fort Ord Cleanup Program prepared a list of Munitions Constituents (MC) for all Military Munitions and Training Devices used at former Fort Ord. If not, Why not?
- b) Of the millions or billions of pounds of military munitions used, how many pounds of their constituents were released into the environment? Any estimates? If not, why not?
- c) Were did the residual contaminates go?
- d) Could all the contaminates simply disappear?
- e) Does soil analysis of ranges include every known or suspected OEW/UXO constituent used at Fort Ord? If not, why not?

²⁶ Map 3: Shows 2 old artillery range fans extending into MRA

²⁷ Attachment 3: Excerpts, list of OE expected to be found at Site 39, Ranges 43-48. Add new items

²⁸ Attachment 7: military munitions constituents and health hazards Table 1 and Table 2 constituents

- f) Babies and toddlers commonly eat soil and other substances off the ground. Has this risk been analyzed? If not, why not?
 - g) Have Maximum Residual Levels (MRL's) been established for the constituents in the attached Military Munitions Chemicals Of Concern Table 1 and 2? If not, why not?
 - h) If the extent of residual contamination and MRL's have not been established, how can an acceptable level of cleanup be known for residential or commercial use?
 - i) Is there a screening program in place to monitor for hazardous substances at Fort Ord? If not, why not? Will there be a program to monitor potential negative health impacts of residents living in homes built on former training areas and ranges? If not, why not?
 - j) Perchlorate is known to be a widely used constituent in military munitions used at Fort Ord . Is there testing being conducted to identify the extent of Perchlorate contamination in former training areas and ranges? If not, why not? If yes, the remediation documents don't appear to include any discussion or analysis.²⁹
 - k) Synergism and synergistic effects of chemicals should be part of Risk Assessment. I don't recall seeing any analysis in the Fort Ord Base Wide RI/FS addressing synergism. Is synergism covered in any Fort Ord Human Health Risk or Environmental Assessments? If not, why not?
- 4) The parcels have not been adequately cleared of Ordnance and Explosives Waste (OEW), Unexploded Ordnance (UXO), or identified the extent of Munitions Constituents (MC) contamination. The extent of contamination is unknown.

Because the extent of deep penetration ordnance and deep OEW burial pits are unknown, scanning equipment capable of detecting deeply buried metallic anomalies should be used.³⁰

Thankfully, early in the cleanup process, DOD and the Regulators understood the significant threats from Ammunition and Explosives. A few quotes:

"It is necessary to identify and remove ammunition and explosives located from the surface to the applicable depth indicated (Commercial/Residential, Utility Construction Activity: Clearance depth; 10 ft. or excavation depth plus 4 feet, whichever is greater)"³¹

"Chapter 12, DOD 6055-9 STD (1992), DOD Ammunition and Explosives

²⁹ Attachment 17: Perchlorate summary DOD 16-106 ppb Fort Ord Site 39

³⁰ Attachment 14: Fort Ord Ordnance Penetration Table and Range Penetration Analysis

³¹ Attachment 12: DDESB OEW site remediation depth for intended use

Safety Standard; DOD real property known to be contaminated with ammunition and explosives that may endanger the general public may not be released from DOD custody until the most stringent efforts have been made to ensure appropriate protection to the public.”³²

“ The Presidio of Monterey does not intend to transfer by deed any known or suspect ordnance and explosive site on former Fort Ord land, prior to the completion of all required OE related actions. We do, however, intend to transfer by deed areas that may have been identified on training maps , but through the archive search process were not identified as potential ordnance sites, i.e. Machine Gun Proficiency Training Areas, Machine Gun Squares, and Mortar Squares.” ³³

“Chapter 12 of DOD 6055-9STD requires a cleanup plan be presented to the DDESB for leasing, transferring, or disposing of DOD real property when ammunition and explosives contamination is known or suspected. The DDESB will review the plan for explosives safety considerations. The following matrix is to be used to identify the appropriate clearance depth. The ability to clear to a given depth will depend on the technology and funds available. It is necessary to identify and remove ammunition and explosives located from the surface to the applicable depth indicated.”³⁴

- a) UXO/OEW cleanup efficiencies have not advanced as a result of new detection technologies and methods, but rather by changing of the rules in order to meet development goals. What happened?

Projectiles capable of penetration depths beyond the Shonstedt GA-52CX detection range have been found in the Group 3 parcels.³⁵ There is good reason to be looking beyond the 4 foot removal depths at Fort Ord.³⁶

- b) To date, what efforts have been made to locate deeply buried ordnance?
- c) Today, what technology is being deployed to locate deep penetrating ordnance?
- d) The Shonstedt GA-52CX has been used at Fort Ord for 15 years. Is the RP using the best technologies available?
- e) Is the GA-52CX the best hand held OE detection technology available?³⁷ It is understood better overall detection equipment exists. Why isn't it being used?

³² Attachment 3: Excerpts, OE-0122 found in HFA/CSU After Action Report

³³ Attachment 5: DOD letter; no known or suspect OE land to transfer by deed prior to completion of all required OE related actions.

³⁴ Attachment 14: Penetration Analysis Table; Range/site design UXO wrong. Deep penetrating ordnance found CSUMB footprint and 13B

³⁵ Map 3: Two artillery Range fans extend into the MRA. Deep penetrating ordnance should be looked for.

³⁶ Attachment 14: Ordnance penetration Table and Penetration Analysis Table

³⁷ Attachment 5: OE-0036 1996 Evaluation and Comparison of UXO Detectors. Better overall detector

- f) Does the EM61-MK2 detect metallic anomaly's as well or better than the GA-52CX or the MK 26?
- g) It is understood the Forester Ferex MK 26 ordnance locator is used by U.S. Military EOD forces. This magnetometer detects deep penetrating ordnance well beyond the capacity of the 52CX. Is the MK 26 being used at Fort Ord? If not, why not?^{38 39}
- h) Which of the following is the UXO/OEW cleanup goal; to locate and remove Ordnance and Explosive Waste to the greatest extent possible or to the extent it is financially practical?
- i) If finding all UXO/OEW items is a goal, would using detection equipment capable of deeper detection capabilities be desired?
- j) Is UXO/OEW in itself , being looked for beyond 4 feet ? If not, why not?

The practice of characterizing former Fort Ord land through the archive search process and visually looking around while walking down bunny trails to identify potential training areas should be abolished. It is abundantly clear, areas not suspected of training activities have turned out to be highly contaminated with dangerous training items, and that dangerous training items show up in the most unexpected places.

5) Chemical Warfare Materials (CWM) and their use in training areas have not been adequately addressed. These types of training devices outside their packaging are not detectable with magnetometers.

On March 10, 1997, 24 ampoules CAIS Chemical Warfare Materials were discovered 2 ft. below ground near 4500 motor pool during ordnance and removal activities at Site OE-13B⁴⁰

On April 14, 1994 during the HFA/CSU OE removal, 2 EOD specialists were overcome by a Hazardous Material and required medical attention at the hospital. Their equipment was confiscated due to concerns of HAZ MAT contamination. Hazardous Material monitoring devices were required for all subsequent OEW removal.

The known CWM were unexpectedly found in a Range/Training area that was not previously identified as a potential CWM training area. It may have been a rare event except it is well documented these CWM are commonly found and buried in training areas. According to Fort Ord records, CAIS Sets were used at Fort Ord until 1974. The K951 ampoules (also called vials) are frequently found in burial

³⁸ Attachment 13: DTSC letter to Army, 3.5" Rocket found after Army declared site safe for unrestricted use

³⁹ Attachment 3: Excerpts, Forester Ferex MK 26 ordnance locator, detects ordnance up to 19 feet deep

⁴⁰ Attachment 5: OE-0265D, OE-0265E; CAIS CWM found during OEW clearance activities 13B

sites at old WWII training areas.⁴¹

- a) Early Fort Ord cleanup documents state CWM were thought not to have been used at Fort Ord. We now know that these training devices were used to train troops at Fort Ord the extent of which is unknown. Is there a cleanup document that discusses in detail these types training devices? If not, why not?
 - b) How were these incidents resolved?
 - c) Army certainly saw this as significant concern. How will the public be protected from potential exposure to these chemical agents?
 - d) Why haven't these incidents been included in all training area documents?
 - e) Due to the common practice of discarding these training devices in the field, what is the justification for allowing the transfer, reuse, and development of training areas and training sites (TS) where these devices have been found or may have been used?
 - f) Is there technology that can identify individual glass vials below the ground surface?
 - g) These CWM materials are contained in glass vials. Has there been any discussions of how this hazard should or will be addressed?
 - h) How can workers be protected from these types of hazards during excavation activities?
 - i) Are there plans to cap (earth fill), military training areas rather than remediate them of UXO/OEW and military constituents? It is evident through limited sampling throughout training sites, most stringent efforts are not being made to find UXO/OEW.
- 6) Critical Administrative Record (AR) documents that contain pertinent site specific known or suspected uses, and OEW contamination information have been omitted.⁴²
- a) Known OE uses have not been included the FORA ESCA RP parcels documents^{43 44}
 - b) UXO/OEW discovered during site sampling and removal actions has disappeared from the FORA ESCA RP parcels historical record.⁴⁵

⁴¹ Attachment 3: Excerpts OE-0202, OE-0265D, OE-0265E

⁴² Attachment 5: Omitted AR documents and dates made available on Fort Ord Cleanup web site

⁴³ Attachment 3: Excerpts, bombing runs were carried out at the MRA the extent of which is unknown

⁴⁴ Attachment 3: Excerpts, Site 15 Range 48, White Phosphorous munitions used in the MRA

⁴⁵ Attachment 3: Excerpts, Attachment 3: Excerpts; sinkhole practice mortar range Site 13B, area backfilled with up to 30' feet of fill during 4400/4500 Block Motor pool construction. The was Range covered over.

- c) Why has the SEDR, MMRP, and FORA ESCA RP databases failed to include all OEW items discovered within the Group 3 RI/FS

It appears the Administrative Record is being manipulated in a way that misrepresents important facts. The public, now and in the future, has a right to know the full extent of the past military training use of individual parcels, and the full historical record of OEW items found within their boundaries. To omit or alter any part of this historical information misleads the reader into believing the parcel is cleaner and safer than it actually is. By keeping the record straight, the public can decide for themselves if they wish to be exposed to the potential remaining OEW hazards. Remediation by data manipulation will have a disastrous outcome and harm someone.

