Final
Remedial Investigation Report
Camp O’Ryan Rifle Range, New York

Munitions Response Site NYHQ-008-R-02
New York National Guard
NYSDEC Site Number 961012

Army National Guard

Contract No. W9133L-14-D-0001
Delivery Order No. 0006

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Acronyms and Abbreviations

°F	degrees Fahrenheit
AECOM	AECOM Technical Services, Inc.
ALM	Adult Lead Methodology
ARNG	Army National Guard
AVS	Acid Volatile Sulfide
BERA	Baseline Ecological Risk Assessment
BLL	blood lead level
bgs	below ground surface
CDC	The Center for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CHE	Chemical Warfare Materiel Hazard Evaluation
CHF	Contamination Hazard Factor
COC	constituent of concern
COI	constituents of interest
COPC	constituent of potential concern
COPEC	constituents of potential ecological concern
CSM	conceptual site model
CWM	Chemical Warfare Materiel
DL	detection limit
DMNA	Division of Military and Naval Affairs
DoD	Department of Defense
DOE	Department of Energy
DQCR	daily quality control report
DQI	Data Quality Indicators
DQO	Data Quality Objectives
DRM	dose rate models
DU	decision unit
DUA	Data Usability Assessment
DVR	Data Validation Report
ECSM	ecological conceptual site model
EHE	Explosive Hazard Evaluation
EPC	exposure point concentration
ERAGS	Ecological Risk Assessment Guidance for Superfund
FS	Feasibility Study
gpm	gallons per minute
H	high
HHE	Health Hazard Evaluation
HI	hazard index
HRR	Historical Records Review
IEUBK	Integrated Exposure Uptake Biokinetic
IS	incremental sample(s)
ISM	incremental sampling methodology
ITRC	Interstate Technology & Regulatory Council

L	low
LCS	laboratory control spike
LCSD	laboratory control spike duplicate
LOD	limit of detection
LOQ	limit of quantitation
M	medium
MC	munitions constituents
MD	munitions debris
MDL	method detection limit
MEC	munitions and explosives of concern
mg/kg	milligram per kilogram
mm	millimeter
MMRP	military munitions response program
MPF	Migration Pathway Factor
MPPEH	material potentially presenting an explosive hazard
MRS	munitions response site
MRSPP	Munitions Response Site Prioritization Protocol
MS	matrix spike
MSD	matrix spike duplicates
NCR	Non-Conformance Report
ND	non-detect
NDNODS	Non-Department of Defense, Non-Operational Defense Site
NOAA	National Oceanic and Atmospheric Administration
NPS	National Parks Service
NWI	National Wetland Inventory
NYARNG	New York Army National Guard
NYRPSCOs	New York Remedial Program Soil Cleanup Objectives
NYSDEC	New York State Department of Environmental Conservation
PA	Preliminary Assessment
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
Parsons	Parsons Infrastructure and Technology Group
PbB	Blood Lead Concentrations
ppm	parts per million
QA	quality assurance
QC	quality control
RAIS	Risk Assessment Information System
RF	Receptor Factor
RI	Remedial Investigation
RPD	relative percent difference
RSD	relative standard deviation
RSL	Regional Screening Level
SEM	Simultaneously Extracted Metals
SI	Site Inspection
SLERA	screening level ecological risk assessment
SMDP	scientific management decision points

SOP	standard operating procedures
TOC	total organic carbon
UFP-QAPP	Unified Federal Policy - Quality Assurance Project Plan
µg/kg	microgram per kilogram
µg/dL	microgram per deciliter
µg/L	microgram per liter
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
US	United States
UXO	unexploded ordinance
XRF	X-ray fluorescence

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Executive Summary

This Remedial Investigation (RI) Report presents the methodology and results of a study of munitions constituents (MC) in soil and sediment conducted at the Camp O'Ryan Rifle Range (hereafter referred to as Camp O'Ryan) Munitions Response Site (MRS), located in Wethersfield, Wyoming County, New York. This is a Non-Department of Defense (DoD), Non-Operational Defense Site (NDNODS) identified by Army Environmental Database Restoration Number NYHQ-008-R-02 and New York State Department of Environmental Conservation (NYSDEC) Site Number 961012. AECOM Technical Services, Inc. (AECOM) performed the RI under Army National Guard (ARNG) Contract Number W9133L-14-D-0001, Delivery Order No. 0006.

Site Background. Camp O'Ryan was located on 376 acres and was used by the NYARNG from 1949 to 1974 and then again from 1989 to 1994 (Parsons Infrastructure and Technology [Parsons], 2011). From 1949 to 1974, training areas at the camp included a rifle range, a pistol range, and a tank driver training course, and structures at the site included a range storage building, a field latrine, and a mess hall. The parcel of land the former mess hall occupied was subdivided from the original training camp and sold by the estate of Edward George, the property owner, in 1999. The former mess hall is currently owned and occupied by King Brothers Masonry Contractors. The ranges were used by NYARNG units stationed at various New York bases (Parsons, 2011).

Pre-RI Studies. After a Site Inspection (SI) conducted in 2009, the size and shape of the Camp O'Ryan MRS were revised. The largest identified MRS area at the former Camp O'Ryan, Camp O'Ryan MRS 3 Maneuvering Area (NYHQ-008-R-03), includes within its footprint the Camp O'Ryan MRS 1 Pistol Range (NYHQ-008-R-01) and Camp O'Ryan MRS 2 Rifle Range (NYHQ-008-R-02).

The Camp O'Ryan MRS 2, which is the subject of this RI, consists of a hillside impact berm and a former 200-yard range with 50 targets and firing berms at distances of 100 and 200 yards. The MRS also includes a concrete retaining wall with target structures still intact. Small arms, including .30 caliber M1, were approved for use Camp O'Ryan MRS 2; additional potential munitions used include .22, .38, and .45 caliber as well as 5.56 millimeter (mm) and 7.62mm. The firing direction at the Camp O'Ryan MRS 2 was to the southeast.

In 2009, NYSDEC conducted a site investigation that included targeted soil sampling to evaluate the potential presence of MC. The assessment included collecting soil samples from the 100-yard firing berm, target area, and an adjacent background area for comparison. Data from these samples showed that MC were present in soil at the 100-yard firing berm and target berm at concentrations above New York Remedial Program Soil Cleanup Objectives (NYRPSCOs) and background levels (Parsons, 2012). Based on these results and a historical records review performed by Parsons, a 2012 SI recommended that the Camp O'Ryan MRS 2 Rifle Range proceed to an RI (Parsons, 2012).

2019-2020 Remedial Investigation. The RI performed between 2019 and 2020 evaluated the presence, nature, and extent of MC at the Camp O'Ryan MRS 2 and assessed potential risk to human and ecological receptors. Sampling occurred in three mobilizations; the first mobilization occurred over a four-day period from 02 June through 06 June 2019. Sampling halted upon the discovery of material potentially presenting an explosive hazard (MPPEH) onsite. Two MPPEH items were removed by the local police department and Erie Bomb Squad. The items were determined to be inert munitions debris (MD) and disposed of by local authorities. Field work resumed with a revised Site Safety and Health Plan in July 2020 and a UXO escort was added to the field team to ensure the safety of the team in case additional unidentified items were discovered. Results were used to guide management decisions as to whether remedial action is required. Per the preliminary conceptual site model (CSM) in the Final RI Work Plan/Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP; AECOM, 2019), potentially complete pathways exist for human receptors to come into direct contact with site soils due to the former range existing on private property. While no critical habitats are present within the MRS, there are species listed as federally threatened for Wyoming County (United States [US] Fish and Wildlife Service [USFWS], 2020b). Forested areas, which may provide habitat for ecological receptors, are present within the MRS. New York State also lists numerous threatened and endangered species with known ranges within the vicinity of the MRS.

RI Decision Units. This RI compiled and evaluated information and data about the MRS relating to the potential contamination associated with its historical use for small arms training activities conducted at Camp O'Ryan MRS 2. The MC associated with small arms are antimony, copper, lead, and zinc; lead is the dominant component. For data interpretation purposes and for assessing risks, the MRS was originally divided into three decision units (DUs), and the sampling approach was designed to characterize the nature and extent of MC contamination in soil berms at the 100-yard Firing Berm, Target Area, and Target Berm Area. Two additional DUs were added during the investigation to assess potential MC in sediment at a temporarily inundated area that collects surface water runoff at the base of the Target Berm (Target Berm-Ponded DU) and a seasonally flooded wetland on the east side of the Target Berm (Wet Meadow DU). The original Target Berm DU was renamed Target Berm-Hillside DU (**Figure ES-1**).

RI Field Activities. Field investigation activities included x-ray fluorescence (XRF) screening of surface soil at the 100-yard Firing Berm DU, Target Area DU, and the perimeter and step out areas of the Target Berm-Hillside DU to evaluate the lateral extent of MC. Activities included the collection of surface soil samples using incremental sampling methodology (ISM) at the DUs. Discrete sampling of subsurface soil at those DUs was performed to assess vertical extent of MC in soil. Discrete sediment samples were collected at the Target Berm-Ponded DU and Wet Meadow DU. Because MC metals are also naturally occurring, site-specific background reference ISM samples were collected and analyzed in an area on the western edge of the MRS not affected by training activities. Analytical results for each DU are summarized below.

RI Analytical Results:

100-yard Firing Berm: The data collected at the 100-yard Firing Berm DU were sufficient to delineate the extent of small arms metals. Exceedances of the human health criterion for lead were observed in XRF screening results at the 100-yard Firing Berm DU and resulted in step-out sampling that enlarged the DU area to 1.39 acres (**Figure ES-2**). ISM sample results indicate that lead MC is present in soil at the human health screening criteria, and antimony concentrations are above ecological screening criteria (**Table ES-1** and **Figure ES-3**). Two locations at the 100-yard Firing Berm DU were selected for discrete subsurface soil sampling. One location indicated that all MC were below human health and ecological screening criterion at the 12- to 18-inches (below ground surface (bgs) depth, and as a result, the 24- to 30-inches bgs sample was not analyzed. The concentration of lead at the second discrete subsurface sample location exceeded human health screening criteria, and the antimony concentration exceeded ecological screening criteria. As a result, the deeper 24- to 30-inches bgs sample was analyzed but did not exceed of ecological or human health screening criteria (**Figure ES-4** and **Table ES-2**).

The Human Health Risk Assessment (HHRA) identified lead as a surface soil ISM constituent of potential concern (COPC). The lead modeling results, assuming a target blood lead level (BLL) of 10 micrograms per deciliter (µg/dL), indicated that adverse health effects are not likely for potential receptors exposed to surface soil.

<u>Target Area</u>: The data collected at the Target Area DU were sufficient to delineate the extent of small arms metals. Exceedances of the human health criterion for lead were observed in XRF screening results at the Target Berm and resulted in step-out sampling that enlarged the DU area to 0.071 acres (**Figure ES-5**). ISM sample results indicate that lead is present in soil above human health screening criteria, and antimony concentrations are above ecological screening criteria (**Table ES-1** and **Figure ES-3**). Two locations at the Target Area DU were selected for discrete subsurface soil sampling. One location (grid #4) indicated that all MC were below human health and ecological screening criterion at the 12- to 18-inches bgs depth, and as a result, the 24- to 30-inches bgs sample was not analyzed. The concentration of lead at the second discrete subsurface sample location (grid#14) exceeded human health screening criteria, and the antimony concentration exceeded ecological screening criteria. As a result, the deeper 24- to 30-inches bgs sample was analyzed and demonstrated no further exceedances of ecological or human health screening criteria (**Figure ES-6** and **Table ES-2**).

The HHRA identified lead as a surface soil ISM COPC. The lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for potential receptors exposed to surface soil.

<u>Target Berm-Hillside</u>: The data collected at the MRS were sufficient to delineate the lateral extent of site-related MC contamination at the Target Berm-Hillside DU. Exceedances of the human health criterion for lead were observed in XRF screening results across the hillside, which resulted in step-out sampling enlarging the DU area to 18.51 acres (**Figure ES-7**). ISM results indicate that lead and zinc are present in soil above human health screening criteria, and antimony concentrations exceeded respective ecological screening values (**Table ES-1**).

Three locations at the Target Berm-Hillside DU were selected for discrete subsurface soil sampling based on elevated surface soil XRF lead results. The discrete subsurface soil sampling location (grid #1) on the northwestern border of the DU closest to the Target Wall indicated that antimony concentrations exceeded ecological screening criteria, and as a result, the sample collected from the deeper interval was analyzed. The deeper sample was collected at 25-inches bgs due to refusal at a large cobble layer. The deeper sample indicated that concentrations of lead, copper, and zinc all exceeded human health screening criteria, and antimony remained above ecological screening criteria. These concentrations are likely due to mechanical movement of soil during active range use to fill in bullet pockets or the collection of bullet fragments against the hard cobble layer. Of the two other discrete subsurface soil sampling locations (grid #s 40 and 46), concentrations at the 12- to 18-inches bgs depth at grid #40 indicated that all MC were below human health and ecological screening criteria; thus, the next deeper sample was not analyzed.

Concentrations of lead at grid #46 exceeded human health screening criteria and prompted analysis of the 24- to 30-inches bgs sample. The deeper sample had no exceedances of ecological or human health screening criteria (**Figure ES-8** and **Table ES-2**).

The HHRA indicated adverse health effects from non-cancer hazard results are not likely for any receptors exposed to copper and zinc in surface soil (0 to 6 inches bgs). Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for potential receptors exposed to surface soil.

Target Berm-Ponded DU: At the Target Berm-Ponded DU, eight discrete sediment samples were collected from evenly spaced locations from south to north along a transect of the DU (**Figure ES-9**). Concentrations of lead exceeded human health screening criteria in each of the eight samples analyzed, and antimony also exceeded human health screening criteria in the sample with the highest lead concentration. All MC concentrations exceeded ecological screening criteria in six of the eight samples, and at least one MC concentration exceeded ecological screening criteria in all eight samples (**Table ES-3**).

The HHRA determined adverse health effects are not likely for potential receptors exposed to antimony in sediment. Lead modeling results, assuming a target BLL of 10 µg/dL, indicated adverse health effects are possible for the child site visitor/recreational user and hypothetical child resident.

Wet Meadow DU: At the Wet Meadow DU, eight discrete sediment samples were collected from evenly spaced locations around the circular DU (**Figure ES-10**). Thick vegetation and trees prevented the collection of samples from the center of the DU. Concentrations of lead exceeded human health screening criteria at four sample locations. Concentrations of copper exceeded ecological screening criteria at four sample locations, and concentrations of zinc exceeded ecological screening criteria at six sample locations (**Table ES-3**). The HHRA eliminated lead as a soil COPC during secondary screening evaluation through use of the lead mean concentration and lead action levels. The Wet Meadow was eliminated from further evaluation.

Based on the results of the RI, it is recommended that the MRS boundary be revised to include areas sampled in the expanded Target Berm-Hillside DU and the Wet Meadow DU; the revised acreage of the MRS is 42.21 acres (**Figure ES-11**). The presence of unacceptable risks to human health warrants a Feasibility Study (FS) for the Camp O'Ryan Rifle Range MRS.

Analytical results for each DU were compared to human health and ecological screening values in accordance with the UFP-QAPP. Due to small arms MC exceedances of the screening criteria, each DU was evaluated further in an HHRA ("HH") and/or SLERA ("Eco"). The following COPCs were identified at each DU:

Decision Unit/Media	Antimony	Copper	Lead	Zinc
100-yard Firing Berm Soil	Eco		HH, Eco	
Target Area Soil	Eco		HH, Eco	

Target Berm-Hillside Soil	Eco	HH	HH, Eco	HH, Eco
Target Berm-Ponded Sediment	HH, Eco	Eco	HH, Eco	Eco
Wet Meadows Sediment	Eco		HH, Eco	Eco

Notes:
Blank cells indicate that screening level criteria was not exceeded and the analyte was not identified as a COPC for either the HHRA or SLERA.

The soil COPCs identified above were also detected above background reference values. The COPCs identified above were carried forward into the risk assessments.

HHRA. The HHRA evaluated the following human receptors: outdoor worker, construction worker, site visitor/recreational user (child/adult), and hypothetical resident (child/adult). Soil-related exposure pathways for each receptor include incidental ingestion, dermal contact, and inhalation of wind-blown particulates from soil. Sediment-related exposure pathways for each receptor include incidental ingestion and dermal contact with MC in the marshy wetland area of the MRS. The HHRA results are summarized below:

100-yd Firing Berm DU:
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to ISM surface soil (0 to 6 inches bgs).

