



Explosives Safety Submission Installation Restoration Site 05 and Dredge Pond 7S Munitions Response Action

Former Mare Island Naval Shipyard,
Vallejo, California

August 2009

Prepared for

Department of the Navy
Base Realignment and Closure
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Prepared under

Environmental Services Cooperative Agreement No. N68711-01-MDC-1061
CERCLA ARF Document Control Number WEST-1061-0000-0122

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NOTES

1. *This Explosives Safety Submission (ESS) supersedes and replaces the previously approved ESS for Installation Restoration Site 05 and Dredge Pond 7S (NOSSA Letter Serial N54-TD/7044 of 01 Dec 06).*

A new ESS has been submitted in lieu of an amendment because of new work processes required to complete the environmental remediation of the site, document format changes implemented by NOSSAINST 8020.15B, and an increase in equipment shielding thickness and site exclusion zone size driven by a change in the site munition with the greatest fragment distance (MGFD).

2. *Correction 1 to the Installation Restoration Site 05 (IR05) and Dredge Pond 7S (DP7S) Explosives Safety Submission (ESS) dated August 2009 more adequately describes the types of global positioning system (GPS) receivers required to support anomaly investigation operations at the site.*

The following is a summary of ESS changes: Section 5-2 – Clarifies that the Real Time Kinematic (RTK) Global Positioning System (GPS) receiver will be used to document the location of DGM anomalies during the Digital Geophysical Mapping (DGM) surveys and to relocate selected anomalies for investigation. Also incorporates the Wide Area Augmentation System (WAAS)-enabled GPS receivers that will be used to document anomaly locations in support of “mag and flag” anomaly location and investigation activities. The pages affected by Correction 1 are: the cover, i, and 11.

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1. BACKGROUND

1.1 PROJECT MANAGER

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1.2 MRS IDENTIFIER AND DESCRIPTION

The *Installation Restoration Site 05 (IR05) and Dredge Pond 7S (DP7S)* Munitions Response Site (MRS) is located on the former Mare Island Naval Shipyard (MINS) located in Vallejo, California. MINS is a closed Navy installation with portions currently being transferred under Base Realignment and Closure (BRAC). The IR05/DP7S site is still under Navy ownership pending the completion of environmental remediation actions that involve chemical contamination as well as munitions issues. Although the IR05/DP7S site includes a total of approximately 60.8 acres (31.6 acres in IR05 and 29.2 acres in DP7S), only a small portion of the total area will be affected by the remaining response action activities to support the excavation of chemically contaminated soil and the identification and removal of anomalies in DGM survey data gap areas.

1.3 REGIONAL MAP(S)

See Figure 1-1.

1.4 SCOPE OF MUNITIONS RESPONSE

This munitions response action includes the excavation and removal of chemically contaminated soil and the resolution of identified “data gaps” in the recent Digital Geophysical Mapping (DGM) survey. The data gap areas consist of small segments and/or locations inaccessible to the DGM survey team due to concerns over the disturbance of wetland habitat. Dependent on site conditions, either a “mag and flag” anomaly clearance or a DGM survey and anomaly

investigation process will be employed in the data gap areas and to support the removal of contaminated soil.

A Geometrics G-858 cesium vertical gradiometer or a Geonics EM-61 inductive time domain electro-magnetic (TDEM) instrument (dependent on the types of MEC prevalent in specific areas based on past munitions activities) may be used, in addition to the “mag and flag” anomaly clearance, to complete the DGM surveys in those data gap areas accessible to the survey equipment. Selected DGM anomalies will then be relocated and investigated to determine if they represent MEC.

Potential MEC anomalies in wetland areas of the site will be cleared utilizing handheld instruments in a “mag and flag” process to facilitate the remediation of chemically contaminated soil. Soils within specific areas of the MRS formerly used to burn pyrotechnics, propellant, and explosives contain chemical contaminants which will be removed under a Time-Critical Removal Action approved by regulatory agencies and partially completed in late 2007. The excavated soil will be transported to the adjacent Investigation Area H1 (also under Navy ownership) where it will be placed in the landfill containment area for use as subgrade fill under an engineered cap. To facilitate the safe excavation of soil, an anomaly clearance operation utilizing handheld instruments to locate and remove any remaining MEC will be completed prior to the removal of each 2-foot layer of soil.

1.5 HISTORY OF MEC USE

IR05 was operated between 1947 and 1975 as a munitions disposal facility supporting the adjacent Mare Island Ammunition Depot established in 1857 (Figure 1-2). Facilities for the destruction of primers, fuzes, pyrotechnics, propellants, and explosives were located on the site. The site was later used as an inert munitions open storage area.

DP7S was used during the 1940's, 50's, and 60's for the deposition of dredge sediments that originated from Carquinez Strait and lower Mare Island Strait berth and pier areas. Dredge outfall locations at Mare Island have typically been found to contain 20 mm, 40 mm, and 1.1 inch anti-aircraft munitions discarded overboard in the period following World War II.

1.6 PREVIOUS STUDIES OF EXTENT OF MEC OR MPPEH CONTAMINATION

1.6.1 Installation Restoration Site 05

IR05 was identified as a munitions area of concern by a series of investigative actions that began with an initial assessment study in 1982, followed by a 1991 Phase I Remedial Investigation and two separate geophysical surveys completed in 1993 and 1994. Those investigations formed the basis for a 1995-97 time critical munitions removal action completed by Mare Island Naval Shipyard and Superintendent of Shipbuilding, Conversion, and Repair, Portsmouth, Virginia (SSPORTS) Environmental Detachment Vallejo. DDESB approval of the 21 month project was obtained in February 1995 (NOC, 1995). All detectable anomalies were investigated, evaluated, and removed during the time critical removal action that was performed on a grid-by-grid basis utilizing handheld survey instruments (MK 26 Ordnance Locators, MK 29 All Metals Locators, and AN-19/2 Mine Detecting Sets) to locate and verify clearance of anomalies. A total of 116 *munitions and explosives of concern* (MEC) items were recovered, including: 20 mm and 40 mm anti-aircraft rounds; 3-inch, 5-inch, and 6-pounder projectiles; and various projectile/bomb/rocket fuzes. Careful examination by UXO Technicians revealed that all of the recovered projectiles were unfired (i.e., they had no rifling marks on their rotating bands) and that none of the fuzes showed any discernable indication of having been armed. Table 3-1 contains a complete listing of MEC recovered from IR05 during the 1995-97 Time-Critical Removal Action. No explosives contamination of soil or groundwater was encountered during the removal action; a small quantity (~270 cubic yards) of lead contaminated soil was removed for disposal from the location of several former propellant burn pads. All detectable anomalies were excavated and removed during the removal action. Details of the removal action are described in the Final Summary Report for the Unexploded Ordnance Time Critical Removal Action for Installation Restoration Site 05 at Mare Island (SSPORTS, 1998a).

The removal of buried munitions during the initial time-critical removal action, completed between November 1995 and September 1997, was intended to satisfy the minimum clearance requirements of the Department of Defense Explosives Safety Board (DDESB) at that time, as outlined in Section 2.1.14 of NAVSEA OP 5 (Ammunition and Explosives Ashore) for the planned reuses of the site. A minimum clearance depth of 4 feet was implemented during the

project approved by the DDESB in their February 1995 letter (NOC, 1995). Clearance depth was based on the planned reuses of the site, in order to maintain public safety in accordance with Chapter 12 of Department of Defense Standard 6055.9 (DOD, 1999). Although the minimum clearance depths for “Public Access” (recreational) and “Limited Public Access” (wildlife preserve) reuses have been removed from DoD 6055.09-STD and OP 5, the "Public Access" (recreational) and "Limited Public Access" (wildlife preserve) reuses are still planned for the site, as described in the Mare Island Final Reuse Plan (City of Vallejo, 1995).

A 2006 DGM survey, covering all accessible areas of the site, identified a total of 10,487 anomalies which met the Geophysical Prove-Out (GPO) anomaly selection criteria. Table 3-2 lists the MEC items recovered during the subsequent 2007 anomaly investigation of IR05 and DP7S. Tidal wetland areas of the site were not surveyed due to inaccessibility or because of concerns relating to the disturbance of endangered species habitat.

1.6.2 Dredge Pond 7S

The Preliminary Assessment Final Summary Report for Ordnance Sites at Mare Island Naval Shipyard (PA) completed in 1995 by PRC Environmental, Inc. (PRC, 1995) led to the geophysical survey and subsequent intrusive investigation of DP7S. The PA described the history of munitions activities at Mare Island, including the potential for munitions discarded overboard in Mare Island Strait to be present in dredge spoils ponds. The PA concluded that the dredge ponds were an area of potential concern and recommended further investigation to determine if buried munitions were present. A geophysical survey of the active dredge ponds was subsequently completed during the 1995-96 Unexploded Ordnance (UXO) Site Investigation (SI) completed by Mare Island Naval Shipyard/SSPORTS. The SI survey of the ponds was performed using handheld MK 26 magnetometers. A total of 390 dredge pond magnetic anomalies were identified by the SI survey, including several located at a historic outfall site in the northwest corner of DP7S (SSPORTS, 1997a). The interior of DP7S was not surveyed due to habitat disturbance concerns and a lack of evidence indicating that munitions items might be present.

All 390 of the documented SI anomalies were subsequently investigated, evaluated, and removed during the 1998-2000 dredge pond intrusive investigation. DDESB approval of the project was obtained in August 1998 (NOC, 1998). A total of 121 MEC items were recovered from the DP7S

outfall location, including: 20 mm, 40 mm, and 1.1 inch anti-aircraft rounds/projectiles; 3 inch and 6 pounder projectiles; and a projectile proximity fuze (see Table 3-2 for a complete listing. Most of the recovered MEC gun ammunition consisted of an integrated cartridge case and projectile assembly. Those few separate projectiles that were recovered were unfired (i.e., they had no rifling marks on their rotating bands or other indication of having been fired). They are believed to have been separated from their associated cartridge cases because of the deteriorated condition of the cases and by handling received during their disposal, deposition, and subsequent recovery. Various scrap metal objects (welding rods, angle iron, etc.) associated with sediments dredged from waterfront area of the Shipyard along Mare Island Strait, accounted for the remainder of the anomalies investigated.

No discernable evidence of explosives contamination in soil or groundwater was noted during the intrusive investigation. The recovered MEC items were substantially intact and no bulk explosives materials were encountered or suspected. Because the approved investigation work plan required sampling only where contamination was known or suspected to exist, no sampling of soil or groundwater for explosives was performed. Details of the removal action are described in the Final Summary Report for the Unexploded Ordnance Intrusive Investigation of the Dredge Ponds at Mare Island (Weston, 2001).

A subsequent second dredge pond survey, incorporating a survey of berms and outfall locations utilizing an EM-61 system, was completed in 2001. That survey did not include DP7S (with the exception of a common berm shared with adjacent Dredge Pond 7). A Final Summary Report for the Ordnance and Explosives Confirmation Survey and Removal Action of the Mare Island Dredge Ponds was completed in March 2002 (Weston, 2002). Only one 20mm round was identified during the extensive evaluation of the identified anomalies.