- d) How has this critical issue slipped by the FORA officials and the regulators?
- e) Are the officials aware of what's happening?
- f) Is this acceptable to the officials and the regulators?
- g) When someone gets blown up or sick, who will be liable?
- h) Is this in the best interest of the taxpayers?
- i) California has strict real estate disclosure laws. How will parcel specific OEW information be known and disclosed?⁴⁶

Additionally, these critical documents have not been included in the Fort Ord cleanup AR web site until very late in the process. The public has had no reasonable way of viewing site specific information. The FORA ESCA RP is omitting key documentation that tells a very different story of the extent of OEW/UXO contamination in the Training Areas.⁴⁷

- j) What steps will be taken to inform the public and future residents of the potential health hazards associated with living over former Training Areas?
- 7) The Fort Ord Military Munitions Response Program (MMRP) database has lost very important AR documentation needed to make accurate and well informed decisions by the Regulators and the Public.

Most training/practice ammunition contains highly toxic, hazardous substances. These munitions, and their constituents are a significant health hazard that remain relatively unaddressed. Many of these practice/inert ammunitions have been

⁴⁶ Attachment 4: California Real Estate Disclosure Law; requires full disclosure of hazardous waste

⁴⁷ Attachment 5: Omitted AR documents and dates made available on Fort Ord Cleanup web site

omitted in the new SEDR database. Withholding this information from new cleanup documents deprives the public of significant, and critical information.^{48 49}

Early in the OE cleanup process, ordnance and explosive training range areas were first referred to as "Sites". They then were referred to as "OE" areas, and now "MRS" areas. As the changing of acronyms has progressed, so has the omission of old site data of UXO/OEW items discovered. Hence a "new" record has emerged.

There's a new FORA ESCA RP concoction of data referred to as the Summary of Existing Data Report (SEDR). The SEDR which evolved from information supplied from the MMRP database is being relied upon to support the Group 3 RI/FS Work Plan. Site Characterizations, Findings, and Determinations of safety are being based on the compilation of the new data resulting from the omission and manipulation of the old data. This new data is resulting in the sites appearing to be relatively benign. This will undoubtedly result in a finding of "no further action". By creating this fictitious new record, RP parcels are being represented as being safer than they really are.

The MMRP database is not being properly maintained as is evident by the omission of large quantities of UXO/OEW discovered in the 3300 acres of the FORA ESCA RP documents.⁵⁰

- a) What Agency or Organization is in charge of the Military Munitions Database, a critical element of the Fort Ord Superfund cleanup?
- b) Has the administration of the Military Munitions Database been privatized?
- c) Is there oversight of the OE/OEW/MEC data that is entered into and/or omitted from the database?
- d) What is the protocol for adding, deleting, or changing data in the Military Munitions Database?
- e) Who is responsible for maintaining the UXO/OEW/MEC AR and ensuring the information is preserved and not tampered with.
- f) Does the database compile all past discovered Ordnance and Explosives i.e., OE, OEW, UXO, DMM, MEC, MD etc. into the same OE dataset?
- g) How could such significant historical site information be missed by the FORA ESCA RP officials and the Regulators?
- h) Is there a public notification and input process of how the database(s) will be maintained?

⁴⁸ Map 2: Lists of OEW items found Site 13B and CSUMB footprint.

⁴⁹ Attachment 9: Practice Bombs, toxic hazards of practice ammunition, widely used at Fort Ord

⁵⁰ Map 2: Lists of OEW items found Site 13B and CSUMB footprint.

- i) Acronyms, synonyms and descriptions of Ordnance and Explosives (OE), Ordnance and Explosives Waste (OEW) have been changed over the years. As a result, valuable and critical information is being lost. Coincidentally, this appears to corresponded with the privatization of Fort Ord Superfund cleanup, the FORA ESCA RP, and the new centralized database. Are the Regulators keeping track of the Fort Ord historical Military Munitions Database and taking steps to prevent this potential travesty?
 - j) Significant OE data for the Group 3 parcels has been lost . Which regulatory Agency is responsible for oversight that will ensure the historical facts of each parcel are preserved?
 - k) It is understood small arms are considered hazardous waste. Is the ESCA Cleanup Program still required to report types, amounts, and locations of all OEW discovered including Small Arms ammunition, 50 cal. or less, and practice and inert ordnance? ⁵¹ If not, why not?
 - l) It is understood small arms tracer ammunition was used for troop training. Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not?
- 7) It is understood non-metallic landmines have been found at Fort Ord. Discovery of these types of munitions raise the same questions as with the CWM issue.
- a) How is this issue being addressed?
 - b) Is there technology that can identify individual non-metallic ordnance below the ground surface?
 - c) Is it safe to develop areas were CWM and non-metallic landmines may have been used? If so, how so?

8) Additional comments and questions

The Group 3 RI/FS Work Plan states: Section 3.1, IA Ranges 43-48
The MMRP database indicates that the majority of the MEC removed from the Interim Action Ranges MRA were located on the surface; however, these data may not include subsurface MEC removed during the Range 45 scraping and sifting operations.

The record shows large quantities of UXO/OEW discovered are subsurface^{52 53}

- a) Subsurface OEW is being diminished. To discover such high quantities of penetrating ordnance on the surface is all the better reason to look harder and deeper for OEW. As with the Group 2 RI/FS comments, is the FORA ESCA RP,

⁵¹ Attachment 5: DTSC letter stating State of California and US EPA position on OEW

⁵² Attachment 20: List of UXO/OEW found prior to 2002, large quantity subsurface

⁵³ Attachment 3: Excerpt, Range 48; 40mm, 60mm, 81mm, 4.2 in, and 4 in mortars found 10 feet deep.

SEDR, and MMRP database commingling a good idea? "data may not include subsurface MEC". Who is interpreting the MMRP data. Is this type data collection in the taxpayers best interest. Do the Officials and Regulators concur?

- b) According to Sec.3.1, 10,165 UXO items and 196,996 pounds of MD have been discovered, This is a much larger quantity than we were aware of. Would you please forward to the CAG a complete list of the UXO items with dates found, depths and the grid location information. Additionally please forward a list of the AR document numbers where the 10,165 UXO items are found. Is there a document that describes the type munitions the 196,996 pounds of MD came from? If so, please provide the AR document number. If not, why not?

We look forward to your substantive response to these serious issues and questions. Please include the entirety of this letter and attachments in the final document.

Sincerely,

Lance Houston, for the FOCAG

Cc.
California DTSC
U.S. EPA
Monterey County Planning Department
California State University Monterey Bay

ATTACHMENTS:

- 1 FOCAG 8-12-09 Position Paper; Environmental Contamination Fort Ord, CA
- 2 DOD document indicating Spent Uranium munitions use at former Fort Ord
- 3 Excerpts Fort Ord UXO/OEW cleanup documents
- 4 California Real Estate Disclosure
- 5 Omitted Documentation and dates posted to Fort Ord Cleanup web site
- 6 Pyrotechnic Devices: uses and constituents
- 7 Military Munitions Constituents (MC) Table 1 and Table 2

- 8 Explosives and Propellants: uses and constituents
- 9 Toxic Hazards of Practice Ammunition
- 10 GAO: DOD to identify contamination from over 200 military Munitions Constituents
- 11 EOD Specialist résumé; 27 years experience OE detection and removal
- 12 UXO Site Remediation Depths
- 13 DTSC letter to Army OEW cleanup concerns
- 14 Fort Ord Ordnance Penetration Table and Range Penetration Analysis
- 15 email, regulators and developer discussing cleanup policy
- 16 White Phosphorous (WP) Profiles
- 17 Perchlorate summary Fort Ord, CA DOD 16-106 ppb Site 39
- 18 1998 Wingspread Statement, Precautionary Principal
- 19 Fort Ord History
- 20 Ranges 43-48 list of UXO/OEW found, many subsurface
- 21 Article: Buried ordnance has residents wondering if their yards hold hidden danger

MAPS

- 1 Ranges 43-48, shows Range 44 Lt. anti-armor WP Range
- 2 Ordnance and explosives Training Sites CSUMB Parcel and UXO/OEW items found
- 3 1994 ASR map shows Artillery range fans extending into Multi Range Area (MRA)
- 4 1994 ASR maps

ATTACHMENT 2

STATEMENT OF RESPONSE TO MUNITIONS AND EXPLOSIVES OF CONCERN

Surf City and Ship Bottom

Public Beaches

17 May 2007

This statement documents the Time Critical Removal Action (Phase I) completed in response to munitions and explosives of concern (MEC) found on public beaches in Surf City and Ship Bottom, New Jersey. The military munitions found were inadvertently placed on the beach areas during a recent coastal storm damage reduction project. The affected beach areas have been carefully investigated, and all detectable MEC has been removed.

The coastal storm damage reduction project (approximately 71-acre site) included placement of about 800,000 cubic yards of sand over 8,100 linear feet of berm (flat beach) to approximate depths of eight feet from North 25th Street in Surf City, New Jersey, to South 5th Street in Ship Bottom, New Jersey. A pre-existing dune was supplemented to create a project dune of 6,600 linear feet with a crest elevation of + 22 feet NAVD, a 30-foot wide flat top, sloping down seaward 70 feet to the flat beach. The coastal storm damage reduction project also included the surf zone, or the underwater area adjacent to the beach, from North 25th Street in Surf City to South 11th Street in Ship Bottom.

Prior to conducting the Time Critical Removal Action (Phase I), a Geophysical Prove-Out (GPO) study was performed in a test plot on the Surf City beach. A variety of geophysical instrumentation was used to determine the maximum detection depth for the type and size of munitions expected to be encountered. The study concluded that Digital Geophysical Mapping (DGM) using an EM-61 towed array was capable of consistently detecting 34 of 36 GPO seed items buried at depths from 0 to 36 inches below the ground surface for a 94.4% detection rate. The handheld Schonstedt Magnetometer detected 20 of 30 GPO seed items to depths of 18 inches below the ground surface. The Forester Mk 26 Magnetometer detected all GPO seed items buried at 36 inches below the ground surface.

The Time Critical Removal Action (Phase I) investigated the following five beach areas for MEC:

1. The 6,600 linear feet of Dune Top was investigated by Digital Geophysical Mapping (DGM) using an EM-61 towed array of four coils. All anomalies were analyzed and those that provided a signature indicative of MEC were intrusively investigated and resolved to the detection depth.

2. The 6,600 linear feet of Dune Slope was investigated and resolved for MEC using Mag and Dig techniques with the handheld Schonstedt Magnetometer. The 18-inch detection depth was considered sufficient because the dune is restricted to pedestrian traffic, with crossovers and pedestrian access points provided.

3. All 24 pedestrian crossovers, 3 vehicle access areas (N. 5th St., N. 12th St, and N. 18th St.), and the handicap ramp (N. 12th St.) located in the 6,600 linear feet of the Dune Top and the Dune Slope were investigated and resolved for MEC using the Forester Mk 26 Magnetometer to the detection depth.

4. The 8,100 linear feet of the berm area was investigated for MEC from the toe of the Dune Slope out to the mean low water mark by DGM using the EM-61 towed array. All anomalies were analyzed and those that provided a signature indicative of MEC were intrusively investigated and resolved to the detection depth.