Target Area DU:
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to ISM surface soil (0 to 6 inches bgs).

Target Berm – Hillside DU:
- Non-cancer hazard results indicated that adverse health effects are not likely for the any of the human receptors exposed to ISM surface soil (0 to 6 inches bgs).
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to ISM surface soil (0 to 6 inches bgs).

Target Berm – Ponded DU:
- Non-cancer hazard results indicated that adverse health effects are not likely for the any of the potential human receptors exposed to sediment.
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are possible for the child site visitor/recreational user and hypothetical child resident from exposure to sediment.
- The heavily vegetated and marshy terrain of the Target Berm-Ponded DU makes access to this DU difficult, especially for a young child receptor ages 0 to 6 years old; the lead modeling results for sediment are likely overestimated due to limited access and conservative modeling assumptions.

Wet Meadow DU:

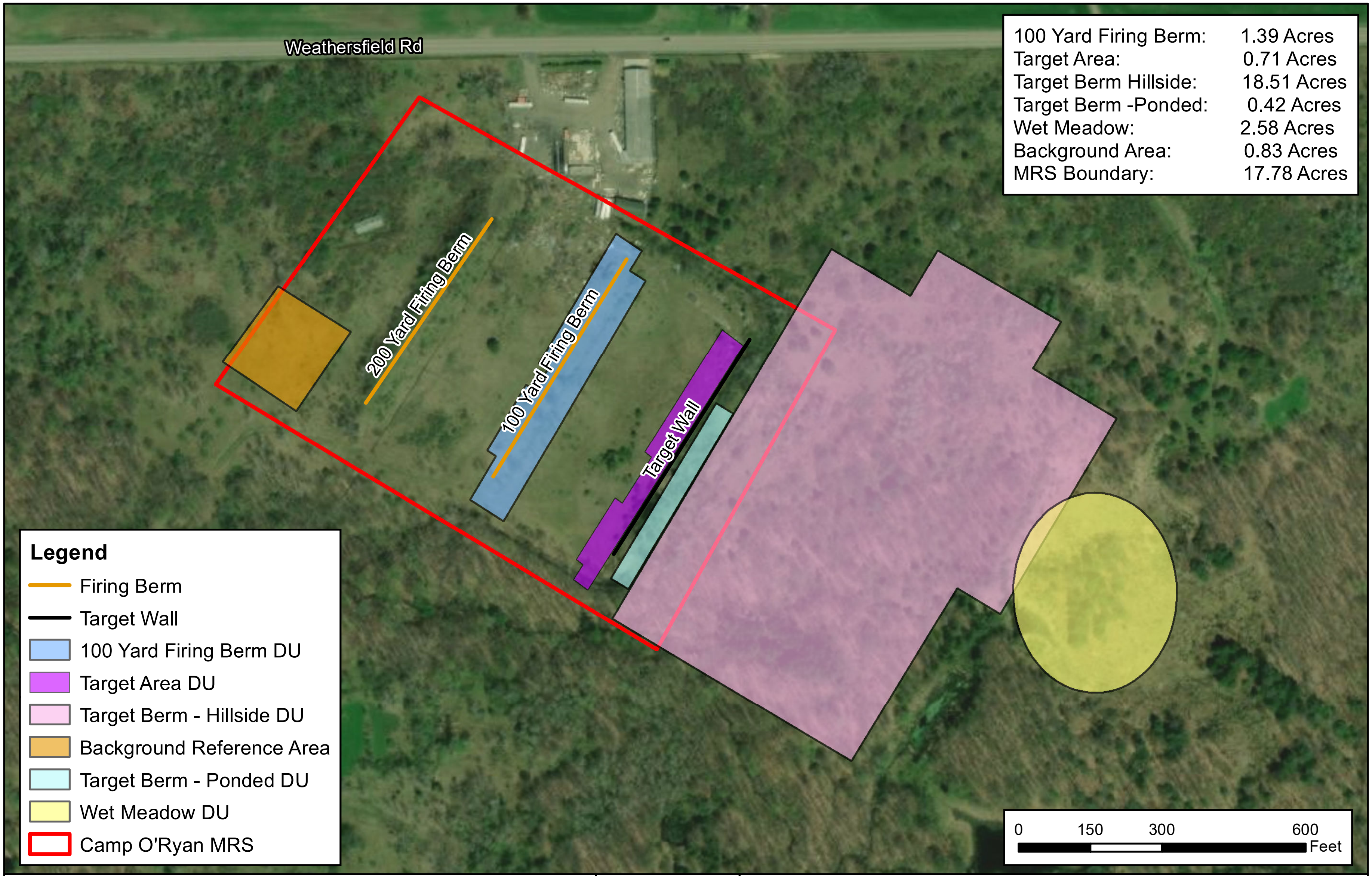
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to sediment.

No unacceptable risk to human receptors was determined at the 100-yard Firing Berm, Target Area, Target Berm-Hillside, and Wet Meadow DUs. However, adverse health effects are possible from exposure to lead in sediment for the child resident/child recreational user at the Target Berm-Ponded DU.

SLERA. Potential ecological exposure was evaluated in a Screening Level Ecological Risk Assessment (SLERA), which is Step 1 and 2 of the 8-step *Ecological Risk Assessment Guidance for Superfund* (ERAGS) process to identify constituents of potential ecological concern (COPECs). The list of COPECs was then refined per Baseline Ecological Risk Assessment (BERA) Step 3 to reduce uncertainty in the SLERA Step 1 and 2 conclusions and to refine the recommendations by applying more realistic exposure assumptions.

The results of the SLERA, BERA Step 3a COPEC refinement, and consideration of the uncertainties present in the evaluation support the following scientific management decision point (SMDP) for the MRS:

- There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk.
    - Negligible Risk
        - Soil macroinvertebrate community
        - Benthic macroinvertebrate community (Wet Meadow DU)
        - Terrestrial wildlife community
        - Aquatic and semi-aquatic wildlife community
        - Groundwater to surface water pathway
- The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted.
        - Benthic macroinvertebrate community (Target Berm-Ponded DU)
- Constituents of Concern (COCs)
    - Lead was identified as a direct contact based COCs in sediment at the Target Berm-Ponded DU within the Camp O'Ryan Rifle Range MRS.



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PROJECT	RI through DD for Camp O'Ryan, NY MRS			
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	AS	11/20/2020

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Camp O'Ryan Revised DUs

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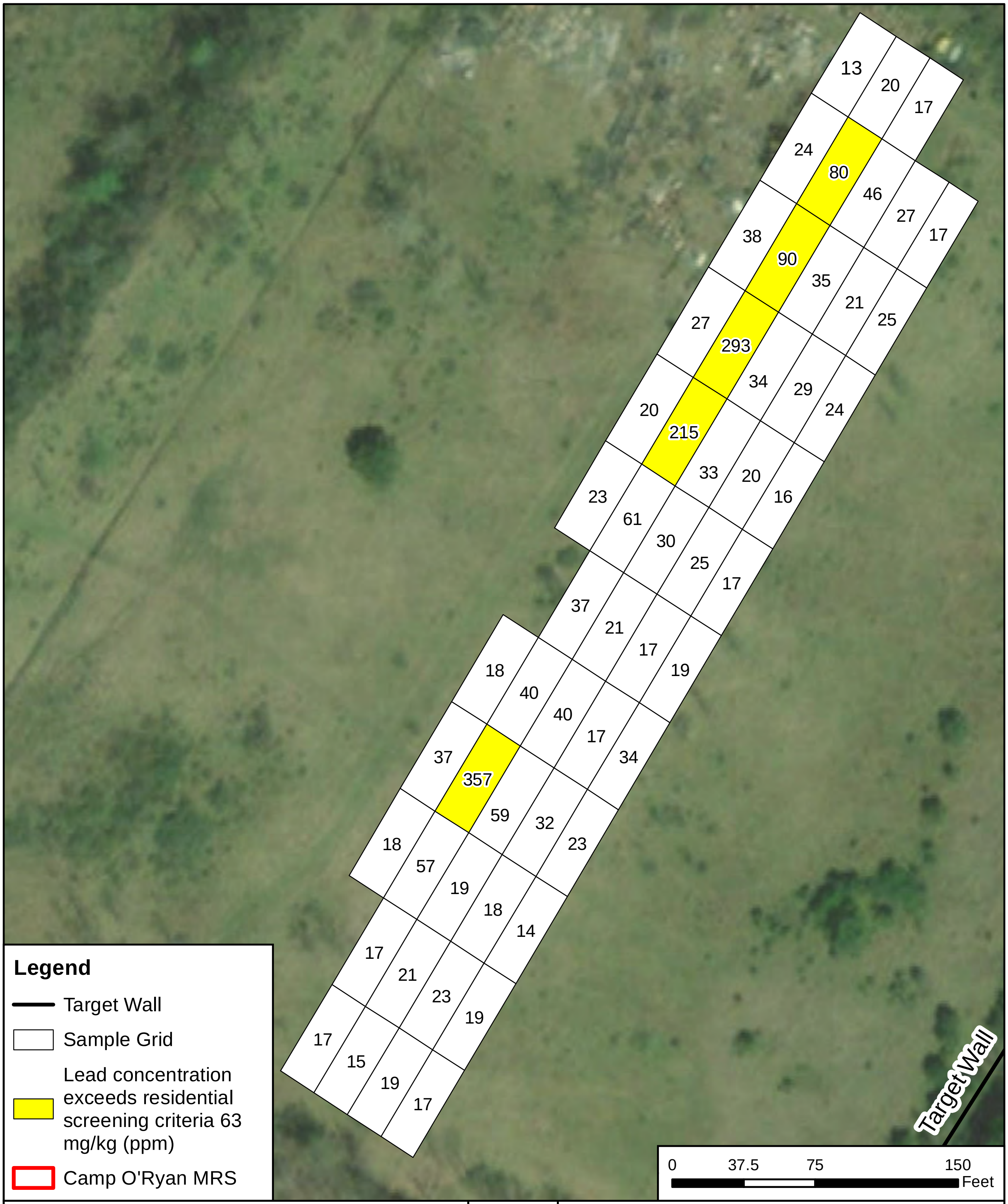
Figure ES-1



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PROJECT	RI through DD for Camp O'Ryan, NY MRS			
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	10/26/2020

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100-yard Firing Berm DU XRF Results

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Figure ES-2

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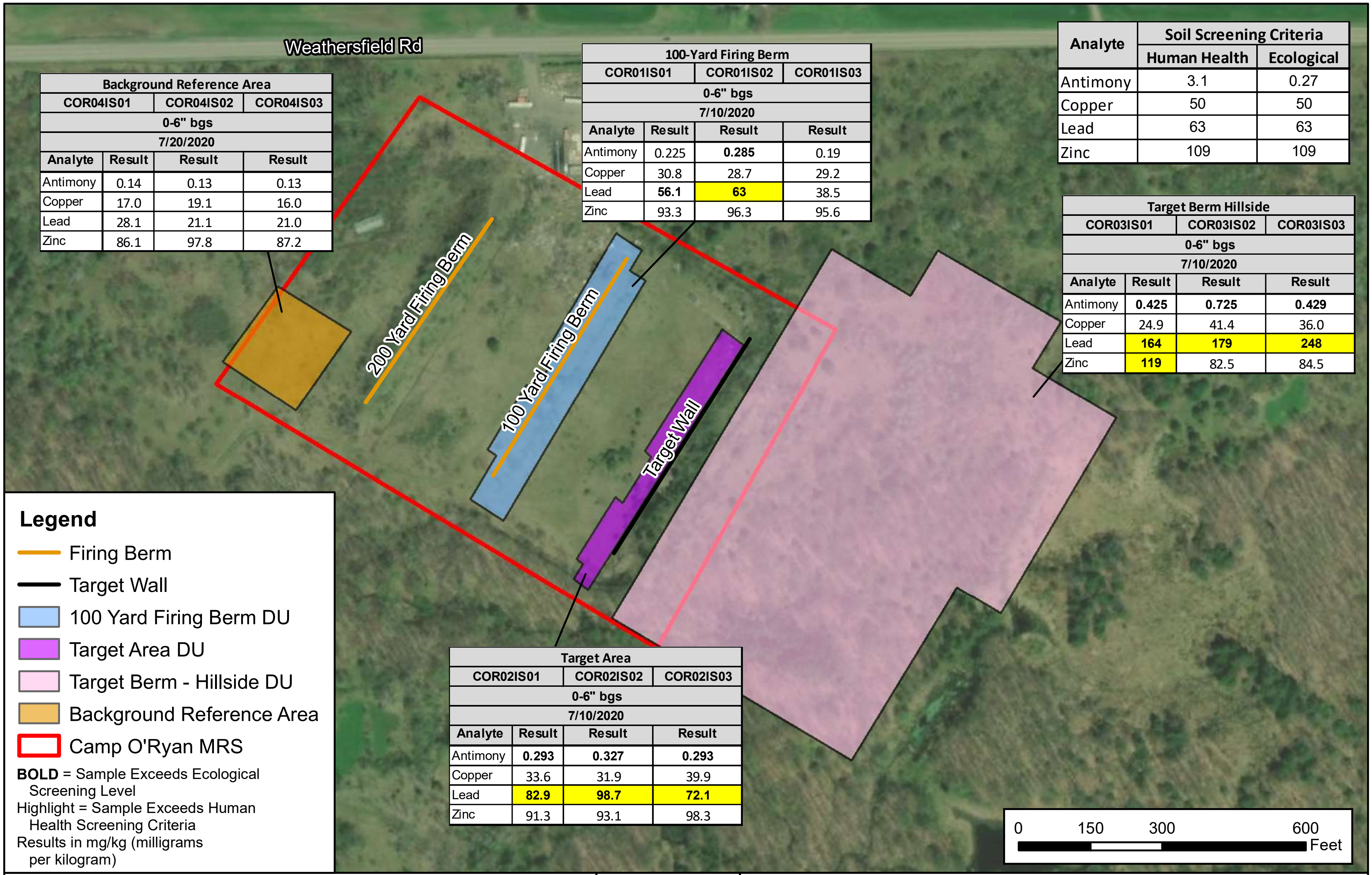

Analyte	Soil Screening Criteria	
	Human Health	Ecological
Antimony	3.1	0.27
Copper	50	50
Lead	63	63
Zinc	109	109

Background Reference Area

	COR04IS01	COR04IS02	COR04IS03
	0-6" bgs		
	7/20/2020		
Analyte	Result	Result	Result
Antimony	0.14	0.13	0.13
Copper	17.0	19.1	16.0
Lead	28.1	21.1	21.0
Zinc	86.1	97.8	87.2

100-Yard Firing Berm

	COR01IS01	COR01IS02	COR01IS03
	0-6" bgs		
	7/10/2020		
Analyte	Result	Result	Result
Antimony	0.225	**0.285**	0.19
Copper	30.8	28.7	29.2
Lead	**56.1**	**63**	38.5
Zinc	93.3	96.3	95.6

Target Berm Hillside

	COR03IS01	COR03IS02	COR03IS03
	0-6" bgs		
	7/10/2020		
Analyte	Result	Result	Result
Antimony	**0.425**	**0.725**	**0.429**
Copper	24.9	41.4	36.0
Lead	**164**	**179**	**248**
Zinc	**119**	82.5	84.5

Target Area

	COR02IS01	COR02IS02	COR02IS03
	0-6" bgs		
	7/10/2020		
Analyte	Result	Result	Result
Antimony	**0.293**	**0.327**	**0.293**
Copper	33.6	31.9	39.9
Lead	**82.9**	**98.7**	**72.1**
Zinc	91.3	93.1	98.3

Legend

- Firing Berm
- Target Wall
- 🟦 100 Yard Firing Berm DU
- 🟪 Target Area DU
- ▨ Target Berm - Hillside DU
- 🟧 Background Reference Area
- 🟥 Camp O'Ryan MRS

BOLD = Sample Exceeds Ecological Screening Level
Highlight = Sample Exceeds Human Health Screening Criteria
Results in mg/kg (milligrams per kilogram)