The removal of dredge pond buried munitions during the intrusive investigation and subsequent confirmation survey was intended to satisfy the minimum clearance requirements of the DDESB at the time, as outlined in Section 2.1.14 of NAVSEA OP 5 (Ammunition and Explosives Ashore) for the planned reuse of the site. A minimum clearance depth of 4 feet was specified by the DDESB in their August 1998 approval letter for the dredge spoils ponds ordnance intrusive investigation (NOC, 1998). Clearance depths were based on the planned reuses of the dredge

ponds, in order to maintain public safety in accordance with Chapter 12 of Department of Defense Standard 6055.9 (DOD, 1999). Although the minimum clearance depths have been removed from DoD 6055.09-STD and OP 5, a “Limited Public Access” (wildlife preserve) reuse is still planned for the site as described in the Mare Island Final Reuse Plan (City of Vallejo, 1995).

The 2006 DGM survey of accessible DP7S berm, outfall, and bottom areas identified a total of 3,626 discrete anomalies. Wetland areas of the DP7S pond bottom were not surveyed due to habitat disturbance concerns; accessible non-wetland (upland) areas of the pond bottom were subjected to a random 10% survey). Table 3-2 lists the MEC items recovered during the subsequent 2007 anomaly investigation of IR05 and DP7S. All MEC items were encountered at or near the former dredge outfall located in the corner of DP7S.

1.6.3 Adjacent Munitions Response Sites

The IR05/DP7S site is located adjacent to three other Mare Island Munitions Response Sites as shown in Figure 1-2:

- The former Upland Magazine Area to the east was initially identified as a potential munitions area of concern but subsequent geophysical survey and investigation actions revealed no evidence of discarded munitions (SSPORTS, 1997b).
- The South Shore Area was a former munitions storage and handling area where munitions were discarded by dumping/burial along the historic shoreline. This area was previously surveyed by the Navy and all identified anomalies were removed (WESTON, 2003). A second munitions confirmation DGM survey was completed in 2006 and a second intrusive investigation of identified anomalies is planned for 2010.
- The Western Magazine Area was the location of a former munitions storage area operated from 1939 through 1975. All identified anomalies were removed from the site during a 1997-98 intrusive investigation action (SSPORTS, 1998b). A second DGM survey and anomaly investigation was completed in 2006-07 (WESTON, 2009).

1.7 JUSTIFICATION FOR NDA/NFA DECISION

N/A (removal action).

2. PROJECT DATES

2.1 PROJECT DATES

The excavation of excavated soil is expected to begin in September 2009 and be completed by October 2009. The treatment of any recovered MEC is expected to be complete by December 2009.

3. TYPES OF MEC OR MPPEH

3.1 TYPES AND QUANTITIES OF MEC AND MPPEH

Numerous MEC items have been recovered from the MRS during the prior investigations and removal actions (see Tables 3-1, 3-2, and 3-3 below). The prevalent MEC items have been small/medium caliber gun projectiles and bomb/projectile fuzes dating to the World War II era.

A total of 215,606 Material Documented as Safe (MDAS) items have also been recovered from the MRS. The 212,635 MDAS items recovered during the 1995-97 UXO Removal Action were comprised of empty pyrotechnic casings, small/medium caliber cartridge cases, projectile/bomb/rocket fuzes, and gun ammunition primers. In comparison, the majority of the 2,971 MDAS items recovered from IR05 during the 2007 munitions response action were empty bomb and projectile fuzes.

Table 3-1 IR05 Recovered MEC (1995-97 Time Critical Removal Action)

MEC Item	Quantity
MK 15 primer	4
40 mm high explosive projectile	1
MK 5 practice bomb (w/black powder spotting charge)	1
MK 18 mechanical time fuze (projectile)	1
MK 21 (series) base detonating fuze	1
20 mm high explosive projectile	7
MK 23 base detonating fuze (projectile)	15
MK 158 nose fuze (5 inch rocket)	10
M 103 nose fuze (bomb)	1
MK 31 base detonating fuze (projectile)	36
6 pounder high explosive projectile	1
3 inch MK 29 armor piercing projectile	1
5 inch MK 32 projectile	1
Bomb fuze booster	28
3 inch MK 27 MOD 3 anti-aircraft high explosive projectile	7
3 inch common (high explosive) projectile	1
Total	116

Table 3-2 IR05/DP7S Recovered MEC (2007 Munitions Response Action)

MEC Item	Quantity
20 mm high explosive projectile	17
20 mm high explosive round	4
37 mm projectile fuze	2
Gun primer	5
1.1-inch anti-aircraft round	1
Mousetrap 7.2-inch anti-submarine rocket	1
40 mm anti-aircraft projectile	3
40 mm anti-aircraft round	1
1 pounder projectile	1
M4 detonator	1
MK 50 5-inch projectile fuze	51
MK 29 5-inch projectile fuze	2
M103 bomb fuze	28
M103 bomb fuze booster	27
Bomb fuze booster	1
16-inch projectile base fuze	33
Scoville 3-inch powder train time fuze	1
MK 149 rocket fuze	47
M1 bomb fuze	2

MEC Item	Quantity
M123 bomb fuze	6
M126 bomb fuze	5
MK 131 hedgehog fuze	7
AN/M115 bomb fuze	17
AN/M112 bomb fuze	5
AN/M116 bomb fuze	13
M14 bomb detonator	1
Total	282

Table 3-3 DP7S Recovered MEC (1998-2001 Intrusive Investigation Action)

MEC Item	Quantity
Projectile proximity fuze (VT fuze)	1
1.1 inch anti-aircraft projectiles	4
20 mm anti-aircraft rounds/projectiles	112
40 mm anti-aircraft rounds/projectiles	2
3 inch/50 caliber anti-aircraft projectile	1
6 pounder projectile	1
Total	121

3.2 MUNITION WITH THE GREATEST FRAGMENTATION DISTANCE (MGFD)

Table 3-4 Primary and Contingency MGFDs for IR05/DP7S

MGFD Type	Munitions Item	MFD-H (ft)
Primary	7.2-inch Mousetrap Anti-Submarine Weapon ⁽¹⁾	1,892 ⁽²⁾
Contingency	5-inch/38 cal MK 35 projectile	2,100 ⁽³⁾
Contingency	5-inch/38 cal MK 32 projectile	2,043 ⁽⁴⁾

Table Notes:

- (1) The 7.2-inch Mousetrap (Hedgehog) is the largest item reasonably expected to exist at the site, based on the most recent (2006-07) munitions removal action.
- (2) MFD-H from the item specific Fragmentation Data Review Form dated 12/31/07.
- (3) MFD-H from the item specific Fragmentation Data Review Form dated 3/31/08.
- (4) MFD-H from Equation (4-33) of TP-16, Rev 3, "Methodologies For Calculating Primary Fragment Characteristics".

3.3 MAXIMUM CREDIBLE EVENT (MCE)

N/A (non-fragmenting MEC is not the only known issue at the site; EZ distances are therefore based on fragmentation).

3.4 EXPLOSIVE SOIL AND CONTAMINATED BUILDINGS

N/A (no known explosive soil or contaminated buildings are located within the MRS).

4. MEC AND MPPEH MIGRATION

4.1 MEC AND MPPEH MIGRATION

MEC migration due to naturally occurring phenomena (flooding, erosion, drought, etc.) is not a realistic concern since the area is flat and covered by vegetation. Frost heave is not an issue since the temperature rarely goes below freezing and never for extended periods.

5. DETECTION TECHNIQUES

5.1 DETECTION EQUIPMENT, METHOD, AND STANDARDS

Handheld AN-19/2 metal detectors and Schonstedt magnetometers will be used in the “mag and flag” clearance of anomalies to support the soil remediation phase of the project.

One of two standard systems commonly used for munitions surveys may also be used to complete the DGM surveys of any identified data gaps:

- A Geonics EM-61 inductive TDEM instrument to survey the Open Storage Area and Detonation/Burn Areas of IR05 and the Pond Bottom Area of DP7S (Figure 5-1) since non-ferrous MEC items have been encountered in those areas.
- A Geometrics G-858 cesium vertical gradiometer to survey the Pond Berms/Outfall Area of DP7S since expected MEC includes small to medium caliber gun ammunition and other munitions items constructed largely of ferrous materials and dredge outfall debris that may be buried at deeper depths.

All geophysical survey instruments will be used in accordance with the Hazards of Electromagnetic Radiation to Ordnance (HERO) restrictions specified by the Naval Surface Warfare Center at Dahlgren Virginia (NOSSA, 2005).

5.2 NAVIGATIONAL EQUIPMENT, METHOD, AND STANDARDS

A Trimble Real Time Kinematic (RTK) Global Positioning System (GPS) receiver will be used to document anomalies located using a “mag and flag” approach and used with the G858 and EM61 systems to determine and record anomaly position information with an expected accuracy of 0.1 feet.

5.3 EQUIPMENT CHECKOUT

Satisfactory operation of the AN-19/2 and Schonstedt handheld instruments will be verified daily using an established onsite test target.

A Geophysical Prove-Out (GPO) Plan, utilizing the existing Geophysical Prove-Out site located in the adjacent South Shore Area that was established to support the 2006 geophysical surveys of the Production Manufacturing Area and South Shore Area, will verify the effectiveness of all detection equipment, operators, and data processing techniques utilizing a test grid established in similar soil conditions for EM-61 and G-858 systems. Targets in the test grid include those typically found at Mare Island sites, including fuzes and 20mm, 40mm, and 3-inch anti-aircraft projectiles. The GPO evaluation will demonstrate the capability of the equipment to locate items at the nominal detection limit of 11 times the item diameter in similar soil conditions.

Performance of the G-858 and EM-61 systems will also be checked at the beginning and end of each workday following the established QC criteria (i.e., equipment warm-up, sensor nulling, static, static spike, cable shake, etc.). Additional function checks may be performed throughout the day, as the operator deems necessary. The data from each sensor test will be compared with data collected on previous days. If there is a significant change in results, the instrument will be

rechecked. If the difference in the data cannot be accounted for, the instrument will be taken out of service until repaired.

Navigation accuracy of the RTK GPS system will be verified each day at a known control point to ensure an accuracy of less than 0.1 feet offset.

5.4 DATA COLLECTION AND STORAGE

Anomaly locations identified using the “mag and flag” approach will be documented using the RTK GPS. Geophysical teams using EM-61 or G-858 systems will provide raw instrument data, digital records, and field notes to the Site Geophysicist within 24 hours after collection in an ASCII-delimited (XYZ) file format suitable for data analysis. All data related to the DGM surveys will be managed using specialized techniques that include the use of U-Hunter and Oasis Geosoft software. Descriptive attribute information about the field surveys, targets, and dig lists will be stored and maintained in a centralized, project master database in a Microsoft® format. This database will contain all QC statistics and processing parameters collected, performed, and calculated on the DGM data. All spatial data will be managed using GIS, and will be stored in ESRI-compatible GIS file formats, primarily ArcInfo coverage’s and ArcView shape files. All data will be provided electronically to the Navy and will be backed up on the contractor’s internal network and project workstation.

6. RESPONSE ACTIONS

6.1 RESPONSE TECHNIQUE

Two separate response actions may be performed:

- A “mag and flag” clearance of anomalies in the proposed soil excavation areas (Figure 6-1) and/or DGM data gap areas will be located and removed using handheld geophysical survey instruments prior to the excavation and removal of chemically contaminated soil.
- A DGM survey and anomaly investigation of accessible DGM data gap areas to identify and remove any remaining MEC items.

6.1.1 Contaminated Soil Remediation and Supporting Anomaly Clearance

All detected anomalies in the planned soil excavation area will be investigated, after being located using handheld detection instruments, in a “mag and flag” clearance process prior to the removal of each soil lift. This clearance method is considered appropriate in consideration of the previous removal actions already completed in the area, and the results of a screening survey that indicated few remaining anomalies.

