FINAL

MILITARY MUNITIONS RESPONSE PROGRAM REMEDIAL INVESTIGATION ADDENDUM #1 REPORT

- **B003 Area Risk Assessment**
- **Munitions Response Site (MRS) Delineations**
- **MRS Prioritization Protocol**
- **Munitions and Explosives of Concern Hazard Assessment**

Fort Hancock Formerly Used Defense Site
Monmouth County, New Jersey

Prepared for:

U.S. Army Corps of Engineers
Baltimore District
Contract: W912DR-09-D-0012, Delivery Order 0002

US Army Corps of Engineers®
BUILDING STRONG®

Prepared by:

ERT, Inc.

Laurel, Maryland 20707

September 2016

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Laurel, Maryland 20707

03/10/15

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COMPLETION OF SENIOR TECHNICAL REVIEW

This document has been produced within the framework of the ERT, Inc. (ERT) quality management system. As such, a senior technical review has been conducted. This included review of all elements addressed within the document, proposed or utilized technologies and alternatives and their applications with respect to project objectives and framework of U.S. Army Corps of Engineers regulatory constraints under the current project, within which this work has been completed.

03/10/15

Jennifer Harlan Date
Senior Technical Reviewer

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ACRONYMS and ABBREVIATIONS

ALM	Adult Lead Model
AP HE	armor piercing high explosive
BAF	bioaccumulation factor
bgs	below ground surface
BLRA	baseline risk assessment
CENAB	U.S. Army Corps of Engineers, Baltimore District
CENAN	U.S. Army Corps of Engineers, New York District
CFR	Code of Federal Regulations
CHE	chemical hazard evaluation
COC	chemical of concern
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
CSF	cancer slope factor
CSM	conceptual site model
CWM	chemical warfare materiel
DoD	Department of Defense
DQI	data quality indicator
DQO	data quality objective
Eco-SSL	ecological soil screening level
EE/CA	Engineering Evaluation Cost Analysis
EHE	explosive hazard evaluation
EM CX	Environmental & Munitions Center of Expertise
ERT	ERT, Inc.
ft	feet
FUDS	Formerly Used Defense Site
HHE	health hazard evaluation
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
IEUBK	integrated exposure biokinetic uptake
IUR	inhalation unit risk
LOAEL	lowest observed adverse effects level
MC	munitions constituents
MEC	munitions and explosives of concern
MEC HA	MEC Hazard Assessment
MD	munitions debris
mg/kg	milligram per kilogram
mg/kg/d	milligrams per kilogram per day

mg/m^3	milligrams per cubic meter
MMRP	Military Munitions Response Program
MRA	Munitions Response Area
MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocol
MS	matrix spike
MSD	matrix spike duplicate
NKSH	no known or suspected hazard
NJDEP	New Jersey Department of Environmental Protection
NOAEL	no observed adverse effect levels
NPS	National Park Service
OSWER	Office of Solid Waste and Emergency Response
PAOI	potential area of interest
PEF	particulate emission factor
QA	quality assurance
QC	quality control
RAGS	Risk Assessment Guidance for Superfund
RI	Remedial Investigation
RPD	relative percent difference
RSL	regional screening level
SI	Site Inspection
SLERA	screening level ecological risk assessment
UCL	95% upper confidence limit
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
UXO	unexploded ordnance
µg/dL	micrograms per deciliters

GLOSSARY OF TERMS

Anomaly Avoidance – Techniques employed on property known or suspected to contain unexploded ordnance (UXO), other munitions that may have experienced abnormal environments (i.e., discarded military munitions [DMM]), munitions constituents (MC) in high enough concentrations to pose an explosive hazard, regardless of configuration, to avoid contact with potential surface or subsurface explosive hazards, to allow entry to the area for the performance of required operations.

Defense Site – All locations that are or were owned by, leased to, or otherwise possessed or used by the DoD. The term does not include any operational range, operating storage or manufacturing facility, or facility that is used or was permitted for the treatment or disposal of military munitions.

Military Munitions – Military munitions means all ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the DoD, the Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants; explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives, and chemical warfare agents; chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges; and devices and components thereof. The term does not include wholly inert items; improvised explosive devices; and nuclear weapons, nuclear devices, and nuclear components, other than nonnuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 U.S.C. 201 1 et seq.) have been completed (10 U.S.C. 101(e)(4)(A) through (C)).

Munitions and Explosives of Concern (MEC) – This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks means (A) UXO, as defined in 10 U.S.C. 101(e)(5); (B) DMM, as defined in 10 U.S.C. 2710(e)(2); or (C) MC (i.e., trinitrotoluene and cyclotrimethylenetrinitramine), as defined in 10 U.S.C. 2710(e)(3), present in high enough concentrations to pose an explosive hazard.

Munitions Constituents – Any materials originating from UXO, DMM, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (10 U.S.C. 2710(e)(3)).

Munitions Debris (MD) – Remnants of munitions (i.e., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal.

Munitions Response – Response actions, including investigation, removal actions and remedial actions to address the explosives safety, human health, or environmental risks presented by UXO, DMM, or MC, or to support a determination that no removal or remedial action is required.

Munitions Response Area (MRA) – Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples include former ranges and munitions burial areas. An MRA is composed of one or more MRSs.

Munitions Response Site – A discrete location within an MRA that is known to require a munitions response.

Unexploded Ordnance – Military munitions that (A) have been primed, fuzed, armed, or otherwise prepared for action; (B) have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and (C) remain unexploded whether by malfunction, design, or any other cause (10 U.S.C. 101(e)(5)(A) through (C)).

UXO-Qualified Personnel – Personnel who have performed successfully in military EOD positions or are qualified to perform in the following Department of Labor, Service Contract Act, Directory of Occupations, contractor positions: UXO Technician II, UXO Technician III, UXO Safety Officer, UXO Quality Control Specialist, or Senior UXO Supervisor.

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

EXECUTIVE SUMMARY

<u>Introduction</u>

ERT, Inc. (ERT) performed an Addendum (#1) to the Remedial Investigation (RI) for the United States Army Corps of Engineers (USACE), at the Fort Hancock Formerly Used Defense Site (FUDS), located in Monmouth County, New Jersey. The work was performed as a performance-based firm fixed price task order under the Multiple-Award Military Munitions Services Contract (W912DR-09-D-0012, Delivery Order 0002), which is administered by the Baltimore District (CENAB), and for which technical oversight is provided by CENAB. The USACE New York District (CENAN) is the project life cycle manager.

The Fort Hancock FUDS is located on the Sandy Hook peninsula in Monmouth County, New Jersey and comprises five munitions response sites (MRSs). RI activities were conducted during the fall and winter of 2011, and the RI Report was finalized in January 2014. This RI Addendum is the result of recommendations arising from the Final RI Report, which concluded that in the B003 Area (within MRS-1), arsenic and lead in soil could potentially pose a threat to human health, and that antimony, arsenic, copper, lead, selenium, and thallium could pose a threat to ecological receptors. The B003 Area contained a grid that was intrusively investigated and defined as a potential munitions and explosives of concern (MEC) disposal area in the 1999 Engineering Evaluation Cost Analysis (EE/CA). Site Inspection (SI) sampling activities in 2006 showed elevated concentrations of metals at a single surface soil sample location at the southern end of the B003 Area.

In addition, Munitions Response Site Prioritization (MRSPP) evaluations and MEC Hazard Assessments (MEC HAs) were not included in the 2014 RI Report, as MRS footprints (boundaries) were undergoing revision and review based on the results of the RI. Site characteristics change with MRS delineations, and MRS footprint reduction and delineations were needed before MRSPPs and MEC HAs could be generated.

<u>Purpose and Scope</u>

The RI Report recommended that additional sampling be completed in the B003 Area in order to adequately and statistically characterize this possible munitions constituents (MC) contamination, since the RI Report conclusions were based largely on the single SI surface soil sample (ERT, 2014a). The purpose of this RI Addendum is to present the results of the July 15, 2014 sampling and to provide complete characterization of the nature and extent of any potential MC contamination resulting from the past U.S. military use of Fort Hancock specific to the B003 Area. The scope of the additional activities included surface soil sampling for select metals on a grid basis in the vicinity of the sample collected in the B003 Area during the SI (USACE, 2007) that had the maximum metals concentrations. The RI Report included a Baseline Risk Assessment (BLRA), which comprised a Human Health Risk Assessment (HHRA) and Screening Level Ecological Risk Assessment (SLERA). The results of the RI Addendum sampling were used to update the B003 Area portion of the BLRA.

Additionally, the RI Addendum presents revised MRS delineations, MRSPP evaluations, and MEC HAs, which have been prepared in accordance with the following guidance documents and rulemaking: U.S. Army Corps of Engineers Formerly used Defense Site Program *Handbook on Delineation and Munitions Response Site Prioritization Protocol Implementation* (29 March 2014); Department of Defense, Office of the Secretary, 32 CFR Part 179, Munitions Response Site

Prioritization Protocol, Final Rule; and the United States Environmental Protection Agency *Munitions and Explosives of Concern Hazard Assessment Methodology*, Interim October 2008, Publication No. 505B08001.

Data Needs and Data Quality Objectives

Data were obtained from environmental sampling of surface soil completed on July 15, 2014, to further characterize MC in the B003 Area. A total of 20 discrete surface soil samples (plus quality control [QC] samples) were collected on a 25 ft x 25 ft grid basis. The grid was established in the area of the SI sample (FHK-NP-SS-06-03) that had the maximum metals concentrations. These data were used to update the HHRA and SLERA for the B003 Area. Prior to grid establishment and surface soil sampling, a UXO Technician II performed a visual inspection with a magnetometer to ensure the surface was clear of MEC and munitions debris (MD). No MEC or MD was found during these anomaly avoidance activities.

The data quality objectives (DQOs) were based on the overall objective of characterizing the nature and extent of MC contamination in the B003 Area and the data needed to accomplish this objective. All DQOs were met.

Updated Human Health Risk Assessment

The updated HHRA dataset included the 2014 RI Addendum samples and the one SI surface soil sample (FHK-NP-SS-06-03) that the original BLRA concluded was driving the potential threats to human health because it contained the maximum metals concentrations in the B003 Area.

Human health risks were quantified for all identified site receptors reflecting current and future site use. The HHRA concluded that potential site contaminants in the B003 Area soil do not pose a threat to human health.

Updated Screening Level Ecological Risk Assessment

The SLERA evaluated potential risks to terrestrial receptors that might contact the site soil within the B003 Area. Similar to the HHRA, the 2014 Addendum SLERA dataset consisted of samples FHK-NP-SS-06-03 and the 2014 soil samples. Both direct exposure and indirect exposure via the food web were considered. Based on the evaluation presented within the SLERA, potential contaminants present in soil at the B003 Area have a limited potential to pose a threat to ecological receptors.

Summary and Conclusions

The nature and extent of MC contamination at the B003 Area has been characterized. The updated HHRA and SLERA conclude that:

- No potential site contaminants posing a human health threat were identified for the B003 Area
- Based on the evaluation presented within the SLERA, potential contaminants present in soil at the B003 Area have a limited potential to pose a threat to ecological receptors.

Therefore, with regard to MC contamination, no further action is recommended for the B003 Area.

Revision of MRS boundaries resulted in six MRSs for the Fort Hancock FUDS, each having a corresponding FUDS project number. These six MRSs were renumbered (relative to the original MRS designations). The renumbered MRSs and their corresponding acreages are as follows:

- Project/MRS 03, Northern Portion Proving Ground (30.2 acres)
- Project/MRS 05, Southern Portion Proving Ground (51 acres)
- Project/MRS 06, Livens Discovery Area (24 acres)
- Project/MRS 07, Remaining Land (952 acres)
- Project/MRS 08, NPS Excluded Area (140 acres)
- Project/MRS 09, Water Ranges (129,611 acres)

With regard to MRSPP evaluations, the following ratings were developed for each MRS:

- Project/MRS 03: MRS Priority 3
- Project/MRS 05: MRS Priority 2
- Project/MRS 06: MRS Priority 2
- Project/MRS 07: MRS Priority 3
- Project/MRS 08: MRS Priority 4
- Project/MRS 09: No Longer Required

With regard to MEC HA evaluations, the following hazard level categories were developed:

- Project/MRS 03: Hazard level 3
- Project/MRS 05: Hazard level 2
- Project/MRS 06: Not evaluated using MEC HA because the area was excluded by NPS from the RI investigation (NPS has recently allowed access to conduct the RI fieldwork and this effort is in process; a MEC HA will be generated based on the field findings).
- Project/MRS 07: Hazard level 3
- Project/MRS 08: Not evaluated using MEC HA; no score can be generated in these areas to which NPS has indefinitely refused right of entry to conduct the RI.
- Project/MRS 09: Not evaluated using MEC HA because no specific MEC hazard has been identified in off-shore areas.

Table ES-1 provides a crosswalk between the revised MRS designations and those in the 2014 RI Report.

Table ES-1. MRS Designations

Revised MRS Designation	MRS Designation - January 2014 RI Report
MRS 03, Northern Portion Proving Ground	MRS-1: MEC/MD Hazard Area 1A
MRS 05, Southern Portion Proving Ground	MRS-1 through 5: MEC/MD Hazard Areas 1B , 2A , 3A/3B , 4A , and 5A/5B
MRS 06, Livens Discovery Area	MRS-7 where NPS excluded RI activities (24 acres)
MRS 07, Remaining Land	Remaining acreage of MRSs-1 through 7
MRS 08, NPS Excluded Area	Portions of MRSs-1 through 6 where NPS denied right of entry for RI activities
MRS 09, Water Ranges	MRS 08

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1.0 INTRODUCTION

ERT, Inc. (ERT), performed an Addendum (#1) to the Remedial Investigation (RI) for the United States Army Corps of Engineers (USACE), at the Fort Hancock Formerly Used Defense Site (FUDS), located in Monmouth County, New Jersey. The work was performed as a performance-based firm fixed price task order under the Multiple-Award Military Munitions Services Contract (W912DR-09-D-0012, Delivery Order 0002), which is administered by the Baltimore District (CENAB), and for which technical oversight is also provided by CENAB.

This project falls under the Military Munitions Response Program (MMRP) of the Defense Environmental Restoration Program/FUDS. The Department of Defense (DoD) established the MMRP under the DERP to address munitions constituents (MC), and munitions and explosives of concern (MEC) (comprising unexploded ordnance [UXO], discarded military munitions, and MC in high enough concentrations to pose an explosive threat) that are located on munitions response sites (MRSs) at current and former military installations. MEC are a safety hazard and may constitute an imminent and substantial endangerment to site personnel and the public. ERT performed all work in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act Section 104 and the National Contingency Plan, Sections 300.120(d) and 300.400(e). Applicable provisions of Chapter 29 of the Code of Federal Regulations 1910.120 apply. All activities involving work in areas potentially containing MEC hazards was conducted in full compliance with USACE, Department of the Army, and DoD safety regulations.

The Project Team consisted of ERT, CENAB and USACE New York District (CENAN), as well as other government and non-government agencies with specific expertise for implementation of specialized components of the field operations. For purposes of this RI Report Addendum, CENAB and CENAN are referred to as "USACE", unless specific responsibilities are discussed.

1.1 Purpose and Scope

RI activities were conducted during the fall and winter of 2011, and the RI Report was finalized in January 2014. As described in more detail in the Final RI Report (ERT, 2014a), the B003 Area – falling within Munitions Response Site (MRS) 03 – represents a special case at the Fort Hancock FUDS. During the 1998 Engineering Evaluation Cost Analysis (EE/CA) investigation (USACE, 1999), several MEC items were found in a grid within this area (Grid B003); however, not all of the anomalies, some of which may have been MEC, were excavated. The EE/CA document describes the B003 Grid as a MEC disposal area. While during the RI only MD (no MEC) was found in the B003 Area, the anomalies identified in Grid B003 during the EE/CA were not further intrusively investigated, in accordance with the approved RI Work Plan (ERT, 2010).

However, based on soil sample results, the Final RI concluded that in the B003 Area, arsenic and lead in soil could potentially pose a threat to human health, and that antimony, arsenic, copper, lead, selenium, and thallium could pose a threat to ecological receptors. The purpose of this RI Addendum is to address the recommendations of the RI arising from these findings.

The RI Report recommended that additional sampling be completed in the B003 Area in order to adequately and statistically characterize this possible MC contamination (ERT, 2014a). This RI Addendum presents the results of the July 15, 2014 sampling and provides complete characterization of the nature and extent of any potential MC contamination resulting from the past U.S. military use of Fort Hancock specific to the B003 Area. All activities were performed in accordance with the RI Work Plan Addendum (ERT, 2014b).

The scope of the additional activities included surface soil sampling for select metals on a grid basis in the vicinity of the 2007 Site Inspection (SI) (USACE, 2007) sample that contained the maximum metals concentrations. The RI Report included a Baseline Risk Assessment (BLRA), which comprised a Human Health Risk Assessment (HHRA) and Screening Level Ecological Risk Assessment (SLERA). The results of the RI Addendum sampling were used to update the B003 Area portion of the BLRA.

The RI Addendum also describes the revised Fort Hancock MRSs, delineated in accordance with the RI results presented in the 2014 Report and the U.S. Army Corps of Engineers Formerly used Defense Site Program *Handbook on Delineation and Munitions Response Site Prioritization Protocol Implementation* (29 March 2014). Munitions Response Site Prioritization Protocol (MRSPP) evaluations and MEC Hazard Assessments were not included in the 2014 report, as MRS footprints were undergoing revision and review at the time the report was generated. The MRSPP evaluations and MEC HAs are included in this addendum for the new MRSs, in accordance with 32 CFR Part 179, Final Rule and the U.S. Environmental Protection Agency Publication No. 505B08001. The revised MRSs and MRSPP and MEC HA evaluations are presented in Section 6.0.

1.2 Property Description

Fort Hancock is located on the Sandy Hook peninsula in Monmouth County, New Jersey, in the Lower Bay of the Hudson River. Raritan Bay is north of Fort Hancock, Sandy Hook Bay borders the site on the west, and the Atlantic Ocean is east of the peninsula. The peninsula, which encompasses approximately 1,700 acres, is known as the Sandy Hook Unit of the Gateway National Recreation Area and is a National Historic Landmark. It is currently managed by the Department of the Interior (National Park Service [NPS]) and the United States Coast Guard (USCG), and is used for a variety of recreational purposes year-round. An active USCG Station is positioned on the northwest corner of the peninsula (approximately 68 acres). The closest city is Highlands, located on the mainland of New Jersey, south of the peninsula.

The RI evaluated seven land-based MRSs and one off-shore MRS. Based on the areas where MEC and MD were found during the RI, the MRS footprints were significantly revised. Five land-based MRSs were redefined, based on the presence or suspected presence of MEC in discrete areas. The new MRSs are described in Section 6.0 of this Addendum and shown on Figures A-2 through A-8 in Appendix A.

The B003 Area, shown in Figure A-1, lies within MRS 03, the Northern Portion Proving Ground. It is bounded on the north by the New Proving Ground Battery Firing Point, on the south by parking area I, on the west by Atlantic Drive, and on the east by the multi-use path.

1.3 Problem Identification

SI sampling activities showed slightly elevated concentrations of metals at a single surface soil sample location, identified as FHK-NP-SS-06-03 and located approximately 150 feet south of the B003 Grid (see Figure A-1). The SI sample data were used to evaluate human health and ecological risks during the RI. The RI investigation determined that in the B003 Area, arsenic and lead in soil could potentially pose a threat to human health, and that antimony, arsenic, copper, lead, selenium, and thallium could pose a threat to ecological receptors. However, these conclusions were based largely on the single SI surface soil sample that contained the maximum detections of these metals. The RI Report concluded that the nature and extent of contamination for this portion of MRS 03 (Northern Portion Proving Ground) had not been determined and that additional sampling was needed in order to adequately and statistically characterize this possible MC contamination (ERT, 2014a).

2.0 REMEDIAL INVESTIGATION ADDENDUM OBJECTIVES

2.1 RI Addendum Objectives

The objective of this RI Addendum is to adequately characterize the nature and extent of any potential MC contamination resulting from the past United States military use of Fort Hancock specific to the B003 Area. In developing this objective, the B003 Area was first characterized during the RI (ERT, 2014a), as identified below.

A second objective is to describe the five new MRSs and present the results of the MRSPP and MEC HA evaluations, as discussed in Section 6.0.

2.2 Site Characterization

2.2.1 MEC/MD

The B003 Area was completely characterized for MEC and munitions debris (MD) in the RI Report, which concluded that MRS 03 has a moderate to high probability of encountering MEC/MD. This Addendum does not impact or otherwise affect the conclusions presented in the RI Report with regard to any MEC/MD hazards.

2.2.2 MC

Based on the HHRA and SLERA conclusions in the RI Report, exposure routes and MC migration pathways in the B003 Area are considered complete for soil, and antimony, arsenic, copper, lead, selenium and thallium were chemicals of potential concern (COPCs) for this Addendum. Section 5.0 presents the analysis of risk for the B003 Area based on the additional characterization sampling.

2.3 Data Needs and Data Quality Objectives

2.3.1 Data Needs

Data were obtained from soil sampling on a 25 feet (ft) x 25 ft grid basis to determine the distribution and concentrations of the COCs in soil at the B003 Area. The grid was established in the area of the SI sample (FHK-NP-SS-06-03) that had the maximum metals concentrations. As described in Section 5.0, these data were used to update the HHRA and SLERA for the B003 Area.

2.3.2 Data Quality Objectives

The data quality objectives (DQOs) were based on the overall objective of characterizing the nature and extent of MC contamination in the B003 Area and the data needed to accomplish this objective. As presented in the approved Work Plan (ERT, 2014b), Table 2-1 presents the overall DQOs for this RI Addendum. All DQOs were met in accordance with the site-specific DQO statements presented in the table.

Table 2-1. Data Quality Objectives

Data Quality Objective Element	Site-Specific DQO Statement
Project Objective(s) Satisfied	To determine if further actions are required to support the continued use of the site for recreational activities
Data User Perspective(s)	To obtain data that satisfy compliance, risk, and if needed, remedy requirements
Contaminant or Characteristic of Interest	To characterize the nature and extent of MC contamination. Select metals to include antimony, arsenic, copper, lead, thallium, and selenium.
Media of Interest	Soil
Required Sampling Locations or Areas and Depths	Soil samples collected in a small vegetated area bounded by asphalt in the vicinity of the SI sample FHK-NP-SS-06-03. Samples collected in a grid pattern with 25 ft spacing. Depth of 0-6 inches (i.e., surface samples).
Number of Samples Required	20 samples taken in a 25 x 25 ft grid formation in the vicinity of the maximum metals SI sample in the B003 Area.
Reference Concentration of Interest or Other Performance Criteria	Human Health: United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs) and New Jersey Soil Remediation Standards. Ecological Risk: USEPA's Eco-Soil Screening Levels and New Jersey Department of Environmental Protection (NJDEP) Ecological Screening Criteria table
Sampling Method	Obtain discrete surface soil using disposable hand trowels.
Analytical Method	Select metals (antimony, arsenic, copper, lead, selenium, and thallium) analysis by SW-846 Method 6010C.

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3.0 CHARACTERIZATION OF MUNITIONS CONSTITUENTS

This section describes the field activities that were performed during the RI Addendum at the B003 Area. All activities were performed in accordance with the RI Work Plan Addendum (ERT, 2014b).

Environmental sampling of surface soil (0-6 inches below ground surface [bgs]) was completed on July 15, 2014, to further characterize MC in the B003 Area. Soil sampling was focused on a 200 ft x 75 ft area approximately 150 ft south of the EE/CA B003 Grid, where SI sampling indicated elevated metals concentrations. A total of 20 discrete surface soil samples (plus quality control [QC] samples) were collected within the area, on a 25 ft x 25 ft grid basis, as identified in Figure A-1 in Appendix A. Prior to grid establishment and surface soil sampling, a UXO Technician II performed a visual inspection with a hand-held Schonstedt GA-52 Cx flux-gate magnetometer to ensure the surface was clear of MEC/MD. No MEC or MD was found during these anomaly avoidance activities.

All surface soil samples were collected by advancing a disposable scoop into the consistently brown, sandy soil to 6 inches bgs. All soil sampling intervals were visually inspected for staining, discoloration, odors, and debris indicative of contamination; there were no notable observations of these characteristics. All disposable sampling equipment was disposed of as regular municipal waste.

All samples were containerized in 8-ounce glass jars and immediately place on ice. Following chain-of-custody procedures, samples were delivered to Accutest Laboratories (Accutest) of Dayton, New Jersey for antimony, arsenic, copper, lead, selenium, and thallium analysis by SW-846 Method 6010C.

A summary of the soil sampling conducted, including sample names, type of analysis, and sample locations is presented in Tables 3-1 and 3-2.

Table 3-1. Soil Sampling Summary

Media	Location	Sample Type	Analytical Parameter	Number of Samples[1]	Rationale
Surface Soil	B003 Area	Discrete	Select Metals[2]	20	Characterize the nature and extent of MC contamination in B003 Area

Notes:
[1] Does not include QC samples.
[2] Select metals (antimony, arsenic, copper, lead, selenium, and thallium) by SW-846 Method 6010C.

Table 3-2. Soil Sample Locations

Sample Name	Location	
	Northing	Easting
FHRI-B003-SO-01	4480067.37	584927.55
FHRI-B003-SO-02	4480063.86	584920.62
FHRI-B003-SO-03	4480060.71	584913.60
FHRI-B003-SO-04	4480057.47	584906.49
FHRI-B003-SO-05	4480054.05	584900.01
FHRI-B003-SO-06	4480050.90	584893.35
FHRI-B003-SO-07	4480047.48	584886.33
FHRI-B003-SO-08	4480044.24	584879.49
FHRI-B003-SO-09	4480074.30	584923.77
FHRI-B003-SO-10	4480071.06	584916.93
FHRI-B003-SO-11	4480067.82	584910.18
FHRI-B003-SO-12	4480064.49	584903.16
FHRI-B003-SO-13	4480061.16	584896.50
FHRI-B003-SO-14	4480057.83	584889.66
FHRI-B003-SO-15	4480054.41	584882.91
FHRI-B003-SO-16	4480051.08	584876.25
FHRI-B003-SO-17	4480081.22	584920.44
FHRI-B003-SO-18	4480077.90	584913.96
FHRI-B003-SO-19	4480074.66	584906.94
FHRI-B003-SO-20	4480071.24	584900.10

Notes: Coordinate System: WGS84 UTM Zone 18N, Meters

4.0 REMEDIAL INVESTIGATION ADDENDUM RESULTS

Environmental sampling of surface soil for MC in the B003 Area was completed as described in Section 3.0. The analytical results for the RI Addendum samples, and the SI sample, are presented in Table B-1 and Table B-2, respectively, of Appendix B-1. Complete analytical reports for the RI Addendum samples are presented in Appendix B-2 (provided on CD only). A formal screening of the data is contained in Section 5.0. The discussions below focus on the results of the RI Addendum sampling.

4.1 Munitions Constituents Findings

Twenty discrete soil samples were collected on July 15, 2014 in the B003 Area (see Figure A-1), where SI sampling indicated elevated metals concentrations. The samples were analyzed for select metals (antimony, arsenic, copper, lead, selenium, and thallium) by SW-846 Method 6010C. Each of these metals was detected at least once in the samples. Summary statistics for the samples collected are provided in Table 4-1.

Table 4-1. Summary Statistics for Soil Samples

Metal	# Samples[1]	# Detects	Min	Max	Mean
Antimony	20	20	0.54 J	34.9	3.5
Arsenic	20	20	3.4	24.5	6.8
Copper	20	20	5.8	58.9	16.8
Lead	20	20	27.3	286	80.9
Selenium	20	1	0.43 U	0.78 J	0.78
Thallium	20	4	0.43 U	0.88 J	0.6

Legend:
[1] Does not include QC samples
Mean calculation does not include non-detects
All results in milligrams per kilogram (mg/kg)

The RI Addendum sampling results did not indicate significant concentrations of the COC metals. Sample B003-SO-15 contained antimony at a concentration (34.9 mg/kg) higher than the maximum antimony concentration in the old SI sample (26.4 mg/kg), but otherwise, the RI Addendum samples contained relatively low concentrations compared to the SI sample. That is, the RI Addendum samples did not confirm the levels of COC metals found in the SI sample. A formal screening of the results against the appropriate regulatory standards is included in the Section 5.0 HHRA.

4.2 Data Quality Assessment

The analytical data provided by Accutest and the sample procedures followed by ERT were reviewed by the ERT Project Chemist and validated by the Meridian Consultant Group, Inc. Senior Chemist. Data validation reports are provided in Appendix B-3. The data quality indicators (DQIs) of precision, accuracy, reproducibility, comparability, completeness, and sensitivity, with respect to the project DQOs, were used to assess the overall quality of the analytical data collected during this investigation. Achievement of the DQIs provides the basis for concluding that the acquired investigation data are scientifically sound, legally defensible, and adequate for their intended use. The assessment of the data quality can be summarized as follows:

- The data validation process produced limited qualifications of the results, with all of them being considered to be of acceptable quality for further evaluation.

- Completeness for the field activities (number of samples collected compared to the number of samples planned to be collected) is 100%.
- Completeness for the analytical activities (the number of analytical results that were determined to be usable) is 100%.
- Overall accuracy is 92%, based on the percentage of matrix spike (MS) and matrix spike duplicate (MSD) analyses that were within the established percent recovery limits.
- Overall precision is 100%, based on the percentage of MS/MSD analyses that were within the established relative percent difference (RPD) limits.
- Overall field duplicate precision is 75%, based on the percentage of field duplicates that met the established RPD precision limits of 30%.
- Representativeness, in terms of meeting the planned field and analytical procedures, was achieved.
- Comparability, in terms of confidently comparing the data collected during this investigation to others of acceptable data quality, was achieved.

5.0 BASELINE RISK ASSESSMENT FOR MC

5.1 Introduction

Located in MRS 03, the B003 Area was previously identified in the EE/CA (USACE, 1999) as a potential munitions disposal area. During the 2006 SI field activities, three surface soil samples were collected within the B003 Area (USACE, 2007). In accordance with the approved RI Work Plan (ERT, 2010), no additional samples were collected from the site during the subsequent RI. The BLRA included in the RI Report used the SI data to assess potential threats to human health and the environment from soil contamination in the B003 Area.

The BLRA concluded that arsenic and lead in soil could pose a threat to human health, and that antimony, arsenic, copper, lead, selenium, and thallium could pose a threat to ecological receptors. These conclusions were based largely on the results of a single sample, FHK-NP-SS-06-03. Because no other samples were collected near FHK-NP-SS-06-03, it was not known whether this sample's results were anomalous or representative of soil conditions. Accordingly, additional soil samples were collected from the vicinity of FHK-NP-SS-06-03 in July 2014 to more accurately assess the extent of soil contamination. This RI Addendum presents the B003 Area baseline risk assessment updated with the July 15, 2014 data.

5.2 Data Used in the Baseline Risk Assessment

On July 15, 2014, 20 surface soil samples were collected from the vicinity of SI sample FHK-NP-SS-06-03 at the locations shown in Figure A-1 in Appendix A. The samples were analyzed for antimony, arsenic, copper, lead, selenium, and thallium. The 2014 Addendum BLRA dataset includes the 2014 RI Addendum samples and SI sample FHK-NP-SS-06-03. FHK-NP-SS-06-03 was analyzed for target analyte list metals and explosives, however, only the analytical results for the six potential risk drivers were considered in this BLRA update, as the other metals and explosives were previously determined in the RI Report BLRA not to pose a threat to human health or the environment. The analytical results for the RI Addendum samples and the SI sample are presented in Table B-1 and Table B-2, respectively, of Appendix B-1.

5.3 Human Health Risk Assessment

5.3.1 <u>Exposure Assessment</u>

5.3.1.1 Exposure Setting and Conceptual Site Model

Potential exposure routes for the B003 Area were identified in the RI Report and include direct contact with surface soil (ingestion and dermal contact) and inhalation via the soil-to-air pathway. Because previous investigations had not included volatile compounds, inhalation of volatilized compounds was not identified as a complete exposure pathway. Potentially complete exposure pathways are not identified for groundwater, sediment, or surface water at the B003 Area as there is no surface water or sediment in the B003 Area, and potential exposure to groundwater throughout the installation was previously evaluated in the RI Report (ERT, 2014a).

5.3.1.2 Receptors

Fort Hancock, part of the Gateway National Recreation Area, receives many visitors year-round with the majority visiting in the summer months to swim, hike, fish, and visit the historic batteries. The Sandy Hook peninsula includes full-time and seasonal residences, a school, a day care center, and facilities owned by NPS, the New Jersey Marine Sciences Consortium, the National

Oceanographic and Atmospheric Administration National Marine Fisheries Service, and the USCG. These facilities are not located within the boundaries of the investigation area. Current land use for the B003 Area is recreational (ERT, 2014a). In addition, the NPS allows archaeologists to investigate cultural and archaeological resources at Fort Hancock. Based on the current land use, the following receptors are identified:

- outdoor maintenance worker (represents a NPS ranger who spends the majority of his/her time patrolling the area on foot);
- adult and child recreational user (represent members of the public who participate in recreational activities at Fort Hancock); and
- archaeologist (either NPS or other researchers performing studies or investigations).

There is the potential that sensitive maritime forest habitat is present in the B003 Area and future development may be limited as a result. For the purposes of this BLRA, it is assumed that the investigation area could be re-developed for future residential use or commercial-type use (i.e., NPS facility). Based on this assumption, future receptors would include hypothetical residents and the construction worker in addition to the outdoor maintenance worker, adult recreational user, child recreational user, and archaeologist. Potential receptors and exposure routes are presented in Risk Assessment Guidance for Superfund (RAGS) Part D Table 1. All RAGS Part D tables for this assessment are presented in Appendix C-1.

5.3.1.3 Screening to Identify Chemicals of Potential Concern

Based on the results of the original RI Report BLRA, the only chemicals of potential concern (COPCs) are the six metals for which the 2014 samples were analyzed. These metals are antimony, arsenic, copper, lead, selenium, and thallium.

5.3.1.4 Exposure Assumptions

This section identifies the exposure routes that were evaluated for each current and future receptor. The potential exposure routes are summarized in RAGS Part D Table 1 in Appendix C-1. For each receptor, the exposure assumptions (i.e., exposure duration, exposure frequency, etc.) are described below and presented in RAGS Part D Table 4.1 through Table 4.14 in Appendix C-1. The potentially complete exposure routes include:

- Outdoor maintenance worker (current and future) – exposed to surface soil through incidental ingestion, dermal contact, and inhalation of fugitive dust emissions. Default exposure assumptions were obtained from Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (USEPA, 2002).
- Adult and child recreational users (current and future) – exposed to surface soil through incidental ingestion, dermal contact, and inhalation of fugitive dust emissions.
- Archaeologist (current and future) – exposed to surface soil through incidental ingestion, dermal contact, and inhalation of fugitive dust emissions. Based on information from the NPS, this receptor is exposed in a similar manner as a construction worker. However, because the archaeologist does not generate significant dust emissions, the ambient air concentrations for the soil-to-air pathway are estimated with the equations for non-intrusive activities.

- Resident (future) – exposed to surface soil through incidental ingestion, dermal contact, and inhalation of fugitive dust emissions. Default exposure assumptions were obtained from USEPA guidance. For non-cancer hazards, the adult resident and child resident were evaluated separately. Cancer risks were estimated using the age-adjusted resident.
- Construction worker (future) – exposed to surface soil and subsurface soil through incidental ingestion, dermal contact, and inhalation of fugitive dust emissions. Based on an approximate depth to groundwater of 4 ft bgs, excavations are not expected to exceed 4 ft bgs. Potential incidental exposure to shallow groundwater is assumed to be negligible. Default exposure assumptions were obtained from Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (USEPA, 2002).

The exposure assumptions listed in RAGS Part D Table 4.1 through Table 4.14 in Appendix C-1 are the values identified in the approved RI Work Plan (ERT, 2010). Since completion of the Work Plan for this project, several default exposure assumptions have been updated by the USEPA. The potential effects of the updated values are assessed in the uncertainty analysis.

5.3.1.5 Calculation of Chronic Daily Intake

The RAGS Part D Table 4.1 through Table 4.14 in Appendix C-1 present the equations used for calculating the chronic daily intake. Consistent with RAGS, the exposure point concentrations are 95% upper confidence limits (UCLs) of the expected value of the data set. For data sets with five or more detections, the USEPA software ProUCL 5.0 was used to calculate a UCL value. For data sets with four or fewer detections, the maximum detected concentration was used as the exposure point concentration. ProUCL output is provided at the end of Appendix C-1.

To evaluate the soil-to-air pathway, it was necessary to estimate the potential ambient air concentration. For this estimate, a particulate emission factor (PEF) was applied to the soil exposure point concentration (95% UCL or maximum detection). For non-intrusive activities, the PEF was the default value of 1.36 x 10^9 cubic meters per kilogram (USEPA, 2002). For scenarios involving excavation activities, the PEF was calculated in accordance with the equations in Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (USEPA, 2002).

In accordance with current guidance, arsenic ingestion was adjusted by a relative bioavailability of 0.6 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/ usersguide.htm).

The exposure point concentrations are provided in the RAGS Part D Table 3.1 (soil concentration), Table 3.2 (estimated air concentrations for non-excavation scenarios), and Table 3.3 (estimated air concentrations for excavation scenarios) in Appendix C-1.

5.3.2 <u>Toxicity Assessment</u>

Reference doses, reference concentrations, cancer slope factors, and inhalation unit risks were obtained from various sources, USEPA and non-USEPA, in accordance with the hierarchy outlined in the Office of Solid Waste and Emergency Response (OSWER) Directive 9285.7-53 (USEPA, 2003). The values used for this HHRA are presented in RAGS Part D Tables 5.1, 5.2, 6.1, and 6.2. Dermal reference doses and cancer slope factors are estimated from oral values in accordance with RAGS Part E, Supplemental Guidance for Dermal Risk Assessment (USEPA, 2004).

The potential effects from exposure to lead are evaluated through blood lead models. The USEPA has developed two models for this evaluation: (1) the IEUBK model; and (2) the Adult Lead Model (ALM). Children and fetuses are the most sensitive receptors with respect to health effects from lead. IEUBK is used to evaluate children's exposure to lead. The ALM is used to assess exposure to the fetus if the pregnant woman is exposed to lead in soil. The ALM calculates the average soil concentration that will result in a fetal blood lead concentration less than 10 micrograms per deciliter (µg/dL), the value determined by USEPA to be protective. IEUBK considers children's exposure to lead in soil and other media, including water and diet.

5.3.3 Risk Characterization Approach

For a given receptor, cancer risks were calculated for each COPC and summed across the exposure medium. The equations for calculating the cancer risk are:

$$\text{(direct contact) ILCR} = \text{Intake (mg/kg/d) x CSF (mg/kg/d)}^{-1}$$

and

$$\text{(inhalation) ILCR} = \text{Adjusted Ca (mg/m}^3\text{) x IUR (mg/m}^3\text{)}^{-1}$$

Where: ILCR = incremental lifetime cancer risk

CSF = cancer slope factor

Adjusted Ca = air concentration adjusted to account for exposure

IUR = inhalation unit risk

mg/kg/d = milligrams per kilogram per day

mg/m^3 = milligrams per cubic meter

The HQ for each COPC was summed across the exposure medium to provide a total hazard index (HI) for each receptor. For HIs greater than 1, a target organ analysis was performed in order to account for differences in toxic mechanisms among the COPCs. The equations for calculating the HQs are:

$$\text{(direct contact) HQ} = \text{Intake (mg/kg/d) / RfD (mg/kg/d)}$$

and

$$\text{(inhalation) HQ} = \text{Adjusted Ca (mg/m}^3\text{)/RfC (mg/m}^3\text{)}$$

Where: HQ = hazard quotient

RfD = reference dose

Adjusted Ca = air concentration adjusted to account for exposure

RfC = reference concentration

mg/kg/d = milligrams per kilogram per day

mg/m^3 = milligrams per cubic meter

5.3.4 Risk Characterization

As previously stated, the following metals are identified as COPCs based on the conclusions of the original RI Report BLRA: antimony, arsenic, copper, lead, selenium, and thallium. Each of these metals is compared to background concentrations below.

- Antimony: The maximum antimony concentration, 34.9 mg/kg, is greater than the 95 percent upper tolerance limit of the New Jersey background value (0.69 mg/kg). Antimony is identified as a potential site contaminant.
- Arsenic: The maximum arsenic concentration, 114 mg/kg reported for the SI sample, is greater than the maximum New Jersey background value (48.9 mg/kg). The RI Addendum samples had arsenic concentrations ranging from 3.4 to 24.5 mg/kg with an arithmetic mean of 6.81 mg/kg and 90th percentile of 8.31 mg/kg. These values are less than the corresponding New Jersey background values (maximum of 48.9 mg/kg; arithmetic mean of 8.26 mg/kg; and 90th percentile of 10.9 mg/kg). The 2014 results provide no evidence of arsenic contamination. Because the 20 soil samples collected in 2014 did not replicate the contamination indicated by the SI result, arsenic is identified as a background constituent. The SI result appears to have been anomalous.
- Copper: The maximum copper concentration, 384 mg/kg reported for the 2006 SI sample, exceeded the maximum New Jersey background value (143 mg/kg). The RI Addendum samples had copper concentrations ranging from 5.8 to 58.9 mg/kg, with an arithmetic mean value of 17.2 mg/kg and a 90th percentile of 28.2 mg/kg. These values are less than the New Jersey background statistics (arithmetic mean of 42.2 mg/kg and 90th percentile of 102 mg/kg). The 2014 analytical results provide no evidence of copper contamination. Because the 20 soil samples collected in 2014 did not replicate the contamination indicated by the SI result, copper is identified as a background constituent. The SI result appears to have been anomalous.
- Lead: The maximum lead concentration, 2,180 mg/kg reported for the SI sample, was greater than the maximum New Jersey background value (617 mg/kg). The RI Addendum samples had lead concentrations ranging from 27.3 to 286 mg/kg, with an arithmetic mean value of 80.7 mg/kg and a 90th percentile of 125 mg/kg. These values are less than the New Jersey background statistics (arithmetic mean of 177.7 mg/kg and 90th percentile of 446 mg/kg). The 2014 analytical results provide no evidence of lead contamination. Because the 20 soil samples collected in 2014 did not replicate the contamination indicated by the SI result, lead is identified as a background constituent. The SI result appears to have been anomalous.
- Selenium: The maximum selenium detection of 3.6 mg/kg was reported for the SI soil sample. This concentration is greater than the maximum New Jersey background value (0.15 mg/kg) and the maximum detection (0.92 J mg/kg) reported for the Fort Hancock background samples. Of the 20 samples collected for the 2014 RI Addendum, selenium was detected only in the field duplicate for location SO-07. The detection, 0.78 J mg/kg, is consistent with Fort Hancock background concentrations. The 2014 results provide no evidence of selenium contamination. Because the 20 soil samples collected in 2014 did not replicate the contamination indicated by the SI result, selenium is identified as a background constituent. The SI result appears to have been anomalous.

