DRAFT – FINAL

Site Inspection Report for Fort Michie

DERP FUDS Project No. **C02NY061203**

Prepared Under: **Contract No. W912DY-04-D-0017**
Task Order # 00170001

Prepared for:
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Fort Michie

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February 2009

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February 2009

CONTRACTOR STATEMENT OF AUTHORSHIP AND INDEPENDENT TECHNICAL REVIEW

Alion Science and Technology Corporation has prepared this Site Inspection Report for Fort Michie, Formerly Used Defense Site (FUDS), Project No. C02NY061203. An independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project, as defined in the Programmatic Work Plan. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of assumptions; methods, procedures, and material used in analyses; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with existing Corps policy. In accordance with Corps requirements, significant authors to this report are presented below.

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Significant concerns and explanation of the resolutions are documented within the project file.

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LIST OF ACRONYMS AND ABBREVIATIONS

Alion	Alion Science and Technology Corporation
AMTB	Anti-Motor Torpedo Boat
ASR	Archive Search Report
bgs	Below ground surface
CAS	Chemical Abstracts Service
CDQAR	Chemical Data Quality Assessment Report
CENAB	Corps of Engineers North Atlantic Baltimore
CENAN	Corps of Engineers North Atlantic New York
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPC	Chemicals of Potential Concern
COPEC	Chemicals of Potential Ecological Concern
CSM	Conceptual Site Model
CTT	Closed Transferring and Transferred
CWM	Chemical Warfare Materiel
CX	Center of Expertise
DC	Design Center
DERP	Defense Environmental Restoration Program
DMM	Discarded Military Munitions
DNT	Dinitrotoluene
DoA	Department of the Army
DoD	Department of Defense
DoI	Department of Interior
DQI	Data Quality Indicator
DQO	Data Quality Objective
Eco-SSL	Ecological Soil Screening Level
EDMS	Electronic Document Management Systems
EDS	Environmental Data Services, Inc.
EM	Engineering Manual
EOD	Explosive Ordnance Disposal
EP	Engineering Pamphlet
EPA	U.S. Environmental Protection Agency
˚F	Degree (s) Fahrenheit
ft	Foot or Feet
FDE	Findings and Determination of Eligibility
FNH	Flashless non-hygroscopic
FUDS	Formerly Used Defense Site(s)
FUDSMIS	FUDS Management Information System

LIST OF ACRONYMS AND ABBREVIATIONS

GIS	Geographic Information Systems
GPL	GPL Laboratories, LLLP
HHE	Health Hazard Evaluation
HHRA	Human Health Risk Assessment
HRS	Hazard Ranking System
HTRW	Hazardous Toxic and Radiological Waste
HQ	Hazard Quotient
In.	Inch (es)
INPR	Inventory Project Report
Ma	Million years ago
MC	Munitions Constituents
MCL	Maximum Contaminant Level
MD	Munitions Debris
MDL	Method Detection Limit
MEC	Munitions and Explosives of Concern
mg/kg	Milligram per kilogram
Mi	Mile(s)
mm	Millimeter(s)
MMRP	Military Munitions Response Program
MPPEH	Material Potentially Presenting an Explosive Hazard
MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocol
MS/MSD	Matrix Spike/Matrix Spike Duplicate
msl	Mean Sea Level
NAD	North American Datum
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDAI	No Department of Defense Action Indicated
NG	Nitroglycerin
NH	Non-hygroscopic
NOAA	National Oceanographic and Atmospheric Administration
NTCRA	Non-Time Critical Removal Action
NYSDEC	New York State Department of Environmental Conservation
NYSOP	New York State Office of Parks
OEW	Ordnance and Explosive Waste
PAOI	Potential Area of Interest
PGM	Program Manager
PM	Project Manager

LIST OF ACRONYMS AND ABBREVIATIONS

PMMQL	Preferred Maximum Method Quantitation Limits
PRG	Preliminary Remediation Goal
PWP	Programmatic Work Plan
PWS	Performance Work Statement
QA	Quality Assurances
QC	Quality Control
RAC	Risk Assessment Code
RCWM	Recovered Chemical Waste Materiel
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RI/FS	Remedial Investigation /Feasibility Study
RL	Reporting Limit
RMIS	Restoration Management Information System
SI	Site Inspection
SL	Screening Level
SLERA	Screening Level Ecological Risk Assessment
SQG	Sediment Quality Guideline
SS	Surface Soil
SSL	Soil Screening Level
SS-WP	Final Site-Specific Work Plan Addendum to the MMRP Programmatic Work Plan for the Site Inspection of Fort Michie
T&E	Threatened and Endangered
TCRA	Time Critical Removal Action
Tetryl	Methyl-2,4,6-trinitrophenylnitramine
TNT	Trinitrotoluene
TPP	Technical Project Planning
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering and Support Center, Huntsville
USDA	United States Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
UXO	Unexploded Ordnance
WWI	World War I
WWII	World War II

GLOSSARY OF TERMS

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) – Congress enacted CERCLA, commonly known as Superfund, on 11 December 1980. This law created a tax on the chemical and petroleum industries and provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment (USACE 2004b).

Discarded Military Munitions (DMM) – Military munitions that were abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that were properly disposed of, consistent with applicable environmental laws and regulations. (10 USC 2710(e)(2)) (Department of the Army [DoA] 2005).

Explosive Ordnance Disposal (EOD) – The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of unexploded explosive ordnance and of other munitions that have become an imposing danger, for example, by damage or deterioration (DoA 2005).

Explosives Safety – A condition where operational capability and readiness, people, property, and the environment are protected from the unacceptable effects or risks of potential mishaps involving military munitions (DoA 2005).

Formerly Used Defense Site (FUDS) – A FUDS is defined as a facility or site (property) that was under the jurisdiction of the Secretary of Defense and owned by, leased to, or otherwise possessed by the United States at the time of actions leading to contamination by hazardous substances. By the Department of Defense Environmental Restoration Program (DERP) policy, the FUDS program is limited to those real properties that were transferred from DoD control prior to 17 October 1986. FUDS properties can be located within the 50 States, District of Columbia, Territories, Commonwealths, and possessions of the United States. ER 200-3-1 (May 10, 2004) (USACE 2004b).

Material Potentially Presenting an Explosive Hazard (MPPEH) – Material potentially containing explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris); or material potentially containing a high enough concentration of explosives such that the material presents an explosive hazard (e.g., equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization or disposal operations). Excluded from MPPEH are munitions within DoD's established munitions management system and other hazardous items that may present explosion hazards (e.g., gasoline cans, compressed gas cylinders) that are not munitions and are not intended for use as munitions (DoA 2005).

GLOSSARY OF TERMS

Military Munitions – All ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the DoD, the Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants; explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives, and chemical warfare agents; chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges; and devices and components thereof. The term does not include wholly inert items; improvised explosive devices; and nuclear weapons, nuclear devices, and nuclear components, other then 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 USC 2011 et seq.) were completed. (10 USC 101(e)(4)(A) through (C)) (DoA 2005).

Munitions and Explosives of Concern (MEC) – This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks means: (A) Unexploded ordnance (UXO), as defined in 10 USC 101(e)(5); (B) DMM, as defined in 10 USC 2710(e)(2); or (C) Munitions constituents (e.g., trinitrotoluene, hexahydro-1,3,5-trinitro-1,3,5-triazine), as defined in 10 USC 2710(e)(3), present in high enough concentrations to pose an explosive hazard (DoA 2005).

Munitions Constituents (MC) – Any materials originating from UXO, DMM, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions. (10 USC 2710(e)(3)) (DoA 2005).

Munitions Debris (MD) – Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal (DoA 2005).

Munitions Response Area – Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples include former ranges and munitions burial areas. A munitions response area is comprised of one or more munitions response sites (32 Code of Federal Regulations [CFR] 179.3).

Munitions Response Site (MRS) – A discrete location within a Munitions Response Area that is known to require a munitions response (32 CFR 179.3).

GLOSSARY OF TERMS

Munitions Response Site Prioritization Protocol (MRSPP) – The MRSPP was published as a rule on 5 October 2005. This rule implements the requirement established in Section 311(b) of the National Defense Authorization Act for Fiscal Year 2002 for the DoD to assign a relative priority for munitions responses to each location in the DoD's inventory of defense sites known or suspected of containing UXO, DMM, or MC. The DoD adopted the MRSPP under the authority of 10 USC 2710(b). Provisions of 10 USC 2710(b) require that the DoD assign to each defense site in the inventory a relative priority for response activities based on the overall conditions at each location and taking into consideration various factors related to safety and environmental hazards.

Non-Time Critical Removal Action (NTCRA) – Actions initiated in response to a release or threat of a release that poses a risk to human health or the environment where more than six months planning time is available (USACE 2007b).

Range – A designated land or water area that is set aside, managed, and used for range activities of the DoD. The term includes firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, electronic scoring sites, buffer zones with restricted access and exclusionary areas. The term also includes airspace areas designated for military use in accordance with regulations and procedures prescribed by the Administrator of the Federal Aviation Administration. (10 USC 101(e)(1)(A) and (B)) (DoA 2005).

Range Activities – Research, development, testing, and evaluation of military munitions, other ordnance, and weapons systems; and the training of members of the armed forces in the use and handling of military munitions, other ordnance, and weapons systems. (10 USC 101(e)(2)(A) and (B)) (DoA 2005).

Range Related Debris – Debris, other than munitions debris, collected from operational ranges or from former ranges (e.g. target debris, military munitions packaging, and crating material).

Risk Assessment Code (RAC) – An expression of the risk associated with a hazard. The RAC combines the hazard severity and accident probability into a single Arabic number on a scale from 1 to 5, with 1 being the greatest risk and 5 the lowest risk. The RAC is used to prioritize response actions (USACE 2004b).

Time Critical Removal Action (TCRA) – Removal actions conducted to respond to an imminent danger posed by the release or threat of a release, where cleanup or stabilization actions must be initiated within 6 months to reduce risk to public health or the environment (USACE 2007b).

Unexploded Ordnance (UXO) – Military munitions that (A) were primed, fuzed, armed, or otherwise prepared for action; (B) were 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 USC 101(e)(5)(A) through (C)) (DoA 2005).

EXECUTIVE SUMMARY

ES.1 Under contract with the United States Army Corps of Engineers (USACE), Alion Science and Technology Corporation (Alion) prepared this Site Inspection (SI) Report to document SI activities and findings for the Fort Michie Formerly Used Defense Site (FUDS), Property No. C02NY0612, located on Great Gull Island, Suffolk County, New York. The Department of Defense (DoD) has established the Military Munitions Response Program (MMRP) under the Defense Environmental Restoration Program (DERP) to address potential munitions and explosives of concern (MEC) and munitions constituents (MC) remaining at FUDS. This SI is completed under MMRP Project No. C02NY061203 and addresses potential MMRP hazards remaining at the Fort Michie FUDS.

ES.2 **Site Inspection Objectives and Scope**. The primary objective of the MMRP SI is to determine whether or not the FUDS project warrants further response action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The SI collects the minimum amount of information necessary to make this determination. The SI also (i) determines the potential need for a Time Critical Removal Action (TCRA); (ii) collects or develops additional data, as appropriate, for potential Hazard Ranking System (HRS) scoring by the United States Environmental Protection Agency (EPA); and (iii) collects data, as appropriate, to characterize the hazardous substance release for effective and rapid initiation of the remedial investigation/feasibility study (RI/FS). An additional objective of the SI is to collect the additional data necessary to evaluate munitions response sites (MRSs) using the Munitions Response Site Prioritization Protocol (MRSPP).

ES.3 The scope of the SI is restricted to the evaluation of the presence of MEC or MC related to historical use of the FUDS prior to property transfer. Potential releases of hazardous, toxic, or radioactive waste (HTRW) are not within the SI scope.

ES.4 **Fort Michie**. The Fort Michie FUDS was comprised of approximately 17 acres located on Great Gull Island, Suffolk County, New York. The military utilized the FUDS as a coastal battery from approximately 1900 to 1949. Ammunition for anti-aircraft guns (.50 cal, 37 mm, and 40 mm) was stored/used onsite along with coastal artillery (90 mm, 3-inch, 6-inch, 10-inch, 12-inch, and 16-inch) ammunition. In 1949, Fort Michie was declared excess and was transferred to the War Assets Administration. From 1949 to 1954, the FUDS property was conveyed to the American Museum of Natural History who is the current owner. The FUDS currently is used as a bird sanctuary and research facility to study the declining tern population.

ES.5 **Technical Project Planning.** The SI approach was developed in concert with stakeholders through USACE's technical project planning (TPP) framework, which was applied at the initial TPP meeting on 12 February 2008. Stakeholders agreed to the SI approach, as presented and modified during the TPP meeting and finalized in the Site-Specific Work Plan (SS-WP). In summary, these agreements were to inspect the MRS and complete multimedia sampling in accordance with the Data Quality Objectives (DQOs) and Final SS-WP.

ES.6 USACE programmatic range documents identified one MRS area at the Fort Michie FUDS: MRS 1, Range Complex No. 1 (Restoration Management Information System [RMIS] Range ID No. C02NY061203R01). No potential areas of interest (PAOIs) were identified at Fort Michie during the TPP meeting by the stakeholders. The water portion of the range fans associated with MRS 1 were not evaluated due to the dynamic nature and depth of the ocean. Due to its scale and variable nature, the ocean presents an unlikely receptor pathway and its extreme depth makes further investigation unfeasible.

ES.7 **Qualitative Site Reconnaissance and Munitions and Explosives of Concern Assessment**. SI field activities were performed on 1 October 2008. A qualitative site reconnaissance, including analog geophysics and visual observations, of the FUDS was performed over approximately 1.0 acres of land. The field sampling approach included magnetometer-assisted reconnaissance following a meandering path in and around sampling locations and former firing points to identify the presence/absence of MEC/munitions debris (MD) or other areas of interest (i.e. areas containing indications of munitions use) at the FUDS. During the reconnaissance and sampling activities, no MEC, MD, or additional areas of interest were identified. No subsurface anomalies were recorded at MRS 1 (Range Complex No. 1).

ES.8 A qualitative MEC screening level risk assessment was conducted based on the SI qualitative reconnaissance, as well as historical data documented in the Inventory Project Report (INPR), Archives Search Report (ASR), and the ASR Supplement. Since military use ended in 1949, one 40mm shell was found at the FUDS by an American Museum of Natural History employee in the 1970s. The shell was accompanied by a letter stating that it was inert and was likely washed ashore due to tidal action. No munitions were found during the 1997 USACE site visit or during the Alion 2008 SI. The potential risk posed by MEC, assessed through three risk factors (i.e., presence of MEC source, accessibility or pathway presence, and potential receptor contact), is low for MRS 1 due to the absence of MEC/MD findings.

ES.9 **Munitions Constituents Sampling and Risk Screening**. A total of four surface soil samples and one surface soil field duplicate were collected at Fort Michie. Samples were

collected from in front of the former firing points of Batteries 912, Benjamin, Pasco, and William Maitland. There were no detections of munitions-related explosives at MRS 1.

ES.10 A list of MC potentially associated with munitions used at the FUDS was developed and used to support analysis of results and the risk screening. The list of site-specific MC for MRS 1 includes dinitrotoluene (DNT) and DNT breakdown products (2,4-dinitrotoluene, 2,6-dinitrotoluene, 2-nitrotoluene, 3-nitrotoluene, 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, and 4-nitrotoluene) (Table ES-1). An additional analyte, nitroglycerin (NG) – a common MC in military munitions – was analyzed in the soil samples collected from Fort Michie. Human Health Risk Assessment (HHRA) and Screening Level Ecological Risk Assessment (SLERA) analyses were performed on MC possibly expelled at the firing point. Metals and explosives associated with the artillery projectile were not analyzed because the projectile was fired offshore into the ocean. Furthermore, there were no historical reports of munitions discoveries on land related to the 90mm or larger artillery used at Fort Michie. Analytical results indicated no detections of explosives related MC in any of the soil samples collected at Fort Michie. The laboratory detection limit for DNT and DNT breakdown products is less than the human health and ecological screening levels; therefore, the results of the HHRA and SLERA indicate that these MC can be eliminated as chemicals of potential concern (COPC) or chemicals of potential ecological concern (COPEC). NG was not detected in any of the soil samples at the FUDS, however, the laboratory reporting limit of NG is higher than the human health screening level. As discussed in section 5.1.4.2, the reporting limit for NG was determined to be adequate for use in the HHRA. No ecological screening level exists for NG, therefore no conclusion was made on the adequacy of the NG laboratory reporting limit. In summary, no MC were detected at the FUDS, therefore, there are no completed pathways for human or ecological receptors in surface soil at MRS 1.

ES.11 **Recommendations.**

- During this SI, the land portion of MRS 1 (Range Complex No. 1) at the Fort Michie FUDS was assessed. Historically, no finds of munitions associated with the artillery, 90mm or larger, installed at Fort Michie were documented or reported. The potential for an explosive safety risk is low based on the evaluation of the potential presence of three elements: a source (presence of MEC/MD), a receptor (person), and interaction (e.g., touching or picking up an item). Based on a weight of evidence evaluation, no analytes were detected; therefore, no MC pose unacceptable risks to human or ecological receptors at the FUDS. Based on the findings and conclusions of the SI report, a No

Department of Defense Action Indicated (NDAI) designation is recommended for the land portion of MRS 1 (Table ES-1).

- During this SI, no environmental sampling or geophysical reconnaissance was conducted within the water portion of the MRS 1 range fans, thus a human health or ecological risk assessment could not be performed. The status of the water portion of MRS 1 remains under evaluation. A TCRA or a non-TCRA is not recommended at this FUDS (Table ES-1).

Table ES-1 Summary of Site Recommendations for Fort Michie
(FUDS Project No. C02NY061203)

MRS	Recommendation	Basis for Recommendation	
		MEC	**MC**
MRS 1 Range Complex No. 1 – Land Portion	NDAI designation TCRA/NTCRA not recommended	MEC Assessment: Low risk Historically: Large Caliber (37mm and larger), HE (CTT18) Historically a 40mm shell was found along the shoreline in the 1970s and was certified to be inert by USACE personnel. No MEC/MD observed during USACE site visit in 1997 or during the 2008 SI field work.	*Risk Screening Assessment:* No risks to human and ecological receptors identified from exposure to MC in any media. *Surface Soil:* No detections of munition-related MC; therefore, no COPC/COPEC were identified.
MRS 1 Range Complex No. 1– Water Portion	Water Portion will be addressed at some undetermined point in the future.	MEC Assessment: Not Evaluated No site reconnaissance was conducted in the water portion of MRS 1 in accordance with the Final SS-WP.	No sampling was conducted in the water portion of MRS 1 in accordance with the Final SS-WP.

COPC – Chemical of Potential Concern	NDAI – No DoD Action Indicated
COPEC – Chemical of Ecological Potential Concern	NTCRA – Non-Time Critical Removal Action
CTT – Closed Transferring and Transferred	SI – Site Investigation
FUDS – Formerly Used Defense Site	SS-WP – Site Specific Work Plan
HE – High Explosive	TCRA – Time Critical Removal Action
MC – Munitions Constituents	USACE – United States Army Corp of Engineers
MEC – Munitions and Explosives of Concern	
MRS – Munitions Response Site	

1. INTRODUCTION

1.0.1 This report documents the findings of the Military Munitions Response Program (MMRP) Site Inspection (SI) performed at the Fort Michie Formerly Used Defense Site (FUDS) located on Great Gull Island, Suffolk County, New York with the MMRP Project No. C02NY061203. Alion Science and Technology Corporation (Alion), along with its subcontractors (Environmental Data Services, Inc. [EDS]; Integral Consulting Inc.; and GPL Laboratories, LLLP [GPL]); prepared this report under contract to the United States Army Engineering and Support Center, Huntsville (USAESCH). The SI is performed in accordance with Contract No. W912DY-04-D-0017, Task Order 00170001 for FUDS in the Northeast Region of the Continental United States. USAESCH transferred management of the contract to the Corps of Engineers North Atlantic Baltimore (CENAB). CENAB is working with the Corps of Engineers North Atlantic New York (CENAN) and its contractor, Alion, on the completion of this project in accordance with the SI Performance Work Statement (Appendix A).

1.0.2 The technical approach of this SI is based on the *Programmatic Work Plan for Formerly Used Defense Sites Military Munitions Response Program Site Inspections at Multiple Sites in the Northeast Region* (Alion 2005) and the *Final Site-Specific Work Plan* (SS-WP) *Addendum to the MMRP Programmatic Work Plan for the Site Inspection of Fort Michie* (Alion 2008b).