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	12/4/2020
SCALE	1:3,600	CHK BY	JW	12/4/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	AS	12/4/2020

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Camp O'Ryan ISM Results

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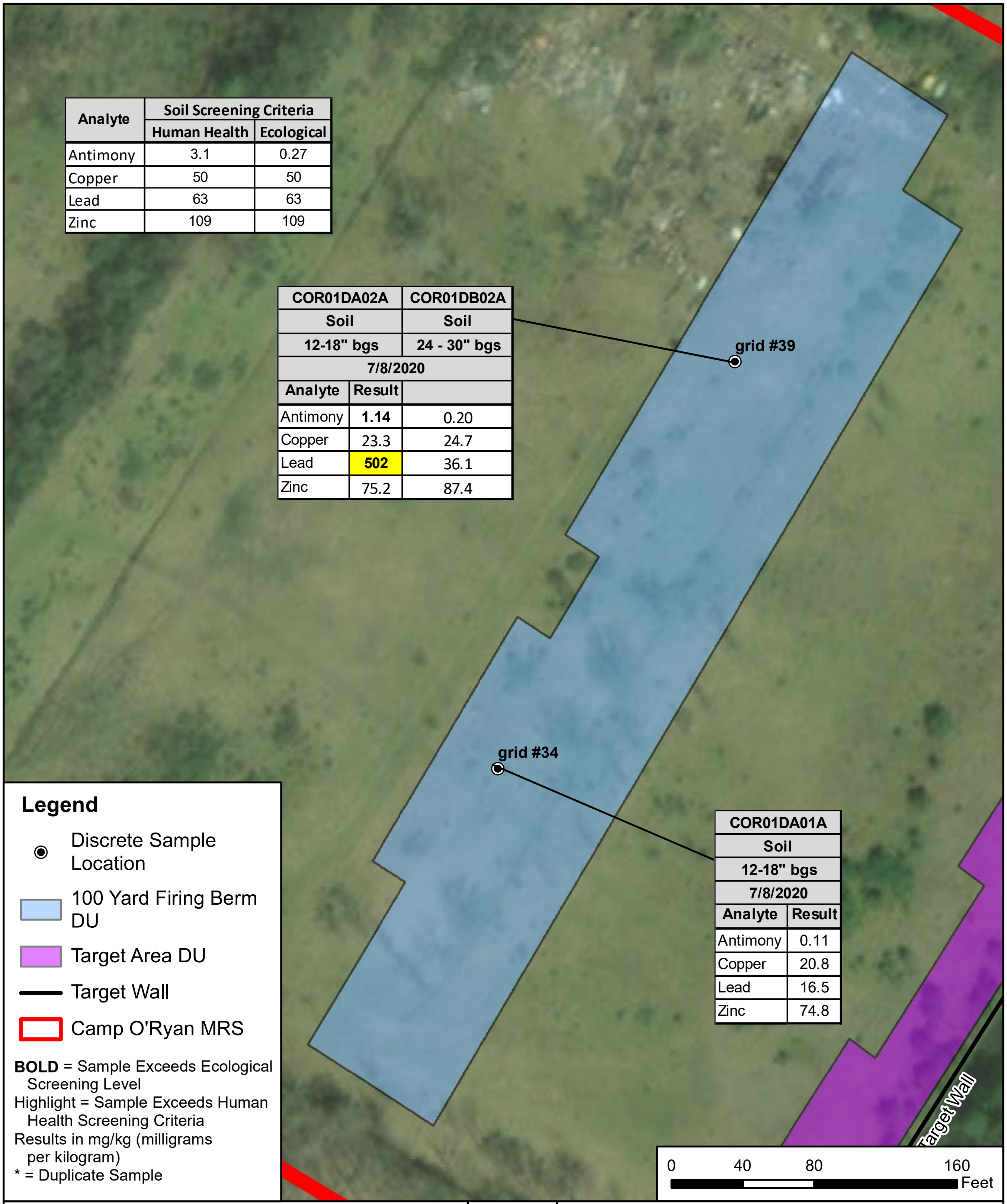
Figure ES-3



Analyte	Soil Screening Criteria	
	Human Health	Ecological
Antimony	3.1	0.27
Copper	50	50
Lead	63	63
Zinc	109	109

COR01DA02A		COR01DB02A
Soil		Soil
12-18" bgs		24 - 30" bgs
7/8/2020		
Analyte	Result	
Antimony	**1.14**	0.20
Copper	23.3	24.7
Lead	**502**	36.1
Zinc	75.2	87.4

COR01DA01A	
Soil	
12-18" bgs	
7/8/2020	
Analyte	Result
Antimony	0.11
Copper	20.8
Lead	16.5
Zinc	74.8

Legend

◉ Discrete Sample Location

🟦 100 Yard Firing Berm DU

🟪 Target Area DU

— Target Wall

🟥 Camp O'Ryan MRS

BOLD = Sample Exceeds Ecological Screening Level
Highlight = Sample Exceeds Human Health Screening Criteria
Results in mg/kg (milligrams per kilogram)
* = Duplicate Sample

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	12/4/2020
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	12/4/2020

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100-Yard Firing Berm DU Discrete Results

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Figure ES-4

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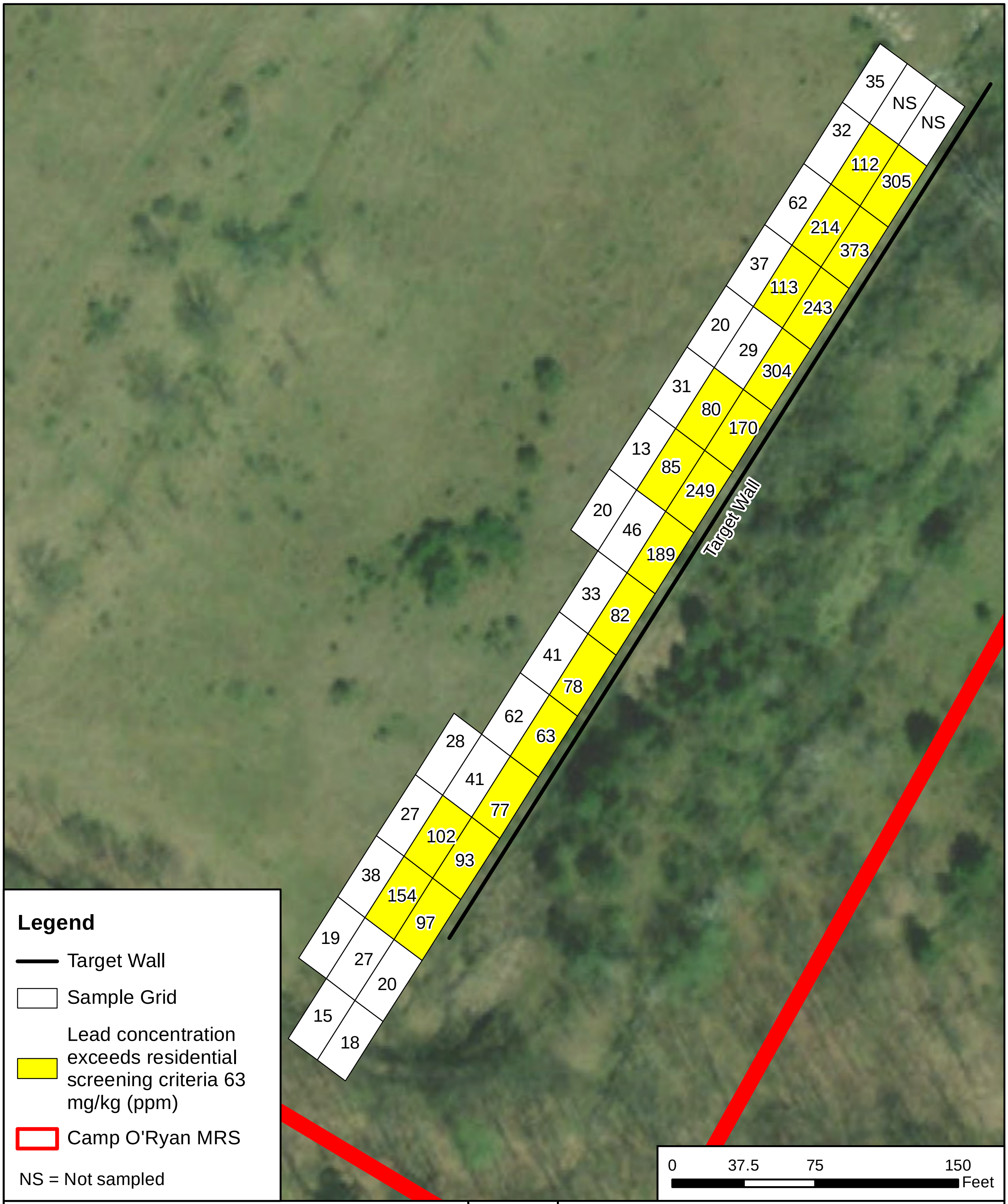

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	10/8/2020

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Target Area DU XRF Results

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Figure ES-5

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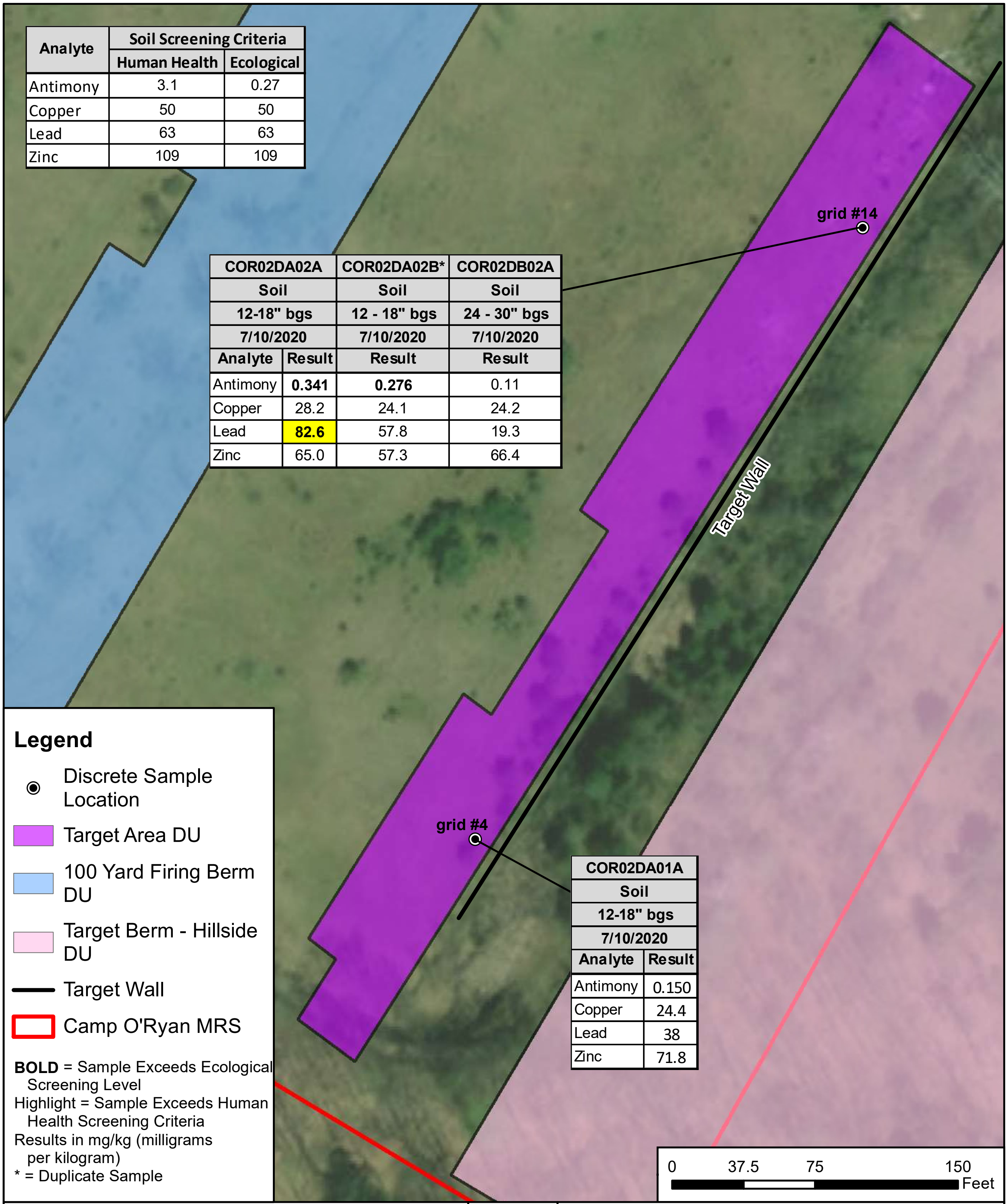

Analyte	Soil Screening Criteria	
	Human Health	Ecological
Antimony	3.1	0.27
Copper	50	50
Lead	63	63
Zinc	109	109

COR02DA02A		COR02DA02B*	COR02DB02A
Soil		Soil	Soil
12-18" bgs		12 - 18" bgs	24 - 30" bgs
7/10/2020		7/10/2020	7/10/2020
Analyte	Result	Result	Result
Antimony	**0.341**	**0.276**	0.11
Copper	28.2	24.1	24.2
Lead	**82.6**	57.8	19.3
Zinc	65.0	57.3	66.4

COR02DA01A	
Soil	
12-18" bgs	
7/10/2020	
Analyte	Result
Antimony	0.150
Copper	24.4
Lead	38
Zinc	71.8

BOLD = Sample Exceeds Ecological Screening Level
Highlight = Sample Exceeds Human Health Screening Criteria
Results in mg/kg (milligrams per kilogram)
* = Duplicate Sample

Target Area DU Discrete Results

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	11/20/2020
SCALE	1:900	CHK BY	JW	11/20/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	11/20/2020

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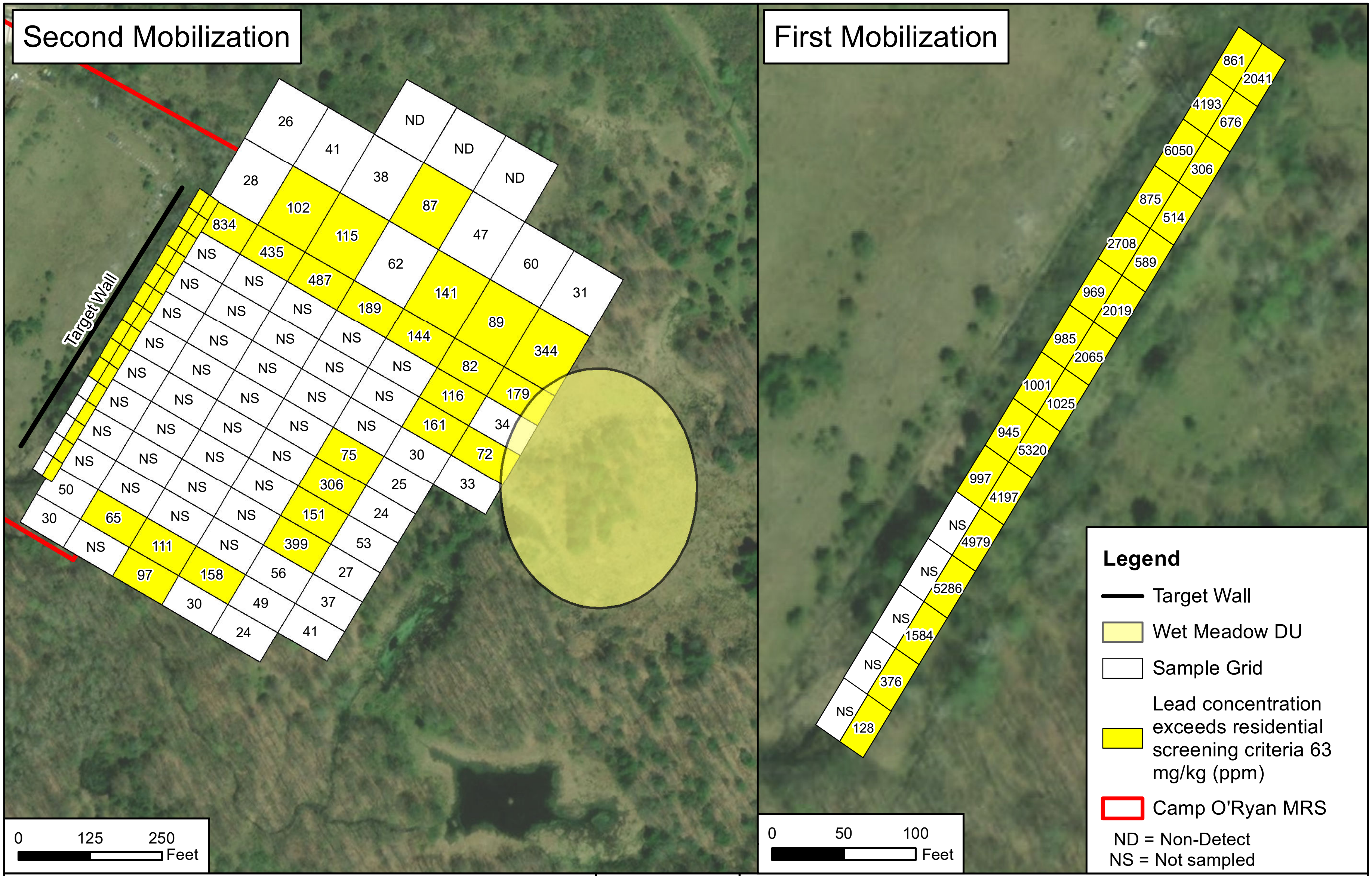
Figure ES-6