Anomalies will be exposed using hand tools; surrounding soil may be removed using an excavator or backhoe to provide access. Anomalies will be investigated to a minimum radius of 2 feet and a minimum depth of 4 feet. Metallic debris may be left in place only if it cannot feasibly be removed and only after a determination that it does not represent potential MEC. Recovered material will be categorized immediately after removal and handled accordingly (see Sections 6.3 and 6.4).

Following completion of the anomaly removal, chemically contaminated soil will then be excavated in 24-inch thick lifts (anticipated excavation depth is 4 feet) using an excavator/backhoe and placed directly into off-road haul trucks for transport to the Investigation Area H1 landfill Containment Area on Mare Island for placement as subgrade fill under an engineered landfill cap. The anomaly removal process will be repeated prior to the removal of each 24-inch layer of soil.

6.1.2 Completion of the DGM Survey and Anomaly Investigation

A second survey and clearance of the site was performed in 2006 as required by regulatory agencies to support the completion of a Remedial Investigation leading to the ultimate transfer of the property. This also provided an opportunity to address previous munitions actions, advances in quality control (QC) methodology, and the availability of new survey techniques to address perceived shortcomings in past survey efforts.

The scope of the current munitions confirmation survey is to support the excavation of chemically contaminated soil and to address data gaps from the 2006 DGM survey to confirm the removal of munitions anomalies. Identified anomalies will be excavated and removed to a lateral radius of 2

feet and a minimum depth of 4 feet using a “mag and flag” approach, or the same DGM process performed in 2006-07 as described in the preceding section.

The site was previously divided into four discrete subareas (shown on Figure 5-1) based on the history of each area and the possible modes of munitions placement:

- **Open Storage Area**—The 14.3-acre portion of IR05 includes those areas of the site used primarily for the open storage of inert munitions following World War II.
- **Detonation/Burn Area**—The 17.3-acre portion of IR05 was used between 1948 and 1975 for the open burning and detonation of unwanted munitions and propellant. The area was the primary munitions disposal area for the Mare Island ammunition facility during that time period.
- **Pond Berms/Outfall Area**—The 4.4-acre area includes the outfall site previously identified by the SI and cleared during the subsequent munitions intrusive investigation. The berms and outfall constitute the portions of DP7S most likely to contain munitions based on the established Mare Island dredge pond “outfall model” characterizing munitions deposition. The northwest berm (common with Dredge Pond 7 to the north) was excluded from this confirmation survey since it was included in the second Dredge Pond Ordnance and Explosives Confirmation Survey and Removal Action completed in 2002 (Weston, 2002).
- **Pond Bottom**—The 24.8-acre dredge pond bottom area was not surveyed during the SI because of its status as endangered species habitat and a low probability of containing discarded munitions. Since the pond bottom is considered to have a very low probability of containing MEC, it will be surveyed only along 100 foot grid lines to yield approximately a 10% sampling of the total area. This is the same survey method, rationale, and coverage applied to all other dredge pond bottom areas on Mare Island.

6.2 EXCLUSION ZONES

A MEC exclusion zone (EZ) will be established around all active munitions response operations in accordance with the requirements of NAVSEA OP5 Section 14.7. Access to an EZ will be limited to essential personnel and authorized visitors. The UXO Safety Officer will determine the

maximum number of persons (essential personnel and authorized visitors) that can be present in the EZ at a given time. Visitor access to the site will be based on the operational risk analysis of the scheduled MEC operations and availability of escorts, as well as a demonstrated visitor need and the completion of visitor safety briefings.

The location and corresponding Inhabited Building Distance (IBD) Explosives Safety Quantity-Distance (ESQD) footprint of the existing NOC (NOSSA) site approved storage facility (Building A180 Magazine) is shown on Figure 1-2. The storage facility was site-approved for the storage of recovered MEC in 1997, with an established 1,250 foot ESQD footprint (IBD) and a limit of 1,000 lbs NEW (Appendix D). Access into the ESQD is controlled by the Navy and is restricted by a series of fences and locked gates.

The location and corresponding exclusion zone footprint of the existing NOC (NOSSA) approved treatment range (Disposal Range #2) is also shown on Figure 1-2. The range has been site-approved for the disposal of recovered MEC since 1994 (see Appendix D), with an established 1,250 foot exclusion zone that is controlled by the Navy and is restricted by fencing and gates.

6.2.1 MGF D Exclusion Zones

Table 6-1 EZs for IR05/DP7S

MGFDs		EZs (ft)				
Description	NEW (lbs)	Fragmentation Effects		Blast Overpressure Effects		
		HFD (ft)	MFD (ft)	K328	K40	K24
Mousetrap (Hedgehog) 7.2-inch anti-submarine rocket	31 ⁽¹⁾	390 ⁽¹⁾	1,892 ⁽¹⁾	1,031	126	76
5-inch/38 cal MK 35 projectile	7.55 ⁽³⁾	398 ⁽³⁾	2,100 ⁽³⁾	637	78	47
5-inch/38 cal MK 32 projectile	2.58 ⁽²⁾	316 ⁽⁴⁾	2,043 ⁽⁵⁾	450	55	33

Table notes:

- (1) NEW, HFD, and MFD of the item from the item-specific Fragmentation Data Review Form dated 12/31/07.
- (2) Net Explosive Weight (NEW) of the item from OP 1664.

- (3) Item data from the item-specific Fragmentation Data Review Form dated 3/31/08.
- (4) HFD of the item from TP-16 Version 1.0," Primary Fragment Range Generic Equations Calculator" for a "robust" item.
- (5) MFD of the item from Equation (4-33) of TP-16, Rev 3, "Methodologies for Calculating Primary Fragment Characteristics".

6.2.2 Exclusion Zone Control

Table 6-2 Controlling EZs for IR05/DP7S

Operation	Sited As	Exposed Site	Basis ⁽⁴⁾	ESQD (feet)
Manual Operations ⁽¹⁾	Unintentional Detonation	UXO Teams ⁽²⁾	K40 of the MGF	126 ⁽³⁾
Manual Operations ⁽¹⁾	Unintentional Detonation	Public & Non-Essential Personnel	HFD of the MGF	390
MEC Treatment of up to 36 pounds NEW ⁽⁵⁾	Intentional Detonation	Public & All Personnel	MFD of the MGF	408 ⁽⁶⁾
MEC Storage Magazine (up to 1,000 pounds NEW)	Aboveground Magazine	Non-essential personnel in structures	Inhabited Building Distance (IBD)	1,250
		Non-essential personnel in the open	Public Transportation Route Distance (PTR)	750

Table notes:

- (1) Manual operations include detector-aided visual surface clearance and removal of anomalies by hand digging (may include the removal of surrounding soil to within 1-ft of suspected MEC anomalies using mechanized equipment).
- (2) Inter-team distance.
- (3) Calculated using $D=KW^{1/3}$, with W equaling the NEW of a single MGF without donor charge.
- (4) MGF is the 7.2-inch Mousetrap (Hedgehog) Anti-Submarine Rocket containing 31 lbs NEW of trinitrotoluene (TNT).
- (5) Total NEW reflects the treatment of a single MGF using a 5 lb donor charge.
- (6) MGF MFD of 1,892 ft (from the Fragmentation Data Review Form) will be mitigated through the use of 6 feet of sand cover to reduce overpressure to 0.066 psi at 40 feet and the maximum fragment distance to 408 feet, as authorized by NOSSA Letter Serial N54-JE/9160 of 3 March 2008 (Modification to Site Approval to Allow Use of TP-16 Buried Explosion Module).

6.2.3 MRS Encumberment by Potential Explosion Sites

N/A (there are no Potential Explosion Sites which encumber any part of the MRS, except for the MEC treatment facility which will not be operated concurrently).

6.3 MEC AND MPPEH HAZARD CLASSIFICATION, STORAGE, AND TRANSPORTATION

Recovered MEC and MPPEH will be hazard classified as C/D 1.1 and will be stored in Magazine A180 per the site approval in Appendix D. No MEC or MPPEH items will be transported over public roads.

6.4 MEC AND MPPEH DISPOSITION PROCESSES

6.4.1 MEC Disposition

Recovered munitions items will be examined by the UXO Technician team leader and the UXOSO to determine whether it may pose an explosive hazard. Items classified as MEC or Material Documented as an Explosives Hazard (MDEH) will be transported to the MEC storage facility pending thermal treatment at the onsite treatment range (items will not be transported over public roads)

Recovered MEC will be thermally treated (detonated) at the onsite treatment range (Disposal Range #2). The location and corresponding exclusion zone footprint of the existing NOC (NOSSA) approved treatment range (Disposal Range #2) is also shown on Figure 1-2. The range has been site-approved for the disposal of recovered MEC since 1994 (see Appendix D), with an established 1,250 foot exclusion zone that is controlled by the Navy and is restricted by fencing and gates. Since all recovered MEC are DMM, and since an established demolition area exists, no in-grid consolidated shots will be required.

The treatment of recovered MEC items will be performed after all site activities have been completed. Donor explosives obtained from a commercial supplier (Alpha Explosives) will be delivered to the site daily by the supplier. Only the anticipated quantity of explosives needed for

the day's activities will be accepted; no donor explosives will be stored onsite. Treatment operations will be completed by qualified UXO Technicians during daylight hours after the notification of local emergency services agencies.

Treatment of MEC items with MFDs exceeding the established range EZ of 1,250 ft will utilize sand cover, as discussed in Section 6 of DDESB Technical Paper 16 (DDESB, 2005), to reduce the size of the required exclusion zone to bring it within range limits. A modification to the range site approval was granted in 2008 (NOSSA, 2008) to allow the treatment of a Mousetrap (Hedgehog) 7.2-inch anti-submarine rocket having a net explosive weight exceeding the established range limit (see Appendix D).

6.4.2 MPPEH Disposition

MPPEH will be inspected by qualified UXO Technicians and determined to be either MDAS or MDEH. MDEH will be placed into temporary storage in Magazine A180 pending thermal treatment with other MEC items. MDAS will be segregated and placed into a locked container for storage, under the control of the SUXOS, pending transfer for disposal. MDAS will be certified to be free of explosives or related materials by the project Senior Unexploded Ordnance Supervisor (SUXOS) and a qualified Navy representative before being transferred to a authorized munitions scrap recycling contractor for demilitarization and disposal. All MPPEH management procedures will be in accordance with Section 13-15 of NAVSEA OP 5.

6.5 EXPLOSIVE SOIL

N/A (no known explosives contaminated soil is present in the MRS).

6.6 CONTAMINATED BUILDINGS

N/A (no contaminated buildings are present in the MRS).

6.7 OPERATIONAL RISK MANAGEMENT

The inherent risks involve the possibility of inadvertent detonation of MEC items, and the resulting fragmentation and blast overpressure hazards to site workers and the public. The public will be protected from fragments and blast overpressure by the established EZ.

An excavator or backhoe may be used to assist in the excavation of detected anomalies. Since mechanized equipment will only be used for the removal of overburden soil (no closer than 1-foot of the suspected anomaly), the operation will be treated as a manual operation. A K40 inter-team distance will provide protection for other anomaly investigation teams.

The excavation and removal of each 2-foot layer of chemically contaminated soil will be performed only after the completion of a “mag and flag” anomaly clearance of the planned excavation area. UXO construction support will be provided during soil excavation activities.

Table 6-3 presents a hazard analysis matrix describing each of the potentially hazardous tasks to be performed, with the corresponding hazard mitigation measures to be implemented.