1.1 Project Authorization

1.1.1 The Department of Defense (DoD) established the MMRP to address DoD sites suspected of containing munitions and explosives of concern (MEC) or munitions constituents (MC). Under the MMRP, the U.S. Army Corps of Engineers (USACE) is conducting environmental response activities at FUDS for the Army as DoD's Executive Agent for the FUDS program.

1.1.2 Pursuant to USACE's Engineer Regulation 200-3-1 (USACE 2004b) and the *Management Guidance for the Defense Environmental Response Program (DERP)* (Office of the Deputy Under Secretary of Defense [Installations and Environment], September 2001), USACE is conducting FUDS response activities in accordance with the DERP statute (10 USC 2701 et seq.), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (42 USC Section 9620), Executive Orders 12580 and 13016, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations Part 300). As such, USACE is conducting SIs, as set forth in the NCP, to evaluate hazardous substance releases or threatened releases from eligible FUDS.

1.1.3 While not all MEC/MC constitute CERCLA hazardous substances, pollutants, or contaminants, the DERP statute provides DoD the authority to respond to releases of MEC/MC, and DoD policy states that such responses shall be conducted in accordance with CERCLA and the NCP.

1.2 Project Scope and Objectives

1.2.1 The primary objective of the MMRP SI is to determine whether or not the FUDS project warrants further response action under CERCLA. The SI collects the minimum amount of information necessary to make this determination. The SI also (i) determines the potential need for a removal action; (ii) collects or develops additional data, as appropriate, for potential Hazard Ranking System (HRS) scoring by the U.S. Environmental Protection Agency (EPA); and (iii) collects data, as appropriate, to characterize the hazardous substance release for effective and rapid initiation of the remedial investigation/feasibility study (RI/FS). An additional objective of the MMRP SI is to collect additional data necessary to evaluate munitions response sites (MRSs) using the Munitions Response Site Prioritization Protocol (MRSPP).

1.2.2 The scope of the SI is restricted to the evaluation of the presence of MEC or MC related to historical use of this FUDS prior to property transfer. The evaluation is performed through records review, qualitative site reconnaissance to assess MEC presence/absence, and sampling where MC might be expected based on the conceptual site model (CSM). Evaluation of potential releases of hazardous, toxic, and radioactive waste (HTRW) is not within the scope of this SI.

1.3 Project Location

1.3.1 The Fort Michie FUDS is located north of Long Island, New York in the eastern portion of Suffolk County, New York. The North American Datum (NAD) 1983 coordinates for the central part of the property are Universal Transverse Mercator (UTM), Zone 18N, (X) 741608 meters (m) and (Y) 4565215 m. This FUDS falls under the geographical jurisdiction of USACE New York District. This SI is being completed under DERP-FUDS Project No. C02NY061203 to address potential MMRP hazards remaining at the FUDS (USACE 2004a).

1.4 Munitions Response Site Prioritization Protocol

1.4.1 This SI Report includes a draft MRSPP ranking for the land and water portion of MRS 1 (Range Complex No. 1) [Appendix K]. The MRSPP scoring will be updated on an annual basis, or when necessary, to incorporate new information, as appropriate.

2. SITE DESCRIPTION

2.1 Site Description and History

2.1.1 Former Fort Michie was approximately 17 acres in area and included nearby Little Gull Island (Figures 2-1 to 2-3). A lighthouse and accommodations were located historically on Little Gull Island. There are no known military uses of Little Gull Island. Prior to the construction of Fort Michie, the land was purchased by the United States Treasury Department in 1803 to construct a lighthouse and accommodations. In 1896, Great Gull Island was transferred from the Treasury Department to the War Department to begin construction of a coastal defense site. In 1899, the site was named Fort Michie. The first batteries to be constructed circa 1900 were Palmer and North. Battery Palmer consisted of two 12-inch breach loading rifles. Battery North consisted of two 10-inch breach loading rifles. Circa 1908, three other batteries were constructed. Batteries Benjamin and Maitland consisted of two 6-inch guns each. Battery Pasco contained two 3-inch rapid firing guns. Great Gull Island and all of the batteries located on the island are encompassed within MRS 1 – Range Complex Number 1 (USACE 1997).

2.1.3 Fort Michie initially had facilities for 450 soldiers; however, in the period between World War I (WWI) and World War II (WWII), Fort Michie was manned by a caretaker force only. Fort Michie also served as a sub-post of Fort Terry prior to and during WWI and as a sub-post to Fort H. G. Wright after WWI. In 1917, Battery North was closed. In 1919, in a similar location to Battery North, construction of Battery J.M.K. Davis began. Battery Davis was armed with one 16-inch gun and began service in 1923. Further construction took place in 1943 with the installation of two 90mm Anti-Motor Torpedo Boat (AMTB) guns in the northwestern portion of the island. The AMTB emplacement was named Battery 912. Other defenses included semi-mobile .50 caliber, 37mm, 40mm, 90mm or 3-inch guns; however, little construction would have taken place due to the semi-mobile characteristics of this type of armament. Other installations include at least two, 3-inch anti-aircraft gun positions, in place by at least 1926, and the use of unarmed Battery Pasco for the storage of anti-aircraft battery ammunition (USACE 1997).

2.1.4 In 1949, Fort Michie was declared excess and was transferred to the War Assets Administration. From 1949 to 1954, the FUDS property was conveyed to the American Museum of Natural History, who is the current owner. The American Museum of Natural History uses the FUDS as an educational research facility and a bird sanctuary to investigate the common and roseate tern population (USACE 1997 and 2004a).

2.2 Munitions Response Site Identification and Munitions Information

2.2.1 The ASR Supplement (originally titled Inventory Project Report [INPR] Supplement) defines the range/sub-ranges associated with the FUDS property and assigns a Risk Assessment Code (RAC) score to each area where historic munitions related activities occurred (USACE 2004a). One range or MRS was identified at the former Fort Michie: Range Complex No. 1 or MRS 1 (Table 2-1). Munitions associated with the MRS were derived from the ASR and ASR Supplement and other USACE munitions data sources and are summarized in Table 2-2.

2.2.2 According to the ASR Supplement (USACE 2004a), the MRS totaled approximately 55 acres of land and 92,163 acres of tidal water (safety range fans). The total FUDS property boundary is 55 acres of land. Figure 2-2 identifies the FUDS boundary as well as MRS 1. The SI addressed the on-land portions of MRS 1. USACE may establish a separate MRS for the water portion of the range fan and conduct separate studies for the water area in the future

2.3 Physical Setting

2.3.0.1 The following sections provide a physical description of the FUDS property with respect to relief, vegetation, and climate as well as the local demographic and land uses.

2.3.1 Topography and Vegetation

2.3.1.1 The former Fort Michie FUDS has elevations that range from sea level to approximately 30 feet above mean sea level (msl) at the northwestern portion of the island. The surface topography is generally flat and the island has a steep, rocky shoreline. The topography of the island is essentially a product of the construction of Fort Michie as much of the island is now composed of imported fill (USDA 2008). Figure 2-3 shows the topographic relief of the FUDS and surrounding water.

2.3.1.2 The former Fort Michie land has both open and heavily vegetated portions. The predominant vegetation is both small and large trees, heavy grass, and numerous shrubs and bushes (USACE 1997).

2.3.2 Climate

2.3.2.1 The climate at the Fort Michie FUDS is highly influenced by the surrounding ocean. Cool sea breezes keep summer temperatures lower than the surrounding mainland with summertime high temperatures of approximately 70°F. Winter is mild with average temperatures in the low to mid-30's. Precipitation is well-distributed throughout the year with Great Gull

Island receiving approximately 3 inches per month. Snowfall is moderate with a seasonal snowfall average of 29 inches. Typically, the ground is bare of snow for extended periods of time during the winter. Precipitation and temperature data were recorded at the Greenport Power House approximately 15 miles southwest of the FUDS. Episodes of heavy rain and snow and high winds are possible during either tropical storms or coastal low pressure systems. The wind direction is typically from the west-northwest at 8-11 miles per hour as recorded in Islip, NY approximately 60 miles to the southwest (USACE 1997).

2.3.3 Local Demographics

2.3.3.1 The American Museum of Natural History currently owns the former Fort Michie property. The former facilities are now used to house research staff during the summer months (USACE 1997).

2.3.3.2 Fort Michie is located on Great Gull Island in Suffolk County, New York approximately eight miles south of the city of New London, Connecticut (Figure 2-3). The nearest populated islands are approximately two miles (Plum Island), five miles (Gardiners and Fishers Island), and seven to twelve miles (Long Island) away. The population density of Suffolk County is 1,593 people per square mile (mi^2). The 2007 Census population estimate for Suffolk County is 1,469,715 people. The 2006 estimate of the number of housing units in Suffolk County is 542,956 housing units. The 2007 population estimate for New London, Connecticut is 25,923 with a 2000 Census population density of 4,636 persons per mi^2 and 2,087 housing units (U.S. Census Bureau 2008). There are no permanent residents on Great Gull Island; however, during the summer months researchers from the American Museum of Natural History temporarily reside on the island.

2.3.4 Current and Future Land Use

2.3.4.1 The Army relinquished the lease for the property to the War Assets Administration in 1949. Since 1949, the American Museum of Natural History has held ownership of former Fort Michie and is the current owner. The FUDS is used as a research facility and bird sanctuary. Future land use is expected to be similar (USACE 1997).

2.3.5 Geologic Setting

2.3.5.1 The soils present at the former Fort Michie FUDS are typically well-drained and associated with Wisconsin stage moraine deposits. Slopes range from approximately level to very steep. Surface, subsurface, and subsoil layers are predominantly sandy with the addition of

gravel in the deeper substratum layer. The depth to substratum ranges from 16 to 32 inches. Soil layers are typically underlain by sand, silt, or glacial till (USACE 1997).

2.3.5.2 The former Fort Michie FUDS is located within the Embayed section of the Coastal Plain physiographic province of Long Island Sound. The bedrock of Suffolk County is not exposed at the surface, but includes Cretaceous (66 – 144 million years ago (Ma)) sedimentary rocks of the Monmouth-Magothy and Raritan sand and mud units underlain by sedimentary and igneous rocks of Jurassic (144 – 208 Ma) and Triassic (208 – 245 Ma) age including the Passaic Formation, Palisades diabase, and Ladontown basalt (Rickard et al. 1970). Overlying the Monmouth-Magothy Formation, sediments currently exposed at the surface include glacial and proglacial till, gravel, sand, and mud of Pleistocene and younger age. Glacial deposits are the result of the Pleistocene age Wisconsin stage of glaciation, which produced Long Island Sound and most of the topographic features in Suffolk County (USACE 1997).

2.3.6 Hydrogeologic Setting

2.3.6.1 Situated in Long Island Sound, the former Fort Michie FUDS is located on an island surrounded by the Atlantic Ocean. There is no permanent surface water located on Great Gull Island, although high tides associated with storms have resulted in flooding of low lying areas (USACE 1997).

2.3.6.2 Upper Pleistocene sediments and the Magothy and Lloyd Sand members of the Raritan Formation serve as the three main aquifers for Suffolk County. The aquifers are predominantly very permeable sands and gravels with minor silt and clay. Due to the narrow land area where the Fort Michie FUDS is located, groundwater does not rise far above sea level; therefore, contamination of freshwater by salt water is possible if excessive pumping takes place (USACE 1997). According to participants at the TPP meeting (Alion 2008), groundwater is not used at the Fort Michie FUDS and potable water is imported to the island from a public water supply.

2.3.7 Area Water Supply/Groundwater Use

2.3.7.1 Research personnel and visitors to Great Gull Island bring their drinking water supply to the island from a public water source (Alion 2008a). New York State does not make well-head protection zone GIS data publically available, therefore these zones are not depicted in this SI Report (NYS GIS Clearinghouse 2008). However, MRS 1 is presumed to be separated from any

wellhead protection zones located in New York or Connecticut by the wide expanse of Long Island and Block Island Sounds.

2.3.8 Sensitive Environments

2.3.8.0.1 The following subsections discuss the sensitive environments associated with the FUDS and the process used to determine the necessity for completing an ecological risk assessment at the FUDS.

2.3.8.1 Army Checklist for Important Ecological Places

2.3.8.1.1 In accordance with USACE Hazardous, Toxic, and Radioactive Waste Center of Expertise guidance, the Army Checklist for Important Ecological Places (USACE 2006 and 2007a) is completed (Table 2-3) to determine if a FUDS requires a screening-level ecological risk assessment). In the case of Fort Michie, rare, threatened, or endangered species were identified by the ASR and New York State Department of Environmental Conservation (NYSDEC). Transient populations of the Roseate and Common tern nest and rear their young on the island (NYSDEC 2008; USAESCH 2001; U.S. Fish and Wildlife Service (USFWS) 2008). Threatened and endangered species consultation responses from both the USFWS and NYSDEC are included in Appendix L.

2.3.8.2 Wetlands

2.3.8.2.1 Wetlands are not known to be present at the Fort Michie FUDS according to the USFWS (USFWS 2008). No wetlands were encountered during the field sampling activities conducted at the Fort Michie FUDS.

2.3.8.3 Coastal Zones

2.3.8.3.1 The former Fort Michie is situated within the New York Coastal Zone (New York State GIS Clearinghouse 2008). This area is managed under the New York Coastal Management Program, which is administered by the Department of State through the Division of Coastal Resources. The SI activities included only surface soil sample collection. Sampling activities did not disturb the coastal areas and were in accordance with coastal regulations. Although Fort Michie is surrounded by water, as per agreement at the 2008 TPP meeting, no sampling or qualitative reconnaissance was conducted in the waters surrounding Great Gull Island (Alion 2008a).

2.4 Previous Investigations for Munitions Constituents and Munitions and Explosives of Concern

2.4.0.1 A summary of previous historical investigations and related discoveries of MC and MEC is provided in the following subsections. Chemical Warfare Materiel (CWM) was not used or stored at the former Fort Michie. The Post Engineer issued a certificate of clearance in 1948 stating that the property was inspected and found to be free of any ammunition or explosives (USACE 1997).

2.4.1 Inventory Project Report

2.4.1.1 USACE issued the Inventory Project Report (INPR) for the Fort Michie FUDS in November 1992. The USACE (1992) INPR was based on a September 1992 preliminary visit and determined that the present condition of the project site was to be the result of a prior DoD ownership, utilization, or activity. Moreover, the INPR determined that an environmental restoration project was an appropriate undertaking within the purview of the DERP for FUDS. The INPR amendment concluded that there were additional areas within the FUDS boundary that potentially warrant further Hazardous Toxic and Radioactive Waste (HTRW) or ordnance and explosive waste (OEW)[1] investigation. The areas identified in the INPR amendment include four underground storage tank fill openings, an abandoned generator, additional generator platforms with possible evidence for underground storage tanks, one location where coal was stored, a second area where coal deposits were found, and armaments including 4-inch, 8-inch, and 16-inch artillery (later archival research determined that .50 caliber, 37mm, 40mm, 90mm, 3-inch, 6-inch, 10-inch, 12-inch, and 16-inch artillery was present). There is the possibility that ordnance may still be present; therefore the property was determined to be eligible for cleanup under the FUDS program. A site survey and a Findings and Determination of Eligibility (FDE) were created in 1992 and included in the INPR (USACE 1997).

2.4.2 Archives Search Report

2.4.2.1 The USACE St. Louis District prepared the Archives Search Report (ASR) Findings for Fort Michie in October 1997. The ASR Findings contain previous investigations at the FUDS, property description, physical characteristics of the FUDS, the historical property ownership summary, site eligibility as a FUDS, a visual site inspection, property MEC/Recovered Chemical Warfare Materiel (RCWM) technical data, an evaluation of ordnance present at the FUDS, and

[1] The project category dealing with military munitions hazards termed OEW and defined under DERP-FUDS as ordnance and explosive waste was replaced with the military munitions response program (MMRP).

recommendations. The ASR also included ordnance technical data sheets, physical and chemical characteristics data sheets, maps, interviews, visual inspection property report and photographs, and a preliminary assessment form. CWM was not used, stored, or disposed of at Fort Michie. The ASR concluded that the Fort Michie FUDS be carried forward to the SI stage (USACE 1997).

2.4.3 2004 Archive Search Report Supplement

2.4.3.1 The ASR Supplement was prepared for the FUDS in 2004 (USACE 2004a). The ASR Supplement assigned a Risk Assessment Code (RAC) score of 4 to the FUDS as a whole. RAC score indicates the level of MEC risk associated with the area. RAC scores range from 1, being the highest category of risk, to 5, being the lowest. During the 1970s[2], one 40-mm shell was found by an employee of the American Museum of Natural History. The shell was determined to be inert and was assumed to have washed ashore as a result of tidal action (USACE 2004a).

2.4.3.2 The information provided in the ASR Supplement was combined with the information regarding specific munitions presented in the ASR and used to generate Table 2-2, which lists the military munitions type and composition for the FUDS. USACE technical documents, technical manuals, and other technical resources, were used to identify the list of MC associated with each munitions type. The list of associated MC includes DNT and DNT breakdown products (2,4-dinitrotoluene, 2,6-dinitrotoluene, 2-amino-4,6-dinitrotoluene, 2-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-dinitrotoluene, and 4-nitrotoluene). As noted in Table 2-2, MC associated with primers and tracers were not sampled at this FUDS since these constituents typically represent less than 5 percent of the MC associated with the munitions. This approach was used in accordance with stakeholder agreements at the TPP meeting (Alion 2008a) and the Final SS-WP (Alion 2008b). A copy of the 2004 ASR Supplement is provided in Appendix L.

2.5 Citizen Reports of Munitions and Explosives of Concern

2.5.1 Since military use of the FUDS ceased, one report of a 40-mm shell by an employee of the American Museum of Natural History was documented. The shell, discovered in the 1970s, was determined to be inert and was assumed to have washed ashore as a result of tidal action (USACE 1997, 2004a). No MEC or MD was observed during the 2008 SI field reconnaissance.

[2] An interviewee referenced in the ASR stated that the 40mm munition find was during the 1980s, however, an interview with the person who found the 40mm shell states that the shell was found during the 1970s. Alion believes that the shell was in fact found during the 1970s and that any references to the 1980s may have been passed on through second party knowledge.

2.6 Non-Department of Defense Contamination/Regulatory Status

2.6.1 There is no evidence, based on historical review and stakeholder comments, that activities occurring prior to or after DoD use of the area contributed to potential MEC, MD, or MC findings.