S:\60519685-GRM2\900-Work\GIS\Other_Sites\NY_ORyan\1_MXD\RI_Figures\Fig5-8_ORyan_DU2_DiscreteResults.mxd



CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	11/30/2020
SCALE	1:3,000	CHK BY	JW	11/30/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	LS	11/30/2020

Target Berm - Hillside DU XRF Results

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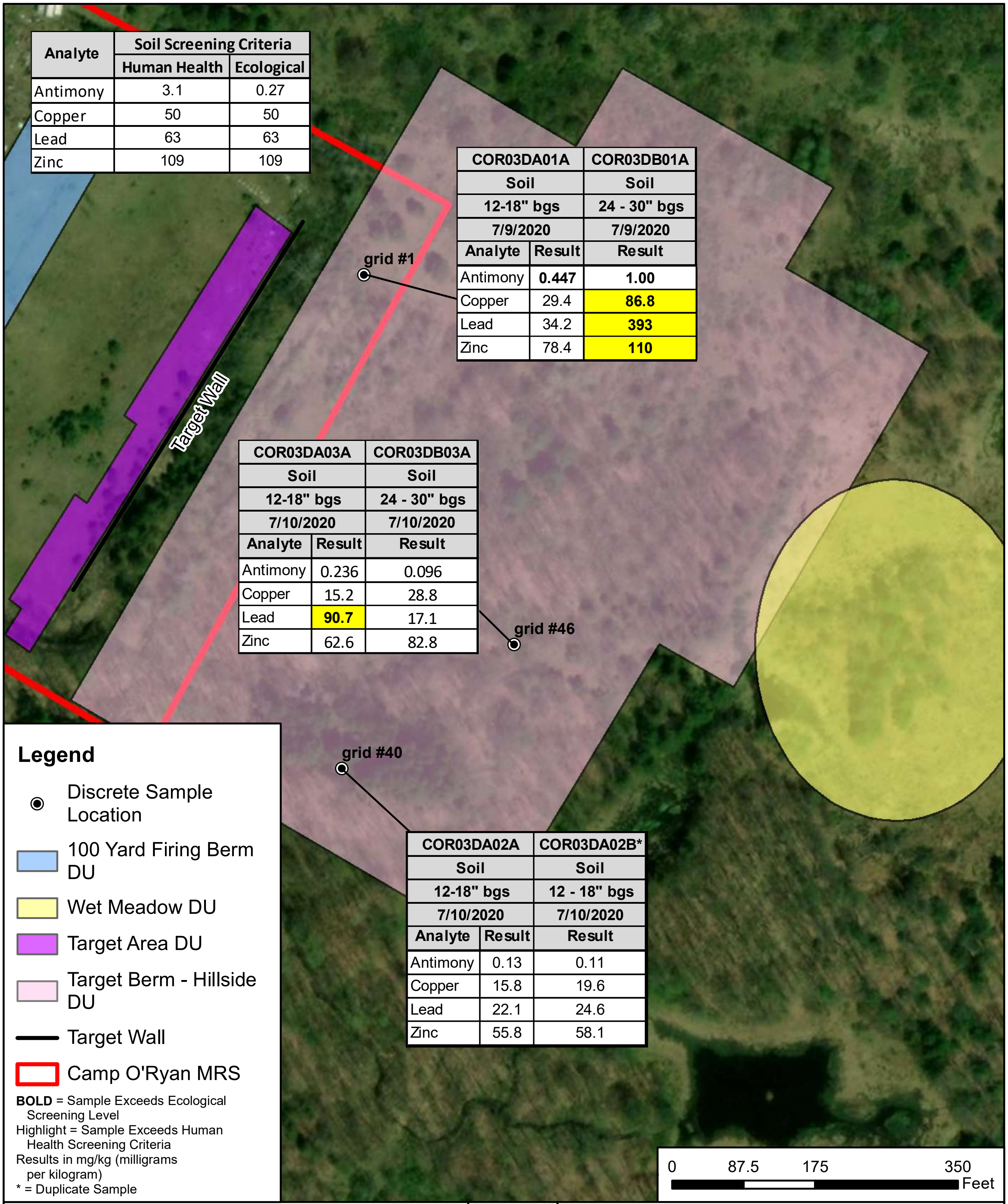
Figure ES-7



Analyte	Soil Screening Criteria	
	Human Health	Ecological
Antimony	3.1	0.27
Copper	50	50
Lead	63	63
Zinc	109	109

	COR03DA01A	COR03DB01A
	Soil	Soil
	12-18" bgs	24 - 30" bgs
	7/9/2020	7/9/2020
Analyte	Result	Result
Antimony	**0.447**	**1.00**
Copper	29.4	**86.8**
Lead	34.2	**393**
Zinc	78.4	**110**

	COR03DA03A	COR03DB03A
	Soil	Soil
	12-18" bgs	24 - 30" bgs
	7/10/2020	7/10/2020
Analyte	Result	Result
Antimony	0.236	0.096
Copper	15.2	28.8
Lead	**90.7**	17.1
Zinc	62.6	82.8

	COR03DA02A	COR03DA02B*
	Soil	Soil
	12-18" bgs	12 - 18" bgs
	7/10/2020	7/10/2020
Analyte	Result	Result
Antimony	0.13	0.11
Copper	15.8	19.6
Lead	22.1	24.6
Zinc	55.8	58.1

BOLD = Sample Exceeds Ecological Screening Level
Highlight = Sample Exceeds Human Health Screening Criteria
Results in mg/kg (milligrams per kilogram)
* = Duplicate Sample

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	12/4/2020
SCALE	1:2,100	CHK BY	JW	12/4/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	12/4/2020

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Target Berm- Hillside DU Discrete Results

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Figure ES-8

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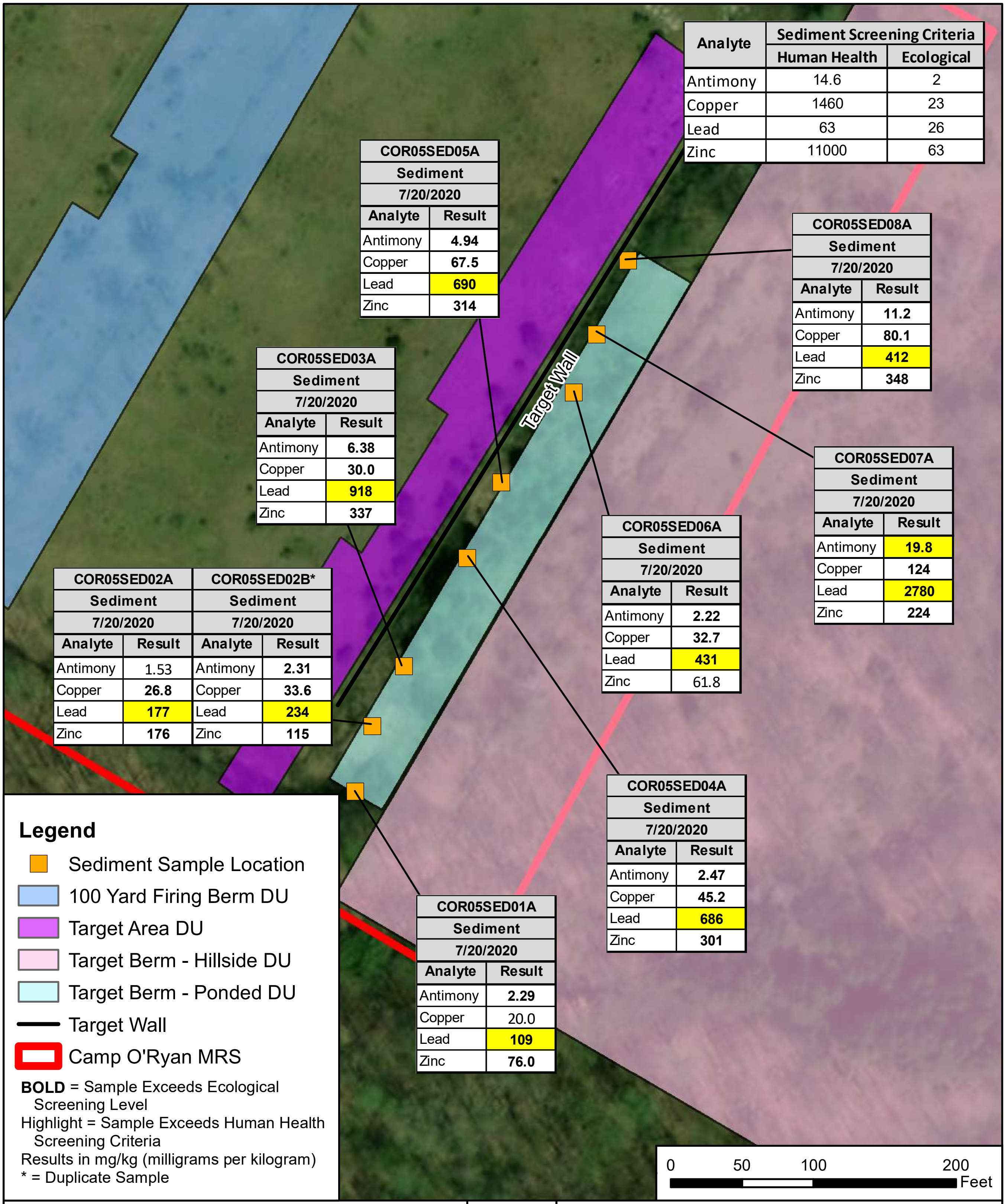

Analyte	Sediment Screening Criteria	
	Human Health	Ecological
Antimony	14.6	2
Copper	1460	23
Lead	63	26
Zinc	11000	63

COR05SED05A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	**4.94**
Copper	**67.5**
Lead	**690**
Zinc	**314**

COR05SED08A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	**11.2**
Copper	**80.1**
Lead	**412**
Zinc	**348**

COR05SED03A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	**6.38**
Copper	**30.0**
Lead	**918**
Zinc	**337**

COR05SED07A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	**19.8**
Copper	**124**
Lead	**2780**
Zinc	**224**

COR05SED06A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	**2.22**
Copper	**32.7**
Lead	**431**
Zinc	61.8

COR05SED02A		COR05SED02B*	
Sediment		Sediment	
7/20/2020		7/20/2020	
Analyte	Result	Analyte	Result
Antimony	1.53	Antimony	**2.31**
Copper	**26.8**	Copper	**33.6**
Lead	**177**	Lead	**234**
Zinc	**176**	Zinc	**115**

COR05SED04A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	**2.47**
Copper	**45.2**
Lead	**686**
Zinc	**301**

COR05SED01A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	**2.29**
Copper	20.0
Lead	**109**
Zinc	**76.0**

BOLD = Sample Exceeds Ecological Screening Level
Highlight = Sample Exceeds Human Health Screening Criteria
Results in mg/kg (milligrams per kilogram)
* = Duplicate Sample

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	11/30/2020
SCALE	1:1,200	CHK BY	JW	11/30/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	11/30/2020

Target Berm- Ponded DU
Discrete Sediment Sample Results

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Figure ES-9

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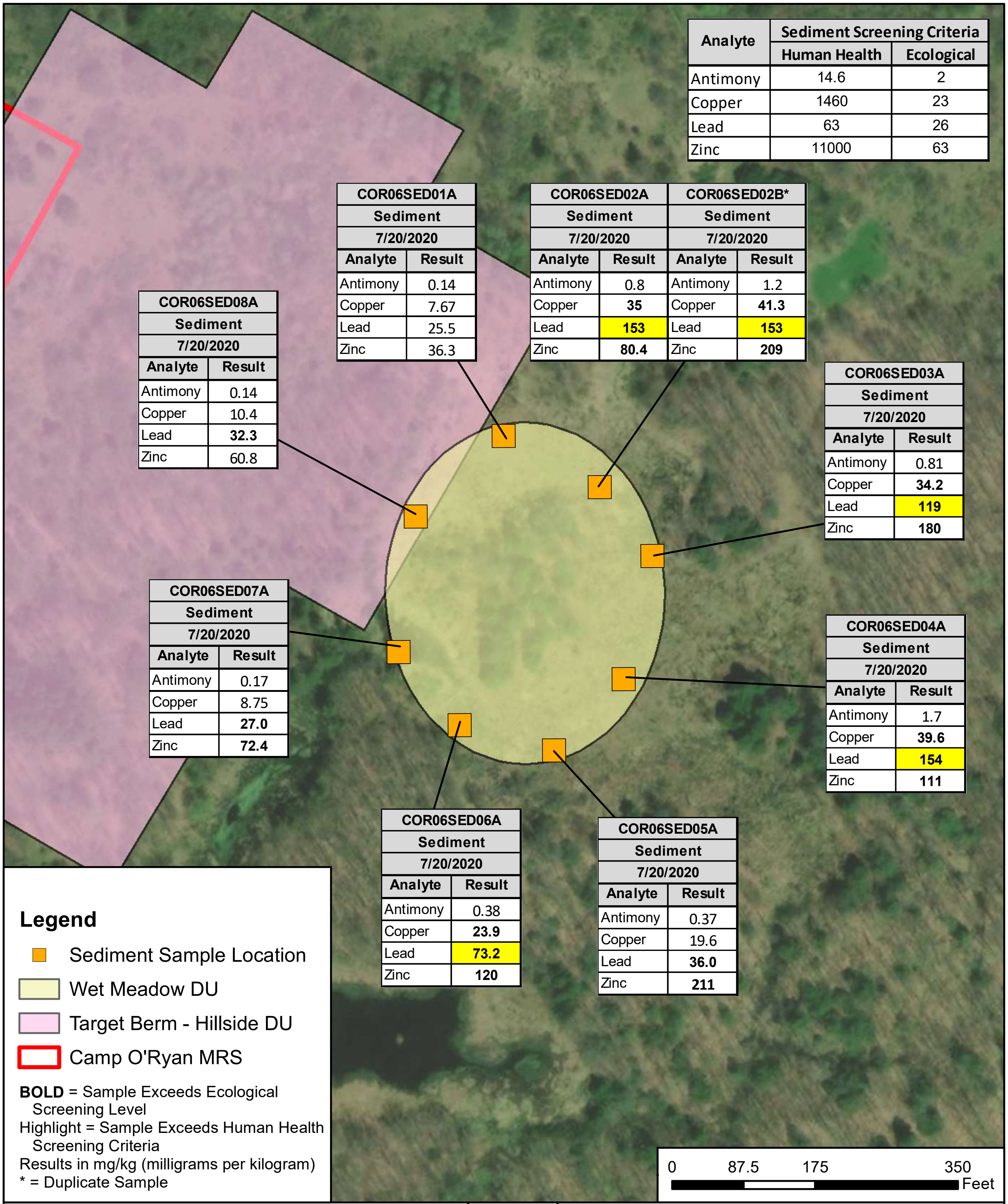

Analyte	Sediment Screening Criteria	
	Human Health	Ecological
Antimony	14.6	2
Copper	1460	23
Lead	63	26
Zinc	11000	63