- Thallium: The maximum thallium concentration, 6.5 mg/kg, was reported for the SI sample. This result is greater than the maximum New Jersey background value (0.46 mg/kg) and the maximum Fort Hancock background concentration (0.94 mg/kg). However, in 2014, thallium was detected in only 4 samples at concentrations ranging from 0.48J to 0.88J mg/kg. These results are consistent with the Fort Hancock background data, and provide no evidence of contamination. Because the 20 soil samples collected in 2014 did not replicate the contamination indicated by the SI result, thallium is identified as a background constituent. The SI result appears to have been anomalous.

The cumulative cancer risk was compared to the USEPA target risk range of 1E-06 to 1E-04. The target organ HIs were compared to a target value of 1. The non-cancer HI and cancer risk calculations for B003 are presented in RAGS Part D Table 7.1 through Table 7.7 and Table 8.1 through Table 8.6, and are summarized in RAGS Part D Table 9.1 through Table 9.8 in Appendix C-1. The risks are discussed by receptor below.

- Current/future outdoor maintenance worker: The total cancer risk, 1E-05, is within the target risk range (1E-06 to 1E-04). The total HI is equal to 0.3, indicating no potential for non-cancer adverse effects.
- Current/future archeologist: The total cancer risk, 2E-06, is on the low end of the target risk range. The total HI is 0.8, indicating no potential for non-cancer adverse effects.
- Current/future child recreational user: The total cancer risk, 3E-06, is on the low end of the target risk range. The total HI is 0.3, indicating no potential for non-cancer adverse effects.
- Current/future adult recreational user: The total cancer risk, 2E-06, is on the low end of the target risk range. The total HI, 0.03, is less than 1, indicating no potential for non-cancer adverse effects.
- Future construction worker: The total cancer risk, 2E-06, is on the low end of the target risk range. The total HI is 1, indicating no potential for non-cancer effects to this receptor.
- Future child resident: Because cancer risks were quantified for the age-adjusted resident, cancer risk calculations were not performed for the child resident. The HI is estimated to be 3. On a target organ basis, the HI for hair (2) is greater than 1. Thallium is the only chemical that contributed to the hair HI. As indicated above, the 2014 data provide no evidence of thallium contamination.
- Future adult resident: Because cancer risks were quantified for the age-adjusted resident, cancer risk calculations were not performed for the adult resident. Exposure to soil resulted in an HI of 0.4, indicating no potential for non-cancer adverse effects.
- Future age-adjusted resident: The total cancer risk calculated for the age-adjusted resident is 6E-05, which is within the target risk range.

In summary, all cumulative cancer risk estimates are within the target risk range of 1E-06 to 1E-04. The child resident is the only receptor for which a target organ HI (hair) exceeds 1. The target organ HI for hair (2) is due exclusively to thallium, which was identified as a background constituent.

5.3.4.1 Lead

Lead is identified as a COPC for the B003 Area. The ALM was used to estimate soil concentrations protective of a fetus whose mother may be exposed while working outside at the B003 Area. The ALM model input and results are shown in RAGS Table 7.8 in Appendix C-1. The protective soil concentration was calculated to be 1,120 mg/kg for a worker engaged in soil contact-intensive activities, such as construction or archaeology. The average lead concentration in B003 surface soil is 181 mg/kg. This exposure point concentration is less than the protective concentration estimated by the ALM, demonstrating that the site does not pose a threat to human health under these exposure scenarios for adult workers. Because the adult recreational user would experience less exposure than the outdoor maintenance worker or construction worker, the concentrations calculated with the ALM would also be protective of this receptor.

The most conservative exposure scenario is residential use of the site. The IEUBK model is used to assess the potential threat posed by lead under residential land use. As noted previously, this model considers exposure to lead in multiple media. For soil, the model uses the mean value as the exposure point concentration. All other input parameters to the IEUBK model were set to the default values. The model output is presented after Table 9.8 in Appendix C-1. The soil concentration of 181 mg/kg resulted in a geometric mean blood lead concentration of 2.55 µg/dL with the blood lead concentration for 99.8 percent of the exposed population falling below the target concentration of 10 µg/dL. If at least 95 percent of the exposed population is estimated to have a blood lead concentration less than 10 µg/dL, then site conditions are protective. The IEUBK output demonstrates that lead in B003 soil does not pose a threat to children exposed under a residential land use scenario.

5.3.5 __Uncertainty Assessment__

The following sections discuss the uncertainties resulting from chemical analysis, exposure assessment, and toxicity assessment.

5.3.5.1 Chemical Analysis

At any site, it is possible that there are more chemicals present than identified in the sampling and analysis effort. To minimize this potential uncertainty, the historical analytical suites for the SI samples included all potential contaminants associated with historical operations. Further, the application of QC throughout the sampling, analysis, and data validation phases reduced uncertainty in the results. Therefore, the chemical identification phase of the risk assessment does not appear to have introduced substantial uncertainty.

The analytical sensitivity associated with non-detect results can also contribute to the HHRA's uncertainty. This potential uncertainty associated with the historical soil samples is evaluated in the RI Report. For the 2014 samples, all analytes were detected in at least one soil sample. Thus, the analytical method used for the samples collected for this Addendum was sufficiently sensitive to identify the potential risk drivers.

5.3.5.2 Exposure Assessment

When evaluating exposure, probable scenarios are developed to estimate conditions and duration of human contact with COPCs. Scenarios are based on observations or assumptions about the current or potential activities of human populations that could result in direct exposure. To prevent underestimations of risk, scenarios incorporate exposure levels, frequencies, and durations at, or near, the top end of the range of probable values. This approach is sometimes referred as a reasonable maximum exposure, one that may be at the high end of a range of exposures but still probable.

In accordance with the approved RI Work Plan (ERT, 2010), historical default values, such as ingestion rates, were used in the exposure calculations to quantify intakes. In 2014, the USEPA updated these default values. The May 2014 Regional Screening Level (RSL) table incorporated the updated default exposure assumptions. Of the contaminants potentially associated with the B003 Area, the RSL value either did not change or increased slightly, suggesting that the changes in default exposure assumptions would have limited impact on the HHRA. In general, the historical default values established by the USEPA erred on the side of conservatism.

Exposure point concentrations of COPCs are developed from the analytical results. It is assumed that contaminant levels will remain constant throughout the exposure period with no reduction due to chemical attenuation, depletion or degradation. This assumption is conservative and most likely results in overestimation of exposure. The associated uncertainty is that actual risk is less than estimated.

The uncertainty associated with the exposure assessment is appreciable. However, the uncertainty is generally from conservative overestimation of exposure variables. This approach is protective of potentially exposed populations. All of these factors contribute to a substantial, but not unusually high, level of uncertainty in the estimates of risk for all exposure pathways. The uncertainty is generally that risk has been overestimated, not underestimated.

5.3.5.3 Toxicity Assessment

All toxicity values were obtained from peer-reviewed sources in accordance with USEPA guidance. For some chemical substances, there is little or no toxicity information available and, for many chemicals, the available data are typically from animal studies. The relative strength of the available toxicological information generates some uncertainty in the evaluation of possible adverse health effects and the exposure level at which they may occur. To account for this uncertainty, the toxicity values developed from epidemiological studies are calculated in a conservative manner. While new epidemiological studies may indicate that existing toxicity values are not sufficiently protective, it is expected that the general approach to toxicity assessment would tend to err on the side of overestimating potential risks.

Numerical toxicity values for dermal exposure have not been developed by USEPA. To quantify risk from dermal exposure, route to route extrapolation of the oral toxicity value to a dermal toxicity value is used. Because of potential differences in patterns of distribution, metabolism, and excretion between oral and dermal routes of exposure, use of oral toxicity values for dermal exposure may over- or underestimate risk, depending on the chemical.

5.3.6 Human Health Risk Assessment Summary and Conclusions

The baseline HHRA evaluated the current and potential future exposure of receptors to soil in the B003 Area. For all identified receptors, the cumulative cancer risks are within the USEPA target risk range of 1E-06 to 1E-04. The hair HI (2) calculated for the child resident exceeds 1. For all other receptors, no target organ HI exceeds 1. The child resident hair HI is due exclusively to thallium, which is identified as a background constituent. Blood lead modeling indicated that lead in B003 soil does not pose a threat to human health. In conclusion, no potential site contaminants posing a human health threat were identified for the B003 Area.

5.4 Screening Level Ecological Risk Assessment

The SLERA is a conservative screening tool to assess whether site conditions indicate sufficient potential ecological threat to warrant further investigation or action, or whether the contamination poses no to minimal threat, thereby justifying a decision for no further action. Because of the conservatism associated with the Step 2 initial screening, the approach also included further data analysis with less conservative assumptions.

5.4.1 Step 1 – Problem Formulation

The initial step in the SLERA process is to formulate the problem. This develops the conceptual site model (CSM) for the SLERA and defines the assessment and measurement endpoints. Fort Hancock provides habitat for several threatened species, endangered species, and species of concern. These species are listed in Table 6-1 of the RI Report (ERT, 2014a). In addition, Fort Hancock encompasses rare habitat, such as the Maritime Holly Forest. A detailed description of the different ecosystems and species present at Fort Hancock is presented in the RI Report (ERT, 2014a).

The only habitat present at the B003 Area is terrestrial habitat. No aquatic habitat is present. The assessment and measurement endpoints for the terrestrial habitat are presented in Table C.2.1 in Appendix C-2 (all SLERA tables are presented in Appendix C-2). Endpoints include plant and invertebrate communities, in addition to wildlife communities that could be exposed to site contaminants through consumption of dietary items in which the contaminants have accumulated. For each potentially-affected feeding guild, representative species were selected to provide a conservative evaluation. The three potentially-affected terrestrial avian communities (granivores, insectivores, and carnivores) are represented by the mourning dove (granivore), American woodcock (insectivore), and red-tailed hawk (carnivore). For terrestrial mammals, the representative species include the meadow vole (herbivore), short-tailed shrew (insectivore), and red fox (carnivore).

A preliminary CSM was developed to depict the potential exposure routes by which ecological receptors could contact site contaminants. The potential exposure routes for soil are listed below.

- Direct contact; and
- Bioaccumulation into plants, soil invertebrates, and small mammals, and consumption of these food items.

5.4.2 Step 2 – Initial Screening

The initial screening was conducted as part of the original BLRA included in the 2014 RI Report. The updated SLERA considered only the potential risk drivers identified in the original RI Report: antimony, arsenic, copper, lead, selenium, and thallium. As described in Section 5.3.4, the 2014 data provide no evidence of arsenic, copper, lead, selenium or thallium contamination at B003. These five metals are identified as background constituents. Antimony is identified as a potential contaminant (Section 5.3.4) and is evaluated further in the subsection below.

5.4.3 Central Tendency Evaluation

A central tendency evaluation was conducted to assess potential risks to ecological receptors from exposure to antimony. This evaluation included evaluating direct contact risks to terrestrial plants and soil invertebrates, as well as bioaccumulative risks to upper trophic level receptors via the food web model. The evaluation is detailed below.

All antimony results are less than the ecological soil screening level (Eco-SSL) for soil invertebrates. Site conditions pose no threat to this community.

The terrestrial plant benchmark value is 5 mg/kg. The antimony concentration in three samples (26.4 mg/kg at FHK-NP-SS-06-03, 34.9 mg/kg at FHRI-B003-SO-15, and 7.3 mg/kg at FHRI-B003-SO-19) is greater than this benchmark value. The average antimony concentration, 4.59 mg/kg, is less than the plant benchmark value, suggesting that soil conditions across the sampled area do not pose a threat to terrestrial plants.

Antimony detections are greater than the Eco-SSL for mammals (0.27 mg/kg) and there is no Eco-SSL for birds. A food web analysis was conducted to evaluate potential risks to wildlife receptors. Chemical intake was calculated using the equation presented below and compared to no observed adverse effects levels (NOAELs) and lowest observed adverse effects levels (LOAELs). Table C.2.2 in Appendix C-2 identifies the exposure assumptions (food ingestion rate, dietary components, etc.) used to quantify chemical intake for each wildlife receptor. The antimony NOAELs were obtained from the Eco-SSL document (USEPA, 2005). The antimony LOAELs were obtained by calculating the geometric mean of the LOAELs for reproduction, growth, and survival listed in the Eco-SSL document.

$$E_j = \left[Cs_j \times P_s \times FIR\right][AUF] + [AUF]\left[\sum_{i=1}^{N} B_{ij} \times P_i \times FIR\right]$$

Where:

E_j	=	total exposure (mg/kg/d)
Cs_j	=	concentration of chemical (j) in soil (mg/kg)
P_s	=	soil ingestion rate as proportion of diet
FIR	=	species-specific food ingestion rate (kg food/kg body weight/d)
B_{ij}	=	concentration of chemical (j) in biota type (i) (mg/kg)
P_i	=	proportion of biota type (i) in diet
AUF	=	area use factor (unitless)

As indicated by the above equation, in order to calculate chemical intake, it is necessary to estimate chemical bioaccumulation. The soil-to-plant, soil-to-earthworm, and soil-to-mammal bioaccumulation factors for antimony were obtained from the Eco-SSL document (USEPA, 2005), and are provided in Table C.2.3 (plants and soil invertebrates) and Table C.2.4 (small mammals) in Appendix C-2.

The food web calculations are presented in Table C.2.5 in Appendix C-2. As shown in Table C.2.5, the NOAEL ecological quotients for antimony are less than 1 for the meadow vole (herbivore) and red fox (carnivore), indicating no threats to these communities. The NOAEL ecological quotient for the short-tailed shrew (insectivore) is greater than 1, but the LOAEL ecological quotient is less than 1. The LOAEL ecological quotient indicates minimal risk to mammalian insectivores by the potential antimony contamination at B003.

A toxicity reference value is not available for birds. The maximum concentration detected in the Fort Hancock background samples is 2.6 mg/kg. With results ranging from 3.1 to 34.9 mg/kg, six B003 Area sample locations had antimony concentrations greater than the maximum background detection. Five samples (FHRI-B003-SO-04, FHRI-B003-SO-12, FHRI-B003-SO-19, FHRI-B003-SO-20, and FHK-NP-SS-06-03) are located in the middle of the investigation area, and are bounded to east-northeast and west-southwest by samples with concentrations less than the maximum background detection. The sixth sample location, FHRI-B003-SO-15, is surrounded to the east, south, and west by samples with concentrations in the background range. These data indicate limited lateral distribution of potential antimony contamination. It is unlikely that the potential contamination is sufficiently extensive to affect the avian communities.

5.4.4 Uncertainty Analysis

As described in the uncertainty analysis for the HHRA (Section 5.3.5), the selection of the analytical suite based on historical site use, the collection of field samples in accordance with the planning documents, and the validation of the analytical results in accordance with the Work Plan (ERT, 2010) minimize the potential uncertainty associated with the reliability of the analytical data and the identification of site contaminants.

5.4.5 Ecological Risk Assessment Summary and Conclusions

The SLERA evaluated potential risks to terrestrial receptors that might contact the site soil in the B003 Area. Both direct exposure and indirect exposure via the food web were considered. Arsenic, copper, lead, selenium, and thallium were determined to be background constituents and were eliminated as COPECs. Antimony was identified as a potential site contaminant. This metal was determined to pose no threat to soil invertebrates based on comparison to the Eco-SSL, and no threat to plants based on the average concentration being less than the plant benchmark. The refined food web evaluation demonstrated that NOAEL and/or LOAEL based ecological quotients are less than 1 for the mammalian receptors. Based on the limited lateral distribution of the potential antimony contamination, it is unlikely that this metal would affect the avian communities. Potential contaminants present in soil at the B003 Area have limited potential to pose a threat to ecological receptors.

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6.0 REVISED MRS DELINEATIONS, MRS PRIORITIZATION PROTOCOL, AND MEC HAZARD ASSESSMENT

6.1 Overview

MRS boundaries and characteristics have changed as a result of the RI. The historical MRSs from the SI are described in Section 1.2.1 of the RI Report, and those MRSs investigated during the RI are summarized in Section 1.2.2. The six SI MRSs were based on limited information available in the 1993 Archives Search Report (ASR). Four of the six MRSs were based on anecdotal information, and after further research, were found not to exist and therefore excluded from the RI. The Livens Discovery Area and portions of the Northern Battery Complex were retained for further study.

Eight MRSs and two potential areas of interest (PAOI) were defined for and investigated during the RI, based primarily on additional historical information that became available during the planning stages of the RI. Six of the MRSs were based on an historical map showing the locations of the proving ground downrange impact areas. A report of a 1927 fire in a munitions storehouse was also located and used to identify the extent of the Livens Discovery Area. An in-water MRS paralleling the eastern shore of the Sandy Hook peninsula was delineated to address the potential that MEC was present in near-shore areas. Lastly, two PAOIs located in front of two of the firing batteries were investigated for potential MEC burials. In accordance with TPP discussions, the off-shore range fans for the batteries were not investigated because of the distance to targets and the depth of water.

The results of the RI were used to delineate five new MRSs, which are described in Section 6.2. These MRSs supersede those identified in the 2007 SI report as well as those described in the 2014 RI Report. MRSPP evaluations for each MRS, as required by 32 CFR § 179, are discussed in Section 6.3 and presented in Appendix D. MEC HA evaluations are discussed in Section 6.4 and presented in Appendix E.

6.2 New MRS Delineations

Two smaller MRSs have been defined, based on the MEC/MD Hazard Areas defined in Section 8.1.1.2 of the RI Report. The Livens Discovery Area is retained for future investigation, and a fourth, larger MRS is defined for all remaining land areas. Lastly, an MRS is defined for the off-shore range fans emanating from the firing batteries. Figures A-2 through A-8 in Appendix A show the six new MRSs. The MRSs designations correspond to newly-created FUDS project numbers; the MRSs are described below.

- **Project/MRS 03, Northern Portion Proving Ground:** This MRS encompasses 30.2 acres and includes the MEC/MD Hazard Area 1A (29 acres) and PAOI 9-Gun Battery (1.2 acres). Three MEC and 26 MD items were found below the ground surface in 8 grids (and in a meandering path in the 9-Gun Battery PAOI) during the RI. The MEC items were a 75 mm projectile, fuzed and fired (south of parking lot I just east of Atlantic Drive); a MK 1, 1-lb, 1.44-inch projectile (northeast of parking lot I); and a 3.5-inch armor piercing high explosive (AP HE) projectile (between the original and new proving batteries). The MRS contains the B003 Area where several MEC items were found during the 1994 EE/CA. These items included 10-inch (three), 4.7-inch (nine), 5-inch, 75 mm (two), 3-inch (one), as well as one live Mark V fuze. All of these items were removed during the EE/CA. Although no MEC was found in the B003 grid during the RI, the potential remains for it to be present. Potential MC metals in the B003 Area were elevated above background and found to pose a potential risk to human and ecological receptors during the RI. These metals are the subject of the additional sampling and risk assessments addressed in Section 5.0 of this RI Report Addendum.

- **Project/MRS 05, Southern Portion Proving Ground:** This MRS encompasses 51 acres and includes the following seven MEC/MD Hazard Areas (as defined in the RI Report): 1B, 2A, 3A, 3B, 4A, 5A, and 5B. Four MEC and 25 MD items were found in the MRS during the RI; MEC items included a 5-inch AP HE round, a 3-inch stokes mortar, a 75 mm shrapnel round, and a 4.5-inch British HE round. No environmental samples were collected in the MRS during the RI, in accordance with the approved Work Plan, and no MC is known or suspected, based on the lack of breached items found during the RI and the results of samples collected during the 2006 site inspection (no MC contaminants above background concentrations).

- **Project/MRS 06, Livens Discovery Area:** This MRS encompasses 24 acres of the area where the 1927 munitions storehouse fire occurred. Several intact MD items and a potentially live Stokes mortar fuze were found during the 1998 EE/CA. In accordance with the RI work plan, the original acreage of the MRS was 28.8 acres. However, NPS granted access to only 4.8 acres for the geophysical investigation of the 2012-13 RI field work. These 4.8 acres did not contain any MEC or MD and therefore were included in MRS 07 (see below). NPS had denied access for geophysical study of the 24 acres due to concerns about sensitive vegetation. However, NPS allowed access in 2015, and results of the field work are documented in a second addendum to the RI Report (ERT, 2016). No MC is known or suspected in the entire 28.8 acres; NPS had allowed access to the whole site for soil sampling during the 2012-13 RI, and no explosives were detected and no MC metals were detected above background concentrations in the samples collected.

- **Project/MRS 07, Remaining Land:** At 952 acres, this MRS encompasses all other land on the eastern side of the Sandy Hook peninsula, where there is a potential MEC hazard from munitions that wash onto shore during storm events in the Atlantic Ocean. Although a portion of this MRS was investigated during the RI and no MEC or MD was found, munitions have historically been found on the beaches after storm events and responded to by Explosives Ordnance Disposal (EOD) units. In addition, erosion and shifting sand dune conditions in this dynamic environment could expose munitions in land areas that have not been investigated. Munitions items that have washed up on the Atlantic beaches since 2010 include: 3.5-inch, 6-inch, and 8-inch projectiles, Marine flare, Mk-25 Marine Marker, and 5-inch AP projectile. These items were identified as live and blown in place by EOD units from Naval Weapons Station Earle. The MRS extends to the northernmost end of the Sandy Hook peninsula and to the southernmost boundary of the national recreation area. The MRS also includes the 4.8 acres of the Livens Discovery Area investigated during the 2012-13 RI.

- **Project/MRS 08, NPS Excluded Area:** This MRS is 140 acres and encompasses portions of the former proving ground to which NPS has indefinitely excluded access for geophysical investigation. Right-of-entry refusal is based on concerns about potential impacts to plant communities (i.e., maritime forest) due to vegetation clearance required for running transects and placing grids. No definitive determination has been made about the presence, absence, or extent of potential MEC or MC contamination in this MRS.

- **Project/MRS 09, Water Ranges:** This MRS is 129,611 acres and encompasses the off-shore portions of the coastal battery range fans. A large portion of the range fans overlaps those of Fort Tilden, another FUDS in New York, and has been excluded from this acreage. The MRS covers the in-water portion of what was called the Northern Battery Complex in the SI. It also encompasses the 154-acre area paralleling the eastern shore of the former proving ground, which was investigated in the RI as MRS 08. No MEC or MD was found along the shore during the RI. Although items may exist within the footprint of the MRS, no MEC or MD or distinct source areas attributable to Fort Hancock have been identified to date. As agreed in RI planning sessions, the majority of the off-shore range fans were not investigated. Deep water in portions of the 129,611 acres is considered a partial barrier to munitions items, if present. No MC samples have been collected off-shore, nor is MC suspected to pose a risk to receptors because of the high dilution factor of the Atlantic Ocean.

6.3 MRSPP Evaluations

In response to a 2002 National Defense Authorization Act requirement, DoD developed the MRSPP as the methodology for prioritizing sites known or suspected to contain MEC or MC for response actions (i.e., MRSs). DoD developed the Protocol in consultation with states and tribes and published the proposed rule in 2003 for public comment. In 2005, the Final Rule was issued and codified at 32 CFR § 179. The Protocol requires that DoD assign to each defense site in the inventory a relative priority based on the overall conditions at each location and various factors related to safety and environmental hazards.

The MRSPP consists of the following three modules to evaluate the unique characteristics of each hazard type at an MRS:

a. The Explosive Hazard Evaluation (EHE) Module addresses explosive hazards posed by MEC and MC in high enough concentrations to pose an explosive hazard. The module considers data elements relative to the source of the explosive hazard, site accessibility, and surrounding receptor populations;
b. The Chemical Warfare Materiel (CWM) Hazard Evaluation (CHE) Module addresses hazards associated with the effects of CWM and considers data elements relative to the source of the CWM hazard, site accessibility, and surrounding receptor populations; and
c. The Health Hazard Evaluation (HHE) Module addresses chronic health and environmental hazards posed by MC and incidental non-munitions-related contaminants. The module considers the contaminant hazard, the migration pathway, and surrounding receptor populations for four environmental media: groundwater, surface water, sediment, and surface soil.

Each of the modules is scored from 38 to 100 and is assigned a rating from “G” (lowest) to “A” (highest), with alternative ratings of Evaluation Pending (insufficient information available), No Known or Suspected Hazard (NKSH), or No Longer Required (cleanup is complete). The highest of the three ratings is used to assign an MRS priority ranking for the MRS, ranging from 1 to 8, with Priority 1 having the highest relative priority and Priority 8 having the lowest. In compliance with 32 CFR § 179.5, stakeholders are provided an opportunity to participate in the application of the rule. Scores are finalized after stakeholder input, USACE internal review, and review by the Army Quality Assurance (QA) Panel.

The detailed MRSPP evaluations are presented in Appendix D of this report and summarized below.

- **Project/MRS 03, Northern Portion Proving Ground:** The MRS priority is 3, based on an EHE module rating of B. The EHE rating is based on the presence of high explosive MEC in the subsurface (found during the RI), the lack of a barrier to prevent access, and a relatively dense population near the site, with multiple buildings and different land uses. The alternate rating of NKSH was assigned to the CHE module, as no CWM is known or suspected, and the rating for the HHE module is C. The HHE module was also assigned the alternate rating of NKSH, based on the absence of MC metals at concentrations posing any threat to human health, and very limited threats to ecological receptors, as discussed in Section 5.4.6 above. [Note that the NKSH rating for the HHE module is new since the Army QA Panel approved the MRSPP in 2014. The revised rating has been entered in the FUDS database and will undergo review by the EM CX and Army QA Panel.]
- **Project/MRS 05, Southern Portion Proving Ground:** The MRS priority is 2, based on an EHE module rating of A. The EHE rating is based on the presence of high explosive MEC found on the surface during the RI, an incomplete barrier around the MRS, and a relatively dense population near the site, with several buildings and different land uses. The rating for the CHE module is NKSH, as is the rating for the HHE module, which is based on the lack of CWM as well as MC above background in surface soil and metals in groundwater not being be attributable to MC at the site.
- **Project/MRS 06, Livens Discovery Area:** The MRS priority is 2, based on an EHE module rating of A. The same explosive hazard conditions apply as in MRS 05 (high explosive MEC found on the surface). Site accessibility is also partial, and population density high near the site with several occupied buildings and land uses. The CHE and HHE modules are both NKSH, based on the lack of CWM and MC above background attributable to the MRS.
- **Project/MRS 07, Remaining Land:** The MRS priority is 3, based on an EHE module rating of B. The EHE rating is based on the munitions items that have washed up on shore and disposed of by EOD units over the past six years. The CHE and HHE modules are both NKSH, based on the lack of CWM and the lack of MC at concentrations posing an unacceptable risk to human and ecological receptors.
- **Project/MRS 08, NPS Excluded Area:** The MRS priority is 4, based on an EHE module rating of C. The EHE module assumes the same type of MEC that was found on adjacent MRS's may be present, but since no investigation was conducted, suspected (historical evidence) is selected for location of munitions in Table 3. The CHE module is NKSH, based on the lack of CWM. The HHE module is assigned the alternative rating of Evaluation Pending, as no soil, surface water, or sediment samples have been collected in the MRS.
- **Project/MRS 09, Water Ranges:** The MRS was assigned the alternative rating of No Longer Required for the EHE module, based on the fact that no MEC was found in the

water during the RI and that deep water significantly reduces the potential for encounters with MEC, if present, in many of these areas. The CHE and HHE modules are both NKSH, based on the lack of CWM and MC known or suspected.

In general, an MRS that presents a greater relative risk to human health, safety, or the environment will be addressed before a site that presents a lesser relative risk. However, in accordance with Army policy, other "risk-plus" factors may be considered in determining the sequence of response actions (i.e., remedial action), based on 32 CFR Part 179.7. These risk-plus factors include but are not limited to concerns by regulators or stakeholders, cultural or social factors, programmatic considerations (e.g., availability of required resources, technical complexity of required response actions, cost avoidance, etc.), and short-term and long-term ecological effects and environmental impacts, including injuries to natural resources. Sequencing decisions for future response actions at Fort Hancock will be developed with input from NJDEP, NPS, and other interested stakeholders, per Army policy and MRSPP requirements.

6.4 MEC Hazard Assessments

In addition to MRSPP evaluations, the MEC Hazard Assessment Methodology was applied to the Fort Hancock MRSs using the U.S. Environmental Protection Agency's 2008 Publication No. 505B08001. The MEC HA assesses potential explosive hazards to human receptors under current and future conditions, given various cleanup and land use or land control alternatives. MEC HA complements the MRSPP and is intended to meet CERCLA requirements for site-specific risk assessments. While the MRSPP was developed primarily to assign a relative priority for response actions, MEC HA was developed to assess existing hazards and evaluate hazard reductions associated with removal or remedial alternatives or land use activity decisions.

MEC HA is structured around three components: severity, accessibility, and sensitivity. There are nine input factors, each associated with a numeric score, with 525 being the lowest total possible score and 1,000 being the highest. The sum of the factors scores falls within one of four defined ranges, called Hazard Levels (1-4, with 1 being the highest hazard). Severity addresses the energetic material type and location of additional human receptors. Accessibility addresses site access, total contact hours, amount of MEC, minimum MEC depth/maximum intrusive depth, and migration potential. Sensitivity addresses MEC classification and size.

MEC HA scores were generated for Project/MRS 03, 05 and 07 and are presented in Appendix E. Scores were not generated for the remaining MRSs because either it is currently unknown if MEC is present (MRS 06 and 08), or no MEC has been identified (MRS 09). In the case of MRS 06, the Livens Discovery Area, NPS has recently allowed access for USACE to conduct the RI fieldwork. A MEC HA score will be generated after the fieldwork is conducted; the MEC HA results will be included in the next RI Report addendum. For MRS 08 and 09, a MEC HA score cannot be generated, as no data have been collected to clearly ascertain whether an explosive hazard exists in these areas.

The MEC HA scores for Project/MRS 03, 05 and 07 are discussed below. It should be noted that no removal or remedial alternatives were evaluated, so there are no comparison scores for different cleanup scenarios. MEC HA scores will be generated for remedial response alternatives after the feasibility study is conducted.

- **Project/MRS 03, Northern Portion Proving Ground:** The hazard level category for MRS 03 is 3, based on a total score of 720. This hazard level reflects that the MRS has a moderate hazard potential. The scoring summary from the MEC HA automated worksheets (located in Appendix E), is shown below.

Site ID:	MRS 03	a. Scoring Summary for Current Use Activities	
Date:	12/1/2014	Response Action Cleanup:	No Response Action
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		10,000 to 99,999 receptor-hrs/yr	40
V. Amount of MEC		Function Test Range	165
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO	110
IX. MEC Size		Small	40
		Total Score	**720**
		Hazard Level Category	**3**

- **Project/MRS 05, Southern Portion Proving Ground:** The hazard level category for MRS 05 is 2, based on a total score of 825. This hazard level reflects that the MRS has a high hazard potential. The scoring summary from the MEC HA automated worksheets (located in Appendix E), is shown below.

Site ID: MRS 05	**a. Scoring Summary for Current Use Activities**	
Date: 12/1/2014	**Response Action Cleanup:**	**No Response Action**
Input Factor	**Input Factor Category**	**Score**
I. Energetic Material Type	High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors	Inside the MRS or inside the ESQD arc	30
III. Site Accessibility	Moderate Accessibility	55
IV. Potential Contact Hours	10,000 to 99,999 receptor-hrs/yr	40
V. Amount of MEC	Target Area	180
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth	Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential	Possible	30
VIII. MEC Classification	UXO	110
IX. MEC Size	Small	40
	Total Score	**825**
	Hazard Level Category	**2**

- **Project/MRS 07, Remaining Land:** The hazard level category for MRS 07 is 3, based on a total score of 705. This hazard level reflects that the MRS has a moderate hazard potential. The scoring summary from the MEC HA automated worksheets (located in Appendix E), is shown below.

Site ID: Ft. Hancock-MRS 07	a. Scoring Summary for Current Use Activities	
Date: 3/15/2016	Response Action Cleanup:	No Response Action
Input Factor	**Input Factor Category**	**Score**
I. Energetic Material Type	High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors	Inside the MRS or inside the ESQD arc	30
III. Site Accessibility	Moderate Accessibility	55
IV. Potential Contact Hours	100,000 to 999,999 receptor hrs/yr	70
V. Amount of MEC	Safety Buffer Areas	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth	Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential	Possible	30
VIII. MEC Classification	UXO	110
IX. MEC Size	Small	40
	Total Score	**705**
	Hazard Level Category	**3**

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7.0 SUMMARY AND CONCLUSIONS

7.1 Summary

RI activities were conducted during the fall and winter of 2011, and the RI Report was finalized in January 2014. The RI Report concluded that in the B003 Area, arsenic and lead in soil could potentially pose a threat to human health, and that antimony, arsenic, copper, lead, selenium, and thallium could pose a threat to ecological receptors. The RI Report recommended that additional sampling be completed in the B003 Area in order to adequately and statistically characterize this possible MC contamination.

This RI Addendum was prepared to present the results of that additional characterization (conducted in July 2014) and provide complete characterization of the nature and extent of any potential MC contamination resulting from the past U.S. military use of Fort Hancock specific to the B003 Area.

7.1.1 Nature and Extent of Contamination in the B003 Area

The B003 Area was completely characterized for MEC/MD in the RI Report; this RI Addendum focused on MC contamination and does not impact or otherwise affect the conclusions presented in the RI Report with regard to any MEC hazards.

Environmental sampling of surface soil for MC in the B003 Area was completed during the RI Addendum, as described in Section 3.0. Twenty discrete surface soil samples were collected during the RI Addendum and analyzed for six potential risk drivers: antimony, arsenic, copper, lead, selenium, and thallium. With the exception of antimony, the 2014 RI Addendum analytical results did not confirm the elevated concentrations reported in the SI sample.

7.1.2 Baseline Risk Assessment

The RI Report included a BLRA (which contained an HHRA and SLERA). The results of the 2014 RI Addendum sampling were used to update the B003 Area portion of the BLRA by incorporating the 2014 sample data with the one SI sample data point.

7.2 Conclusions

The nature and extent of MC contamination at the B003 Area has been characterized as described above. The updated HHRA and SLERA conclude that:

- No potential site contaminants posing a human health threat were identified for the B003 Area
- Based on the evaluation presented within the SLERA, potential contaminants present in soil at the B003 Area have a limited potential to pose a threat to ecological receptors.

Therefore, with regard to MC contamination, no further action is recommended for the B003 Area.