Table 2-1. Range Inventory (USACE 2004a)

Site Name	Range Name	Sub-range Name	RMIS Range Number	RAC Score	Acreage (land/water)
Fort Michie	MRS 1 – Range Complex No. 1	Battery Pasco	C02NY061203R01-SR01	4	10.71 / 15225.88
		Battery Benjamin	C02NY061203R01-SR02	4	12.21 / 17199.92
		Battery North	C02NY061203R01-SR03	4	9.73 / 23172.08
		Battery Palmer	C02NY061203R01-SR04	4	21.96 / 23159.85
		Battery William Maitland	C02NY061203R01-SR05	4	15.76 / 17744.81
		Battery 912	C02NY061203R01-SR06	4	3.03 / 15257.31

MRS – Munitions Response Site
RAC – Risk Assessment Code Score. The RAC allows a score of 1 (highest risk) to 5 (lowest risk).
RMIS – Restoration Management Information System

Table 2-2. Military Munitions Type and Composition (USACE 2004a and other documents)

Range ID MRS	Sub-range	Munitions ID	Munitions Type[6]	Composition (explosives and metallic components) [1]	Associated MC Analysis[1, 3, 4]
MRS 1 – Range Complex No. 1	Battery Pasco	Large Caliber (37mm and larger), HE (CTT18)	3-inch, HE, M1915	**Projectile Composition** **Projectile Body:** Steel **Explosive D Filler:** Ammonium picrate **Booster:** TNT, Tetryl **Detonator:** Mercury fulminate **Percussion Primer[1]:** Primer mixture, black powder[4]	*MC generated during the expenditure of the munition will be analyzed for at MRS 1. Metals are associated with the projectile only. The projectiles when fired are discharged far from the firing point. At Fort Michie the impact area is located in deep waters within Long Island and Block Island Sound.* **Explosives:** DNT [2] Nitroglycerine (NG) [7]
				Firing Point Composition **Propellant:** Flashless non-hygroscopic (FNH) powder (nitrocellulose[3] and dinitrotoluene [DNT], diphenylamine) **M28A1 Primer[1]:** M61 (Potassium chlorate, lead thiocyanate, antimony sulfide, TNT), black powder[4]	
	Batteries Benjamin and William Maitland		6-inch, AP (Shell), M1911; 6-inch, Mk 35	**Projectile Composition** **Same as 3-inch M1915**	
				Firing Point Composition **Propellant:** FNH powder (nitrocellulose[3] and DNT, diphenylamine, rosaliline) **M30 Primer[1]:** Nitrocellulose, black powder[4]	
	Battery North		16-inch, AP, Mk 5	**Projectile Composition** **Projectile Body:** Steel **Explosive D Filler:** Ammonium picrate **Booster:** Tetryl	None [5]

Table 2-2. Military Munitions Type and Composition (USACE 2004a and other documents)

Range ID MRS	Sub-range	Munitions ID	Munitions Type[6]	Composition (explosives and metallic components) [1]	Associated MC Analysis[1, 3, 4]
				Detonator: Mercury fulminate **Primer[1]:** Primer mixture **Delay Pellet:** Black powder[4] **Firing Point Composition** **Propellant:** NH Powder (nitrocellulose[3], rosaliline, diphenylamine) **Primer[1]:** Mercury fulminate, nitrocellulose[3], black powder[4]	
	Battery Palmer		12-inch, AP, M1912; 12-inch, AP, Mk15	**Projectile Composition** **Same as 16-inch, Mk 5** **Firing Point Composition** **Same as 16-inch, Mk 5**	None [5]
	Battery 912		90mm, AP, M77	**Projectile Composition** **Solid steel** **Firing Point Composition** **Propellant:** Nitrocellulose[3], DNT, dibutylphthalate, diphenylamine **Primer[1]:** M61 Primer (Potassium chlorate, lead thiocyanate, antimony sulfide, TNT), black powder[4]	**Explosives:** DNT [2]
	Anti-aircraft armament	Large Caliber (37mm and larger), HE (CTT18)	37mm, general	**Projectile Composition** **Projectile: Steel** **Detonator:** Potassium chlorate, antimony sulfide, lead azide, carborundum (silicon carbide), Tetryl **Booster:** Tetryl **Filler:** Tetryl or Comp A (RDX) **Firing Point Composition** **Propellant:** Nitrocellulose[3],	None[6]

Table 2-2. Military Munitions Type and Composition (USACE 2004a and other documents)

Range ID MRS	Sub-range	Munitions ID	Munitions Type[6]	Composition (explosives and metallic components) [1]	Associated MC Analysis[1, 3, 4]
				DNT, dibutylphthalate, diphenylamine, barium nitrate, nitroglycerin, potassium nitrate, ethyl centralite, graphite **Primer[1]:** Potassium chlorate, lead thiocyanate, antimony sulfide, TNT, black powder[4]	
		Large Caliber (37mm and larger), HE (CTT18)	40mm, general	**Projectile Composition** **Projectile: Steel** **Detonator:** Potassium chlorate, antimony sulfide, lead azide, carborundum (silicon carbide), Tetryl **Booster:** Tetryl **Fuze:** Primer mixture, lead azide, tetryl **Filler:** TNT or Tetryl **Tracer:** Strontium nitrate, magnesium powder, charcoal, carnauba wax, ammonium perchlorate, barium peroxide, aluminum powder, black powder	None[6]
				Firing Point Composition **Propellant:** Nitrocellulose[3], DNT, dibutylphthalate, diphenylamine, barium nitrate, nitroglycerin, potassium nitrate, ethyl centralite, graphite **Primer[1]:** Potassium chlorate, lead thiocyanate, antimony sulfide, TNT, black powder[4]	
		Small arms (CTT01)	.50 caliber	**Projectile:** Lead, Antimony, cupro-nickel and soft steel (iron and carbon) **Shell casing:** Brass (copper-zinc alloy) or Steel (iron and carbon)[c] **Propellant:** Single or double – base smokeless powder (nitrocellulose[3], nitroglycerine [NG], DNT, potassium sulfate, graphite)	None[6]

Table 2-2. Military Munitions Type and Composition (USACE 2004a and other documents)

Range ID MRS	Sub-range	Munitions ID	Munitions Type[6]	Composition (explosives and metallic components) [1]	Associated MC Analysis[1, 3, 4]
				Primer [e]: Barium nitrate, lead styphnate	

AP – Armor Piercing	Mk – Mark
CTT – Closed Transferring and Transferred	mm – millimeter
DNT – Dinitrotoluene	MRS – Munitions Response Site
FNH – Flashless non-hygroscopic	NH – Non-hygroscopic
FUDS – Formerly Used Defense Site	NG – Nitroglycerine
ID – Identification	PWP – Programmatic Work Plan
HE – High Explosive	RDX - Hexahydro-1,3,5-trinitro-1,3,5-triazine
M – Model	Tetryl - Methyl-2,4,6-trinitrophenylnitramine
MC – Munitions Constituents	TNT - Trinitrotoluene

[1] Based on available technical manuals, MCs identified for the Fort Michie FUDS munitions include the following: Primer, Detonator and Fuze. These materials, when combined, typically represent a very small percentage (<5%) of the total projectile weight and, along with the propellant, typically burn as the projectile is fired. Therefore, the MC sampling/analysis typically focuses on primary constituents present in propellants at the firing point and the projectile/casings in impact areas. Therefore primer, detonator and fuze constituents will not be sampled in this SI.

[2] DNT and break down products currently on the approved PWP explosives analysis using method 8330A list (including 2,4-Dinitrotoluene; 2,6-Dinitrotoluene; 2-Amino-4,6-dinitrotoluene; 2-Nitrotoluene; 3-Nitrotoluene; 4-Nitrotoluene 4-Amino-2,6-dinitrotoluene) were analyzed.

[3] Simple single-based nitrocellulose readily breaks down in the environment and is not expected to persist while more complex nitrocellulose may persist longer in the environment (Duran et al. 1994). Nitrocellulose is not toxic, and consequently no risk-based screening values have been developed for the compound. Furthermore, there are no chemical analysis techniques that quantify nitrocellulose separately from the natural common essential nutrient nitrate. Based on this rationale, no sampling for nitrocellulose is proposed.

[4] Black powder is not sampled within the FUDS because a) the black powder is a rapidly burning material that, when fired, leaves little residue as either decomposition products or uncombusted compounds (ITRC, 2003) and b) typically any residual amounts are insignificant in volume to present a MC hazard. Additionally, the original chemical constituents and the decomposition products (sodium nitrate or potassium nitrate plus charcoal and sulfur) are, in general, common soil compounds (organic carbon, CO2, nitrates, etc.), which would be difficult to specifically identify as originating from within the FUDS boundary.

[5] The propellant known to be used at Batteries Palmer and North was NH powder which is comprised of nitrocellulose, rosaliline, and diphenylamine. No samples will be collected at Batteries Palmer and North because the propellant (NH powder) used does not contain hazardous explosive constituents

[6] Included within the ASR is the statement “Semi-mobile air defense guns of the 40mm and 3-inch or 90mm calibers were installed on the island…” indicating the possibility that 40 mm guns were installed at Fort Michie. Additionally, the ASR included other typical anti-aircraft munitions that were likely stored and possibly used at Fort Michie. Anti-aircraft munitions included .50 caliber, 37 and 40mm munitions. The gun emplacements for these munitions were semi-mobile (USACE 1997). The ASR Supplement, however, does not include .50 caliber, 37mm, or 40mm munitions in its list of armaments at Fort Michie (USACE 2004a). A specific location of the firing points is unknown for the anti-aircraft weapons, however, MC of concern associated with the propellant (DNT, NG) used for these munitions was analyzed at all sample locations.

[7] Nitroglycerine is a common MC found in an assortment of military propellants therefore it was added to the MC analyte list for the artillery guns at Ft. Michie.

Table 2-3. Army Checklist for Important Ecological Places

No.	Checklist Item	Yes / No		Comments
1.	Locally important ecological place identified by the Integrated Natural Resource Management Plan, Base Realignment and Closure Act Cleanup Plan or Redevelopment Plan, or other official land management plans.		No	
2.	Critical habitat for Federally designated endangered or threatened species. See No. 12 below.	Yes		There is evidence of endangered and/or threatened species (Roseate and Common Tern) within the Fort Michie FUDS (Appendix L, T&E response letters).
3.	Marine Sanctuary		No	
4.	National Park		No	
5.	Designated Federal Wilderness Area		No	
6.	Areas identified under the Coastal Zone Management Act	Yes		The coastline of Great Gull Island was identified by the New York Department of State as a coastal zone (New York State GIS Clearinghouse 2008).
7.	Sensitive Areas identified under the National Estuary Program or Near Coastal Waters Program		No	
8.	Critical areas identified under the Clean Lakes Program		No	
9.	National Monument		No	
10.	National Seashore Recreational Area		No	
11.	National Lakeshore Recreational Area		No	
12.	Habitat known to be used by Federally designated or proposed endangered or threatened species	Yes		There is evidence of endangered and/or threatened species (Roseate and Common Tern) within the Fort Michie FUDS (Appendix L, T&E response letters).
13.	National preserve		No	
14.	National or State Wildlife Refuge		No	
15.	Unit of Coastal Barrier Resources System		No	
16.	Coastal Barrier (undeveloped)		No	

Table 2-3. Army Checklist for Important Ecological Places

No.	Checklist Item	Yes / No		Comments
17.	Federal land designated for protection of natural ecosystems		No	
18.	Administratively Proposed Federal Wilderness Area		No	
19.	Spawning areas critical for the maintenance of fish/shellfish species within river, lake, or coastal tidal waters		No	
20.	Migratory pathways and feeding areas critical for maintenance of anadromous fish species within river reaches or areas in lakes or coastal tidal waters in which fish spend extended periods of time		No	
21.	Terrestrial areas utilized for breeding by large or dense aggregations of animals		No	
22.	National river reach designated as Recreational		No	
23.	Habitat known to be used by state designated endangered or threatened species	Yes		There is evidence of endangered and/or threatened species (Roseate and Common Tern) within the Fort Michie FUDS (Appendix L, T&E response letters).
24.	Habitat known to be used by species under review as to its Federal endangered or threatened status		No	
25.	Coastal Barrier (partially developed)		No	
26.	Federally designated Scenic or Wild River		No	
27.	State land designated for wildlife or game management		No	
28.	State-designated Scenic or Wild River		No	
29.	State-designated Natural Areas		No	
30.	Particular areas, relatively small in size, important to maintenance of unique biotic communities		No	
31.	State-designated areas for protection or maintenance of aquatic life		No	
32.	Wetlands		No	
33.	Fragile landscapes, land sensitive to degradation if vegetative habitat or cover diminishes		No	

Fort Michie

Great Gull Island, New York
Suffolk County

Legend

FUDS Boundary

Imagery Source: New York Geographic Information Systems Clearinghouse (2001)

N
W E
S

0 150 300 600 Feet

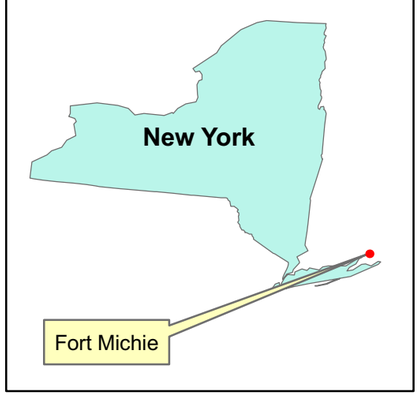
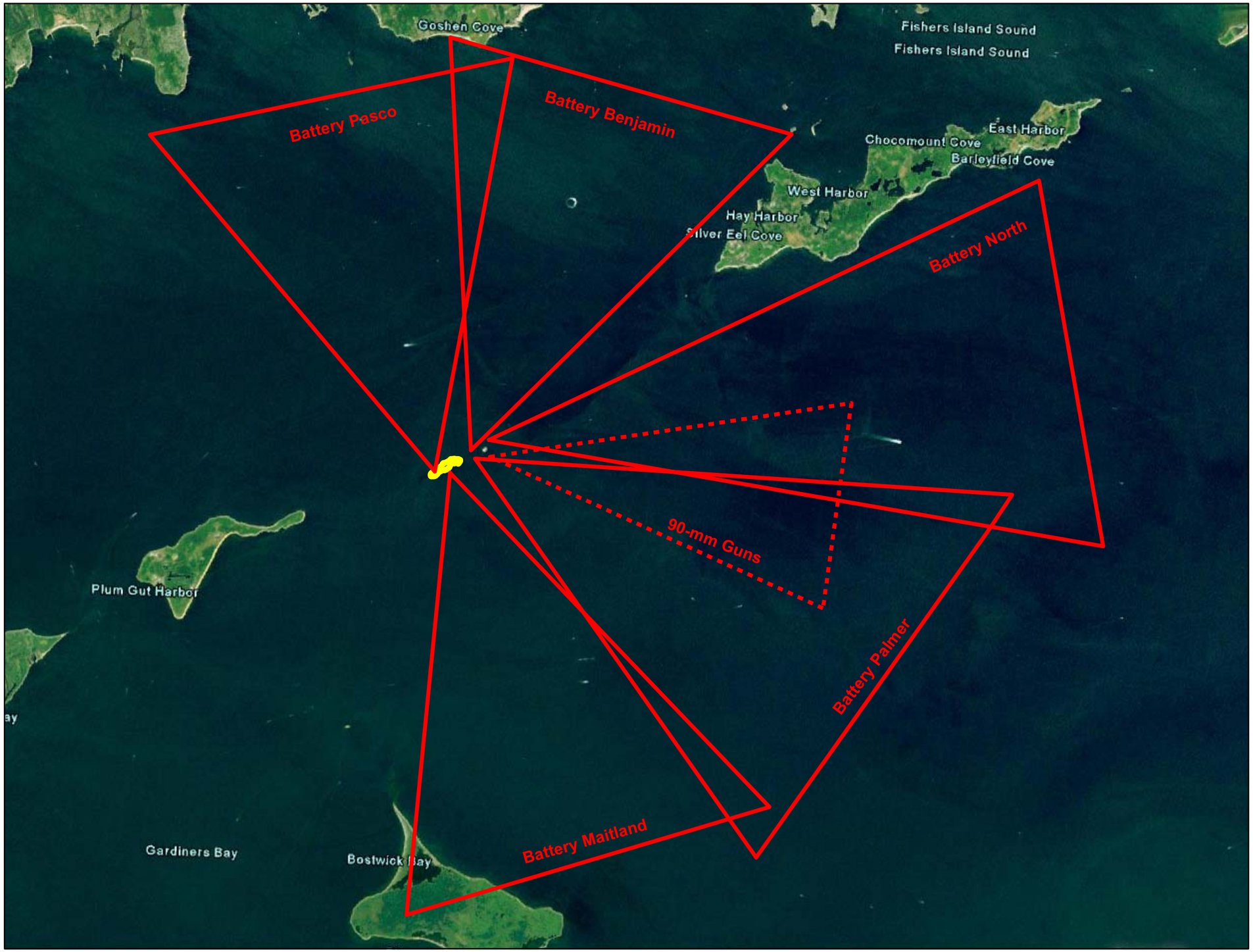


Figure 2-1. Historic Site Layout



Fort Michie

Great Gull Island, New York
Suffolk County

Legend

- 90-mm Guns
- MRS - 1 Range Complex
- FUDS Boundary

Imagery Source: New York Geographic Information Systems Clearinghouse (2001)

N
W E
S

Feet
0 4,900 9,800 19,600

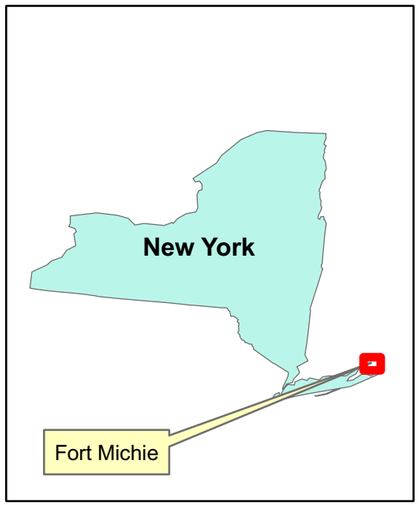


Figure 2-2. Munitions Response Site Boundary and Impact Area

Fort Michie

Great Gull Island, New York
Suffolk County

Legend

FUDS Boundary

Imagery Source: National Oceanic and Atmospheric Administration Chart 13230 (2008)

Sounding in feet at mean lower low water

0 400 800 1,600 Feet

New York

Fort Michie

Figure 2-3. Site Location and Bathymetric Map.

Fort Michie

Great Gull Island, New York
Suffolk County

Legend

MRS - 1 Range Complex

FUDS Boundary

Imagery Source: USGS National Map
Seamless Server 100K DRG (1996)

N
W E
S

Feet
0 4,750 9,500 19,000

Figure 2-4. General Site Location

3. SITE INSPECTION ACTIVITIES

3.1 Technical Project Planning

3.1.1 The first TPP Meeting for Fort Michie was conducted on 12 February 2008 at the Montauk Fire Station, Montauk, New York. The Final TPP Memorandum documenting the meeting was issued in April 2008 (Alion 2008a). The meeting participants included representatives from EPA, NYSDEC, USACE Baltimore District, USACE New York District, the American Museum of Natural History (property owner) and Alion Science and Technology. The participants in the TPP meeting discussed the results of previous investigations, historical aerial photographs, the CSM, and Data Quality Objectives (DQOs).

3.1.2 **DQO 1 – Determine if the site requires additional investigation through an RI/FS or if the site may be recommended for No DoD Action Indicated (NDAI) designation based on the presence or absence of MEC and MC.** The basis of an RI/FS recommendation is specified below:

- Historic data that indicate the presence of MEC or MD.
- Visual evidence or anomalies classified as MEC, MD, or material potentially presenting and explosive hazard (MPPEH).
- One or more anomalies in a target area near historic or current MEC/MD finds or within an impact crater.
- Physical evidence indicating the presence of MEC (e.g., distressed vegetation, stained soil, ground scarring, bomb craters, burial pits).

3.1.2.1 The basis for an RI/FS recommendation related to the presence/absence of MC includes:

- Maximum concentrations at the FUDS exceed EPA regional values screening values based on current and future land use.

- Maximum concentrations at the FUDS exceed EPA interim ecological risk screening values.

- Maximum concentrations at the FUDS exceed site-specific background levels.

- Data indicating the presence or absence (less than Method Detection Limits [MDL] for metals and less than the Reporting Limit [RL] for explosives) of analytes for which no screening criteria are available are to be used to support the weight-of-evidence evaluation of MC at the FUDS.

3.1.2.2 In each of these instances, all lines of evidence (e.g., historic data, field data) are to be used to make a final recommendation for a NDAI designation or RI/FS recommendation. If none of the above scenarios occur, then the recommendation for a NDAI designation for MEC/MC is a possible option.

3.1.3 **DQO 2 – Determine the potential need for a Time Critical Removal Action (TCRA) for MEC and MC by collecting data from previous investigations/reports, conducting site visits, performing analog geophysical activities, and by collecting MC samples.** The basis for recommendations is specified below:

- A TCRA **–** If there is a complete pathway between source and receptor and the MEC/MC and the situation are viewed as an imminent danger posed by the release or threat of a release. Cleanup or stabilization actions must be initiated within six months to reduce risk to public health or the environment.

- A non-TCRA (NTCRA) – If a release or threat of release that poses a risk where more than six months planning time is available.

3.1.3.1 In each of these instances, all lines of evidence (e.g., historic data, field data) are to be used to make a final recommendation for a TCRA or NTCRA.

3.1.4 **DQO 3 – Collect or develop additional data, as appropriate, to support potential Hazard Ranking System scoring by EPA.**

- Verification that data were collected in accordance with the Final SS-WP in the SI Report.

3.1.5 **DQO 4 – Collect the additional data necessary to complete the MRSPP.**

- Completion of the MRSPP for the MRS with all available data and documentation of any data gaps for future annual MRSPP updates.

3.1.6 The TPP meeting participants concurred with the DQOs and the general technical approach for the planned SI activities discussed during the TPP and as revised and subsequently documented in the Final SS-WP (Alion 2008b). In summary, these agreements were to inspect the cited areas of concern and conduct sampling in accordance with the Final SS-WP and complete the assessment in accordance with the DQOs (Appendix B). As part of this SI Report, Alion evaluated the DQOs presented in the SS-WP (Alion 2008b) and completed a DQO attainment verification worksheet to document completion of the DQOs (Appendix B).