COR06SED01A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	0.14
Copper	7.67
Lead	25.5
Zinc	36.3

COR06SED02A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	0.8
Copper	**35**
Lead	**153**
Zinc	**80.4**

COR06SED02B*	
Sediment	
7/20/2020	
Analyte	Result
Antimony	1.2
Copper	**41.3**
Lead	**153**
Zinc	**209**

COR06SED08A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	0.14
Copper	10.4
Lead	**32.3**
Zinc	60.8

COR06SED03A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	0.81
Copper	**34.2**
Lead	**119**
Zinc	**180**

COR06SED07A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	0.17
Copper	8.75
Lead	**27.0**
Zinc	**72.4**

COR06SED04A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	1.7
Copper	**39.6**
Lead	**154**
Zinc	**111**

COR06SED06A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	0.38
Copper	**23.9**
Lead	**73.2**
Zinc	**120**

COR06SED05A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	0.37
Copper	19.6
Lead	**36.0**
Zinc	**211**

Legend

- 🟧 Sediment Sample Location
- 🟨 Wet Meadow DU
- 🟪 Target Berm - Hillside DU
- 🟥 Camp O'Ryan MRS

BOLD = Sample Exceeds Ecological
Screening Level
Highlight = Sample Exceeds Human Health
Screening Criteria
Results in mg/kg (milligrams per kilogram)
* = Duplicate Sample

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	11/30/2020
SCALE	1:2,100	CHK BY	JW	11/30/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	11/30/2020

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Wet Meadow DU Sediment Sample Results

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Figure ES-10

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100 Yard Firing Berm:	1.39 Acres
Target Area:	0.71 Acres
Target Berm Hillside:	18.51 Acres
Target Berm -Ponded:	0.42 Acres
Wet Meadow:	2.58 Acres
Background Area:	0.83 Acres
Revised MRS Boundary:	42.21 Acres

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	11/20/2020
SCALE	1:3,600	CHK BY	JW	11/20/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	AS	11/20/2020

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Camp O'Ryan Revised MRS Boundary

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Figure ES-11

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Table ES-1. Incremental Sampling Results Summary

		Location:	100-Yard Firing Berm DU											
		Sample ID:	COR01IS01				COR01IS02				COR01IS03			
		Sample Depth (inches bgs):	0-6				0-6				0-6			
		Date Collected:	7/10/2020				7/10/2020				7/10/2020			
Analyte	**Human Health Screening Level**	**Ecological Screening Level**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1(1)	0.27(3)	0.225	N			**0.285**				0.19			
Copper	50(2)	50(4)	30.8	N			28.7				29.2			
Lead	63(2)	63(4)	56.1	NA			**63**				38.5			
Zinc	109(2)	109(4)	93.3				96.3				95.6			

		Location:	Target Area DU											
		Sample ID:	COR02IS01				COR02IS02				COR02IS03			
		Sample Depth (inches bgs):	0-6				0-6				0-6			
		Date Collected:	7/10/2020				7/10/2020				7/10/2020			
Analyte	**Human Health Screening Level**	**Ecological Screening Level**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1(1)	0.27(3)	**0.293**				**0.327**	N			**0.293**			
Copper	50(2)	50(4)	33.6				31.9	N			39.9			
Lead	63(2)	63(4)	**82.9**				**98.7**	NEA			**72.1**			
Zinc	109(2)	109(4)	91.3				93.1				98.3			

		Location:	Target Berm Hillside DU											
		Sample ID:	COR03IS01				COR03IS02				COR03IS03			
		Sample Depth (inches bgs):	0-6				0-6				0-6			
		Date Collected:	7/10/2020				7/10/2020				7/10/2020			
Analyte	**Human Health Screening Level**	**Ecological Screening Level**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1(1)	0.27(3)	**0.425**				**0.725**				**0.429**	N		
Copper	50(2)	50(4)	24.9				41.4				36.0	NA		
Lead	63(2)	63(4)	**164**				**179**				**248**	NA		
Zinc	109(2)	109(4)	**119**				82.5				84.5	A		

		Location:	Background Reference Area											
		Sample ID:	COR04IS01				CORIS0402				COR04IS03			
		Sample Depth (inches bgs):	0-6				0-6				0-6			
		Date Collected:	7/20/2020				7/20/2020				7/20/2020			
Analyte	**Human Health Screening Level**	**Ecological Screening Level**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1(1)	0.27(3)	0.14				0.13				0.13			
Copper	50(2)	50(4)	17.0				19.1				16.0			
Lead	63(2)	63(4)	28.1				21.1				21.0			
Zinc	109(2)	109(4)	86.1				97.8				87.2			

Notes:

Bold = Sample exceeds Ecological Screening Level
🟨 Sample exceeds Human Health Screening Level
mg/kg = milligrams per kilogram
bgs = below ground surface
LQ = Laboratory qualifier (LQ flags available in lab report)
VQ = Validiation qualifier
RC = Reason Code
N = pre-digestion spiked sample recovery is not within control limits
A = post-digestion spiked sample recovery is not within control limits
E = reported value is estimated because of the presence of interference (as indicated by serial dilution)

(1) USEPA. 2020. USEPA's Residential Soil regional Screening Levels (RSLs) (May 2020), protective of a target hazard quotient of 0.1 and a target cancer risk of 1x10-6. For sediment, the recreator RSLs were calculated using the on-line calculator; an exposure frequency of 75 days/year and 1 hour/event was assumed. Same target thresholds were used as the soil. The lead screening level is not modified because it is a background level established by the New York State Remedial Program.

(2) NYSDEC 2010. DER-10/Technical Guidance for Site Investigation and Remediation. Final DEC Program Policy. May. Soil Cleanup Objectives for Unrestricted Use.

(3) USEPA. 2015. USEPA Region 4 Ecological Risk Assessment Supplemental Guidance Soil Screening Values for Hazardous Waste Sites.

(4) NYSDEC. 2006. New York Remedial Program Soil Cleanup Objectives for Restricted Use, Protection of Ecological Resources.

Table ES-2. Discrete Soil Sampling Results Summary

100-Yard Firing Berm DU

		Sample ID:	COR01DA01A (#34)				COR01DA02A (#39)				COR01DB02A (#39)			
		Decision Unit - XRF Location:	**100-Yard Berm**				**100-Yard Berm**				**100-Yard Berm**			
		Media:	**Soil**				**Soil**				**Soil**			
		Sample Depth (inches bgs):	**12 - 18**				**12 - 18**				**24-30**			
		Date Collected:	**7/8/2020**				**7/8/2020**				**7/8/2020**			
Analyte	**Human Health Screening Level (mg/kg) Soil**	**Ecological Screening Level (mg/kg) Soil**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1	0.27	0.11				**1.14**	N		m	0.20			
Copper	50	50	20.8				23.3	NE		m	24.7			
Lead	63	63	16.5				**502**	NA		m	36.1			
Zinc	109	109	74.8				75.2	EA		s	87.4			

Target Area DU

		Sample ID:	COR02DA01A (#4)				COR02DA02A (#14)				COR02DA02B (#14)				COR02DB02A (#14)			
		Decision Unit - XRF Location:	**Target Area**				**Target Area**				**Target Area**				**Target Area**			
		Media:	**Soil**				**Soil**				**Soil**				**Soil**			
		Sample Depth (inches bgs):	**12 - 18**				**12 - 18**				**12 - 18**				**24-30**			
		Date Collected:	**7/10/2020**				**7/10/2020**				**7/10/2020**				**7/10/2020**			
Analyte	**Human Health Screening Level (mg/kg) Soil**	**Ecological Screening Level (mg/kg) Soil**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)																		
Antimony	3.1	0.27	0.150	N			**0.341**				**0.276**				0.11	N	J	
Copper	50	50	24.4	NEA			28.2				24.1				24.2	E		
Lead	63	63	38	NA			**82.6**				57.8				19.3	NA		
Zinc	109	109	71.8	NEA			65.0				57.3				66.4	E		

Target Berm Hillside DU

		Sample ID:	COR03DA01A (#1)				COR03DB01A (#1)				COR03DA02A (#40)				COR03DA02B (#40)				COR03DA03A (#46)				COR03DB03A (#46)			
		Decision Unit - XRF Location:	**Target Berm Hillside**				**Target Berm Hillside**				**Target Berm Hillside**				**Target Berm Hillside**				**Target Berm Hillside**				**Target Berm Hillside**			
		Media:	**Soil**				**Soil**				**Soil**				**Soil**				**Soil**				**Soil**			
		Sample Depth (inches bgs):	**12 - 18**				**24 - 25**				**12 - 18**				**24 - 30**				**12 - 18**				**24 - 30**			
		Date Collected:	**7/9/2020**				**7/9/2020**				**7/10/2020**				**7/10/2020**				**7/10/2020**				**7/10/2020**			
Analyte	**Human Health Screening Level (mg/kg) Soil**	**Ecological Screening Level (mg/kg) Soil**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)																										
Antimony	3.1	0.27	**0.447**				**1.00**				0.13				0.11				0.236	N*			0.096	J		
Copper	50	50	29.4				**86.8**				15.8				19.6				15.2				28.8			
Lead	63	63	34.2				**393**				22.1	B			24.6	B			**90.7**	NA			17.1			
Zinc	109	109	78.4				**110**				55.8				58.1				62.6	N			82.8			

Notes:

Bold = Sample exceeds Ecological Screening Level
🟨 Sample exceeds Human Health Screening Level
mg/kg = milligrams per kilogram
bgs = below ground surface
LQ = laboratory qualifier (LQ flag descriptions available in lab report)
VQ = validiation qualifier
RC = reason code
NA = not applicable

A = post-digestion spiked sample recovery is not within control limits
B = analyte detected in the laboratory method blank
E = reported value is estimated because of the presence of interference (as indicated by serial dilution)
N = pre-digestion spiked sample recovery is not within control limits
* = the duplicate sample analysis relative percent difference (RPD) is not within control limits
J = estimated

Table ES-3. Discrete Sediment Sample Results Summary

Target Berm-Ponded DU

		Sample ID:	COR05SED01A				COR05SED02A				COR05SED02B				COR05SED03A				COR05SED04A				COR05SED05A				COR05SED06A				COR05SED07A				COR05SED08A			
		Decision Unit - XRF Location:	Target Berm - Ponded DU 5																																			
		Media:	Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment			
		Sample Depth (inches bgs):																																				
		Date Collected:	7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020			
Analyte	**Human Health Screening Level (mg/kg) Sediment**	**Ecological Screening Level (mg/kg) Sediment**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)																																						
Antimony	14.6	2	**2.29**				1.53				**2.31**				**6.38**				**2.47**	N			**4.94**				**2.22**				**19.8**				**11.2**			
Copper	1460	23	20.0				**26.8**				**33.6**				**30.0**				**45.2**	A			**67.5**				**32.7**				**124**				**80.1**			
Lead	63	26	**109**				**177**				**234**				**918**				**686**	N*A			**690**				**431**				**2780**				**412**			
Zinc	11000	63	**76.0**				**176**				**115**				**337**				**301**	EA			**314**				61.8				**224**				**348**			

Wet Meadow DU

		Sample ID:	COR06SED01A				COR06SED02A				COR06SED02B				COR06SED03A				COR06SED04A				COR06SED05A				COR06SED06A				COR06SED07A				COR06SED08A			
		Decision Unit - XRF Location:	Sediment Wetland Meadow DU 6																																			
		Media:	Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment			
		Sample Depth (inches bgs):																																				
		Date Collected:	7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020			
Analyte	**Human Health Screening Level (mg/kg) Sediment**	**Ecological Screening Level (mg/kg) Sediment**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)																																						
Antimony	14.6	2	0.14	J			0.8	J			1.2				0.81	J			1.7				0.37				0.38	J			0.17				0.14			
Copper	1460	23	7.67				**35**				**41.3**				**34.2**				**39.6**	A			19.6				**23.9**				8.75				10.4			
Lead	63	26	25.5				**153**				**153**				**119**				**154**	N*A			**36.0**				**73.2**				**27.0**				**32.3**			
Zinc	11000	63	36.3				**80.4**				**209**				**180**				**111**	A			211				**120**				**72.4**				60.8			

Notes:

Bold = Sample exceeds Ecological Screening Level
🟨 Sample exceeds Human Health Screening Level
mg/kg = milligrams per kilogram
µg/L = micrograms per liter
bgs = below ground surface
LQ = laboratory qualifier (LQ flag descriptions available in lab report)
VQ = validiation qualifier
RC = reason code
NA = not applicable
A = post-digestion spiked sample recovery is not within control limits
E = reported value is estimated because of the presence of interference (as indicated by serial dilution)
N = pre-digestion spiked sample recovery is not within control limits
J = estimated
* = the duplicate sample analysis relative percent difference (RPD) is not within control limits

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1 Introduction

This Remedial Investigation (RI) report has been prepared in support of the long term management of the Non-Department of Defense (DoD), Non-Operational Defense Site (NDNODS) Camp O'Ryan Rifle Range Munitions Response Site (MRS; Army Environmental Database Restoration Number NYHQ-008-R-02 and New York State Department of Environmental Conservation [NYSDEC] Site Number 961012), located in New York (**Figure 1-1**).

1.1 Project Authorization

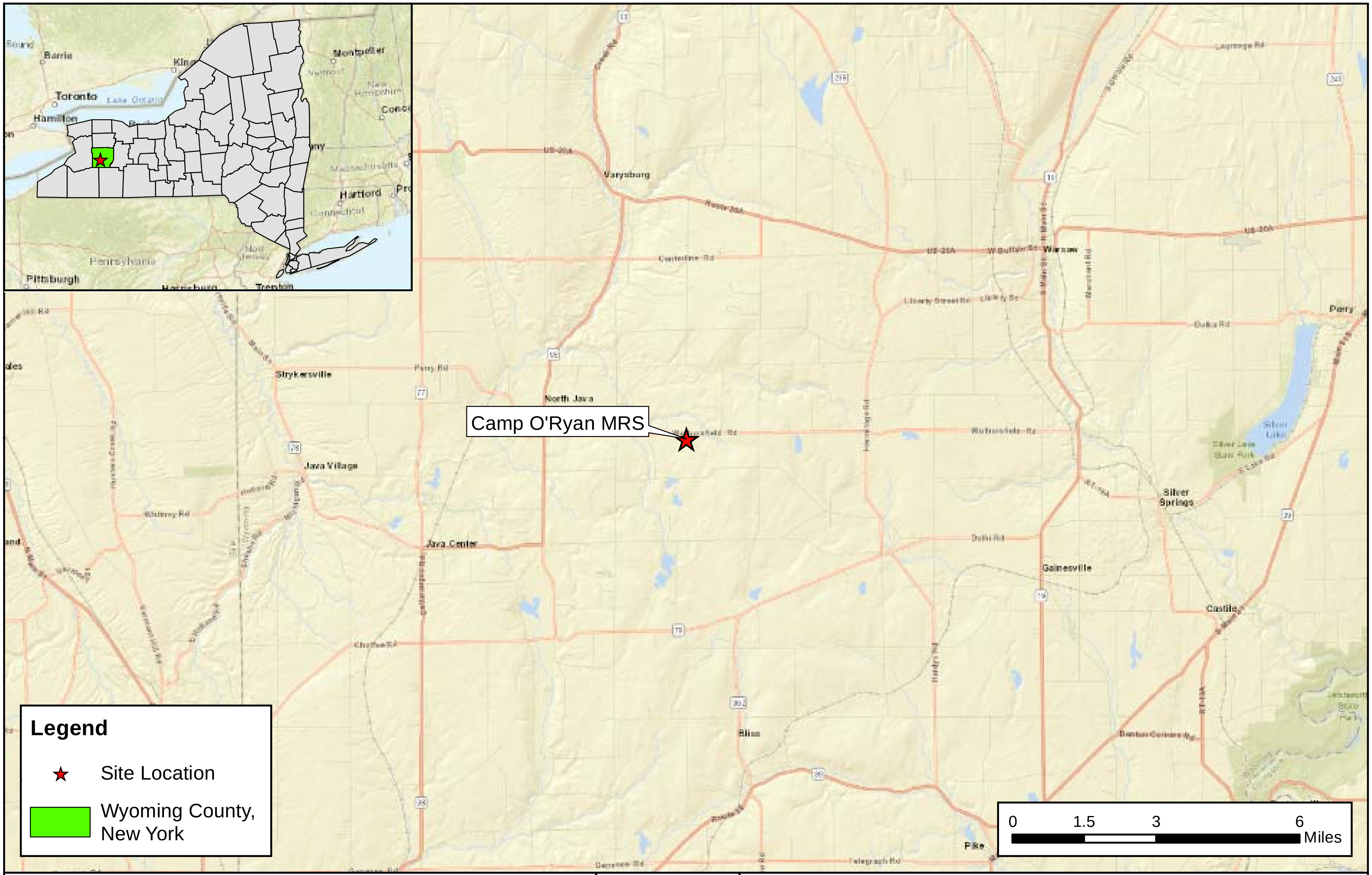
Based on the results of a Site Inspection (SI; Parsons Infrastructure and Technology [Parsons], 2012), the Army National Guard (ARNG) determined an RI should be conducted at a single NDNODS MRS in New York under the Military Munitions Response Program (MMRP) Munitions Response Services. The RI is being performed pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986.