Table 6-3 Hazard Analysis Matrix for IR05/DP7S

Process Step	Hazard	Triggering Event	Initial Risk Index	Hazard Mitigation	Final Risk Index
1	DGM Surveys	MEC reacts to impact or movement during DGM surveys	C/II/3	Initial surface survey to remove any exposed MEC	D/II/4
2	Manual Anomaly Investigation	MEC reacts to impact or movement during excavation of anomalies	C/II/3	Initial mechanized excavation beside anomaly; final excavation using hand tools	D/IV/5
3	MEC treatment by OD	MEC or donor charges react to impact, heat, friction, or electro-static discharge	C/II/3	All demo personnel trained; 1,250 EZ established, demo personnel wearing cotton clothing; demo ops suspended during potential electrical storms	D/II/4

6.8 CONTINGENCIES

The option to complete a DGM survey and anomaly removal instead of the planned “mag and flag” anomaly clearance process may be exercised during the contaminated soil excavation phase of the project. This would be implemented only if the density of anomalies encountered in the planned excavation area becomes too high to effectively remove using the mag and flag process.

7. QC/QA

7.1 QC IMPLEMENTATION

Quality control (QC) measures for the mag and flag anomaly removal process will be implemented by the UXO Quality Control Specialist, in accordance with project work plan requirements. Anomaly removal QC measures will include the following:

- Satisfactory operation of handheld instruments will be verified daily at a test area established at the site for that purpose. Any inability of an instrument to locate a test item will be corrected before the instrument is used.
- One blind seed item (1/2-inch rebar) will be placed at a depth of 5.5 inches below ground surface in each 2-foot layer of soil within each 100 x 100-foot grid. Any failure to locate a seed item will result in a 100% resurvey of the grid, an evaluation of anomaly location procedures, and the implementation of appropriate corrective action.
- 100% of all no-finds will be QC checked prior to the removal of chemically contaminated soil. Any anomalies found during this QC check will be investigated and removed, and another 100% resurvey of the grid completed before the grid is released for soil excavation.
- MDAS and non-munitions scrap accumulation areas will be inspected daily to ensure material is being properly segregated in locked containers. Any items found to be incorrectly segregated will result in a review of segregation procedures and the implementation of appropriate corrective action.

- The classification, handling, and storage of encountered MEC items will be continuously monitored to ensure they are properly managed in a safe manner. Any identified discrepancies will be immediately corrected and appropriate corrective action implemented to prevent a recurrence.

In the event that Digital Geophysical Mapping (DGM) surveys and the associated data processing and anomaly selection processes are used, the following data quality objectives (DQOs) are applicable. Corrective action for any identified discrepancies will be determined by the project geophysicist, and may include whatever actions considered appropriate, including the resurvey of affected grids and the reprocessing of data.

- Geophysical sensor data are of acceptable precision, sensitivity, accuracy, and completeness.
- Navigation and position data are precise and accurate.
- Data are reproducible and defensible in supporting project objectives.
- Data of sufficient density and quality to detect smallest item in area of interest per metric in addition to larger features (i.e. caches).
- Data processing to decrease noise and lower false positives.
- Signals undergo standardization to support anomaly prioritization.
- Validate anomaly selection criteria positional accuracy.
- Confirm low-amp anomalies are not processing.

Proper control of recovered MDAS and non-munitions scrap will be maintained through use of DD 1348 (Transfer of Custody) forms signed by a contractor UXO Technician and a qualified Navy representative (MDAS), or by two contractor UXO Technicians (non-munitions debris). The primary concern is to prevent the inadvertent release of MEC or munitions scrap to an unauthorized recipient.

7.2 QA IMPLEMENTATION

A QA Plan developed by the Navy to independently assess the quality of project work will be implemented by an independent third party contractor (Engineering/Remediation Resources Group, Inc.). The contractor will provide regular oversight of all anomaly clearance field operations and perform a final QA inspection of cleared areas prior to the start of soil excavation activities.

8. TECHNICAL SUPPORT

8.1 EOD

In the event that a munitions item is encountered that cannot safely be handled, EOD assistance from the 60th Civil Engineer Squadron based at Travis Air Force Base will be obtained. Donor explosives are not stored onsite and are not available on short notice to support a blow-in-place operation.

8.2 UXO CONTRACTOR

The qualifications of all UXO Technicians performing MEC-related functions will meet or exceed the requirements of DDESB TP18 for their respective jobs. All employees working at the IR05/DP7S site will have completed the 40-hour hazardous waste operations and emergency response (HAZWOPER) training mandated by OSHA, including annual refresher training. Those holding the SUXOS position will also have received HAZWOPER supervisory training. Documentation showing that employees have been trained, found qualified, and are certified to perform their assigned tasks will be available for review.

8.3 PHYSICAL SECURITY

The MRS is located in a remote area not readily accessible to the public. The site is secured by a combination of natural barriers (water and wetlands) and a gate on the only access road to the site as shown on Figure 1-2. Access to the site will be strictly controlled during operations.

No donor explosives will be stored onsite; explosives for treatment operations will be brought in daily by a local supplier. The MEC storage facility is an existing site-approved magazine structure located in a restricted area and protected by three separate layers of fencing/gates. The MEC treatment facility is accessed through the IR05 site and is also located in a remote area of Mare Island surrounded by wetlands and former dredge spoils ponds adjacent to Carquinez Strait and San Pablo Bay. The MEC storage and treatment facilities are shown on Figure 8-1.

9. ENVIRONMENTAL, ECOLOGICAL, CULTURAL, AND/OR OTHER CONSIDERATIONS

9.1 REGULATORY STATUTE, PHASE, AND OVERSIGHT

The remediation of the PWA site is being accomplished as a CERCLA action and is currently in the Remedial Investigation phase of the CERCLA process. The California Environmental Protection Agency Department of Toxic Substances Control is the lead regulatory agency for the removal action. There is no legally binding completion date, except that the excavated soil is to be placed under the Investigation Area H1 landfill Containment Area engineered cap scheduled for completion in late 2009.

9.2 ENVIRONMENTAL, ECOLOGICAL, CULTURAL, AND/OR OTHER CONSIDERATIONS

The MRS is primarily an upland area, except for portions of IR05 and the DP7S pond bottom which are classified as tidal or non-tidal wetlands. The primary environmental considerations involved with the project involve those wetland areas containing pickleweed presumed to be habitat for the endangered Salt Marsh Harvest Mouse (*Reithrodontomys raviventris*) and other Federal and state endangered/threatened species. The planned excavation of contaminated soil will impact some of these wetland areas. Therefore an Endangered Species Act formal consultation with the U.S. Fish and Wildlife Service (USFWS) was initiated to address the potential impact of planned work on the adjacent pickleweed wetlands. A biological opinion was obtained from the USFWS in June 2009 which included appropriate mitigation measures for the wetland areas to minimize potential impacts to the SMHM.

The MEC storage facility (Building A180) and the MEC treatment facility (Disposal Range #2) will be operated in accordance with the requirements of the *Engineering Evaluation/Cost Analysis and Removal Action Workplan (EECA/RAW) for the Operation of Mare Island Ordnance Storage and Treatment Facilities* (Weston, 2004). Signature of the EECA/RAW document in 2004 constituted approval by State and Federal regulatory agencies (in lieu of the RCRA Part A/B permitting process) to continue use of the established MEC storage and treatment facilities until all MEC actions on Mare Island have been completed.

9.3 NON-EXPLOSIVE SOIL

Soil sampling has been performed at the MRS in support of the draft Remedial Investigation report. No munitions constituents exceeding the established limits for human health or ecological risk were identified. However, other contaminants do exceed human health and/or ecological risk criteria, which is the basis for the planned soil removal within portions of IR05.

10. RESIDUAL RISK MANAGEMENT

10.1 LAND USE CONTROLS

The site is currently still under Navy control. Once all required actions have been completed to facilitate transfer of the property to the City of Vallejo, restrictions appropriate for the MEC-related history of the site will be developed and implemented during the Record of Decision phase of the CERCLA process. Although no engineering controls are anticipated, institutional controls similar to those implemented for the adjoining Western Early Transfer Area may be required by regulatory agencies and may include the following:

- Deed restrictions limiting allowable reuse of the property, such as prohibiting residences, schools, day care centers, or hospitals (property is currently slated for recreational and wildlife preserve reuses).
- Restriction on excavations or other soil disturbance unless approved by regulatory agencies and performed with UXO support.

- Implementation of an education and awareness program, including formational signage to educate the public on the munitions hazard and on steps to follow should a suspected munitions item be encountered.

10.2 LONG-TERM MANAGEMENT

Periodic long-term monitoring of the site will be implemented to minimize the chance of any remaining munitions being encountered by the public.

11. SAFETY EDUCATION PROGRAM

11.1 SAFETY EDUCATION PROGRAM

The site is currently restricted and is under the control of the Navy. To ensure that all persons who may enter the site in the future are aware of the potential hazards associated with possible remaining munitions, a safety education program will be implemented. The education program will place emphasis on potential future passive use by recreational visitors. Informational signage to educate the public on potential munitions hazards, and to instruct them on the steps to follow should they encounter a suspected munitions item, will be provided as part of the land use controls for the site.

12. STAKEHOLDER INVOLVEMENT

12.1 STAKEHOLDER INVOLVEMENT

All potential stakeholders have been involved throughout the planning stages of the munitions response action and soil remediation actions. A fact sheet, summarizing the planned soil removal activities under the Time-Critical Removal Action, was prepared and mailed to all Mare Island residents, landowners, and tenants, and to several hundred other potentially interested individuals and organizations in Vallejo and the surrounding communities. Presentations to the public detailing progress of previous munitions and soil remediation activities and planning for the current activities at the MRS have been made at meetings of the Mare Island Restoration Advisory Board.