With regard to MRSPP evaluations, the following ratings were developed for each MRS:

- Project/MRS 03: MRS Priority 3
- Project/MRS 05: MRS Priority 2
- Project/MRS 06: MRS Priority 2
- Project/MRS 07: MRS Priority 3

- Project/MRS 08: MRS Priority 4
- Project/MRS 09: No Longer Required

With regard to MEC HA evaluations, the following hazard level categories were developed:

- Project/MRS 03: Hazard level 3
- Project/MRS 05: Hazard level 2
- Project/MRS 06: Pending RI field investigation
- Project/MRS 07: Hazard level 3
- Project/MRS 08: Right of entry rejected; RI not complete.
- Project/MRS 09: Project designated No DoD Action Indicated, MEC HA not required

8.0 REFERENCES

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Appendix A: Figures

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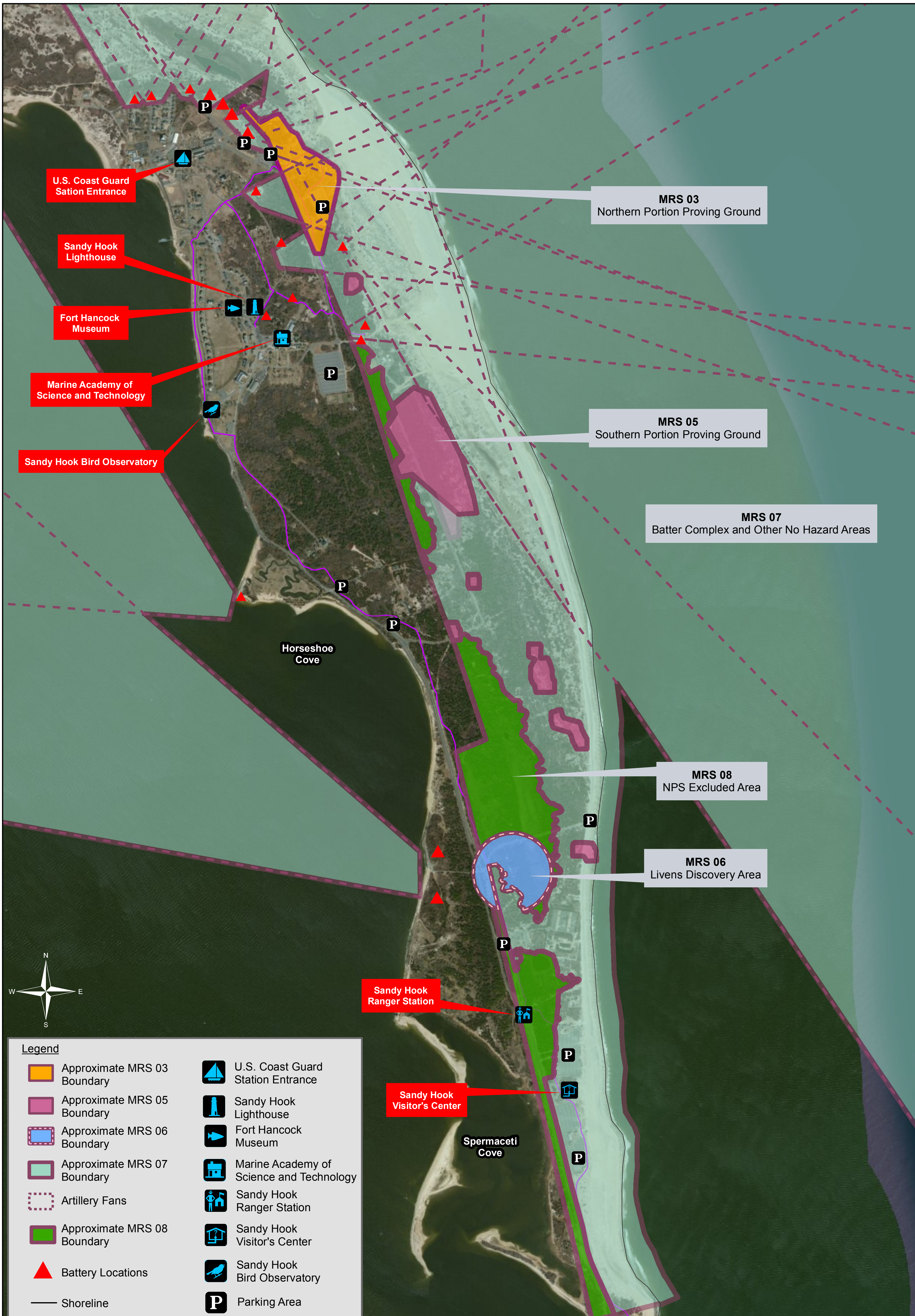
Remedial Investigation Addendum # 1
Fort Hancock Formerly Used Defense Site, Monmouth County, New Jersey

Contract No.: W912DR-09-D-0012

Figure A-1
B003 Area Sampling

Date: October 2014

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



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Remedial Investigation Addendum # 1
Fort Hancock Formerly Used Defense Site,
Monmouth County, New Jersey

Contract No.: W912DR-09-D-0012

Figure A-2

Revised MRS Footprints
(Updated for MMRP Realignment)

0 0.25 0.5 Miles

Date: October 2014

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Remedial Investigation Addendum #1
Fort Hancock Formerly Used Defense Site,
Monmouth County, New Jersey

Contract No.: W912DR-09-D-0012

Figure A-3
MRS 03
(Northern Portion Proving Ground)

0 500 1,000 Feet

Date: October 2014

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Remedial Investigation / Feasibility Study
Fort Hancock Formerly Used Defense Site,
Monmouth County, New Jersey

Contract No.: W912DR-09-D-0012

Figure A-4
MRS 05
(Southern Portion Proving Ground)

0 1,000 2,000 Feet

Date: October 2014

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Remedial Investigation Addendum #1
Fort hancock Formerly Used Defense Site,
Monmouth County, New Jersey

Contract No.: W912DR-09-D-0012

Figure A-5

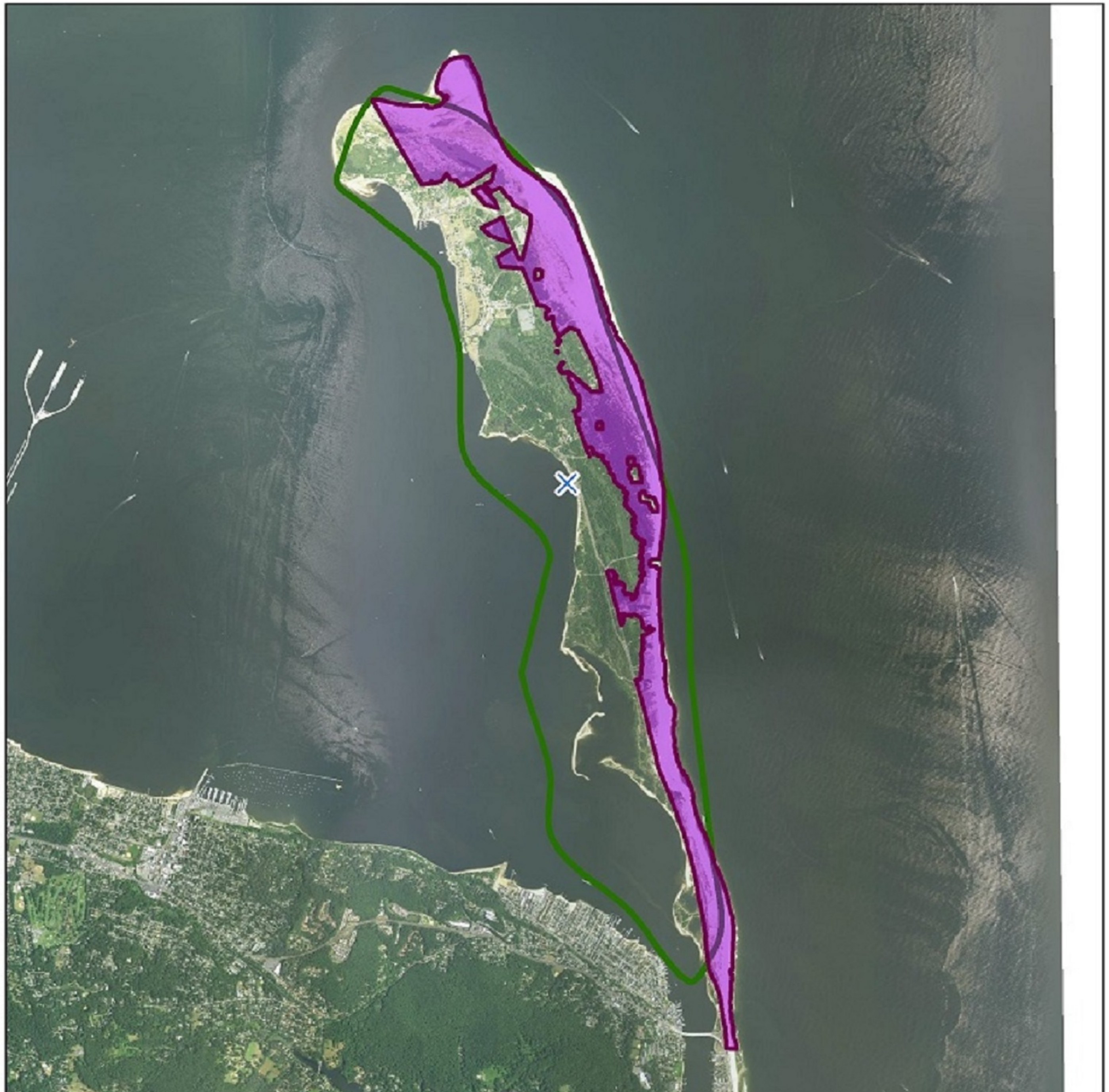
MRS 06

(Livens Discovery Area)

0 500 1,000 Feet

Date: October 2014

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend

- × CENTROID
  UTM ZONE 18 (NAD83)
  585369.3m E
  4477566.9m N
  40° 26' 40" N
  (40.44435565° N)
  73° 59' 36" W
  (-73.99336347° W)
- APPROXIMATE MRS BOUNDARY
  ACREAGE = 952 Ac
- APPROXIMATE PROPERTY BOUNDARY

N

UPDATED FOR MMRP REALIGNMENT

0 3,500 7,000 Feet

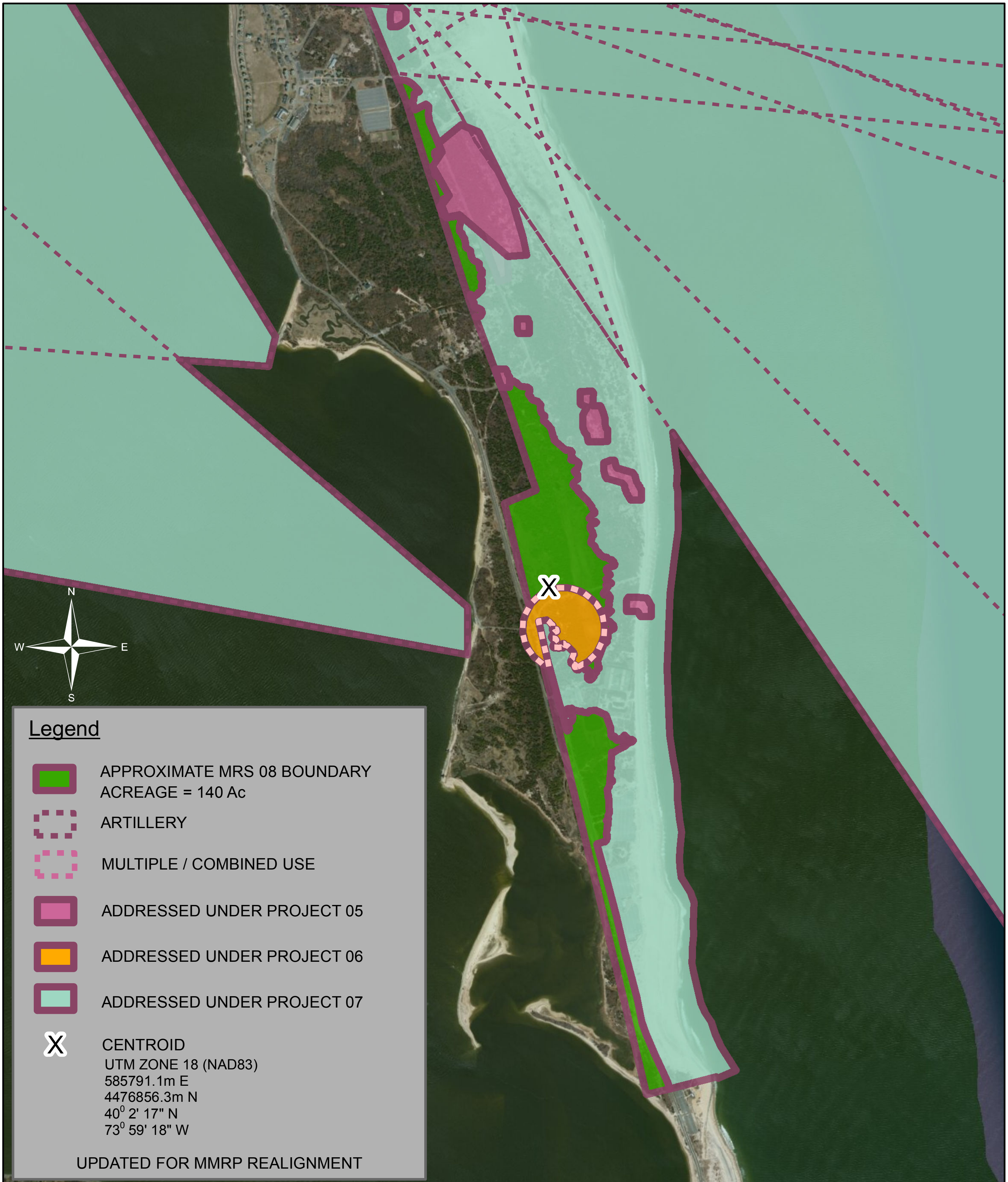
U. S. ARMY CORPS OF ENGINEERS
ST. LOUIS DISTRICT

FORT HANCOCK
FUDS PROPERTY NO. C02NJ000409
MUNITIONS RESPONSE MAP

OTHER LAND AREAS

PROJ. DATE: Mar 2016		MRS / MRA ID 07 / 07R01

Path: H:\OEW2013\New Jersey\Fort_Hancock\Revised_Fort_Hancock_project07.mxd



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Remedial Investigation Addendum #1
Fort Hancock Formerly Used Defense Site,
Monmouth County, New Jersey

Contract No.: W912DR-09-D-0012

Figure A-7

MRS 08

(NPS Excluded Area)

0 1,750 3,500 Feet

Date: October 2014

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Appendix B: Analytical Results

Appendix B-1. Data Summary Table

Appendix B-2. Analytical Data Packages and Electronic Data Deliverables (provided on CD only)

Appendix B-3. Data Quality Assessment - Validation Reports

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Appendix B-1:
Data Summary Table

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FORT HANCOCK FUDS RI ADDENDUM #1

TABLE B-1: Validated Data

Sample ID:		EPA Region 3,6, 9 Resid. RSL - Soil - THQ=0.1 (USEPA 5/14)	FHRI-BOO3-SO-01		FHRI-BOO3-SO-02		FHRI-BOO3-SO-03		FHRI-BOO3-SO-04		FHRI-BOO3-SO-05		FHRI-BOO3-SO-06		FHRI-BOO3-SO-07		FHRI-BOO3-SO-08	
Date Sampled:			7/15/2014		7/15/2014		7/15/2014		7/15/2014		7/15/2014		7/15/2014		7/15/2014		7/15/2014	
Matrix:			Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
Antimony	mg/kg	3.1	0.57	J	1.7	J	0.81	J	3.1		1.3	J	1.1	J	0.79	J	1.7	J
Arsenic	mg/kg	0.67	***4.4***		***7.6***		***4.8***		***8.1***		***6.1***		***6.1***		***5.8***		***6.5***	
Copper	mg/kg	310	5.8		18.4		8.4		15.9		11.1		11.7		11.2		24.5	
Lead	mg/kg	400	27.3		105		48.3		80.1		57		61.9		50.6		79.2	
Selenium	mg/kg	39	0.49	U	0.47	U	0.45	U	0.46	U	0.47	U	0.48	U	0.53	UJ	0.46	U
Thallium	mg/kg	0.078	0.49	U	0.47	U	0.45	U	0.46	U	0.47	U	0.48	U	0.53	UJ	0.46	U

Sample ID:		EPA Region 3,6, 9 Resid. RSL - Soil - THQ=0.1 (USEPA 5/14)	FHRI-BOO3-SO-09		FHRI-BOO3-SO-10		FHRI-BOO3-SO-11		FHRI-BOO3-SO-12		FHRI-BOO3-SO-13		FHRI-BOO3-SO-14		FHRI-BOO3-SO-15		FHRI-BOO3-SO-16	
Date Sampled:			7/15/2014		7/15/2014		7/15/2014		7/15/2014		7/15/2014		7/15/2014		7/15/2014		7/15/2014	
Matrix:			Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
Antimony	mg/kg	3.1	0.54	J	1.8		1	J	3.1		1.3	J	2.2		***34.9***		1	J
Arsenic	mg/kg	0.67	***5.1***		***7.9***		***4.5***		***10.2***		***4.5***		***7.4***		***3.9***		***3.4***	
Copper	mg/kg	310	9.2		15.4		9.2		26.5		11.3		18.2		8.2		6.6	
Lead	mg/kg	400	43.2		70.2		28.2		136		42.6		96.3		114		31.5	
Selenium	mg/kg	39	0.52	U	0.43	U	0.5	U	0.43	U	0.49	U	0.46	U	0.43	U	0.5	U
Thallium	mg/kg	0.078	0.52	U	0.43	U	0.5	U	***0.48***	J	0.49	U	***0.49***	J	0.43	U	0.5	U

Sample ID:		EPA Region 3,6, 9 Resid. RSL - Soil - THQ=0.1 (USEPA 5/14)	FHRI-BOO3-SO-17		FHRI-BOO3-SO-18		FHRI-BOO3-SO-19		FHRI-BOO3-SO-20		FHRI-BOO3-SO-DUP1 (of 07)		FHRI-BOO3-SO-DUP2 (of 20)	
Date Sampled:			7/15/2014		7/15/2014		7/15/2014		7/15/2014		7/15/2014		7/15/2014	
Matrix:			Soil		Soil		Soil		Soil		Soil		Soil	
Antimony	mg/kg	3.1	0.99	J	0.68	J	***7.3***		***3.8***	J-	1.1	J	2.7	J-
Arsenic	mg/kg	0.67	***6.6***		***4.9***		***24.5***		***4***		***5.6***		***4***	
Copper	mg/kg	310	11.7		17.2		58.9		36.8	J	12.4		50.8	J
Lead	mg/kg	400	83.6		49.2		286		128		50.7		119	
Selenium	mg/kg	39	0.5	U	0.52	U	0.49	U	0.5	U	0.78	J	0.53	U
Thallium	mg/kg	0.078	0.5	U	0.52	U	***0.88***	J	0.5	U	***0.5***	J	0.53	U

J estimated value, biased low (-)

U not detected at limit of detection (LOD)

Bold is exceedance of Residential RSL.

TABLE B-2: 2007 SI Sample Validated Data

Sample ID:		FHK-NP-SS-06-03	
Date Sampled:		6/21/2006	
Matrix:		Soil	
Metals (TAL)			
Aluminum	mg/kg	1000	J
Antimony	mg/kg	26.4	
Arsenic	mg/kg	114	
Barium	mg/kg	149	
Beryllium	mg/kg	0.22	
Cadmium	mg/kg	0.072	U
Calcium	mg/kg	433	
Chromium	mg/kg	11.6	
Cobalt	mg/kg	3.1	
Copper	mg/kg	384	
Iron	mg/kg	48200	
Lead	mg/kg	2180	
Magnesium	mg/kg	494	J
Manganese	mg/kg	44.1	
Mercury	mg/kg	0.087	
Molybdenum	mg/kg	2.3	
Nickel	mg/kg	6.2	
Potassium	mg/kg	1230	J
Selenium	mg/kg	3.6	J
Silver	mg/kg	7.6	
Sodium	mg/kg	152	J
Strontium	mg/kg	3.3	
Thallium	mg/kg	6.5	J
Titanium	mg/kg	23	
Vanadium	mg/kg	11.3	
Zinc	mg/kg	371	
Zirconium	mg/kg	7.1	
Explosives			
1,3,5-Trinitrobenzene	mg/kg	0.04	U
1,3-Dinitrobenzene	mg/kg	0.04	U
2,4-Dinitrotoluene	mg/kg	0.04	U
2,6-Dinitrotoluene	mg/kg	0.04	U
2-Amino-4,6-dinitrotoluene	mg/kg	0.04	U
2-Nitrotoluene	mg/kg	0.08	U
3-Nitrotoluene	mg/kg	0.08	U
4-Amino-2,6-dinitrotoluene	mg/kg	0.04	U
4-Nitrotoluene	mg/kg	0.08	U
HMX	mg/kg	0.08	U
Nitrobenzene	mg/kg	0.04	U
Nitroglycerin	mg/kg	4	U
PETN	mg/kg	0.2	U
RDX	mg/kg	0.08	U
Tetryl	mg/kg	0.08	U
TNT	mg/kg	0.04	U

J estimated value, biased low (-)

U not detected at limit of detection (LOD)

Appendix B-2:
Analytical Data Packages and Electronic Data Deliverables
(Provided on CD only)

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Appendix B-3:
Data Quality Assessment - Validation Reports

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MCGI

USEPA
Inorganic
Data Validation Report

Fort Hancock FUDS
Sandy Hook, NJ

Accutest Labs Report # JB1669
MCGI Project No. ER081401-1669-I

Prepared for:

Earth Resources Technology, Inc.
Laurel, MD

Prepared by:

"MCGI"
Meridian Consultant Group, Inc.
Environmental Services & Data Validation

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August 2014

CONTENTS

GLOSSARY OF ACRONYMS & TERMS

GLOSSARY OF ACRONYMS & TERMS

One or more of the following acronyms and terms may have been used in the descriptive process of the **Inorganic** Data Validation.

Acronyms:

AA	Atomic Absorption
CARD	CLP Analytical Results Database
CCB	Continuing Calibration Blank
CCS	Contract Compliance Screening
CCV	Continuing Calibration Verification
CF	Calibration Factor
CLP	Contract Laboratory Program
COC	Chain of Custody
CRDL	Contract Required Detection Limit
CSF	Complete SDG File
CV	Cold Vapor
%D	Percent Difference
DAS	Delivery of Analytical Services
DSF	Data Summary Form
EMSL-LV	Environmental Monitoring Support Laboratory - Las Vegas
EPA	United States Environmental Protection Agency
ICAL	Initial Calibration
ICB	Initial Calibration Blank
ICP	Inductively Coupled Plasma
ICS	Interference Check Sample
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
IRDA	Inorganic Regional Data Assessment
LCS	Laboratory Control Sample
LCL	Lower Control Limit
MCL	Maximum Contamination Level
MDC	Minimum Detectable Concentration
MDL	Method Detection Limit
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSA	Method of Standard Addition
PB	Preparation Blank
PCB	Poly Chlorinated Biphenyl
PRP	Potential Responsible Party
QA/QC	Quality Assurance/Quality Control
QAPjP	Quality Assurance Project Plan
QC	Quality Control

%R	Percent Recovery of spiked amount
RAS	Routine Analytical Services
RPD	Relative Percent Difference
RRF	Relative Response Factor
RSD	Relative Standard Deviation
SDG	Sample Delivery Group
SMO	Sample Management Office
SOP	Standard Operation Procedures
SOW	Statement of Work
SSL	Samples Shipping Log
TAL	Target Analyte List
TR	Traffic Report
UCL	Upper Control Limit
VTSR	Validated Time of Sample Receipt

Terms:

Associated Samples
Any sample related to a particular QC analysis. For Example:
- For ICV, all samples run under the same calibration curve.
- For duplicate RPD, all SDG samples digested/distilled of the same matrix.

Case A finite, usually predetermined number of samples collected over a given time period for a particular site. A Case consists of one or more Sample Delivery Group(s).

Continuing Calibration Blank (CCB)
A deionized water sample run every ten (10) samples designed to detect any carryover contamination.

Continuing Calibration Verification (CCV)
A deionized water sample run every ten (10) samples designed to detect any carryover contamination.

Contract Compliance Screening (CCS)
A process in which the SMO inspects the data for contractual compliance and provides EMSL-LV laboratories and the Regions with their findings.

Contractual Holding Time
The time from VTSR (validated time of sample receipt) to laboratory extraction and /or analysis.

Data Validation Qualifier (DVQ)

This refers to the column on the data summary form in which EPA Region III and other qualifiers have been placed by the data validator.

Data Validation Result (DVR)

This refers to the column on the data summary form used to report results that have been modified by the data validator. A result in the DVR column that is qualified "U" indicates a modification of the reporting limit.

Field Blank Field blanks are intended to identify contaminants that may have been introduced in the field. Examples are rinsate blank (RB), field blanks (FB) and trip blank (TB).

Field Duplicate

A duplicate sample generated in the field; not in the laboratory.

Initial Calibration (ICAL)

The establishment of a calibration curve with the appropriate number of standards and concentration ranges. The calibration curve plots absorbancies and/or emissions versus concentration of the standards.

.

Initial Calibration Blank (ICB)

First blank run after the calibration curve .

Initial Calibration Verification (ICV)

First standard run after the calibration curve .

Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Introduction of a known concentration of a compound into a sample to provide information about the effect of sample matrix on the extraction and/or measurement methodology.

Post Digestion Spike

The addition of known amount of standard after digestion. (Also identified as analytical spike, or spike, for furnace analyses.)

Preparation Blank (PB)

Blank taken through the digestion process to detect internal laboratory contamination.

Sample Delivery Group (SDG)

Defined by one of the following, whichever occurs first:

- case of sample
- each twenty field samples in a case or
- each 14-day calendar period during which field samples in a case are received, beginning with the receipt of the first sample in the SDG.

Serial Dilution

A sample run at a specific dilution to determine whether any significant chemical or physical interferences exist due to sample matrix effect, for ICP only.

Technical Holding Time

The time from sample collection to laboratory extraction and /or analysis.

COMMUNICATION RECORDS

N/A

GLOSSARY OF DATA VALIDATION QUALIFIERS

GLOSSARY OF DATA QUALIFIER CODES (INORGANIC)

CODES RELATED TO IDENTIFICATION:
(Confidence concerning presence or absence of compounds)

U	=	Not detected above the level of the associated value. The associated value is either the approximate sample quantitation or detection limit.
NO CODE	=	Confirmed identification
U1	=	Not detected substantially above the level reported in laboratory or field blanks.
R	=	Unusable results. Analyte may or may not be present in the sample.
N	=	Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.

CODES RELATED TO QUANTITATION:
(Can be used for both positive results and sample quantitation limits)

J	=	Analyte present. Reported value may not be accurate or precise (estimated value).
J+	=	Analyte present. Reported value may be biased high. Result is estimated high.
J-	=	Analyte present. Reported value may be biased low. Result is estimated low.
UJ	=	Not detected. Quantitation limit may be inaccurate or imprecise (Estimated).
UJ-	=	Not detected. Quantitation limit may be biased low. Quantitation limit is probably higher.

OTHER CODES:

NJ	=	Qualitative identification questionable. Presumptively present at approximate quantity.
Q	=	No analytical result.
X	=	Data not Validated.

DATA VALIDATION REPORT NARRATIVE

MCGI

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DATE: August 14, 2014

SUBJECT: USEPA Inorganic Data Validation Report
Metals
Accutest Labs SDG No. JB1669
Site: Fort Hancock FUDS
MSTI Project No. ER081401-1669-I

FROM: Sherif N. Mina
Meridian Consultant Group, Inc.

TO: Mr. Mike Gearheart
Earth Resources Technology, Inc.

OVERVIEW

This Sample Delivery Group (SDG) consisted of twenty-two (22) soil samples submitted to Accutest Laboratories, Orlando, FL, for Metals analysis according to SW-846 Methods 6010C. The sample set included two (2) soil field duplicate pairs. The sample was analyzed in accordance with the Chain-of-Custody (COC), see Sample Identification Summary.

Sample Identification Summary

SAMPLE INFORMATION			Analysis
Field ID	**Lab ID**	**Matrix**	**M**
FHRI-BOO3-SO-01	JB71669-01	Soil	x
FHRI-BOO3-SO-02	JB71669-02	Soil	x
FHRI-BOO3-SO-03	JB71669-03	Soil	x
FHRI-BOO3-SO-04	JB71669-04	Soil	x
FHRI-BOO3-SO-05	JB71669-05	Soil	x
FHRI-BOO3-SO-06	JB71669-06	Soil	x
FHRI-BOO3-SO-07	JB71669-07	Soil	x
FHRI-BOO3-SO-DUP1	JB71669-08	Soil	x
FHRI-BOO3-SO-08	JB71669-09	Soil	x
FHRI-BOO3-SO-09	JB71669-10	Soil	x
FHRI-BOO3-SO-10	JB71669-11	Soil	x
FHRI-BOO3-SO-11	JB71669-12	Soil	x

SAMPLE INFORMATION			Analysis
Field ID	**Lab ID**	**Matrix**	**M**
FHRI-BOO3-SO-12	JB71669-13	Soil	x
FHRI-BOO3-SO-13	JB71669-14	Soil	x
FHRI-BOO3-SO-14	JB71669-15	Soil	x
FHRI-BOO3-SO-15	JB71669-16	Soil	x
FHRI-BOO3-SO-16	JB71669-17	Soil	x
FHRI-BOO3-SO-17	JB71669-18	Soil	x
FHRI-BOO3-SO-18	JB71669-19	Soil	x
FHRI-BOO3-SO-19	JB71669-20	Soil	x
FHRI-BOO3-SO-20	JB71669-21	Soil	x
FHRI-BOO3-SO-DUP2	JB71669-22	Soil	x

M=Metals

Field Duplicates: FHRI-BOO3-SO-DUP1/FHRI-BOO3-SO-07
FHRI-BOO3-SO-DUP2/FHRI-BOO3-SO-20

The analytical results were validated according to the pertinent parts of U.S. Environmental Protection Agency (USEPA) National Functional for Inorganic Data Review, dated October 2013; against the specifications in the project-specific QAPP; along with the Quality Assurance/Quality Control (QA/QC) criteria/requirements for the analytical methods used for the analyses. The validation was based on the following parameters:

Data Validation Summary

	Parameters	M		
		q	t	a
*	Data Completeness		22	0
*	Holding Time		22	0
*	Calibration Verification		22	0
*	Laboratory and Field Blanks analyses		22	0
*	ICP Interference Check Sample results		22	0
	Matrix Spike recoveries (MS)	x	22	2
	Laboratory and Field Duplicates	x	22	2
*	Laboratory Control Sample(LCS)		22	0
*	Serial Dilution results		22	0
*	Furnace Atomic Absorption results (FAA)		22	0
*	Analyte Identification		22	0
*	Analyte Quantitation		22	0
* All Criteria were met for that Parameter, M=Metals				

q=qualified; t=total number of samples analyzed; a=number of samples affected

SUMMARY

All samples were successfully analyzed for all target analytes according to Quality Assurance/Quality Control (QA/QC) criteria/requirements that are identified in the project-specific QAPP & the analytical methods used for the analyses. All instruments and method sensitivities were according to the specified analytical methods. Refer to Minor Problems for information regarding biases identified during data validation.

Deviation from USEPA NFG: The “U” qualifier recommended by USEPA NFG for blank contamination was replaced by the “U1” qualifier to clearly indicate blank contamination on the EDDs.

MAJOR ISSUES

- None noted.

MINOR ISSUES

- ***Laboratory and Field Blanks analyses:*** The maximum concentration of all compounds found in the analyses of the trip, field or laboratory method blanks are listed in the following table. Associated samples with positive results of theses contaminants were qualified “U1" based on the concentration level found in the samples, according to USEPA National Functional Guideline for Inorganic Data Review, dated October 2013.

Analyte	Blank Type	Affected Samples Lab ID

CB = Container Blank
PB = Preparation Blank
ICB = Initial Calibration Blank
CCB = Continuing Calibration Blank
FB = Field Blank
EB = Equipment Blank

- ***Matrix Spike/Matrix Spike Duplicate (MS/MSD):*** The MS/MSD associated with batch MP80715 (Samples FHRI-BOO3-SO-20 & FHRI-BOO3-SO-Dup2) displayed low recoveries (*i.e.,* 30%<%R<75%) for Sb analyte. Positive results in these two (2) sample maybe biased low and were qualified “J-“.

- ***Field Duplicate:*** The Se & Tl analytes in the soil field duplicate pair FHRI-BOO3-SO-DUP1/FHRI-BOO3-SO-07 displayed positive result (<CRQL) in one sample and non-detect in the other. It is the validator’s professional judgement to qualify positive result & quantitation limit in this field duplicate pair only as estimated “J” & “UJ”, respectively.

  The Cu analyte in the soil field duplicate pair FHRI-BOO3-SO-DUP2/FHRI-BOO3-SO-20 displayed an RPD slightly outside the QC limit of 30%, as stated in the QAPjP. Since there are two (2) soil field duplicate pairs in this sample set, it is the validator’s professional judgement to qualify the Cu results in this field duplicate pair as estimated “J”.

  The Sb analyte in the soil field duplicate pair FHRI-BOO3-SO-DUP2/FHRI-BOO3-SO-20 displayed an RPD slightly outside the QC limit of 30%, as stated in the QAPjP. This analyte was previously qualified as “J-“ due to MS/MSD recovery. It is the validator’s professional judgement that no further qualification be applied based on the field duplicate RPD.

NOTES

- ***Electronic Data Deliverable (EDD):*** Several rows in an electronic data deliverable (EDD) are marked with an “X” and hidden before printing a data summary form. These rows may include quality control samples such as Method Blanks, Laboratory Control Samples, Matrix Spikes, or Matrix Spike Duplicates which are not validated. Additionally, some field sample results may not be used since only one (1) result for each compound is reported after validation. The following list indicates some instances in which an "X" may be placed in the DVQ column:

1. The compounds in an analysis that have exceeded the instrument calibration range.
2. All compounds in a diluted analysis that were within the calibration range in the initial analysis.
3. All compounds in either the initial analysis or re-analysis of a sample, depending on which analysis is not reported on the EDD.

Although QC samples and some field samples results may not be used, all data were reviewed and considered in the overall assessment.

- ***Data Validation Qualifier (DVQ)*****:** This refers to the column on the data summary form in which EPA Region III and other qualifiers have been placed by the data validator.

- ***Data Validation Result (DVR):*** This refers to the column on the data summary form used to report results that have been modified by the data validator. A result in the DVR column that is qualified "U" indicates a modification of the reporting limit. Results in the DVR column supersede those reported by the laboratory.

- ***Compound Quantitation:*** Positive results for compounds which are below the CRQL were qualified as estimated "J" on the EDD.

REPORT CONTENT STATEMENT

All data for this project were reviewed in accordance with the pertinent parts of the U.S. Environmental Protection Agency (USEPA) National Functional Guideline for Inorganic Data Review, dated October 2013; against the specifications in the project specific QAPP; along with the Quality Assurance/Quality Control (QA/QC) criteria/requirements for the analytical methods used for the analyses. The text of the report addresses only those problems affecting data usability.

ATTACHMENTS

1) Glossary of Data Qualifiers
2) Electronic Data Deliverable (EDD). These include:
    (a) All results for target analytes with qualifier codes where applicable.
    (b) All unusable detection limits (qualified "R"), where applicable.
3) Electronic Data Package (.pdf file) as Support Documentation

DCN: ER081401-1669-I

Respectfully Submitted,

Sherif N. Mina   Date: August 14, 2014

Sherif N. Mina

QA/Review: SM

Appendix C: Risk Assessment - Supporting Tables

Appendix C-1. **Human Health Risk Assessment Tables**

Appendix C-2. **Screening Level Ecological Risk Assessment Tables**

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Appendix C-1:
Human Health Risk Assessment Tables

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APPENDIX C-1
HHRA TABLES

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
B003, Fort Hancock

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Soil	Surface Soil	Direct contact with surface soil	Adult Recreational User	Adult	Ingestion	On-Site	Quant.	Under current and expected future site conditions, this exposure pathway is potentially complete
						Dermal Contact	On-Site	Quant.	Under current and expected future site conditions, this exposure pathway is potentially complete
				Child Recreational User	Child	Ingestion	On-Site	Quant.	Under current and expected future site conditions, this exposure pathway is potentially complete
						Dermal Contact	On-Site	Quant.	Under current and expected future site conditions, this exposure pathway is potentially complete
				Outdoor Maintenance Worker	Adult	Ingestion	On-Site	Quant.	Under current and expected future site conditions, this exposure pathway is potentially complete
						Dermal Contact	On-Site	Quant.	Under current and expected future site conditions, this exposure pathway is potentially complete
				Archaeologist	Adult	Ingestion	On-Site	Quant.	Under current and expected future site conditions, this exposure pathway is potentially complete
						Dermal Contact	On-Site	Quant.	Under current and expected future site conditions, this exposure pathway is potentially complete
		Air	Dust emissions from surface soil	Adult Recreational User	Adult	Inhalation	On-Site	Quant.	Under current and expected future site conditions, this exposure pathway is potentially complete
				Child Recreational User	Child	Inhalation	On-Site	Quant.	Under current and expected future site conditions, this exposure pathway is potentially complete
				Outdoor Maintenance Worker	Adult	Inhalation	On-Site	Quant.	Under current and expected future site conditions, this exposure pathway is potentially complete
				Archaeologist	Adult	Inhalation	On-Site	Quant.	Under current and expected future site conditions, this exposure pathway is potentially complete
Future	Surface Soil*	Surface Soil	Direct contact with surface soil	Construction Worker	Adult	Ingestion	On-Site	Quant.	This pathway may be complete under future site conditions.
						Dermal Contact	On-Site	Quant.	This pathway may be complete under future site conditions.
				Hypothetical Resident	Adult/Child and age-adjusted	Ingestion	On-Site	Quant.	This pathway may be complete under future site conditions.
						Dermal Contact	On-Site	Quant.	This pathway may be complete under future site conditions.
		Air	Dust emissions from surface soil	Construction Worker	Adult	Inhalation	On-Site	Quant.	This pathway may be complete under future site conditions.
				Hypothetical Resident	Adult/Child and age-adjusted	Inhalation	On-Site	Quant.	This pathway may be complete under future site conditions.

* The site dataset contains surface soil samples only.

There is no surface water or sediment at B003. The 2014 Remedial Investigation Report evaluated potential exposure to groundwater and recommended a risk managem decision of no further action for this medium.

Table 3.1
Surface Soil
EXPOSURE POINT CONCENTRATION SUMMARY
B003, Fort Hancock

Scenario Timeframe: Current and Future
Medium: Surface Soil
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure		
				Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Antimony	mg/kg	3.49E+01		1.3E+01	95% Chebyshev(Mean, Sd) UCL	[1]
Arsenic	mg/kg	1.1E+02		3.5E+01	95% Chebyshev (Mean, Sd) UCL	[2]
Copper	mg/kg	3.8E+02		1.1E+02	95% Chebyshev (Mean, Sd) UCL	[2]
Lead	mg/kg	2.2E+03		1.8E+02	Average	[4]
Selenium	mg/kg	3.6E+00		3.6E+00	Maximum	[3]
Thallium	mg/kg	6.5E+00		1.3E+00	95% KM (BCA) UCL	[1]

[1] Data appear lognormally distributed; the ProUCL recommended statistical method was used.

[2] Data do not follow a discernible distribution; the ProUCL recommended statistical method was used.

[3] Detected in only two samples. Maximum detection used as EPC.

[4] The average concentration is used for blood lead modeling.

Table 3.2
Air
EXPOSURE POINT CONCENTRATION SUMMARY
Non-Excavation Scenarios
B003, Fort Hancock

Scenario Timeframe: Future
Medium: Site Soil
Exposure Medium: Air

Chemical of Potential Concern	Units	Maximum Estimated Concentration	Maximum Qualifier	Reasonable Maximum Exposure		
				Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Antimony	ug/m^3	2.6E-05	NA	9.6E-06	95% Chebyshev(Mean, Sd) UCL	[1]
Arsenic	ug/m^3	8.4E-05	NA	2.5E-05	95% Chebyshev (Mean, Sd) UCL	[1]
Copper	ug/m^3	8.3E-05	NA	8.3E-05	95% Chebyshev (Mean, Sd) UCL	[1]
Selenium	ug/m^3	2.6E-06	NA	2.6E-06	Maximum	[2]
Thallium	ug/m^3	4.8E-06	NA	9.7E-07	95% KM (BCA) UCL	[1]

Air concentration = soil concentration x (1/PEF)
PEF = particulate emission factor; 1.36×10^9 m^3/kg
PEF obtained from Supplemental Guidance for the Development of Soil Screening Levels at Superfund Sites, EPA 2002.
[1] The EPC was estimated using the 95% UCL of the soil data (see Table 3.1).
[2] Insufficient detection frequency to support a 95% UCL calculation. The maximum detection is used as the EPC.
EPC = exposure point concentration

Table 3.3
Air
EXPOSURE POINT CONCENTRATION SUMMARY
Construction Worker Exposure Scenarios
B003, Fort Hancock

Scenario Timeframe: Future
Medium: Site Soil
Exposure Medium: Air

Chemical of Potential Concern	Units	Maximum Estimated Concentration	Maximum Qualifier	Reasonable Maximum Exposure		
				Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Antimony	ug/m^3	4.1E-02	NA	1.5E-02	95% Chebyshev(Mean, Sd) UCL	[1]
Arsenic	ug/m^3	1.3E-01	NA	4.0E-02	95% Chebyshev (Mean, Sd) UCL	[1]
Copper	ug/m^3	4.5E-01	NA	1.3E-01	95% Chebyshev (Mean, Sd) UCL	[1]
Selenium	ug/m^3	4.2E-03	NA	4.2E-03	Maximum	[2]
Thallium	ug/m^3	7.6E-03	NA	1.5E-03	95% KM (BCA) UCL	[1]

Air concentration = soil concentration x (1/PEF)
PEF = particulate emission factor; 8.57 x 10^5 m^3/kg
PEF calculated in accordance with Supplemental Guidance for the Development of Soil Screening Levels at Superfund Sites, EPA 2002.
[1] The EPC was estimated using the 95% UCL of the soil data (see Table 3.1).
[2] Insufficient detection frequency to support a 95% UCL calculation. The maximum detection is used as the EPC.
EPC = exposure point concentration

Table 4.1

VALUES USED FOR DAILY INTAKE CALCULATIONS

B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Outdoor Maintenance Worker
Receptor Age: Adult

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg			Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 2002	CS x IR-S x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	225	EPA, 2002	
	ED	Exposure Duration	years	25	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg			CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,300	EPA, 2004	CS x SA x SSAF x DABS x CF x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.2	EPA, 2004	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	- -	
	EF	Exposure Frequency	days/year	225	EPA, 2002	
	ED	Exposure Duration	years	25	EPA, 1991	
	BW	Body Weight	kg	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 92

EPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2

VALUES USED FOR DAILY INTAKE CALCULATIONS

B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Outdoor Maintenance Worker
Receptor Age: Adult

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical Concentration in Air	mg/m^3			Adjusted air concentration (mg/m^3) =
	ET	Exposure time	hours/day	8	EPA, 1991	CA xET x EF x ED x 1/AT
	EF	Exposure Frequency	days/year	225	EPA, 2002	
	ED	Exposure Duration	years	25	EPA, 1991	
	AT-C	Averaging Time (Cancer)	hours	613,200	EPA, 2009	
	AT-N	Averaging Time (Non-Cancer)	hours	219,000	EPA, 2009	

Sources:

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.3

VALUES USED FOR DAILY INTAKE CALCULATIONS

B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Archaeologist
Receptor Age: Adult

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg			Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	330	[1]	CS x IR-S x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	[2]	
	ED	Exposure Duration	years	1	[2]	
	CF	Conversion Factor	kg/mg	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg			CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,300	[1]	CS x SA x SSAF x DABS x CF x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.3	[1]	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	- -	
	EF	Exposure Frequency	days/year	250	[2]	
	ED	Exposure Duration	years	1	[2]	
	BW	Body Weight	kg	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	

Notes:

[1] Default value for construction worker (EPA 2002). Archaeologist assumed to experience similar degree of direct contact.

[2] Assumed archaeologist to spend one year working at Fort Hancock.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.4

VALUES USED FOR DAILY INTAKE CALCULATIONS

B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Archaeologist
Receptor Age: Adult

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical Concentration in Air	mg/m^3			Adjusted air concentration (mg/m^3) =
	ET	Exposure time	hours/day	8	[1]	CA xET x EF x ED x 1/AT
	EF	Exposure Frequency	days/year	250	[1]	
	ED	Exposure Duration	years	1	[1]	
	AT-C	Averaging Time (Cancer)	hours	613,200	EPA, 2009	
	AT-N	Averaging Time (Non-Cancer)	hours	8,760	EPA, 2009	

Notes:

[1] Archeaologist assumed to spend a standard work year at the site.

AT-C = 24 hours/day x 365 days/year x 70 years

AT-N = 24 hours/day x 365 days/year x ED

Sources:

EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5

VALUES USED FOR DAILY INTAKE CALCULATIONS

B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Recreational User
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg			Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	[1]	CS x IR-S x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	30	[2]	
	ED	Exposure Duration	years	6	[3]	
	CF	Conversion Factor	kg/mg	0.000001	- -	
	BW	Body Weight	kg	15	[4]	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg			CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	2,800	[5]	CS x SA x SSAF x DABS x CF x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.2	[6]	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	- -	
	EF	Exposure Frequency	days/year	30	[2]	
	ED	Exposure Duration	years	6	[3]	
	BW	Body Weight	kg	15	[4]	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	

Notes:

[1] Same ingestion rate as for the child resident (EPA, 1991).

[2] Assume receptor spends each weekend at the site between Memorial Day and Labor Day.

[3] Same age span as the child resident receptor (EPA, 1991).

[4] Body weight associated with the age span of 0-6 years (EPA, 1991).

[5] Corresponds to skin surface area for child resident receptor exposed to soil (EPA, 2004).

[6] Corresponds to soil-to-skin adherence factor for child resident receptor (EPA, 2004).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1997. Exposure Factors Handbook

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.6

VALUES USED FOR DAILY INTAKE CALCULATIONS

B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Recreational User
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical Concentration in Air	mg/m^3			Adjusted air concentration (mg/m^3) =
	ET	Exposure time	hours/day	8	[1]	CA xET x EF x ED x 1/AT
	EF	Exposure Frequency	days/year	30	[2]	
	ED	Exposure Duration	years	6	[3]	
	AT-C	Averaging Time (Cancer)	hours	613,200	EPA, 2009	
	AT-N	Averaging Time (Non-Cancer)	hours	52,560	EPA, 2009	

Notes:

[1] Assume receptor spends 8 hours per day at the site.

[2] Assume receptor spends each weekend at the site between Memorial Day and Labor Day.

[3] Same age span as the child resident receptor (EPA, 1991).

AT-C = 24 hours/day x 365 days/year x 70 years

AT-N = 24 hours/day x 365 days/year x ED

Sources:

EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.7

VALUES USED FOR DAILY INTAKE CALCULATIONS

B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg			Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	[1]	CS x IR-S x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	30	[2]	
	ED	Exposure Duration	years	30	[3]	
	CF	Conversion Factor	kg/mg	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	10,950	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg			CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,700	[4]	CS x SA x SSAF x DABS x CF x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.07	[5]	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	- -	
	EF	Exposure Frequency	days/year	30	[2]	
	ED	Exposure Duration	years	30	[3]	
	BW	Body Weight	kg	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	10,950	EPA, 1989	

Notes:

[1] Same ingestion rate as for the adult resident (EPA, 2002).

[2] Assume receptor spends each weekend at the site between Memorial Day and Labor Day.

[3] Assume receptor lives in the vicinity of site for 30 years, the default exposure duration for a resident.