Environmental work is being conducted at the MRS by the ARNG and the New York ARNG (NYARNG). This project is being executed by AECOM Technical Services, Inc. (AECOM), under ARNG Contract Number W9133L-14-D-0001, Delivery Order No. 0006, issued 20 September 2016 and modified 27 June 2017. Under this delivery order, AECOM is responsible for fully executing the RI and related tasks at the Camp O'Ryan Rifle Range.

1.2 Project Purpose and Scope

The overall objectives for the RI of Camp O'Ryan MRS 2 Rifle Range were to collect sufficient information to characterize the nature and extent of munitions constituents (MC) in soil resulting from historical activities and to evaluate the associated risks to human health and the environment. The Camp O'Ryan MRS 2 Rifle Range was investigated using several sampling techniques to achieve the project objectives that were specified in the Final RI Work Plan (AECOM, 2019).

Soil sampling was performed using incremental and discrete sampling methods in accordance with the RI Work Plan. Discrete sediment sampling was performed to assess two decision units (DUs) added during field work when different site conditions were observed. The information collected during the RI was also used to complete the Munitions Response Site Prioritization Protocol (MRSPP) tables for the MRS, to assess the need to evaluate remedial alternatives in a Feasibility Study (FS), and support informed risk management decisions for future remedial decisions.



CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	MS	11/20/2017
SCALE	1:190,080	CHK BY	JW	11/20/2017
SOURCE	ARNG; State of New York, ESRI & Partners	PM	LS	11/20/2017

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Camp O'Ryan Munitions Response Site 2 Site Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 1-1

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1.3 Remedial Investigation Report Organization

Brief descriptions of the document sections and appendices are as follows:

Section 1: **Introduction.** This section describes the authorization, project purpose, and scope, and it presents the report organization.

Section 2: **Munitions Response Site Description.** Presents the MRS background, historical use, and environmental setting; summarizes previous MRS investigations relevant to the RI; and describes current and future land use.

Section 3: **Field Investigation Activities.** Describes the methodology and procedures followed for the RI field activities.

Section 4: **Data Quality Assessment.** Discusses the field collection methods and the laboratory analytical techniques for soil samples to determine data usability.

Section 5: **Remedial investigation Results.** Presents the soil sampling results for the RI.

Section 6: **Contaminant Fate and Transport.** Discusses migration and contaminant persistence for MC at the MRS.

Section 7: **Risk Assessment.** Presents the evaluation of the potential of MC to pose a risk to human or ecological receptors.

Section 8: **Munitions Response Site Prioritization Protocol.** Summarizes the results of the MRSPP modules and score for the MRS.

Section 9: **Summary and Conclusions.** Provides an overview of the findings of the RI for the MRS.

Section 10: **References.** This section provides the references used to develop this document.

Appendix A: Field Forms

Appendix B: Photographic Record

Appendix C: Data Validation Report

Appendix D: Laboratory Data Analytical Package (on CD)

Appendix E: Human Health Risk Assessment

Appendix F: Screening Level Ecological Risk Assessment

Appendix G: MRSPP Tables

Appendix H: Additional Sampling Procedures

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2 Munitions Response Site Description

2.1 Location and Setting

Camp O'Ryan is located in Wethersfield, Wyoming County, New York (**Figure 1-1**). Camp O'Ryan as a whole was divided into three MRSs: Camp O'Ryan MRS 1 Pistol Range, Camp O'Ryan MRS 2 Rifle Range, and Camp O'Ryan MRS 3 Maneuvering Area. The focus of this RI is Camp O'Ryan MRS 2 Rifle Range, located on the northern boundary of the 370-acre former Camp O'Ryan. The former small arms range at MRS 2 was originally about 17.5 acres and was expanded to 42.41 acres as a result of the RI. This MRS contains mostly gently rolling, forested terrain comprising deciduous trees with patches of open grass fields. The area outside of the Camp O'Ryan MRS 2, within the former Camp O'Ryan, was used by NYARNG for both company and squad level training including maneuver practicing and camping.

The MRS consists of a hillside impact berm and a former 200-yard range with 50 targets and firing berms at distances of 100 and 200 yards (**Figure 2-1**). It also includes a concrete retaining wall. Small arms, including .30 caliber M1, were approved for use at Camp O'Ryan MRS 2; additional potential munitions used include .22, .38, and .45 caliber as well as 5.56 millimeter (mm) and 7.62mm. The firing direction at the Camp O'Ryan MRS 2 was to the southeast. The largest identified MRS area at the former Camp O'Ryan, Camp O'Ryan MRS 3 Maneuvering Area (NYHQ-008-R-03), includes within its footprint the Camp O'Ryan MRS 1 Pistol Range (NYHQ-008-R-01) and Camp O'Ryan MRS 2 Rifle Range (NYHQ-008-R-02) (**Figure 2-2**).

Live-fire training no longer occurs at the MRS. The property is privately owned and administered by the Edward N. George Estate. The MRS is easily accessible off Wethersfield Road (Route 32), and the range is located behind property owned by the King Brothers Masonry Contractors (3060 Wethersfield Rd, Gainesville, New York 14066) (NYSDEC, 2009); the small parcel (4.83 acres, SBL-I06.2-61.2) borders the Camp O'Ryan MRS 2 to the north.

2.2 Historical Use

Camp O'Ryan (also known as the North Java Rifle Range, the Wethersfield Training Area, and the Wethersfield Target Range and Maneuver Area) was located on 376 acres and was used by the NYARNG from 1949 to 1974 and then again from 1989 to 1994 (Parsons, 2011 [Appendix H-3]). It is the understanding of the New York State Division of Military and Naval Affairs (DMNA) that the United States (US) Army Corps of Engineers (USACE) leased the property from 1949 to 1974, based on a DMNA 2008 memorandum (DMNA, 2008). The property was previously owned and developed by the USACE and sold to Edward George, who leased it back to the USACE in 1949. From 1949 to 1974, training areas at the camp included a rifle range, a pistol range, and a tank driver training course, and structures at the site included a range storage building, a field latrine, and a mess hall. The parcel of land the former mess hall occupied was subdivided from the original training camp and sold by the estate of Edward George, the property owner, in 1999. The former mess hall is currently owned and occupied by King Brothers Masonry Contractors. The ranges were used by NYARNG units stationed in New York bases, including Batavia, Buffalo, Dunkirk, Jamestown, Medina, and Rochester (Parsons, 2011).

Camp O'Ryan Munitions Response Site Layout

CLIENT Army National Guard

PROJECT RI through DD for Camp O'Ryan, NY MRS

REVISION NO	0	GIS BY	MS	8/13/2018
SCALE	1:3,600	CHK BY	JW	8/13/2018
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	8/13/2018

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AECOM
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Germantown, MD 20876

ARMY NATIONAL GUARD

Figure 2-1

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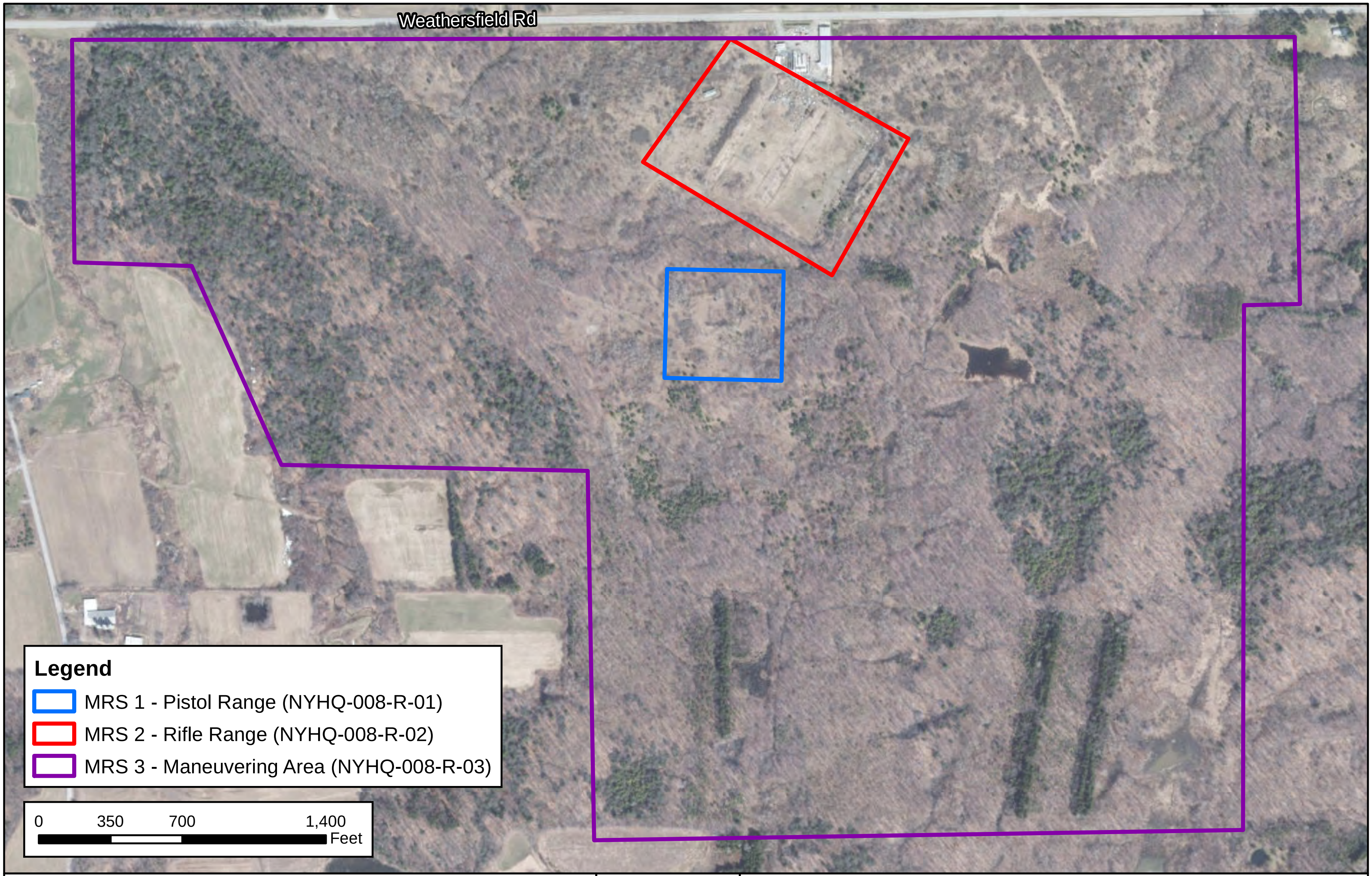

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	MS	8/31/2018
SCALE	1:8,400	CHK BY	JW	8/31/2018
SOURCE	ARNG; State of New York, ESRI & Partners	PM	LS	8/31/2018

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Camp O'Ryan Site Munitions Response Sites

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Figure 2-2

Q:\Projects\ENV\GEARS\GEO\NGB IDIQ\NDNODS 6 SARs\900-Work\GIS\Other_Sites\NY_ORyan\1_MXD\Work_Plan_Figures\Fig_2-2_ORyan_All_MRSes.mxd

Camp O'Ryan was reactivated as a training area in 1989 and was used until 23 November 1994, when the lease was terminated. In a 1989 letter to the property owner, the NYARNG indicated that they planned on using the camp for infantry training maneuvers, including the setup and use of bivouac areas and field fortifications, off-road driver training, and communication exercises. It is unknown if the ranges were also reactivated in 1989. According to a 1986 NYARNG letter, the existing ranges did not meet the requirements of Army Regulation 385-63 (Range Safety) for the following reasons: 1) The maximum range of the M-16 extended past the property boundary; 2) Due to the topography of the area, berms or baffles would be required before the area could be used as a firing range; and 3) The property would have to be fenced to prevent unauthorized access. The 1989 NYARNG letter to the property owner also indicated that a safety analysis would need to be conducted and approved to reactivate the ranges. No documentation that confirmed a safety analysis was conducted was obtained during data collection (Parsons, 2011).

2.3 Environmental Setting

The Camp O'Ryan Rifle Range MRS is located in the Great Lakes ecoregion (US Environmental Protection Agency [USEPA], 2013). The ecoregion is characterized by warm summers and cold, snowy winters that are milder to the south; most of this ecoregion has low relief. Lakes, poorly drained depressions, morainic hills, drumlins, eskers, outwash plains, and other glacial features are typical of the area, which was entirely covered by glaciers during parts of the Pleistocene age. The MRS contains mostly gently rolling, forested terrain comprising deciduous trees with patches of open grass fields. Currently, the property is privately owned, and live-fire training no longer occurs at the MRS.

2.3.1 Climate

The climate at O'Ryan Rifle Range is classified as humid and continental and is characterized by warm summers and cold winters with high precipitation. Average temperatures in the area vary from 60 degrees Fahrenheit (°F) in summer to 20°F in winter. The average maximum temperature is 76°F in July, and the average minimum temperature is 13°F in January. The long-term average annual temperature for the nearby Warsaw, NY area is 44°F. Summertime (June through August) temperatures range from an average low of 56°F in the evenings to an average high of 74°F during the daytime (National Oceanic and Atmospheric Association [NOAA], 2020).

The total annual average precipitation is 188 inches, with the majority occurring as snowfall (142 inches). The snowiest month of the year is January, with an average of 36.9 inches. Rainfall is fairly evenly distributed throughout the year, with the wettest month being June, which averages 4.65 inches of rainfall. The driest month is February, with an average of 2.57 inches of precipitation. Winter snowstorms can occur from November through April, with the harshest conditions occurring December through March (NOAA, 2020).

2.3.2 Geology

The Camp O'Ryan MRS 2 Rifle Range is on the northern margin of the Appalachian Plateaus physiographic province in southwestern New York. Devonian rocks are at the surface or subcrop glacial deposits in the vicinity of the Camp O'Ryan MRS. These Paleozoic sediments are deeply eroded, particularly by geologically recent glaciations (Olcott, 1995).