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FIGURES

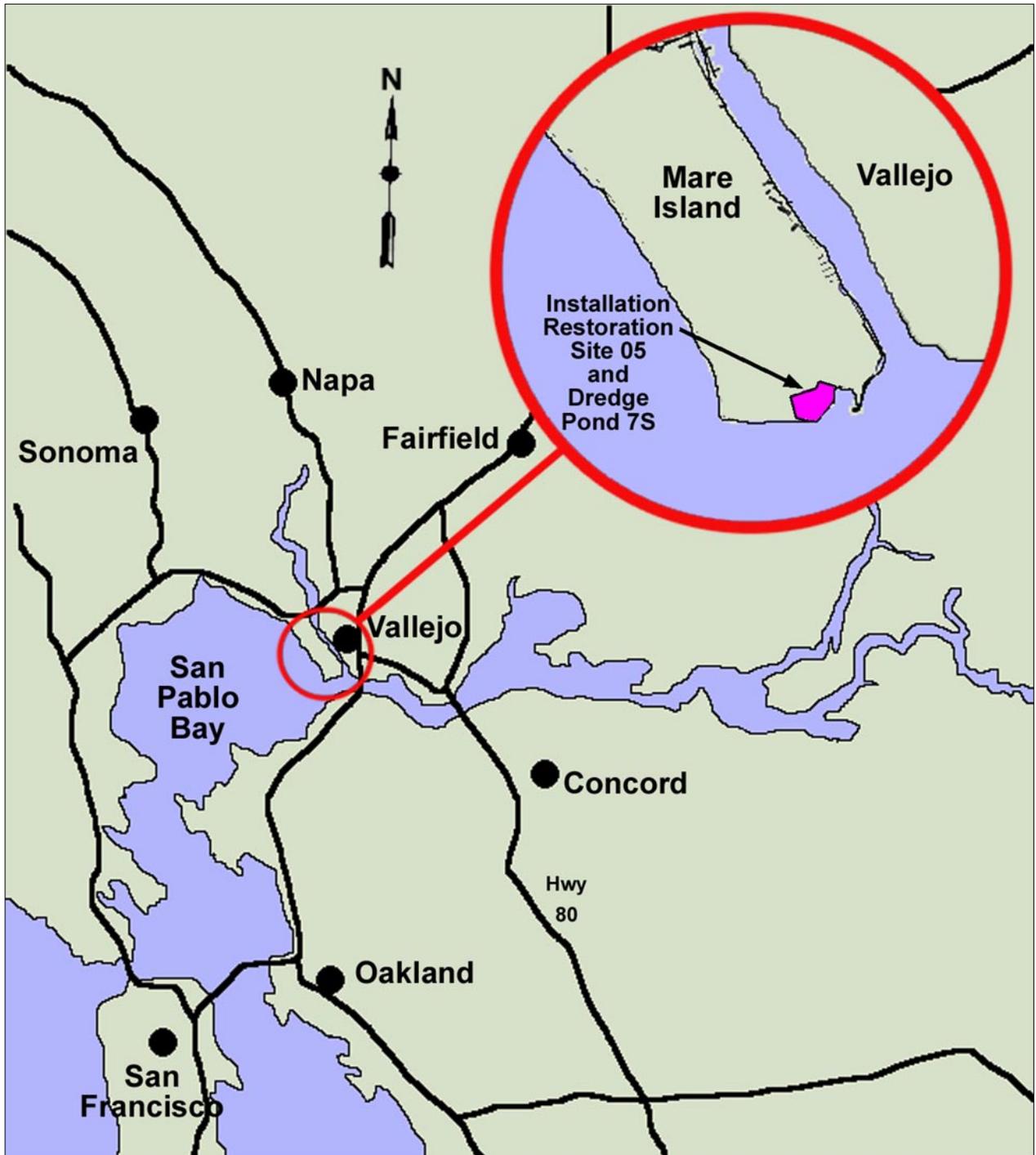
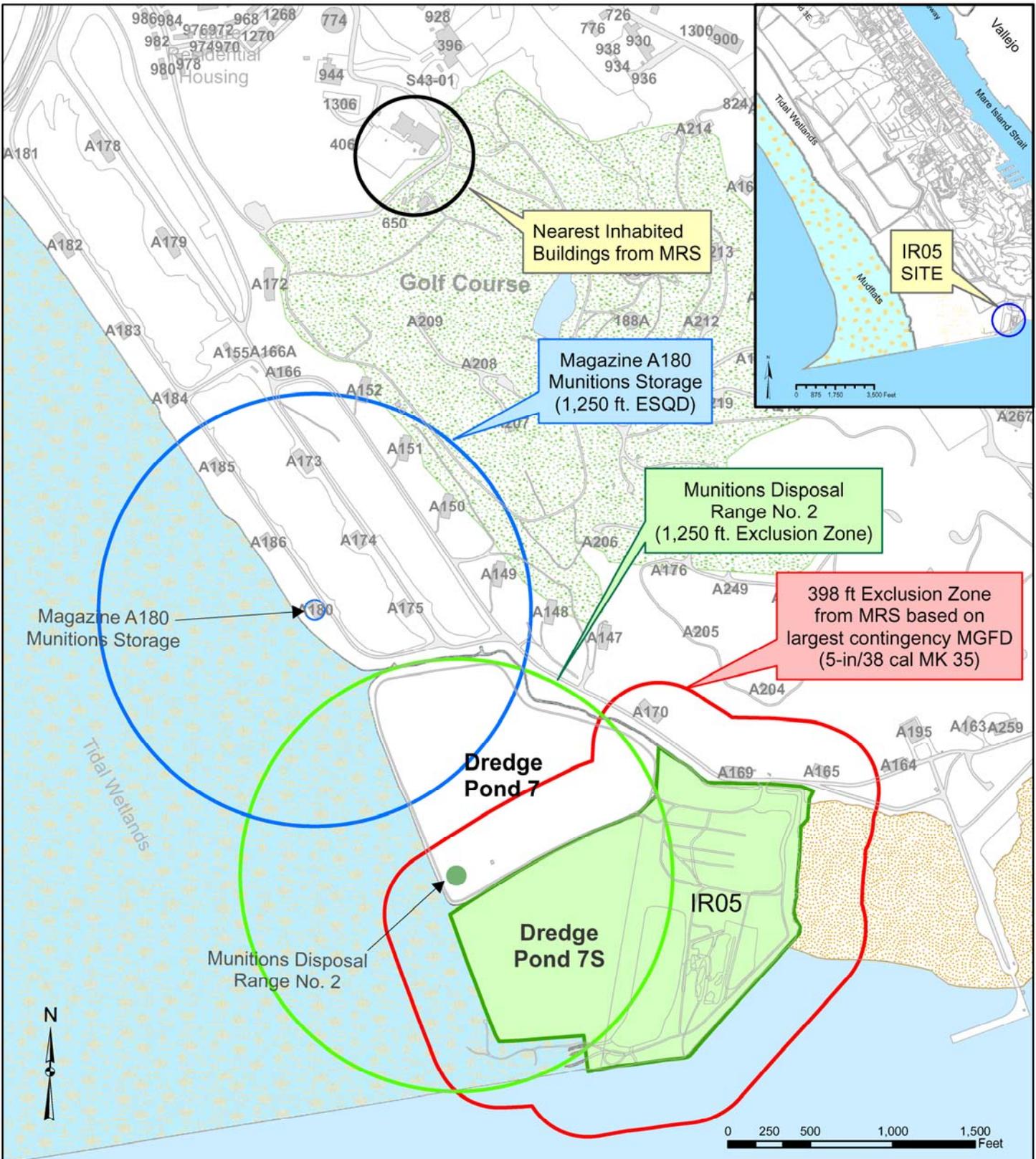


Figure 1-1—Regional Map



Nearest Inhabited Buildings from MRS

Magazine A180 Munitions Storage (1,250 ft. ESQD)

Munitions Disposal Range No. 2 (1,250 ft. Exclusion Zone)

398 ft Exclusion Zone from MRS based on largest contingency MGFD (5-in/38 cal MK 35)

Magazine A180 Munitions Storage

Dredge Pond 7

Dredge Pond 7S

IR05

Munitions Disposal Range No. 2

- LEGEND**
- IR05 Boundary
 - Mudflats
 - Open Water Tidal Wetlands
 - Munitions Disposal Range #2
 - Magazine A180 Munitions Storage
 - Roads, Water Channels, Berms, etc.

BRAC Program Management Office West
San Diego, California

**FIGURE 2-1
IR05 AND DP7S
SITE LOCATION MAP**

Explosives Safety Submission
Installation Restoration Site 05 and Dredge Pond 7S
Former Mare Island Naval Shipyard, Vallejo, California



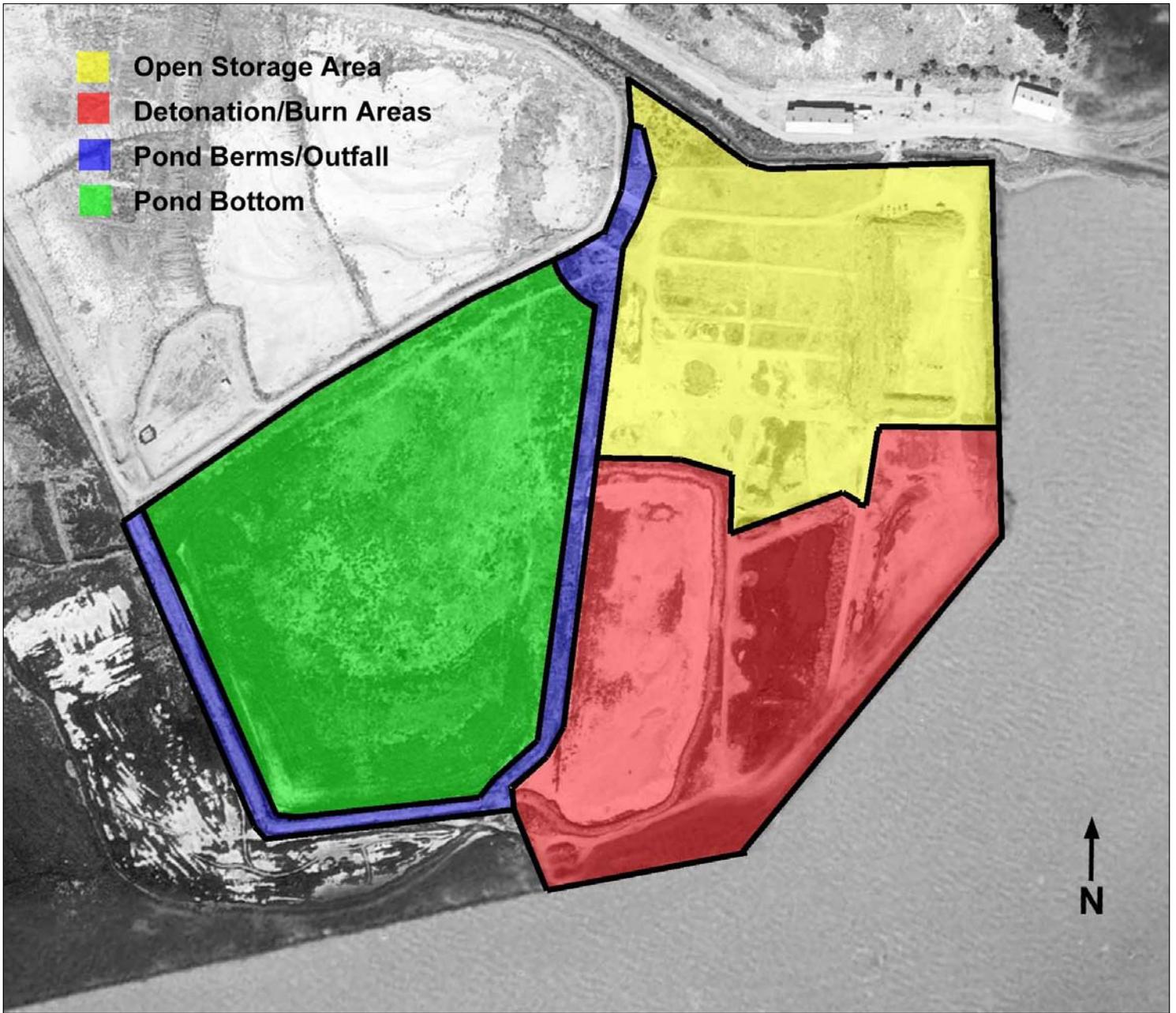


Figure 5-1 IR05 and DP 7S Munitions Response Areas



- LEGEND**
- PROPOSED EXCAVATION AREA
 - WATER
 - PICKLEWEED
 - 50-FOOT WETLAND BUFFER
 - TIDAL DITCH
 - HABITAT BOUNDARY
 - IR05 BOUNDARY
 - DREDGE LINE (INACTIVE)
 - FORMER STORM WATER PIPELINE
 - FENCE
 - DRAINAGE WEIR
 - DREDGE SPOIL POND OUTFALL
 - STORM WATER OUTFALL
 - SEDIMENT SAMPLE LOCATION
 - SOIL SAMPLE LOCATION
 - SURFACE WATER SAMPLE LOCATION
 - MONITORING WELL LOCATION
 - GRAB SAMPLE LOCATION
 - HOT SPOT SAMPLE LOCATION
 - EXCLUSION ZONE
 - LSA 2007 SURVEYED WETLAND
 - PROPOSED VERIFICATION SAMPLE LOCATION