5. The surf zone was investigated and resolved for MEC using the Forester Mk 26 Magnetometer from the low tide mark out to 150 feet or 4 feet of water depth, whichever occurred first. If an offshore sandbar was present, the trough between the berm and the sandbar, and the entire sandbar to the ocean-side edge was investigated and resolved for MEC using the handheld Schonstedt Magnetometer.

To date, over 1,100 MEC items have been recovered from the beach by the TCRA investigation or turned in by citizens. An attached table provides a summary of the distribution of the MEC items found by the TCRA investigation, as of 14 May 2007, across the project site according to the street designations. These items include unfired, fused, low explosive loaded Mark I 37mm projectiles, Mark II and III booster assemblies, and Mark II Point Detonating Fuzes. Due to the location where the MEC items were dredged from, and the configuration of the MEC items (fuzes with boosters, and boosters by themselves), these items are considered to be discarded military munitions (DMM).

Military Munitions are manufactured to withstand a certain amount of rough handling such as transport, soldier maneuvers and a significant jolt when fired. Subsequently, the probability of detonation of the DMM items due to human contact would be extremely low. The problem occurs not with the contact, but with the actions after contact. Explosives will detonate when exposed to "heat, friction or shock" or any combination of the three.

The TCRA investigation for MEC to detection depth results in a low potential for an explosive hazard to be encountered on the public beaches. Additionally, the type of military munitions recovered, along with extensive public information about the potential presence of munitions on the beach, and what to do should a munition be discovered, reduces the potential for an explosive incident to occur.

This Time Critical Removal Action has lowered the likelihood that the public will encounter MEC. However, there remains the potential for MEC to be present below the depth of detection, and beach instability and weather may cause MEC to surface. Erosion and wave action may also cause MEC to migrate into the areas previously investigated or beyond the project limits. Very little erosion of the Dune Top and Dune Slope is expected, except in the case of a major climatic event, such as a Nor'easter or hurricane. The MEC potentially present offshore, and outside the areas of the surf zone investigated, could potentially be moved into the surf zone during periods of heavy wave action.

The US Army Corps of Engineers recommends the following Land Use Controls be implemented and/or maintained to reduce the potential for MEC to be encountered on the beach during recreational activities:

- Public information signs addressing the 3Rs (Recognize, Retreat, Report) of explosives safety be posted at public and private access points.
- Public information brochures be distributed.
- The use of metal detectors on the beach be prohibited.
- A dig restriction -- no digging below a depth of one-foot -- be implemented.
- The dune (except at crossover areas) be restricted from public access with fences and signage.
- A private crossover construction policy be implemented to ensure that MEC is not encountered during construction.

In addition to the Time Critical Removal Action (Phase I) and the implementation of Land Use Controls, the US Army Corps of Engineers will implement a Public Information Plan. This plan will include training for police, lifeguards, beach pass inspectors, and beach maintenance staff, and the presence of a USACE Ordnance and Explosives Safety Specialist throughout the summer to provide MEC contingency response.

This action has been conducted in accordance with Army Regulation 405-90.

APPROVED:



GWEN E. BAKER
Lieutenant Colonel, Corps of Engineers
Commanding

5-18-07

Date

Attachment: Distribution of MEC found as of 14 May 2007

MEC-TCRA at Surf City and Ship Bottom Beaches

Project Summary MEC to 5/14/2007

Total MEC Items: 1,074

<i>Street</i>	<i>MEC</i>	<i>MEC Items</i>
DIV	MKII BOOSTER	18
	MKIII BOOSTER	22
	Projectile 37 mm	4
	<i>Total MEC Items:</i>	<i>44</i>
N10TH	Base Detonating Fuse - 1906	4
	MKII BOOSTER	95
	MKIII BOOSTER	99
	Projectile 37 mm	14
	<i>Total MEC Items:</i>	<i>212</i>
N11TH	MKII BOOSTER	23
	MKIII BOOSTER	86
	Projectile 37 mm	4
	<i>Total MEC Items:</i>	<i>113</i>
N12TH	MKII BOOSTER	4
	MKIII BOOSTER	9
	Projectile 37 mm	1
	<i>Total MEC Items:</i>	<i>14</i>

<i>Street</i>	<i>MEC</i>	<i>MEC Items</i>
N13TH	<i>Base Detonating Fuze - 1906</i>	1
	<i>MKII BOOSTER</i>	60
	<i>MKIII BOOSTER</i>	65
	<i>Projectile 37 mm</i>	1
	<i>Total MEC Items:</i>	127
N14TH	<i>Base Detonating Fuze - 1906</i>	3
	<i>MKII BOOSTER</i>	31
	<i>MKIII BOOSTER</i>	38
	<i>Projectile 37 mm</i>	3
	<i>Total MEC Items:</i>	75
N15TH	<i>Base Detonating Fuze - 1906</i>	1
	<i>MKII BOOSTER</i>	24
	<i>MKIII BOOSTER</i>	83
	<i>Total MEC Items:</i>	108
N16TH	<i>MKII BOOSTER</i>	15
	<i>MKIII BOOSTER</i>	14
	<i>Total MEC Items:</i>	29
N17TH	<i>MKII BOOSTER</i>	11
	<i>MKIII BOOSTER</i>	7
	<i>Total MEC Items:</i>	18

<i>Street</i>	<i>MEC</i>	<i>MEC Items</i>
N18TH		
	MKII BOOSTER	16
	MKIII BOOSTER	20
	Projectile 37 mm	2
	<i>Total MEC Items:</i>	38
N19TH		
	MKII BOOSTER	10
	MKIII BOOSTER	6
	<i>Total MEC Items:</i>	16
N1ST		
	Base Detonating Fuze - 1906	1
	MKII BOOSTER	17
	MKIII BOOSTER	13
	Projectile 37 mm	5
	<i>Total MEC Items:</i>	36
N20TH		
	MKII BOOSTER	4
	MKIII BOOSTER	7
	<i>Total MEC Items:</i>	11
N21ST		
	MKII BOOSTER	4
	MKIII BOOSTER	8
	<i>Total MEC Items:</i>	12
N22ND		
	MKII BOOSTER	2
	MKIII BOOSTER	2
	<i>Total MEC Items:</i>	4

<i>Street</i>	<i>MEC</i>	<i>MEC Items</i>
N23RD		
	MKII BOOSTER	2
	<i>Total MEC Items:</i>	2
N24TH		
	MKIII BOOSTER	3
	Projectile 37 mm	1
	<i>Total MEC Items:</i>	4
N2ND		
	MKII BOOSTER	9
	MKIII BOOSTER	6
	<i>Total MEC Items:</i>	15
N3RD		
	MKII BOOSTER	4
	MKIII BOOSTER	30
	<i>Total MEC Items:</i>	34
N4TH		
	MKIBOOSTER	1
	MKII BOOSTER	4
	MKIII BOOSTER	7
	<i>Total MEC Items:</i>	12
N5TH		
	MKII BOOSTER	2
	MKIII BOOSTER	7
	<i>Total MEC Items:</i>	9
N6TH		
	MKII BOOSTER	1
	MKIII BOOSTER	5
	<i>Total MEC Items:</i>	6

<i>Street</i>	<i>MEC</i>	<i>MEC Items</i>
N8TH	MKII BOOSTER	9
	MKIII BOOSTER	5
	Projectile 37 mm	1
	<i>Total MEC Items:</i>	15
N9TH	MKII BOOSTER	7
	MKIII BOOSTER	59
	Projectile 37 mm	3
	<i>Total MEC Items:</i>	69
S1ST	MKII BOOSTER	3
	MKIII BOOSTER	2
	<i>Total MEC Items:</i>	5
S2ND	MKII BOOSTER	2
	MKIII BOOSTER	10
	Projectile 37 mm	1
	<i>Total MEC Items:</i>	13
S3RD	MKII BOOSTER	2
	Projectile 37 mm	3
	<i>Total MEC Items:</i>	5
S4TH	MKIII BOOSTER	1
	<i>Total MEC Items:</i>	1

<i>Street</i>	<i>MEC</i>	<i>MEC Items</i>
S5TH	<i>MKII BOOSTER</i>	11
	<i>MKIII BOOSTER</i>	9
	<i>Projectile 37 mm</i>	2
	<i>Total MEC Items:</i>	22
S6TH	<i>MKII BOOSTER</i>	1
	<i>MKIII BOOSTER</i>	4
	<i>Total MEC Items:</i>	5

Fort Ord Community Advisory Group (FOCAG)
PO Box 969
Seaside, CA 93955
Website: www.fortordcag.org



FOR THE ADMINISTRATIVE RECORD

9-29-09

BRAC Environmental
Environmental and Natural Resources
c/o Gail Youngblood
P.O. Box 5008
Monterey, CA 93944-5008

Coordinator US EPA, Region 9
c/o Judy Huang
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San Francisco, CA 94105

California DTSC
c/o Roman Racca & Jim Austreng
8800 California Center Drive
Sacramento, CA 95826

Fort Ord Reuse Authority
c/o Stan Cook, ESCA Manager
100 12th Street, Bldg. 2880
Marina, Ca 93933

RE: Follow-up to FOCAG comments dated 8-20-09; Group 3 RI/FS WP Draft Final

The "Fort Ord Community Advisory Group is a public interest group formed to review, comment and advise on the remediation (cleanup) of the Fort Ord Army Base, Superfund Site, to ensure that human health, safety and the environment are protected to the greatest extent possible." - Mission Statement.

The FOCAG comments by Houston and Weaver delivered to FORA have not been posted to the AR. Why not?

Question:

The Foerster MK26 magnetometer appears to be a superior magnetometer for detecting ordnance. What is the justification for not including the Foerster MK26 magnetometer in Fort Ord OE Detection Studies and OE Sampling and Removal Actions?

Please provide comments to the issues and questions raised in the FOCAG comments dated 8-20-09 and the above question. Kindly make this letter and all responses in their entirety part of the AR.

Respectfully,

Lance Houston
FOCAG member

Attachment: FOCAG comments dated 8-20-09; Group 3 RI/FS WP Draft Final

S

Fort Ord Community Advisory Group (FOCAG)
PO Box 969
Seaside, CA 93955
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Website: www.fortordcag.org

FOR THE ADMINISTRATIVE RECORD

Please distribute to all FORA Board Members
Letter Pages 3 Attachments 24 Pages

August 20, 2009

Fort Ord Reuse Authority (FORA)
100 12th St., Building 2880
Marina, CA 93933
FORA ESCA Program Manager
c/o Stan Cook

RE: Fort Ord CAG Comments: FORA ESCA Remediation Program Draft Final Group 3 RI/FS Study Work Plan; Interim Action Ranges, Military Operations in Urban Terrain, Laguna Seca Parking, and Del Rey Oaks / Monterey Munitions Response Areas, Doc. Control Number: 09595-09-079-010

Concerns: Military Munitions Residual Contamination, OE/UXO/OEW/MEC Detection, OE/UXO/OEW/MEC Clearance Depths, Administrative Record Keeping, Military Munitions Database, Omissions of Pertinent Historical Site Documentation and Information, Compliance with Cleanup Standards

The "Fort Ord Community Advisory Group is a public interest group formed to review, comment and advise on the remediation (cleanup) of the Fort Ord Army Base, Superfund Site, to ensure that human health, safety and the environment are protected to the greatest extent possible." - Mission Statement.