3.2 Supplemental Records Review

3.2.0.1 State agencies were contacted regarding threatened and endangered species and cultural and ecological resources at the FUDS property.

3.2.1 Threatened and Endangered Species

3.2.1.1 Threatened or endangered (T&E) species were documented at Fort Michie (USACE 1997 and Appendix L consultation 206 response letters). The New York State Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources and the U.S. Department of Interior Fish and Wildlife Service were contacted and identified the Roseate and Common Terns as the only T&E species that may be present at the FUDS (NYSDEC 2008; USFWS 2008). The complete list of species is provided in Appendix L of this SI Report. Field activities were conducted in a manner and during a time period in which any adverse impacts to these T&E species and their habitat would be avoided (Appendix L).

3.2.2 Cultural and Archaeological Resources

3.2.2.1 There is no information in the ASR Findings regarding cultural or archaeological resources for the former Fort Michie property (USACE 1997). USACE/Alion consulted with the

New York State Office of Parks, Recreation, and Historic Preservation and New York Landmarks Commission to ensure cultural, archaeological and water resources were not present at Fort Michie and/or would not be disturbed during field activities. No adjustments were required to the sampling design to avoid impacts with cultural resources (Appendix L, Section 106 Consultation Letters).

3.3 Site Inspection Fieldwork

3.3.1 On 1 October 2008, the Alion field team visited the former Fort Michie to conduct SI field activities in accordance with the Programmatic Work Plan and the Final SS-WP (Alion 2005, 2008b). A qualitative magnetometer-assisted site reconnaissance for MEC and sample collection and analysis for possible MC contamination was completed (see Fig. 3-1 and 3-2 for Geophysical Reconnaissance Route). An estimated 1.0 acres of land were assessed using qualitative reconnaissance during the field work. A total of four surface soil samples and one duplicate surface soil sample were collected.

3.3.2 MEC reconnaissance findings and MC sample results are discussed in Sections 4 and 5, respectively. As-collected sample locations, sample designations, sampling rationale, and field observations are summarized in Table 3-1. Sampling locations are depicted on Figure 3-1. Additional information pertaining to the field activities, including field notes, forms, and chain of custodies, are provided in Appendix D. A photo documentation log from the SI is included in Appendix E.

3.4 Work Plan Deviations and Field Determinations

3.4.1 Deviations from the Final SS-WP (Alion 2008b) included slight changes to sample locations and the addition of NG as an analyte of concern. Surface soil sample MIC-RC-SS-01-01 was collected as near to the proposed location as possible, however, at this location no medium was available for sampling directly in front of the gun emplacement. At this battery, the sampling location was modified slightly because of site conditions (e.g., change in site conditions, topography, inaccessibility) and to areas where surface soil or other sampling media were present in adequate quantities for sampling. The remaining samples were collected in front of the gun emplacements. Upon future research, references to semi-mobile anti-aircraft guns were found in the 1997 USACE ASR. Munitions associated with the anti-aircraft guns were added to Table 2-2 of the SI report. NG is a common constituent in munitions associated with anti-aircraft weaponry and was included in the sample analyte list and documented in the results and risk screening analyses completed in this SI Report. These deviations were minor in nature

and did not affect the quality of data collected. Refer to the DQO Verification Worksheet included in Appendix B.

3.5 Site Inspection Laboratory Data Quality Indicators

3.5.1 This section summarizes the data quality assessment for the Fort Michie SI analytical data. Data were generated by GPL under the 2006 DoD Quality Systems Manual Version III (DoD 2006) and validated by a third-party (EDS) using EPA Region II Functional Guidelines. The detailed GPL and EDS reports are contained in Appendices F and G, respectively. The data were also analyzed using the Automated Data Review Version 8.1 based on the DoD Quality Systems Manual Version III guidelines, and these results are included in the electronic document management systems (EDMS) database. Data Quality Indicators (DQIs) include precision, accuracy, representativeness, completeness, and comparability as well as sensitivity. At Fort Michie, no quality assurance split samples were collected in accordance with USACE direction. Therefore, the USACE Memorandum for Record-CQAR of Quality Assurance Split Samples is not applicable to this Draft SI Report. However, CENAB will provide a Chemical Data Quality Assessment Report (CDQAR) for inclusion in the Final Appendix G.

3.5.2 Precision is a measure of the reproducibility of repetitive measurements of the same process under similar conditions. Precision is determined by measuring the agreement among individual measurements of the same property, under similar conditions, and is calculated as an absolute value. The degree of agreement was expressed as the relative percent difference between the separate measurements (usually matrix spike/matrix spike duplicate [MS/MSD] pairs) and the observed relative percent difference compared to acceptable values. Any differences between MS/MSD pairs for the Fort Michie data were examined and any affected sample results qualified as discussed in the Region II Functional Guidelines. The MS/MSD samples achieved acceptable values, and these samples were qualified appropriately (Appendix G). Field precision is measured by the comparison of field duplicate samples, which is also discussed as appropriate in Appendix G.

3.5.3 Accuracy is the degree of agreement of a measurement with an accepted reference or true value. Accuracy measures the bias or systematic error of the entire data collection process. To determine accuracy, a sample that was spiked with a known concentration is analyzed by the laboratory as the MS, MSD, surrogate and blank spikes, or Laboratory Control Spike. EDS assessed accuracy according to Region II Functional Guidelines and assigned qualifiers as appropriate (Appendix G).

3.5.4 Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is achieved through proper development of the field sampling program during the TPP and work plan development. Deviations from the Final SS-WP were minor: sample locations were moved slightly due to site-specific conditions, therefore the representative DQI was achieved for Fort Michie.

3.5.5 Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. Data are complete and valid if the data achieve all acceptance criteria including accuracy, precision, and any other criteria specified by the particular analytical method being used. None of the 40 total analyte results associated with this sample effort was rejected; therefore, the completeness indicator is 100 percent. The Fort Michie data meet the completeness data quality indicator.

3.5.6 Comparability expresses the confidence with which one data set can be compared to another. There are no previous analyses of MC at Fort Michie for comparison of reported concentrations from this project. Standard methods for sampling and analyses were followed as documented in the SS-WP; therefore, the comparability DQI was achieved.

3.5.7 Sensitivity is a measure of the screening criteria as they compare to detection limits. If screening criteria exceed detection limits, the certainty of "non-detected" data is called into question. The laboratory reported to the RL for explosives, which represents the lowest concentration at which calibration standards were assessed. Consequently, if sensitivity DQIs were satisfied for explosives, there are no issues. Calibration standards are not analyzed between the Method Detection Limit and the Reporting Limit. The issues with Reporting Limits and/or Method Detection Limits are discussed in Section 5.1.4, however the sensitivity DQI was achieved for all analyte/receptor/matrix combinations. The reporting limit for NG is higher than the human health screening level, and NG has no ecological screening value. Uncertainties associated with the absence of screening values for these MC are discussed within the context of analytical sample results in Section 5. This uncertainty discussion indicates that for this particular FUDS, the absence of screening values does not undermine the certainty with which the determinations of risk for human and ecological receptors can be made.

Table 3-1. Fort Michie Sample Location Descriptions

Location	Sampling ID	Coordinates (NAD 83 UTM Zone 18N)		Rationale of Sampling Locations
		Easting(m)	Northing(m)	
MRS 1 – Range Complex No. 1	MIC-RC-SS-01-01	741542.712	4565253.930	Approximately 28m west of the former Battery Pasco firing point
	MIC-RC-SS-01-02	741727.908	4565364.949	Approximately 5m north-northwest of the eastern gun located at the former Battery Benjamin firing point
	MIC-RC-SS-01-03	741881.305	4565352.056	In the vicinity of the former Battery 912 firing point
	MIC-RC-SS-01-04	741542.712	4565120.985	Approximately 6m west of the former Battery William Maitland firing point

Fort Michie

Great Gull Island, New York
Suffolk County

Legend

- Surface Soil (Reduced 8330A Explosives)
- Geophysics
- FUDS Boundary

Imagery Source: New York Geographic Information Systems Clearinghouse (2001)

N
W E
S

Feet
0 125 250 500

Figure 3-1. Geophysical Reconnaissance Paths.

Fort Michie

Great Gull Island, New York
Suffolk County

Legend

- Photo Locations
- Geophysics
- FUDS Boundary

Imagery Source: New York Geographic Information Systems Clearinghouse (2001)

N
W E
S

Feet
0 125 250 500

Figure 3-2. Site Inspection Photograph Locations

4. MUNITIONS AND EXPLOSIVES OF CONCERN SCREENING LEVEL RISK ASSESSMENT

4.1 Operational History

4.1.1 Fort Michie served as a coastal artillery battery for the Army until 1949 when the property was transferred to the War Assets Administration. Within five years of closure, the property was transferred to the American Museum of Natural History (USACE 1997, 2004a).

4.1.2 One MRS was identified at the former Fort Michie (See Table 2-2). Historical document reviews performed as part of the SI indicated that .50 caliber, 37mm, 40mm, 90mm, 3-inch, 6-inch, 10-inch, 12-inch and 16-inch guns and artillery emplacements were located within MRS 1. One 40mm shell was found on the shore by an employee of the American Museum of Natural History in the 1970s. The 40mm shell was certified as inert and was most likely washed ashore due to tidal action. No MEC or MD was found at the former Fort Michie during the 1997 USACE ASR site investigation or the 2008 Alion SI (USACE 1997 and Alion 2008b).

4.2 Site Inspection Munitions and Explosives of Concern Field Observations

4.2.0.1 A qualitative reconnaissance based on both visual observations and analog geophysics was completed. A visual reconnaissance of the site surface was completed to identify MPPEH/MD/MEC and suspect areas and visual metallic debris associated with munitions. Analog geophysics was used primarily to support anomaly avoidance activities for the field crew.

4.2.0.2 The SI findings are presented below. The total estimated acreage subject to the qualitative reconnaissance is approximately 1.0 acres of land.[3]

4.2.1 Range Complex No. 1 (MRS 1)

4.2.1.1 Range Complex No. 1 (MRS 1) encompasses approximately 92,217.99 acres (54.62 acres of land and 92,163.37 acres of tidal water). Alion completed land reconnaissance of MRS 1 using a ferrous metal geophysics detector (Schonstedt) following a meandering path. Site reconnaissance paths are shown on Figure 3-1. A photograph log is included in Appendix E and the photograph locations are shown on Figure 3-2. Area observations are presented below.

[3] Extent of reconnaissance estimated from global positioning system tracks and includes a 25-ft diameter around each sample location and observations along the global positioning system tracks covering a 6-ft swath.

- Former Fort Michie is only accessible by boat and is operated as a private research facility. Trees and other vegetation occupy a large portion of the FUDS as well as degraded concrete areas associated with the former batteries.
- Qualitative Reconnaissance (QR) was performed along the perimeter of Great Gull Island and around the various artillery battery emplacements. Most of the artillery battery emplacements (Batteries Benjamin, North, Palmer, William Maitland and 90mm guns) were intact and in-place with the exception of Battery Pasco which was partially destroyed due to tidal erosion.
- No subsurface anomalies were detected, however, rebar from the concrete emplacements was still in-place and the Schonstedt detected these metallic objects.
- No MEC/MD were observed in the MRS.
- A total of four surface soil samples and one duplicate surface soil sample were successfully collected at MRS 1.

4.2.2 Background Samples

4.2.4.1 Background samples were not collected because only explosives were analyzed in this SI. Explosives are anthropogenic compounds and would not be expected to be found outside of the FUDS; therefore no basis for comparison with samples collected inside the FUDS could be made.

4.3 Munitions and Explosives of Concern Risk Assessment

4.3.0.1 A qualitative MEC screening level risk assessment was conducted based on the SI qualitative reconnaissance, as well as historical data documented in the INPR, ASR, and ASR Supplement (USACE 1997 and 2004a). An explosive safety risk is the probability of the detonation of an MEC item which could potentially cause harm as a result of human activities. An explosive safety risk exists if a person is in proximity or in contact with MEC and causes a detonation. The potential for an explosive safety risk depends on the presence of three elements: a source (presence of MEC), a receptor (person), and interaction (e.g., touching or picking up an item). The CSM for MRS 1 reflects this MEC assessment strategy (Appendix J).

4.3.0.2 The exposure route for an MEC receptor typically is through direct contact with an MEC item on the surface or through subsurface activities (e.g., digging during construction). A MEC item tends to remain in place unless disturbed through human or natural forces (e.g., frost heaving and erosion). If MEC movement occurs, the probability of direct human contact may increase, but not necessarily result in direct contact or exposure.

4.3.0.3 Each of these primary risk factors was used to evaluate the field and historic data to generate an overall hazard assessment rating of either low, moderate, or high. The MEC source is based on the MEC type, sensitivity, density and depth distribution. The likelihood of exposure and thereby injury, may be severe (lethal if detonation occurs), moderate (minor or major injury if detonation occurs) or low (no detonation and no injury occurs). MEC sensitivity, the likelihood of detonation and severity of exposure (fuzing and weathering, for instance), may be very sensitive (e.g., electronic fuzing, land mines, booby traps), less sensitive (standard fuzing), and insensitive/inert (residual risk or no injury). MEC density and depth are generally unknown and evaluated during follow on studies (RI/FS).

4.3.0.4 Site characteristics are based on site accessibility (no restrictions, limited restrictions, and complete restrictions to access) and site stability (stable, moderately stable, and unstable). Finally, human interaction includes the type of human contact (low, moderate, and significant), population number and frequency of access (low, moderate, high).

Based on these criteria, low, moderate, and high MEC risks are defined as follows in Table 4-1.

Table 4-1. Low, Moderate, High MEC Risk Assessment Categories

MEC Factor	Low MEC Risk	Moderate MEC Risk	High MEC Risk
MEC Source	Low MEC Type (no detonation and no injury) Insensitive/Inert MEC	Moderate MEC Type (minor/major injury) Moderate Sensitive MEC	Severe MEC Type (lethal) Very Sensitive MEC
Site Characteristics	Complete restrictions to access Stable (no MEC exposure by natural events	Limited restrictions to access Moderately stable (MEC may be exposed by natural events)	No restrictions to access Unstable (MEC exposure most likely by natural events)
Human Interactions	Low potential for and frequency of contact (e.g., no general public access, infrequent site access primarily by site personnel, no subsurface activity)	Moderate potential for and frequency of contact (e.g., a limited number of the general public has open and somewhat frequent access, few site uses, surface/subsurface intrusive activity possible)	High potential for and frequency of contact (e.g., general public has open and frequent access, high potential for surface/subsurface intrusive activity)

4.3.1 Range Complex No. 1 (MRS 1)

4.3.1.1 As discussed in Section 4.1.2, one 40mm shell was found by an employee of the American Museum of Natural History at the FUDS in the 1970s. The shell was certified to be inert and interpreted to have washed ashore due to tidal action (USACE 1997 and 2004a). Since military use of the FUDS ended in 1949, no other reports of munitions were reported. No munitions were observed by USACE personnel during the 1997 site visit. No MEC/MD was observed during the 2008 SI reconnaissance.

4.3.1.2 No documented injuries have occurred at the FUDS property. Although the FUDS is accessible by boat only and restricted to research personnel, access to the island is still available. Access to MRS 1 is open to research personnel of the American Natural History Museum whom are the most likely human receptors. Trespassers/visitors are also likely human receptors. The area is moderately occupied during the summer months for research purposes and unoccupied during the winter. MRS 1 has a slightly elevated risk of MEC due to the historic MD find (40mm shell). The overall MEC risk is low based on the single historical MD discovery, site characteristics restricting continual public access, and the limited potential for receptor exposure. This exposure scenario is reflected as such in the CSM (Appendix J).

5. MUNITIONS CONSTITUENTS SAMPLING AND ANALYSIS

5.0.1 A Human Health Risk Assessment (HHRA) and Screening Level Ecological Risk Assessment (SLERA) were conducted to determine whether MC in environmental media at Fort Michie may warrant a more detailed assessment of potential risk to current or future human and ecological receptors. The screening methodology, CSM, analytical results for the MC sampling, and results of the screening assessment are presented below.

5.1 Data Evaluation Methodology

5.1.0.1 The following sections present the process used to evaluate the MC data collected for the Fort Michie FUDS. The methodology is designed to evaluate data for relevant MCs in the HHRA and SLERA using the appropriate screening criteria. The methodology also provides a means to evaluate uncertainty in the screening HHRA and SLERA process and provide context for the risk conclusions. This process is consistent with the decision rules outlined in Section 3.1 (TPP) of this report, and is described in more detail in the following sections.

5.1.1 Refinement of Munitions Constituents

5.1.1.1 During the SI process, Alion evaluated MCs potentially associated with Fort Michie. MCs were identified based on knowledge of munitions historically used at the FUDS. Information on historic use was obtained from munitions data sheets, historical documents, and other munitions reference documents.

5.1.1.2 The list of MCs for the single MRS identified at Fort Michie is provided below and presented in further detail in Table 2-2.

Range Complex No. 1 (MRS 1)

- Explosives (DNT and DNT breakdown products {2,4-DNT, 2,6-DNT, 2-amino-4,6-DNT, 2-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-DNT, and 4-nitrotoluene}, Nitroglycerine (NG))

5.1.2 Data Quality

5.1.2.1 Only validated data were used in the screening process. The validated data were composed of the following samples:

1. Four surface soil samples (collected zero to six inches bgs)
2. One duplicate[4] surface soil sample

5.1.2.2 The first step in the screening risk assessments was the evaluation of the analytical data. Inclusion or exclusion of data on the basis of analytical qualifiers was performed in accordance with U.S. EPA guidance (EPA 1989a and 1989b). The following provides a listing of the qualifiers in the validated analytical data and their treatment in the risk assessments:

- Analytical results bearing the U qualifier (indicating that the analyte was not detected at the given detection limit) were retained in the data set. The reporting limit was used for non-detected samples.

5.1.3 Screening Values

5.1.3.1 Screening concentrations were used in the HHRA and SLERA to support risk-based conclusions and recommendations regarding the FUDS property. Maximum property concentrations for relevant MCs were compared to the risk-based concentrations as part of the selection process for COPCs and COPECs.

5.1.3.2 For the HHRA, EPA regional screening levels (SLs) for residential soil and industrial soil (outdoor worker) were selected as the screening criteria to select COPCs in soil. The SLs, referred to in this section as "regional SLs" are available from the EPA (EPA 2008b). SLs are developed from toxicity values and standard exposure factors to estimate contaminant concentrations that are protective of humans, including sensitive subgroups, over a lifetime. The regional SLs for residential and industrial soils consider exposures through direct contact (e.g., incidental ingestion, dermal contact, inhalation of particulates and vapors) and reflect exposure pathways identified for MCs in the SS-WP that could occur at the FUDS (i.e., potentially completed pathways).

5.1.3.3 In some cases, SLs are based on the toxicity, or relative toxicity of related compounds. The regional SLs for 2-amino-4,6-DNT and 4-amino-2,6-DNT are based on toxicity information for 2,4-DNT. Because the amino-DNT isomers may behave differently from 2,4-DNT, the use of the regional SLs for these MCs may result in some uncertainty in the risk assessment.

[4] The duplicate sample was treated as a discrete sample; duplicates were not averaged for the purpose of this risk screening.

5.1.3.4 The regional SLs for direct contact with soil correspond to typical risk thresholds of a one-in-one million (1E-06) cancer risk or a non-carcinogenic hazard quotient (HQ) of 1.0. The HHRA screening levels for 2-nitrotoluene and 4-nitrotoluene are based on carcinogenic endpoints. The HHRA screening levels for 2,4-DNT, 2,6-DNT, 2-amino-4,6-DNT, 3-nitrotoluene, 4-amino-2,6-DNT, and NG are based on non-carcinogenic endpoints.

5.1.3.5 As discussed in the SS-WP Addendum, the screening levels derived from non-carcinogenic endpoints were divided by ten to provide a means to account for potential occurrence of adverse non-carcinogenic health effects due to exposure to multiple non-carcinogens. The application of HHRA screening values is described in Sections 5.1.3.9 and 5.1.3.10. Results of the HHRA are discussed in Section 5.3 and presented in Table 5-1.

5.1.3.6 Screening for ecological-based COPECs was conducted by calculating an HQ, which represents the ratio of the maximum detected chemical concentration in environmental media to a medium specific ecological screening level. Screening levels derived from studies in specific medium and environmentally similar conditions to those at the FUDS are the most relevant and appropriate for screening. In cases where screening values derived from environmentally specific environments are not available, alternative screening values may offer a sufficient screening tool.