**BRAC Program Management Office West
San Diego, California**

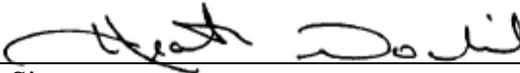
**FIGURE 6-1
CHEMICALLY CONTAMINATED SOIL
EXCAVATION AREA**

Explosives Safety Submission
Installation Restoration Site 05 and Dredge Pond 7Sd
Former Mare Island Naval Shipyard, Vallejo, California

WESTON SOLUTIONS

APPENDIX A
SIGNATURE PAGE

Table A-1. Signature Page

NAVFAC PROJECT		BRAC PMO PROJECT	
Project name:		Project name: Installation Restoration Site 05 and Dredge Pond 7S Munitions Response Action	
Explosives Safety Officer or UXO Contractor Safety Officer		Explosives Safety Officer or UXO Contractor Safety Officer	
			
Signature		Signature L. Maggini	August 10, 2009
Printed name	Date	Printed name	Date
Public Works Office Planning Department		Program Management Office Planning Department	
			
Signature		Signature PATRICIA MCFADDEN	August 13, 2009
Printed name	Date	Printed name	Date
Remedial Project Manager		Remedial Project Manager	
			
Signature		Signature Heather Wochnick	August 10, 2009
Printed name	Date	Printed name	Date

APPENDIX B

FRAGMENTATION DATA REVIEW FORMS

FRAGMENTATION DATA REVIEW FORM

Database Revision Date 12/31/07

Category: DODIC:
Munition: Date Record Created:
Primary Database Category: Last Date Record Updated:
Secondary Database Category: Individual Last Updated Record:
Munition Case Classification: Date Record Retired:

Munition Information and Fragmentation Characteristics

Explosive Type:
Explosive Weight (lb):
Diameter (in):
Max Fragment Weight (lb):
Critical Fragment Velocity (fps):

Theoretical Calculated Fragment Range

HFD [Range to No More Than 1 Hazardous Fragment per 600 Square Feet] (ft):
MFR-V [Vertical Range of Max Weight Fragment] (ft):
MFR-H [Horizontal Range of Maximum Weight Fragment] (ft):

Overpressure Distances

Inhabited Building Distance (12 psi), K40 Distance:
Inhabited Building Distance (09 psi), K50 Distance:
Intentional MSD (0065 psi), K328 Distance:

Minimum Thickness to Prevent Perforation

4000 psi Concrete (Prevent Spall):
Mild Steel:
Hard Steel:
Aluminum:
LEXAN:
Plexi-glass:
Bullet Resist Glass:

Required Sandbag Thickness

Max Fragment Weight (lb)SB:
Critical Fragment Velocity (fps)SB:
Kinetic Energy 106 (lb-ft²/s²)SB:
Required Wall Roof Sandbag Thickness (in)SB:
Expected Maximum Sandbag Throw Distance (ft)SB:
Minimum Separation Distance (ft)SB:

Water Containment System and Minimum Separation Distance:

Max Fragment Weight (lb)W:
Critical Fragment Velocity (fps)W:
Kinetic Energy 106 (lb-ft²/s²)W:
Water Containment System:
Minimum Separation Distance (ft)W:



Print This Form

Close Form

FRAGMENTATION DATA REVIEW FORM

Database Revision Date 3/31/08

Category:	HE Rounds	DODIC:	
Munition:	5" 38 Caliber Mk 35	Date Record Created:	7/30/2004
Primary Database Category:	projectile	Last Date Record Updated:	1/23/2008
Secondary Database Category:	5 in	Individual Last Updated Record:	Crull
Munition Case Classification:	Robust	Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	Explosive D
Explosive Weight (lb):	7.55000
Diameter (in):	5.0000
Max Fragment Weight (lb):	0.382160
Critical Fragment Velocity (fps):	2872

Theoretical Calculated Fragment Range

HFD [Range to No More Than 1 Hazardous Fragment per 600 Square Feet] (ft):	398
MFR-V [Vertical Range of Max Weight Fragment] (ft):	1566
MFR-H [Horizontal Range of Maximum Weight Fragment] (ft):	2100

Overpressure Distances

Inhabited Building Distance (12 psi), K40 Distance:	78
Inhabited Building Distance (09 psi), K50 Distance:	97
Intentional MSD (0065 psi), K328 Distance:	637

Minimum Thickness to Prevent Perforation

4000 psi Concrete (Prevent Spall):	4.75
Mild Steel:	0.89
Hard Steel:	0.73
Aluminum:	1.83
LEXAN:	5.56
Plexi-glass:	3.96
Bullet Resist Glass:	3.32

Required Sandbag Thickness

Max Fragment Weight (lb)SB:	0.382160
Critical Fragment Velocity (fps)SB:	2872
Kinetic Energy 106 (lb-ft ² /s ²)SB:	1.5761
Required Wall Roof Sandbag Thickness (in)SB:	36
Expected Maximum Sandbag Throw Distance (ft)SB:	220
Minimum Separation Distance (ft)SB:	220

Water Containment System and Minimum Separation Distance:

Max Fragment Weight (lb)W:	0.382160
Critical Fragment Velocity (fps)W:	2872
Kinetic Energy 106 (lb-ft ² /s ²)W:	1.5761
Water Containment System:	1100 gal tank
Minimum Separation Distance (ft)W:	275



Print This Form

Close Form



Figure 32. 5-inch Common Mk 32 Mods 1—4

5-inch Common Mk 32 Mods 1—4

Guns used in.....	5"/38
Over-all length, inches	
With cap & windshield.....	20.7
Without cap & windshield.....	13.6
Diameter of base, inches.....	4.973
Distance base to band, inches.....	2.43
Width of band, inches.....	2.25
Diameter at bourrelet, inches.....	4.985
Filling.....	Explosive D
Weight of filling, pounds.....	2.58
Weight of loaded projectile, pounds.....	54.00
Charge/weight ratio.....	5.0%
Cartridge Case.....	Mk 5
Primer.....	Mk 13 and all Mods
Tracer.....	Mk 9
Fuzes.....	Base — Mk 20 and all Mods

5-inch H.C. Mk 39 Mods 1 and 2

Guns used in.....	5"/51
	Bag or case gun
Over-all length, inches	
With nose fuze.....	17.0
Without nose fuze.....	13.18
Diameter of base, inches.....	4.985
Distance base to band, inches.....	1.15

Width of band, inches.....	2.0
Diameter at bourrelet, inches.....	4.985
Filling.....	Explosive D
Weight of filling, pounds.....	3.65
Weight of loaded projectile, pounds.....	50.0
Charge/weight ratio.....	7.0%
Cartridge Case.....	Bag gun
Primer.....	Mk 15 Mod 1
Tracer.....	Mk 5 Mod 1
Fuzes	
Base.....	Mk 28 and Mods
Nose.....	Mk 29 Mods 2 and 3 (P.D.F.)
	Mk 18 Mods 2, 3, and 4 (M.T.F.)
	Mk 50 and all Mods (M.T.F.)
	Mk 63 Mod 0 (M.T.F.)
	Steel Nose Plug
Auxiliary Detonating Fuze	
	Mk 17 and Mods
	Mk 46 Mod 0
	Mk 54 Mod 0 and 1

Only a very few 5"/51 guns are in service in the fleet.

When employed in the 5"/51 case gun, Cartridge Case Mk 3 and Primer Mk 13 and all Mods are used.

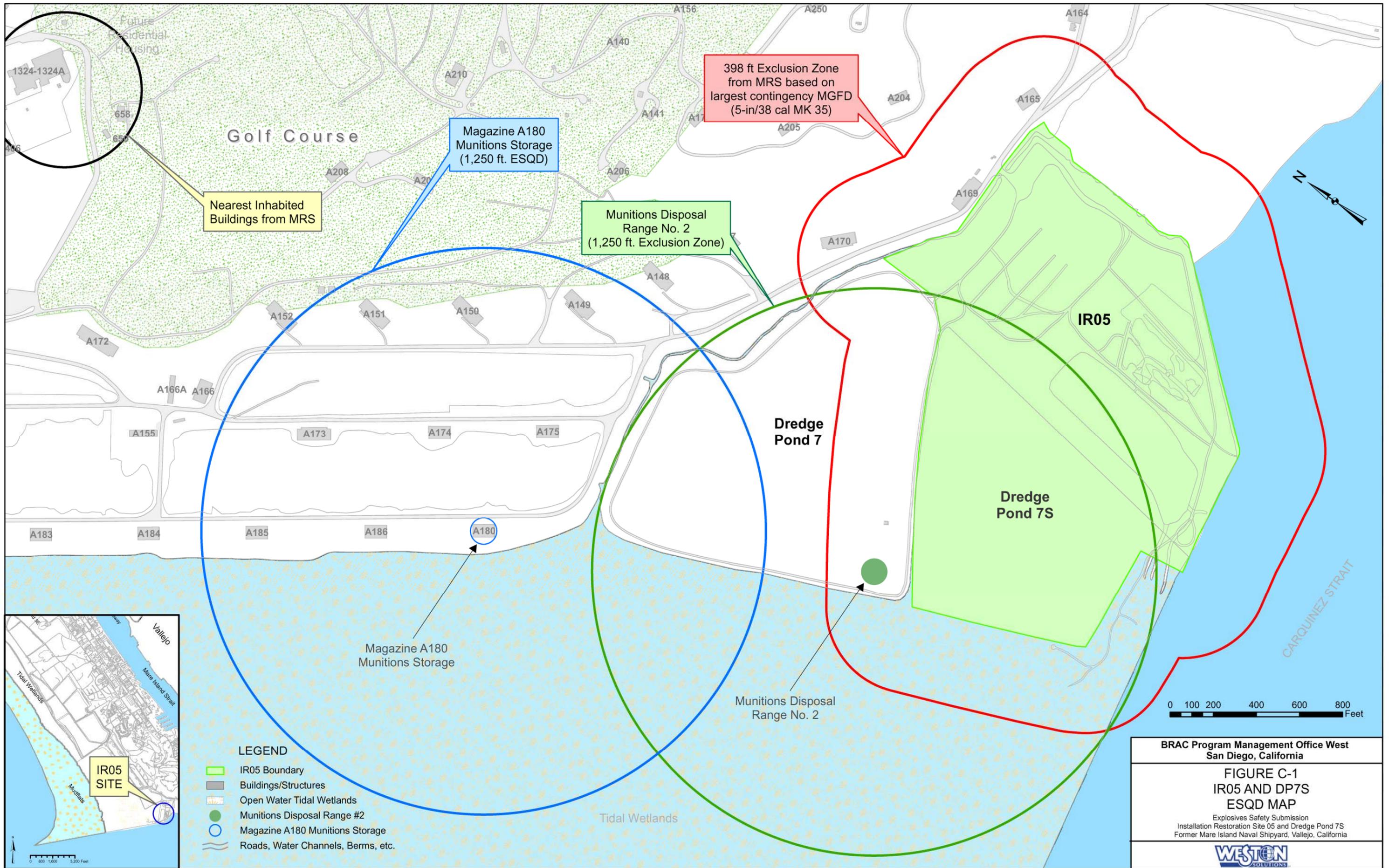
The Auxiliary Detonating Fuze Mk 54 is replacing the Mk 17 and Mk 46 in all assemblies.