Dear Mr. Cook;

The FOCAG is resubmitting their comments to the Draft Group 3 RI/FS Study Work Plan, Doc. Control Number: 09595-09-079-001 for the following reasons:

- 1) FORA ESCA RP responses to the Draft Group 3 RI/FS are laughable in that they are deficient and lack substantive content.
- 2) Most of the RP responses avoid or evade the FOCAG questions by referring to previous RP response letters that do not directly answer the questions and or refer to cleanup documents of which due to their deficiencies, the outstanding questions were asked. At best, parts of some of the questions are answered but overall leave the questions unanswered.
- 3) Requested materials (maps and UXO/OEW data), essential to commenting on the Draft Final Group 3 RI/FS Study Work Plan was not received by the FOCAG nor were we notified of the requested materials availability.

- 4) The MEC and Ordnance Constituents questions and concerns raised by the FOCAG are inseparable in that Superfund cleanup of OEW as a whole is the issue at hand. The fact that DoD, BRAC, FORA, and the ESCA RP land disposal/transfers are primarily based on explosive hazards and omit the Ordnance Constituents hazards. FORA land planning is being carried out without addressing the equally if not a greater remaining hazard of Ordnance Constituents. Unfortunately, the Land Disposal Site Plan 1994 (LDSP), OE-0142, that defines explosive hazard cleanup requirements under the Department of Defense Standard 6055.9, fails to specifically address Ordnance Constituents. However, The LDSP states; "... remediation of areas containing OEW waste." "...95% of all OEW will be removed...". It is the CAG's understanding that Ordnance Constituents are considered Ordnance and Explosives Waste (OEW). OEW Constituents should be addressed parallel with FORA Land Planning, Remediation and fully resolved prior to transfer, development and habitation by the public.

Additional comment and reference document to MEC detection:

The FOCAG has come across a 2007 DoD Munitions, Time Critical Removal Action carried out in New Jersey, Surf City and Ship Button public beaches. The document raises additional significant questions with the Fort Ord munitions detection equipment and adequacy of MEC detection and removal under the Fort Ord RP.

The document refers to a GPO study and concludes as follows; The study concluded that Digital Geophysical Mapping (DGM) using an EM-61 towed array was capable of consistently detecting 34 of 36 GPO seed items buried at depths from 0 to 36 inches below the ground surface for a 94.4% detection rate. The Schonstedt Magnetometer detected 20 of 30 GPO seed items to depths of 18 inches below the ground surface a 66.3% detection rate. The Forester Mk 26 Magnetometer detected all GPO seed items buried at 36 inches below the ground surface a 100% detection rate.

The document refers to detection of 37 mm projectiles of which the Schonstedt has a very poor detection capability.

The Foerster Ferex is capable of ordnance location to the following depths:

ITEM	DEPTH
Small Arms Round	1 ft
Hand Grenade	2 ft
Anti-Personnel Mine	3 ft
Anti-Tank Mine	4.5 ft
Medium Projectile	10 ft
Small Bomb	15 ft
Large Bomb	19 ft

Although the Foerster Ferex Ordnance Locator will detect disturbances caused by changes in soil conditions, its ability to detect metallic items is not affected by local soil conditions.

We look forward to your substantive response to these serious issues and questions.
Please include the entirety of this letter and attachments in the final document.

Sincerely,

Lance Houston,
FOCAG Member

Cc.
California DTSC
U.S. EPA
Monterey County Planning Department
California State University Monterey Bay

Attachments:

- 1) FOCAG Comments 3-28-09; Draft Group 3 RI/FS Study Work Plan,
Control No: 09595-09-079-001
- 2) DoD TCRA 2007; Surf City and Ship Button public beaches

Fort Ord Community Advisory Group (FOCAG)
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AR-ESCA-0154

March 28, 2009

FOR THE ADMINISTRATIVE RECORD
Please distribute to all FORA Board Members
Letter Pages 15 Attachments and Maps 182 Pages

Fort Ord Reuse Authority (FORA)
100 12th St., Building 2880
Marina, CA 93933
FORA ESCA Program Manager
c/o Stan Cook

RE: Fort Ord CAG Comments: FORA ESCA Remediation Program Draft Group 3 RI/FS Study Work Plan; Interim Action Ranges, Military Operations in Urban Terrain, Laguna Seca Parking, and Del Rey Oaks / Monterey Munitions Response Areas, Doc. Control Number: 09595-09-079-001, **AR-ESCA-0141**

Concerns: Military Munitions Residual Contamination, OE/UXO/OEW/MEC Detection, OE/UXO/OEW/MEC Clearance Depths, Administrative Record Keeping, Military Munitions Database, Omissions of Pertinent Historical Site Documentation and Information, Compliance with Cleanup Standards

The "Fort Ord Community Advisory Group is a public interest group formed to review, comment and advise on the remediation (cleanup) of the Fort Ord Army Base, Superfund Site, to ensure that human health, safety and the environment are protected to the greatest extent possible." - Mission Statement.

Dear Mr. Cook;

There are a wide range of concerns and issues that have been raised by the Fort Ord CAG over the years, most of which remain unaddressed and unanswered.¹ In a recent CAG letter sent to FORA and the Regulators raising old and new concerns, the Army responded instead, on behalf of FORA and the Regulators. The public has often not been privy to the decision making process.² A great deal of time and taxpayer money is being spent to avoid answering our questions by referring us to documents that do not answer our specific questions and concerns. It would be helpful in the future to 1) answer the questions, 2) give the name and AR number of the document the answer is found in, and 3) give the page or section number and paragraph that the answer came from.

As is evident from OE Sampling and Removal Actions, extensive Troop Training and Munitions use occurred throughout areas that were not previously identified as Training Areas. This drives home the point that Fort Ord trained several million troops over a

¹ Attachment 1: FOCAG 8-12-08 letter to FORA, DTSC, US EPA

² Attachment 15: email; Regulators and Developer discussing Superfund UXO/OEW cleanup policy

period of 77 years, kept extremely poor records, used unknown millions of pounds/tons of munitions, and that these are found in unexpected places. Areas East of General Jim Moore Blvd. and Eighth St. are highly contaminated with military munitions the extent of which is unknown.^{3 4}

The Military Munitions Response Program (MMRP) database information the FORA ESCA RP is relying on is a far cry from what the historical record shows. The MMRP is arbitrarily omitting significant information from the Group 3 RI/FS. In doing so, a new record is being created that gives the appearance the land is cleaner than it really is.⁵

Critical documents (The Fort Ord Projectile Penetration Study) used for assessing potential explosive hazards associated with excavation activities and required remediation depths contains erroneous Site specific ordnance discovered information.⁶ What type penetration ordnance is being used for the evaluations of the Group 3 RI/FS parcels?

A new scheme is unfolding. The Insufficient Data category (ISD) is a scary one. Has money spent on past contractors been for nothing because they didn't know how to identify the ordnance they were finding?⁷ The FORA ESCA RP is arbitrarily throwing whatever munitions they want into the ISD category. There is no supporting documentation or explanation other than, because they say so.

Critical Administrative Record (AR) documents that contain pertinent Site specific information of known or suspected OE uses and depths that OEW contamination may be found have been omitted from the Group 3 RI/FS Work Plan.⁸ By doing so, bogus claims of site specific conditions found in the "new" SEDR database cannot be refuted. Findings for suitability to transfer the parcels are being made based on this manipulation of data rather than data reflecting the actual site specific conditions, and potential remaining health hazards. The FORA ESCA RP is becoming what many of us feared, a dumbing-down of the extent of, and the danger of conditions existing on this former Army base. FORA political decisions based on real estate desires are not effective in protecting the community and future residents health and safety.

In addition, a great hazard remains largely unaddressed. Residual contamination from military Munitions Constituents (MC) exists. The Fort Ord ESCA Cleanup Program has failed to initiate a comprehensive MC sampling plan. To date, we are unaware of a list of MC for all military munitions and Training Devices used at former Fort Ord. If the list exists, please forward a copy to the CAG. Some 3300 acres are slated for turnover to the public without addressing this significant threat to human health.

³ Attachment 3: Excerpts, training areas and range configurations are unknown: OE-0005A: "Site 16 Rocket moving target range...only discovered 18 months ago, this area was saturated with 2.36"rockets both HEAT and practice.... 400-500 were HEAT warheads."

⁴ Map 2: CSU Footprint, previously unidentified Training Areas highly contaminated with Ordnance and Explosive Waste (OEW) live and inert ammunition.

⁵ Attachment 4: California Real Estate Disclosure Law; requires full disclosure of hazardous waste

⁶ Attachment 14: penetrating ordnance Group 3 parcels; projectiles; 22mm, 40mm, 37mm, 57mm, 60mm, 75mm, 81mm, 84mm, 4.2in mortar, 105mm, 155mm, 8 inch naval rounds

⁷ Attachment 11: EOD Specialist Résumé, 27 years experience UXO identification and removal

⁸ Attachment 5: IA Ranges 43-48 White Phosphorous (WP) Range, 1993 ASR munitions 7-10 feet deep.

- 1) In order to better understand the extent of military training at former Fort Ord, and the potential contamination from training activities, fundamental questions need to be answered or at least estimated.

A story told by a retired sergeant that trained Fort Ord troops:

A retired sergeant said he trained soldiers to fire 60mm and 81mm mortars in the northern and northeastern portions of Site 39. He would take out 400 soldiers for bivouac maneuvers (multi day outings in the field). When asked how many rounds each soldier fired in a day, he estimated each man would fire 30 to 60 Mortar rounds. He indicated they were practice mortars. Using a median number of 45 mortars multiplied by 400 soldiers, 18,000 mortars were fired in a day by a single group of trainees. It is understood practice munitions unlike High Explosive (HE) munitions use pyrotechnics for identifying where the rounds hit (spotting).^{9 10}

Note: at the height of training there were 50,000 soldiers at Fort Ord. Estimates are, from 1940-1974 1.5 million troops trained at Fort Ord.¹¹

- a) Several million troops trained at Fort Ord. How many millions or billions of pounds of military munitions were used in the training of troops? Any estimates? If not, why not?