5.1.3.7 Ecological soil screening levels (eco-SSLs) were used to screen for COPECs in soil. Eco-SSLs are screening level benchmark concentrations for contaminants in soil that were determined to be protective of terrestrial-based ecological receptors that commonly come into contact with soil or ingest biota that live in or on the soil. These benchmark concentrations generally are used for screening-level purposes to identify COPECs in upland soils that may require further evaluation. Eco-SSLs are derived using information on toxicity and estimated ingestion exposure doses for terrestrial ecological receptors. As described in the SS-WP Addendum CSM diagram for Fort Michie, potentially completed transfer pathways for surface soils to ecological receptors at the FUDS are ingestion, dermal contact, and inhalation. EPA guidance (2005) states that because dermal and inhalation pathways are generally less significant compared to ingestion, they do not warrant inclusion in the derivation of eco-SSLs. Therefore, the eco-SSLs derived using exposure assumptions for ingestion only, are determined to be adequate for the purposes of the SLERA.

5.1.3.8 No eco-SSLs were available from EPA for any of the explosives evaluated at the FUDS. Consistent with previous SLERAs under this program, screening values were obtained from Talmage et al. (1999) for these MCs. The eco-SSLs of 30 mg/kg for 2,4-DNT, 2,6-DNT, 2-

nitrotoluene, 3-nitrotoluene, and 4-nitrotoluene are based on toxicity data for 2,4,6-Trinitrotoluene (2,4,6- TNT). 2,4,6-TNT can be reduced by several pathways. Although there is not conclusive evidence on the dominant process by which 2,4,6-TNT is reduced in soil, several studies show bacterial degradation of 2,4,6-TNT to 2- and 4- amino-DNT under aerobic and anaerobic conditions (Vorbeck et al. 1998). An *in vitro* study completed in a *Psuedomonas bacterium* species suggests that 2,4,6-TNT breaks down to 2,4-DNT (Haidour and Ramos 1996). Laboratory studies support the observations of Haidour and Ramos (1996) that bacteria strains can generate 2, 4- DNT from TNT (Martin et al. 1997). These findings support the use of TNT as a surrogate for DNT and DNT breakdown products. However, because there is not definitive knowledge regarding the reductive processes that dominate TNT breakdown (Vorbeck et al. 1998), there is some uncertainty associated with adopting a surrogate screening value from 2,4,6-TNT. A limited amount of data were available for the derivation of eco-SSLs for 2-amino-4,6-DNT, and 4-amino-2,6-DNT. These eco-SSLs were derived using data from a single study in plants. No eco-SSL was available for NG.

5.1.3.9 In accordance with EPA Guidance, the following screening process is utilized.

1. The maximum concentration of each chemical detected in each medium is identified.

2. If a chemical was detected in at least one sample in a specific medium, it is retained for consideration in the screening of COPCs/COPECs.

3. If the concentration of a specific chemical exceeds its screening value and is above the maximum background concentration, the chemical is retained as a COPC/COPEC.

4. If a screening concentration is not available for a specific chemical in a particular medium, the screening concentration for a structurally similar compound is used, if warranted. The screening tables list any surrogates that are used.

5. An analyte is eliminated from the list of COPCs/COPECs if it is an essential nutrient of low toxicity, and its reported maximum concentration is unlikely to be associated with adverse health impacts.

5.1.3.10 All target analytes detected at the FUDS were evaluated against screening criteria determined for the HHRA. For the HHRA, the maximum detected concentration was compared to the screening value. If the maximum concentration was less than the screening value, the

target analyte was eliminated from consideration. If the maximum concentration exceeded the screening value, the analyte was retained as a COPC.

5.1.3.11 Under the SLERA, an HQ analysis was completed for each detected analyte. An HQ is defined as the measured concentration divided by the screening criteria. If the maximum concentration was less than the screening value (HQ < 1.0), the analyte was eliminated from consideration as a COPEC. If the maximum concentration exceeded the screening value (HQ > 1.0), the analyte was retained as a COPEC.

5.1.3.12 For both the HHRA and SLERA, in cases in which no screening criteria are available, any available information regarding the potential for the MC to present a risk to receptors is presented.

5.1.4 Comparison of Screening Levels with Reporting Limits for Never-Detected Analytes

5.1.4.1 The usability of the analytical data for making conclusions regarding risk was evaluated by comparing the reporting limits for never-detected chemicals to their respective screening values used for human health (Table 5-2) and ecological (Table 5-3) risk screening. If a chemical was never detected, but the reporting limit was higher than the screening value, then eliminating the chemical as a COPC or COPEC for the FUDS would introduce uncertainty into the risk assessment. Where no screening values are available, no conclusions can be drawn regarding the adequacy of the reporting limits for screening risk, and as a result, uncertainty is introduced into the risk assessment.

5.1.4.2 Table 5-2 compares the reporting limits and human health screening values for all analytes never detected in surface soil. All of the explosives analyzed were never detected above their respective reporting limits in soil. For all MC, with the exception of NG, these screening criteria were higher than their associated reporting limits. When the residential soil SL of 6.1 mg/kg for NG is divided by ten to account for the potential exposure to multiple non-carcinogens (as described in Section 5.1.3.5), the resulting screening soil concentration of 0.61 mg/kg is lower than the reporting limit of 4 mg/kg for NG in soil. However, under the methodology employed in the HHRA for cumulative non-carcinogenic risk, ten chemicals are assumed to elicit toxic effects on the same target organ. At this MRS, only eight MCs were identified. Each of these MCs is not anticipated to act by the same non-carcinogenic mode of action or at the same target organ. Considering these factors, the reporting limit for NG is determined to be adequate for the HHRA screening at this FUDS. As described in Section 5.1.3.4, the regional SLs for 2-amino-4,6-DNT and 4-amino-2,6-DNT are based on toxicity information for 2,4-DNT. The

reporting limits of 0.04 mg/kg in soil for the amino-DNT isomers are below screening criteria developed from regional SLs for use in the HHRA (15 and 200 mg/kg, 2-amino-4,6-DNT; 15 and 190 mg/kg, 4-amino-2,6-DNT). Any uncertainties in the application of these screening levels to the risk assessment are, therefore, determined not to be significant for the HHRA.

5.1.4.3 Table 5-3 shows a comparison of the reporting limits and ecological screening values for analytes never detected in surface soil. All eight of the explosives analyzed were never detected above their respective reporting limits. The reporting limits for 2,4-DNT, 2,6-DNT, 2-amino-4,6-DNT, 2-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-DNT, and 4-nitrotoluene were below their respective ecological screening values used in the SLERA. The eco-SSL for 2,4,6-TNT was adopted for 2,4-DNT, 2,6-DNT, 2-nitrotoluene, 3-nitrotoluene, and 4-nitrotoluene. As described in Section 5.1.3.8, the use of the 2,4,6-TNT screening value for these MCs introduces some uncertainty into the risk screening. The reporting limits of 0.04 mg/kg for 2,4-DNT and 2,6-DNT and 0.08 mg/kg for 2-nitrotoluene, 3-nitrotoluene, and 4-nitrotoluene are well below the soil screening value of 30 mg/kg adopted for these MC in the SLERA. Therefore, any uncertainties associated with the use of 2,4,6-TNT as a surrogate for these five MCs are determined not to be significant for the SLERA. Since there was no screening level available for NG, no conclusion regarding the adequacy of the reporting limit obtained for this MC can be made.

5.2 Conceptual Site Model

5.2.0.1 The CSM diagram for MRS 1 at Fort Michie is provided in Appendix J. The CSM defines the source(s) (e.g., the secondary source/media), interaction (e.g., secondary release mechanism, tertiary source, exposure route), and receptors at the FUDS and provides an overview of completed and potentially completed pathways. The CSM is limited to those areas potentially impacted by MEC and/or MCs based on the site use and history. These areas are shown in Figure 2-2. In this SI Report, the CSM was revised from the version presented in the SS-WP to reflect the results of the human and ecological risk screening (Alion 2008b).

5.2.0.2 Current and future potential human receptors for the FUDS are expected to be visitors/trespassers, construction workers, and employees. In the HHRA, the screening values for the trespassers/visitors were based on regional SLs for direct contact with residential soil. The screening values used for construction workers and employees were based on the regional SLs for direct contact with industrial soils. The ecological receptors of concern for the FUDS are plants, benthic invertebrates, terrestrial-feeding mammals, and terrestrial-feeding birds. Screening values selected for the SLERA were applied uniformly to all ecological receptors. As described in the SS-WP Addendum for Fort Michie there are no permanent surface water bodies

within the FUDS or MRS 1. Given that the bedrock at the MRS is very shallow, stakeholders agreed that subsurface soil is not a medium of concern for the FUDS. According to stakeholders at the TPP meeting, no wells are located, or are anticipated to be constructed in the future, at Great Gull Island (Alion 2008a). Therefore groundwater was also determined not to be a medium of concern (Alion 2008b).

5.2.0.3 Potentially complete pathways for human and ecological receptors are based on the presence of MEC/MC and interactions including transport and release mechanisms and receptor use patterns.

5.2.0.4 A pathway is complete if all of the following conditions are present:

1. Source and mechanism of chemical release (e.g. a munitions-related organic chemical is detected).

2. Transfer mechanisms (e.g. overland flow of contaminants into an adjacent stream, advection of contaminants with groundwater flow).

3. Point of contact (exposure point, e.g., drinking water, soil).

4. Exposure route to receptor (e.g., ingestion, inhalation, etc.).

5.2.0.5 Once it was determined that complete pathways exist between media and receptors, as discussed in Section 5.2.0.4, comparisons of maximum detected site concentrations to risk-based screening values are used to determine if the MC is a COPC or COPEC, depending on the risk screening being conducted (human health and ecological respectively). Using a weight of evidence approach, a RI/FS may be recommended for MC where COPC and/or COPEC are identified. An NDAI designation may be recommended for MC if there are no MC detections, no COPCs or COPECs are identified through the risk screening process, or if the weight of evidence evaluation indicates that COPCs/COPECs do not pose an unacceptable risk to the exposed receptor.

5.2.0.6 In conclusion, pathway completeness will result in an RI/FS recommendation for MC only in the instance where risk screening criteria exceedances occur. A pathway can be complete but an RI/FS is not recommended if there are no exceedances of risk screening criteria or if identified risks are determined to be at acceptable risk levels. When a pathway is incomplete, an RI/FS recommendation is not made.

5.3 Range Complex No. 1 (MRS 1)

5.3.0.1 As presented in Section 5.1.1, DNT and its breakdown products and NG were identified as the MCs for evaluation in MRS 1. Surface soil was identified as the single medium of concern. Table 5-1 presents results of the screening level analysis in surface soil for MRS 1.

5.3.1 Soil Pathway and Screening Results

5.3.1.1 Potentially complete exposure pathways in surface soils were initially identified for human and ecological receptors. Four surface samples and one duplicate surface sample were collected in MRS 1 in the area of the former firing points (in front of one of the two gun emplacements of Batteries Pasco, Benjamin, William Maitland, and 912). All five samples were analyzed for DNT and its breakdown products and NG. Table 5-1 presents the analytical results for surface soils along with the human health and ecological screening values described previously in Section 5.1.3.

5.3.1.2 As described in the SS-WP Addendum for Fort Michie the ingestion of, dermal contact with, and inhalation of MC from surface soil were identified as potentially completed pathways for visitors/trespassers, construction workers, employees, and biota.

5.3.1.3 No explosives were detected in concentrations above their respective reporting limits in surface soil samples collected at MRS 1. The reporting limits for 2,4-DNT, 2,6-DNT, 2-amino-4,6-DNT, 2-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-DNT, and 4-nitrotoluene were below the screening criteria selected for the HHRA, which confirms the ability of the analytical techniques to detect the MCs at levels sufficient to screen for risks to human receptors. As described in Section 5.1.4.2, the reporting limit for NG was also deemed adequate to support the HHRA. Based on the fact that no MCs were detected; no completed pathways for human receptors from surface soils are present in MRS 1.

5.3.1.4 As described above, no explosive MCs were detected in the soil samples for MRS 1. The reporting limits for 2,4-DNT, 2,6-DNT, 2-amino-4,6-DNT, 2-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-DNT, and 4-nitrotoluene were below the ecological screening criteria selected for the SLERA. This confirms the ability of the analytical techniques to detect the MCs at levels sufficient to screen for risks to ecological receptors.

5.3.1.5 No eco-SSL was available for NG, therefore it is not possible to make a similar comparison for this MC. NG is readily biodegradable and is not expected to bioconcentrate or biomagnify, which makes food chain exposures unlikely (United States Army Center for Health Promotion and Preventative Medicine (USACHPPM) 2007). Based on the fact that NG was not detected above the analytical reporting limit, and its fate and transport characteristics, NG was not identified as a COPEC in MRS 1 and is not expected to introduce an unacceptable level of uncertainty into the SLERA. Based on the fact that no MCs were detected; no completed pathways for ecological receptors from surface soil are present at MRS 1.

Table 5-1 Summary of Soil Analytical Results

			Screening Levels Residential Soil Direct Contact [a,b]	Screening Levels Industrial Soil- Direct [a,b]	Interim Eco-SSLs					
		Sample Name:				MIC-RC-SS-01-01	MIC-RC-SS-01-02	FD #01	MIC-RC-SS-01-03	MIC-RC-SS-01-04
		Sample Date:				10/1/2008	10/1/2008	10/1/2008	10/1/2008	10/1/2008
		Parent Name:						MIC-RC-SS-01-02		
		MRS:				MRS 1	MRS 1	MRS 1	MRS 1	MRS 1
Analyte	**CAS**	**Unit**	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**					
Explosives										
2,4-DINITROTOLUENE	121-14-2	mg/kg	12	120	30 [d]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,6-DINITROTOLUENE	606-20-2	mg/kg	6.1	62	30 [d]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	15 [c]	200 [c]	80 [d]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-NITROTOLUENE	88-72-2	mg/kg	2.9	13	30 [d]	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
3-NITROTOLUENE	99-08-1	mg/kg	120	1,200	30 [d]	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	15 [c]	190 [c]	80 [d]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
4-NITROTOLUENE	99-99-0	mg/kg	30	110	30 [d]	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
NITROGLYCERIN	55-63-0	mg/kg	0.61	6.2	NSL	4.00 U	4.00 U	4.00 U	4.00 U	4.00 U

[a] Screening levels for residential and industrial soils are derived from EPA 2008. EPA. 2008a. Screening levels for chemical contaminants. Available at:http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.html. U.S. Department of Energy, U.S. Environmental Protection Agency.

[b] For non-carcinogens, the soil residential and industrial soil screening level was divided by 10. No adjustment was made for carcinogens.

[c] The EPA regional screening level for 2-amino-4,6-dinitrotoluene and 4-amino-2,6-dinitrotoluene is based on toxicity information for 2,4-dinitrotoluene (from EPA's IRIS).

[d] Talmage et al. 1999. Nitroaromatic munition compounds: environmental effects and screening values. Rev. Environ. Contam. Toxicol. 161: 1-156. Values based on 2,4,6-TNT with the except ion of 2-amino-4,6-dinitrotoluene and 4-amino-2,6-dinitrotoluene.

CAS = Chemical Abstract Service
eco-SSL = Ecological soil screening level
EPA = United States Environmental Protection Agency
IRIS = EPA's Integrated Risk Information System
mg/kg = Milligram per kilogram
MRS = Munitions Response Site
NSL = No screening level

RfD = Reference dose
U = Not detected. Values are reporting limits (RLs)

Shaded and bolded values represent exceedance of human health screening criteria.
Shaded and italicized values represent exceedance of ecological screening criteria.

Table 5-2
Non-Detection Concentrations and Screening Values for Human Receptors for Never-Detected Analytes

Analyte	CAS	Units	Minimum Non-Detect Concentration [a]	Maximum Non-Detect Concentration [a]	Screening Value - Visitor/Trespasser [b]	Screening Value - Workers [b]
Surface Soil						
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.04	0.04	12	120
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.04	0.04	6.1	62
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	0.04	0.04	15	200
2-NITROTOLUENE	88-72-2	mg/kg	0.08	0.08	2.9	13
3-NITROTOLUENE	99-08-1	mg/kg	0.08	0.08	120	1,200
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	0.04	0.04	15	190
4-NITROTOLUENE	99-99-0	mg/kg	0.08	0.08	30	110
NITROGLYCERIN	55-63-0	mg/kg	4	4	0.61	6.2

[a] Detection limits are reporting limits (RL).
[b] Sources and derivations of screening levels for all receptors are detailed in Table 5-1.

CAS = Chemical Abstract Service.
mg/kg = Milligram per kilogram.

Table 5-3
Non-Detection Concentrations and Screening Values for Ecological Receptors for Never-Detected Analytes

Analyte	CAS	Units	Minimum Non-Detect Concentration [a]	Maximum Non-Detect Concentration [a]	Ecological Screening Value [b]
Surface Soil					
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.04	0.04	30
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.04	0.04	30
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	0.04	0.04	80
2-NITROTOLUENE	88-72-2	mg/kg	0.08	0.08	30
3-NITROTOLUENE	99-08-1	mg/kg	0.08	0.08	30
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	0.04	0.04	80
4-NITROTOLUENE	99-99-0	mg/kg	0.08	0.08	30
NITROGLYCERIN	55-63-0	mg/kg	4	4	NSL

[a] Detection limits are reporting limits (RL).
[b] Sources and derivations of screening criteria are detailed in Table 5-1.

CAS = Chemical Abstract Service.
mg/kg = Milligram per kilogram.
NSL = No screening level

6. SUMMARY AND CONCLUSIONS

6.0.1 The Fort Michie FUDS is located north of Long Island, New York in the eastern portion of Suffolk County, New York. The NAD 1983 coordinates for the central part of the property are UTM, Zone 18N, (X) 741608 meters (m) and (Y) 4565215 m. This FUDS falls under the geographical jurisdiction of USACE New York District. This SI is being completed under DERP-FUDS Project No. C02NY061203 to address potential MMRP hazards remaining at the FUDS (USACE 2004a).

6.0.2 During the SI, one MRS was identified in the Fort Michie FUDS, as follows:

- MRS 1 – Range Complex No. I

6.0.3 A summary of the results and conclusions is presented below, and is summarized in Table 6-1.

6.1 Range Complex No. 1 (MRS 1)

6.1.1 Range Complex No. 1 (MRS 1) encompasses the entirety of Great Gull Island and totals approximately 55 acres of land. Potential human receptors for MRS 1 include visitors/trespassers, construction workers and employees. Potential ecological receptors include benthic organisms, terrestrial-feeding mammals, and terrestrial-feeding birds.

6.1.2 According to programmatic and historical documentation, stakeholders and the SI field crew, the only reported ordnance findings at MRS 1 include the 40mm shell found by the American Museum of Natural History employee in the 1970s (Alion 2008a and 2008b; USACE 1997 and 2004a). Additionally, during the 1997 ASR site visit USACE personnel did not observed any MD or MEC within the MRS. The 2008 Alion SI field activities did not observed any MD or MEC. The overall MEC risk at MRS 1 is low based on historic and SI findings and the potential for receptors to interact with MEC/MD.

6.1.0.3 Surface soil was the only medium with a potentially complete exposure pathway for human and ecological receptors in MRS 1. No MC were detected, therefore, there are no completed pathways for human or ecological receptors at MRS 1. No COPCs or COPECs were identified.

Table 6-1 Summary of Human Health and Ecological Screening Level Risk Assessment Results

Medium of Concern/MRS	Human Health COPCs (HHRA) [a]	Ecological COPECs (SLERA)[a]
Surface Soil/ MRS 1	No exceedence of screening criteria No COPC	No exceedence of screening criteria No COPEC

[a] Sources and derivations of screening levels for all receptors and environmental media in the HHRA and SLERA are detailed in Table 5-1.

COPC = Chemical of potential concern
COPEC = Chemical of potential environmental concern
HHRA = Human health risk assessment
MRS = Munitions Response Site
SLERA = Screening level ecological risk assessment

7. RECOMMENDATIONS FOR FURTHER ACTION

7.0.1 One MRS, MRS 1 – Range Complex No. 1, was identified at the Fort Michie FUDS. The water portion of the range was not evaluated given the depth and dynamic nature of the ocean which presents an unlikely receptor pathway thus making further investigation unfeasible.