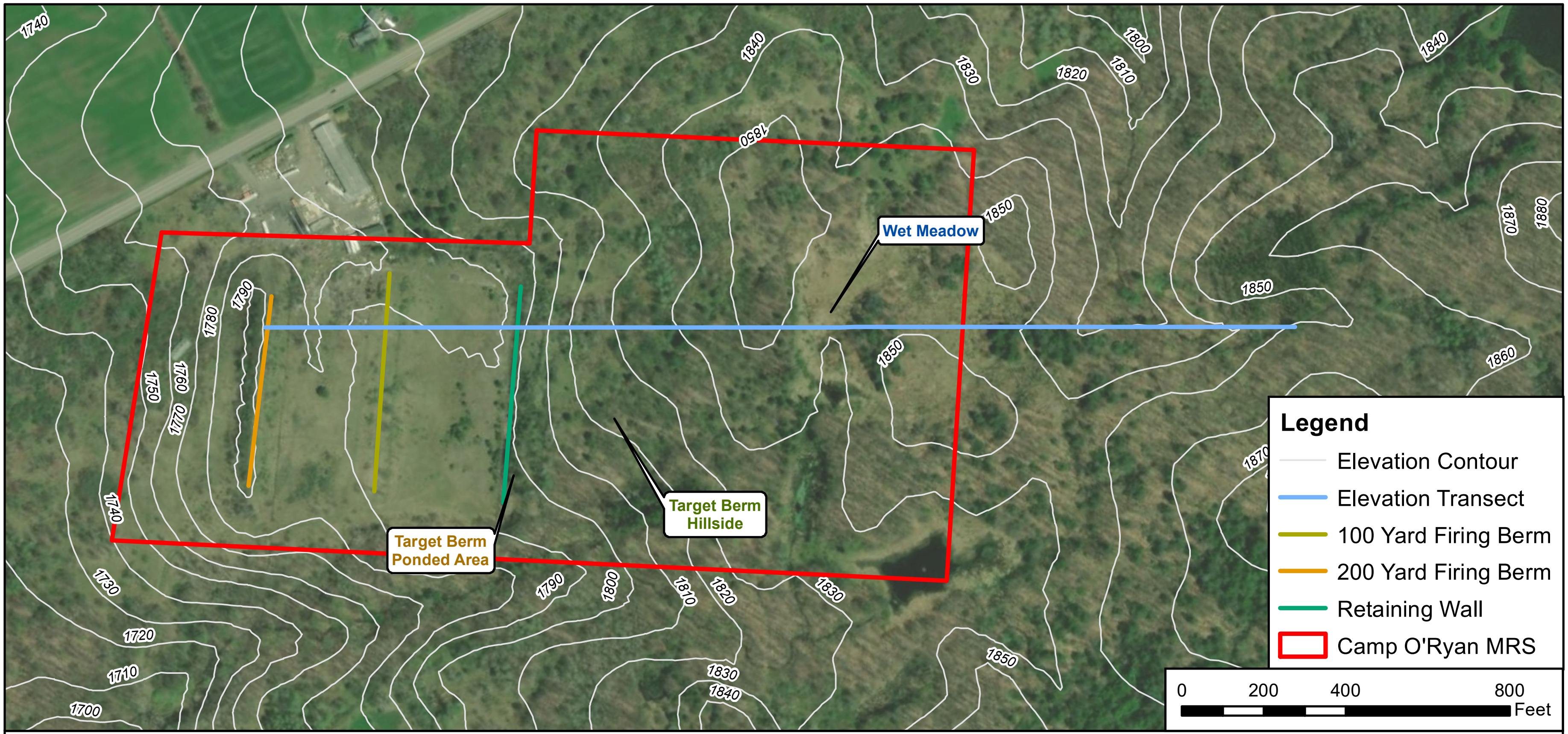
Continental-scale glaciers episodically covered most of the northern US over the last 1.8 million years. New York has been covered by ice multiple times, including during the last advance approximately 22,000 years ago. Glaciers scoured and removed soil and soft weathered surface rocks as they moved and polished the hard bedrock surface below the ice. A variety of landforms were left behind when the glaciers eventually receded approximately 10,000 years ago (Skehan, 2008). As the ice melted, the sediment load was dropped in place as unsorted till, a mixture of silt, gravel, and boulders of various sizes in a clay matrix, or was redistributed as outwash by the vast amounts of meltwater released by the glacier. The glacial outwash sediments, deposited by streams and rivers of meltwater in front of the receding glaciers (glaciofluvial deposits), tend to be graded from coarse to fine with increasing distance from the glacier. Meltwater could also be impounded in lakes that were dammed either by the ice or by glacial sediments. Lake plains, terraces, and beaches were left in place when the dammed water found a lower outlet (Olcott, 1995). The "Finger Lakes" northwest of the MRS are of glacial origin.

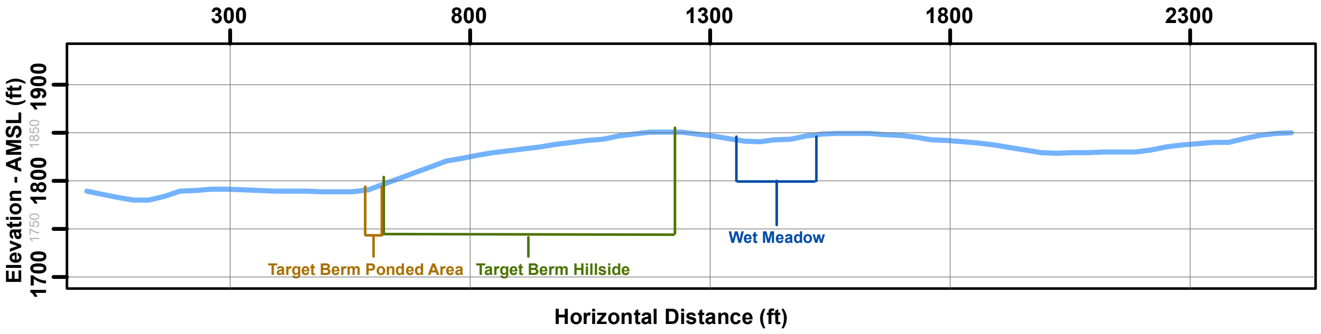
2.3.3 Surface Topography

The Camp O'Ryan MRS 2 Rifle Range is located in an area that has a downward regional slope from the southeast to northwest on a glacial lake plain that is incised by streams to produce a rolling surface within the MRS. The MRS includes a large hill along the eastern boundary that acted as an impact berm downrange of the former target area. Elevations range from approximately 1,745 feet above sea level in the northwest corner of the MRS to 1,810 feet above sea level in the southeast corner (US Geological Survey [USGS], 1995) of the original MRS boundary. The revised MRS boundary includes the larger hillside area in the southeast direction, which rises to approximately 1,905 feet at its highest point before plateauing in a meadow at the revised MRS boundary. The terrain continues to rise farther southeast, beyond the revised MRS boundary (**Figure 2-3**).

2.3.4 Hydrogeology and Hydrology

Coarse-grained glacial outwash, ice contact, and alluvial deposits form the productive sand and gravel aquifers of the surficial aquifer system. Yield from sand and gravel aquifers depends on thickness and grain size of deposits. Higher yields may be obtained where deposits are hydraulically connected to an adjacent body of surface water. Groundwater well depths generally range from 10 to 120 feet and could exceed 500 feet below land surface (Olcott, 1995). Major consolidated bedrock aquifers in the vicinity of the Camp O'Ryan MRS 2 Rifle Range are in Devonian age limestone formations at or near the surface. Little primary porosity or permeability remain in rocks following the lithification process.





Notes:

- The Y-Axis has a vertical exaggeration of 2X.
- The X-Axis shows the horizontal distance with the 200 yard firing berm as the origin.

CLIENT	Army National Guard			
PROJECT	O'Ryan			
REVISION NO	0	GIS BY	SK	11/19/2020
SCALE	1:4,800	CHK BY	JW	11/19/2020
SOURCE	ARNG; State of New York, ESRI & Partners	PM	LS	11/19/2020

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Camp O'Ryan Topographic Map

AECOM
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Germantown, MD 20876

Figure 2-3

Groundwater in limestone aquifers is stored in solution cavities that are interconnected through complex dissolution channels, which results in highly variable yields. Wells commonly yield 10 to 30 gallons per minute (gpm), although yields of 1000 gpm have been reported from carbonate aquifers in New York. Aquifers generally are unconfined in the upper 200 feet (Olcott, 1995). There are no groundwater wells within the Camp O'Ryan MRS. Two domestic water wells exist approximately 0.25 miles from the MRS. Well number WO 430 to the southeast shows a depth to water of 15 feet below ground surface (bgs). Well number WO 868 is north of the MRS with a depth to water of 50 feet bgs.

The low-lying area immediately downrange of the target area collects surface water runoff from the adjacent target berm-hillside and becomes temporarily inundated during and after precipitation events; the soil in this area is regularly saturated. This area, referred to as the target berm ponded area, spans the entire length of the eastern side of the target wall between the target wall and the target berm hillside. This area is not listed as a wetland on the US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) (USFWS, 2020a).

An 8.05-acre freshwater forested/shrub wetland exists approximately 0.1 miles southeast of the original MRS boundary and downrange from the target berm hillside (USFWS, 2020a). This area is listed on the USFWS NWI as a wetland habitat and is characterized as semi-permanently flooded because surface water persists throughout the growing season in most years. During RI field work, the wetland was observed to have shallow water and saturated soils, and it was designated as the Wet Meadow because of its distinguishable land and habitat differences from the adjacent target berm hillside. The elevation at the Wet Meadow is considerably higher than the adjacent MRS features, including the majority of the target berm hillside. Due to the Wet Meadow elevation and local topography, neither groundwater nor surface water from MC source areas are expected to migrate towards the Wet Meadow. Groundwater is anticipated to follow topography, and surface water flow is away from the Wet Meadow to the northwest, in the direction of other MRS features. If shallow groundwater is discharging to the Wet Meadow, it is likely to be flowing to the meadow from upslope southeast direction.

The original MRS boundary was revised as a result of the RI to include the Wet Meadow.

2.3.5 Vegetation and Habitat

The majority of the MRS is comprised of a cleared grassy field. The boundary of the MRS is heavily vegetated with trees and shrubs, and the central portion of the MRS is less densely vegetated. King Brothers Masonry Contractors property bounds the MRS to the North.

No critical habitats are present within the MRS; however, the Northern Long-Eared Bat (Myotis septentrionalis) and Bog Turtle (Clemmys muhlenbergii) are listed as federally threatened wherever found, and are listed for Wyoming County (USFWS, 2018).

A depressed area that directly abuts the eastern side of the target wall, referred to as the "Target Berm Ponded Area", collects surface water runoff and becomes temporarily inundated. The Target Berm Ponded Area represents a different habitat type than the cleared grassy fields associated with most of the MRS range floor and the heavily forested adjacent target berm hillside area. Additionally, a wet meadow area farther to the east of the MRS represents a distinguishably different habitat type from all other areas within the MRS. This freshwater forested/shrub wetland is located east of the original MRS boundary; the revised MRS boundary included within this RI encompasses the wetland area. For this RI, the area is referred to as the Wet Meadow. The Wet Meadow is located southeast of the target berm hillside, on a plateau elevated above the hillside and remaining MRS area. During RI field activities, the deepest standing water observed in this area was only a few inches (AECOM, 2020). According to the NWI, wetlands of this type are a mixture of woody vegetation less than 6 ft tall (shrub, saplings, and/or stunted trees) and broad-leaved deciduous trees (USFWS, 2020a). They are seasonally flooded with surface water remaining during the growing season; substrate remains saturated near the surface even during the absence of surface water (USFWS, 2020a).

2.3.6 Ecological Receptors

Forested areas, which may provide habitat for ecological receptors, are present within the MRS. No federal critical habitats are located within the direct vicinity of the MRS (USFWS, 2020b and 2020c). Although no specific habitat was identified within or near the MRS, endangered species (northern long-eared bat [*Myotis septentrionalis*]) and migratory birds (black-capped chickadee [*Poecile atricapillus practicus*] and bobolink [*Dolichonyx oryzivorous*]) have large ranges that may overlap the MRS (USFWS, 2020c). New York also lists numerous threatened and endangered species with known ranges or locations within the vicinity of the MRS, including species of mollusks, insects, fish, amphibians, reptiles, birds, and mammals (NYSDEC, 2019). A thorough review of threatened and endangered species is provided in **Appendix F.**

2.3.7 Cultural Resources

There are no historic or cultural resources at Camp O'Ryan MRS 2 Rifle Range. Additionally, there are no National Historic Landmarks located in Wyoming County, New York (National Park Services [NPS], 2018a and 2018b).

2.4 Previous Investigations

Five environmental assessments have been completed at the Camp O'Ryan Rifle Range since 2009. These assessments include the following:

- NYSDEC Site Investigation Report Camp O'Ryan Rifle Range (NYSDEC, 2009)
- Final National Guard Bureau Non-Department of Defense Owned Non- Operational Defense Sites Inventory Report for New York, July 2009 (Preliminary Assessment [PA]; Malcolm Pirnie, Inc., 2009)
- Preliminary Site Investigation Report Former Camp O'Ryan (FUDS Property No. C0NY1132) (Woods Hole Group, Inc., 2011)
- Final Historical Records Review (HRR)/Work Plan, New York, 2011 (Parsons, 2011 [Appendix H-3])
- Final New York SI Report, ARNG MMRP, 2012 (Parsons, 2012)

These investigations resulted in revisions to the size and shape of the MRS. The MRS boundary and acreage presented in the 2009 PA included all three MRSs: Camp O'Ryan MRS 1 Pistol Range, Camp O'Ryan MRS 2 Rifle Range, and Camp O'Ryan MRS 3 Maneuvering Area. These

MRSs are summarized in **Table 2-1** and shown on **Figure 2-2**. The Camp O'Ryan MRS 2 Rifle Range (NYHQ-008-R-02) is the subject of this RI and consists of a former 200-yard small arms range with firing berms at distances of 100 and 200 yards, a hillside impact berm, and a concrete retaining wall with target structures still intact.

Table 2-1 Summary of Munitions Response Sites

Munitions Response Site (MRS)	AEDB-R No.	Description
Camp O'Ryan MRS 1 Pistol Range	NYHQ-008-R-01	Camp O'Ryan MRS 1 Pistol Range is a 6.9-acre former small arms firing range that includes a target berm and backstop. MRS 1 was recommended for RI by the 2012 SI report, but is not the focus of this investigation.
Camp O'Ryan MRS 2 Rifle Range	NYHQ-008-R-02	Camp O'Ryan MRS 2 Rifle Range is a former small arms firing range that includes a firing berm and target berm; it is the focus of this RI. The original MRS size was 17.5 acres and was expanded to 42.21 acres as a result of this investigation.
Camp O'Ryan MRS 3 Maneuvering Area	NYHQ-008-R-03	Camp O'Ryan MRS 3 Maneuvering Area is an approximately 370-acre former maneuvering area. The MRS 3 was recommended for RI by the 2012 SI report, but is not the focus of this investigation.

The 2009 NYSDEC study included targeted soil sampling at the Camp O'Ryan MRS 2 Rifle Range to evaluate the potential presence of MC (NYSDEC, 2009). Soil samples were collected from the 100-yard firing berm, target berm, and an adjacent background area for comparison. Data from these samples showed that MC were present in soil at the 100-yard firing berm and target berm at concentrations above New York Remedial Program Soil Cleanup Objectives (NYRPSCOs) and background levels. At the 100-yard Firing Berm, total lead concentrations in soil ranged from 18 mg/kg to 90.9 mg/kg. One sample exhibited a total lead concentration of 1,930 mg/kg; this result is over one order of magnitude greater than all other samples and may be considered an outlier. At the target berm, total lead concentrations in soil ranged from 24.6 mg/kg to 50,900 mg/kg (NYSDEC, 2009). Data from the 2009 NYSDEC study are included in **Appendix I**.

The Preliminary Site Investigation Report included surface water samples and shallow groundwater samples collected from streams within the adjacent Pistol Range and Maneuvering Area MRSs (Woods Hole Group, Inc., 2011). Surface water and shallow groundwater samples were collected from locations downgradient of the Camp O'Ryan MRS 2 Rifle Range. In all samples, concentrations were non-detect for total and dissolved lead. The only detected result was for total lead (0.018 milligrams per liter [mg/L]) in a duplicate field sample of shallow groundwater; however, the detection was below the New York State Ambient Water Quality Standard for lead (0.05 mg/L; New York State Ambient Water Quality Standards and Guidance Values, June 1998). Additionally, the associated parent field sample was non-detect (Woods Hole Group, Inc., 2011). Data from the Preliminary Site Investigation Report are included in **Appendix I**.

Based on the elevated total lead concentrations in soil samples and the 2011 HRR, the 2012 SI recommended that the Camp O'Ryan MRS 2 Rifle Range be carried forward to RI/FS.

2.5 Current and Future Land Use

Currently, the former rifle range is privately owned and administered by the Edward N. George Estate. Live-fire training no longer occurs at the MRS, and the range is located behind property owned by the King Brothers Masonry Contractors. Because the land is privately owned, there is potential that the MRS could be used for residential and/or recreational purposes in the future.

2.6 Preliminary Conceptual Site Model

The preliminary Conceptual Site Model (CSM) for the Camp O'Ryan Rifle Range MRS was generated based on the information presented in the previous studies and from observations made during the RI planning stage site visit. The CSM describes the potential physical, chemical, and biological processes that may transport contaminants from sources to receptors and provides the basis for evaluating potential risks to human health and the environment.