Figure 33. 5-inch H.C. Mk 39 Mods 1 and 2

APPENDIX C

ESQD MAPS



BRAC Program Management Office West
San Diego, California

FIGURE C-1
IR05 AND DP7S
ESQD MAP

Explosives Safety Submission
Installation Restoration Site 05 and Dredge Pond 7S
Former Mare Island Naval Shipyard, Vallejo, California



APPENDIX D

SUPPORTING DOCUMENTATION



DEPARTMENT OF THE NAVY
NAVAL ORDNANCE CENTER
FARRAGUT HALL BLDG D-323
23 STRAUSS AVENUE
INDIAN HEAD MD 20640-5555

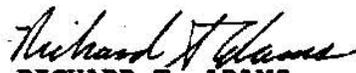
8020
OPR N711
Ser N71/5590
29 Jan 97

FIRST ENDORSEMENT on SUPSHIP Portsmouth ltr 8020 Ser 120/272
of 18 Dec 96

From: Commander, Naval Ordnance Center
To: Supervisor of Shipbuilding, Conversion, and Repair, USN,
Portsmouth, Director, SSPORTS Environmental Detachment,
Vallejo, CA

Subj: SITE APPROVAL CHANGE REQUEST FOR MAGAZINE A-180, MARE
ISLAND, VALLEJO, CALIFORNIA

1. Forwarded for continuing action.
2. This project, to reduce the explosives limit of torpedo Magazine A-180 to allow storage of C/D 1.1 explosives in support of removal of buried ordnance, has been reviewed with respect to and meets the explosives safety criteria of reference (a).
3. The new limit for Magazine A-180 is 1,000 pounds net explosives weight (NEW) C/D 1.1 material for dud-fired/unserviceable ammunition.


RICHARD T. ADAMS
By direction

Copy to:
NAVORDCEN ESSOPAC (Code 004) ←
ENGFLDACT West (Code 20)

**REQUEST FOR PROJECT SITE APPROVAL/EXPLOSIVES SAFETY CERTIFICATION NAVFAC 11010/31 (REV. 4-87)
PART II DIVISION A—EXPLOSIVES SAFETY
INSTRUCTIONS ON REVERSE AND NAVFACINST 11010.44E**

1. **NEW/Class/Division/ESQD arc* of project:** Convert the existing site approved demolition training range (Demolition Range #2) to a disposal range with a maximum limit of 25 pounds NEW for use by Navy Explosive Ordnance Disposal personnel in support of Mare Island unexploded ordnance removal operations.

2. **CNO Waivers and Exemptions:** None

3. **Personnel (numbers)**

No Change

	Proposed	Existing
Military:	0	0
Civilian:	0	0
Contractor:	0	0
Other:	0	0
Total:	0	0

4. **Facility Number/Type**

Disposal Range

Personnel

0

NEW

25 pounds maximum*

Class/Division

1.1, 1.2 (except (18) frag material),
1.3, and 1.4

Distance*

1250 feet

* Actual quantities will be kept as small as possible to mitigate noise impact on surrounding communities.

5. **Siting Rationale:**

The range will be used for the treatment, by open burning/open detonation, of recovered unexploded ordnance materials. The range is a Class D detonation site generating a 1250 foot ESQD arc per OP 5 Volume 1, Table 13-1 Note 4.

The range is exempt from Federal, State, and local permit requirements in support of on-site response actions pursuant to Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Sections 300.120(c) and 300.400(e) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR Part 300).

There are no IBD, PTR, or IM arc interfaces. No structures of any type are located in the immediate range area.

*Distance from project. Specify IB, (Inhabited Building); IL, (Intraline); IM, (Intermagazine); PTR, (Public Transportation Route); B (Barricaded); UB, (Unbarricaded)

6. **Point of Contact:**

John Randell, Mare Island Naval Shipyard Code 106.4

8. **Requested By:**

CDR R. J. WESTBERG, JR.

7. **Telephone Number:**

Commercial (707) 646-6430. DSN 253-6430

8. **Date:**

SEP 16 1994

REQUEST FOR PROJECT SITE APPROVAL/EXPLOSIVES SAFETY CERTIFICATION NAVFAC 11010/31 (REV. 4-87)
PART I
INSTRUCTIONS ON REVERSE AND NAVFACINST 11010.44E

SECTION A

1. To: COMMANDER, WESTERN DIVISION, NAVAL FACILITIES ENGINEERING COMMAND			2. From: COMMANDER, MARE ISLAND NAVAL SHIPYARD		
3. Program Year: 95	4. Cost (\$000): N/A	5. Type Funding: N/A	6. Activity UIC: N00221	7. Date: 9-13-94	
8. Category Code and Project Title: ORDNANCE DISPOSAL RANGE 148-20				9. Project Number: N/A	
10. Type of Project: <input type="checkbox"/> New Construction <input type="checkbox"/> Change Use <input type="checkbox"/> Addition to Existing Facility <input type="checkbox"/> Major Modification to Existing Facility			<input type="checkbox"/> Relocation of Structure <input type="checkbox"/> Maintenance and/or Repairs <input type="checkbox"/> Repair By Replacement <input checked="" type="checkbox"/> Other		11. Type of Request: <input type="checkbox"/> Site Approval <input checked="" type="checkbox"/> Explosives Safety Certification <input type="checkbox"/> Resubmittal
12. Project Description: Convert existing approved demolition training range No. 2 (Ordnance demolition) to an ordnance disposal range with a maximum NEW of 25 pounds. Existing ESQD Arc will not change.					
13. <u>6</u> Sets of Project Maps Attached			14. <u>5</u> Sets Part II Division(s) <u>A</u> Attached		

SECTION B

1. Name/Code/Phone No. of Reviewer: <i>June Packinlean, Code 09FNP, DSN 494-3767</i>		2. Date Received: <i>27 SEP 94</i>
3. Evaluation:		
4. EFD Action: (check appropriate box(es))		
<input type="checkbox"/> Site Approved <input type="checkbox"/> Site Disapproved <input type="checkbox"/> Returned <input type="checkbox"/> Additional Data	<input type="checkbox"/> Requires NAVFACHQ Approval <input checked="" type="checkbox"/> Explosives Safety <input type="checkbox"/> Airfield Safety <input type="checkbox"/> Electromagnetic Radiation Safety	
5. Date Approval/Forwarding: <i>9-30-94</i>	6. Signature of Approving/Forwarding Official: 	

SECTION C

1. Name and Code of Reviewer:		2. Date Received:
3. Safety Review Requested: (check appropriate box(es))		
<input type="checkbox"/> NAVSEA <input type="checkbox"/> CNO <input type="checkbox"/> DDESB <input type="checkbox"/> SPAWAR <input type="checkbox"/> NAVAIR <input type="checkbox"/> OTHER		4. Date:
5. Date of Safety Certification: <input type="checkbox"/> NAVSEA <input type="checkbox"/> CNO <input type="checkbox"/> DDESB <input type="checkbox"/> SPAWAR <input type="checkbox"/> NAVAIR <input type="checkbox"/> OTHER		

SECTION D

1. Approvals:- <input type="checkbox"/> Site Approved <input type="checkbox"/> Site Disapproved <input type="checkbox"/> Deferred/Returned <input type="checkbox"/> Explosives Safety Certification Approved <input type="checkbox"/> Explosives Safety Certification DISAPPROVED <input type="checkbox"/> Interim Construction Waiver Approved		2. Certification Identification:	
		3. Remarks:	
4. Other Approvals Required: <input type="checkbox"/> Airfield Safety Waiver Required <input type="checkbox"/> Final Explosives Safety Review Required		5. Approving Official:	6. Date:

ENCL 1



DEPARTMENT OF THE NAVY
ENGINEERING FIELD ACTIVITY, WEST
NAVAL FACILITIES ENGINEERING COMMAND
900 COMMODORE DRIVE
SAN BRUNO, CALIFORNIA 94066-2402

105
IN REPLY REFER TO:

11010
Ser 09F1JP/P1-212

001 -5 1994

From: Commanding Officer, Engineering Field Activity, West
To: Commander, Department of Defense Explosive Safety Board
Via: Commander, Naval Ordnance Center (N711)

Subj: SITE APPROVAL REQUEST TO INCREASE NET EXPLOSIVE WEIGHT
FOR EXISTING ORDNANCE DISPOSAL RANGE NO. 2, NAVAL
SHIPYARD, MARE ISLAND

Ref: (a) OPNAVINST 8020.8J
(b) NAVFACINST 11010.44E
(c) NAVSEA OP-5, Vol. 1 (Fifth Rev)

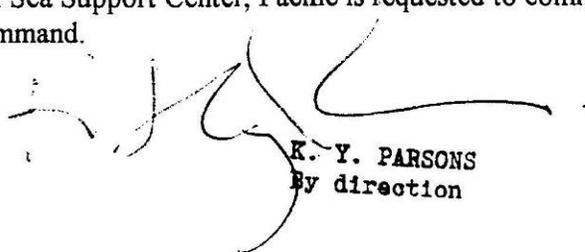
Encl: (1) NAVFAC Form 11010/31 (w/Part II, Div.A)
(2) Site Data Sketch dtd 27 Sep 94
(3) Station Map

1. In compliance with references (a), (b) and (c), enclosures (1) and (2) are forwarded to obtain site plan approval and final explosive safety review. Enclosure (3) is provided as additional information.

2. Site approval is requested to increase the Net Explosive Weight (NEW) of Disposal Range No. 2 from 5 pounds of Class 1.1 to 25 pounds of Class 1.1, 1.2 (except (18) frag material), 1.3, and 1.4 material. This is not a change in function nor does it increase or change the existing Explosive Safety Quantity Distance (ESQD) arc already approved for this range. The range will be used for the treatment, by open burning/open detonation, of recovered unexploded ordnance materials. The range is a Class D detonation site.

3. The existing site is compatible with related, planned, and existing facilities and land use. There is no cost associated with this project.