7.0.2 Based on the results and conclusions of this SI, the following recommendations are provided:

MRS 1 (Range Complex No. 1) Land Portion – An NDAI designation is recommended at MRS 1 (land portion). Only one MEC/MD report was made at MRS 1 historically and no MEC/MD were observed during the 1997 ASR SI or during this SI. The one MEC/MD item (40mm shell) found during the 1970's was determined to be inert and was likely transported to the FUDS via tidal action (USACE 1997). Based on historical research of MRS 1, the general absence of reported munitions finds, and the focused inspection of the area where MEC/MD would most likely be found, there is a reasonable probability that MEC or MD is not present at MRS 1. There were no detections of explosives related MC in any of the environmental samples collected at MRS 1, therefore, no unacceptable risks were identified to any receptors since no COPC's or COPEC's were identified. Based on the findings and conclusions of the SI Report, a NDAI designation is recommended for the land portion of MRS 1.

MRS 1 (Range Fans) Water Portion – During this SI, no environmental sampling or geophysical reconnaissance was conducted within the water portion of MRS 1, thus a human health or ecological risk assessment could not be performed. The status of the water portion of MRS 1 remains under evaluation. USACE should establish separate MRSs for the land and water portions of MRS 1. Separate MRSPP evaluations for the land and water portions were prepared to support this recommendation.

7.0.3 Neither a TCRA nor a NTCRA are recommended for MRS 1 at Fort Michie.

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APPENDIX A – SCOPE OF WORK

Located on CD.

APPENDIX B – TECHNICAL PROJECT PLANNING MEMORANDUM

- Technical Project Planning Memorandum (Located on CD)
- Data Quality Objective Verification Worksheets

Data Quality Objective Verification Worksheet			
Site: **Fort Michie**			
Project: FUDS MMRP SI Project Number **C02NY061203**			
DQO Statement Number: **1 of 4**			
DQO Element Description	**Site-Specific DQO Statement**	**Attained?**	**Required Corrective Action**
Intended Data Use(s):			
Project Objective(s) Satisfied	Determine if the site requires additional investigation through a remedial investigation/feasibility study (RI/FS) or if the site may be recommended for No Department of Defense Action Indicated (NDAI) based on the presence or absence of munitions and explosives of concern (MEC) and munitions constituents (MC).	Yes ☑ No ☐	
Data Needs Requirements:			
Data User Perspective(s)	Risk - MEC and MC, Compliance	Yes ☑ No ☐	
Contaminant or Characteristic of Interest	MEC or Material Potentially Presenting an Explosive Hazard (MPPEH) and MC	Yes ☑ No ☐	
Media of Interest	MEC - Surface soil MC - Surface soil	Yes ☑ No ☐	
Required Sampling Locations or Areas	MEC and MC: Areas where military munition-related operations occurred and/or where MEC or MPPEH has been identified historically based on existing documentation and interviews.	Yes ☑ No ☐	
Number of Samples Required	MEC: Analog geophysical and visual reconnaissance data, rather than discrete sampling data, will be collected to accomplish this objective. These data will be collected using a "meandering path" to and from the sampling points. The UXO Technician will collect data on an approximately 6-ft wide path using the geophysical equipment. The visual reach of observations is approximately 12 ft, and may be limited by the presence of vegetation. Once at the individual sampling point, the geophysical equipment will be used to assess an approximately 25 ft radius circle for anomalies around the sampling point as site conditions permit. In some areas, there may be limitations to the ability to complete geophysical and visual observations. The total estimated area on the paths to/from the sampling locations is approximately 84,356 ft² [1.94 acres] on land. The area around the sampling locations is approximately 7,814 ft² [0.18 acres] (See Appendix A Figure 8) MC: A total of 4 surface soil samples will be collected.	Yes ☑ No ☐	The acreage was calculated incorrectly in the Final SS-WP. The correct proposed acreage was 1.2 acres, therefore the 1.0 acres performed during the SI satisfies the requirements proposed in the DQO.

Data Quality Objective Verification Worksheet			
Site: **Fort Michie**			
Project: FUDS MMRP SI Project Number C02NY061203			
DQO Statement Number: **1 of 4**			
DQO Element Description	**Site-Specific DQO Statement**	**Attained?**	**Required Corrective Action**
Reference Concentration of Interest or Other Performance Criteria	MEC: If historic data indicate the presence of MEC and one anomaly classified as MPPEH, or confirmed MEC are found with the magnetometer, or if physical evidence indicating the presence o MEC are found during the visual inspection, then an RI/FS may be recommended. If no anomalies, MPPEH, or confirmed MEC are found, or if the UXO Technician indicates that there is no potential hazard from past use of munitions or MEC discoveries, then an NDAI designation may be recommended. In each of these instances, all lines of evidence (e.g., historic data, field data, etc.) will be used to make a final decision for an NDAI designation or RI/FS recommendation. In both instances (RI/FS or NDAI), all lines of evidence (e.g., historic data, field data etc. for both MEC and MC) will be used to make a final decision for an NDAI or RI/FS.	Yes ☑ No ☐	
	MC: If the maximum concentrations measured at the site exceed EPA Regional Screening Levels based on current and future land use, or EPA interim ecological risk screening values, or site-specific background levels (highest value and mean value), then an RI/FS may be recommended for the site. If the maximum concentrations measured at the site do not exceed EPA Regional Screening Levels or ecological risk screening values, then an NDAI designation may be recommended. In summary, all lines of evidence including secondary lines of evidence, such as historic data, field data, and comparison to regional background concentration ranges for metals (if available), will be used to make a final decision for an NDAI designation or RI/FS. Screening values selected for comparison at this site are specified in the chemical-specific measurement quality objective (MQO) tables.	Yes ☑ No ☐	
Appropriate Sampling and Analysis Methods:			
Sampling Method and Depths	MEC: Geophysics with a handheld analog magnetometer will be used to collect related data. The magnetometer is accurate to an approximate depth of 2 ft. Global Positioning System (GPS) equipment will be used to log locations of MEC items encountered by the magnetometer, subsurface anamolies, and the path of qualitative reconnissance. Visual observations will provide a continuous source of additional information which will be noted in the field log book with GPS coordinates of any munitions found. Photographs are used as an additional documentation method. Geophysical methods/procedures will be described in detail in Section 3 of the SS-WP, and the Field Activities section of the programmatic field sampling plan (PFSP). MC: Sampling methods for MC are described in detail in Section 4 of the SS-WP, and Field Activities section of the PFSP.	Yes ☑ No ☐	

Data Quality Objective Verification Worksheet			
Site: Fort Michie			
Project: FUDS MMRP SI Project Number C02NY061203			
DQO Statement Number: **1 of 4**			
DQO Element Description	**Site-Specific DQO Statement**	**Attained?**	**Required Corrective Action**
Analytical Method	MEC: Analytical methods are not used with analog magnetometry. However, trained UXO professionals, engineers, and scientists will review all data to determine whether evidence gathered indicates the presence or absence of MEC. This analysis will be subject to an independent review within the Alion Team, by the USACE North Atlantic New York (CENAN), USACE Baltimore District Design Center (CENAB), and USACE Center of Expertise. MC: The methods that are used for analysis include the following: Explosives Method - 8330A; Explosives Prep Method - 8330A and 8330A(mod)	Yes ☑ No ☐	

Data Quality Objective Verification Worksheet			
Site: **Fort Michie**			
Project: FUDS MMRP SI Project Number **C02NY061203**			
DQO Statement Number: **2 of 4**			
DQO Element Description	**Site-Specific DQO Statement**	**Attained?**	**Required Corrective Action**
Intended Data Use(s):			
Project Objective(s) Satisfied	Determine the potential need for a Time-Critical Removal Action (TCRA) for MEC and MC by collecting data from previous investigations/reports, conducting site visits, performing analog geophysical activities, and by collecting MC samples.	Yes ☑ No ☐	
Data Needs Requirements:			
Data User Perspective(s)	Risk - MEC and MC, Compliance	Yes ☑ No ☐	
Contaminant or Characteristic of Interest	MEC or Material Potentially Presenting an Explosive Hazard (MPPEH) and MC	Yes ☑ No ☐	
Media of Interest	MEC - Surface soil MC - Surface soil	Yes ☑ No ☐	
Required Sampling Locations or Areas	Areas where military munitions-related operations occurred and/or where MEC or MPPEH has been identified historically based on existing documentation and interviews.	Yes ☑ No ☐	
Number of Samples Required	Refer to DQO 1 for MC/MEC sampling parameters.	Yes ☑ No ☐	
Reference Concentration of Interest or Other Performance Criteria	If MC is reported in samples collected at the FUDS at concentrations exceeding screening criteria and those exceedances result in unacceptable risk and an imminent threat to receptors as identified through human health and ecological risk assessments or if one piece of confirmed MEC is found with the magnetometer or if physical evidence indicating the presence of MEC is found during the visual inspection, and if the item(s) is determined by a qualified UXO-Technician, explosive ordnance disposal (EOD) unit, and/or the USACE to be an immediate or imminent threat, then one of two actions may be initiated:		
	TCRA - If there is a complete pathway between source and receptor and the MEC and the situation is viewed as an "imminent danger threat posed by the release or threat of a release, where cleanup or stabilization actions must be initiated within six months to reduce risk to public health or the environment", the Alion Team will immediately notify the Military Munitions Design Center Project Manager at USACE and the property owner. USACE will determine, with input from the Alion Team and stakeholders, whether or not a TCRA will be implemented.	Yes ☑ No ☐	
	Non-TCRA - A non-TCRA (NTCRA) may be initiated in response to a release or threat of release that poses a risk where more than six months planning time is available.	Yes ☑ No ☐	
Appropriate Sampling and Analysis Methods:			
Sampling Method and Depths	MEC: Geophysical methods/procedures are described in detail in Section 3 of the SS-WP, and the Field Activities section of the programmatic field sampling plan (PFSP). MC: Sampling methods for MC are described in detail in Section 4 of the SS-WP, and Field Activities section of the PFSP.	Yes ☑ No ☐	
Analytical Method	Refer to DQO 1 for MEC and MC analytical methods to be incorporated.	Yes ☑ No ☐	

Data Quality Objective Verification Worksheet			
Site: **Fort Michie**			
Project: FUDS MMRP SI Project Number **C02NY061203**			
DQO Statement Number: **3 of 4**			
DQO Element Description	**Site-Specific DQO Statement**	**Attained?**	**Required Corrective Action**
Intended Data Use(s):			
Project Objective(s) Satisfied	Collect, or develop, additional data, as appropriate, in support of potential Hazard Ranking System (HRS) scoring by Environmental Protection Agency (EPA).	Yes ☑ No ☐	
Data Needs Requirements:			
Data User Perspective(s)	Risk-MEC and MC, Compliance	Yes ☑ No ☐	
Contaminant or Characteristic of Interest	Data for HRS worksheet parameters will be compiled by gathering basic identifying information, general site description, site type, waste description, demographics, water use, sensitive environments, and response actions.	Yes ☑ No ☐	
Media of Interest	MEC - Surface soil MC - Surface soil	Yes ☑ No ☐	
Required Sampling Locations or Areas	Areas where MEC has been historically found, used, or disposed as documented in interviews or existing documentation.	Yes ☑ No ☐	
Number of Samples Required	Refer to DQOs 1and 2.		
Reference Concentration of Interest or Other Performance Criteria	The HRS levels of contamination are Level I (concentrations that meet the criteria for actual contamination and are at or above media specific benchmark levels), Level II (concentrations that either mee the criteria for actual contamination but are less than media-specific benchmarks, or meet the criteria for actual contamination based on direct observation), and Potential (no observed release is required but targets must be within the target distance limit). These levels are weighted for each target by EPA (Level I carries the greatest weight) and scores of 28.5 or above are then eligible for listing on the National Priorities List (NPL).	Yes ☑ No ☐	
Appropriate Sampling and Analysis Methods:			
Sampling Method and Depths	Methods associated with historic data field reconnaissance and sampling (see DQOs 1 and 2). Refer to NPL Characteristics Data Collection Form, Version 3.0 (EPA 2001).	Yes ☑ No ☐	
Analytical Method	Refer to DQOs 1and 2 for associated methods.		

Data Quality Objective Verification Worksheet			
Site: **Fort Michie**			
Project: FUDS MMRP SI Project Number **C02NY061203**			
DQO Statement Number: **4 of 4**			
DQO Element Description	**Site-Specific DQO Statement**	**Attained?**	**Required Corrective Action**
Intended Data Use(s):			
Project Objective(s) Satisfied	Collect the additional data necessary to the complete the Munitions Response Site Prioritization Protocol (MRSPP).	Yes ☑ No ☐	
Data Needs Requirements:			
Data User Perspective(s)	Risk-MEC and MC, Compliance	Yes ☑ No ☐	
Contaminant or Characteristic of Interest	Explosive Hazard Evaluation (EHE), Chemical Warfare Materiel Hazard Evaluation (CHE), and Health Hazard Evaluation (HHE). For the EHE and CHE modules, factors evaluated include the details of the hazard, accessibility to the Munitions Response Site (MRS), and receptor information. HHE factors include an evaluation of MC and any non-munitions-related incidental contaminants present, receptor information, and details pertaining to environmental migration pathways. Typical information compiled includes details pertaining to historical use, current/future use and ownership, cultural/ecological resources, and structures.	Yes ☑ No ☐	
Media of Interest	MEC - Surface soil MC - Surface soil	Yes ☑ No ☐	
Required Sampling Locations or Areas	Areas where MEC has been identified historically and where sampling is recommended.	Yes ☑ No ☐	
Number of Samples Required	Refer to DQOs 1 and 2 for related sampling required.		
Reference Concentration of Interest or Other Performance Criteria	An MRS priority is determined by USACE based on integrating the ratings from the EHE, CHE, and HHE modules. Refer to Federal Register/Vol. 70, No. 192/Wednesday, October 5, 2005/Rules and Regulations.	Yes ☑ No ☐	
Appropriate Sampling and Analysis Methods:			
Sampling Method and Depths	Data gathering prior to field activities as well as additional data gathered during field reconnaissance and sampling (DoD 2005).	Yes ☑ No ☐	
Analytical Method	Refer to DQOs 1and 2 for associated methods.		

APPENDIX C – INTERVIEW DOCUMENTATION

APPENDIX D – FIELD NOTES AND FIELD FORMS

- Daily Quality Control Reports
- Field Forms
- Logbook
- Chain of Custody

Alion Science and Technology, Inc.

DAILY QUALITY CONTROL REPORT

Report Number:	10-01-08-01	Date: October 1, 2008	
Project Name:	C02NY061203	Contract Number:	W912DY-04-D-0017
Location of Work:	Ft. Michie, Suffolk County, NY		
Description of Work: Conduct meandering path geophysics throughout the site with a focus around the former artillery batteries. Collect surface soil samples in front of selected batteries for explosives analysis.			
Weather: Cloudy	Rainfall: Trace	Temperature: Min. 54 f	Max. 64 f

1. Work performed today by Alion:

The Alion field team conducted qualitative reconnaissance on approximately 43,874 square feet (1.007 acres) within MRS-1 on Great Gull Island (Ft. Michie). The Alion field team also collected four surface soil samples (+ 1 duplicate).

Samples Collected: Some sample locations may vary from SS-WP maps due to accessibility.

MIC-RC-SS-01-01
MIC-RC-SS-01-02
MIC-RC-SS-01-03
MIC-RC-SS-01-04
Soil-Dup-01

Reconnaissance Acreage / Discussion:

Reconnaissance was conducted in the meandering path fashion. Travel paths varied slightly from the geophysical site reconnaissance on figures in the SS-WP due to natural terrain and accessibility.

2. Work performed today by Subcontractors.

Captain Mathew was subcontracted to transport the field team from Waterford, CT via boat to Great Gull Island (former Ft. Michie) which is located in the Block Island Sound. Captain Mathew performed the boat transportation services adequately and without incident.

3. Type and results of Control Phases and Inspection. (Indicate whether Preparatory – P, Initial – I, or Follow-Up – F and include satisfactory work completed or deficiencies with actions to be taken)

Preparatory phase inspections for the field were completed prior to mobilization to the Ft. Michie in Block Island Sound New York. Initial phase of inspections were completed upon arrival at the site. No follow-up inspections were completed. Satisfactory work completed.

4. List type and location of tests performed and results of these tests.

GPS benchmark control point coordinates were collected prior to field work and then again after completion of the fieldwork (see below). Schonstedt checked ok.

Benchmark coordinates: Northing 4565355.90 meters (m), Easting 741730.609 m (UTM, Zone 18N, Conus 1983)

Initial GPS reading: Northing 4565355.312 m, Easting 741730.782 m (UTM, Zone 18N, Conus 1983)

Post event GPS reading: Northing 4565355.743 m, Easting 741731.007 m (UTM, Zone 18N, Conus 1983)

Benchmark was located on Great Gull Island, NY.

5. List material and equipment received.

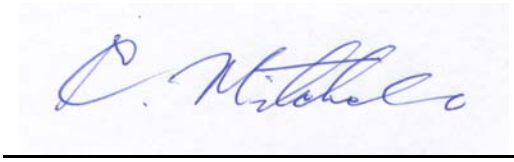
All equipment (GPS unit, geophysical instrument) supplied by Alion.

Alion Science and Technology, Inc.

DAILY QUALITY CONTROL REPORT

6. Submittals reviewed. (Include Transmittal No., Item No., Spec/Plan Reference, by whom, and any action.
None
7. Off-site surveillance activities, including action taken.
None
8. Job Safety. (Report safety violations observed and actions taken)
No health and safety violations occurred during the sampling event. All work was performed in a safe and efficient manner.
9. Remarks. (Instructions received or given. Conflicts in Plans or Specifications)
Qualitative Reconnaissance (QR) was performed along the perimeter of Great Gull Island and around the various artillery battery emplacements. Most of the artillery battery emplacements (Batteries Benjamin, North, Palmer, Maitland and 90mm guns) were intact and in-place with the exception of Battery Pasco which was partially destroyed due to tidal erosion. No subsurface anomalies were detected, however rebar from the concrete emplacements was still in-place and the Schonstedt detected these metallic objects. No munitions debris (MD), munitions and explosives of concern (MEC) or munitions presenting a potential explosive hazard (MPPEH) were identified at the MRS.

Alion Science and Technology, Inc's Verification: On behalf of Alion, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.