[4] Corresponds to skin surface area for adult resident receptor exposed to soil (EPA, 2004).

[5] Corresponds to soil-to-skin adherence factor for adult resident receptor (EPA, 2004).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.8

VALUES USED FOR DAILY INTAKE CALCULATIONS

B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical Concentration in Air	mg/m^3			Adjusted air concentration (mg/m^3) =
	ET	Exposure time	hours/day	8	[1]	CA xET x EF x ED x 1/AT
	EF	Exposure Frequency	days/year	30	[2]	
	ED	Exposure Duration	years	30	[3]	
	AT-C	Averaging Time (Cancer)	hours	613,200	EPA, 2009	
	AT-N	Averaging Time (Non-Cancer)	hours	262,800	EPA, 2009	

Notes:

[1] Assume receptor spends 8 hours per day at the site.

[2] Assume receptor spends each weekend at the site between Memorial Day and Labor Day.

[3] Assume receptor lives in the vicinity of site for 30 years, the default exposure duration for a resident.

AT-C = 24 hours/day x 365 days/year x 70 years

AT-N = 24 hours/day x 365 days/year x ED

Sources:

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.9

VALUES USED FOR DAILY INTAKE CALCULATIONS

B003, Fort Hancock

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg			Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	EPA, 1991	CS x IR-S x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	- -	
	BW	Body Weight	kg	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg			CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	2,800	EPA, 2004	CS x SA x SSAF x DABS x CF x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.2	EPA, 2004	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.10

VALUES USED FOR DAILY INTAKE CALCULATIONS

B003, Fort Hancock

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical Concentration in Air	mg/m^3			Adjusted air concentration (mg/m^3) =
	ET	Exposure time	hours/day	24	EPA, 1991	CA xET x EF x ED x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	
	AT-C	Averaging Time (Cancer)	hours	613,200	EPA, 2009	
	AT-N	Averaging Time (Non-Cancer)	hours	52,560	EPA, 2009	

Sources:

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.11

VALUES USED FOR DAILY INTAKE CALCULATIONS

B003, Fort Hancock

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg			Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1991	CS x IR-S x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	
	ED	Exposure Duration - cancer	years	24	EPA, 1991	
	ED	Exposure Duration - noncancer	years	30	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	10,950	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg			
						CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,700	EPA, 2004	CS x SA x SSAF x DABS x CF x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.07	EPA, 2004	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	
	ED	Exposure Duration - cancer	years	24	EPA, 1991	
	ED	Exposure Duration - noncancer	years	30	EPA, 1991	
	BW	Body Weight	kg	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	10,950	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.12

VALUES USED FOR DAILY INTAKE CALCULATIONS

B003, Fort Hancock

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical Concentration in Air	mg/m^3			Adjusted air concentration (mg/m^3) =
	ET	Exposure time	hours/day	24	EPA, 1991	CA xET x EF x ED x 1/AT
	EF	Exposure Frequency	days/year	350	EPA, 1991	
	ED	Exposure Duration - cancer	years	24	EPA, 1991	
	ED	Exposure Duration - noncancer	years	30		
	AT-C	Averaging Time (Cancer)	hours	613,200	EPA, 2009	
	AT-N	Averaging Time (Non-Cancer)	hours	262,800	EPA, 2009	

Sources:

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.13

VALUES USED FOR DAILY INTAKE CALCULATIONS

B003, Fort Hancock

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg			Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	330	EPA, 2002	CS x IR-S x EF x ED x CF x 1/BW x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	
	ED	Exposure Duration	years	1	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	- -	
	BW	Body Weight	kg	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg			CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,300	EPA, 2002	CS x SA x SSAF x DABS x CF x EF x
	SSAF	Soil to Skin Adherence Factor	mg/cm^2-day	0.3	EPA, 2002	ED x 1/BW x 1/AT
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	- -	
	EF	Exposure Frequency	days/year	250	EPA, 1991	
	ED	Exposure Duration	years	1	EPA, 1991	
	BW	Body Weight	kg	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.14

VALUES USED FOR DAILY INTAKE CALCULATIONS

B003, Fort Hancock

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Chemical Concentration in Air	mg/m^3			Adjusted air concentration (mg/m^3) =
	ET	Exposure time	hours/day	8	EPA, 1991	CA xET x EF x ED x 1/AT
	EF	Exposure Frequency	days/year	250	EPA, 1991	
	ED	Exposure Duration	years	1	EPA, 1991	
	AT-C	Averaging Time (Cancer)	hours	613,200	EPA, 2009	
	AT-N	Averaging Time (Non-Cancer)	hours	8,760	EPA, 2009	

Sources:

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

B003, Fort Hancock

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Aug-14
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Aug-14
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract		HEAST	1997
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Oct-14
Thallium	Chronic	1.0E-05	mg/kg-day	1	1.0E-05	mg/kg-day	Hair	3000	IRIS	Aug-14

Notes:

IRIS = EPA Integrated Risk Information System

HEAST = Health Effects Assessment Summary Tables

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For HEAST, date of last table update

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION

B003, Fort Hancock

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC: Target Organ	Dates of RfC: Target Organ (MM/DD/YY) [1]
Antimony		NV	mg/m3	NA			
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Aug-14
Copper		NV	mg/m3	NA			
Selenium		2.0E-02	mg/m3	liver, cardiovascular system, nervous system		CalEPA	Oct-14
Thallium		NV	mg/m3	NA			

Notes:

NV = no toxicity value

CalEPA - Calfiornia Environmental Protection Agency

NA = not applicable

(1) For CalEPA, date that database was searched

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

B003, Fort Hancock

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Antimony	NV	0.15	NV	$(mg/kg\text{-}day)^{-1}$			
Arsenic	1.5E+00	1	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	Aug-14
Copper	NV	1	NV	$(mg/kg\text{-}day)^{-1}$	D	IRIS	Aug-14
Selenium	NV	1	NV	$(mg/kg\text{-}day)^{-1}$	D	IRIS	Oct-14
Thallium	NV	1	NV	$(mg/kg\text{-}day)^{-1}$			

Notes:

IRIS = Integrated Risk Information System

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

B003, Fort Hancock

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m^3)	Inhalation Unit Risk per mg/m3	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Aug-14
Copper	NV	NV			
Selenium	NV	NV	D	IRIS	Oct-14
Thallium	NV	NV			

Notes:

IRIS = Integrated Risk Information System

NV = no toxicity value

(1) Date of database search

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

TABLE 7.1
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Outdoor Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion								
	Antimony	1.3E+01	mg/kg	1.1E-05	mg/kg-day	4.0E-04	mg/kg-day	0.03
	Arsenic	3.5E+01	mg/kg	1.8E-05	mg/kg-day	3.0E-04	mg/kg-day	0.06
	Copper	1.1E+02	mg/kg	9.9E-05	mg/kg-day	4.0E-02	mg/kg-day	0.002
	Selenium	3.6E+00	mg/kg	3.2E-06	mg/kg-day	5.0E-03	mg/kg-day	0.0006
	Thallium	1.3E+00	mg/kg	1.2E-06	mg/kg-day	1.0E-05	mg/kg-day	0.1
Ingestion Route Total								0.2
Dermal Absorption								
	Antimony	1.3E+01	mg/kg	7.6E-07	mg/kg-day	6.0E-05	mg/kg-day	0.01
	Arsenic	3.5E+01	mg/kg	6.0E-06	mg/kg-day	3.0E-04	mg/kg-day	0.02
	Copper	1.1E+02	mg/kg	6.5E-06	mg/kg-day	4.0E-02	mg/kg-day	0.0002
	Selenium	3.6E+00	mg/kg	2.1E-07	mg/kg-day	5.0E-03	mg/kg-day	0.00004
	Thallium	1.3E+00	mg/kg	7.7E-08	mg/kg-day	1.0E-05	mg/kg-day	0.01
Dermal Absorption Route Total								0.04
Inhalation								
	Antimony	9.6E-09	mg/m^3	2.0E-09	mg/m^3	NV	mg/m^3	NV
	Arsenic	2.5E-08	mg/m^3	5.2E-09	mg/m^3	1.5E-05	mg/m^3	0.0003
	Copper	8.3E-08	mg/m^3	1.7E-08	mg/m^3	NV	mg/m^3	NV
	Selenium	2.6E-09	mg/m^3	5.4E-10	mg/m^3	2.0E-02	mg/m^3	0.00000003
	Thallium	9.7E-10	mg/m^3	2.0E-10	mg/m^3	NV	mg/m^3	NV
Inhalation Route Total								0.0003
Total of Receptor Hazards Across All Media								0.3

TABLE 7.2
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Archaeologist
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion								
	Antimony	1.3E+01	mg/kg	4.2E-05	mg/kg-day	4.0E-04	mg/kg-day	0.1
	Arsenic	3.5E+01	mg/kg	6.7E-05	mg/kg-day	3.0E-04	mg/kg-day	0.2
	Copper	1.1E+02	mg/kg	3.6E-04	mg/kg-day	4.0E-02	mg/kg-day	0.01
	Selenium	3.6E+00	mg/kg	1.2E-05	mg/kg-day	5.0E-03	mg/kg-day	0.002
	Thallium	1.3E+00	mg/kg	4.3E-06	mg/kg-day	1.0E-05	mg/kg-day	0.4
Ingestion Route Total								0.8
Dermal Absorption								
	Antimony	1.3E+01	mg/kg	1.3E-06	mg/kg-day	6.0E-05	mg/kg-day	0.02
	Arsenic	3.5E+01	mg/kg	1.0E-05	mg/kg-day	3.0E-04	mg/kg-day	0.03
	Copper	1.1E+02	mg/kg	1.1E-05	mg/kg-day	4.0E-02	mg/kg-day	0.0003
	Selenium	3.6E+00	mg/kg	3.5E-07	mg/kg-day	5.0E-03	mg/kg-day	0.00007
	Thallium	1.3E+00	mg/kg	1.3E-07	mg/kg-day	1.0E-05	mg/kg-day	0.01
Dermal Absorption Route Total								0.07
Inhalation								
	Antimony	9.6E-09	mg/m^3	2.2E-09	mg/m^3	NV	mg/m^3	NV
	Arsenic	2.5E-08	mg/m^3	5.8E-09	mg/m^3	1.5E-05	mg/m^3	0.0004
	Copper	8.3E-08	mg/m^3	1.9E-08	mg/m^3	NV	mg/m^3	NV
	Selenium	2.6E-09	mg/m^3	6.0E-10	mg/m^3	2.0E-02	mg/m^3	0.00000003
	Thallium	9.7E-10	mg/m^3	2.2E-10	mg/m^3	NV	mg/m^3	NV
Inhalation Route Total								0.0004
Total of Receptor Hazards Across All Media								0.8

TABLE 7.3
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion								
	Antimony	1.3E+01	mg/kg	1.4E-05	mg/kg-day	4.0E-04	mg/kg-day	0.04
	Arsenic	3.5E+01	mg/kg	2.3E-05	mg/kg-day	3.0E-04	mg/kg-day	0.08
	Copper	1.1E+02	mg/kg	1.2E-04	mg/kg-day	4.0E-02	mg/kg-day	0.003
	Selenium	3.6E+00	mg/kg	3.9E-06	mg/kg-day	5.0E-03	mg/kg-day	0.0008
	Thallium	1.3E+00	mg/kg	1.5E-06	mg/kg-day	1.0E-05	mg/kg-day	0.1
Ingestion Route Total								0.3
Dermal Absorption								
	Antimony	1.3E+01	mg/kg	4.0E-07	mg/kg-day	6.0E-05	mg/kg-day	0.01
	Arsenic	3.5E+01	mg/kg	3.2E-06	mg/kg-day	3.0E-04	mg/kg-day	0.01
	Copper	1.1E+02	mg/kg	3.4E-06	mg/kg-day	4.0E-02	mg/kg-day	0.0001
	Selenium	3.6E+00	mg/kg	1.1E-07	mg/kg-day	5.0E-03	mg/kg-day	0.00002
	Thallium	1.3E+00	mg/kg	4.1E-08	mg/kg-day	1.0E-05	mg/kg-day	0.004
Dermal Absorption Route Total								0.02
Inhalation								
	Antimony	9.6E-09	mg/m^3	2.6E-10	mg/m^3	NV	mg/m^3	NV
	Arsenic	2.5E-08	mg/m^3	7.0E-10	mg/m^3	1.5E-05	mg/m^3	0.00005
	Copper	8.3E-08	mg/m^3	2.3E-09	mg/m^3	NV	mg/m^3	NV
	Selenium	2.6E-09	mg/m^3	7.3E-11	mg/m^3	2.0E-02	mg/m^3	0.000000004
	Thallium	9.7E-10	mg/m^3	2.7E-11	mg/m^3	NV	mg/m^3	NV
Inhalation Route Total								0.00005
Total of Receptor Hazards Across All Media								0.3

TABLE 7.4
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion								
	Antimony	1.3E+01	mg/kg	1.5E-06	mg/kg-day	4.0E-04	mg/kg-day	0.004
	Arsenic	3.5E+01	mg/kg	2.4E-06	mg/kg-day	3.0E-04	mg/kg-day	0.008
	Copper	1.1E+02	mg/kg	1.3E-05	mg/kg-day	4.0E-02	mg/kg-day	0.0003
	Selenium	3.6E+00	mg/kg	4.2E-07	mg/kg-day	5.0E-03	mg/kg-day	0.00008
	Thallium	1.3E+00	mg/kg	1.6E-07	mg/kg-day	1.0E-05	mg/kg-day	0.02
Ingestion Route Total								0.03
Dermal Absorption								
	Antimony	1.3E+01	mg/kg	6.1E-08	mg/kg-day	6.0E-05	mg/kg-day	0.001
	Arsenic	3.5E+01	mg/kg	4.9E-07	mg/kg-day	3.0E-04	mg/kg-day	0.002
	Copper	1.1E+02	mg/kg	5.3E-07	mg/kg-day	4.0E-02	mg/kg-day	0.00001
	Selenium	3.6E+00	mg/kg	1.7E-08	mg/kg-day	5.0E-03	mg/kg-day	0.000003
	Thallium	1.3E+00	mg/kg	6.2E-09	mg/kg-day	1.0E-05	mg/kg-day	0.001
Dermal Absorption Route Total								0.003
Inhalation								
	Antimony	9.6E-09	mg/m^3	2.6E-10	mg/m^3	NV	mg/m^3	NV
	Arsenic	2.5E-08	mg/m^3	7.0E-10	mg/m^3	1.5E-05	mg/m^3	0.00005
	Copper	8.3E-08	mg/m^3	2.3E-09	mg/m^3	NV	mg/m^3	NV
	Selenium	2.6E-09	mg/m^3	7.3E-11	mg/m^3	2.0E-02	mg/m^3	0.000000004
	Thallium	9.7E-10	mg/m^3	2.7E-11	mg/m^3	NV	mg/m^3	NV
Inhalation Route Total								0.00005
							Total of Receptor Hazards Across All Media	0.03

TABLE 7.5
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
B003, Fort Hancock

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion								
	Antimony	1.3E+01	mg/kg	1.7E-04	mg/kg-day	4.0E-04	mg/kg-day	0.4
	Arsenic	3.5E+01	mg/kg	2.7E-04	mg/kg-day	3.0E-04	mg/kg-day	0.9
	Copper	1.1E+02	mg/kg	1.4E-03	mg/kg-day	4.0E-02	mg/kg-day	0.04
	Selenium	3.6E+00	mg/kg	4.6E-05	mg/kg-day	5.0E-03	mg/kg-day	0.01
	Thallium	1.3E+00	mg/kg	1.7E-05	mg/kg-day	1.0E-05	mg/kg-day	2
Ingestion Route Total								3
Dermal Absorption								
	Antimony	1.3E+01	mg/kg	4.7E-06	mg/kg-day	6.0E-05	mg/kg-day	0.1
	Arsenic	3.5E+01	mg/kg	3.7E-05	mg/kg-day	3.0E-04	mg/kg-day	0.1
	Copper	1.1E+02	mg/kg	4.0E-05	mg/kg-day	4.0E-02	mg/kg-day	0.001
	Selenium	3.6E+00	mg/kg	1.3E-06	mg/kg-day	5.0E-03	mg/kg-day	0.0003
	Thallium	1.3E+00	mg/kg	4.7E-07	mg/kg-day	1.0E-05	mg/kg-day	0.05
Dermal Absorption Route Total								0.3
Inhalation								
	Antimony	9.6E-09	mg/m^3	9.2E-09	mg/m^3	NV	mg/m^3	NV
	Arsenic	2.5E-08	mg/m^3	2.4E-08	mg/m^3	1.5E-05	mg/m^3	0.002
	Copper	8.3E-08	mg/m^3	7.9E-08	mg/m^3	NV	mg/m^3	NV
	Selenium	2.6E-09	mg/m^3	2.5E-09	mg/m^3	2.0E-02	mg/m^3	0.0000001
	Thallium	9.7E-10	mg/m^3	9.3E-10	mg/m^3	NV	mg/m^3	NV
Inhalation Route Total								0.002
							Total of Receptor Hazards Across All Media	3

TABLE 7.6
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
B003, Fort Hancock

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Antimony	1.3E+01	mg/kg	1.8E-05	mg/kg-day	4.0E-04	mg/kg-day	0.04
	Arsenic	2.1E+01	mg/kg	2.8E-05	mg/kg-day	3.0E-04	mg/kg-day	0.09
	Copper	1.1E+02	mg/kg	1.5E-04	mg/kg-day	4.0E-02	mg/kg-day	0.004
	Selenium	3.6E+00	mg/kg	4.9E-06	mg/kg-day	5.0E-03	mg/kg-day	0.001
	Thallium	1.3E+00	mg/kg	1.8E-06	mg/kg-day	1.0E-05	mg/kg-day	0.2
Ingestion Route Total								0.3
Dermal Absorption	Antimony	1.3E+01	mg/kg	7.1E-07	mg/kg-day	6.0E-05	mg/kg-day	0.01
	Arsenic	2.1E+01	mg/kg	3.4E-06	mg/kg-day	3.0E-04	mg/kg-day	0.01
	Copper	1.1E+02	mg/kg	6.1E-06	mg/kg-day	4.0E-02	mg/kg-day	0.0002
	Selenium	3.6E+00	mg/kg	2.0E-07	mg/kg-day	5.0E-03	mg/kg-day	0.00004
	Thallium	1.3E+00	mg/kg	7.2E-08	mg/kg-day	1.0E-05	mg/kg-day	0.01
Dermal Absorption Route Total								0.03
Inhalation	Antimony	9.6E-09	mg/m^3	9.2E-09	mg/m^3	NV	mg/m^3	NV
	Arsenic	2.5E-08	mg/m^3	2.4E-08	mg/m^3	1.5E-05	mg/m^3	0.002
	Copper	8.3E-08	mg/m^3	7.9E-08	mg/m^3	NV	mg/m^3	NV
	Selenium	2.6E-09	mg/m^3	2.5E-09	mg/m^3	2.0E-02	mg/m^3	0.0000001
	Thallium	9.7E-10	mg/m^3	9.3E-10	mg/m^3	NV	mg/m^3	NV
Inhalation Route Total								0.002
							Total of Receptor Hazards Across All Media	0.4

TABLE 7.7
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
B003, Fort Hancock

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion								
	Antimony	1.3E+01	mg/kg	4.2E-05	mg/kg-day	4.0E-04	mg/kg-day	0.1
	Arsenic	3.5E+01	mg/kg	6.7E-05	mg/kg-day	3.0E-04	mg/kg-day	0.2
	Copper	1.1E+02	mg/kg	3.6E-04	mg/kg-day	4.0E-02	mg/kg-day	0.01
	Selenium	3.6E+00	mg/kg	1.2E-05	mg/kg-day	5.0E-03	mg/kg-day	0.002
	Thallium	1.3E+00	mg/kg	4.3E-06	mg/kg-day	1.0E-05	mg/kg-day	0.4
Ingestion Route Total								0.8
Dermal Absorption								
	Antimony	1.3E+01	mg/kg	1.3E-06	mg/kg-day	6.0E-05	mg/kg-day	0.02
	Arsenic	3.5E+01	mg/kg	1.0E-05	mg/kg-day	3.0E-04	mg/kg-day	0.03
	Copper	1.1E+02	mg/kg	1.1E-05	mg/kg-day	4.0E-02	mg/kg-day	0.0003
	Selenium	3.6E+00	mg/kg	3.5E-07	mg/kg-day	5.0E-03	mg/kg-day	0.00007
	Thallium	1.3E+00	mg/kg	1.3E-07	mg/kg-day	1.0E-05	mg/kg-day	0.01
Dermal Absorption Route Total								0.07
Inhalation								
	Antimony	1.5E-05	mg/m^3	3.5E-06	mg/m^3	NV	mg/m^3	NV
	Arsenic	4.0E-05	mg/m^3	9.2E-06	mg/m^3	1.5E-05	mg/m^3	0.6
	Copper	1.3E-04	mg/m^3	3.0E-05	mg/m^3	NV	mg/m^3	NV
	Selenium	4.2E-06	mg/m^3	9.6E-07	mg/m^3	2.0E-02	mg/m^3	0.00005
	Thallium	1.5E-06	mg/m^3	3.5E-07	mg/m^3	NV	mg/m^3	NV
Inhalation Route Total								0.6
Total of Receptor Hazards Across All Media								1

Table 7.8

Lead Risk-based Concentration for the Adult Outdoor Maintenance Worker or Construction Worker

B003, Fort Hancock

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Site Soil
Receptor Population: Outdoor Maintenance Worker/Construction Worker
Receptor Age: Adult

PbS calculated	Lead Concentration in Surface Soil	Exceedance?
1120	181	No

$$PbB_{adult,\ central} = PbB_{fetal,\ 0.95,goal} / ((GSD\text{^}1.645) * R)$$

$$PbS = ((PbB_{adult,\ central} - PbB_{adult,0}) * AT) / (BKSF * IR * AF * EF)$$

Exposure Parameter	Description	Industrial Adult Values	Source[1]
PbS	Calculated Soil Lead Concentration expressed in ug/g;	1,120	Calc.
$PbB_{adult,central}$	Central estimate of Blood Lead Concentrations in adults exposed to the site expressed in ug/dl;	4.23	Calc.
$PbB_{fetal,0.95,goal}$	Goal for 95th % blood lead concentration (ug/dl);	10	A
GSD	Geometric standard deviation (dimensionless);	1.8	B
R	Constant of proportionality between fetal blood lead concentration at birth and maternal blood lead concentration (dimensionless);	0.9	A
$PbB_{adult,0}$	Typical Blood Lead Concentration in the absence of exposure to the site expressed in ug/dL;	1.00	B
AT	Averaging Time (days/year)	365	A
BKSF	Biokinetic Slope Factor expressed in ug/dL blood lead increase per ug/day lead uptake;	0.4	A
IR	Intake rate of soil (g/day);	0.1	C
AF	Gastrointestinal absorption fraction for ingested lead in soil and lead in dust from soil (dimensionless)	0.12	A
EF	Exposure frequency (days/year)	219	C

A - EPA, January 2003. *Recommendations of the Technical Review Group for Lead for an Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil. EPA-540-R-03-001*

B - EPA, June 2009. *Update of the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters.* OSWER 9200.2-82.

C - EPA Adult Lead Model website, found at http://www.epa.gov/superfund/health/contaminants/lead/almfaq.htm
EPA recommended ingestion rate for contact intensive outdoor exposure scenarios
Exposure frequency is EPA recommended central tendency value.

Table 8.1
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Outdoor Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Antimony	1.3E+01	mg/kg	4.1E-06	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Arsenic	3.5E+01	mg/kg	6.5E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.E-05
	Copper	1.1E+02	mg/kg	3.5E-05	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Selenium	3.6E+00	mg/kg	1.1E-06	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Thallium	1.3E+00	mg/kg	4.2E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
Ingestion Route Total								1.E-05
Dermal Absorption	Antimony	1.3E+01	mg/kg	2.7E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Arsenic	3.5E+01	mg/kg	2.2E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.E-06
	Copper	1.1E+02	mg/kg	2.3E-06	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Selenium	3.6E+00	mg/kg	7.5E-08	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Thallium	1.3E+00	mg/kg	2.7E-08	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
Dermal Absorption Route Total								3.E-06
Inhalation	Antimony	9.6E-09	mg/m^3	7.0E-10	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Arsenic	2.5E-08	mg/m^3	1.9E-09	mg/m^3	4.3E+00	$(mg/m^3)^{-1}$	8.E-09
	Copper	8.3E-08	mg/m^3	6.1E-09	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Selenium	2.6E-09	mg/m^3	1.9E-10	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Thallium	9.7E-10	mg/m^3	7.1E-11	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
Inhalation Route Total								8.E-09
Total of Receptor Hazards Across All Media								1.E-05

Table 8.2
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Archaeologist
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion								
	Antimony	1.3E+01	mg/kg	6.0E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Arsenic	3.5E+01	mg/kg	9.6E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.E-06
	Copper	1.1E+02	mg/kg	5.2E-06	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Selenium	3.6E+00	mg/kg	1.7E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Thallium	1.3E+00	mg/kg	6.1E-08	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
Ingestion Route Total								1.E-06
Dermal Absorption								
	Antimony	1.3E+01	mg/kg	1.8E-08	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Arsenic	3.5E+01	mg/kg	1.4E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.E-07
	Copper	1.1E+02	mg/kg	1.6E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Selenium	3.6E+00	mg/kg	5.0E-09	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Thallium	1.3E+00	mg/kg	1.8E-09	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
Dermal Absorption Route Total								2.E-07
Inhalation								
	Antimony	9.6E-09	mg/m^3	3.1E-11	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Arsenic	2.5E-08	mg/m^3	8.3E-11	mg/m^3	4.3E+00	$(mg/m^3)^{-1}$	4.E-10
	Copper	8.3E-08	mg/m^3	2.7E-10	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Selenium	2.6E-09	mg/m^3	8.6E-12	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Thallium	9.7E-10	mg/m^3	3.2E-12	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
Inhalation Route Total								4.E-10
							Total of Receptor Hazards Across All Media	2.E-06

Table 8.3
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Recreational User
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion								
	Antimony	1.3E+01	mg/kg	1.2E-06	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Arsenic	3.5E+01	mg/kg	1.9E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.E-06
	Copper	1.1E+02	mg/kg	1.1E-05	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Selenium	3.6E+00	mg/kg	3.4E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Thallium	1.3E+00	mg/kg	1.2E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
Ingestion Route Total								3.E-06
Dermal Absorption								
	Antimony	1.3E+01	mg/kg	3.4E-08	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Arsenic	3.5E+01	mg/kg	2.7E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	4.E-07
	Copper	1.1E+02	mg/kg	3.0E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Selenium	3.6E+00	mg/kg	9.5E-09	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Thallium	1.3E+00	mg/kg	3.5E-09	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
Dermal Absorption Route Total								4.E-07
Inhalation								
	Antimony	9.6E-09	mg/m^3	2.3E-11	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Arsenic	2.5E-08	mg/m^3	6.0E-11	mg/m^3	4.3E+00	$(mg/m^3)^{-1}$	3.E-10
	Copper	8.3E-08	mg/m^3	1.9E-10	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Selenium	2.6E-09	mg/m^3	6.2E-12	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Thallium	9.7E-10	mg/m^3	2.3E-12	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
Inhalation Route Total								3.E-10
							Total of Receptor Hazards Across All Media	3.E-06

Table 8.4
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
B003, Fort Hancock

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion								
	Antimony	1.3E+01	mg/kg	6.6E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Arsenic	3.5E+01	mg/kg	1.0E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.E-06
	Copper	1.1E+02	mg/kg	5.6E-06	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Selenium	3.6E+00	mg/kg	1.8E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Thallium	1.3E+00	mg/kg	6.7E-08	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
Ingestion Route Total								2.E-06
Dermal Absorption								
	Antimony	1.3E+01	mg/kg	2.6E-08	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Arsenic	3.5E+01	mg/kg	2.1E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	3.E-07
	Copper	1.1E+02	mg/kg	2.3E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Selenium	3.6E+00	mg/kg	7.2E-09	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Thallium	1.3E+00	mg/kg	2.7E-09	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
Dermal Absorption Route Total								3.E-07
Inhalation								
	Antimony	9.6E-09	mg/m^3	1.1E-10	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Arsenic	2.5E-08	mg/m^3	3.0E-10	mg/m^3	4.3E+00	$(mg/m^3)^{-1}$	1.E-09
	Copper	8.3E-08	mg/m^3	9.7E-10	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Selenium	2.6E-09	mg/m^3	3.1E-11	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Thallium	9.7E-10	mg/m^3	1.1E-11	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
Inhalation Route Total								1.E-09
							Total of Receptor Hazards Across All Media	2.E-06

Table 8.5
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
B003, Fort Hancock

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion								
	Antimony	1.3E+01	mg/kg	2.0E-05	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Arsenic	3.5E+01	mg/kg	3.2E-05	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	5.E-05
	Copper	1.1E+02	mg/kg	1.8E-04	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Selenium	3.6E+00	mg/kg	5.6E-06	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Thallium	1.3E+00	mg/kg	2.1E-06	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
Ingestion Route Total								5.E-05
Dermal Absorption								
	Antimony	1.3E+01	mg/kg	6.4E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Arsenic	3.5E+01	mg/kg	5.1E-06	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.E-06
	Copper	1.1E+02	mg/kg	5.5E-06	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Selenium	3.6E+00	mg/kg	1.8E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Thallium	1.3E+00	mg/kg	6.5E-08	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
Dermal Absorption Route Total								8.E-06
Inhalation								
	Antimony	9.6E-09	mg/m^3	3.9E-09	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Arsenic	2.5E-08	mg/m^3	1.0E-08	mg/m^3	4.3E+00	$(mg/m^3)^{-1}$	4.E-08
	Copper	8.3E-08	mg/m^3	3.4E-08	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Selenium	2.6E-09	mg/m^3	1.1E-09	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Thallium	9.7E-10	mg/m^3	4.0E-10	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
Inhalation Route Total								4.E-08
Total of Receptor Hazards Across All Media								6.E-05

Table 8.6

CALCULATION OF CANCER RISKS

REASONABLE MAXIMUM EXPOSURE

B003, Fort Hancock

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Antimony	1.3E+01	mg/kg	6.0E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Arsenic	3.5E+01	mg/kg	9.6E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.E-06
	Copper	1.1E+02	mg/kg	5.2E-06	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Selenium	3.6E+00	mg/kg	1.7E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Thallium	1.3E+00	mg/kg	6.1E-08	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
Exposure Route Total								1.E-06
Dermal Absorption	Antimony	1.3E+01	mg/kg	1.8E-08	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Arsenic	3.5E+01	mg/kg	1.4E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	2.E-07
	Copper	1.1E+02	mg/kg	1.6E-07	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Selenium	3.6E+00	mg/kg	5.0E-09	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
	Thallium	1.3E+00	mg/kg	1.8E-09	mg/kg-day	NV	$(mg/kg\text{-}day)^{-1}$	NV
Exposure Route Total								2.E-07
Inhalation	Antimony	1.5E-05	mg/m^3	5.0E-08	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Arsenic	4.0E-05	mg/m^3	1.3E-07	mg/m^3	4.3E+00	$(mg/m^3)^{-1}$	6.E-07
	Copper	1.3E-04	mg/m^3	4.3E-07	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Selenium	4.2E-06	mg/m^3	1.4E-08	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
	Thallium	1.5E-06	mg/m^3	5.0E-09	mg/m^3	NV	$(mg/m^3)^{-1}$	NV
Exposure Route Total								6.E-07
							Total of Receptor Hazards Across All Media	2.E-06

TABLE 9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

B003, Fort Hancock

Scenario Timeframe: Current/Future
Receptor Population: Outdoor Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil											
			Antimony	NV	- -	NV	NV	Antimony	Blood	0.03	- -	0.01	0.04
			Arsenic	1.E-05	- -	3.E-06	1.E-05	Arsenic	Skin/Vascular	0.06	- -	0.02	0.08
			Copper	NV	- -	NV	NV	Copper	Gastrointestinal Tract	0.002	- -	0.0002	0.003
			Selenium	NV	- -	NV	0.E+00	Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.0006	- -	0.00004	0.0007
			Thallium	NV	- -	NV	NV	Thallium	Hair	0.1	- -	0.01	0.1
			Chemical Total	1.E-05	- -	3.E-06	1.E-05	Chemical Total	- -	0.2	- -	0.04	0.2
	Exposure Medium Total						1.E-05						0.2
	Air	Volatile and Fugitive Dust Emissions											
			Antimony	- -	NV	- -	NV	Antimony	NA	- -	NV	- -	NV
			Arsenic	- -	8.E-09	- -	8.E-09	Arsenic	Development, vascular, nervous system	- -	0.0003	- -	0.0003
			Copper	- -	NV	- -	NV	Copper	NA	- -	NV	- -	NV
			Selenium	- -	NV	- -	0.E+00	Selenium	liver, cardiovascular system, nervous system	- -	0.00000003	- -	0.00000003
			Thallium	- -	NV	- -	NV	Thallium	NA	- -	NV	- -	NV
			Chemical Total	--	8.E-09	--	8.E-09	Chemical Total		--	0.0003	--	0.0003
	Exposure Medium Total						8.E-09						0.0003
Soil Total							1.E-05						0.3

Total Risk Across All Media 1.E-05

Total Hazard Index Across All Media 0.3

TABLE 9.2

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

B003, Fort Hancock

Scenario Timeframe: Current/Future
Receptor Population: Archaeologist
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil											
			Antimony	NV	- -	NV	NV	Antimony	Blood	0.1	- -	0.02	0.1
			Arsenic	1.E-06	- -	2.E-07	2.E-06	Arsenic	Skin/Vascular	0.2	- -	0.03	0.3
			Copper	NV	- -	NV	NV	Copper	Gastrointestinal Tract	0.01	- -	0.0003	0.01
			Selenium	NV	- -	NV	0.E+00	Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.002	- -	0.00007	0.002
			Thallium	NV	- -	NV	NV	Thallium	Hair	0.4	- -	0.01	0.4
			Chemical Total	1.E-06	- -	2.E-07	2.E-06	Chemical Total	- -	0.8	- -	0.07	0.8
	Exposure Medium Total						2.E-06						0.8
	Air	Volatile and Fugitive Dust Emissions											
			Antimony	- -	NV	- -	NV	Antimony	NA	- -	NV	- -	NV
			Arsenic	- -	4.E-10	- -	4.E-10	Arsenic	Development, vascular, nervous system	- -	0.0004	- -	0.0004
			Copper	- -	NV	- -	NV	Copper	NA	- -	NV	- -	NV
			Selenium	- -	NV	- -	0.E+00	Selenium	liver, cardiovascular system, nervous system	- -	0.00000003	- -	0.00000003
			Thallium	- -	NV	- -	NV	Thallium	NA	- -	NV	- -	NV
			Chemical Total	--	4.E-10	--	4.E-10	Chemical Total		--	0.0004	--	0.0004
	Exposure Medium Total						4.E-10						0.0004
Soil Total							2.E-06						0.8

Total Risk Across All Media 2.E-06

Total Hazard Index Across All Media 0.8

TABLE 9.3

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

B003, Fort Hancock

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil											
			Antimony	NV	- -	NV	NV	Antimony	Blood	0.04	- -	0.01	0.04
			Arsenic	3.E-06	- -	4.E-07	3.E-06	Arsenic	Skin/Vascular	0.08	- -	0.011	0.09
			Copper	NV	- -	NV	NV	Copper	Gastrointestinal Tract	0.003	- -	0.0001	0.003
			Selenium	NV	- -	NV	NV	Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.0008	- -	0.00002	0.0008
			Thallium	NV	- -	NV	NV	Thallium	Hair	0.1	- -	0.004	0.1
			Chemical Total	3.E-06	- -	4.E-07	3.E-06	Chemical Total	- -	0.3	- -	0.02	0.3
	Exposure Medium Total						3.E-06						0.3
	Air	Volatile and Fugitive Dust Emissions											
			Antimony	- -	NV	- -	NV	Antimony	NA	- -	NV	- -	NV
			Arsenic	- -	3.E-10	- -	3.E-10	Arsenic	Development, vascular, nervous system	- -	0.00005	- -	0.00005
			Copper	- -	NV	- -	NV	Copper	NA	- -	NV	- -	NV
			Selenium	- -	NV	- -	NV	Selenium	liver, cardiovascular system, nervous system	- -	0.000000004	- -	0.000000004
			Thallium	- -	NV	- -	NV	Thallium	NA	- -	NV	- -	NV
			Chemical Total	--	3.E-10	--	3.E-10	Chemical Total		--	0.00005	--	0.00005
	Exposure Medium Total						3.E-10						0.00005
Soil Total							3.E-06						0.3

Total Risk Across All Media	3.E-06	Total Hazard Index Across All Media	0.3

TABLE 9.4

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

B003, Fort Hancock

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Antimony	NV	- -	NV	NV	Antimony	Blood	0.004	- -	0.001	0.00
			Arsenic	2.E-06	- -	3.E-07	2.E-06	Arsenic	Skin/Vascular	0.008	- -	0.0016	0.010
			Copper	NV	- -	NV	NV	Copper	Gastrointestinal Tract	0.0003	- -	0.00001	0.0003
			Selenium	NV	- -	NV	NV	Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00008	- -	0.000003	0.00009
			Thallium	NV	- -	NV	NV	Thallium	Hair	0.02	- -	0.001	0.02
			Chemical Total	2.E-06	- -	3.E-07	2.E-06	Chemical Total	- -	0.03	- -	0.003	0.03
	Exposure Medium Total						2.E-06						0.03
	Air	Volatile and Fugitive Dust Emissions	Antimony	- -	NV	- -	NV	Antimony	NA	- -	NV	- -	NV
			Arsenic	- -	1.E-09	- -	1.E-09	Arsenic	Development, vascular, nervous system	- -	0.00005	- -	0.00005
			Copper	- -	NV	- -	NV	Copper	NA	- -	NV	- -	NV
			Selenium	- -	NV	- -	NV	Selenium	liver, cardiovascular system, nervous system	- -	0.000000004	- -	0.000000004
			Thallium	- -	NV	- -	NV	Thallium	NA	- -	NV	- -	NV
			Chemical Total	--	1.E-09	--	1.E-09	Chemical Total		--	0.00005	--	0.00005
	Exposure Medium Total						1.E-09						0.00005
Soil Total							2.E-06						0.03

Total Risk Across All Media	2.E-06	Total Hazard Index Across All Media	0.03

TABLE 9.5

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

B003, Fort Hancock

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Antimony	Blood	0.4	- -	0.08	0.5
			Arsenic	Skin/Vascular	0.9	- -	0.1	1
			Copper	Gastrointestinal Tract	0.04	- -	0.001	0.04
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.009	- -	0.0003	0.009
			Thallium	Hair	2	- -	0.05	2
			Chemical Total		3	- -	0.3	3
	Exposure Medium Total							3
	Air	Volatile and Fugitive Dust Emissions	Antimony	NA	- -	NV	- -	NV
			Arsenic	Development, vascular, nervous system	- -	0.002	- -	0.002
			Copper	NA	- -	NV	- -	NV
			Selenium	liver, cardiovascular system, nervous system	- -	0.0000001	- -	0.0000001
			Thallium	NA	- -	NV	- -	NV
			Chemical Total		--	0.002	--	0.002
	Exposure Medium Total							0.002
Soil Total								3

Total Hazard Index Across All Media	3

Total Neurological HI =	0.01
Total Skin/Vascular HI =	1
Total Development HI =	0.002
Total Gastrointestinal HI =	0.04
Total Blood HI =	0.5
Total Respiratory System HI =	0.0000000
Total Hair HI =	2
Total Liver HI =	0.0000001
Total Nails and Teeth HI =	0.009

TABLE 9.6

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

B003, Fort Hancock

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Antimony	Blood	0.04	- -	0.01	0.06
			Arsenic	Skin/Vascular	0.09	- -	0.01	0.1
			Copper	Gastrointestinal Tract	0.004	- -	0.0002	0.004
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.001	- -	0.00004	0.001
			Thallium	Hair	0.2	- -	0.01	0.2
			Chemical Total	- -	0.3	- -	0.03	0.4
	Exposure Medium Total							0.4
	Air	Volatile and Fugitive Dust Emissions	Antimony	NA	- -	NV	- -	NV
			Arsenic	Development, vascular, nervous system	- -	0.002	- -	0.002
			Copper	NA	- -	NV	- -	NV
			Selenium	ardiovascular system, nervous	- -	0.0000001	- -	0.0000001
			Thallium	NA	- -	NV	- -	NV
			Chemical Total		--	0.002	--	0.002
	Exposure Medium Total							0.002
Soil Total								0.4

Total Hazard Index Across All Media: 0.4

TABLE 9.7

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

B003, Fort Hancock

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil					
			Antimony	NV	- -	NV	NV
			Arsenic	5.E-05	- -	8.E-06	6.E-05
			Copper	NV	- -	NV	NV
			Selenium	NV	- -	NV	NV
			Thallium	NV	- -	NV	NV
			Chemical Total	5.E-05	- -	8.E-06	6.E-05
	Exposure Medium Total						6.E-05
	Air	Volatile and Fugitive Dust Emissions					
			Antimony	- -	NV	- -	NV
			Arsenic	- -	4.E-08	- -	4.E-08
			Copper	- -	NV	- -	0.E+00
			Selenium	- -	NV	- -	NV
			Thallium	- -	NV	- -	NV
			Chemical Total	--	4.5E-08	--	4.5E-08
	Exposure Medium Total						4.E-08
Soil Total							6.E-05