Detailed Issues, Concerns, and Questions:

- 2) The Group 3 RI/FS Work Plan, Interim Action Ranges and other parcels are some of the most highly contaminated areas at former Fort Ord. The FORA ESCA RP is based in large part on the creation of a data set based on sampling and removals to a depth of 4 feet. The MMRP is assuming no UXO/OEW will be found below 4 feet. However, it appears deep penetrating UXO/OEW is not being looked for.

From early on in the Superfund cleanup of UXO/OEW, the use of quantified science has been absent. The Enron/Arthur Anderson creative accounting style of data collection and manipulation is detrimental to human health and safety and is not in the communities best interest. If protection of human health and safety is the goal, a scientific approach to UXO/OEW cleanup requires the inclusion of all potential exposure scenarios to explosive and residual contamination, and that all aspects of munitions use be quantified. To date UXO/OEW investigations and removals have been limited to the explosive hazard and soil sampling for a few constituents arbitrarily chosen by DOD, Cal EPA (DTSC) and US EPA are concurring with this absurd approach.

Another dangerous approach to Ordnance and Explosives Site assessments has been, lack of evidence of OE use through Archive Searches and Site Walks is sufficient to conclude OE and training devices were not used at suspected training areas.¹² This rational defies

⁹ Attachment 9: Practice Bombs, toxic hazards of practice ammunition

¹⁰ Attachment 6: Pyrotechnic Devices, Military Munitions (Chemistry) Chapter 10

¹¹ Attachment 19: Fort Ord History

¹² Attachment 21: Article; Buried munitions in residential development, deed restriction was lifted

commonsense. To date, several training areas previously unidentified as UXO/OEW sites, have proven to be highly contaminated with munitions and training devices. Unresolved issues with the Fort Ord MMRP approach exist:

- a) The Army kept extremely poor records. Why isn't a precautionary approach being taken when it comes to potential training areas?(assume it is UXO/OEW contaminated unless proven otherwise rather than assuming it was not used for training based on Archive Search Records and Site Walks) Never assume Fort Ord land is safe.¹³
- b) Identifying past range uses is critical. It is understood range reconfigurations where a common practice.¹⁴ Site 39 historical maps show ranges over tops of ranges, the extent of which is unknown. If wanting to know the extent of range and training area uses is a goal, compiling a list of all known and suspected munitions and training device constituents and extensive site soil sampling would be very helpful. Is there a list of all constituents associated with munitions and training devices used at former Fort Ord?¹⁵ If not, why not?
- c) It is understood a common practice was to cover over former training ranges with earth, out of sight out of mind.¹⁶ Is there a cleanup document that discusses in detail the practice of covering over old ranges and training areas? If not, why not?
- d) It was a common practice to bury OE/OEW.¹⁷ Is there a cleanup document that discusses in detail the practice of burying OE/OEW? If not, why not?
- e) The MMRP does not appear to be looking for deeply buried munitions. Why isn't the MMRP looking for UXO/OEW deeper than 4 feet?
- f) OE/OEW is likely deeply buried in ranges and training areas. The approach the MMRP has taken with OE/OEW is, don't look, don't find. Superfund cleanup as the FOCAG understands it, is a program intended to identify and remove hazardous waste and substances to the greatest extent possible. If OE/OEW and training devices aren't being looked for, they surely won't be found. Is the MMRP doing a cleanup to the greatest extent possible? If not, why not?
- g) Former uses at Site 39 have been omitted from the record, aerial bombing runs were carried out in the MRA. Why has this significant historical use been omitted from the record?¹⁸ What is the penetration depth of a 100, 250, and 500 lb bomb? Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not?

¹³ Attachment 16: The Precautionary Principle; 1998 Wingspread Statement

¹⁴ Attachment 3: Excerpt, Range 48; 40mm, 60mm, 81mm, 4.2 in, and 4 in mortars found 10 feet deep

¹⁵ Attachment 10: DOD to identify contamination from over 200 military Munitions Constituents (MC)

¹⁶ Attachment 3: Excerpt, Site 13B sink hole Practice Mortar Range under 30 feet of fill

¹⁷ Attachment 21: Article Buried munitions. Deeply buried ordnance is not being looked for.

¹⁸ Attachment 3: Excerpts, Bombing runs where carried out at Fort Ord. A live 250 lb. bomb found in front of Ranges 41-43. A 100lb. Found at CSUMP parcel Site 8.

- h) It is understood large amounts of Practice and HE munitions were used to train troops the extent of which is unknown. How many troops are estimated to have trained at Ranges 43-48? Any estimates? If not, why not?
- i) It is understood burning off ranges to remove old munitions was a common practice. The extent of munitions constituents contamination is unknown. A site were UXO/OEW has been discovered may have been cleared of munitions annually for many years. A range used in this manner would likely have significant COC's on-site. Where is the list of known ranges that had this done? Is there a cleanup document that discusses in detail this potential health and safety issue? If not, why not?
- j) The significant hazards of Practice munitions have not been addressed. It is well documented Practice munitions were extensively used in the training of troops. The FOCAG has discovered these munitions contain highly toxic substances. The FOCAG is unaware of a cleanup document or report that discusses in detail Practice munitions and their constituents. If a document exists addressing practice munitions and their constituents please forward a copy to the FOCAG.
- k) The FOCAG has discovered a map showing the Interim Action Ranges. Range 44 is identified as a LT antiarmor WP Range.^{19 20} The 1993 ASR indicates White Phosphorous munitions use occurred at Site 39. Is Range 44 a White Phosphorous Range? Is there a cleanup document that discusses in detail these types munitions and where they were used at Fort Ord? If not, why not?
- l) It is understood incendiary, armor piercing munitions were used at Site 39.²¹ Have armor piercing munitions such as Depleted Uranium been discovered at Site 39? ²² Is Depleted Uranium being looked for? Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not? Could you please send the FOCAG a copy of the full scale map that map1 was generated from?
- m) Range 43 is identified as a 81mm and 4.2 in mortar range.²³ Is the he MMRP looking beyond 4 feet for deep penetrating ordnance? If not, why not? Could you please send the FOCAG a hard copy and a CD of the full scale map that Map1 was generated from?

The 1993 ASR states Range 48 has ordnance at 10 feet and the Impact Area of which the entire IA Ranges are located, has munitions at 7-10 feet.²⁴ According to listed ordnance used at 43-48,²⁵ Penetration depths should not exceed 4.1 ft.. A

¹⁹ Attachment 3: Excerpts, types munitions used at Site 39

²⁰ Attachment 16: White Phosphorous is highly toxic

²¹ Map 1: shows Range 44 as White Phosphorous (WP) Range (must enlarge map to see)

²² Attachment 2: DOD document indicating Spent Uranium anti tank munitions use at former Fort Ord

²³ Map 1: shows Range 43 as a 81mm, 4.2 mortar range (must enlarge map to see)

²⁴ Attachment 3: Excerpts, depths OE is expected to be found Ranges 43-48 and the MRA/impact area.

²⁵ Attachment 3: Excerpts, list of OE expected to be found at Site 39, Ranges 43-48

couple of possibilities. 1) these ranges were covered over to reduce hazards from past OE use, or 2) Ranges 43-48 are a impact area from old artillery ranges located in the North and Eastern portion of Fort Ord,²⁶ perhaps old Camp Ord. Historical records indicate early Fort Ord was a Artillery training facility. Regardless, there is a high likelihood, explosive and residual hazards remain unaddressed with the IA and adjacent ranges. When will the Army begin a RI/FS that targets artillery OEW?

- n) Have there been any excavations to investigate whether OE is found at 10 ft. in the IA Ranges? If not, why not? Is the era and size of munitions fired from the artillery ranges in map 3 known? Have the firing points and impact areas been looked for and located? If not, why not?
- o) 4.2 in. and 4 in. Stokes mortars are identified as being used and found in the IA Ranges.²⁷ In addition, Livens projectiles have been found nearby. It is understood these types WW I mortars and munitions have been found to contain titanium tetrachloride, a CWM. Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not?
- p) Why aren't the Regulators asking and getting answers to these fundamental questions? Its not to late to get it right.

3) Most military munitions constituents are known or suspected endocrine disruptors, carcinogens, mutagens, toxicants, etc.. The CAG has compiled a list of military munitions constituents found in the types of munitions used at Fort Ord. The list includes the potential negative human health impacts that may result from exposure to each of the constituents. Former Military Training Areas are highly contaminated with hazardous chemicals.²⁸ If you knew of the potential risk, would you want or allow your children to live on and play in soil possibly contaminated with the Table 1 and Table 2 constituents?

- a) Has the Fort Ord Cleanup Program prepared a list of Munitions Constituents (MC) for all Military Munitions and Training Devices used at former Fort Ord. If not, Why not?
- b) Of the millions or billions of pounds of military munitions used, how many pounds of their constituents were released into the environment? Any estimates? If not, why not?
- c) Were did the residual contaminates go?
- d) Could all the contaminates simply disappear?
- e) Does soil analysis of ranges include every known or suspected OEW/UXO constituent used at Fort Ord? If not, why not?

²⁶ Map 3: Shows 2 old artillery range fans extending into MRA

²⁷ Attachment 3: Excerpts, list of OE expected to be found at Site 39, Ranges 43-48. Add new items

²⁸ Attachment 7: military munitions constituents and health hazards Table 1 and Table 2 constituents

- f) Babies and toddlers commonly eat soil and other substances off the ground. Has this risk been analyzed? If not, why not?
 - g) Have Maximum Residual Levels (MRL's) been established for the constituents in the attached Military Munitions Chemicals Of Concern Table 1 and 2? If not, why not?
 - h) If the extent of residual contamination and MRL's have not been established, how can an acceptable level of cleanup be known for residential or commercial use?
 - i) Is there a screening program in place to monitor for hazardous substances at Fort Ord? If not, why not? Will there be a program to monitor potential negative health impacts of residents living in homes built on former training areas and ranges? If not, why not?
 - j) Perchlorate is known to be a widely used constituent in military munitions used at Fort Ord . Is there testing being conducted to identify the extent of Perchlorate contamination in former training areas and ranges? If not, why not? If yes, the remediation documents don't appear to include any discussion or analysis.²⁹
 - k) Synergism and synergistic effects of chemicals should be part of Risk Assessment. I don't recall seeing any analysis in the Fort Ord Base Wide RI/FS addressing synergism. Is synergism covered in any Fort Ord Human Health Risk or Environmental Assessments? If not, why not?
- 4) The parcels have not been adequately cleared of Ordnance and Explosives Waste (OEW), Unexploded Ordnance (UXO), or identified the extent of Munitions Constituents (MC) contamination. The extent of contamination is unknown.