Curtis W Mitchell

DAILY SITE SAFETY JOURNAL
Page 1 of 2

DATE: 10/1/08	PROJECT: Michie
SUXOS: Mitchell	PM:
SSO: Mitchell	QCO:

AREA / ITEMS INSPECTED	SAT	UNSAT
Proper work attire (PPE)	✓	
Vehicle condition	✓	
Emergency equipment	✓	
Safe demolition procedures	N/A	
Field office, inside	N/A	
Field office grounds	N/A	
Schoolstadt	✓	
Trimble	✓	

[ ] Last Work Days Events
[✓] Site Description
[✓] Work Area Description
[✓] Work Area Hazards
[✓] On-Site Emergency
[✓] Site Evacuation Procedures
[✓] Emergency Response Personnel
[✓] Emergency Telephone Numbers
[✓] Directions to Hospital
[✓] First Aid
[✓] Heat / Cold Stress
[ ] Asbestos Awareness & ID
[ ] Ticks
[✓] Safety Concerns
[✓] Personnel Protective Equipment
[✓] Safe Work Practices
[✓] Emergency Response Plan
[ ] Chemical Hazards
[✓] Emergency Equipment, Location
[✓] Emergency Equipment, by Type
[✓] Emergency Decontamination
[ ] Safe Work Practices - General
[✓] Site specific OE Safety Precautions
[✓] Site specific OE Identification Features
[ ] Liquid Contaminates / Landfill Material
[ ] Other _____

Comments:

SSO SIGNATURE: C. Mitchell

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DAILY SITE SAFETY JOURNAL
MEETING ATTENDEES
DATE: Oct 1, 2008
Page 2 of 2

	Name	Affiliation
1	Maria Borejsza-Wysocka	Alion
2	Ben Ekaus	Alion
3	Todd Beaver	Alion
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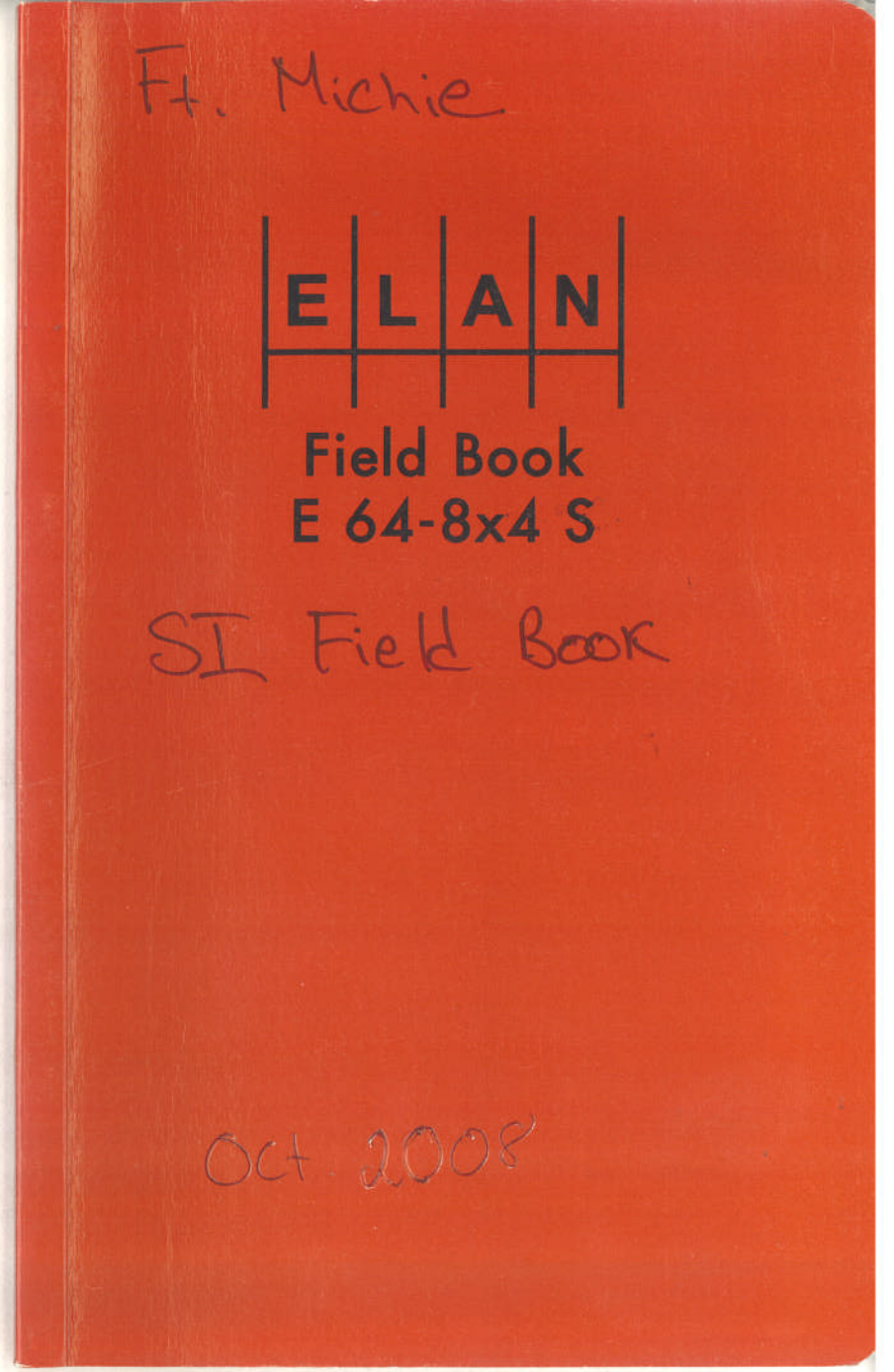
Ft. Michie
ELAN
Field Book
E 64-8x4 S
SI Field Book
Oct. 2008

CURVE FORMULAS

$T = R \tan \frac{1}{2} I$	$R = T \cot \frac{1}{2} I$	Chord def. $= \frac{\text{chord}^2}{R}$
$T = \frac{50 \tan \frac{1}{2} I}{\text{Sin. } \frac{1}{2} D}$	$R = \frac{50}{\text{Sin. } \frac{1}{2} D}$	No. chords $= \frac{I}{D}$
$\text{Sin. } \frac{1}{2} D = \frac{50}{R}$	$E = R \text{ ex. sec } \frac{1}{2} I$	Tan. def. $= \frac{1}{2}$ chord def.
$\text{Sin. } \frac{1}{2} D = \frac{50 \tan \frac{1}{2} I}{T}$	$E = T \tan \frac{1}{4} I$	

The square of any distance, divided by twice the radius, will equal the distance from tangent to curve, very nearly.

To find angle for a given distance and deflection.

Rule 1. Multiply the given distance by .01745 (def. for 1° for 1 ft.) and divide given deflection by the product.

Rule 2. Multiply given deflection by 57.3, and divide the product by the given distance.

To find deflection for a given angle and distance. Multiply the angle by .01745, and the product by the distance.

GENERAL DATA

Right Angle Triangles. Square the altitude, divide by twice the base. Add quotient to base for hypotenuse.

Given Base 100, Alt. $10.10^2 \div 200 = .5$. $100 + .5 = 100.5$ hyp.

Given Hyp. 100, Alt. $25.25^2 \div 200 = 3.125$. $100 - 3.125 = 96.875$ = Base.

Error in first example, .002; in last, .045.

To find Tons of Rail in one mile of track: multiply weight per yard by 11, and divide by 7.

Leveling. The correction for curvature and refraction, in feet and decimals of feet is equal to $0.574\ d^2$, where d is the distance in miles. The correction for curvature alone is closely, $\frac{2}{3} d^2$. The combined correction is negative.

Probable Error. If d_1, d_2, d_3, etc. are the discrepancies of various results from the mean, and if Σd^2 = the sum of the squares of these differences and n = the number of observations, then the probable error of the mean $= \pm 0.6745 \sqrt{\frac{\Sigma d^2}{n(n-1)}}$

MINUTES IN DECIMALS OF A DEGREE

1'	.0167	11'	.1833	21'	.3500	31'	.5167	41'	.6833	51'	.8500
2	.0333	12	.2000	22	.3667	32	.5333	42	.7000	52	.8667
3	.0500	13	.2167	23	.3833	33	.5500	43	.7167	53	.8833
4	.0667	14	.2333	24	.4000	34	.5667	44	.7333	54	.9000
5	.0833	15	.2500	25	.4167	35	.5833	45	.7500	55	.9167
6	.1000	16	.2667	26	.4333	36	.6000	46	.7667	56	.9333
7	.1167	17	.2833	27	.4500	37	.6167	47	.7833	57	.9500
8	.1333	18	.3000	28	.4667	38	.6333	48	.8000	58	.9667
9	.1500	19	.3167	29	.4833	39	.6500	49	.8167	59	.9833
10	.1667	20	.3333	30	.5000	40	.6667	50	.8333	60	1.0000

INCHES IN DECIMALS OF A FOOT

1/16	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	7/8
.0052	.0078	.0104	.0156	.0208	.0260	.0313	.0417	.0521	.0625	.0729

1	2	3	4	5	6	7	8	9	10	11
.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167

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1

Contract List.

Capt. Mathew: 860-625-0581

Rich Gajdek: 917-514-7242

Time: 0630, 10/11 - call before (Tues).

15 1st street. NE
Waterford, CT
- www.Sunbeam.com

2

If found, please return to:

Corinne Shia
3975 Fair Ridge Drive
Suite 125 South
Fairfax, VA 22033
703 - 259 - 5147

3

Signature Page

Curtis Rusty Michaud II
Ben Claus
Todd Beamer
Marius Borejsza-Wysocki

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Table of Contents

10/11/08 Ft. Michie SI Event 6

0615: Leave Hotel to mob to dock and meet Cpt. Matt (boat operator).
0630: Arrive at waterfed, CT boat dock.
0640: field event personnel.
Rusty Mitchell: HFA/UXO tech
Ben Clace: Alion/FTL
Todd Belanger: Alion/Field Tech
Maria Borejsza-Wysocka/Alion.
0645: weather: overcast, 58°F-64°F, drizzle, 0-5 mph wind.
0645: Rusty Mitchell gives HES briefing
Topics: water safety, UXO avoidance, slips/trips/falls, water bird safety
0750: Arrive at Great Gull Island, location of former Ft. Michie.
0800: Conduct Visual and magnetometer assisted QR to Sample locations.

10/11/08 Ft. Michie SI Event 7

Benchmark GPS, UTM, zone 18N (m)
B-mark coords.
N = 4565355.510
E = 741730.609
Trimble ProXRS coords,
N = 4565355.312
E = 741730.782

0820: All environmental samples will be analyzed for select explosives only, Ft. Michie firing points only.
8:25 surface sample
MIC-RC-SS-01-03
loamy sand
MS/MSD
8:30 surface sample
MICRC-SS-101-02
8:35 Surface Dup #1 at location MIC-RC-SS-01-02
loamy sand
8:45 Sample
MIC-RC-SS-01-01
Pebbly Sand

10/11/08

⑧ Ft. Michie SI Event

09:05 Sample MIC-RC-SS-01-04

Sandy loam

9:30 Arrived back at the rocky beach ~~and~~ and boarded the boat

10:00: All environmental samples collected. Various gun batteries (emplacements) located, Samples collected in front of batteries. Samples collected in front of B

Battery Pasco: SS-01-01

Battery Benjamin: SS-01-02

Battery 912: SS-01-03

Battery W. Maitland: SS-01-04.

All samples analyzed for explosives based on Munitions.

Note: No Munitions Debris (MD) munitions and explosives of concern (MEC) located on island

~~No Sub~~ Sub. Any/all subsurface "mag" hit was attributable to cultural debris (utilities, rebar etc.).

T. C. Lee

10/11/08

Ft. Michie SI Event ⑨

Sample Coordinates

UTM NAD83 Zone 18N

Sample ID	Northing (m)	Easting (m)
MIC-RC-SS-01-01	4565253.93	741525.483
MIC-RC-SS-01-02	4565364.949	741727.908
MIC-RC-SS-01-03	4565352.056	741881.305
MIC-RC-SS-01-04	4565120.985	741542.712

1100: Arrive back at waterford, CT boat dock. No HES incidents.

1130: Samples packed up, and will be shipped to analytical lab. (GPL). Demob from ~~the~~ Site.

End of Day & Event.

T. C. Lee

GPL LABORATORIES, LLC

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference:

1 of 1 Pgs.

Project: Ft. Michie
Client: Alion Science
Send Results To: Corinne Shia Bi Claus
Address: 3975 Fair Ridge Dr.
Fairfax, VA 22033
Phone: 703-259-5264

Turnaround Time: Standard
# of Containers: 1
Container Type: 8oz
Preservative Used: NA
Type of Analysis

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	2,4-Dinitrotoluene (confirm)	2,6-DNT	2-Amino-4,6-DNT	3-Nitrotoluene	2-Nitrotoluene	4-Nitrotoluene	4-Amino-2,6-DNT				Lab Cooler No. / CLIENT COMMENTS
MIC-RC-SS-01-01	10/1/08	~~0825~~	soil	BC	X	X	X	X	X	X	X				
MIC-RC-SS-01-02	10/1/08	0830	soil	BC	X	X	X	X	X	X	X				
MIC-RC-SS-01-03	10/1/08	0825	soil	BC	X	X	X	X	X	X	X				MS/MSD
MIC-RC-SS-01-04	10/1/08	905	soil	BC	X	X	X	X	X	X	X				
Soil-Dup-01	10/1/08	0835	soil	BC	X	X	X	X	X	X	X				

Relinquished By:	Date/Time 10/1/08 1600	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
Relinquished By:	Date/Time	Received By:	Date/Time / Shipper:	Airbill No.:	
Relinquished By:	Date/Time	Received By:	Lab Comments:		Temp:

G.P. W.O. _____

APPENDIX E – PHOTO DOCUMENTATION LOG

APPENDIX E – PHOTOGRAPHIC LOG

Project/Site: Fort Michie
Project No.: C02NY061203

Date	Photo ID	Description
10/1/2008	E.1	View of former Battery Maitland structure.
10/1/2008	E.2	Signage indicating that Great Gull Island is a Research Facility.
10/1/2008	E.3	View of Battery North.
10/1/2008	E.4	View of Battery Benjamin, North Shore.
10/1/2008	E.5	Sampling surface soil (MIC-RC-SS-01-01) near Battery Pasco.
10/1/2008	E.6	Surface soil sample MIC-RC-SS-01-02 taken east of Battery North.
10/1/2008	E.7	View of Battery Benjamin, northern shore.
10/1/2008	E.8	View of Battery William Maitland (foreground) and Fire Control Tower (background).

Fort Michie – Field Photographs

Site:	Fort Michie
Photographer :	B. Claus
Location of Photograph:	South shore
GPS Coordinates:	E 741537.1 m N: 4565128.6 m (UTM Zone 18N)
Direction of Photo:	Southeast
Comments:	View of former Battery Maitland structure.

Photograph No.: **E1** Date:10/01/08 Time: 9:00 AM

Site:	Fort Michie
Photographer :	B. Claus
Location of Photograph:	North shore near dock
GPS Coordinates:	E 741519.7 m N 4565267.1 m (UTM Zone 18N)
Direction of Photo:	South
Comments:	Signage indicating that Great Gull Island is a Research Facility.

Photograph No.: **E2** Date:10/01/08 Time: 8:40 AM

Fort Michie – Field Photographs

Site:	Fort Michie
Photographer:	B. Claus
Location of Photograph:	Battery North
GPS Coordinates:	E 741836.7 m N 4565341.6 m (UTM Zone 18N)
Direction of Photo:	Northeast
Comments:	View of Battery North.

Photograph No.: **E3** Date:10/01/08 Time: 8:15 AM

Site:	Fort Michie
Photographer:	B. Claus
Location of Photograph:	
GPS Coordinates:	E 741733.0 m N 4565360.9 m (UTM Zone 18N)
Direction of Photo:	South
Comments:	View of Battery Benjamin, North Shore.

Photograph No.: **E4** Date:10/01/08 Time: 8:20 AM

Fort Michie – Field Photographs

Site:	Fort Michie
Photographer:	B. Claus
Location of Photograph:	Sample MIC-RC-SS-01-01
GPS Coordinates:	E 741525.5 m N 4565253.4 m (UTM Zone 18N)
Direction of Photo:	East
Comments:	Sampling surface soil (MIC-RC-SS-01-01) near Battery Pasco.

Photograph No.: **E.5** Date:10/01/08 Time: 8:45 AM

Site:	Fort Michie
Photographer:	B. Claus
Location of Photograph:	East of Battery North
GPS Coordinates:	E 741882.3 m N 4565352.6 m (UTM Zone 18N)
Direction of Photo:	West
Comments:	Surface soil sample MIC-RC-SS-01-02 taken east of Battery North.

Photograph No.: **E.6** Date:10/01/08 Time: 8:25 AM

Fort Michie – Field Photographs

Site:	Fort Michie
Photographer:	B. Claus
Location of Photograph:	
GPS Coordinates:	E 741732.0 m N 4565345.6 m (UTM Zone 18N)
Direction of Photo:	North
Comments:	View of Battery Benjamin, northern shore.

Photograph No.: **E.7** Date:10/01/08 Time: 8:23 AM

Site:	Fort Michie
Photographer:	B. Claus
Location of Photograph:	
GPS Coordinates:	E 741581.4 m N 4565128.0 m (UTM Zone 18N)
Direction of Photo:	Northwest
Comments:	View of Battery William Maitland (foreground) and Fire Control Tower (background).

Photograph No.: **E.8** Date:10/01/08 Time: 9:10 AM

APPENDIX F – ANALYTICAL DATA

- Automated Data Review Library
- Automated Data Review EDDs
- EDMS
- Analytical Summary Reports
- Analytical Data Reports
- SEDD Deliverable

Located on CD.

APPENDIX G – ANALYTICAL DATA QUALITY ASSURANCE/ QUALITY CONTROL REPORT

- Validated Data from EDS
- USACE Memorandum for Record-CQAR of Quality Assurance Split Samples. (Split Samples not collected in accordance to CENAB direction.)

Located on CD.

APPENDIX H – GEOGRAPHIC INFORMATION SYSTEMS DATA

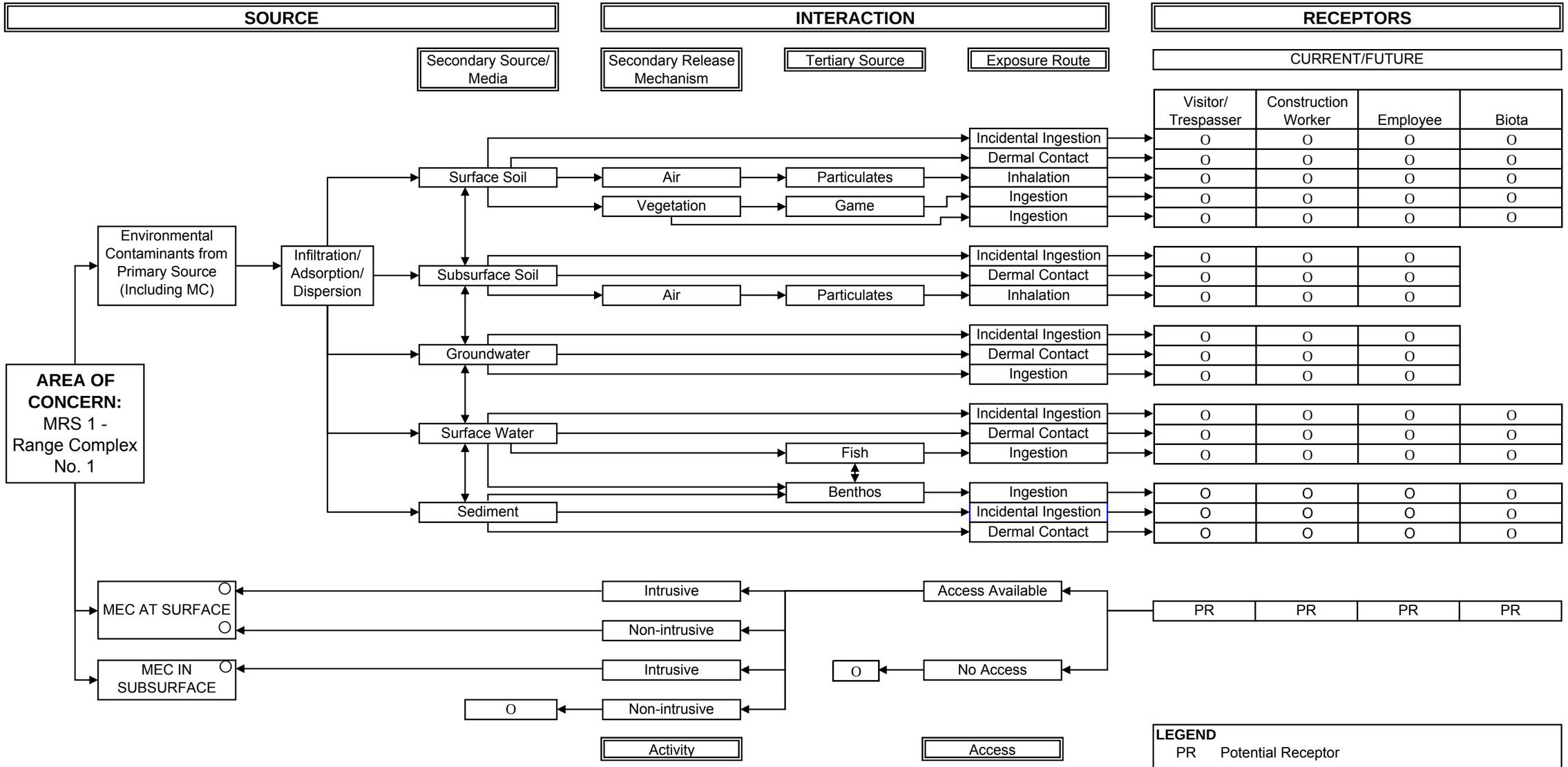
Per USACE guidance submitted during the Final SIR.

APPENDIX I – GEOPHYSICAL DATA

Appendix not used.

APPENDIX J – CONCEPTUAL SITE MODEL

- MRS 1



NOTES:

1. For the MMRP SI at Fort Michie, this CSM summarizes the potential risk exposure scenarios for MRS 1 - Range Complex No. 1. For a pathway to be complete, it must include a source, an exposure medium, an exposure route, and a receptor. A complete pathway may also include a release mechanism and a transport medium. Interaction between a potential receptor and MEC has two components: access and activity.