Total Risk Across All Media 6.E-05

TABLE 9.8

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

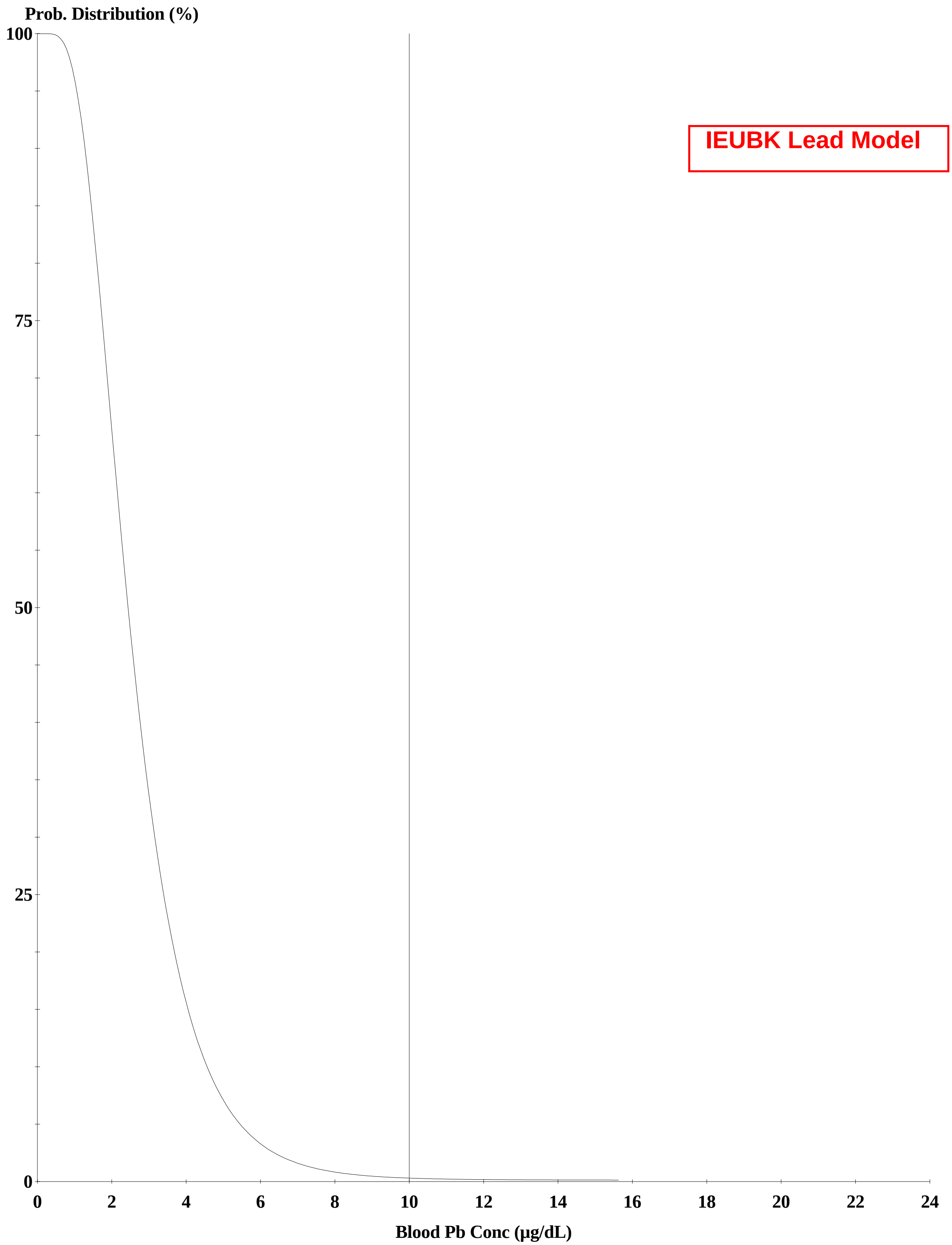
B003, Fort Hancock

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Antimony	NV	- -	NV	NV	Antimony	Blood	0.1	- -	0.02	0.1
			Arsenic	1.E-06	- -	2.E-07	2.E-06	Arsenic	Skin/Vascular	0.2	- -	0.03	0.3
			Copper	NV	- -	NV	NV	Copper	Gastrointestinal Tract	0.01	- -	0.0003	0.01
			Selenium	NV	- -	NV	NV	Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.002	- -	0.00007	0.002
			Thallium	NV	- -	NV	NV	Thallium	Hair	0.4	- -	0.01	0.4
			Chemical Total	1.E-06	- -	2.E-07	2.E-06	Chemical Total	- -	0.8	- -	0.07	0.8
	Exposure Medium Total						2.E-06						0.8
	Air	Volatile and Fugitive Dust Emissions	Antimony	- -	NV	- -	NV	Antimony	NA	- -	NV	- -	NV
			Arsenic	- -	6.E-07	- -	6.E-07	Arsenic	Development, vascular, nervous system	- -	0.6	- -	0.6
			Copper	- -	NV	- -	NV	Copper	NA	- -	NV	- -	NV
			Selenium	- -	NV	- -	NV	Selenium	liver, cardiovascular system, nervous system	- -	0.00005	- -	0.00005
			Thallium	- -	NV	- -	NV	Thallium	NA	- -	NV	- -	NV
			Chemical Total	--	6.E-07	--	6.E-07	Chemical Total		--	0.6	--	0.6
	Exposure Medium Total						6.E-07						0.6
Soil Total							2.E-06						1

Total Risk Across All Media: 2.E-06

Total Hazard Index Across All Media: 1



Cutoff = 10.000 µg/dl
Geo Mean = 2.557
GSD = 1.600
% Above = 0.185

Age Range = 0 to 84 months

Run Mode = Research

UCL Statistics for Uncensored Full Data Sets	
User Selected Options	
Date/Time of Computation	8/12/2014 12:08:31 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Antimony

General Statistics			
Total Number of Observations	21	Number of Distinct Observations	16
		Number of Missing Observations	0
Minimum	0.54	Mean	4.59
Maximum	34.9	Median	1.3
SD	8.899	Std. Error of Mean	1.942
Coefficient of Variation	1.939	Skewness	2.949
Normal GOF Test			
Shapiro Wilk Test Statistic	0.474	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.393	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.193	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	7.939	95% Adjusted-CLT UCL (Chen-1995)	9.12
		95% Modified-t UCL (Johnson-1978)	8.148
Gamma GOF Test			
A-D Test Statistic	2.549	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.788	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.267	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.198	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.697	k star (bias corrected MLE)	0.629
Theta hat (MLE)	6.586	Theta star (bias corrected MLE)	7.296
nu hat (MLE)	29.27	nu star (bias corrected)	26.42
MLE Mean (bias corrected)	4.59	MLE Sd (bias corrected)	5.787
		Approximate Chi Square Value (0.05)	15.7
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	15.07
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	7.722	95% Adjusted Gamma UCL (use when n<50)	8.047

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.844	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.191	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.193	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.616	Mean of logged Data	0.656
Maximum of Logged Data	3.552	SD of logged Data	1.122
Assuming Lognormal Distribution			
95% H-UCL	7.177	90% Chebyshev (MVUE) UCL	6.36
95% Chebyshev (MVUE) UCL	7.676	97.5% Chebyshev (MVUE) UCL	9.502
99% Chebyshev (MVUE) UCL	13.09		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	7.784	95% Jackknife UCL	7.939
95% Standard Bootstrap UCL	7.724	95% Bootstrap-t UCL	22.36
95% Hall's Bootstrap UCL	23.08	95% Percentile Bootstrap UCL	7.896
95% BCA Bootstrap UCL	9.474		
90% Chebyshev(Mean, Sd) UCL	10.42	95% Chebyshev(Mean, Sd) UCL	13.05
97.5% Chebyshev(Mean, Sd) UCL	16.72	99% Chebyshev(Mean, Sd) UCL	23.91
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	**13.05**		

Arsenic			
General Statistics			
Total Number of Observations	21	Number of Distinct Observations	19
		Number of Missing Observations	0
Minimum	3.4	Mean	11.92
Maximum	114	Median	6.1
SD	23.8	Std. Error of Mean	5.193
Coefficient of Variation	1.997	Skewness	4.349
Normal GOF Test			
Shapiro Wilk Test Statistic	0.337	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.434	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.193	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	20.88	95% Adjusted-CLT UCL (Chen-1995)	25.73
		95% Modified-t UCL (Johnson-1978)	21.7
Gamma GOF Test			
A-D Test Statistic	3.72	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.768	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.374	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.195	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.072	k star (bias corrected MLE)	0.951
Theta hat (MLE)	11.12	Theta star (bias corrected MLE)	12.54
nu hat (MLE)	45.04	nu star (bias corrected)	39.94
MLE Mean (bias corrected)	11.92	MLE Sd (bias corrected)	12.22
		Approximate Chi Square Value (0.05)	26.46
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	25.61
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	17.99	95% Adjusted Gamma UCL (use when n<50)	18.58

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.686	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.281	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.193	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.224	Mean of logged Data	1.944
Maximum of Logged Data	4.736	SD of logged Data	0.767
Assuming Lognormal Distribution			
95% H-UCL	13.84	90% Chebyshev (MVUE) UCL	14.22
95% Chebyshev (MVUE) UCL	16.49	97.5% Chebyshev (MVUE) UCL	19.63
99% Chebyshev (MVUE) UCL	25.81		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	20.46	95% Jackknife UCL	20.88
95% Standard Bootstrap UCL	20.44	95% Bootstrap-t UCL	98.98
95% Hall's Bootstrap UCL	59.68	95% Percentile Bootstrap UCL	21.91
95% BCA Bootstrap UCL	27.45		
90% Chebyshev(Mean, Sd) UCL	27.5	95% Chebyshev(Mean, Sd) UCL	34.56
97.5% Chebyshev(Mean, Sd) UCL	44.35	99% Chebyshev(Mean, Sd) UCL	63.59
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	**34.56**		

Copper			
General Statistics			
Total Number of Observations	21	Number of Distinct Observations	19
		Number of Missing Observations	0
Minimum	5.8	Mean	35.02
Maximum	384	Median	12.4
SD	81.11	Std. Error of Mean	17.7
Coefficient of Variation	2.316	Skewness	4.381
Normal GOF Test			
Shapiro Wilk Test Statistic	0.343	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.399	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.193	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	65.55	95% Adjusted-CLT UCL (Chen-1995)	82.21
		95% Modified-t UCL (Johnson-1978)	68.37
Gamma GOF Test			
A-D Test Statistic	2.936	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.78	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.314	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.196	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.804	k star (bias corrected MLE)	0.721
Theta hat (MLE)	43.58	Theta star (bias corrected MLE)	48.6
nu hat (MLE)	33.75	nu star (bias corrected)	30.26
MLE Mean (bias corrected)	35.02	MLE Sd (bias corrected)	41.25
		Approximate Chi Square Value (0.05)	18.7
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	18
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	56.67	95% Adjusted Gamma UCL (use when n<50)	58.87

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.803	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.222	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.193	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.758	Mean of logged Data	2.818
Maximum of Logged Data	5.951	SD of logged Data	0.932
Assuming Lognormal Distribution			
95% H-UCL	43.28	90% Chebyshev (MVUE) UCL	42.16
95% Chebyshev (MVUE) UCL	49.87	97.5% Chebyshev (MVUE) UCL	60.57
99% Chebyshev (MVUE) UCL	81.6		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	64.13	95% Jackknife UCL	65.55
95% Standard Bootstrap UCL	63.62	95% Bootstrap-t UCL	209.7
95% Hall's Bootstrap UCL	167.4	95% Percentile Bootstrap UCL	68.51
95% BCA Bootstrap UCL	89		
90% Chebyshev(Mean, Sd) UCL	88.12	95% Chebyshev(Mean, Sd) UCL	112.2
97.5% Chebyshev(Mean, Sd) UCL	145.6	99% Chebyshev(Mean, Sd) UCL	211.1
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	112.2		

Lead			
General Statistics			
Total Number of Observations	21	Number of Distinct Observations	21
		Number of Missing Observations	0
Minimum	27.3	Mean	180.9
Maximum	2180	Median	70.2
SD	461.6	Std. Error of Mean	100.7
Coefficient of Variation	2.552	Skewness	4.473
Normal GOF Test			
Shapiro Wilk Test Statistic	0.314	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.443	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.193	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	354.6	95% Adjusted-CLT UCL (Chen-1995)	451.6
		95% Modified-t UCL (Johnson-1978)	371
Gamma GOF Test			
A-D Test Statistic	3.162	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.784	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.338	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.197	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.734	k star (bias corrected MLE)	0.661
Theta hat (MLE)	246.4	Theta star (bias corrected MLE)	273.6
nu hat (MLE)	30.83	nu star (bias corrected)	27.76
MLE Mean (bias corrected)	180.9	MLE Sd (bias corrected)	222.5
		Approximate Chi Square Value (0.05)	16.74
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	16.09
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	299.9	95% Adjusted Gamma UCL (use when n<50)	312.2

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.798	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.192	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.193	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.307	Mean of logged Data	4.38
Maximum of Logged Data	7.687	SD of logged Data	0.951
Assuming Lognormal Distribution			
95% H-UCL	213.3	90% Chebyshev (MVUE) UCL	206.2
95% Chebyshev (MVUE) UCL	244.4	97.5% Chebyshev (MVUE) UCL	297.5
99% Chebyshev (MVUE) UCL	401.7		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	346.5	95% Jackknife UCL	354.6
95% Standard Bootstrap UCL	341.6	95% Bootstrap-t UCL	1838
95% Hall's Bootstrap UCL	1097	95% Percentile Bootstrap UCL	374.7
95% BCA Bootstrap UCL	491.6		
90% Chebyshev(Mean, Sd) UCL	483	95% Chebyshev(Mean, Sd) UCL	619.9
97.5% Chebyshev(Mean, Sd) UCL	809.9	99% Chebyshev(Mean, Sd) UCL	1183
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	**619.9**		

UCL Statistics for Data Sets with Non-Detects			
Thallium			
General Statistics			
Total Number of Observations	21	Number of Distinct Observations	10
Number of Detects	5	Number of Non-Detects	16
Number of Distinct Detects	5	Number of Distinct Non-Detects	8
Minimum Detect	0.48	Minimum Non-Detect	0.43
Maximum Detect	6.5	Maximum Non-Detect	0.52
Variance Detects	7.02	Percent Non-Detects	76.19%
Mean Detects	1.77	SD Detects	2.65
Median Detects	0.5	CV Detects	1.497
Skewness Detects	2.214	Kurtosis Detects	4.916
Mean of Logged Detects	-0.0793	SD of Logged Detects	1.12
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.597	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.432	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.396	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	0.753	Standard Error of Mean	0.314
SD	1.289	95% KM (BCA) UCL	1.324
95% KM (t) UCL	1.295	95% KM (Percentile Bootstrap) UCL	1.326
95% KM (z) UCL	1.27	95% KM Bootstrap t UCL	12.05
90% KM Chebyshev UCL	1.696	95% KM Chebyshev UCL	2.123
97.5% KM Chebyshev UCL	2.716	99% KM Chebyshev UCL	3.881
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.984	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.694	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.388	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.365	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.899	k star (bias corrected MLE)	0.493
Theta hat (MLE)	1.969	Theta star (bias corrected MLE)	3.59
nu hat (MLE)	8.991	nu star (bias corrected)	4.93
MLE Mean (bias corrected)	1.77	MLE Sd (bias corrected)	2.521
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	0.341	nu hat (KM)	14.33
Approximate Chi Square Value (14.33, α)	6.799	Adjusted Chi Square Value (14.33, β)	6.403
95% Gamma Approximate KM-UCL (use when n>=50)	1.587	95% Gamma Adjusted KM-UCL (use when n<50)	1.685

Gamma ROS Statistics using Imputed Non-Detects			
Minimum	0.01	Mean	0.429
Maximum	6.5	Median	0.01
SD	1.412	CV	3.291
k hat (MLE)	0.263	k star (bias corrected MLE)	0.257
Theta hat (MLE)	1.633	Theta star (bias corrected MLE)	1.67
nu hat (MLE)	11.04	nu star (bias corrected)	10.79
MLE Mean (bias corrected)	0.429	MLE Sd (bias corrected)	0.846
		Adjusted Level of Significance (β)	0.0383
Approximate Chi Square Value (10.79, α)	4.443	Adjusted Chi Square Value (10.79, β)	4.134
95% Gamma Approximate UCL (use when n>=50)	1.042	95% Gamma Adjusted UCL (use when n<50)	1.12
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.699	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.317	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.396	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.469	Mean in Log Scale	-2.351
SD in Original Scale	1.4	SD in Log Scale	1.553
95% t UCL (assumes normality of ROS data)	0.997	95% Percentile Bootstrap UCL	1.057
95% BCA Bootstrap UCL	1.37	95% Bootstrap t UCL	3.515
95% H-UCL (Log ROS)	1.034		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	-0.654	95% H-UCL (KM -Log)	0.81
KM SD (logged)	0.586	95% Critical H Value (KM-Log)	2.07
KM Standard Error of Mean (logged)	0.143		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.604	Mean in Log Scale	-1.108
SD in Original Scale	1.36	SD in Log Scale	0.775
95% t UCL (Assumes normality)	1.116	95% H-Stat UCL	0.662
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (BCA) UCL	1.324		

Appendix C-2:
Screening Level Ecological Risk Assessment Tables

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APPENDIX C-2
SLERA TABLES

Table C.2.1			
Preliminary Assessment and Measurement Endpoints			
Ecological Risk Assessment – B003, Fort Hancock			
Assessment Endpoint	**Basis For Assessment Endpoint**	**Measurement Endpoint**	**Receptor**
Terrestrial Habitats			
Growth, survival, and reproduction of soil invertebrate communities.	Soil invertebrates promote development of a well-conditioned soil to support plant growth. Soil invertebrates are an important dietary component for a number of upper trophic level receptors.	Comparison of the detected concentration in the top two feet of soil to benchmark values.	Soil Invertebrates (earthworms)
Growth, survival, and reproduction of terrestrial plant communities.	Plants provide food and habitat for a multitude of wildlife receptors.	Comparison of the detected concentrations in the top two feet of soil to benchmark values.	Terrestrial plants
Growth, survival, and reproduction of avian terrestrial herbivores.	Avian terrestrial herbivores are consumers of the nuts, seeds, and berries produced by plants, and serve as prey species for upper trophic level receptors.	Calculation of chemical intake and comparison to NOAELs and LOAELs found in the literature.	Mourning dove
Growth, survival, and reproduction of avian terrestrial insectivores.	Avian terrestrial insectivores are important consumers of soil invertebrates, and serve as prey species for upper trophic level receptors.	Calculation of chemical intake and comparison to NOAELs and LOAELs found in the literature.	American woodcock
Growth, survival, and reproduction of avian terrestrial carnivores.	Avian terrestrial carnivores consume small birds and mammals, thereby ensuring balance in the ecosystem. These receptors may be particularly vulnerable to compounds which bioaccumulate.	Calculation of chemical intake and comparison to NOAELs and LOAELs found in the literature.	Red-tailed hawk
Growth, survival, and reproduction of mammalian terrestrial herbivores.	Mammalian terrestrial herbivores are consumers of the nuts, seeds, and berries produced by plants, and serve as prey species for upper trophic level receptors.	Calculation of chemical intake and comparison to NOAELs and LOAELs found in the literature.	Meadow vole
Growth, survival, and reproduction of mammalian terrestrial insectivores.	Mammalian terrestrial insectivores are important consumers of soil invertebrates, and serve as prey species for upper trophic level receptors.	Calculation of chemical intake and comparison to NOAELs and LOAELs found in the literature.	Short-tailed shrew
Growth, survival, and reproduction of mammalian terrestrial carnivores.	Mammalian terrestrial carnivores consume small birds and mammals, thereby ensuring balance in the ecosystem. These receptors may be particularly vulnerable to compounds which bioaccumulate.	Calculation of chemical intake and comparison to NOAELs and LOAELs found in the literature.	Red fox

Table C.2.2
Exposure Parameters for Upper Trophic Level Ecological Receptors
B003, Fort Hancock

Receptor	Food Ingestion Rate (g/g-day) Value	Food Ingestion Rate (g/g-day) Comment	Soil Ingestion rate (as fraction of food ingestion rate) Value	Soil Ingestion rate (as fraction of food ingestion rate) Comment	Dietary Composition (percent) Terr. Plants	Terr. Invert.	Small Mammals	Fish	Benthic Invert.	Comment	Foraging Area Value	Foraging Area Comment
Birds												
Mourning dove	0.19 (high end) 0.137 (mean)	Dry weight basis, Attachment 4-1, OSWER Directive, 9285,7-55, rev. April 2007	13.9%	Attachment 4-1, OSWER Directive 9285.7-55, rev. April 2007	100	0	0	0	0	Conservative assumption to represent granivore community	NA	
American woodcock	0.77	Stickel, et al, 1965	10.4%	Attachment 4-1, OSWER Directive 9285.7-55, rev. April 2007	0	100	0	0	0	Conservative assumption to represent insectivore community	4.5 ha	Adult female with brood, Gregg, 1984
Red-tailed hawk	0.11 (max) 0.099 (mean)	Maximum and average of reported values	5.7%	Attachment 4-1, OSWER Directive 9285.7-55, rev. April 2007	0	0	100	0	0		697 ha	Mean value for Michigan fields and wood lots, Craighead and Craighead, 1956
Mammals												
Meadow vole	0.35	high end of reported range, Ognev 1950	2.4%	USEPA 1993	100	0	0	0	0	Illinois/bluegrass, summer, Lindroth and Batzli, 1984; 9% seeds	0.0069 ha	adult female, summer, Virginia/old field, Madison, 1980
Short-tailed shrew	0.62	Barrett and Stuek, 1976	3.0%	Attachment 4-1, OSWER Directive 9285.7-55, rev. April 2007	0	100	0	0	0	Conservative assumption to represent insectivore community	0.39	Buckner, 1966
Red fox	0.14	Adult female after whelping, Sargeant, 1978	2.8%	USEPA 1993	4.6	0.2	94.6	0	0	Spring diet, Illinois farm/woods, Knable, 1974	699 ha	Adult female, spring, Sargeant, 1972

Notes:
Excluding OSWER Directive 9285.7-55, all references were as cited in Wildlife Exposure Factors Handbook, EPA/600/R-93/187, December 1993.
Attachment 4-1, Guidance for Developing Eco SSLs: Exposure Factors & Bioaccumulation Models for Derivation of Wildlife Eco-SSLs, OSWER Directive 9285.7-55, rev. April 2007.
Ingestion rates provided in wet food weight per body weight
Assumed water content of terrestrial diet components is: 85% plants, 9.3% seeds, 84% earthworms, and 68% small mammals (Attachment 4-1, EPA, 2003)
NA - information was not found

Table C.2.3
Soil Bioaccumulation Factors Used For Plants and Soil Invertebrates
B003, Fort Hancock

Analyte	Soil-Plant BAF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganic Compounds				
Antimony	ln(plant) = 0.938ln(soil)-3.233	EPA, 2005	1	EPA, 2005

Notes:
EPA, 2005. Ecological Soil Screening Levels for Antimony, Interim Final, February 2005.

Table C.2.4

Soil Bioaccumulation Factors Used For Small Mammals

B003, Fort Hancock

Analyte	Soil-Mammal BAF (dry weight)	
	Value	Reference
Metals		
Antimony	0.05	EPA, 2005

Notes:

EPA, 2005. Ecological Soil Screening Levels for Antimony, Interim Final, February 2005.

Analyte	Receptor	Food Consumption Rate (kg-wet/kg bw-day) (dry)	Food Consumption Rate (kg-dry/kg bw-day) (dry)	Plants, diet fract.	Plants, dry weight ingestion rate (kg-dw/kg bw-day)	Invert., diet fract.	Invert., dry weight ingestion rate (kg-dw/kg bw-day)	Mammals fraction of diet	Mammals, dry weight ingestion rate (kg-dw/kg bw-day)	Soil Ingestion Rate, fraction of food ingestion rate	Exposure Point Concentration (mg/kg)	Soil-to-Plant BAF	Plant Tissue Concentration (mg/kg-dw)
Antimony													
	Mourning dove	NA	0.137	1	0.137	0	0	0	0	13.90%	13.05	eqn	0.438903051
	American Woodcock	0.77	NA	0	0	1	0.1232	0	0	10.40%	13.05	eqn	0.438903051
	Red-Tailed Hawk	0.099	NA	0	0	0	0	1	0.03168	5.70%	13.05	eqn	0.438903051
	Meadow Vole	0.35	NA	1	0.0525	0	0	0	0	2.40%	13.05	eqn	0.438903051
	Short-tailed Shrew	0.62	NA	0	0	1	0.0992	0	0	3.00%	13.05	eqn	0.438903051
	Red Fox	0.14	NA	0.046	0.000966	0.002	0.0000448	0.946	0.0423808	2.80%	13.05	eqn	0.438903051

Notes:
BAF = bioaccumulation factor; BAFs listed in Tables 8 and 9
NOAEL = no observed adverse effects level
LOAEL = lowest observed adverse effects level
Shaded cells indicate a NOAEL ecological quotient greater than 1 or a LOAEL ecological quotient greater than or equal to 1
NOAELs were obtained from Eco-SSL documents
LOAELs were calculated as the geometric mean of the LOAELs listed for reproduction, growth, and survival in each chemical's respective Eco-SSL document.
Water content of plants = 85%; dry weight content fraction = 0.15
Water content of soil invertebrates = 84%; dry weight content fraction = 0.16
Water content of mammals = 68%; dry weight content fraction = 0.32

Analyte	Receptor	Soil-to-earthworm BAF	Earthworm Tissue Concentration (mg/kg-dw)	Soil-to-mammal BAF	Mammal Tissue Concentration (mg/kg-dw)	Foraging Area Ratio	Chemical Intake Rate (mg/kg-day)	NOAEL (mg/kg-day)	NOAEL Ecological Quotient	LOAEL (mg/kg-day)	LOAEL Ecological Quotient
Antimony											
	Mourning dove	1	13.05	eqn	0.6525	1	3.1E-01	No TRV	NA	No TRV	NA
	American Woodcock	1	13.05	eqn	0.6525	0.044984256	8.0E-02	No TRV	NA	No TRV	NA
	Red-Tailed Hawk	1	13.05	eqn	0.6525	0.000290429	1.3E-05	No TRV	NA	No TRV	NA
	Meadow Vole	1	13.05	eqn	0.6525	1	3.9E-02	0.059	0.7	7.6	0.005
	Short-tailed Shrew	1	13.05	eqn	0.6525	0.519049102	6.9E-01	0.059	12	7.6	0.1
	Red Fox	1	13.05	eqn	0.6525	0.000289598	1.3E-05	0.059	0.0002	7.6	0.000002

Appendix D: Munitions Response Site Prioritization Protocol

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the **MRS Summary**, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Munitions Response Site Name: Northern Portion Proving Ground
Component: U.S. Army Corps of Engineers, Formerly Used Defense Site (FUDS) Program
Installation/Property Name: (NJ29799F692400) FORT HANCOCK
Location (City, County, State): Highlands, Monmouth County, New Jersey
Site Name/Project Name (Project No.): **C02NJ000403R01 Northern Portion Proving Ground**.

Date Information Entered/Updated: 01/30/2014 Updated 12/01/2014
Point of Contact (Name/Phone): Public Affairs – (917) 790-8007
Project Phase (check only one):

❑ PA	❑ SI	☑ RI	❑ FS	❑ RD
❑ RA-C	☑ RI	❑ RA-O	❑RC	❑ LTM

Media Evaluated (check all that apply):

☑ Groundwater	❑ Sediment (human receptor)
☑ Surface soil	❑ Surface Water (ecological receptor)
❑ Sediment (ecological receptor)	❑ Surface Water (human receptor)

MRS Summary:
MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM, or MC known or suspected to be present. When possible, identify munitions, CWM, and MC by type:

The Northern Portion Proving Ground was used from 1874 to 1918 for testing weapons and ordnance; this was the Army's first proving ground and all experimental guns and carriages were tested here. MRS 03 is 30.2 acres and encompasses MEC/MD Hazard Area 1A and a portion of Potential Area of Interest (PAOI) 9-Gun Battery, defined in the Final Remedial Investigation (RI) Report. MEC/MD Area 1A is 29 acres and covers the "new" firing battery and the B003 grid area identified in the 1998 EE/CA (Figure A-5-6, RI Report). Three MEC items (projectiles) were found during the RI, including a 3.5" armor piercing high explosive (AP HE) with base fuze, 1-lb 1.44-in Mk 1, and a 75 mm with a fuze (Section 5.1.1, RI Report).

Surface soil samples were collected in the B003 area of the MRS during the 2007 Site Inspection and the 2014 RI Addendum. No explosive compounds were detected in any of the samples, but the following metals were detected above background concentrations: antimony, arsenic, cobalt, copper, lead, molybdenum, selenium, silver, and thallium (Table 7-5, SI Report, and App B-1, RI Addendum #1 Report). No surface water or sediment samples were collected in the MRS, per the approved RI Work Plan. Five groundwater samples collected during the RI were used to represent conditions across all MRSs. No explosives were detected in any of the samples, and no metals were detected above background concentrations (Sections 4.2.3 and 5.3.3, RI Report). Baseline risk assessments conducted in the RI and RI Addendum concluded that metals in surface soil do not pose a threat to human receptors (Sections 6.2.3.6, 6.2.5, RI Report; Section 5.3.4, RI Addendum #1 Report). Therefore, the HHE module is assigned the alternative rating of No Known or Suspected Hazard.

Both physical and historical evidence indicates that CWM was not present at this MRS (Sec 1.2.1 and 1.4.2, RI Report). Therefore, the CHE module has been assigned the alternative rating of No Known or Suspected CWM Hazard.

Stakeholder coordination of the MRSPP evaluation occurred through the technical project planning process for the RI. Documentation of stakeholder coordination can be found in FRMD at C02NJ000403_01.22_0500.

Throughout the MRSPP, the reference to "RI Report" refers to the "Final MMRP Remedial Investigation Report, Remedial Investigation/Feasibility Study, Fort Hancock Formerly Used Defense Site, Monmouth County, New Jersey," dated January 2014, found on FRMD at C02NJ000403_03.10_0500 and _0501.
The reference for the SI Report is "Final Site Inspection Report for Fort Hancock," dated August 2007, found on FRMD at C02NJ000403_01.09_1003. The reference to "RI Addendum #1 Report" refers to the "MMRP Remedial Investigation Addendum #1 Report, Remedial Investigation/Feasibility Study, Fort Hancock Formerly Used Defense Site, Monmouth County, New Jersey," available on FRMD under document sequence 03.10.

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the **MRS Summary**, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Description of Pathways for Human and Ecological Receptors: The potential exposure media and associated exposure pathways for human receptors are: Soil: direct contact with surface soil (ingestion, dermal contact); inhalation via the soil-to-air pathway; Groundwater: direct contact (ingestion, dermal contact). The potential exposure pathways for ecological receptors are: Soil: Direct contact; and Bioaccumulation into plants, soil invertebrates, and small mammals, and consumption of these food items (Sections 6.2.1 and 6.3.1, RI Report)

Description of Receptors (Human and Ecological): As described in the BLRA in the RI Report, based on the current land use, the following human receptors were identified: (1) Outdoor maintenance worker (represents a National Park Service [NPS] ranger who spends the majority of his/her time patrolling the area on foot); (2) Adult and child recreational user (represent members of the public who partake in recreational activities at Fort Hancock); and (3) NPS Archaeologist. Ecological receptors include three potentially-affected terrestrial avian communities (granivores, insectivores, and carnivores) are represented by the mourning dove (granivore), American woodcock (insectivore), red-tailed hawk (carnivore) and the great blue heron (piscivore). For terrestrial mammals, the representative species will be the meadow vole (herbivore), short-tailed shrew (insectivore), and red fox (carnivore). (see Sections 6.2.1.2 and 6.3.1 RI Report)

Table 1
EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the scores that correspond with **all** the munitions types known or suspected to be present at the MRS. **Note:** The terms *practice munitions, small arms ammunition, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ UXO that are considered most likely to function upon any interaction with exposed persons (e.g., submunitions, 40mm high-explosive [HE] grenades, white phosphorus [WP] munitions, high-explosive antitank [HEAT] munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions). ◆ Hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard.	30
High explosive (used or damaged)	◆ UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	$\boxed{25}$
Pyrotechnic (used or damaged)	◆ UXO containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades). ◆ DMM containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	20
High explosive (unused)	◆ DMM containing a high-explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	15
Propellant	◆ UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	15
Bulk secondary high explosives, pyrotechnics, or propellant	◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM that are bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ DMM containing a pyrotechnic filler (i.e., red phosphorus), other than white phosphorus filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ UXO that are practice munitions that are not associated with a sensitive fuze. ◆ DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ Used munitions or DMM that are categorized as small arms ammunition. (Physical evidence or historical evidence that no other types of munitions [e.g., grenades, subcaliber training rockets, demolition charges] were used or are present on the MRS is required for selection of this category.)	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 30).	$\boxed{25}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

MEC items found in MRS 03 during the RI included the following projectiles: 3.5 inch APHE with base fuze, 1 lb Mk1, and 75 mm with fuze (Section 5.1.1 and Appendix C-2, RI Report; photos of MEC items in Appendix C-4).

Table 2

EHE Module: Source of Hazard Data Element Table

DIRECTIONS: Below are 11 classifications describing sources of explosive hazards. Circle the scores that correspond with **all** the sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms *former range, practice munitions, small arms range, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Former range	◆ The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include impact or target areas and associated buffer and safety zones.	$\boxed{10}$
Former munitions treatment (i.e., OB/OD) unit	◆ The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.	8
Former practice munitions range	◆ The MRS is a former military range on which only practice munitions without sensitive fuzes were used.	6
Former maneuver area	◆ The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.	5
Former burial pit or other disposal area	◆ The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.	5
Former industrial operating facilities	◆ The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility.	4
Former firing points	◆ The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range.	4
Former missile or air defense artillery emplacements	◆ The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range.	2
Former storage or transfer points	◆ The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system).	2
Former small arms range	◆ The MRS is a former military range where only small arms ammunition was used. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.	0
SOURCE OF HAZARD	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 10).	$\boxed{10}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Source of Hazard*** classifications in the space provided.

MRS 03 was part of the United States Army's first official proving ground for testing weapons and ordnance. Firing points and targets are as identified in the Ordnance History-Fort Hancock (1874-1919) (Sections 1.2.2 and 1.3, RI Report).

Table 3
EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eight classifications of munitions locations and their descriptions. Circle the scores that correspond with **all** the locations where munitions are known or suspected to be present at the MRS.

Note: The terms *confirmed, surface, subsurface, small arms ammunition, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Confirmed surface	◆ Physical evidence indicates that there are UXO or DMM on the surface of the MRS. ◆ Historical evidence (i.e., a confirmed report such as an explosive ordnance disposal [EOD], police, or fire department report that an incident or accident that involved UXO or DMM occurred) indicates there are UXO or DMM on the surface of the MRS.	25
Confirmed subsurface, active	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS, and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM.	$\boxed{20}$
Confirmed subsurface, stable	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed.	15
Suspected (physical evidence)	◆ There is physical evidence (e.g., munitions debris such as fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.	$\boxed{10}$
Suspected (historical evidence)	◆ There is historical evidence indicating that UXO or DMM may be present at the MRS.	$\boxed{5}$
Subsurface, physical constraint	◆ There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.	2
Small arms (regardless of location)	◆ The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present at the MRS to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
LOCATION OF MUNITIONS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 25).	$\boxed{20}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of Munitions*** classifications in the space provided.

MEC, including Mk1 (1 lb), and 3.5-inch and a 75mm projectile, were found in the subsurface in MRS 03 during the RI (Section 5.1.1 and Appendix C-2, RI Report). The MRS is located on an active recurved sand spit that changes size and shape from dune and wave action, gaining sand in some areas and losing in others (Section 2.1.4, RI Report).

Table 4

EHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to the MRS. Circle the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the Primer.

Classification	Description	Score
No barrier	◆ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	10
Barrier to MRS access is incomplete	◆ There is a barrier preventing access to parts of the MRS, but not the entire MRS.	$\boxed{8}$
Barrier to MRS access is complete but not monitored	◆ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5
Barrier to MRS access is complete and monitored	◆ There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0
EASE OF ACCESS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	**8**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classification in the space provided.

The MRS is open to the public, upon entry into the Sandy Hook Unit of Gateway National Recreation Area (a national park). There is a significant amount of dense, brushy vegetation preventing access to portions of the MRS (Sections 1.2, 2.1.1, and 2.1.7, RI Report).

Table 5

EHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

Classification	Description	Score
Non-DoD control	◆ The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies. ◆ The MRS is at a location that is owned by DoD, but that DoD has leased to another entity and for which DoD does not control access 24 hours per day.	$\boxed{5}$
Scheduled for transfer from DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the Protocol is applied.	3
DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year.	0
STATUS OF PROPERTY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classification in the space provided.

The MRS is located on the Sandy Hook Peninsula of New Jersey. This peninsula, which encompasses approximately 1,700 acres, is known as the Sandy Hook Unit of the Gateway National Recreation Area and is a National Historic Landmark. The location of the MRS is currently managed by the Department of the Interior (NPS) and is used for a variety of recreational purposes year-round (Section 1.2, RI Report).

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications for population density and their descriptions. Determine the population density per square mile that most closely corresponds with the population of the MRS, including the area within a two-mile radius of the MRS's perimeter. Circle the most appropriate score.

Note: Use the U.S. Census Bureau tract data available to capture the **highest** population density within a two-mile radius of the perimeter of the MRS.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	$\boxed{5}$
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	3
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	1
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	5

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classification in the space provided.

The population density of Monmouth County, NJ is 1,344.7 persons per square mile (http://quickfacts.census.gov/qfd/states/34/34025.html)

Table 7

EHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the potential population near the MRS. Determine the number of inhabited structures within two miles of the MRS boundary and circle the score that corresponds with the number of inhabited structures.

Note: The term *inhabited structures* is defined in Appendix C of the Primer.

Classification	Description	Score
26 or more inhabited structures	◆ There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	$\boxed{5}$
16 to 25 inhabited structures	◆ There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4
11 to 15 inhabited structures	◆ There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3
6 to 10 inhabited structures	◆ There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2
1 to 5 inhabited structures	◆ There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1
0 inhabited structures	◆ There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classification in the space provided.

Inhabited structures include NPS and USCG buildings, residences, a school and daycare facility, and beach houses for use by recreational visitors (Section 2.1.7, RI Report; Google Earth used to calculate total number of inhabited structures within two-mile radius).

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and circle the scores that correspond with **all** the activities/structure classifications at the MRS.

Note: The term *inhabited structure* is defined in Appendix C of the Primer.

Classification	Description	Score
Residential, educational, commercial, or subsistence	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	5
Parks and recreational areas	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	4
Agricultural, forestry	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	3
Industrial or warehousing	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2
No known or recurring activities	◆ There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	5

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space provided.

Types of activities/structures within 2 miles include NPS and U.S. Coast Guard (USCG) buildings, residences, a school and daycare facility, and beach houses for use by recreational visitors. An active USCG Station is positioned on the northwest corner of the peninsula (approximately 68 acres) (Section 2.1.7, RI Report).

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resources present on the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the Primer.

Classification	Description	Score
Ecological and cultural resources present	◆ There are both ecological and cultural resources present on the MRS.	5
Ecological resources present	◆ There are ecological resources present on the MRS.	3
Cultural resources present	◆ There are cultural resources present on the MRS.	3
No ecological or cultural resources present	◆ There are no ecological resources or cultural resources present on the MRS.	0
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	5

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classification in the space provided.

This MRS exhibits a diverse fauna that depend on a wide variety of habitats including forest, wetland, dune shrubland, dune grassland, and beach as well as intertidal marine habitats. Beach and dune flora is predominantly characterized by grasses, forbs and stunted shrubs. Inland flora is predominantly characterized by evergreen and mixed maritime forests, with deciduous forests (both maritime and non-maritime) on the western portion of the MRS. Based on previous archaeological investigations, Fort Hancock may include archaeological artifacts, features and locations that are associated with the former military use of Fort Hancock. The Fort Hancock and Sandy Hook Proving Ground Historic District, which includes all of the Fort's structures, and the Sandy Hook Lighthouse are National Historic Landmarks (Sections 1.2 and 2.1.8, RI Report).

Table 10
Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. *Circle the appropriate range for the EHE Module Total below.*
5. *Circle the EHE Module Rating that corresponds to the range selected and record this value in the EHE Module Rating box found at the bottom of the table.*

Note:

An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 1	25	35
Source of Hazard	Table 2	10	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	20	33
Ease of Access	Table 4	8	
Status of Property	Table 5	5	
Receptor Factor Data Elements			
Population Density	Table 6	5	20
Population Near Hazard	Table 7	5	
Types of Activities/Structures	Table 8	5	
Ecological and/or Cultural Resources	Table 9	5	
		EHE MODULE TOTAL	88

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	**B**

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the scores that correspond with **all** the CWM configurations known or suspected to be present at the MRS.

Note: The terms *CWM/UXO, CWM/DMM, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, that are either UXO, or explosively configured damaged DMM	The CWM known or suspected of being present at the MRS are: ◆ CWM that are UXO (i.e., CWM/UXO) ◆ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	◆ The CWM known or suspected of being present at the MRS are undamaged CWM/DMM or CWM not configured as a munition that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM/DMM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS are: ◆ Nonexplosively configured CWM/DMM either damaged or undamaged ◆ Bulk CWM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS are CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	0
CWM CONFIGURATION	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 30).	0

DIRECTIONS: **Document any MRS-specific data used in selecting the *CWM Configuration* classifications in the space provided.**

Both physical and historical evidence indicates that CWM was not present at this MRS (Sections 1.2.1 and 1.4.2, RI Report).