Because the extent of deep penetration ordnance and deep OEW burial pits are unknown, scanning equipment capable of detecting deeply buried metallic anomalies should be used.³⁰

Thankfully, early in the cleanup process, DOD and the Regulators understood the significant threats from Ammunition and Explosives. A few quotes:

"It is necessary to identify and remove ammunition and explosives located from the surface to the applicable depth indicated (Commercial/Residential, Utility Construction Activity: Clearance depth; 10 ft. or excavation depth plus 4 feet, whichever is greater)"³¹

"Chapter 12, DOD 6055-9 STD (1992), DOD Ammunition and Explosives

²⁹ Attachment 17: Perchlorate summary DOD 16-106 ppb Fort Ord Site 39

³⁰ Attachment 14: Fort Ord Ordnance Penetration Table and Range Penetration Analysis

³¹ Attachment 12: DDESB OEW site remediation depth for intended use

Safety Standard; DOD real property known to be contaminated with ammunition and explosives that may endanger the general public may not be released from DOD custody until the most stringent efforts have been made to ensure appropriate protection to the public.”³²

“ The Presidio of Monterey does not intend to transfer by deed any known or suspect ordnance and explosive site on former Fort Ord land, prior to the completion of all required OE related actions. We do, however, intend to transfer by deed areas that may have been identified on training maps , but through the archive search process were not identified as potential ordnance sites, i.e. Machine Gun Proficiency Training Areas, Machine Gun Squares, and Mortar Squares.” ³³

“Chapter 12 of DOD 6055-9STD requires a cleanup plan be presented to the DDESB for leasing, transferring, or disposing of DOD real property when ammunition and explosives contamination is known or suspected. The DDESB will review the plan for explosives safety considerations. The following matrix is to be used to identify the appropriate clearance depth. The ability to clear to a given depth will depend on the technology and funds available. It is necessary to identify and remove ammunition and explosives located from the surface to the applicable depth indicated.”³⁴

- a) UXO/OEW cleanup efficiencies have not advanced as a result of new detection technologies and methods, but rather by changing of the rules in order to meet development goals. What happened?

Projectiles capable of penetration depths beyond the Shonstedt GA-52CX detection range have been found in the Group 3 parcels.³⁵ There is good reason to be looking beyond the 4 foot removal depths at Fort Ord.³⁶

- b) To date, what efforts have been made to locate deeply buried ordnance?
- c) Today, what technology is being deployed to locate deep penetrating ordnance?
- d) The Shonstedt GA-52CX has been used at Fort Ord for 15 years. Is the RP using the best technologies available?
- e) Is the GA-52CX the best hand held OE detection technology available?³⁷ It is understood better overall detection equipment exists. Why isn't it being used?

³² Attachment 3: Excerpts, OE-0122 found in HFA/CSU After Action Report

³³ Attachment 5: DOD letter; no known or suspect OE land to transfer by deed prior to completion of all required OE related actions.

³⁴ Attachment 14: Penetration Analysis Table; Range/site design UXO wrong. Deep penetrating ordnance found CSUMB footprint and 13B

³⁵ Map 3: Two artillery Range fans extend into the MRA. Deep penetrating ordnance should be looked for.

³⁶ Attachment 14: Ordnance penetration Table and Penetration Analysis Table

³⁷ Attachment 5: OE-0036 1996 Evaluation and Comparison of UXO Detectors. Better overall detector

- f) Does the EM61-MK2 detect metallic anomaly's as well or better than the GA-52CX or the MK 26?
- g) It is understood the Forester Ferex MK 26 ordnance locator is used by U.S. Military EOD forces. This magnetometer detects deep penetrating ordnance well beyond the capacity of the 52CX. Is the MK 26 being used at Fort Ord? If not, why not?^{38 39}
- h) Which of the following is the UXO/OEW cleanup goal; to locate and remove Ordnance and Explosive Waste to the greatest extent possible or to the extent it is financially practical?
- i) If finding all UXO/OEW items is a goal, would using detection equipment capable of deeper detection capabilities be desired?
- j) Is UXO/OEW in itself , being looked for beyond 4 feet ? If not, why not?

The practice of characterizing former Fort Ord land through the archive search process and visually looking around while walking down bunny trails to identify potential training areas should be abolished. It is abundantly clear, areas not suspected of training activities have turned out to be highly contaminated with dangerous training items, and that dangerous training items show up in the most unexpected places.

5) Chemical Warfare Materials (CWM) and their use in training areas have not been adequately addressed. These types of training devices outside their packaging are not detectable with magnetometers.

On March 10, 1997, 24 ampoules CAIS Chemical Warfare Materials were discovered 2 ft. below ground near 4500 motor pool during ordnance and removal activities at Site OE-13B ⁴⁰

On April 14, 1994 during the HFA/CSU OE removal, 2 EOD specialists were overcome by a Hazardous Material and required medical attention at the hospital. Their equipment was confiscated due to concerns of HAZ MAT contamination. Hazardous Material monitoring devices were required for all subsequent OEW removal.

The known CWM were unexpectedly found in a Range/Training area that was not previously identified as a potential CWM training area. It may have been a rare event except it is well documented these CWM are commonly found and buried in training areas. According to Fort Ord records, CAIS Sets were used at Fort Ord until 1974. The K951 ampoules (also called vials) are frequently found in burial

³⁸ Attachment 13: DTSC letter to Army, 3.5" Rocket found after Army declared site safe for unrestricted use

³⁹ Attachment 3: Excerpts, Forester Ferex MK 26 ordnance locator, detects ordnance up to 19 feet deep

⁴⁰ Attachment 5: OE-0265D, OE-0265E; CAIS CWM found during OEW clearance activities 13B

sites at old WWII training areas.⁴¹

- a) Early Fort Ord cleanup documents state CWM were thought not to have been used at Fort Ord. We now know that these training devices were used to train troops at Fort Ord the extent of which is unknown. Is there a cleanup document that discusses in detail these types training devices? If not, why not?
- b) How were these incidents resolved?
- c) Army certainly saw this as significant concern. How will the public be protected from potential exposure to these chemical agents?
- d) Why haven't these incidents been included in all training area documents?
- e) Due to the common practice of discarding these training devices in the field, what is the justification for allowing the transfer, reuse, and development of training areas and training sites (TS) where these devices have been found or may have been used?
- f) Is there technology that can identify individual glass vials below the ground surface?
- g) These CWM materials are contained in glass vials. Has there been any discussions of how this hazard should or will be addressed?
- h) How can workers be protected from these types of hazards during excavation activities?
- i) Are there plans to cap (earth fill), military training areas rather than remediate them of UXO/OEW and military constituents? It is evident through limited sampling throughout training sites, most stringent efforts are not being made to find UXO/OEW.

6) Critical Administrative Record (AR) documents that contain pertinent site specific known or suspected uses, and OEW contamination information have been omitted.⁴²

- a) Known OE uses have not been included the FORA ESCA RP parcels documents^{43 44}
- b) UXO/OEW discovered during site sampling and removal actions has disappeared from the FORA ESCA RP parcels historical record.⁴⁵

⁴¹ Attachment 3: Excerpts OE-0202, OE-0265D, OE-0265E

⁴² Attachment 5: Omitted AR documents and dates made available on Fort Ord Cleanup web site

⁴³ Attachment 3: Excerpts, bombing runs were carried out at the MRA the extent of which is unknown

⁴⁴ Attachment 3: Excerpts, Site 15 Range 48, White Phosphorous munitions used in the MRA

⁴⁵ Attachment 3: Excerpts, Attachment 3: Excerpts; sinkhole practice mortar range Site 13B, area backfilled with up to 30' feet of fill during 4400/4500 Block Motor pool construction. The was Range covered over.

- c) Why has the SEDR, MMRP, and FORA ESCA RP databases failed to include all OEW items discovered within the Group 3 RI/FS

It appears the Administrative Record is being manipulated in a way that misrepresents important facts. The public, now and in the future, has a right to know the full extent of the past military training use of individual parcels, and the full historical record of OEW items found within their boundaries. To omit or alter any part of this historical information misleads the reader into believing the parcel is cleaner and safer than it actually is. By keeping the record straight, the public can decide for themselves if they wish to be exposed to the potential remaining OEW hazards. Remediation by data manipulation will have a disastrous outcome and harm someone.

- d) How has this critical issue slipped by the FORA officials and the regulators?
- e) Are the officials aware of what's happening?
- f) Is this acceptable to the officials and the regulators?
- g) When someone gets blown up or sick, who will be liable?
- h) Is this in the best interest of the taxpayers?
- i) California has strict real estate disclosure laws. How will parcel specific OEW information be known and disclosed?⁴⁶

Additionally, these critical documents have not been included in the Fort Ord cleanup AR web site until very late in the process. The public has had no reasonable way of viewing site specific information. The FORA ESCA RP is omitting key documentation that tells a very different story of the extent of OEW/UXO contamination in the Training Areas.⁴⁷

- j) What steps will be taken to inform the public and future residents of the potential health hazards associated with living over former Training Areas?
- 7) The Fort Ord Military Munitions Response Program (MMRP) database has lost very important AR documentation needed to make accurate and well informed decisions by the Regulators and the Public.

Most training/practice ammunition contains highly toxic, hazardous substances. These munitions, and their constituents are a significant health hazard that remain relatively unaddressed. Many of these practice/inert ammunitions have been

⁴⁶ Attachment 4: California Real Estate Disclosure Law; requires full disclosure of hazardous waste

⁴⁷ Attachment 5: Omitted AR documents and dates made available on Fort Ord Cleanup web site

omitted in the new SEDR database. Withholding this information from new cleanup documents deprives the public of significant, and critical information.^{48 49}

Early in the OE cleanup process, ordnance and explosive training range areas were first referred to as "Sites". They then were referred to as "OE" areas, and now "MRS" areas. As the changing of acronyms has progressed, so has the omission of old site data of UXO/OEW items discovered. Hence a "new" record has emerged.

There's a new FORA ESCA RP concoction of data referred to as the Summary of Existing Data Report (SEDR). The SEDR which evolved from information supplied from the MMRP database is being relied upon to support the Group 3 RI/FS Work Plan. Site Characterizations, Findings, and Determinations of safety are being based on the compilation of the new data resulting from the omission and manipulation of the old data. This new data is resulting in the sites appearing to be relatively benign. This will undoubtedly result in a finding of "no further action". By creating this fictitious new record, RP parcels are being represented as being safer than they really are.

The MMRP database is not being properly maintained as is evident by the omission of large quantities of UXO/OEW discovered in the 3300 acres of the FORA ESCA RP documents.⁵⁰

- a) What Agency or Organization is in charge of the Military Munitions Database, a critical element of the Fort Ord Superfund cleanup?
- b) Has the administration of the Military Munitions Database been privatized?
- c) Is there oversight of the OE/OEW/MEC data that is entered into and/or omitted from the database?
- d) What is the protocol for adding, deleting, or changing data in the Military Munitions Database?
- e) Who is responsible for maintaining the UXO/OEW/MEC AR and ensuring the information is preserved and not tampered with.
- f) Does the database compile all past discovered Ordnance and Explosives i.e., OE, OEW, UXO, DMM, MEC, MD etc. into the same OE dataset?
- g) How could such significant historical site information be missed by the FORA ESCA RP officials and the Regulators?
- h) Is there a public notification and input process of how the database(s) will be maintained?