5. By copy of this letter, Naval Sea Support Center, Pacific is requested to comment directly to Naval Ordnance Command.


K. Y. PARSONS
By direction

Copy to:
NAVSEACENPAC (w/encls)
NAVSHIPYD Mare Island (Code 106.4) (w/encls (1) and (2))

C-861



DEPARTMENT OF THE NAVY
NAVAL ORDNANCE CENTER
FARRAGUT HALL BLDG D-323
23 STRAUSS AVENUE
INDIAN HEAD MD 20640-5555

8020
OPR N711
Ser N71/5857
4 Nov 94

FIRST ENDORSEMENT on EFA West ltr 11010 Ser 09F1JP/P1-212
of 5 Oct 94

From: Commander, Naval Ordnance Center
To: Commanding Officer, Engineering Field Activity West, Naval
Facilities Engineering Command

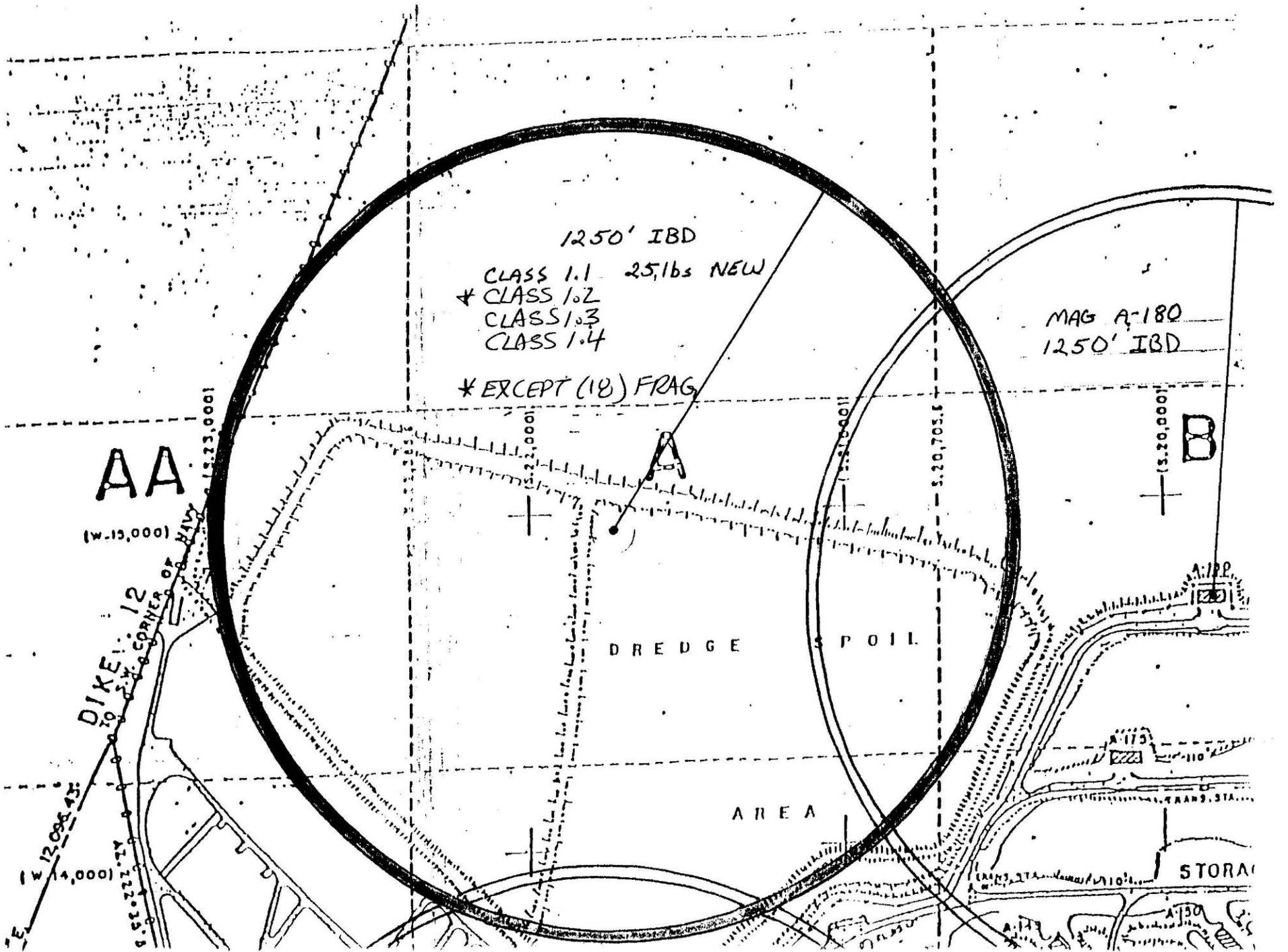
Subj: SITE APPROVAL REQUEST TO INCREASE NET EXPLOSIVE WEIGHT FOR
EXISTING ORDNANCE DISPOSAL RANGE NO. 2, NAVAL SHIPYARD,
MARE ISLAND

1. Readdressed and returned for continuing action.
2. This project has been reviewed with respect to and meets the explosives safety criteria of reference (c). Accordingly, the project is granted both explosives safety site and final safety approvals. The following stipulations must be satisfied:
 - a. The revised explosive limit for Ordnance Disposal Range No. 2 is 25 pounds net explosive weight (NEW) of all classes/divisions (C/D) of explosives except C/D 1.2 (18), which may not be disposed of on the range.
 - b. All other provisions of existing approvals for this range remain in effect.


EDWARD W. KRATOVIL
By direction

Copy to:
NAVSEACENPAC (Code 950)
NAVSHIPYD Mare Island (Code 106.4)

C-861





DEPARTMENT OF THE NAVY
NAVAL ORDNANCE SAFETY AND SECURITY ACTIVITY
FARRAGUT HALL
3817 STRAUSS AVENUE, SUITE 108
INDIAN HEAD, MD 20640-5151

8020
Ser N54-JE/9160
03 Mar 08

From: Commanding Officer, Naval Ordnance Safety and Security Activity
To: Base Realignment and Closure Program Management Office, West (BPMOW.MSB)
Subj: REQUEST FOR MODIFICATION TO SITE APPROVAL TO ALLOW USE OF BURIED EXPLOSION MODULE IN TP-16 AT FORMER NAVAL SHIPYARD, MARE ISLAND [T-138]
Ref: (a) DDESB memo DDESB-KO of 14 Jul 98
Encl: (1) DDESB memo DDESB-PE of 01 Nov 07
(2) Buried Explosion Module Printout, DDESB TP-16 dtd 24 Jul 08

1. Enclosure (1), which provides final safety approval to modify the site approval granted by reference (a), at the former Naval Shipyard (NAVSHIPYD), Mare Island, is forwarded for continuing action. The approval is based on the following conditions:

a. The current approved surface detonation limit of 25 pounds net explosives weight (NEW) of any Class/Division (C/D) material, that does not have a known fragment distance greater than 1,250 feet, remains unchanged.

b. There is an immediate need for treating a 7.2-inch Rocket (Mouse Trap), also known as a Hedgehog 7.2-inch Anti-Submarine Weapon, having a NEW of 31 pounds of C/D 1.1, with a long-term need for treating potential unknown items.

c. The use of Department of Defense Explosives Safety Board (DDESB)-approved engineering controls to mitigate blast overpressure and/or hazardous fragments resulting from intentional detonation operations of the 7.2-inch Rocket (Mousetrap) on Range 2 are authorized. Specifically, enclosure (2) requires that six feet of earth cover be applied for tamping, to reduce overpressure to 0.066 psi at 40 feet and the maximum fragment distance to 408 feet.

d. The use of enclosure (2) for items other than the 7.2-inch Rocket (Mousetrap) will require that specific information

Subj: REQUEST FOR MODIFICATION TO SITE APPROVAL TO ALLOW USE OF
BURIED EXPLOSION MODULE IN TP-16 AT FORMER NAVAL
SHIPYARD, MARE ISLAND [T-138]

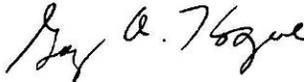
be submitted to the Naval Ordnance Safety and Security Activity (NOSSA)/N54 for concurrence, prior to initiating the treatment plan.

e. Recovered munitions and explosives of concern (MEC), to include demolition debris, will be inspected and certified free of explosive hazards, prior to release for off-site recycling and further demilitarization.

f. An amendment to the original Explosives Safety Submission (ESS) shall be submitted to the DDESB, via NOSSA N53, to account for the discovery of the 7.2-inch rocket.

2. If changes occur during or after completion of this effort that could increase explosive hazards to site workers or the public, due to the presence of military munitions at the site, an amendment to this ESS must be submitted through NOSSA, to the DDESB, for review and approval.

3. The NOSSA point-of-contact for this project is Mr. Jim Elligson, N546, at DSN: 354-4966, at Commercial: (301) 744-4966, or at E-mail: jim.elligson@navy.mil.



GARY A. HOGUE

By direction

Copy to:
CNO (N411; N453)
COMNAVFACENGCOM (ENV3)
NOSSA ESSOPAC (N5P)



DEPARTMENT OF DEFENSE EXPLOSIVES SAFETY BOARD
2461 EISENHOWER AVENUE
ALEXANDRIA, VIRGINIA 22331-0600

DDESB-PE

NOV 01 2007

MEMORANDUM FOR COMMANDING OFFICER, NAVAL ORDNANCE SAFETY AND SECURITY ACTIVITY (ATTENTION: CODE N54)

SUBJECT: DDESB Approval of Request for Modification to Site Approval to Allow Use of Buried Explosion Module in TP-16 at Former Naval Shipyard, Mare Island [N00221/T-138]

- References:
- (a) Naval Ordnance Safety and Security Activity (NOSSA) ltr 8020 Ser N54-TD/7292 of 14 August 2007, First Endorsement on BRAC PMO WEST ltr 5090 Ser BPMOW.MSB/0708 of 24 July 2007, Subject: Request for Modification to Site Approval to Allow Use of Buried Explosion Module in TP-16 at Former Naval Shipyard, Mare Island [N00221/T-138]
 - (b) DoD 6055.9-STD, DoD Ammunition and Explosives Safety Standards, 5 October 2004
 - (c) DDESB-KO Memorandum of 14 July 1998, Subject: Unexploded Ordnance Removal in the Dredge Spoils at the Former Mare Island Naval Shipyard

The Department of Defense Explosives Safety Board (DDESB) Staff has reviewed the subject site approval forwarded by reference (a), against the requirements of reference (b). Based on the information provided, approval is granted to modify the site approval granted by reference (c) at Former Naval Shipyard, Mare Island. This approval is based on the following:

- a. The use of DDESB approved engineering controls to mitigate blast overpressure and/or hazardous fragments resulting from intentional detonation operations on Range 2 of the 7.2-inch Rocket (Mouse Trap) are authorized provided the Navy ensures; overpressure is ≤ 0.066 psi and the maximum fragment distance are contained within the authorized inhabited building distance of 1,250 feet.
- b. The Navy must notify and provide the proposed engineering controls to the DDESB if weapons are recovered with a net explosive weight or a maximum fragment distance exceeding those of the 7.2-inch Rocket prior to disposal.
- c. All other requirements established via reference (c) remain in effect.

ENC (1)

BURIED EXPLOSION MODULE

(Version 5.0)

Based on DDESB Technical Paper 16, Revision 2 and EARTHEX software

(ENGLISH UNITS)

SELECT ITEM DESCRIPTION

7.2" Rocket (Mousetrap) ▼

SINGLE ITEM NEW (lbs)

31.00

SINGLE ITEM TNT EQUIVALENCE (lbs)

31.00

MAXIMUM FRAGMENT WEIGHT (lbs)

0.1145

MAXIMUM FRAGMENT VELOCITY (ft/s)

8,051

ENTER TOTAL NUMBER OF ITEMS

1

ENTER WEIGHT OF BOOSTER (lbs)

5.00

TOTAL TNT WEIGHT (lbs)

36.00

ENTER DEPTH OF BURIAL (ft)

6.00

ENTER RANGE (for pressure calculation) (ft)

1,250

SELECT SOIL TYPE

(See TP 16, Revision 2 for soil details)

Dry Sandy Clay ▼

CRATER OR CAMOUFLET?

CRATER

TRUE CRATER RADIUS (ft)

8.13

MAXIMUM SOIL EJECTA RANGE (ft)

408

FRAGMENT EXIT VELOCITY (ft/s)

4

FRAGMENT LAUNCH ANGLE (°)

36.4

MAXIMUM FRAGMENT RANGE (ft)

12

RANGE AT WHICH PRESSURE IS 0.066 PSI (328W ^{1/3} EQUIVALENT) (ft)	40
FRAGMENT HAZARD RANGE (ft)	408
PRESSURE AT FRAGMENT HAZARD RANGE (psi)	0.0047
PRESSURE AT FRAGMENT HAZARD RANGE (dB)	124.2
PRESSURE AT RANGE ENTERED (psi)	0.0013
PRESSURE AT RANGE ENTERED (dB)	113.2

Scaled Depth and/or Scaled Distance out of range--Pressure extrapolated

7/24/2007

1

ENCL (2)