Tables 12 through 19 are intentionally omitted
Per Army Guidance (U.S. Army, 2009)

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	**Score**	**Value**
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		
Population Near Hazard	Table 17		
Types of Activities/Structures	Table 18		
Ecological and/or Cultural Resources	Table 19		
CHE MODULE TOTAL			0

CHE Module Total	**CHE Module Rating**
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	**No Known or Suspected CWM Hazard**

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: ***Record the*** *maximum concentrations* ***of all contaminants in the MRS's groundwater and their*** *comparison values* ***(from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the*** *ratios* ***for each contaminant by dividing the*** *maximum concentration* ***by the*** *comparison value****. Determine the*** *CHF* ***by adding the contaminant*** *ratios* ***together, including any additional groundwater contaminants recorded on Table 27. Based on the*** *CHF****, use the*** *CHF Scale* ***to determine and record the*** *CHF Value****. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.***

Contaminant	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios
CHF Scale	*CHF Value*	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	
	No Known or Suspected Groundwater MC Hazard	☑

No MC were detected above background concentrations (Secs 4.2.3 and 5.3.3, RI Report)

Table 22
HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: ***Record the*** *maximum concentrations* ***of all contaminants in the MRS's surface water and their*** *comparison values* ***(from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the*** *ratios* ***for each contaminant by dividing the*** *maximum concentration* ***by the*** *comparison value.* ***Determine the*** *CHF* ***by adding the contaminant*** *ratios* ***together, including any additional surface water contaminants recorded on Table 27. Based on the*** *CHF*, ***use the*** *CHF Scale* ***to determine and record the*** *CHF Value.* ***If there is no known or suspected MC hazard with human endpoints present in the surface water, select the box at the bottom of the table.***

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	*CHF Value*	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no surface water samples were collected in this MRS (see Section 4.2.2 of the RI Report).

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ☐

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

*DIRECTIONS: **Record the** maximum concentrations **of all contaminants in the MRS's sediment and their** comparison values **(from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the** ratios **for each contaminant by dividing the** maximum concentration **by the** comparison value. **Determine the** CHF **by adding the contaminant** ratios **together, including any additional sediment contaminants recorded on Table 27. Based on the** CHF**, use the** CHF Scale **to determine and record the** CHF Value. **If there is no known or suspected MC hazard with human endpoints present in the sediment, select the box at the bottom of the table.***

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
CHF Scale	*CHF Value*	**Sum The Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no sediment samples were collected in this MRS (see Section 4.2.2 of the RI Report).

No Known or Suspected Sediment (Human Endpoint) MC Hazard ☐

Table 24
HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: ***Record the*** *maximum concentrations* ***of all contaminants in the MRS's surface water and their*** *comparison values* ***(from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the*** *ratios* ***for each contaminant by dividing the*** *maximum concentration* ***by the*** *comparison value****. Determine the*** *CHF* ***by adding the contaminant*** *ratios* ***together, including any additional surface water contaminants recorded on Table 27. Based on the*** *CHF****, use the*** *CHF Scale* ***to determine and record the*** *CHF Value****. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.***

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	*CHF Value*	**Sum the Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no surface water samples were collected in this MRS (see Section 4.2.2 of the RI Report).

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ☐

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: ***Record the*** *maximum concentrations* ***of all contaminants in the MRS's sediment and their*** *comparison values* ***(from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the*** *ratios* ***for each contaminant by dividing the*** *maximum concentration* ***by the*** *comparison value****. Determine the*** *CHF* ***by adding the contaminant*** *ratios* ***together, including any additional sediment contaminants recorded on Table 27. Based on the*** *CHF****, use the*** *CHF Scale* ***to determine and record the*** *CHF Value****. If there is no known or suspected MC hazard with ecological endpoints present in the sediment, select the box at the bottom of the table.***

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
CHF Scale	*CHF Value*	**Sum the Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no sediment samples were collected in this MRS (see Section 4.2.2 of the RI Report).

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ☐

Table 26
HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: ***Record the** maximum concentrations **of all contaminants in the MRS's surface soil and their** comparison values **(from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the** ratios **for each contaminant by dividing the** maximum concentration **by the** comparison value. **Determine the** CHF **by adding the contaminant** ratios **together, including any additional surface soil contaminants recorded on Table 27. Based on the** CHF, **use the** CHF Scale **to determine and record the** CHF Value. **If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.***

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratio
Antimony	34.9	31	1.13
Arsenic	114	22	5.18
Copper	384	3,100	0.12
Lead	2,180	400	5.25
Cobalt	3.1	1,400	0.002
CHF Scale	*CHF Value*	**Sum the Ratios**	20.046
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	M

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	M

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	M

Results for SI Sample FHK-NP-SS-06-03 are summarized in Table 7-5 (p. 3 of 5) of the 2007 SI Report. Results for additional samples are summarized in Appendix B-1 of the 2014 RI Addendum Report #1.

No Known or Suspected Surface Soil MC Hazard ❑

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Only use this table if there are more than five contaminants in any given medium present at the MRS. **This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the** media **in which these contaminants are present. Then record all** contaminants**, their** maximum concentrations **and their** comparison values **(from Appendix B of the Primer) in the table below. Calculate and record the** ratio **for each contaminant by dividing the** maximum concentration **by the** comparison value**. Determine the** CHF **for each medium on the appropriate media-specific tables.**

Note: **Do not add ratios from different media.**

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio
Surface soil	Selenium	3.6 mg/kg	390 mg/kg	0.009
Surface soil	Thallium	6.5 mg/kg	0.78 mg/kg	8.33
Surface soil	Molybdenum	2.3 mg/kg	390 mg/kg	0.006
Surface soil	Silver	7.6 mg/kg	390 mg/kg	0.019

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard**, **Migration Pathway**, and **Receptor Factors** for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the **HHE Ratings** provided below, determine each media's rating (A–G) and record the letter in the corresponding **Media Rating** box below.

Media (Source)	**Contaminant Hazard Factor Value**	**Migratory Pathway Factor Value**	**Receptor Factor Value**		**Three-Letter Combination (Hs-Ms-Ls)**		**Media Rating (A-G)**
Groundwater (Table 21)							No Known or Suspected Hazard
Surface Water/Human Endpoint (Table 22)							
Sediment/Human Endpoint (Table 23)							
Surface Water/Ecological Endpoint (Table 24)							
Sediment/Ecological Endpoint (Table 25)							
Surface Soil (Table 26)	M	M	M		MMM		D

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the **HHE Module Rating** box.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE MODULE RATING	D

HHE Ratings (for reference only)

Combination	Rating
HHH	A
HHM	B
HHL	C
HMM	
HML	D
MMM	
HLL	E
MML	
MLL	F
LLL	G

Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Table 29

MRS Priority

DIRECTIONS: ***In the chart below, circle the letter** rating **for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical** priority **for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS Priority is the single highest priority; record this relative priority in the** MRS Priority or Alternative MRS Rating **at the bottom of the table.***

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	B	2	A	2
B	**3**	C	3	B	3
C	4	D	4	C	4
D	5	E	5	D	5
E	6	F	6	E	6
F	7	G	7	F	7
G	8			G	8
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		**No Known or Suspected CWM Hazard**		**No Known or Suspected MC Hazard**	
MRS PRIORITY or ALTERNATIVE MRS RATING				**3**	

MRS 05

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the **MRS Summary**, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Munitions Response Site Name: Southern Portion Proving Ground
Component: U.S. Army Corps of Engineers, Formerly Used Defense Site (FUDS) Program
Installation/Property Name: (NJ29799F69240) FORT HANCOCK
Location (City, County, State): Highlands, Monmouth County, New Jersey
Site Name/Project Name (Project No.): C02NJ000405R01 Southern Portion Proving Ground.

Date Information Entered/Updated: 01/30/2014
Point of Contact (Name/Phone): Public Affairs – (917) 790-8007
Project Phase (check only one):

❑ PA	❑ SI	☑ RI	❑ FS	❑ RD
❑ RA-C	❑ RI	❑ RA-O	❑RC	❑ LTM

Media Evaluated (check all that apply):

☑ Groundwater	❑ Sediment (human receptor)
❑Surface soil	❑ Surface Water (ecological receptor)
❑ Sediment (ecological receptor)	❑ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM, or MC known or suspected to be present. When possible, identify munitions, CWM, and MC by type:

The Fort Hancock Southern Portion Proving Ground was used by the U.S. Army from 1874 to 1918 for testing weapons and ordnance. Fort Hancock housed the Army's first official proving ground. This MRS consists of seven, noncontiguous portions of the down-range impact areas, south of the two firing batteries included in MRS 03. The seven portions were identified in the 2014 Remedial Investigation as MEC/MD Hazard Areas 1B, 2A, 3A, 3B, 4A, 5A, and 5B (Figs A-5-6, A-5-7, A-5-8, and A-5-9, RI Report). In total, the areas comprise 51 acres; 25 MD and 4 MEC items were found throughout 13 grids installed and intrusively investigated during the RI. The MEC items include: 5" AP HE projectile; 3" stokes mortar; 75 mm shrapnel round; and 4.5" British AP HE projectile, with base fuze (Secs 5.1.2-5.1.5, RI Report).

No MC is known or suspected in the MRS. Per the approved RI work plan, no soil samples were collected during the RI, as no breached munitions items or high concentrations of munitions debris were found. Also per the approved work plan, no surface water or sediment samples were collected in the MRS during the RI (Secs 6.1.1 and 6.1.3, RI Report). Metals detected in soil samples collected during the SI in nearby areas were determined to represent background conditions (Secs 6.2.3.1, 6.2.3.2, and 6.3.3.3, RI Report). Five groundwater samples were collected during the RI to represent conditions across all MRSs. No explosives were detected and all metals reflected background conditions (Secs 4.2.3 and 5.3.3, RI Report). Based on the baseline risk assessment conducted during the RI, no unacceptable risk was found; the HHE module has been assigned an alternate rating of No Known or Suspected MC Hazard (Table 8-3, RI Report).

Both physical and historical evidence indicates that CWM was not present at this MRS (Secs 1.2.1 and 1.4.2, RI Report). Therefore, the CHE module has been assigned the alternative rating of No Known or Suspected CWM Hazard.

Stakeholder coordination of the MRSPP evaluation occurred through the technical project planning process for the RI. Documentation of stakeholder coordination can be found in FRMD at C02NJ000403_01.22_0500.

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Throughout the MRSPP, the reference to the "RI Report" refers to the "Final MMRP Remedial Investigation Report, Remedial Investigation/Feasibility Study, Fort Hancock Formerly Used Defense Site, Monmouth County, New Jersey," dated January 2014, found on FRMD at C02NJ000403_03.10_0500 and _0501.

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the **MRS Summary**, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Description of Pathways for Human and Ecological Receptors: The potential exposure media and associated exposure pathways for human receptors are: Soil: direct contact with surface soil (ingestion, dermal contact); inhalation via the soil-to-air pathway; Sediment: direct contact (ingestion, dermal contact); Surface water: direct contact (ingestion, dermal contact); and Groundwater: direct contact (ingestion, dermal contact). The potential exposure pathways for ecological receptors are: Soil: Direct contact; and Bioaccumulation into plants, soil invertebrates, and small mammals, and consumption of these food items. Sediment: Incidental ingestion; and Bioaccumulation into sediment invertebrate tissue and consumption of the invertebrates. Surface water: Ingestion; and Bioaccumulation into fish and consumption of fish(Sections 6.2.1 and 6.3.1, RI Report).

Description of Receptors (Human and Ecological): Based on the current land use, the following human receptors were identified: (1) Outdoor maintenance worker (represents a National Park Service [NPS] ranger who spends the majority of his/her time patrolling the area on foot); (2) Adult and child recreational user (represent members of the public who partake in recreational activities at Fort Hancock); and (3) NPS Archaeologist. Ecological receptors include three potentially-affected terrestrial avian communities (granivores, insectivores, and carnivores) are represented by the mourning dove (granivore), American woodcock (insectivore), red-tailed hawk (carnivore) and the great blue heron (piscivore). For terrestrial mammals, the representative species will be the meadow vole (herbivore), short-tailed shrew (insectivore), and red fox (carnivore)(see Sections 6.2.1.2 and 6.3.1 RI Report).

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the scores that correspond with **all** the munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms ammunition, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ UXO that are considered most likely to function upon any interaction with exposed persons (e.g., submunitions, 40mm high-explosive [HE] grenades, white phosphorus [WP] munitions, high-explosive antitank [HEAT] munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions). ◆ Hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard.	30
High explosive (used or damaged)	◆ UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	$\boxed{25}$
Pyrotechnic (used or damaged)	◆ UXO containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades). ◆ DMM containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	20
High explosive (unused)	◆ DMM containing a high-explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	15
Propellant	◆ UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	15
Bulk secondary high explosives, pyrotechnics, or propellant	◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM that are bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ DMM containing a pyrotechnic filler (i.e., red phosphorus), other than white phosphorus filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ UXO that are practice munitions that are not associated with a sensitive fuze. ◆ DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ Used munitions or DMM that are categorized as small arms ammunition. (Physical evidence or historical evidence that no other types of munitions [e.g., grenades, subcaliber training rockets, demolition charges] were used or are present on the MRS is required for selection of this category.)	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	$\boxed{25}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

MEC items found in MRS 05 during the RI included a 5 inch, APHE round with a base fuze, a 75 mm shrapnel round, a 3 inch Stokes mortar,and a 4.5 inch, Mark V British APHE round with a base fuze, (see Sections 5.1.2, 5.1.4, and 5.1.5 and Appendix C-2 of the RI Report; photos of the MEC items are in Appendix C-4).

Table 2
EHE Module: Source of Hazard Data Element Table

DIRECTIONS: Below are 11 classifications describing sources of explosive hazards. Circle the scores that correspond with **all** the sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms *former range, practice munitions, small arms range, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Former range	◆ The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include impact or target areas and associated buffer and safety zones.	$\boxed{10}$
Former munitions treatment (i.e., OB/OD) unit	◆ The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.	8
Former practice munitions range	◆ The MRS is a former military range on which only practice munitions without sensitive fuzes were used.	6
Former maneuver area	◆ The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.	5
Former burial pit or other disposal area	◆ The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.	5
Former industrial operating facilities	◆ The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility.	4
Former firing points	◆ The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range.	4
Former missile or air defense artillery emplacements	◆ The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range.	2
Former storage or transfer points	◆ The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system).	2
Former small arms range	◆ The MRS is a former military range where only small arms ammunition was used. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.	0
SOURCE OF HAZARD	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 10).	$\boxed{10}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Source of Hazard*** classifications in the space provided. MRS 05 was part of the United States Army's first official proving ground for testing weapons and ordnance. Firing points and targets are as identified in the Ordnance History-Fort Hancock (1874-1919) (see Sections 1.2.2 and 1.3 of the RI Report).

Table 3
EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eight classifications of munitions locations and their descriptions. Circle the scores that correspond with **all** the locations where munitions are known or suspected to be present at the MRS.

Note: The terms *confirmed, surface, subsurface, small arms ammunition, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Confirmed surface	◆ Physical evidence indicates that there are UXO or DMM on the surface of the MRS. ◆ Historical evidence (i.e., a confirmed report such as an explosive ordnance disposal [EOD], police, or fire department report that an incident or accident that involved UXO or DMM occurred) indicates there are UXO or DMM on the surface of the MRS.	$\boxed{25}$
Confirmed subsurface, active	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS, and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM.	$\boxed{20}$
Confirmed subsurface, stable	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed.	15
Suspected (physical evidence)	◆ There is physical evidence (e.g., munitions debris such as fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.	$\boxed{10}$
Suspected (historical evidence)	◆ There is historical evidence indicating that UXO or DMM may be present at the MRS.	$\boxed{5}$
Subsurface, physical constraint	◆ There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.	2
Small arms (regardless of location)	◆ The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present at the MRS to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
LOCATION OF MUNITIONS	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 25).	$\boxed{25}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of Munitions*** classifications in the space provided.

A MEC item (5-inch APHE round) was found on the surface, and a 75mm shrapnel round, 3 inch Stokes mortar, and 4.5 inch, Mark V British APHE round with a base fuze were found in the subsurface in MRS 05 during the RI. In addition, 25 pieces of both intact and scrap/frag MD were found in the subsurface (see Section 5.1 and Appendix C-2 of the RI Report).

Table 4

EHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to the MRS. Circle the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the Primer.

Classification	Description	Score
No barrier	◆ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	10
Barrier to MRS access is incomplete	◆ There is a barrier preventing access to parts of the MRS, but not the entire MRS.	8
Barrier to MRS access is complete but not monitored	◆ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5
Barrier to MRS access is complete and monitored	◆ There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0
EASE OF ACCESS	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 10).	**8**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classification in the space provided.

The MRS is open to the public, upon entry into the Sandy Hook Unit of Gateway National Recreation Area (a national park). There is a significant amount of dense, brushy vegetation in portions of the MRS (see Section 1.2, 2.1.1, and 2.1.7 of the RI Report).

Table 5

EHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

Classification	Description	Score
Non-DoD control	◆ The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies. ◆ The MRS is at a location that is owned by DoD, but that DoD has leased to another entity and for which DoD does not control access 24 hours per day.	$\boxed{5}$
Scheduled for transfer from DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the Protocol is applied.	3
DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year.	0
STATUS OF PROPERTY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classification in the space provided.

The MRS is located on the Sandy Hook Peninsula of New Jersey. This peninsula, which encompasses approximately 1,700 acres, is known as the Sandy Hook Unit of the Gateway National Recreation Area and is a National Historic Landmark. The location of the MRS is currently managed by the Department of the Interior (NPS) and is used for a variety of recreational purposes year-round (see Section 1.2 of the RI Report).

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications for population density and their descriptions. Determine the population density per square mile that most closely corresponds with the population of the MRS, including the area within a two-mile radius of the MRS's perimeter. Circle the most appropriate score.

Note: Use the U.S. Census Bureau tract data available to capture the **highest** population density within a two-mile radius of the perimeter of the MRS.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	$\boxed{5}$
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	3
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	1
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classification in the space provided.

The population density of Monmouth County, NJ is 1,344.7 persons per square mile (http://quickfacts.census.gov/qfd/states/34/34025.html)

Table 7

EHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the potential population near the MRS. Determine the number of inhabited structures within two miles of the MRS boundary and circle the score that corresponds with the number of inhabited structures.

Note: The term *inhabited structures* is defined in Appendix C of the Primer.

Classification	Description	Score
26 or more inhabited structures	◆ There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	5
16 to 25 inhabited structures	◆ There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4
11 to 15 inhabited structures	◆ There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3
6 to 10 inhabited structures	◆ There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2
1 to 5 inhabited structures	◆ There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1
0 inhabited structures	◆ There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	5

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classification in the space provided.

Inhabited structures include NPS and USCG buildings, residences, a school and daycare facility, and beach houses for use by recreational visitors (see Section 2.1.7 of the RI Report; Google Earth was used to calculate the total number of inhabited structures within the two-mile radius for this MRS).

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and circle the scores that correspond with **all** the activities/structure classifications at the MRS.

Note: The term *inhabited structure* is defined in Appendix C of the Primer.

Classification	Description	Score
Residential, educational, commercial, or subsistence	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	$\boxed{5}$
Parks and recreational areas	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	$\boxed{4}$
Agricultural, forestry	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	3
Industrial or warehousing	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2
No known or recurring activities	◆ There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space provided.

Types of activities/structures within 2 miles include NPS and U.S. Coast Guard (USCG) buildings, residences, a school and daycare facility, and beach houses for use by recreational visitors. An active USCG Station is positioned on the northwest corner of the peninsula (approximately 68 acres) (see Section 2.1.7 of the RI Report).

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resources present on the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the Primer.

Classification	Description	Score
Ecological and cultural resources present	◆ There are both ecological and cultural resources present on the MRS.	$\boxed{5}$
Ecological resources present	◆ There are ecological resources present on the MRS.	3
Cultural resources present	◆ There are cultural resources present on the MRS.	3
No ecological or cultural resources present	◆ There are no ecological resources or cultural resources present on the MRS.	0
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classification in the space provided.

This MRS exhibits a diverse fauna that depend on a wide variety of habitats including forest, wetland, dune shrubland, dune grassland, and beach as well as intertidal marine habitats. Beach and dune flora is predominantly characterized by grasses, forbs and stunted shrubs. Inland flora is predominantly characterized by evergreen and mixed maritime forests, with deciduous forests (both maritime and non-maritime) on the western portion of the MRS. Based on previous archaeological investigations, Fort Hancock may include archaeological artifacts, features and locations that are associated with the former military use of Fort Hancock. The Fort Hancock and Sandy Hook Proving Ground Historic District, which includes all of the Fort's structures, and the Sandy Hook Lighthouse are National Historic Landmarks (see Sections 1.2 and 2.1.8 of the RI Report).

Table 10

Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.

2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.

3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.

4. Circle the appropriate range for the **EHE Module Total** below.

5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Munitions Type	Table 1	**25**	35
Source of Hazard	Table 2	**10**	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	**25**	38
Ease of Access	Table 4	**8**	
Status of Property	Table 5	**5**	
Receptor Factor Data Elements			
Population Density	Table 6	**5**	20
Population Near Hazard	Table 7	**5**	
Types of Activities/Structures	Table 8	**5**	
Ecological and /or Cultural Resources	Table 9	**5**	
EHE MODULE TOTAL			**93**

EHE Module Total	EHE Module Rating
92 to 100	**A**
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	A

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the scores that correspond with **all** the CWM configurations known or suspected to be present at the MRS.

Note: The terms *CWM/UXO, CWM/DMM, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, that are either UXO, or explosively configured damaged DMM	The CWM known or suspected of being present at the MRS are: ◆ CWM that are UXO (i.e., CWM/UXO) ◆ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	◆ The CWM known or suspected of being present at the MRS are undamaged CWM/DMM or CWM not configured as a munition that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM/DMM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS are: ◆ Nonexplosively configured CWM/DMM either damaged or undamaged ◆ Bulk CWM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS are CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	0
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	0

DIRECTIONS: Document any MRS-specific data used in selecting the *CWM Configuration* classifications in the space provided.

Both physical and historical evidence indicates that CWM was not present at this MRS (see Sections 1.2.1 and 1.4.2 of the RI Report).

Tables 12 through 19 are intentionally omitted

Per Army Guidance (U.S. Army, 2009)

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.

2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.

3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.

4. Circle the appropriate range for the **CHE Module Total** below.

5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		0
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		0
Population Near Hazard	Table 17		
Types of Activities/Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			**0**

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	**No Known or Suspected CWM Hazard**

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's groundwater and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional groundwater contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	*CHF Value*	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No MC were detected above background concentrations (Secs 4.2.3 and 5.3.3, RI Report)

No Known or Suspected Groundwater MC Hazard ☑

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with human endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios
CHF Scale	*CHF Value*	**Sum The Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no surface water samples were collected in this MRS (see Section 4.2.2 of the RI Report)

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ☐

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
CHF Scale	*CHF Value*	**Sum The Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no sediment samples were collected in this MRS (Section 4.2.2, RI Report).

No Known or Suspected Sediment (Human Endpoint) MC Hazard ☐

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	*CHF Value*	**Sum the Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no surface water samples were collected in this MRS (section 4.2.2, RI Report).

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ☐

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
CHF Scale	*CHF Value*	**Sum the Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no sediment samples were collected in this MRS.(section 4.2.2, RI Report).

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ☐

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface soil and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface soil contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratio
CHF Scale	*CHF Value*	**Sum the Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no soil samples were collected during the RI, as no breached MEC items or concentrated MD were found (Section 6.1.1, RI Report).

No Known or Suspected Surface Soil MC Hazard ☐

Table 27
HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)
DIRECTIONS: Only use this table if there are more than five contaminants in any given medium present at the MRS. This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the media in which these contaminants are present. Then record all contaminants, their maximum concentrations and their comparison values (from Appendix B of the Primer) in the table below. Calculate and record the ratio for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF for each medium on the appropriate media-specific tables.

Note: Do not add ratios from different media.

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard**, **Migration Pathway**, and **Receptor Factors** for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the **HHE Ratings** provided below, determine each media's rating (A–G) and record the letter in the corresponding **Media Rating** box below.

Media (Source)	**Contaminant Hazard Factor Value**	**Migratory Pathway Factor Value**	**Receptor Factor Value**		*Three-Letter Combination (Hs-Ms-Ls)*		*Media Rating (A-G)*
Groundwater (Table 21)							No Known or Suspected Hazard
Surface Water/Human Endpoint (Table 22)							
Sediment/Human Endpoint (Table 23)							
Surface Water/Ecological Endpoint (Table 24)							
Sediment/Ecological Endpoint (Table 25)							
Surface Soil (Table 26)							

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the **HHE Module Rating** box.

Note:

An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE MODULE RATING	

HHE Ratings (for reference only)

Combination	**Rating**
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G

Alternative Module Ratings	
	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Table 29

MRS Priority

DIRECTIONS: In the chart below, circle the letter rating for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical priority for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS Priority is the single highest priority; record this relative priority in the MRS Priority or Alternative MRS Rating at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	**2**	B	2	A	2
B	3	C	3	B	3
C	4	D	4	C	4
D	5	E	5	D	5
E	6	F	6	E	6
F	7	G	7	F	7
G	8			G	8
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		**No Known or Suspected CWM Hazard**		**No Known or Suspected MC Hazard**	
MRS PRIORITY or ALTERNATIVE MRS RATING				**2**	

MRS 06

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the **MRS Summary**, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Munitions Response Site Name: Livens Discovery Area
Component: U.S. Army Corps of Engineers Formerly Used Defense Site (FUDS) Program
Installation/Property Name: (NJ29799F692400) FORT HANCOCK
Location (City, County, State): Highlands, Monmouth County, New Jersey
Site Name/Project Name (Project No.): C02NJ000406R01 Livens Discovery Area

Date Information Entered/Updated: 01/30/2014
Point of Contact (Name/Phone): Public Affairs – (917) 790-8007
Project Phase (check only one):

❑ PA	❑ SI	☑ RI	❑ FS	❑ RD
❑ RA-C	❑ RI	❑ RA-O	❑RC	❑ LTM

Media Evaluated (check all that apply):

☑ Groundwater	❑ Sediment (human receptor)
☑ Surface soil	❑ Surface Water (ecological receptor)
❑ Sediment (ecological receptor)	❑ Surface Water (human receptor)

MRS Summary: MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM, or MC known or suspected to be present. When possible, identify munitions, CWM, and MC by type:

Project/MRS 06 Livens Discovery Area is 24 acres and overlaps the proving ground between the 3,000-yd and 3-mile impact areas (Fig A-5-2, RI Report). A magazine that stored Livens projectiles (containing FM smoke) and other munitions exploded in this area in 1927. 29 acres were delineated in the RI Report using the hazard fragmentation distance for a Livens projectile (Secs 1.2.1, 1.2.2, and 1.4, RI Report).The National Park Service restricted access to the majority of the MRS for the geophysical investigation, and only 4.8 of the 29 acres were investigated for MEC. No MEC or MD items were discovered, so the 4.8 acres are included in MRS 07 (Secs 2.1.8, 4.1.1.2, 5.2.2.7, RI Report). The EHE module is based on historical information since access was refused for the RI.

In 1981, four Livens projectiles were discovered by NPS personnel. In 1988, during a USACE-led EE/CA, UXO including a 3" and 4.7" projectile, one full Livens projectile (containing FM smoke), and a potentially live Stokes mortar fuze were discovered, along with various MD (empty gas grenades, smoke dispensers, Stokes mortar fuzes, base of a 4.7" projectile, nose fuze, empty Livens projectiles, and UXO-related frag) (EE/CA Report, 1999).*

Five surface soil samples were collected in MRS 06 during the 2007 SI, and 21 surface soil samples were collected during the RI across the MRS (NPS allowed access for sampling). No explosives were detected, and all metals were consistent with background concentrations (Secs 5.3.1.2, 6.1.1, and 6.2.3.5, RI Report). Five groundwater samples collected during the RI were used to represent conditions across all MRSs. No explosives were detected; metals were detected but not above background concentrations (Secs 4.2.3 and 5.3.3, RI Report). Per the approved RI work plan, no surface water or sediment samples were collected in the MRS. The RI concluded there is no source of MC in the MRS and no risks to receptors (Table 8-4, RI Report). As a result, the HHE module has been assigned the alternative rating of No Known or Suspected MC Hazard.

Both physical and historical evidence indicates that CWM was not present at this MRS. See Sections 1.2.1 and 1.4.2 of the RI Report. Therefore, the CHE module has been assigned the alternative rating of No Known or Suspected CWM Hazard.

Stakeholder coordination of the MRSPP evaluation occurred through the technical project planning process for the RI. Documentation of stakeholder coordination can be found in FRMD at C02NJ000403_01.22_0500.

Throughout the MRSPP, the reference to the "RI Report" refers to the "Final MMRP Remedial Investigation Report, Remedial Investigation/Feasibility Study, Fort Hancock Formerly Used Defense Site, Monmouth County, New Jersey," dated January 2014, on FRMD at C02NJ000403_03.10_0500.

Description of Pathways for Human and Ecological Receptors:
The potential exposure media and associated exposure pathways for human receptors are: Soil: direct contact with surface soil (ingestion, dermal contact); inhalation via the soil-to-air pathway; Groundwater: direct contact (ingestion, dermal contact). The potential exposure pathways for ecological receptors are: Soil: Direct contact; and Bioaccumulation into plants, soil invertebrates, and small mammals, and consumption of these food items. Potential for contact with MEC includes walking over surface MEC, handling/collecting MEC, or contact with subsurface MEC due to any intrusive activities.(Sections 6.2.1 and 6.3.1, RI Report)

Description of Receptors (Human and Ecological):
Based on the current land use, the following human receptors were identified: Outdoor maintenance worker (represents a National Park Service [NPS] ranger who spends the majority of his/her time patrolling the area on foot); Adult and child recreational user (represent members of the public who partake in recreational activities at Fort Hancock); and NPS Archaeologist. Ecological receptors include three potentially-affected terrestrial avian communities (granivores, insectivores, and carnivores) are represented by the mourning dove (granivore), American woodcock (insectivore), red-tailed hawk (carnivore) and the great blue heron (piscivore). For terrestrial mammals, the representative species will be the meadow vole (herbivore), short-tailed shrew (insectivore), and red fox (carnivore).(see Sections 6.2.1.2 and 6.3.1 RI Report)

*EE/CA Report, 1999 refers to the “Draft Final Former Fort Hancock EE/CA” prepared by Foster Wheeler Environmental Corporation, December 1999 (Final not available). This can be found on FRMD at document sequence no. 02.16.

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the scores that correspond with **all** the munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms ammunition, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ UXO that are considered most likely to function upon any interaction with exposed persons (e.g., submunitions, 40mm high-explosive [HE] grenades, white phosphorus [WP] munitions, high-explosive antitank [HEAT] munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions). ◆ Hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard.	30
High explosive (used or damaged)	◆ UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	$\boxed{25}$
Pyrotechnic (used or damaged)	◆ UXO containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades). ◆ DMM containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	$\boxed{20}$
High explosive (unused)	◆ DMM containing a high-explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	15
Propellant	◆ UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	15
Bulk secondary high explosives, pyrotechnics, or propellant	◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM that are bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ DMM containing a pyrotechnic filler (i.e., red phosphorus), other than white phosphorus filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ UXO that are practice munitions that are not associated with a sensitive fuze. ◆ DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ Used munitions or DMM that are categorized as small arms ammunition. (Physical evidence or historical evidence that no other types of munitions [e.g., grenades, subcaliber training rockets, demolition charges] were used or are present on the MRS is required for selection of this category.)	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	$\boxed{25}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

Four FM-smoke filled Livens projectiles were found in 1981 by NPS. In 1998 during the USACE-led EE/CA, UXO including one 3-inch and one 4.7-inch projectile, one full Livens projectile (containing FM smoke), and a potentially live Stokes mortar fuze were discovered, along with various munitions debris items (empty gas grenades, smoke dispensers, Stokes mortar fuzes, the base of a 4.7-in projectile, a nose fuze, empty Livens projectiles, and UXO-related frag) (Sections 1.4.2, 1.4.4, and 5.1.6 of the RI Report).

Table 2

EHE Module: Source of Hazard Data Element Table

DIRECTIONS: Below are 11 classifications describing sources of explosive hazards. Circle the scores that correspond with **all** the sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms *former range, practice munitions, small arms range, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Former range	◆ The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include impact or target areas and associated buffer and safety zones.	$\boxed{10}$
Former munitions treatment (i.e., OB/OD) unit	◆ The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.	8
Former practice munitions range	◆ The MRS is a former military range on which only practice munitions without sensitive fuzes were used.	6
Former maneuver area	◆ The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.	5
Former burial pit or other disposal area	◆ The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.	5
Former industrial operating facilities	◆ The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility.	4
Former firing points	◆ The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range.	4
Former missile or air defense artillery emplacements	◆ The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range.	2
Former storage or transfer points	◆ The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system).	$\boxed{2}$
Former small arms range	◆ The MRS is a former military range where only small arms ammunition was used. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.	0
SOURCE OF HAZARD	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 10).	$\boxed{\mathbf{10}}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Source of Hazard*** classifications in the space provided.

MRS 06 overlaps the Fort Hancock proving ground, which was the Army's first official proving ground for testing weapons and ordnance. The MRS also was the area of an ammunition storage depot, where a storage magazine exploded in 1927 (see Sections 1.3 and 1.4.2 of the RI Report).

Table 3

EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eight classifications of munitions locations and their descriptions. Circle the scores that correspond with **all** the locations where munitions are known or suspected to be present at the MRS.

Note: The terms *confirmed, surface, subsurface, small arms ammunition, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Confirmed surface	◆ Physical evidence indicates that there are UXO or DMM on the surface of the MRS. ◆ Historical evidence (i.e., a confirmed report such as an explosive ordnance disposal [EOD], police, or fire department report that an incident or accident that involved UXO or DMM occurred) indicates there are UXO or DMM on the surface of the MRS.	$\boxed{25}$
Confirmed subsurface, active	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS, and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM.	20
Confirmed subsurface, stable	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed.	15
Suspected (physical evidence)	◆ There is physical evidence (e.g., munitions debris such as fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.	$\boxed{10}$
Suspected (historical evidence)	◆ There is historical evidence indicating that UXO or DMM may be present at the MRS.	$\boxed{5}$
Subsurface, physical constraint	◆ There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.	2
Small arms (regardless of location)	◆ The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present at the MRS to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
LOCATION OF MUNITIONS	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 25).	**$\boxed{25}$**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of Munitions*** classifications in the space provided.

MEC and MD were found in the MRS during the 1999 EE/CA. UXO included a 3-inch and 4.7-inch projectile, one full Livens projectile (containing FM smoke), and a potentially live Stokes mortar fuze. Various MD indicative of MEC was also found historically by NPS (EE/CA Report, 1999; Sections 1.4.2 and 1.4.4 of the RI Report).

Table 4

EHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to the MRS. Circle the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the Primer.

Classification	Description	Score
No barrier	◆ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	10
Barrier to MRS access is incomplete	◆ There is a barrier preventing access to parts of the MRS, but not the entire MRS.	8
Barrier to MRS access is complete but not monitored	◆ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5
Barrier to MRS access is complete and monitored	◆ There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0
EASE OF ACCESS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	8

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classification in the space provided.

The MRS is open to the public, upon entry into the Sandy Hook Unit of Gateway National Recreation Area (a national park). Most of the MRS contains dense, brushy vegetation that prevents access to portions of the MRS (see Section 1.2, 2.1.1, and 2.1.7 of the RI Report).

Table 5

EHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

Classification	Description	Score
Non-DoD control	◆ The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies. ◆ The MRS is at a location that is owned by DoD, but that DoD has leased to another entity and for which DoD does not control access 24 hours per day.	$\boxed{5}$
Scheduled for transfer from DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the Protocol is applied.	3
DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year.	0
STATUS OF PROPERTY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classification in the space provided.

The MRS is located on the Sandy Hook Peninsula. This peninsula, which encompasses approximately 1,700 acres, is known as the Sandy Hook Unit of the Gateway National Recreation Area and is a National Historic Landmark. The location of the MRS is currently managed by the Department of the Interior (NPS) and is used for a variety of recreational purposes year-round (see Section 1.2 of the RI Report).

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications for population density and their descriptions. Determine the population density per square mile that most closely corresponds with the population of the MRS, including the area within a two-mile radius of the MRS's perimeter. Circle the most appropriate score.

Note: Use the U.S. Census Bureau tract data available to capture the **highest** population density within a two-mile radius of the perimeter of the MRS.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	$\boxed{5}$
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	3
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	1
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classification in the space provided.

The population density of Monmouth County, NJ is 1,344.7 persons per square mile (http://quickfacts.census.gov/qfd/states/34/34025.html)

Table 7

EHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the potential population near the MRS. Determine the number of inhabited structures within two miles of the MRS boundary and circle the score that corresponds with the number of inhabited structures.

Note: The term *inhabited structures* is defined in Appendix C of the Primer.

Classification	Description	Score
26 or more inhabited structures	◆ There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	5
16 to 25 inhabited structures	◆ There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4
11 to 15 inhabited structures	◆ There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3
6 to 10 inhabited structures	◆ There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2
1 to 5 inhabited structures	◆ There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1
0 inhabited structures	◆ There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classification in the space provided.

Inhabited structures include NPS buildings, residences, a school and daycare facility, and beach houses for use by recreational visitors (see Section 2.1.7 of the RI Report; Google Earth was used to calculate the total number of inhabited structures within the two-mile radius for this MRS).

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and circle the scores that correspond with **all** the activities/structure classifications at the MRS.

Note: The term *inhabited structure* is defined in Appendix C of the Primer.

Classification	Description	Score
Residential, educational, commercial, or subsistence	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	$\boxed{5}$
Parks and recreational areas	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	$\boxed{4}$
Agricultural, forestry	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	3
Industrial or warehousing	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2
No known or recurring activities	◆ There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{\mathbf{5}}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space provided.

Types of activities/structures within 2 miles of the MRS include NPS buildings, a school and daycare facility, and beach houses that are used by recreational visitors (see Section 2.1.7 of the RI Report).

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resources present on the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the Primer.

Classification	Description	Score
Ecological and cultural resources present	◆ There are both ecological and cultural resources present on the MRS.	$\boxed{5}$
Ecological resources present	◆ There are ecological resources present on the MRS.	3
Cultural resources present	◆ There are cultural resources present on the MRS.	3
No ecological or cultural resources present	◆ There are no ecological resources or cultural resources present on the MRS.	0
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classification in the space provided.

This MRS exhibits a diverse fauna that depend on a wide variety of habitats including forest, wetland, dune shrubland, dune grassland, and beach as well as intertidal marine habitats. Beach and dune flora is predominantly characterized by grasses, forbs and stunted shrubs. Inland flora is predominantly characterized by evergreen and mixed maritime forests, with deciduous forests (both maritime and non-maritime) on the western portion of the MRS. Based on previous archaeological investigations, Fort Hancock may include archaeological artifacts (features and locations that are associated with the former military use of Fort Hancock). The Fort Hancock and Sandy Hook Proving Ground Historic District (which includes all the Fort's structures), as well as the Sandy Hook Lighthouse, are National Historic Landmarks (see Sections 1.2 and 2.1.8 of the RI Report).

Table 10

Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.

2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.

3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.

4. Circle the appropriate range for the **EHE Module Total** below.

5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Munitions Type	Table 1	**25**	35
Source of Hazard	Table 2	**10**	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	**25**	38
Ease of Access	Table 4	**8**	
Status of Property	Table 5	**5**	
Receptor Factor Data Elements			
Population Density	Table 6	**5**	20
Population Near Hazard	Table 7	**5**	
Types of Activities/Structures	Table 8	**5**	
Ecological and /or Cultural Resources	Table 9	**5**	
EHE MODULE TOTAL			**93**

EHE Module Total	EHE Module Rating
92 to 100	**A**
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	**A**

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the scores that correspond with **all** the CWM configurations known or suspected to be present at the MRS.

Note: The terms *CWM/UXO, CWM/DMM, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, that are either UXO, or explosively configured damaged DMM	The CWM known or suspected of being present at the MRS are: • CWM that are UXO (i.e., CWM/UXO) • Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	• The CWM known or suspected of being present at the MRS are undamaged CWM/DMM or CWM not configured as a munition that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	• The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM/DMM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS are: • Nonexplosively configured CWM/DMM either damaged or undamaged • Bulk CWM (e.g., ton container).	15
CAIS K941 and CAIS K942	• The CWM/DMM known or suspected of being present at the MRS are CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	• CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	• Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	$\boxed{0}$
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	$\boxed{0}$

DIRECTIONS: Document any MRS-specific data used in selecting the *CWM Configuration* classifications in the space provided.

Both physical and historical evidence indicates that CWM was not present at this MRS (see Sections 1.2.1 and 1.4.2 of the RI Report).

Tables 12 through 19 are intentionally omitted
Per Active Army Guidance (U.S. Army, 2009)

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.

2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.

3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.

4. Circle the appropriate range for the **CHE Module Total** below.

5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		0
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		0
Population Near Hazard	Table 17		
Types of Activities/Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			**0**

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	**No Known or Suspected CWM Hazard**

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's groundwater and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional groundwater contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	*CHF Value*	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	
	No Known or Suspected Groundwater MC Hazard	☑

Groundwater samples did not contain any MC above background concentrations (Secs 4.2.3 and 5.3.3, RI Report)

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with human endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
NA			
CHF Scale	*CHF Value*	**Sum The Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no surface water samples were collected in this MRS (Section 4.2.2, RI Report).

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ❑

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
NA			
CHF Scale	*CHF Value*	**Sum The Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no sediment samples were collected in this MRS (Section 4.2.2, RI Report).

No Known or Suspected Sediment (Human Endpoint) MC Hazard ❑

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
NA			
CHF Scale	*CHF Value*	**Sum the Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no surface water samples were collected in this MRS(Section 4.2.2, RI Report) .

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ❑

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
NA			
CHF Scale	*CHF Value*	**Sum the Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no sediment samples were collected in this MRS(Section 4.2.2, RI Report) .