⁴⁸ Map 2: Lists of OEW items found Site 13B and CSUMB footprint.

⁴⁹ Attachment 9: Practice Bombs, toxic hazards of practice ammunition, widely used at Fort Ord

⁵⁰ Map 2: Lists of OEW items found Site 13B and CSUMB footprint.

- i) Acronyms, synonyms and descriptions of Ordnance and Explosives (OE), Ordnance and Explosives Waste (OEW) have been changed over the years. As a result, valuable and critical information is being lost. Coincidentally, this appears to corresponded with the privatization of Fort Ord Superfund cleanup, the FORA ESCA RP, and the new centralized database. Are the Regulators keeping track of the Fort Ord historical Military Munitions Database and taking steps to prevent this potential travesty?
 - j) Significant OE data for the Group 3 parcels has been lost . Which regulatory Agency is responsible for oversight that will ensure the historical facts of each parcel are preserved?
 - k) It is understood small arms are considered hazardous waste. Is the ESCA Cleanup Program still required to report types, amounts, and locations of all OEW discovered including Small Arms ammunition, 50 cal. or less, and practice and inert ordnance? ⁵¹ If not, why not?
 - l) It is understood small arms tracer ammunition was used for troop training. Is there a cleanup document that discusses in detail these types munitions and their use at former Fort Ord? If not, why not?
- 7) It is understood non-metallic landmines have been found at Fort Ord. Discovery of these types of munitions raise the same questions as with the CWM issue.
- a) How is this issue being addressed?
 - b) Is there technology that can identify individual non-metallic ordnance below the ground surface?
 - c) Is it safe to develop areas were CWM and non-metallic landmines may have been used? If so, how so?

8) Additional comments and questions

The Group 3 RI/FS Work Plan states: Section 3.1, IA Ranges 43-48
The MMRP database indicates that the majority of the MEC removed from the Interim Action Ranges MRA were located on the surface; however, these data may not include subsurface MEC removed during the Range 45 scraping and sifting operations.

The record shows large quantities of UXO/OEW discovered are subsurface^{52 53}

- a) Subsurface OEW is being diminished. To discover such high quantities of penetrating ordnance on the surface is all the better reason to look harder and deeper for OEW. As with the Group 2 RI/FS comments, is the FORA ESCA RP,

⁵¹ Attachment 5: DTSC letter stating State of California and US EPA position on OEW

⁵² Attachment 20: List of UXO/OEW found prior to 2002, large quantity subsurface

⁵³ Attachment 3: Excerpt, Range 48; 40mm, 60mm, 81mm, 4.2 in, and 4 in mortars found 10 feet deep.

SEDR, and MMRP database commingling a good idea? "data may not include subsurface MEC". Who is interpreting the MMRP data. Is this type data collection in the taxpayers best interest. Do the Officials and Regulators concur?

- b) According to Sec.3.1, 10,165 UXO items and 196,996 pounds of MD have been discovered, This is a much larger quantity than we were aware of. Would you please forward to the CAG a complete list of the UXO items with dates found, depths and the grid location information. Additionally please forward a list of the AR document numbers were the 10,165 UXO items are found. Is there a document that describes the type munitions the 196,996 pounds of MD came from? If so, please provide the AR document number. If not, why not?

We look forward to your substantive response to these serious issues and questions. Please include the entirety of this letter and attachments in the final document.

Sincerely,

Lance Houston, for the FOCAG

Cc.
California DTSC
U.S. EPA
Monterey County Planning Department
California State University Monterey Bay

ATTACHMENTS: Available at: <http://fortordcleanup.com/adminrec/arsearch.asp>
Enter Record Number ESCA-0154

- 1 FOCAG 8-12-09 Position Paper; Environmental Contamination Fort Ord, CA
- 2 DOD document indicating Spent Uranium munitions use at former Fort Ord
- 3 Excerpts Fort Ord UXO/OEW cleanup documents
- 4 California Real Estate Disclosure
- 5 Omitted Documentation and dates posted to Fort Ord Cleanup web site
- 6 Pyrotechnic Devices: uses and constituents
- 7 Military Munitions Constituents (MC) Table 1 and Table 2

- 8 Explosives and Propellants: uses and constituents
- 9 Toxic Hazards of Practice Ammunition
- 10 GAO: DOD to identify contamination from over 200 military Munitions Constituents
- 11 EOD Specialist résumé; 27 years experience OE detection and removal
- 12 UXO Site Remediation Depths
- 13 DTSC letter to Army OEW cleanup concerns
- 14 Fort Ord Ordnance Penetration Table and Range Penetration Analysis
- 15 email, regulators and developer discussing cleanup policy
- 16 White Phosphorous (WP) Profiles
- 17 Perchlorate summary Fort Ord, CA DOD 16-106 ppb Site 39
- 18 1998 Wingspread Statement, Precautionary Principal
- 19 Fort Ord History
- 20 Ranges 43-48 list of UXO/OEW found, many subsurface
- 21 Article: Buried ordnance has residents wondering if their yards hold hidden danger

MAPS

- 1 Ranges 43-48, shows Range 44 Lt. anti-armor WP Range
- 2 Ordnance and explosives Training Sites CSUMB Parcel and UXO/OEW items found
- 3 1994 ASR map shows Artillery range fans extending into Multi Range Area (MRA)
- 4 1994 ASR maps

STATEMENT OF RESPONSE TO MUNITIONS AND EXPLOSIVES OF CONCERN

Surf City and Ship Bottom Public Beaches 17 May 2007

This statement documents the Time Critical Removal Action (Phase I) completed in response to munitions and explosives of concern (MEC) found on public beaches in Surf City and Ship Bottom, New Jersey. The military munitions found were inadvertently placed on the beach areas during a recent coastal storm damage reduction project. The affected beach areas have been carefully investigated, and all detectable MEC has been removed.

The coastal storm damage reduction project (approximately 71-acre site) included placement of about 800,000 cubic yards of sand over 8,100 linear feet of berm (flat beach) to approximate depths of eight feet from North 25th Street in Surf City, New Jersey, to South 5th Street in Ship Bottom, New Jersey. A pre-existing dune was supplemented to create a project dune of 6,600 linear feet with a crest elevation of + 22 feet NAVD, a 30-foot wide flat top, sloping down seaward 70 feet to the flat beach. The coastal storm damage reduction project also included the surf zone, or the underwater area adjacent to the beach, from North 25th Street in Surf City to South 11th Street in Ship Bottom.

Prior to conducting the Time Critical Removal Action (Phase I), a Geophysical Prove-Out (GPO) study was performed in a test plot on the Surf City beach. A variety of geophysical instrumentation was used to determine the maximum detection depth for the type and size of munitions expected to be encountered. The study concluded that Digital Geophysical Mapping (DGM) using an EM-61 towed array was capable of consistently detecting 34 of 36 GPO seed items buried at depths from 0 to 36 inches below the ground surface for a 94.4% detection rate. The handheld Schonstedt Magnetometer detected 20 of 30 GPO seed items to depths of 18 inches below the ground surface. The Forester Mk 26 Magnetometer detected all GPO seed items buried at 36 inches below the ground surface.

The Time Critical Removal Action (Phase I) investigated the following five beach areas for MEC:

1. The 6,600 linear feet of Dune Top was investigated by Digital Geophysical Mapping (DGM) using an EM-61 towed array of four coils. All anomalies were analyzed and those that provided a signature indicative of MEC were intrusively investigated and resolved to the detection depth.

2. The 6,600 linear feet of Dune Slope was investigated and resolved for MEC using Mag and Dig techniques with the handheld Schonstedt Magnetometer. The 18-inch detection depth was considered sufficient because the dune is restricted to pedestrian traffic, with crossovers and pedestrian access points provided.

3. All 24 pedestrian crossovers, 3 vehicle access areas (N. 5th St., N. 12th St, and N. 18th St.), and the handicap ramp (N. 12th St.) located in the 6,600 linear feet of the Dune Top and the Dune Slope were investigated and resolved for MEC using the Forester Mk 26 Magnetometer to the detection depth.

4. The 8,100 linear feet of the berm area was investigated for MEC from the toe of the Dune Slope out to the mean low water mark by DGM using the EM-61 towed array. All anomalies were analyzed and those that provided a signature indicative of MEC were intrusively investigated and resolved to the detection depth.

5. The surf zone was investigated and resolved for MEC using the Forester Mk 26 Magnetometer from the low tide mark out to 150 feet or 4 feet of water depth, whichever occurred first. If an offshore sandbar was present, the trough between the berm and the sandbar, and the entire sandbar to the ocean-side edge was investigated and resolved for MEC using the handheld Schonstedt Magnetometer.

To date, over 1,100 MEC items have been recovered from the beach by the TCRA investigation or turned in by citizens. An attached table provides a summary of the distribution of the MEC items found by the TCRA investigation, as of 14 May 2007, across the project site according to the street designations. These items include unfired, fuzed, low explosive loaded Mark I 37mm projectiles, Mark II and III booster assemblies, and Mark II Point Detonating Fuzes. Due to the location where the MEC items were dredged from, and the configuration of the MEC items (fuzes with boosters, and boosters by themselves), these items are considered to be discarded military munitions (DMM).

Military Munitions are manufactured to withstand a certain amount of rough handling such as transport, soldier maneuvers and a significant jolt when fired. Subsequently, the probability of detonation of the DMM items due to human contact would be extremely low. The problem occurs not with the contact, but with the actions after contact. Explosives will detonate when exposed to "heat, friction or shock" or any combination of the three.

The TCRA investigation for MEC to detection depth results in a low potential for an explosive hazard to be encountered on the public beaches. Additionally, the type of military munitions recovered, along with extensive public information about the potential presence of munitions on the beach, and what to do should a munition be discovered, reduces the potential for an explosive incident to occur.

This Time Critical Removal Action has lowered the likelihood that the public will encounter MEC. However, there remains the potential for MEC to be present below the depth of detection, and beach instability and weather may cause MEC to surface. Erosion and wave action may also cause MEC to migrate into the areas previously investigated or beyond the project limits. Very little erosion of the Dune Top and Dune Slope is expected, except in the case of a major climatic event, such as a Nor'easter or hurricane. The MEC potentially present offshore, and outside the areas of the surf zone investigated, could potentially be moved into the surf zone during periods of heavy wave action.