2. Primary sources will vary but will include the MRS 1 range area where historical MEC activities occurred. Potential MC source is not expected to be present in subsurface soil since bedrock is shallow on the island. No permanent surface water bodies are present on the island and the ocean water is dynamic and tidally influenced rendering this source as unlikely for MC presence. Site groundwater is not used as a drinking water source (incomplete pathway for ingestion) and is tidally influenced; therefore, this medium is an incomplete pathway.

DIAGRAM OF THE INTEGRATED CONCEPTUAL SITE MODEL FOR

Fort Michie [1, 2 and 3]

MRS 1 - Range Complex No. 1 (Land Portion)

(WORKING DRAFT)

Revised December 2008 Figure J1

Source: U.S. Army Corps of Engineers (USACE). 2003. *Conceptual Site Models for Ordnance and Explosives (OE) and Hazardous, Toxic, and Radioactive Wastes (HTRW)*

APPENDIX K – MUNITIONS RESPONSE SITE PRIORITIZATION PROTOCOL RESULTS

- MRS 1 (Land and Water Ranges)

MRS 1 (LAND RANGE)

Table A
MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from DoD databases, such as RMIS. 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 non-munitions related contaminants found at the MRS (e.g., benzene, trichloroethylene), and any potentially exposed human and ecological receptors. Include a map of the MRS, if one is available.

Munitions Response Site Name: Range Complex No. 1

Component: U.S. Army

Installation/Property Name: Fort Michie (FFID: NY9799F1151)

Location (City, County, State): Great Gull Island, Suffolk County, NY

Site Name (RMIS ID)/Project Name (Project No.): Fort Michie(C02NY061203)/(RMIS ID C02NY0612303R01)

Date Information Entered/Updated: 2/3/2009 1:32:34 AM

Point of Contact (Name/Phone): Rick Gajdek (917-790-8234)

Project Phase (check only one):

☐ PA	■ SI	☐ RI	☐ FS	☐ RD
☐ RA-C	☐ RIP	☐ 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 (by type of munition, if known) or munitions constituents (by type, if known) known or suspected to be present):

The Fort Michie FUDS was used by the Army as a coastal battery from 1900 to 1949. The property was declared excess in 1949 and was transferred to the War Assets Administration. Between 1949 and 1954 the General Services Administration conveyed the island to the American Museum of Natural History for education research. One MRS was identified. MRS 1, Range Complex No. 1, was a coastal battery with .50 caliber, 37mm, 40mm, and 90mm anti-aircraft guns and 3", 6", 10", 12" and 16" artillery (USACE 2004a). Refer to Sections 2.1 (entire), 2.4.3.1, 2.4.3.2, 2.5.1, 4.2.1.1, 4.3.1.1, and 4.3.1.2 and Table 2-2 of the SI report for more information concerning the history of the FUDS and the types of munitions used at MRS 1.

Note: The scoring of this MRSPP pertains to the land portion of MRS 1 and up to 100 yards from the mean high tide line. A separate evaluation was conducted for the water portion of MRS 1 as the water portion was not evaluated during the SI.

Description of Pathways for Human and Ecological Receptors:

Based on analytical data collected during the SIR and subsequent human health and ecological risk assessments no complete pathways were identified at MRS 1.
Description of Receptors (Human and Ecological):
Construction worker, trespasser/visitor, employee, biota

Table 1

EHE Module: Munitions Type Data Element Table

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

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

Classification	Description	Score
Sensitive	◆ All UXO that are considered 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]. ◆ All hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazardard.	30
High explosive (used or damaged)	◆ All UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ All 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)	◆ All UXO containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades). ◆ All DMM containing pyrotechnic fillers other than white phosphorous (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)	◆ All 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	◆ All UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ All 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, pyrothechnics, or propellant	◆ All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor), that are deteriorated. ◆ 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)	◆ All DMM containing a pyrotechnic fillers (i.e., red phosphorous), other than white phosphorous filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ All UXO that are practice munitions that are not associated with a sensitive fuze. ◆ All 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	◆ All UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ All 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).	*0*

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

Prior to the 1997 ASR site visit the ASR team conducted an interview with an employee of the American Museum of Natural History. The employee showed the ASR team a 40mm shell casing that had reportedly washed ashore at Fort Michie in the 1970's. The shell casing was accompanied with a letter stating that the shell casing was inert. The ASR team speculated that the 40mm shell casing washed ashore as a result of tidal action. No munitions were found during the 1997 ASR site visit and none were found during the SI at MRS 1 (USACE 1997, 2004a). Refer to Sections 2.4.1.1, 2.4.2.1, 2.5.1, 4.2.1.1, 4.3.1.1, 4.3.1.2 and Table 2-2 of this SI report for more information.

Note: The scoring of this MRSPP pertains only to the land portion of MRS 1 and up to 100 yards from the mean high tide line. Per current DERP guidance, this MRSPP scoring only addresses the land portion of MRS 1 and does not address the water portions of the range fan. Separate MRSPP scoring sheets are included in the SI Report that address the water range portion of MRS 1. DoD may use the water range MRSPP scoring for future investigations of the water portion of MRS 1. All of the munitions used at MRS 1 were fired away from the land portion of the MRS, therefore propellant is the only expected muntions type to be of concern.

TABLES 2-9 EXCLUDED AS PER CX GUIDANCE

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	0	
Source of Hazard	Table 2		
Accessibility Factor Data Elements			
Location of Munitions	Table 3		
Ease of Access	Table 4		
Status of Property	Table 5		
Receptor Factor Data Elements			
Population Density	Table 6		
Population Near Hazard	Table 7		
Types of Activities/ Structures	Table 8		
Ecological and /or Cultural Resources	Table 9		
EHE MODULE TOTAL			*0*

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	*G*

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the score(s) that correspond to **all** 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, explosive configuration either UXO or damaged DMM	The CWM known or suspected of being present at the MRS is: ◆ Explosively configured 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 explosively configured CWM/DMM that have not been damaged, or nonexplosively configured 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, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS is: ◆ Nonexplosively configured CWM/DMM. ◆ Bulk CWM/DMM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS is CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ Only 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.

Based on the ASR, there are no known or suspected CWM hazards used, stored, or disposed of at Fort Michie (USACE 1997, 2004a). Refer to Sections 2.4.0.1 and 2.4.2.1 of the SI Report.

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	
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	*G*

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) 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 ratios for each medium together, including additional 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.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	*CHF* =	[Maximum Concentration of Contaminant] / [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 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 ■

Table 21 Comments: Groundwater is not a medium of concern. Groundwater was not sampled. Refer to Sections 2.3.6.2, 2.3.7.1 and 5.2.0.2 in the SI for further information.

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 groundwater and their comparison values (from Appendix B) 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 ratios for each medium together, including additional 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 for human endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	*CHF* = [Maximum Concentration of Contaminant] / [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 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).	

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

Table 22 Comments: Surface water is not a medium of concern. Surface water was not sampled. Refer to Sections 2.3.6.1 and 5.2.0.2 of the SI report for further information.

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 groundwater and their comparison values (from Appendix B) 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 ratios for each medium together, including additional 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 for human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	*CHF* =	[Maximum Concentration of Contaminant] / [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 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).	

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

Table 23 Comments: Sediment is not a medium of concern. Sediment was not sampled. Refer to Sections 2.3.6.1 and 5.2.0.2 of the SI report for further information.

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) 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 ratios for each medium together, including additional 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 for ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	*CHF* = [Maximum Concentration of Contaminant] / [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 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).	

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

Table 24 Comments: Surface water is not a medium of concern. Surface water was not sampled. Refer to Sections 2.3.6.1 and 5.2.0.2 of the SI report for further information.

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) 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 ratios for each medium together, including additional 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 for ecological endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	*CHF* =	[Maximum Concentration of Contaminant] / [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 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).	

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

Table 25 Comments: Sediment is not a medium of concern. Sediment was not sampled. Refer to Sections 2.3.6.1 and 5.2.0.2 of the SI report for further information.

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) 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 ratios for each medium together, including additional 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	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	*CHF* = [Maximum Concentration of Contaminant] / [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 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 ■

Table 26 Comments: Four surface samples were collected in MRS 1. Sample ID MIC-RC-SS-01-01, MIC-RC-SS-01-02, MIC-RC-SS-01-03, MIC-RC-SS-01-04. Analytical results report non-detect for explosive compounds. Reference Sections 5.1.4.2, 5.1.4.3, 5.3.0.1, 5.3.1 (entire) and Tables 5-1, 5-2, and 5-3 in the SI 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 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) 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: Remember not to 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 reference 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)					
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 below.

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.

HHE MODULE RATING	

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 number in the MRS or Alternative Priority box 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 or ALTERNATIVE PRIORITY				*7*	

MRS 1 (WATER RANGE)

Table A
MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from DoD databases, such as RMIS. 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 non-munitions related contaminants found at the MRS (e.g., benzene, trichloroethylene), and any potentially exposed human and ecological receptors. Include a map of the MRS, if one is available.

Munitions Response Site Name: Range Complex No. 1

Component: U.S. Army

Installation/Property Name: Fort Michie (FFID: NY9799F1151)

Location (City, County, State): Great Gull Island, Suffolk County, NY

Site Name (RMIS ID)/Project Name (Project No.): Fort Michie(C02NY061203)/(RMIS ID C02NY0612303R01)

Date Information Entered/Updated: 12/17/2008 1:52:54 AM

Point of Contact (Name/Phone): Rick Gajdek (917-790-8234)

Project Phase (check only one):

☐ PA	■ SI	☐ RI	☐ FS	☐ RD
☐ RA-C	☐ RIP	☐ 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 (by type of munition, if known) or munitions constituents (by type, if known) known or suspected to be present):

The Fort Michie FUDS was used by the Army as a coastal battery and anti-aircraft emplacement (for air defense) from 1900 to 1949. The property was declared excess in 1949 and was transferred to the War Assets Administration. Between 1949 and 1954 the General Services Administration conveyed the island to the American Museum of Natural History for education research. One MRS was identified. MRS 1, Range Complex No. 1, was a coastal battery with .50 caliber, 37mm, 40mm, and 90mm anti-aircraft guns and 3", 6", 10", 12" and 16" artillery (USACE 2004a). Refer to Sections 2.1 (entire), 2.4.3.1, 2.4.3.2, 2.5.1, 4.2.1.1, 4.3.1.1, and 4.3.1.2 and Table 2-2 of the SI report for more information concerning the history of the FUDS and the types of munitions used at MRS 1.

The scoring of this MRSPP pertains to the water portion beyond 100 yards from the mean high tide line at MRS 1. No SI activites were conducted for the water range, however, MEC (projectiles) may be present on the ocean floor. Although MC would be contained within intact projectiles on the ocean floor, any degradation of the projectiles may result in the release of MC, however, MC is not anticipated to exist at detectable levels in the water range due to the volume and dynamic nature of the ocean environment. MC that were associated with projectiles from Fort Michie include metals, DNT and DNT breakdown products and nitroglycerine. A separate evaluation was conducted for the land portion of MRS 1.

Description of Pathways for Human and Ecological Receptors:
Based on the history of Fort Michie and the field activties conducted on the land portion of the MRS, no complete MC pathways exist for the water range. Any MC associated with the projectiles is expected to be contained within the projectile or, if released, would be diluted to below detectable levels in the aquatic environment. Due to the anticipated presence of MEC within Long Island or Block Island Sound, MEC pathways are potentially complete. Exposure to MEC on the ocean floor is a potentially complete pathway for fishermen (during bottom fishing) and benthic biota.
Description of Receptors (Human and Ecological):
Current and future receptors include: Fishermen and biota.

Table 1

EHE Module: Munitions Type Data Element Table

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

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

Classification	Description	Score
Sensitive	◆ All UXO that are considered 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]. ◆ All hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazardard.	30
High explosive (used or damaged)	◆ All UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ All 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)	◆ All UXO containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades). ◆ All DMM containing pyrotechnic fillers other than white phosphorous (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)	◆ All 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	◆ All UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ All 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, pyrothechnics, or propellant	◆ All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor), that are deteriorated. ◆ 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)	◆ All DMM containing a pyrotechnic fillers (i.e., red phosphorous), other than white phosphorous filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ All UXO that are practice munitions that are not associated with a sensitive fuze. ◆ All 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	◆ All UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ All 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.

The water portion of MRS 1 is 92,163 acres of tidal waters. Fort Michie consisted of several gun emplacement protecting Long Island and Block Island Sounds (Figures 2-2 and 2-4). Prior to the 1997 ASR site visit, the ASR team conducted an interview with an employee of the American Museum of Natural History. The employee showed the ASR team a 40mm shell casing that had reportedly washed ashore at Fort Michie in the 1970's. The shell casing was accompanied with a letter stating that the shell casing was inert. The ASR team speculated that the 40mm shell casing washed ashore as a result of tidal action. No munitions were found within the land portion of MRS 1 during the 1997 ASR site visit and none were found during the SI at MRS 1 (USACE 1997, 2004a). The SI field team found no evidence of MEC within the land portion of MRS 1 during field reconnaissance. MEC may be present in the sediment of Long Island and Block Island Sounds. No investigation was conducted on the water portion of MRS 1. Refer to Sections 2.4.1.1, 2.4.2.1, 2.5.1, 4.2.1.1, 4.3.1.1, 4.3.1.2 and Table 2-2 of this SI report for more information.

Table 2

EHE Module: Source of Hazard Data Element Table

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

Note: The terms former range, practice munitions, small arms, 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, associated buffer and safety zones, firing points, and live-fire maneuver areas.	*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).	*10*

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

Based on historical documents, artillery shells were practice-fired into Long Island and Block Island Sounds (USACE 1997). MEC may be present in the ocean sediment of the water range portion of MRS 1. Refer to the SI Report Sections 2.2.1, 2.2.2, and 4.2.1.1.

Table 3

EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eight classifications of munitions locations and their descriptions. Circle the score(s) that correspond with **all** locations where munitions are located or suspected of being found at the MRS.

Note: The terms surface, subsurface, 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 (e.g., a confirmed incident report or accident report) 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, heat 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, heat 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 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).	*5*

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

Based on historical documents, artillery shells wer practice-fired into Long Island and Block Island Sounds (USACE 1997). MEC may be present in the ocean sediment of the water portion of MRS 1. Prior to the 1997 ASR site visit, the ASR team conducted an interview with an employee of the American Museum of Natural History. The employee showed the ASR team a 40mm shell casing that had reportedly washed ashore at Fort Michie in the 1970's. The shell casing was accompanied with a letter stating that the shell casing was inert. The ASR team speculated that the 40mm shell casing washed ashore as a result of tidal action. Refer to SI Report Section 4.2.1.1.

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 any explosive materiel. 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).	*10*

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

Great Gull Island, located in Long Island Sound, is 2 to 5 miles from surrounding islands and approximately 7 miles south of mainland Connecticut. There are no barriers or controls to restrict access to Long Island or Block Island Sounds. Refer to Section 4.3.1.2 of the SI 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.	*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 rule 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*** classifications in the space provided.

The water portion of MRS 1 extends into Long Island and Block Island Sounds, which are not under DoD control. Refer to SI Report Sections 4.2.1.1.

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications of population density and their descriptions. Determine the population density per square mile in the vicinity of the MRS and circle the score that corresponds with the associated population density.

Note: If an MRS is located in more than one county, use the largest population density value among the counties. If the MRS is within or borders a city or town, use the population density for the city or town, rather than that of the county.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	*5*
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	3
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	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*** classifications in the space provided.

The population density of Suffolk County, NY is 1593 persons per square mile (US Census 2008). Refer to Section 2.3.3.2 of the SI report for more information.

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 population near the hazard. Determine the number of inhabited structures within two miles of the MRS boundary and circle the score that corresponds with the associated population near the known or suspected hazard.

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*** classifications in the space provided.

Based on aerial photos, there are greater than 26 potentially inhabited structures within a 2-mile radius of the northern facing MRS 1 range fans. There is one temporarily inhabited structure located on Great Gull Island within MRS 1 (USACE 1997). Refer to Sections 2.1.4, 2.3.3.1, 2.3.3.2, and 2.3.4.1 and Figures 2-2 and 2-4 of this SI report for more information.

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures near the hazard 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 score(s) that correspond with **all** the activities/structures 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.

Residential and other structures exist north and east of the range fans associated with Batteries Pasco, Benjamin, and North. Refer to the SI Report Section 2.3.3.2 and Figures 2-2 and 2-4.

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 resource classifications at 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).	*3*

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

Ecological receptors are present in Long Island and Block Island Sounds. No cultural or archaeological resources were identified in the water portion of MRS 1. Reference SI Report Sections 2.3.8.1.1, 3.2.1.1, 3.2.2.1, Table 2-3, and Appendix L - Consultation Letters.

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.

Although an EHE rating was determined, no reconnaissance or environmental samples were conducted within the MRS 1 water range, therefore no recommendation can be made and the rating is evaluation pending. Reference SIR Section ES.11 and 7.0.2.

	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	5	20
Ease of Access	Table 4	10	
Status of Property	Table 5	5	
Receptor Factor Data Elements			
Population Density	Table 6	5	18
Population Near Hazard	Table 7	5	
Types of Activities/ Structures	Table 8	5	
Ecological and /or Cultural Resources	Table 9	3	
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	***Evaluation Pending***

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the score(s) that correspond to **all** 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, explosive configuration either UXO or damaged DMM	The CWM known or suspected of being present at the MRS is: ◆ Explosively configured 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 explosively configured CWM/DMM that have not been damaged, or nonexplosively configured 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, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS is: ◆ Nonexplosively configured CWM/DMM. ◆ Bulk CWM/DMM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS is CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ Only 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.

Based on the ASR, there are no known or suspected CWM hazards used, stored, or disposed of at Fort Michie (USACE 1997, 2004a). Refer to Sections 2.4.0.1 and 2.4.2.1 of the SI Report.

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	
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	*G*

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) 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 ratios for each medium together, including additional 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.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	*CHF* =	[Maximum Concentration of Contaminant] / [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 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 ■

Table 21 Comments: Groundwater is not a medium of concern in the water range of MRS 1 and no related samples were collected in accordance with the scope of this SI. Refer to Sections 2.3.6.2, 2.3.7.1 and 5.2.0.2 in the SI for further information.

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 groundwater and their comparison values (from Appendix B) 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 ratios for each medium together, including additional 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 for human endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	*CHF* = [Maximum Concentration of Contaminant] / [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 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).	

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

Table 22 Comments: Surface water is a medium of concern in the water portion of the MRS, however, sample collection was outside the scope of this SI. The ocean waters are dynamic and any MC present would be diluted to levels below concern to human receptors. Refer to Sections 2.3.6.1 and 5.2.0.2 of the SI report for further information.

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 groundwater and their comparison values (from Appendix B) 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 ratios for each medium together, including additional 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 for human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	*CHF* =	[Maximum Concentration of Contaminant] / [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 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).	

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

Table 23 Comments: Sediment is a medium of concern in the water portion of the MRS, however, sample collection was outside the scope of this SI. The ocean waters and sediment are dynamic and any MC present would be diluted to levels below concern to human receptors. Refer to Sections 2.3.6.1 and 5.2.0.2 of the SI report for further information.

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) 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 ratios for each medium together, including additional 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 for ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	*CHF* = [Maximum Concentration of Contaminant] / [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 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).	

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

Table 24 Comments: Surface water is a medium of concern in the water portion of the MRS, however, sample collection was outside the scope of this SI. The ocean waters are dynamic and any MC present would be diluted to levels below concern to ecological receptors. Refer to Sections 2.3.6.1 and 5.2.0.2 of the SI report for further information.

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) 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 ratios for each medium together, including additional 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 for ecological endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	*CHF* =	[Maximum Concentration of Contaminant] / [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 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).	

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

Table 25 Comments: Sediment is a medium of concern in the water portion of the MRS, however, sample collection was outside the scope of this SI. The ocean waters and sediment are dynamic and any MC present would be diluted to levels below concern to human receptors. Refer to Sections 2.3.6.1 and 5.2.0.2 of the SI report for further information.

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) 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 ratios for each medium together, including additional 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	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	*CHF* =	[Maximum Concentration of Contaminant] / [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 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 ◉

Table 26 Comments: Surface soil is not a medium of concern because the medium is not present.

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 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) 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: Remember not to 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 reference 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)					
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 below.

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.

HHE MODULE RATING	

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 number in the MRS or Alternative Priority box 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 or ALTERNATIVE PRIORITY		*7*	

APPENDIX L – REFERENCE COPIES

Located on CD.