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ❑

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: ***Record the*** *maximum concentrations* ***of all contaminants in the MRS's surface soil and their*** *comparison values* ***(from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the*** *ratios* ***for each contaminant by dividing the*** *maximum concentration* ***by the*** *comparison value****. Determine the*** *CHF* ***by adding the contaminant*** *ratios* ***together, including any additional surface soil contaminants recorded on Table 27. Based on the*** *CHF****, use the*** *CHF Scale* ***to determine and record the*** *CHF Value****. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.***

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratio
CHF Scale	*CHF Value*	**Sum the Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Five grab samples were collected during the SI and 21 grab samples were collected during the RI; no explosives were detected and all metals were determined to be consistent with background concentrations (sections 5.3.1.2, 6.1.1, and 6.2.3.5, RI Report). Therefore, no soil results are reported above.

No Known or Suspected Surface Soil MC Hazard ☑

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Only use this table if there are more than five contaminants in any given medium present at the MRS. **This is a supplemental table designed to hold information about contaminants that do no fit in the previous tables. Indicate the** media **in which these contaminants are present. Then record all** contaminants**, their** maximum concentrations **and their** comparison values **(from Appendix B of the Primer) in the table below. Calculate and record the** ratio **for each contaminant by dividing the** maximum concentration **by the** comparison value**. Determine the** CHF **for each medium on the appropriate media-specific tables.**

Note: **Do no add ratios from different media.**

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard**, **Migration Pathway**, and **Receptor Factors** for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the **HHE Ratings** provided below, determine each media's rating (A–G) and record the letter in the corresponding **Media Rating** box below.

Media (Source)	**Contaminant Hazard Factor Value**	**Migratory Pathway Factor Value**	**Receptor Factor Value**		*Three-Letter Combination (Hs-Ms-Ls)*		*Media Rating (A-G)*
Groundwater (Table 21)							No Known or Suspected Hazard
Surface Water/Human Endpoint (Table 22)							
Sediment/Human Endpoint (Table 23)							
Surface Water/Ecological Endpoint (Table 24)							
Sediment/Ecological Endpoint (Table 25)							
Surface Soil (Table 26)							No Known or Suspected Hazard

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the **HHE Module Rating** box.

Note:

An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE MODULE RATING	

HHE Ratings (for reference only)

Combination	**Rating**
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G

Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Table 29

MRS Priority

DIRECTIONS: ***In the chart below, circle the letter*** *rating* ***for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical*** *priority* ***for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS Priority is the single highest priority; record this relative priority in the*** *MRS Priority or Alternative MRS Rating* ***at the bottom of the table.***

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	**2**	B	2	A	2
B	3	C	3	B	3
C	4	D	4	C	4
D	5	E	5	D	5
		F	6	E	6
F	7	G	7	F	7
G	8				
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		**No Known or Suspected CWM Hazard**		**No Known or Suspected MC Hazard**	
MRS PRIORITY or ALTERNATIVE MRS RATING				**2**	

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the **MRS Summary**, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Munitions Response Site Name: Remaining Land
Component: U.S. Army Corps of Engineers Formerly Used Defense Site (FUDS) Program
Installation/Property Name: (NJ29799F692400) FORT HANCOCK
Location (City, County, State): Highlands, Monmouth County, New Jersey
Site Name/Project Name (Project No.): C02NJ000407R01 Remaining Land

Date Information Entered/Updated: 03/10/2016
Point of Contact (Name/Phone): Public Affairs – (917) 790-8007
Project Phase (check only one):

☐ PA	☐ SI	☑ RI	☐ FS	☐ RD
☐ RA-C	☐ RI	☐ RA-O	☐RC	☐ LTM

Media Evaluated (check all that apply):

☑ Groundwater	☑ Sediment (human receptor)
☑ Surface soil	☑ Surface Water (ecological receptor)
☑ Sediment (ecological receptor)	☑ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM, or MC known or suspected to be present. When possible, identify munitions, CWM, and MC by type:

Project/MRS 07 is approx. 952 acres and encompasses the majority of the eastern side of the Sandy Hook peninsula (those areas outside of MRSs 03, 05, 06 and 08). The southern portion of the MRS was used from 1874 to 1918 as part of the Army's first proving ground used for testing weapons and ordnance. The northern portion was used for coastal defense; multiple firing batteries were placed, which faced the Atlantic Ocean. Although no MEC or MD was found on those portions investigated during the RI, munitions items historically wash up on the beaches after significant storm events, and there is a risk to users of the Gateway National Recreation Area including fishermen, beachgoers, and hikers. Munitions items that have washed up on the Atlantic beaches since 2010 include: 3.5-inch, 6-inch, and 8-inch projectiles, Marine flare, Mk-25 Marine Marker, and 5-inch AP projectile. These items were identified as live and blown in place by military Explosives Ordnance Disposal (EOD) units. In addition, ongoing erosion and shifting sand dunes in this dynamic environment could expose potential subsurface MEC in the portions of the MRS that were not investigated during the RI (i.e., the northern portions). Potential munitions include any UXO that was fired both in the proving ground as well as at off-shore targets in the Atlantic Ocean and may wash ashore during storm events. The MRS also includes the 4.8 acres of the Livens Discovery Area that was investigated during the RI and not included in MRS 06 (Secs 1.2 and 1.3, RI Report; Secs 6.1, Sec 6.2, RI Addendum #1, and EOD).

Sediment and surface water samples were collected from three locations in the Nike pond during the RI. No explosives were detected in the surface water samples, but several MC metals were detected above background concentrations. 2,6-Dinitrotoluene was detected in sediment, along with several metals above background. Surface soil samples were collected in the MRS during the 2007 SI, and seven incremental soil samples were collected after MEC items found during the RI were blown in place (Sec 4.2, RI Report). No explosives compounds were detected in surface soil samples, and metals were found to be at or below background concentrations (Secs 6.2.3.1-5, RI Report). Five groundwater samples collected during the RI were used to represent conditions across all MRSs. No explosives were detected, and no metals were detected above background concentrations (Secs 4.2.3 and 5.3.3, RI Report). Because the human health and ecological risk assessments determined that no unacceptable risk is posed by surface water or sediment (Sections 6.2.3.3 and 6.2.3.8, RI Report), the HHE module has been assigned the rating of No Known or Suspected Hazard.

Both physical and historical evidence indicates that CWM was not present at this MRS (Secs 1.2.1 and 1.4.2, RI Report). Therefore, the CHE module has been assigned the alternative rating of No Known or Suspected CWM Hazard.

Stakeholder coordination of the MRSPP evaluation occurred through review of the RI Addendum #1. Documentation of stakeholder coordination can be found on FRMD at C02NJ000403_xx.xx_xxxx.

Throughout the MRSPP:

- "RI Report" refers to the "Final MMRP Remedial Investigation Report, Remedial Investigation/Feasibility Study, Fort Hancock Formerly Used Defense Site, Monmouth County, New Jersey," dated January 2014, on FRMD at C03NJ000403_03.10_0500 and _0501.
- "RI Addendum #1" refers to the "Final Military Munitions Response Program, Remedial Investigation Addendum #1 Report," dated XX, 2016, located on FRMD at C03NJ000403_03.XX.
- "EOD, 2015" refers to an e-mail from EOD, Naval Weapons Station Earle, to USACE listing items found at Sandy Hook in 2010, 2011, and 2013, dated October 29, 2015 and located on FRMD at C03NJ000407_01.01_0500.

Description of Pathways for Human and Ecological Receptors:

The potential exposure media and associated exposure pathways for human receptors are: Soil: direct contact with surface soil (ingestion, dermal contact); inhalation via the soil-to-air pathway; Groundwater: direct contact (ingestion, dermal contact). The potential exposure pathways for ecological receptors are: Soil: Direct contact; and Bioaccumulation into plants, soil invertebrates, and small mammals, and consumption of these food items.

Potential for contact with MEC includes walking over surface MEC, handling/collecting MEC, or contact with subsurface MEC due to any intrusive activities (Sections 6.2.1 and 6.3.1, RI Report).

Description of Receptors (Human and Ecological):

Based on the current land use, the following human receptors were identified: Outdoor maintenance worker (represents a National Park Service [NPS] ranger who spends the majority of his/her time patrolling the area on foot); Adult and child recreational user (represent members of the public who partake in recreational activities at Fort Hancock); and NPS Archaeologist. Ecological receptors include three potentially-affected terrestrial avian communities (granivores, insectivores, and carnivores) are represented by the mourning dove (granivore), American woodcock (insectivore), red-tailed hawk (carnivore) and the great blue heron (piscivore). For terrestrial mammals, the representative species will be the meadow vole (herbivore), short-tailed shrew (insectivore), and red fox (carnivore) (Sections 6.2.1.2 and 6.3.1, RI Report).

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the scores that correspond with **all** the munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms ammunition, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ UXO that are considered most likely to function upon any interaction with exposed persons (e.g., submunitions, 40mm high-explosive [HE] grenades, white phosphorus [WP] munitions, high-explosive antitank [HEAT] munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions). ◆ Hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard.	30
High explosive (used or damaged)	◆ UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	25
Pyrotechnic (used or damaged)	◆ UXO containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades). ◆ DMM containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	20
High explosive (unused)	◆ DMM containing a high-explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	15
Propellant	◆ UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	15
Bulk secondary high explosives, pyrotechnics, or propellant	◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM that are bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ DMM containing a pyrotechnic filler (i.e., red phosphorus), other than white phosphorus filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ UXO that are practice munitions that are not associated with a sensitive fuze. ◆ DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ Used munitions or DMM that are categorized as small arms ammunition. (Physical evidence or historical evidence that no other types of munitions [e.g., grenades, subcaliber training rockets, demolition charges] were used or are present on the MRS is required for selection of this category.)	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	**25**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

MEC found in MRS 07 includes the following UXO that were identified as HE items: 3.5-inch, 6-inch, and 8-inch projectiles, Marine flare, Mk-25 Marine Marker, and 5-inch AP projectile. These items were found between 2010 and 2013 and responded to by EOD units out of Naval Weapons Station Earle. The items were identified as live and blown in place by EOD (EOD, 2015).

Table 2

EHE Module: Source of Hazard Data Element Table

DIRECTIONS: Below are 11 classifications describing sources of explosive hazards. Circle the scores that correspond with **all** the sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms *former range, practice munitions, small arms range, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Former range	• The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include impact or target areas and associated buffer and safety zones.	$\boxed{10}$
Former munitions treatment (i.e., OB/OD) unit	• The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.	8
Former practice munitions range	• The MRS is a former military range on which only practice munitions without sensitive fuzes were used.	6
Former maneuver area	• The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.	5
Former burial pit or other disposal area	• The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.	5
Former industrial operating facilities	• The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility.	4
Former firing points	• The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range.	4
Former missile or air defense artillery emplacements	• The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range.	2
Former storage or transfer points	• The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system).	2
Former small arms range	• The MRS is a former military range where only small arms ammunition was used. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present to place an MRS into this category.)	1
Evidence of no munitions	• Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.	0
SOURCE OF HAZARD	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 10).	$\boxed{\textbf{10}}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Source of Hazard*** classifications in the space provided.

MRS 07 is a former proving ground and firing range complex, with gun batteries that fired at off-shore targets. The southern portion encompasses a part of the former proving ground; the northern portion encompasses the land portion of the range fans associated with the batteries that fired east, including the 9-Gun Battery (Sec 1.3, RI Report and Sec 6.2, RI Addendum #1).

Table 3

EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eight classifications of munitions locations and their descriptions. Circle the scores that correspond with **all** the locations where munitions are known or suspected to be present at the MRS.

Note: The terms *confirmed, surface, subsurface, small arms ammunition, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Confirmed surface	◆ Physical evidence indicates that there are UXO or DMM on the surface of the MRS. ◆ Historical evidence (i.e., a confirmed report such as an explosive ordnance disposal [EOD], police, or fire department report that an incident or accident that involved UXO or DMM occurred) indicates there are UXO or DMM on the surface of the MRS.	25
Confirmed subsurface, active	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS, and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM.	$\boxed{20}$
Confirmed subsurface, stable	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed.	15
Suspected (physical evidence)	◆ There is physical evidence (e.g., munitions debris such as fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.	10
Suspected (historical evidence)	◆ There is historical evidence indicating that UXO or DMM may be present at the MRS.	5
Subsurface, physical constraint	◆ There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.	2
Small arms (regardless of location)	◆ The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present at the MRS to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
LOCATION OF MUNITIONS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 25).	**20**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of Munitions*** classifications in the space provided.

Historical evidence (confirmed reports by EOD) indicate that UXO or DMM exist in the subsurface and conditions at the MRS are likely to cause items to be exposed, as evidenced by the discovery of UXO or DMM on the beaches of the Gateway National Recreation Area (Sandy Hook) after significant storm events (EOD, 2015).

Table 4

EHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to the MRS. Circle the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the Primer.

Classification	Description	Score
No barrier	◆ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	$\boxed{10}$
Barrier to MRS access is incomplete	◆ There is a barrier preventing access to parts of the MRS, but not the entire MRS.	8
Barrier to MRS access is complete but not monitored	◆ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5
Barrier to MRS access is complete and monitored	◆ There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0
EASE OF ACCESS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	$\boxed{\textbf{10}}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classification in the space provided.

The MRS is open to the public, as it is located in a national park known as the Sandy Hook Unit of Gateway National Recreation Area (Sec 1.2, RI Report).

Table 5

EHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

Classification	Description	Score
Non-DoD control	◆ The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies. ◆ The MRS is at a location that is owned by DoD, but that DoD has leased to another entity and for which DoD does not control access 24 hours per day.	5
Scheduled for transfer from DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the Protocol is applied.	3
DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year.	0
STATUS OF PROPERTY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classification in the space provided.

The MRS is located on the Sandy Hook Peninsula. This peninsula, which encompasses approximately 1,700 acres, is known as the Sandy Hook Unit of the Gateway National Recreation Area and is a National Historic Landmark. The location of the MRS is currently managed by the Department of the Interior (NPS) and is used for a variety of recreational purposes year-round (see Section 1.2 of the RI Report).

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications for population density and their descriptions. Determine the population density per square mile that most closely corresponds with the population of the MRS, including the area within a two-mile radius of the MRS's perimeter. Circle the most appropriate score.

Note: Use the U.S. Census Bureau tract data available to capture the **highest** population density within a two-mile radius of the perimeter of the MRS.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	$\boxed{5}$
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	3
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	1
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classification in the space provided.

The population density of Monmouth County, NJ is 1,344.7 persons per square mile (http://quickfacts.census.gov/qfd/states/34/34025.html)

Table 7

EHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the potential population near the MRS. Determine the number of inhabited structures within two miles of the MRS boundary and circle the score that corresponds with the number of inhabited structures.

Note: The term *inhabited structures* is defined in Appendix C of the Primer.

Classification	Description	Score
26 or more inhabited structures	◆ There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	$\boxed{5}$
16 to 25 inhabited structures	◆ There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4
11 to 15 inhabited structures	◆ There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3
6 to 10 inhabited structures	◆ There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2
1 to 5 inhabited structures	◆ There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1
0 inhabited structures	◆ There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classification in the space provided.

Inhabited structures include NPS buildings, residences, a school and daycare facility, and beach houses for use by recreational visitors (see Section 2.1.7 of the RI Report; Google Earth was used to calculate the total number of inhabited structures within the two-mile radius for this MRS).

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and circle the scores that correspond with **all** the activities/structure classifications at the MRS.

Note: The term *inhabited structure* is defined in Appendix C of the Primer.

Classification	Description	Score
Residential, educational, commercial, or subsistence	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	$\boxed{5}$
Parks and recreational areas	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	$\boxed{4}$
Agricultural, forestry	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	3
Industrial or warehousing	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2
No known or recurring activities	◆ There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{\mathbf{5}}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space provided.

Types of activities/structures within 2 miles include NPS buildings, a school and daycare facility, and beach houses for use by recreational visitors (see Section 2.1.7 of the RI Report).

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resources present on the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the Primer.

Classification	Description	Score
Ecological and cultural resources present	◆ There are both ecological and cultural resources present on the MRS.	$\boxed{5}$
Ecological resources present	◆ There are ecological resources present on the MRS.	3
Cultural resources present	◆ There are cultural resources present on the MRS.	3
No ecological or cultural resources present	◆ There are no ecological resources or cultural resources present on the MRS.	0
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classification in the space provided.

This MRS exhibits a diverse fauna that depend on a wide variety of habitats including forest, wetland, dune shrubland, dune grassland, and beach as well as intertidal marine habitats. Beach and dune flora is predominantly characterized by grasses, forbs and stunted shrubs. Inland flora is predominantly characterized by evergreen and mixed maritime forests, with deciduous forests (both maritime and non-maritime) on the western portion of the MRS. Based on previous archaeological investigations, the MRS may contain archaeological artifacts (features and locations that are associated with the former military use of Fort Hancock) (see Sections 1.2 and 2.1.8 of the RI Report).

Table 10

Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. Circle the appropriate range for the **EHE Module Total** below.
5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Munitions Type	Table 1	**25**	35
Source of Hazard	Table 2	**10**	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	**20**	35
Ease of Access	Table 4	**10**	
Status of Property	Table 5	**5**	
Receptor Factor Data Elements			
Population Density	Table 6	**5**	20
Population Near Hazard	Table 7	**5**	
Types of Activities/Structures	Table 8	**5**	
Ecological and /or Cultural Resources	Table 9	**5**	
EHE MODULE TOTAL			**80**

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	**B**
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	**B**

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the scores that correspond with **all** the CWM configurations known or suspected to be present at the MRS.

Note: The terms *CWM/UXO, CWM/DMM, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, that are either UXO, or explosively configured damaged DMM	The CWM known or suspected of being present at the MRS are: ◆ CWM that are UXO (i.e., CWM/UXO) ◆ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	◆ The CWM known or suspected of being present at the MRS are undamaged CWM/DMM or CWM not configured as a munition that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM/DMM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS are: ◆ Nonexplosively configured CWM/DMM either damaged or undamaged ◆ Bulk CWM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS are CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	0
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	0

DIRECTIONS: Document any MRS-specific data used in selecting the *CWM Configuration* classifications in the space provided.

Both physical and historical evidence indicates that CWM was not present at this MRS (see Sections 1.2.1 and 1.4.2 of the RI Report).

Tables 12 through 19 are intentionally omitted

Per Active Army Guidance (U.S. Army, 2009)

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.

2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.

3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.

4. Circle the appropriate range for the **CHE Module Total** below.

5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		0
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		0
Population Near Hazard	Table 17		
Types of Activities/Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
		CHE MODULE TOTAL	**0**

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	**No Known or Suspected CWM Hazard**

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's groundwater and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional groundwater contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	*CHF Value*	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	
	No Known or Suspected Groundwater MC Hazard	☑

Groundwater samples did not contain any MC above background (Secs 4.2.3 and 5.3.3, RI Report)

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with human endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
Antimony	0.61	6	.10
Arsenic	2.8	4.5	.62
Copper	18	620	0.03
Iron	777	11000	0.07
Lead	6.6	15	.44
Manganese	37.3	320	.12
Thallium	1.3	0.16	8.125
CHF Scale	*CHF Value*	**Sum The Ratios**	9.505
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**	*CHF =* $\sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**M**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ❑

Surface water sample results are summarized in Tables 2.12 of Appendix G-1, RI Report.

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
2,6-Dinitrotoluene	0.16	18	0.009
Antimony	2.2	31	0.071
Arsenic	7.7	34	0.226
Chromium	34.6	1600	0.022
Copper	41.2	3100	0.013
Iron	14,600	55,000	0.265
Lead	286	400	0.715
CHF Scale	*CHF Value*	**Sum The Ratios**	2.167
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right maximum value = H).	**M**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	$\boxed{\text{M}}$
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	$\boxed{\text{M}}$
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Sediment (Human Endpoint) MC Hazard ❑

Sediment sample results are summarized in Table 2.11 of Appendix G-1, RI Report.

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios
Antimony	0.61	30	0.02
Arsenic	2.8	150	0.02
Copper	18	9.0	2
Iron	777	1,000	.777
Lead	6.6	2.5	2.64
Manganese	37.3	120	.311
Thallium	1.3	0.8	1.625
CHF Scale	*CHF Value*	**Sum the Ratios**	7.393
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	**M**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ❑

Surface water sample results are summarized in Tables 2.12 of Appendix G-1, RI Report.

Table 25
HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: *Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the sediment, select the box at the bottom of the table.*

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
2,6-dintrotoluene	0.16	0.039	4.1
Antimony	2.2	2	1.1
Arsenic	7.7	9.8	0.78
Chromium	34.6	43.4	0.79
Copper	41.2	31.6	1.3
Iron	14,600	20,000	
Lead	286	35.8	7.9
Mercury	0.34	0.18	1.9
Selenium	2.5	2	1.25
CHF Scale	*CHF Value*	**Sum the Ratios**	19.83
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	**M**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ☐

Sediment sample results are summarized in Table 2.11 of Appendix G-1, RI Report.

Table 26
HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value.** Determine the **CHF** by adding the contaminant **ratios** together, including any additional surface soil contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record **CHF Value**. If there is no known or suspected MC hazard with present in the surface soil, select the box at the bottom of the table.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
CHF Scale	**CHF Value**	**Sum the Ratios**	
CHF > 100	**H (High)**	CHF = $\sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	**H**
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e. tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	**M**
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to the presence of geological structures or physical controls.)	**L**
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	**H**
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	**M**
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	**L**
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Soil MC Hazard ☒

No explosives compounds were detected in surface soil samples, and metals were found to be at or below background concentrations (Secs 6.2.3.1-5, RI Report).

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Only use this table if there are more than five contaminants in any given medium present at the MRS. **This is a supplemental table designed to hold information about contaminants that do no fit in the previous tables. Indicate the** media **in which these contaminants are present. Then record all** contaminants**, their** maximum concentrations **and their** comparison values **(from Appendix B of the Primer) in the table below. Calculate and record the** ratio **for each contaminant by dividing the** maximum concentration **by the** comparison value**. Determine the** CHF **for each medium on the appropriate media-specific tables.**

Note: **Do not add ratios from different media.**

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio
Sediment/Human	Mercury	0.34 mg/kg	23 mg/kg	0.015
Sediment/Human	Selenium	2.5 mg/kg	390 mg/kg	0.006
Sediment/Human	Thallium	0.54 mg/kg	0.78 mg/kg	0.692
Sediment/Human	Vanadium	51.7 mg/kg	390 mg/kg	0.133

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard, Migration Pathway,** and **Receptor Factors** for the media (from Tables 21-26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the **HHE Ratings** provided below, determine each media's rating (A-G) and record the letter in the corresponding **Media Rating** box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value	Three-Letter Combination (Hs-Ms-Ls)	Media Rating (A-G)
Groundwater (Table 21)					No Known or Suspected Hazard
Surface Water/Human Endpoint (Table 22)	M	M	M	MMM	D
Sediment/ Human Endpoint (Table 23)	M	M	M	MMM	D
Surface Water/Ecological Endpoint (Table 24)	M	M	M	MMM	D
Sediment/Ecological Endpoint (Table 25)	M	M	M	MMM	D
Surface Soil (Table 26)					No Known or Suspected Hazard

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is the highest; G is the lowest) and enter the letter in the **HHE Module Rating** box.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE MODULE RATING	**D**

HHE Ratings (for reference only)

Combination	Rating
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Table 29

MRS Priority

DIRECTIONS: In the chart below, circle the letter rating for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical priority for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS Priority is the single highest priority; record this relative priority in the MRS Priority or Alternative MRS Rating at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	B	2	A	2
B	**3**	C	3	B	3
C	4	D	4	C	4
D	5	E	5	D	5
E	6	F	6	E	6
F	7	G	7	F	7
G	8			G	8
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		**No Known or Suspected CWM Hazard**		**No Known or Suspected MC Hazard**	
MRS PRIORITY or ALTERNATIVE MRS RATING				**3**	

MRS 08

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the **MRS Summary**, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Munitions Response Site Name: NPS Excluded Area
Component: U.S. Army Corps of Engineers, Formerly Used Defense Site (FUDS) Program
Installation/Property Name: (NJ29799F69240) FORT HANCOCK
Location (City, County, State): Highlands, Monmouth County, New Jersey
Site Name/Project Name (Project No.): **C02NJ000408R01 NPS Excluded Area**

Date Information Entered/Updated: 01/30/2014
Point of Contact (Name/Phone): Public Affairs – (917) 790-8007
Project Phase (check only one):

❑ PA	❑ SI	☑ RI	❑ FS	❑ RD
❑ RA-C	❑ RI	❑ RA-O	❑RC	❑ LTM

Media Evaluated (check all that apply):

☑ Groundwater	❑ Sediment (human receptor)
❑Surface soil	❑ Surface Water (ecological receptor)
❑ Sediment (ecological receptor)	❑ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM, or MC known or suspected to be present. When possible, identify munitions, CWM, and MC by type:

The Fort Hancock NPS Excluded Area was used by the U.S. Army from 1874 to 1918 for testing weapons and ordnance; it consists of 140 acres encompassing portions of the six MRS's described in the RI covering the former proving ground: southwest corner of MRS-1; western edges of MRS-2 and MRS-6; small northwest and southwest corners of MRS-3; western one-third of MRS-4; and western two-thirds of MRS-5. The National Park Service restricted access to these areas during the 2014 RI because of concerns about impacts to sensitive plant communities (i.e., maritime forest). Based on the geophysical investigation in other areas of the former proving ground (Projects 03 and 05), potential MEC exists in the MRS: 75 mm projectiles, MK 1, 1-lb, 1.44-inch projectiles, 3.5-inch armor piercing high explosive (AP HE) projectiles, 5-inch AP HE projectiles, 3-inch stokes mortars, and 75 mm shrapnel rounds (Secs 5.1.2-5.1.5, RI Report).

Five groundwater samples collected during the RI were used to represent conditions across all MRSs. No explosives were detected; metals detected are not attributable to the FUDS because they reflect background conditions (Secs 4.2.3 and 5.3.3, RI Report). Because access was restricted, no surface soil, surface water, or sediment samples were collected during the RI (Secs 6.1.1 and 6.1.3, RI Report) and the HHE module has been assigned the alternative rating of Evaluation Pending.

Both physical and historical evidence indicates that CWM was not present at this MRS (Secs 1.2.1 and 1.4.2, RI Report). Therefore, the CHE module has been assigned the alternative rating of No Known or Suspected CWM Hazard.

Stakeholder coordination of the MRSPP evaluation occurred through the technical project planning process for the RI. Documentation of stakeholder coordination can be found in FRMD at C02NJ000403_ 01.22_0500.
.
Throughout the MRSPP, the reference to the "RI Report" refers to the "Final MMRP Remedial Investigation Report, Remedial Investigation/Feasibility Study, Fort Hancock Formerly Used Defense Site, Monmouth County, New Jersey," dated January 2014, found on FRMD at C02NJ000403.10_500 and _501.

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the **MRS Summary**, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Description of Pathways for Human and Ecological Receptors: The potential exposure media and associated exposure pathways for human receptors are: Soil: direct contact with surface soil (ingestion, dermal contact); inhalation via the soil-to-air pathway; Sediment: direct contact (ingestion, dermal contact); Surface water: direct contact (ingestion, dermal contact); and Groundwater: direct contact (ingestion, dermal contact). The potential exposure pathways for ecological receptors are: Soil: Direct contact; and Bioaccumulation into plants, soil invertebrates, and small mammals, and consumption of these food items (Sections 6.2.1 and 6.3.1, RI Report).

Description of Receptors (Human and Ecological): Based on the current land use, the following human receptors were identified: (1) Outdoor maintenance worker (represents a National Park Service [NPS] ranger who spends the majority of his/her time patrolling the area on foot); (2) Adult and child recreational user (represent members of the public who partake in recreational activities at Fort Hancock); and (3) NPS Archaeologist. Ecological receptors include three potentially-affected terrestrial avian communities (granivores, insectivores, and carnivores) are represented by the mourning dove (granivore), American woodcock (insectivore), red-tailed hawk (carnivore) and the great blue heron (piscivore). For terrestrial mammals, the representative species will be the meadow vole (herbivore), short-tailed shrew (insectivore), and red fox (carnivore)(see Sections 6.2.1.2 and 6.3.1 RI Report).

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the scores that correspond with **all** the munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms ammunition, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ UXO that are considered most likely to function upon any interaction with exposed persons (e.g., submunitions, 40mm high-explosive [HE] grenades, white phosphorus [WP] munitions, high-explosive antitank [HEAT] munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions). ◆ Hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard.	30
High explosive (used or damaged)	◆ UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	$\boxed{25}$
Pyrotechnic (used or damaged)	◆ UXO containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades). ◆ DMM containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	20
High explosive (unused)	◆ DMM containing a high-explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	15
Propellant	◆ UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	15
Bulk secondary high explosives, pyrotechnics, or propellant	◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM that are bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ DMM containing a pyrotechnic filler (i.e., red phosphorus), other than white phosphorus filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ UXO that are practice munitions that are not associated with a sensitive fuze. ◆ DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ Used munitions or DMM that are categorized as small arms ammunition. (Physical evidence or historical evidence that no other types of munitions [e.g., grenades, subcaliber training rockets, demolition charges] were used or are present on the MRS is required for selection of this category.)	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 30).	$\boxed{25}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

MEC items suspected in the MRS are based on MEC found in MRS 03 and 05 during the RI, including a 5 inch, APHE round with a base fuze, a 75 mm shrapnel round, a 3 inch Stokes mortar,and a 4.5 inch, Mark V British APHE round with a base fuze, (Sections 5.1.2, 5.1.4, and 5.1.5 and Appendix C-2 of RI Report) and a 3.5 inch APHE with base fuze, 1 lb Mk1, and 75 mm with fuze (Section 5.1.1 and Appendix C-2, RI Report; photos of MEC items in Appendix C-4).

Table 2

EHE Module: Source of Hazard Data Element Table

DIRECTIONS: Below are 11 classifications describing sources of explosive hazards. Circle the scores that correspond with **all** the sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms *former range, practice munitions, small arms range, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Former range	◆ The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include impact or target areas and associated buffer and safety zones.	$\boxed{10}$
Former munitions treatment (i.e., OB/OD) unit	◆ The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.	8
Former practice munitions range	◆ The MRS is a former military range on which only practice munitions without sensitive fuzes were used.	6
Former maneuver area	◆ The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.	5
Former burial pit or other disposal area	◆ The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.	5
Former industrial operating facilities	◆ The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility.	4
Former firing points	◆ The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range.	4
Former missile or air defense artillery emplacements	◆ The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range.	2
Former storage or transfer points	◆ The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system).	2
Former small arms range	◆ The MRS is a former military range where only small arms ammunition was used. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.	0
SOURCE OF HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	$\boxed{10}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Source of Hazard*** classifications in the space provided. MRS 08 was part of the United States Army's first official proving ground for testing weapons and ordnance. Firing points and targets are as identified in the Ordnance History-Fort Hancock (1874-1919) (see Sections 1.2.2 and 1.3 of the RI Report).

Table 3

EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eigmuht classifications of munitions locations and their descriptions. Circle the scores that correspond with **all** the locations where munitions are known or suspected to be present at the MRS.

Note: The terms *confirmed, surface, subsurface, small arms ammunition, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Confirmed surface	◆ Physical evidence indicates that there are UXO or DMM on the surface of the MRS. ◆ Historical evidence (i.e., a confirmed report such as an explosive ordnance disposal [EOD], police, or fire department report that an incident or accident that involved UXO or DMM occurred) indicates there are UXO or DMM on the surface of the MRS.	25
Confirmed subsurface, active	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS, and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM.	20
Confirmed subsurface, stable	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed.	15
Suspected (physical evidence)	◆ There is physical evidence (e.g., munitions debris such as fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.	
Suspected (historical evidence)	◆ There is historical evidence indicating that UXO or DMM may be present at the MRS.	$\boxed{5}$
Subsurface, physical constraint	◆ There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.	2
Small arms (regardless of location)	◆ The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present at the MRS to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
LOCATION OF MUNITIONS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 25).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of Munitions*** classifications in the space provided.

No MEC or MD has been documented on the MRS during previous government investigations. It is suspected based on based on MEC finds in nearby areas of the former proving ground including a 5 inch, APHE round with a base fuze, a 75 mm shrapnel round, a 3 inch Stokes mortar,and a 4.5 inch, Mark V British APHE round with a base fuze, (Sections 5.1.2, 5.1.4, and 5.1.5 and Appendix C-2 of RI Report) and a 3.5 inch APHE with base fuze, 1 lb Mk1, and 75 mm with fuze (Section 5.1.1 and Appendix C-2 of RI Report). In addition, 25 pieces of both intact and scrap/frag MD were found in the subsurface of nearby areas (Section 5.1 and Appendix C-2 of RI Report).

Table 4

EHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to the MRS. Circle the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the Primer.

Classification	Description	Score
No barrier	◆ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	10
Barrier to MRS access is incomplete	◆ There is a barrier preventing access to parts of the MRS, but not the entire MRS.	$\boxed{8}$
Barrier to MRS access is complete but not monitored	◆ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5
Barrier to MRS access is complete and monitored	◆ There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0
EASE OF ACCESS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	**8**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classification in the space provided.

The MRS is open to the public, upon entry into the Sandy Hook Unit of Gateway National Recreation Area (a national park). There is a significant amount of dense, brushy vegetation in portions of the MRS (see Section 1.2, 2.1.1, and 2.1.7 of the RI Report).

Table 5

EHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

Classification	Description	Score
Non-DoD control	◆ The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies. ◆ The MRS is at a location that is owned by DoD, but that DoD has leased to another entity and for which DoD does not control access 24 hours per day.	$\boxed{5}$
Scheduled for transfer from DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the Protocol is applied.	3
DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year.	0
STATUS OF PROPERTY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classification in the space provided.

The MRS is located on the Sandy Hook Peninsula of New Jersey. This peninsula, which encompasses approximately 1,700 acres, is known as the Sandy Hook Unit of the Gateway National Recreation Area and is a National Historic Landmark. The location of the MRS is currently managed by the Department of the Interior (NPS) and is used for a variety of recreational purposes year-round (see Section 1.2 of the RI Report).

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications for population density and their descriptions. Determine the population density per square mile that most closely corresponds with the population of the MRS, including the area within a two-mile radius of the MRS's perimeter. Circle the most appropriate score.

Note: Use the U.S. Census Bureau tract data available to capture the **highest** population density within a two-mile radius of the perimeter of the MRS.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	$\boxed{5}$
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	3
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	1
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classification in the space provided.

The population density of Monmouth County, NJ is 1,344.7 persons per square mile (http://quickfacts.census.gov/qfd/states/34/34025.html)

Table 7

EHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the potential population near the MRS. Determine the number of inhabited structures within two miles of the MRS boundary and circle the score that corresponds with the number of inhabited structures.

Note: The term *inhabited structures* is defined in Appendix C of the Primer.

Classification	Description	Score
26 or more inhabited structures	• There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	$\boxed{5}$
16 to 25 inhabited structures	• There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4
11 to 15 inhabited structures	• There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3
6 to 10 inhabited structures	• There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2
1 to 5 inhabited structures	• There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1
0 inhabited structures	• There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classification in the space provided.

Inhabited structures include NPS and USCG buildings, residences, a school and daycare facility, and beach houses for use by recreational visitors (see Section 2.1.7 of the RI Report; Google Earth was used to calculate the total number of inhabited structures within the two-mile radius for this MRS).

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and circle the scores that correspond with **all** the activities/structure classifications at the MRS.

Note: The term *inhabited structure* is defined in Appendix C of the Primer.

Classification	Description	Score
Residential, educational, commercial, or subsistence	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	$\boxed{5}$
Parks and recreational areas	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	$\boxed{4}$
Agricultural, forestry	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	3
Industrial or warehousing	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2
No known or recurring activities	◆ There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space provided.

Types of activities/structures within 2 miles include NPS and U.S. Coast Guard (USCG) buildings, residences, a school and daycare facility, and beach houses for use by recreational visitors. An active USCG Station is positioned on the northwest corner of the peninsula (approximately 68 acres) (see Section 2.1.7 of the RI Report).

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resources present on the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the Primer.

Classification	Description	Score
Ecological and cultural resources present	◆ There are both ecological and cultural resources present on the MRS.	$\boxed{5}$
Ecological resources present	◆ There are ecological resources present on the MRS.	3
Cultural resources present	◆ There are cultural resources present on the MRS.	3
No ecological or cultural resources present	◆ There are no ecological resources or cultural resources present on the MRS.	0
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 5).	$\boxed{5}$

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classification in the space provided.

This MRS exhibits a diverse fauna that depend on a wide variety of habitats including forest, wetland, dune shrubland, dune grassland, and beach as well as intertidal marine habitats. Beach and dune flora is predominantly characterized by grasses, forbs and stunted shrubs. Inland flora is predominantly characterized by evergreen and mixed maritime forests, with deciduous forests (both maritime and non-maritime) on the western portion of the MRS. Based on previous archaeological investigations, Fort Hancock may include archaeological artifacts, features and locations that are associated with the former military use of Fort Hancock. The Fort Hancock and Sandy Hook Proving Ground Historic District, which includes all of the Fort's structures, and the Sandy Hook Lighthouse are National Historic Landmarks (see Sections 1.2 and 2.1.8 of the RI Report).

Table 10

Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. Circle the appropriate range for the **EHE Module Total** below.
5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Munitions Type	Table 1	**25**	35
Source of Hazard	Table 2	**10**	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	**5**	18
Ease of Access	Table 4	**8**	
Status of Property	Table 5	**5**	
Receptor Factor Data Elements			
Population Density	Table 6	**5**	20
Population Near Hazard	Table 7	**5**	
Types of Activities/Structures	Table 8	**5**	
Ecological and /or Cultural Resources	Table 9	**5**	
EHE MODULE TOTAL			**73**

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	**C**
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	**C**

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the scores that correspond with **all** the CWM configurations known or suspected to be present at the MRS.

Note: The terms *CWM/UXO, CWM/DMM, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, that are either UXO, or explosively configured damaged DMM	The CWM known or suspected of being present at the MRS are: ◆ CWM that are UXO (i.e., CWM/UXO) ◆ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	◆ The CWM known or suspected of being present at the MRS are undamaged CWM/DMM or CWM not configured as a munition that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM/DMM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS are: ◆ Nonexplosively configured CWM/DMM either damaged or undamaged ◆ Bulk CWM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS are CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	$\boxed{0}$
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	$\boxed{0}$

DIRECTIONS: Document any MRS-specific data used in selecting the *CWM Configuration* classifications in the space provided.

Both physical and historical evidence indicates that CWM was not present at this MRS (see Sections 1.2.1 and 1.4.2 of the RI Report).

Tables 12 through 19 are intentionally omitted

Per Army Guidance (U.S. Army, 2009)

Table 20
Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.

2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.

3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.

4. Circle the appropriate range for the **CHE Module Total** below.

5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		0
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		0
Population Near Hazard	Table 17		
Types of Activities/Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			**0**

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	**No Known or Suspected CWM Hazard**

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's groundwater and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional groundwater contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	*CHF Value*	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Groundwater samples did not contain MC above background (Secs 4.2.3 and 5.3.3, RI Report)

No Known or Suspected Groundwater MC Hazard ☑

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's groundwater and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional groundwater contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with human endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	*CHF Value*	**Sum The Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's groundwater and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional groundwater contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios

MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no surface water samples were collected in this MRS (see Section 4.2.2 of the RI Report)

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ☐

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
CHF Scale	*CHF Value*	**Sum The Ratios**	
CHF > 100	**H (High)**		

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's groundwater and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional groundwater contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no sediment samples were collected in this MRS (Section 4.2.2, RI Report).

No Known or Suspected Sediment (Human Endpoint) MC Hazard ☐

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	*CHF Value*	**Sum the Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no surface water samples were collected in this MRS (section 4.2.2, RI Report).

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ☐

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
CHF Scale	*CHF Value*	**Sum the Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to the presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Per the Final RI Work Plan, no sediment samples were collected in this MRS (section 4.2.2, RI Report).

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ☐

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface soil and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface soil contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratio
CHF Scale	*CHF Value*	**Sum the Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$

<table>
<tr><td colspan="4">

Table 26

HHE Module: Surface Soil Data Element Table

<u>Contaminant Hazard Factor (CHF)</u>

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface soil and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface soil contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.
</td></tr>
<tr><th>Contaminant</th><th>Maximum Concentration (mg/kg)</th><th>Comparison Value (mg/kg)</th><th>Ratio</th></tr>
<tr><td>CONTAMINANT HAZARD FACTOR</td><td colspan="2">DIRECTIONS: Record <u>the CHF Value</u> from above in the box to the right (maximum value = H).</td><td></td></tr>
<tr><td colspan="4"><u>Migratory Pathway Factor</u>
DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.</td></tr>
<tr><th>Classification</th><th colspan="2">Description</th><th>Value</th></tr>
<tr><td>Evident</td><td colspan="2">Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.</td><td>H</td></tr>
<tr><td>Potential</td><td colspan="2">Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.</td><td>M</td></tr>
<tr><td>Confined</td><td colspan="2">Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to the presence of geological structures or physical controls).</td><td>L</td></tr>
<tr><td>MIGRATORY PATHWAY FACTOR</td><td colspan="2">DIRECTIONS: Record <u>the single highest value</u> from above in the box to the right (maximum value = H).</td><td></td></tr>
<tr><td colspan="4"><u>Receptor Factor</u>
DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.</td></tr>
<tr><th>Classification</th><th colspan="2">Description</th><th>Value</th></tr>
<tr><td>Identified</td><td colspan="2">Identified receptors have access to surface soil to which contamination has moved or can move.</td><td>H</td></tr>
<tr><td>Potential</td><td colspan="2">Potential for receptors to have access to surface soil to which contamination has moved or can move.</td><td>M</td></tr>
<tr><td>Limited</td><td colspan="2">Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.</td><td>L</td></tr>
<tr><td>RECEPTOR FACTOR</td><td colspan="2">DIRECTIONS: Record <u>the single highest value</u> from above in the box to the right (maximum value = H).</td><td></td></tr>
<tr><td colspan="4">Per the Final RI Work Plan, no soil samples were collected during the RI (Section 6.1.1, RI Report).</td></tr>
<tr><td colspan="3">No Known or Suspected Surface Soil MC Hazard</td><td>☐</td></tr>
</table>

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

<u>Contaminant Hazard Factor (CHF)</u>

DIRECTIONS: Only use this table if there are more than five contaminants in any given medium present at the MRS. This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the media in which these contaminants are present. Then record all contaminants, their maximum concentrations and their comparison values (from Appendix B of the Primer) in the table below. Calculate and record the ratio for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF for each medium on the appropriate media-specific tables.