The US Army Corps of Engineers recommends the following Land Use Controls be implemented and/or maintained to reduce the potential for MEC to be encountered on the beach during recreational activities:

- Public information signs addressing the 3Rs (Recognize, Retreat, Report) of explosives safety be posted at public and private access points.
- Public information brochures be distributed.
- The use of metal detectors on the beach be prohibited.
- A dig restriction -- no digging below a depth of one-foot -- be implemented.
- The dune (except at crossover areas) be restricted from public access with fences and signage.
- A private crossover construction policy be implemented to ensure that MEC is not encountered during construction.

In addition to the Time Critical Removal Action (Phase I) and the implementation of Land Use Controls, the US Army Corps of Engineers will implement a Public Information Plan. This plan will include training for police, lifeguards, beach pass inspectors, and beach maintenance staff, and the presence of a USACE Ordnance and Explosives Safety Specialist throughout the summer to provide MEC contingency response.

This action has been conducted in accordance with Army Regulation 405-90.

APPROVED:



GWEN E. BAKER
Lieutenant Colonel, Corps of Engineers
Commanding

5-18-07

Date

Attachment: Distribution of MEC found as of 14 May 2007

MEC-TCRA at Surf City and Ship Bottom Beaches

Project Summary MEC to 5/14/2007

Total MEC Items: 1,074

<i>Street</i>	<i>MEC</i>	<i>MEC Items</i>
DIV	MKII BOOSTER	18
	MKIII BOOSTER	22
	Projectile 37 mm	4
	<i>Total MEC Items:</i>	<i>44</i>
N10TH	Base Detonating Fuze - 1906	4
	MKII BOOSTER	95
	MKIII BOOSTER	99
	Projectile 37 mm	14
	<i>Total MEC Items:</i>	<i>212</i>
N11TH	MKII BOOSTER	23
	MKIII BOOSTER	86
	Projectile 37 mm	4
	<i>Total MEC Items:</i>	<i>113</i>
N12TH	MKII BOOSTER	4
	MKIII BOOSTER	9
	Projectile 37 mm	1
	<i>Total MEC Items:</i>	<i>14</i>

<i>Street</i>	<i>MEC</i>	<i>MEC Items</i>
N13TH		
	<i>Base Detonating Fuze - 1906</i>	1
	<i>MKII BOOSTER</i>	60
	<i>MKIII BOOSTER</i>	65
	<i>Projectile 37 mm</i>	1
	<i>Total MEC Items:</i>	127
N14TH		
	<i>Base Detonating Fuze - 1906</i>	3
	<i>MKII BOOSTER</i>	31
	<i>MKIII BOOSTER</i>	38
	<i>Projectile 37 mm</i>	3
	<i>Total MEC Items:</i>	75
N15TH		
	<i>Base Detonating Fuze - 1906</i>	1
	<i>MKII BOOSTER</i>	24
	<i>MKIII BOOSTER</i>	83
	<i>Total MEC Items:</i>	108
N16TH		
	<i>MKII BOOSTER</i>	15
	<i>MKIII BOOSTER</i>	14
	<i>Total MEC Items:</i>	29
N17TH		
	<i>MKII BOOSTER</i>	11
	<i>MKIII BOOSTER</i>	7
	<i>Total MEC Items:</i>	18

<i>Street</i>	<i>MEC</i>	<i>MEC Items</i>
N18TH	MKII BOOSTER	16
	MKIII BOOSTER	20
	Projectile 37 mm	2
	<i>Total MEC Items:</i>	38
N19TH	MKII BOOSTER	10
	MKIII BOOSTER	6
	<i>Total MEC Items:</i>	16
N1ST	Base Detonating Fuze - 1906	1
	MKII BOOSTER	17
	MKIII BOOSTER	13
	Projectile 37 mm	5
	<i>Total MEC Items:</i>	36
N20TH	MKII BOOSTER	4
	MKIII BOOSTER	7
	<i>Total MEC Items:</i>	11
N21ST	MKII BOOSTER	4
	MKIII BOOSTER	8
	<i>Total MEC Items:</i>	12
N22ND	MKII BOOSTER	2
	MKIII BOOSTER	2
	<i>Total MEC Items:</i>	4

<i>Street</i>	<i>MEC</i>	<i>MEC Items</i>
N23RD	MKII BOOSTER	2
	<i>Total MEC Items:</i>	2
N24TH	MKIII BOOSTER	3
	Projectile 37 mm	1
	<i>Total MEC Items:</i>	4
N2ND	MKII BOOSTER	9
	MKIII BOOSTER	6
	<i>Total MEC Items:</i>	15
N3RD	MKII BOOSTER	4
	MKIII BOOSTER	30
	<i>Total MEC Items:</i>	34
N4TH	MKIBOOSTER	1
	MKII BOOSTER	4
	MKIII BOOSTER	7
	<i>Total MEC Items:</i>	12
N5TH	MKII BOOSTER	2
	MKIII BOOSTER	7
	<i>Total MEC Items:</i>	9
N6TH	MKII BOOSTER	1
	MKIII BOOSTER	5
	<i>Total MEC Items:</i>	6

<i>Street</i>	<i>MEC</i>	<i>MEC Items</i>
N8TH	MKII BOOSTER	9
	MKIII BOOSTER	5
	Projectile 37 mm	1
	<i>Total MEC Items:</i>	15
N9TH	MKII BOOSTER	7
	MKIII BOOSTER	59
	Projectile 37 mm	3
	<i>Total MEC Items:</i>	69
S1ST	MKII BOOSTER	3
	MKIII BOOSTER	2
	<i>Total MEC Items:</i>	5
S2ND	MKII BOOSTER	2
	MKIII BOOSTER	10
	Projectile 37 mm	1
	<i>Total MEC Items:</i>	13
S3RD	MKII BOOSTER	2
	Projectile 37 mm	3
	<i>Total MEC Items:</i>	5
S4TH	MKIII BOOSTER	1
	<i>Total MEC Items:</i>	1

<i>Street</i>	<i>MEC</i>	<i>MEC Items</i>
S5TH		
	<i>MKII BOOSTER</i>	<i>11</i>
	<i>MKIII BOOSTER</i>	<i>9</i>
	<i>Projectile 37 mm</i>	<i>2</i>
	<i>Total MEC Items:</i>	<i>22</i>
S6TH		
	<i>MKII BOOSTER</i>	<i>1</i>
	<i>MKIII BOOSTER</i>	<i>4</i>
	<i>Total MEC Items:</i>	<i>5</i>

Fort Ord Reuse Authority
100 12th St., Building 2880
Marina, CA 93933
c/o Stan Cook, FOR A/ESCA Program Manager



SC
LB-original

August 20, 2009

Re: Draft Final Group 3
Remedial Investigation/Feasibility Study Work Plan
Interim Action Ranges, Military Operations in Urban Terrain,
Laguna Seca Parking, and Del Rey Oaks/Monterey
Munition Response Areas
Former Fort Ord
Monterey County, California
Dated July 20, 2009

Prepared for: Fort Ord Reuse Authority

Prepared under: Environmental Services Cooperative Agreement
No. W9128F-07-2-01621
FORA Remediation Services Agreement (3/30/07)
Document Control Number: 09595-09-079-010

FOR THE ADMINISTRATIVE RECORD

Via fax: (831) 883-3675, hard copy to follow via U.S. Mail

Dear Stan Cook,

Former Army training ranges and bomb fields categorized as "Track 3" by the Army are some of the most dangerous and contaminated areas on former Fort Ord. Indeed, as there is no "Track 4 Category", everything really dangerous got clumped into Track 3. I am therefore disappointed at the lack of substance in the responses to the many issues raised in the FOCAG letter submitted by Lance Houston dated March 28, 2009.

In this Draft Final Document the public is asked to respond to FOR A, and yet the U.S. Army in your Draft is addressing responses to concerns. It is reiterated that FOR A is addressing the threat of unexploded ordnance. However, the Army is responsible for residual chemical contamination of the surface and subsurface. The clean up is being piecemealed. What is the timeline for clean up of residual chemical contamination? Some of the dirtiest and most dangerous property is being transferred, or proposed for transfer, for public uses based on records of decision involving inadequate land use controls. I believe modification of clean up standards and procedures is being done outside the knowledge of the community. Certainly the Federal Facilities Agreement was modified.

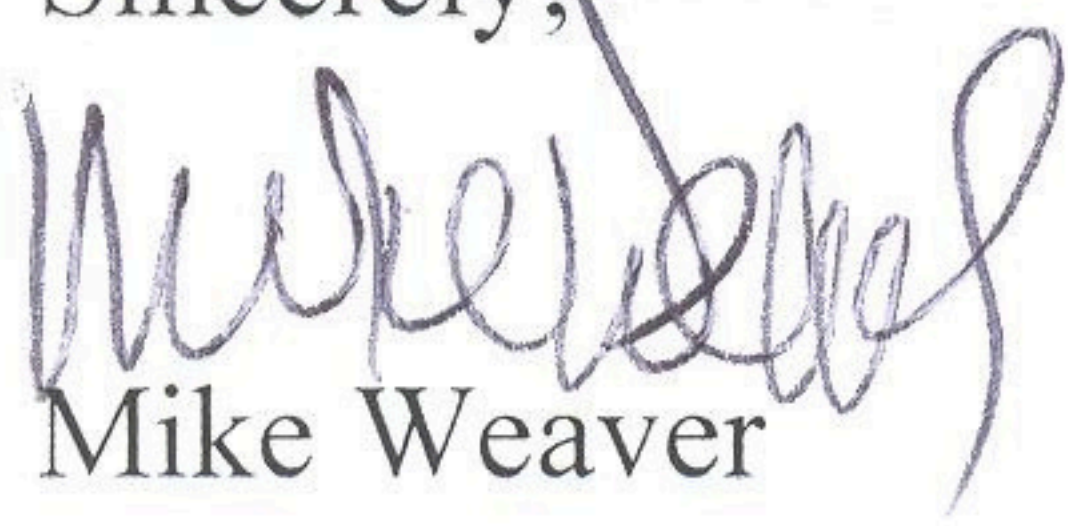
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Page 2

Once again, the amendments to the Federal Facilities Agreement (FFA) required in order to try to implement the Finding of Suitability for Early Transfer (FOSET) and this Environmental Services Cooperative Agreement (ESCA) are illegal because the amendments vest FOR A with the authority, indeed the obligation, to carry out the remediation at the parcels covered by the ESCA and FOSET. This contravenes the Superfund Statute, which requires that an interagency agreement call for performance of necessary remediation by the U.S Department or Agency (the Army) responsible for the contamination at the facility.

I believe the numerous risks to the public's health and safety are being downplayed.

Sincerely,

A handwritten signature in dark ink, appearing to read "Mike Weaver", is written over the printed name.

Mike Weaver

Fort Ord Community Advisory Group member

P.O. Box 969

Seaside, CA 93955

Email: focagemail@yahoo.com