Note: Do not add ratios from different media.

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard**, **Migration Pathway**, and **Receptor Factors** for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the **HHE Ratings** provided below, determine each media's rating (A–G) and record the letter in the corresponding **Media Rating** box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value		*Three-Letter Combination (Hs-Ms-Ls)*		*Media Rating (A-G)*
Groundwater (Table 21)							No Known or Suspected Hazard
Surface Water/Human Endpoint (Table 22)							
Sediment/Human Endpoint (Table 23)							
Surface Water/Ecological Endpoint (Table 24)							
Sediment/Ecological Endpoint (Table 25)							
Surface Soil (Table 26)							

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the **HHE Module Rating** box.

Note:

An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE MODULE RATING	

HHE Ratings (for reference only)

Combination	Rating
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G

Alternative Module Ratings	**Evaluation Pending**
	No Longer Required
	No Known or Suspected MC Hazard

Table 29
MRS Priority

DIRECTIONS: In the chart below, circle the letter rating for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical priority for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS Priority is the single highest priority; record this relative priority in the MRS Priority or Alternative MRS Rating at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	B	2	A	2
B	3	C	3	B	3
C	**4**	D	4	C	4
D	5	E	5	D	5
E	6	F	6	E	6
F	7	G	7	F	7
G	8			G	8
Evaluation Pending		Evaluation Pending		**Evaluation Pending**	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		**No Known or Suspected CWM Hazard**		No Known or Suspected MC Hazard	
MRS PRIORITY or ALTERNATIVE MRS RATING				**4**	

Appendix E: MEC Hazard Assessment

MEC HA Summary Information

Comments

Site ID: **Ft. Hancock-MRS 03**

Date: 12/1/2014

Please identify the single specific area to be assessed in this hazard assessment. From this point forward, all references to "site" or "MRS" refer to the specific area that you have defined.

A. Enter a unique identifier for the site:

Ft. Hancock-MRS 03

Provide a list of information sources used for this hazard assessment. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.

Ref. No.	Title (include version, publication date)
1	RI/FS Work Plan (ERT 2010)
2	ASR (USACE 1993)
3	Supplemental ASR (USACE 2004)
4	EE/CA (USACE 1998)
5	SI (USACE 2006)
6	Ordnance History-Fort Hancock (1874-1919)
7	RI Report (ERT 2012)
8	RI Explosives Site Plan (USACE 2010)
9	Gateway National Recreation Area website http://www.nps.gov/gate/index.htm
10	Fragmentation Database (USACE 2012)

B. Briefly describe the site:

1. Area (include units): 30.2 acres
2. Past munitions-related use:
   Function Test Range
3. Current land-use activities (list all that occur):
   National Park (recreational, including beach activities)
4. Are changes to the future land-use planned? No
5. What is the basis for the site boundaries?
   Historical reports, aerial photos, prior investigations, RI findings (MEC presence and/or MD densities).
6. How certain are the site boundaries?
   Boundaries reflect MEC presence and/or MD densities based on the RI findings.

Reference(s) for Part B:

Ordnance History-Fort Hancock (1874-1919)

C. Historical Clearances

1. Have there been any historical clearances at the site? Yes, subsurface clearance
2. If a clearance occurred:
   a. What year was the clearance performed? 1998, 2011

   b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of removed items, and whether metal detectors were used):

   Subsurface clearance conducted with intrusive investigations, associated with the EE/CA and this RI.

Reference(s) for Part C:

EE/CA (USACE 1998)
RI Report (ERT 2012)

D. Attach maps of the site below (select 'Insert/Picture' on the menu bar.)

Site ID: **Ft. Hancock-MRS 03**
Date: **12/1/2014**

Cased Munitions Information

Item No.	Munition Type (e.g., mortar, projectile, etc.)	Munition Size	Munition Size Units	Mark/ Model	Energetic Material Type	Is Munition Fuzed?	Fuzing Type	Fuze Condition	Minimum Depth for Munition (ft)	Location of Munitions	Comments (include rationale for munitions that are "subsurface only")
1	Artillery	3.5	inches		High Explosive	Yes	Impact	UNK	1	Subsurface Only	Item was found below ground surface.
2											
3											
4											
5											
6											
7											
8											
9											
10											

Reference(s) for table above:
RI Report (ERT 2014)
RI Explosives Site Plan (USACE 2010)

Bulk Explosive Information

Item No.	Explosive Type	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Reference(s) for table above:

Site ID: **Ft. Hancock-MRS 03**
Date: **12/1/2014**

Activities Currently Occurring at the Site

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	NPS permanent staff	6	250	**1,500**	4	Of approx 55 permanent staff, assume 10% (6 staffers) spend 5 hours per work week (50 weeks) in MRS 03 (6 x 5 x 50 = 1500). Depth is maximum a worker might achieve performing menial routine work tasks (i.e., no digging with heavy machinery).
2	Visitors	40,000	1.00	**40,000**	1	Park has approx. 2.5 million visitors per year (source is Sandy Hook website). MRS 03 has a highly trafficked parking lot and beach house. Assume approx 2,000 individuals per weekend x 20 weeks of seasonal high activity x 1 hour in this area (2000 x 20 x 1 = 40,000)
3						
4						
5						
6						
7						
8						

Total Potential Contact Time (receptor hrs/yr): **41,500**

Maximum intrusive depth at site (ft): **4**

Reference(s) for table above:

RI/FS Work Plan (ERT December, 2010)

Gateway National Recreation Area website http://www.nps.gov/gate/index.htm

Site ID: **Ft. Hancock-MRS 03**
Date: **12/1/2014**

Planned Remedial or Removal Actions

Response Action No.	Response Action Description	Expected Resulting Minimum MEC Depth (ft)	Expected Resulting Site Accessibility	Will land use activities change if this response action is implemented?	What is the expected scope of cleanup?	Comments
1						
2						
3						
4						
5						
6						

According to the 'Summary Info' worksheet, no future land uses are planned. For those alternatives where you answered 'No' in Column E, the land use activities will be assessed against current land uses.

Reference(s) for table above:

RI Report (ERT 2014)

[redacted]

Site ID: **Ft. Hancock-MRS 03**

Date: **12/1/2014**

Energetic Material Type Input Factor Categories

The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
High Explosive and Low Explosive Filler in Fragmenting Rounds	100	100	100
White Phosphorus	70	70	70
Pyrotechnic	60	60	60
Propellant	50	50	50
Spotting Charge	40	40	40
Incendiary	30	30	30

The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'High Explosive and Low Explosive Filler in Fragmenting Rounds'.

	Score
Baseline Conditions:	**100**
Surface Cleanup:	**100**
Subsurface Cleanup:	**100**

Location of Additional Human Receptors Input Factor Categories

1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS? 126 feet

2. Are there currently any features or facilities where people may congregate within the MRS, or within the ESQD arc? Yes

3. Please describe the facility or feature.

Beach house, historical tourist attraction, parking lot, walking/bike path

MEC Item(s) used to calculate the ESQD for current use activities

[redacted]

Item #3. Artillery (3-inch common, MK 3, Mod 7)

The following table is used to determine scores associated with the location of additional human receptors (current use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

4. Current use activities are 'Inside the MRS or inside the ESQD arc', based on Question 2.' *Score*

Baseline Conditions:	**30**
Surface Cleanup:	**30**
Subsurface Cleanup:	**30**

5. Are there future plans to locate or construct features or facilities where people may congregate within the MRS, or within the ESQD arc?

6. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for future use activities

[redacted]

Item #1. Artillery (3.5inches, High Explosive)

The following table is used to determine scores associated with the location of additional human receptors (future use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

7. Please answer Question 5 above to determine the scores. *Score*

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Comments

ESQD arc for a 3-inch common, MK 3, Mod 7

Site Accessibility Input Factor Categories

The following table is used to determine scores associated with site accessibility:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Full Accessibility	No barriers to entry, including signage but no fencing	80	80	80
Moderate Accessibility	Some barriers to entry, such as barbed wire fencing or rough terrain	55	55	55
Limited Accessibility	Significant barriers to entry, such as unguarded chain link fence or requirements for special transportation to reach the site	15	15	15
Very Limited Accessibility	A site with guarded chain link fence or terrain that requires special equipment and skills (e.g., rock climbing) to access	5	5	5

Current Use Activities

Score

Select the category that best describes the site accessibility under the current use scenario:

Moderate Accessibility

Some natural access limitations based on vegetation and fencing.

Baseline Conditions: **55**
Surface Cleanup: **55**
Subsurface Cleanup: **55**

Future Use Activities

Select the category that best describes the site accessibility under the future use scenario:

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Reference(s) for above information:

[redacted]

Response Alternative No. 1:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 2:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 3:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 4:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 5:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 6:
Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Potential Contact Hours Input Factor Categories

The following table is used to determine scores associated with the total potential contact time:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Many Hours	≥1,000,000 receptor-hrs/yr	120	90	30
Some Hours	100,000 to 999,999 receptor hrs/yr	70	50	20
Few Hours	10,000 to 99,999 receptor-hrs/yr	40	20	10
Very Few Hours	<10,000 receptor-hrs/yr	15	10	5

Current Use Activities :

Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: **41,500** receptor hrs/yr
Based on the table above, this corresponds to a input factor score for baseline conditions of: **40** Score

Future Use Activities :

Input factors are only determined for baseline conditions for future use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: receptor hrs/yr
Based on the table above, this corresponds to a input factor score of: Score

Response Alternative No. 1:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 2:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 3:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 4:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 5:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time

Based on the table above, this corresponds to input factor scores of: **Score**

Baseline Conditions:

Surface Cleanup:

Subsurface Cleanup:

Response Alternative No. 6:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time

Based on the table above, this corresponds to input factor scores of: **Score**

Baseline Conditions:

Surface Cleanup:

Subsurface Cleanup:

Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Target Area	Areas at which munitions fire was directed	180	120	30
OB/OD Area	Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs.	180	110	30
Function Test Range	Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items.	165	90	25
Burial Pit	The location of a burial of large quantities of MEC items.	140	140	10
Maneuver Areas	Areas used for conducting military exercises in a simulated conflict area or war zone	115	15	5
Firing Points	The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released.	75	10	5
Safety Buffer Areas	Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas.	30	10	5
Storage	Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas.	25	10	5
Explosive-Related Industrial Facility	Former munitions manufacturing or demilitarization sites and TNT production plants	20	10	5

Select the category that best describes the ***most hazardous*** amount of MEC: ***Score***

Function Test Range

Baseline Conditions: **165**

Surface Cleanup: **90**

Subsurface Cleanup: **25**

Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

Current Use Activities

The shallowest minimum MEC depth, based on the 'Cased Munitions Information' Worksheet: **1** ft

The deepest intrusive depth: **4** ft

The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240	150	95
Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	240	50	25
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150	N/A	95
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.	50	N/A	25

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MECs are located only subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.' For 'Current Use Activities', only Baseline Conditions are considered. **150** ***Score***

Future Use Activities

Deepest intrusive depth: ft

Not enough information has been entered to determine the input factor category. ***Score***

Response Alternative No. 1:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 2:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 3:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 4:
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft
Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 5:
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft
Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 6:
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft
Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Migration Potential Input Factor Categories

Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion) to expose subsurface MEC items, or move surface or subsurface MEC items? Yes

If "yes", describe the nature of natural forces. Indicate key areas of potential migration (e.g., overland water flow) on a map as appropriate (attach a map to the bottom of this sheet, or as a separate worksheet).

Beach (surf) and wind erosion, tidal (storm) surges, flooding

The following table is used to determine scores associated with the migration potential:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Possible	30	30	10
Unlikely	10	10	10

Based on the question above, migration potential is 'Possible.' ***Score***

Baseline Conditions: **30**
Surface Cleanup: **30**
Subsurface Cleanup: **10**

Reference(s) for above information:

RI/FS Work Plan (ERT 2010)

MEC Classification Input Factor Categories

Cased munitions information has been inputed into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MECs for this MRS.

The 'Amount of MEC' category is 'Function Test Range'. It cannot be automatically assumed that the MEC items from this category are DMM. Therefore, the conservative assumption is that the MEC items in this MRS are UXO.

Has a technical assessment shown that MEC in the OB/OD Area is DMM?

Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet: No

- Submunitions
- Rifle-propelled 40mm projectiles (often called 40mm grenades)
- Munitions with white phosphorus filler
- High explosive anti-tank (HEAT) rounds
- Hand grenades
- Fuzes
- Mortars

At least one item listed in the 'Munitions, Bulk Explosive Info' Worksheet was identified as 'fuzed'.

The following table is used to determine scores associated with MEC classification categories:

	UXO	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
UXO Special Case		180	180	180
UXO		110	110	110
Fuzed DMM Special Case		105	105	105
Fuzed DMM		55	55	55
Unfuzed DMM		45	45	45
Bulk Explosives		45	45	45

Based on your answers above, the MEC classification is 'UXO'.

	Score
Baseline Conditions:	**110**
Surface Cleanup:	**110**
Subsurface Cleanup:	**110**

MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Small	Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation	40	40	40
Large	All munitions weigh more than 90 lbs; too large to move without equipment	0	0	0

Based on the definitions above and the types of munitions at the site (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is: Small

	Score
Baseline Conditions:	**40**
Surface Cleanup:	**40**
Subsurface Cleanup:	**40**

Scoring Summary

Site ID:	Ft. Hancock-MRS 03	a. Scoring Summary for Current Use Activities	
Date:	12/1/2014	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		10,000 to 99,999 receptor-hrs/yr	40
V. Amount of MEC		Function Test Range	165
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO	110
IX. MEC Size		Small	40
		Total Score	720
		Hazard Level Category	3

MEC HA Hazard Level Determination		
Site ID: Ft. Hancock-MRS 03 **Date:** 12/1/2014	**Hazard Level Category**	**Score**
a. Current Use Activities	3	720
b. Future Use Activities	4	445
c. Response Alternative 1:		
d. Response Alternative 2:		
e. Response Alternative 3:		
f. Response Alternative 4:		
g. Response Alternative 5:		
h. Response Alternative 6:		
Characteristics of the MRS		
Is critical infrastructure located within the MRS or within the ESQD arc?	Yes	
Are cultural resources located within the MRS or within the ESQD arc?	Yes	
Are significant ecological resources located within the MRS or within the ESQD arc?	Yes	

MEC HA Summary Information

Comments

Site ID: **Ft. Hancock-MRS 05**
Date: 12/1/2014

Please identify the single specific area to be assessed in this hazard assessment. From this point forward, all references to "site" or "MRS" refer to the specific area that you have defined.

A. Enter a unique identifier for the site:

Ft. Hancock-MRS 05

Provide a list of information sources used for this hazard assessment. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.

Ref. No.	Title (include version, publication date)
1	RI/FS Work Plan (ERT 2010)
2	ASR (USACE 1993)
3	Supplemental ASR (USACE 2004)
4	EE/CA (USACE 1998)
5	SI (USACE 2006)
6	Ordnance History-Fort Hancock (1874-1919)
7	RI Report (ERT 2014)
8	RI Explosives Site Plan (USACE 2010)
9	Gateway National Recreation Area website http://www.nps.gov/gate/index.htm
10	Fragmentation Database (USACE 2012)

B. Briefly describe the site:

1. Area (include units): 51 acres
2. Past munitions-related use:

Function Test Range

3. Current land-use activities (list all that occur):

National Park (recreational, including beach activities)

4. Are changes to the future land-use planned? No
5. What is the basis for the site boundaries?

Historical reports, aerial photos, prior investigations, RI findings (MEC presence and/or MD densities).

6. How certain are the site boundaries?

Boundaries reflect MEC presence or MD densities based on the RI findings.

Reference(s) for Part B:

Ordnance History-Fort Hancock (1874-1919)

C. Historical Clearances

1. Have there been any historical clearances at the site? Yes, subsurface clearance
2. If a clearance occurred:
   a. What year was the clearance performed? 1998, 2011

   b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of removed items, and whether metal detectors were used):

   Subsurfance clearance conducted with intrusive investigations, associated with the EE/CA and this RI.

Reference(s) for Part C:
EE/CA (USACE 1998)
RI Report (ERT 2014)

D. Attach maps of the site below (select 'Insert/Picture' on the menu bar.)

Site ID: **Ft. Hancock-MRS 05**
Date: **12/1/2014**

Cased Munitions Information

Item No.	Munition Type (e.g., mortar, projectile, etc.)	Munition Size	Munition Size Units	Mark/ Model	Energetic Material Type	Is Munition Fuzed?	Fuzing Type	Fuze Condition	Minimum Depth for Munition (ft)	Location of Munitions	Comments (include rationale for munitions that are "subsurface only")
1	Artillery	5	inches		High Explosive	Yes	UNK	UNK	0	Surface and Subsurface	Item was found along a transect, on the surface.
2											
3											
4											
5											
6											
7											
8											
9											
10											

Reference(s) for table above:
RI Report (ERT 2012)
RI Explosives Site Plan (USACE 2010)

Bulk Explosive Information

Item No.	Explosive Type	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Reference(s) for table above:

Site ID: **Ft. Hancock-MRS 05**
Date: **12/1/2014**

Activities Currently Occurring at the Site

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Visitors and NPS staff	40,000	0.16	6,400	4	MRS 05 consists of mostly vegetated areas where visitors and staff are not expected. However, the western portion of 2A encompasses a walking/biking path where visitors and staff are expected on a regular basis. Assume a total of 20,000 (staff and visitors) pass thru 2A, each spending 10 minutes (0.16 hrs) in the area per year. Conservatively, depth is maximum a worker might achieve performing menial routine work tasks (i.e., no digging with heavy machinery).
2	Visitors and NPS staff	40,000	1.00	40,000	4	A portion of MEC/MD Hazard Area-5B is on "Fishing Beach" which is highly frequented. Fishing Beach Road is within ESQD arc of 363 ft. Assume approx 2,000 individuals per weekend x 20 weeks of seasonal high activity x 1 hour in this area (most will just be passing through the small footprint of 5B, averaging out to 1 hr). This is 2,000 x 20 x 1 = 40,000. Conservatively, depth is maximum a worker might achieve performing menial routine work tasks (i.e., no digging with heavy machinery).
3	NPS permanent staff	6	50	300	4	Assume staff spend time in other, vegetated portions of the MRS. Of approx 55 permanent staff, assume 10% (6 staffers) spend a total of 1 hour per work week (50 weeks) in MEC/MD Hazard Areas 3A, 3B, 4A, and 5A (6 x 1 x 50 = 300). Conservatively, depth is maximum a worker might achieve performing menial routine work tasks (i.e., no digging with heavy machinery).
4						
5						
6						
7						
8						

Total Potential Contact Time (receptor hrs/yr): **46,700**
Maximum intrusive depth at site (ft): **4**

Reference(s) for table above:

RI/FS Work Plan (ERT December, 2010)

Site ID: **Ft. Hancock-MRS 05**
Date: **12/1/2014**

Planned Remedial or Removal Actions

Response Action No.	Response Action Description	Expected Resulting Minimum MEC Depth (ft)	Expected Resulting Site Accessibility	Will land use activities change if this response action is implemented?	What is the expected scope of cleanup?	Comments
1						
2						
3						
4						
5						
6						

According to the 'Summary Info' worksheet, no future land uses are planned. For those alternatives where you answered 'No' in Column E, the land use activities will be assessed against current land uses.

Reference(s) for table above:

RI Report (ERT 2014)

Ft. Hancock-
Site ID: **MRS 05**
Date: **12/1/2014**

Energetic Material Type Input Factor Categories

Comments

The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
High Explosive and Low Explosive Filler in Fragmenting Rounds	100	100	100
White Phosphorus	70	70	70
Pyrotechnic	60	60	60
Propellant	50	50	50
Spotting Charge	40	40	40
Incendiary	30	30	30

The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'High Explosive and Low Explosive Filler in Fragmenting Rounds'.

	Score
Baseline Conditions:	**100**
Surface Cleanup:	**100**
Subsurface Cleanup:	**100**

Location of Additional Human Receptors Input Factor Categories

1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS? 363 feet

ESQD arc for a 4.5 inch Mark V High Explosive Round.

2. Are there currently any features or facilities where people may congregate within the MRS, or within the ESQD arc? Yes

3. Please describe the facility or feature.

Beach, Fishing Beach road, parking area, walking/bike path

MEC Item(s) used to calculate the ESQD for current use activities

[redacted]

Item #3. Artillery (4.5inches, High Explosive)

The following table is used to determine scores associated with the location of additional human receptors (current use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

4. Current use activities are 'Inside the MRS or inside the ESQD arc', based on Question 2.

	Score
Baseline Conditions:	**30**
Surface Cleanup:	**30**
Subsurface Cleanup:	**30**

5. Are there future plans to locate or construct features or facilities where people may congregate within the MRS, or within the ESQD arc?

6. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for future use activities

[redacted]

Item #1. Artillery (3.5inches, High Explosive)

The following table is used to determine scores associated with the location of additional human receptors (future use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

7. Please answer Question 5 above to determine the scores. *Score*

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Site Accessibility Input Factor Categories

The following table is used to determine scores associated with site accessibility:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Full Accessibility	No barriers to entry, including signage but no fencing	80	80	80
Moderate Accessibility	Some barriers to entry, such as barbed wire fencing or rough terrain	55	55	55
Limited Accessibility	Significant barriers to entry, such as unguarded chain link fence or requirements for special transportation to reach the site	15	15	15
Very Limited Accessibility	A site with guarded chain link fence or terrain that requires special equipment and skills (e.g., rock climbing) to access	5	5	5

Current Use Activities

Score

Select the category that best describes the site accessibility under the current use scenario:

Moderate Accessibility

Some natural access limitations based on vegetation and fencing.

Baseline Conditions: **55**
Surface Cleanup: **55**
Subsurface Cleanup: **55**

Future Use Activities

Select the category that best describes the site accessibility under the future use scenario:

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Reference(s) for above information:

[redacted]

Response Alternative No. 1:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 2:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 3:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 4:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 5:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 6:
Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Potential Contact Hours Input Factor Categories

The following table is used to determine scores associated with the total potential contact time:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Many Hours	≥1,000,000 receptor-hrs/yr	120	90	30
Some Hours	100,000 to 999,999 receptor hrs/yr	70	50	20
Few Hours	10,000 to 99,999 receptor-hrs/yr	40	20	10
Very Few Hours	<10,000 receptor-hrs/yr	15	10	5

Current Use Activities :

Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: **46,700** receptor hrs/yr
Based on the table above, this corresponds to a input factor score for baseline conditions of: **40** Score

Future Use Activities :

Input factors are only determined for baseline conditions for future use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: receptor hrs/yr
Based on the table above, this corresponds to a input factor score of: Score

Response Alternative No. 1:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 2:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 3:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 4:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 5:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time

Based on the table above, this corresponds to input factor scores of: **Score**

Baseline Conditions:

Surface Cleanup:

Subsurface Cleanup:

Response Alternative No. 6:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time

Based on the table above, this corresponds to input factor scores of: **Score**

Baseline Conditions:

Surface Cleanup:

Subsurface Cleanup:

Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Target Area	Areas at which munitions fire was directed	180	120	30
OB/OD Area	Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs.	180	110	30
Function Test Range	Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items.	165	90	25
Burial Pit	The location of a burial of large quantities of MEC items.	140	140	10
Maneuver Areas	Areas used for conducting military exercises in a simulated conflict area or war zone	115	15	5
Firing Points	The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released.	75	10	5
Safety Buffer Areas	Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas.	30	10	5
Storage	Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas.	25	10	5
Explosive-Related Industrial Facility	Former munitions manufacturing or demilitarization sites and TNT production plants	20	10	5

Select the category that best describes the ***most hazardous*** amount of MEC: ***Score***

Target Area

Baseline Conditions: **180**

Surface Cleanup: **120**

Subsurface Cleanup: **30**

Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

Current Use Activities

The shallowest minimum MEC depth, based on the 'Cased Munitions Information' Worksheet: **0** ft
The deepest intrusive depth: **4** ft
The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240	150	95
Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	240	50	25
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150	N/A	95
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.	50	N/A	25

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.' For 'Current Use Activities', only Baseline Conditions are considered. **240** *Score*

Future Use Activities

Deepest intrusive depth: ft

Not enough information has been entered to determine the input factor category. *Score*

Response Alternative No. 1:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 2:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 3:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 4:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 5:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 6:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Migration Potential Input Factor Categories

Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion) to expose subsurface MEC items, or move surface or subsurface MEC items? Yes

If "yes", describe the nature of natural forces. Indicate key areas of potential migration (e.g., overland water flow) on a map as appropriate (attach a map to the bottom of this sheet, or as a separate worksheet).

Beach (surf) and wind erosion, tidal (storm) surges, flooding

The following table is used to determine scores associated with the migration potential:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Possible	30	30	10
Unlikely	10	10	10

Based on the question above, migration potential is 'Possible.' *Score*

Baseline Conditions: **30**
Surface Cleanup: **30**
Subsurface Cleanup: **10**

Reference(s) for above information:

RI/FS Work Plan (ERT 2010) [redacted]

MEC Classification Input Factor Categories

Cased munitions information has been inputed into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MECs for this MRS.

The 'Amount of MEC' category is 'Target Area'. It cannot be automatically assumed that the MEC items from this category are DMM. Therefore, the conservative assumption is that the MEC items in this MRS are UXO.

Has a technical assessment shown that MEC in the OB/OD Area is DMM?

Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet: No

Grenade referenced in ESP was determined to be practice. No evidence of live grenades on site.

- Submunitions
- Rifle-propelled 40mm projectiles (often called 40mm grenades)
- Munitions with white phosphorus filler
- High explosive anti-tank (HEAT) rounds
- Hand grenades
- Fuzes
- Mortars

3-inch Stokes Mortar had only minor energetics and does not equate to 'special case'

At least one item listed in the 'Munitions, Bulk Explosive Info' Worksheet was identified as 'fuzed'.

The following table is used to determine scores associated with MEC classification categories:

UXO	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
UXO Special Case	180	180	180
UXO	110	110	110
Fuzed DMM Special Case	105	105	105
Fuzed DMM	55	55	55
Unfuzed DMM	45	45	45
Bulk Explosives	45	45	45

Based on your answers above, the MEC classification is 'UXO'.

	Score
Baseline Conditions:	**110**
Surface Cleanup:	**110**
Subsurface Cleanup:	**110**

MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Small	Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation	40	40	40
Large	All munitions weigh more than 90 lbs; too large to move without equipment	0	0	0

Based on the definitions above and the types of munitions at the site (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is: Small

	Score
Baseline Conditions:	**40**
Surface Cleanup:	**40**
Subsurface Cleanup:	**40**

Scoring Summary

Site ID:	Ft. Hancock-MRS 05	a. Scoring Summary for Current Use Activities	
Date:	12/1/2014	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		10,000 to 99,999 receptor-hrs/yr	40
V. Amount of MEC		Target Area	180
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO	110
IX. MEC Size		Small	40
		Total Score	825
		Hazard Level Category	2

MEC HA Hazard Level Determination		
Site ID: Ft. Hancock-MRS 05 **Date:** 12/1/2014	**Hazard Level Category**	**Score**
a. Current Use Activities	2	825
b. Future Use Activities	4	460
c. Response Alternative 1:		
d. Response Alternative 2:		
e. Response Alternative 3:		
f. Response Alternative 4:		
g. Response Alternative 5:		
h. Response Alternative 6:		
Characteristics of the MRS		
Is critical infrastructure located within the MRS or within the ESQD arc?	No	
Are cultural resources located within the MRS or within the ESQD arc?	Yes	
Are significant ecological resources located within the MRS or within the ESQD arc?	Yes	

MEC HA Summary Information

Comments

Site ID: **Ft. Hancock-MRS 07**

Date: 3/15/2016

Please identify the single specific area to be assessed in this hazard assessment. From this point forward, all references to "site" or "MRS" refer to the specific area that you have defined.

A. Enter a unique identifier for the site:

Ft. Hancock-MRS 07

Provide a list of information sources used for this hazard assessment. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.

Ref. No.	Title (include version, publication date)
1	RI/FS Work Plan (ERT 2010)
2	ASR (USACE 1993)
3	Supplemental ASR (USACE 2004)
4	EE/CA (USACE 1998)
5	SI (USACE 2006)
6	Ordnance History-Fort Hancock (1874-1919)
7	RI Report (ERT 2014)
8	RI Explosives Site Plan (USACE 2010)
9	Gateway National Recreation Area website http://www.nps.gov/gate/index.htm
10	Fragmentation Database (USACE 2012)
11	RI Addendum #1 Report (ERT 2016)

B. Briefly describe the site:

1. Area (include units): 952 acres
2. Past munitions-related use:
   Safety Buffer Areas
3. Current land-use activities (list all that occur):
   National Park (recreational, including beach activities)
4. Are changes to the future land-use planned? No
5. What is the basis for the site boundaries?
   Historical reports, aerial photos, prior investigations, RI findings.
6. How certain are the site boundaries?
   Boundaries reflect historical maps, range fans for seacoast defense batteries, and EOD MEC finds on Atlantic beaches.

Reference(s) for Part B:

Ordnance History-Fort Hancock (1874-1919) [redacted]

C. Historical Clearances

1. Have there been any historical clearances at the site? Yes, surface clearance
2. If a clearance occurred:
   a. What year was the clearance performed? 2010-2013

   b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of removed items, and whether metal detectors were used):

   EOD surface clearance on Atlantic beaches after storm events (called in by NPS). Six items removed: 3.5", 5" AP, 6", 8" projectiles; Mk-25 marine marker, marine flare.

Reference(s) for Part C:

Navy e-mail to USACE (10/29/15) [redacted]

D. Attach maps of the site below (select 'Insert/Picture' on the menu bar.)

Site ID: **Ft. Hancock-MRS 07**
Date: **3/15/2016**

Cased Munitions Information

Item No.	Munition Type (e.g., mortar, projectile, etc.)	Munition Size	Munition Size Units	Mark/ Model	Energetic Material Type	Is Munition Fuzed?	Fuzing Type	Fuze Condition	Minimum Depth for Munition (ft)	Location of Munitions	Comments (include rationale for munitions that are "subsurface only")
1	Artillery	3.5	inches		High Explosive	UNK	UNK	UNK	0	Surface and Subsurface	Item found on beach
2	Artillery	5	inches	AP	High Explosive	UNK	UNK	UNK	0	Surface and Subsurface	Item found on beach
3	Artillery	6	inches		High Explosive	UNK	UNK	UNK	0	Surface and Subsurface	Item found on beach
4	Artillery	8	inches		High Explosive	UNK	UNK	UNK	0	Surface and Subsurface	Item found on beach
5	Pyrotechnic			Mk25	Pyrotechnic	UNK	UNK	UNK	0	Surface and Subsurface	Item found on beach
6	Pyrotechnic			marine flare	Pyrotechnic	UNK	UNK	UNK	0	Surface and Subsurface	Item found on beach
7											
8											
9											
10											

Reference(s) for table above:

[redacted]

Navy e-mail to USACE (10/29/15)

Bulk Explosive Information

Item No.	Explosive Type	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Reference(s) for table above:

[redacted]

Site ID: **Ft. Hancock-MRS 07**
Date: **3/15/2016**

Activities Currently Occurring at the Site

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Visitors and NPS starr (park rangers, in season); walking/fishing/wading in surf zone	400,000	2.00	**800,000**	4	A portion of the MRS is on the Atlantic beaches, which are highly frequented. Assume approx 20,000 individuals per week who walk/fish/wade in surf zone (where items are found) x 20 weeks of seasonal high activity x ave of 2 hours of activity in these areas. This is 20,000 x 20 x 2 = 800,000. Conservatively, depth is maximum a worker might achieve performing menial routine work tasks (i.e., no digging with heavy machinery).
3	NPS permanent staff: maintenance and biological monitoring in upland areas	11	500	**5,500**	4	Assume staff spend time in other, vegetated portions of the MRS. Of approx 55 permanent staff, assume 20% (11 staffers) spend a total of 10 hours per work week (50 weeks) within the MRS (11 x 10 x 50 = 5,500). Conservatively, depth is maximum a worker might achieve performing menial routine work tasks (i.e., no digging with heavy machinery).
4						
5						
6						
7						

8					

Total Potential Contact Time (receptor hrs/yr): **805,500**

Maximum intrusive depth at site (ft): **4**

Reference(s) for table above:

[redacted]

RI / FS Work Plan (ERT December, 2010)

Site ID: **Ft. Hancock-MRS 07**
Date: **3/15/2016**

Planned Remedial or Removal Actions

Response Action No.	Response Action Description	Expected Resulting Minimum MEC Depth (ft)	Expected Resulting Site Accessibility	Will land use activities change if this response action is implemented?	What is the expected scope of cleanup?	Comments
1						
2						
3						
4						
5						
6						

According to the 'Summary Info' worksheet, no future land uses are planned. For those alternatives where you answered 'No' in Column E, the land use activities will be assessed against current land uses.

Reference(s) for table above:

RI Report (ERT 2014)

Site ID: **Ft. Hancock-MRS 07**

Date: **3/15/2016**

Energetic Material Type Input Factor Categories

Comments

The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
High Explosive and Low Explosive Filler in Fragmenting Rounds	100	100	100
White Phosphorus	70	70	70
Pyrotechnic	60	60	60
Propellant	50	50	50
Spotting Charge	40	40	40
Incendiary	30	30	30

The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'High Explosive and Low Explosive Filler in Fragmenting Rounds'.

	Score
Baseline Conditions:	**100**
Surface Cleanup:	**100**
Subsurface Cleanup:	**100**

Location of Additional Human Receptors Input Factor Categories

1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS? 363 feet

ESQD arc for a 4.5 inch Mark V High Explosive Round.

2. Are there currently any features or facilities where people may congregate within the MRS, or within the ESQD arc? Yes

3. Please describe the facility or feature.

Beaches, bath houses, parking areas, walking/bike path

MEC Item(s) used to calculate the ESQD for current use activities

Item #3. Artillery (4.5inches, High Explosive)

The following table is used to determine scores associated with the location of additional human receptors (current use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

4. Current use activities are 'Inside the MRS or inside the ESQD arc', based on Question 2.

	Score
Baseline Conditions:	**30**
Surface Cleanup:	**30**
Subsurface Cleanup:	**30**

5. Are there future plans to locate or construct features or facilities where people may congregate within the MRS, or within the ESQD arc?

6. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for future use activities

Item #1. Artillery (3.5inches, High Explosive)

The following table is used to determine scores associated with the location of additional human receptors (future use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

7. Please answer Question 5 above to determine the scores.

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	

Site Accessibility Input Factor Categories

The following table is used to determine scores associated with site accessibility:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Full Accessibility	No barriers to entry, including signage but no fencing	80	80	80
Moderate Accessibility	Some barriers to entry, such as barbed wire fencing or rough terrain	55	55	55
Limited Accessibility	Significant barriers to entry, such as unguarded chain link fence or requirements for special transportation to reach the site	15	15	15
Very Limited Accessibility	A site with guarded chain link fence or terrain that requires special equipment and skills (e.g., rock climbing) to access	5	5	5

Current Use Activities

Score

Select the category that best describes the site accessibility under the current use scenario:

Moderate Accessibility

Some natural access limitations based on vegetation and fencing.

Baseline Conditions:	**55**
Surface Cleanup:	**55**
Subsurface Cleanup:	**55**

Future Use Activities

Select the category that best describes the site accessibility under the future use scenario:

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Reference(s) for above information:

[redacted]

Response Alternative No. 1:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 2:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 3:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 4:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 5:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 6:
Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Potential Contact Hours Input Factor Categories

The following table is used to determine scores associated with the total potential contact time:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Many Hours	≥1,000,000 receptor-hrs/yr	120	90	30
Some Hours	100,000 to 999,999 receptor hrs/yr	70	50	20
Few Hours	10,000 to 99,999 receptor-hrs/yr	40	20	10
Very Few Hours	<10,000 receptor-hrs/yr	15	10	5

Current Use Activities:

Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: **805,500** receptor hrs/yr
Based on the table above, this corresponds to a input factor score for baseline conditions of: **70** Score

Future Use Activities:

Input factors are only determined for baseline conditions for future use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: receptor hrs/yr
Based on the table above, this corresponds to a input factor score of: Score

Response Alternative No. 1:
Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 2:
Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 3:
Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 4:
Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: *Score*
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 5:
Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: **Score**

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 6:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time

Based on the table above, this corresponds to input factor scores of: **Score**

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Target Area	Areas at which munitions fire was directed	180	120	30
OB/OD Area	Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs.	180	110	30
Function Test Range	Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items.	165	90	25
Burial Pit	The location of a burial of large quantities of MEC items.	140	140	10
Maneuver Areas	Areas used for conducting military exercises in a simulated conflict area or war zone	115	15	5
Firing Points	The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released.	75	10	5
Safety Buffer Areas	Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas.	30	10	5
Storage	Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas.	25	10	5
Explosive-Related Industrial Facility	Former munitions manufacturing or demilitarization sites and TNT production plants	20	10	5

Select the category that best describes the ***most hazardous*** amount of MEC: ***Score***

Safety Buffer Areas

Baseline Conditions: **30**
Surface Cleanup: **30**
Subsurface Cleanup: **30**

Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

Current Use Activities

The shallowest minimum MEC depth, based on the 'Cased Munitions Information' Worksheet: **0** ft

The deepest intrusive depth: **4** ft

The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240	150	95
Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	240	50	25
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150	N/A	95
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.	50	N/A	25

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.' For 'Current Use Activities', only Baseline Conditions are considered. **240** *Score*

Future Use Activities

Deepest intrusive depth: ft

Not enough information has been entered to determine the input factor category. *Score*

Response Alternative No. 1:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 2:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 3:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 4:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 5:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 6:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Migration Potential Input Factor Categories

Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion) to expose subsurface MEC items, or move surface or subsurface MEC items? Yes

If "yes", describe the nature of natural forces. Indicate key areas of potential migration (e.g., overland water flow) on a map as appropriate (attach a map to the bottom of this sheet, or as a separate worksheet).

Beach (surf) and wind erosion, tidal (storm) surges, flooding

The following table is used to determine scores associated with the migration potential:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Possible	30	30	10
Unlikely	10	10	10

Based on the question above, migration potential is 'Possible.' *Score*

	Score
Baseline Conditions:	**30**
Surface Cleanup:	**30**
Subsurface Cleanup:	**10**

Reference(s) for above information:

RI/FS Work Plan (ERT 2010) [redacted]

MEC Classification Input Factor Categories

Cased munitions information has been inputed into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MECs for this MRS.

The 'Amount of MEC' category is 'Safety Buffer Areas'. It cannot be automatically assumed that the MEC items from this category are DMM. Therefore, the conservative assumption is that the MEC items in this MRS are UXO.

Has a technical assessment shown that MEC in the OB/OD Area is DMM?

Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet: No

Grenade referenced in ESP was determined to be practice. No evidence of live grenades on site.

- Submunitions
- Rifle-propelled 40mm projectiles (often called 40mm grenades)
- Munitions with white phosphorus filler
- High explosive anti-tank (HEAT) rounds
- Hand grenades
- Fuzes
- Mortars

3-inch Stokes Mortar had only minor energetics and does not equate to 'special case'

None of the items listed in the 'Munitions, Bulk Explosive Info' Worksheet were identified as 'fuzed'.

The following table is used to determine scores associated with MEC classification categories:

UXO	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
UXO Special Case	180	180	180
UXO	110	110	110
Fuzed DMM Special Case	105	105	105
Fuzed DMM	55	55	55
Unfuzed DMM	45	45	45
Bulk Explosives	45	45	45

Based on your answers above, the MEC classification is 'UXO'.

	Score
Baseline Conditions:	**110**
Surface Cleanup:	**110**
Subsurface Cleanup:	**110**

MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Small	Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation	40	40	40
Large	All munitions weigh more than 90 lbs; too large to move without equipment	0	0	0

Based on the definitions above and the types of munitions at the site (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is: Small

	Score
Baseline Conditions:	**40**
Surface Cleanup:	**40**
Subsurface Cleanup:	**40**

Scoring Summary

Site ID:	Ft. Hancock-MRS 07	a. Scoring Summary for Current Use Activities	
Date:	3/15/2016	Response Action Cleanup:	Response
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		100,000 to 999,999 receptor hrs/yr	70
V. Amount of MEC		Safety Buffer Areas	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC	240
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO	110
IX. MEC Size		Small	40
		Total Score	**705**
		Hazard Level Category	**3**

MEC HA Hazard Level Determination		
Site ID: Ft. Hancock-MRS 07		
Date: 3/15/2016		
	Hazard Level Category	Score
a. Current Use Activities	3	705
b. Future Use Activities	4	310
c. Response Alternative 1:		
d. Response Alternative 2:		
e. Response Alternative 3:		
f. Response Alternative 4:		
g. Response Alternative 5:		
h. Response Alternative 6:		
Characteristics of the MRS		
Is critical infrastructure located within the MRS or within the ESQD arc?	No	
Are cultural resources located within the MRS or within the ESQD arc?	Yes	
Are significant ecological resources located within the MRS or within the ESQD arc?	Yes	