MC Sources

As described in **Section 2.2**, former munitions-related training was limited to small arms (rifles and potentially pistols) at the Camp O'Ryan MRS 2. The MC associated with small arms use are antimony, copper, lead, and zinc. Lead is the dominant component.

Data from the 2009 NYSDEC Site Investigation showed that surface soil at two identified areas, the 100-yard Firing Berm and Target Berm, exhibited elevated levels of lead; the highest concentrations of lead in surface soil came from the Target Berm area. The maximum detected concentration of antimony (328 milligrams per kilogram [mg/kg]), copper (5,530 mg/kg), and lead (50,900 mg/kg) in the biased surface soil samples exceeded their respective calculated background concentrations. The maximum detected concentrations of copper and lead also exceeded their respective NYRPSCOs (50 mg/kg and 63 mg/kg, respectively). Antimony does not have an NYRPSCO, but the maximum concentration of antimony in surface soil exceeded the USEPA Regional Screening Level (RSL) for human health (31 mg/kg). Based on the analytical results presented in the 2009 NYSDEC report, an impact to human health due to exposure to antimony, copper, and lead in surface soil at the Camp O'Ryan MRS 2 Rifle Range was expected to be possible.

Based on the 2012 SI, visual survey observations, range type, timeframe of use, and location, additional munitions including .22 caliber, .38 caliber, and .45 caliber were potentially used at the MRS (Parsons, 2012). Potential MC present within the 100-yard Firing Berm and Target Berm soil as a result of small arms projectiles are primarily lead and secondarily antimony, copper, and zinc.

There is no historical evidence of munitions and explosives of concern (MEC) use at the MRS.

Pathways

MC deposited in surface soil as a result of firing activities at the MRS have limited potential to migrate from source areas (i.e., 100-yard Firing Berm, Target Area, and target berm hillside areas) to beyond the Camp O'Ryan MRS 2 Rifle Range MRS boundary. During the RI planning stage site visit, no surface water bodies were present within the MRS at or near source areas or in the immediate surrounding area; therefore, transport pathways from soil in source areas to surface water bodies were considered incomplete in the preliminary CSM. This is supported by surface water sample results collected from downgradient stream areas during the 2011 Preliminary Site Investigation. Total and dissolved lead concentrations in all samples (Woods Hole Group, Inc., 2011; **Appendix I**).

MC metals have a strong affinity to sorb to soil particles, particularly soils that are rich in organic matter or high in pH, and usually only migrate via physical transport pathways. Because of these chemical properties, they typically do not leach to groundwater except where shallow groundwater exists less than 5 feet bgs. According to data presented in the 2012 SI report (Parsons, 2012), two domestic water wells located approximately 0.25 miles from the MRS show groundwater depths of 15 feet bgs and 50 feet bgs. Additionally, shallow groundwater samples collected from downgradient areas during the 2011 Preliminary Site Investigation showed non-detect results for total and dissolved lead in all samples except one duplicate. The duplicate sample showed a total lead concentration of 0.018 mg/L; however, the detection was below the New York State Ambient Water Quality Standard for lead (0.05 mg/L), and the associated parent field sample was non-detect (Woods Hole Group, Inc., 2011; **Appendix I**).

Based on these samples results and MC properties, the migration of MC metals to groundwater at source areas (100-yard Firing Berm, Target Area, and Target Berm-Hillside areas) within this MRS was not expected. The same rationale applies with respect to the migration of MC metals to surface water and sediment outside the MRS boundary. MC metals were not anticipated to have migrated to surface water/sediment based on their chemical/physical properties and the distance between the potential source and the surface water in the vicinity of the MRS. Based on the limited amount of contaminated surface soil anticipated, contaminated dust was not expected to migrate off-site.

Complete exposure pathways may exist for site visitors through direct contact (i.e., incidental ingestion, dermal contact, and inhalation of suspended particulates) because MC were discovered to be present in surface soil above background concentrations and human health screening criteria. There also is the potential for exposure to these compounds in subsurface soil; however, these subsurface pathways are incomplete for the site visitors because it is unlikely for the receptors to expose themselves to subsurface soil for anticipated non-intrusive activities.

Receptors

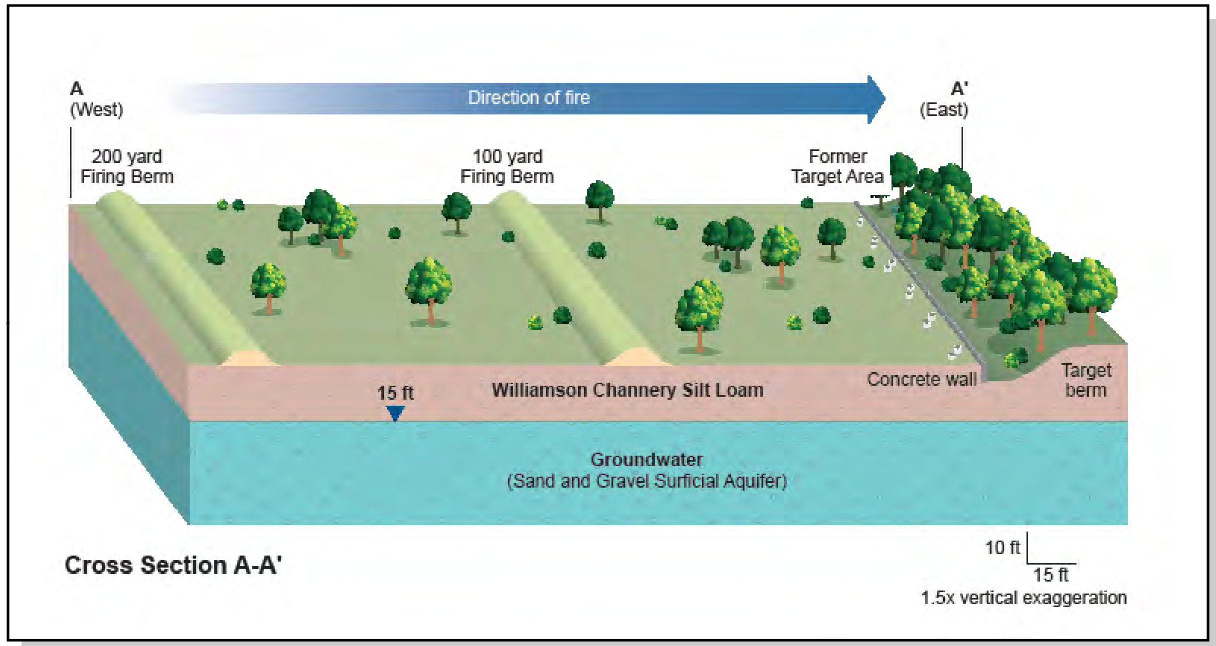
The Camp O'Ryan MRS 2 is located on a privately-owned parcel consisting mostly of forestland. While the area immediately surrounding the MRS is mostly undeveloped, there are two domestic drinking water wells located 0.25 miles from the MRS. The central portion of the MRS is densely vegetated. Current receptors include site workers/visitors and ecological receptors. Forested areas, which may provide habitat for ecological receptors, are present within the MRS.

No federally listed critical habitats are present within the MRS; however, the Northern Long-Eared Bat (Myotis septentrionalis) and Bog Turtle (Clemmys muhlenbergii) are listed as federally threatened wherever found and are listed for Wyoming County (USFWS, 2018). New York State also lists threatened and endangered species (NYSDEC, 2015). New York State threatened and endangered species with the potential to occur at or near the MRS based on their known home ranges and preferred habitat are listed in **Table 2-2**.

Table 2-2 New York State Threatened and Endangered Species

New York State Endangered Species		New York State Threatened Species	
Type	**Name**	**Type**	**Name**
Insects	Tomah Mayfly (*Siphlonisca aerodromia*)	**Insects**	Pine Barrens Bluet (*Enallagma recurvatum*)
	Karner Blue Butterfly (*Lycaeides melissa samuelis*)		Scarlet Bluet (*Enallagma pictum*)
	Regal Fritillary (*Speyeria idalia*)		Frosted Elfin (*Callophrys irus*)
	Persius Duskywing (*Erynnis persius*)	**Reptiles**	Timber Rattlesnake (*Crotalus horridus*)
	Grizzled Skipper (*Pyrgus centaureae wyandot*)	**Birds**	Pied-billed Grebe (*Podilymbus podiceps*)
	Grizzled Skipper (*Pyrgus centaureae wyandot*)		Least Bittern (*Ixobrychus exilis*)
Reptiles	Massasauga (*Sistrurus catenatus*)		Bald Eagle (*Haliaeetus leucocephalus*)
Birds	Peregrine Falcon (*Falco peregrinus*)		Upland Sandpiper (*Bartamia longicauda*)
	Piping Plover (*Charadrius melodus*)		Northern Harrier (*Circus cyaneus*)
	Black Rail (*Laterallus jamaicensis*)		King Rail (*Rallus elegans*)
	Black Tern (*Chlidonias niger*)		Common Tern (*Sterna hirundo*)
			Least Tern (*Sterna antillarum*)
			Sedge Wren (*Cistothorus platensis*)
			Henslow's Sparrow (*Ammodramus henslowii*)
		Mammals	Northern Long-eared Bat (*Myotis septentrionalis*)

Figure 2-4 presents a pictorial diagram of the preliminary CSM.



A – Sources
Metals, particularly lead, in soil at the 100 yard Firing Berm Target Berm as a result of historical small arms training.

B – Pathways
Metals MC have limited potential to migrate from soil at the 100 yard Firing Berm and Target Berm (Source areas: “A” on map) beyond MRS boundaries. MC from the 100 yard Firing Berm and Target berm is unlikely to travel offsite due to the retardation of transport from vegetation and adhesion to soil. Groundwater at the MRS is approximately 15 feet below ground surface (Cross section A-A’). Groundwater pathways are incomplete since metals are highly unlikely to leach from 100 yard Firing Berm and Target berm soil to groundwater. MC within MRS soil is anticipated to remain at the 100 yard Firing Berm and Target berm.

C - Receptors
Historic range features are surrounded by undeveloped, forested land to the south, and the King Brothers Masonry Contractors property to the north. The MRS is unused except for debris storage by the King Brothers Masonry Contractors. The areas surrounding the MRS are predominantly rural. Current and future human receptors may visit the MRS to conduct maintenance or construction activities. Site visitors and/or trespassers may also visit the site.

There are no federally-listed critical habitats present within the MRS; however, the Northern Long-Eared Bat (Myotis septentrionalis) and Bog Turtle (Clemmys muhlenbergii) are listed as federally threatened wherever found, and are listed for Wyoming County. New York State also lists numerous threatened and endangered species with known ranges potentially within the vicinity of the MRS. New York State listed threatened and endangered species with the potential to be found at or near the MRS include species of insects, reptiles, fish, birds, and mammals

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Figure 2- 4
Preliminary Conceptual Site Model
Camp O'Ryan, New York

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Date....................November 2018
Prepared by....................AECOM

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3 Field Investigation Activities

Soil and sediment samples were collected, identified, handled, and documented following the procedures detailed in the *Final Remedial Investigation Work Plan and Unified Federal Policy - Quality Assurance Project Plan* (UFP-QAPP; AECOM, 2019). Sediment sampling was determined to be needed during RI field work; therefore, this procedure was documented in a Non-Conformance Report (NCR).

The sampling approach of the RI was designed to characterize the nature and extent of MC contamination in all media of interest in areas associated with historical small arms training activities (100-yard Firing Berm, Target Area, and Target Berm) conducted at Camp O'Ryan. The investigation of these three areas, which are referred to as DUs, focused on soil at target features within the MRS. Two additional DUs were identified during RI field work: The Target Berm-Ponded DU and the Wet Meadow DU. Because the additional DUs are temporarily or semi-permanently flooded, the RI focused on sediment in these areas. The SI (Parsons, 2012) indicated that the groundwater exposure pathway was incomplete for the human receptor; therefore, groundwater was not sampled during the RI. The sampling design rationale for the MRS was based on historical use, range layout, previous sampling results, and the preliminary CSM. Field forms and a photograph log are presented in **Appendix A** and **Appendix B**, respectively.

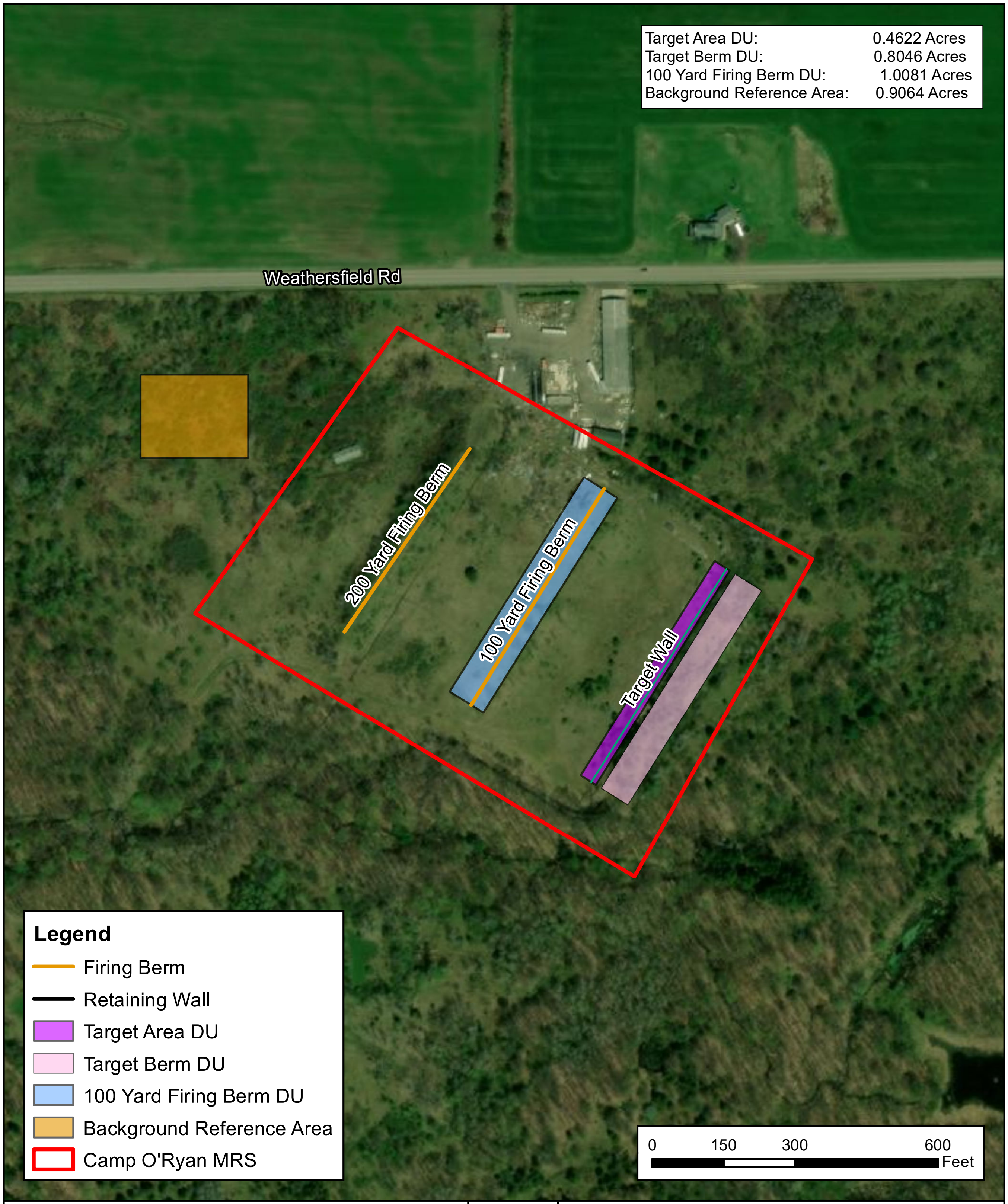
3.1 Soil Sampling Methodology

Based on the findings of the SI and site history, the 100-yard Firing Berm (1.01 acres), the Target Area (0.5 acres), and the Target Berm-Hillside (0.90 acres) were selected as the DUs for investigation (**Figure 3-1**). **Table 3-1**, which includes samples from areas not originally included as a part of the RI, summarizes the soil samples collected. A phased approach that included assessing the lateral extent of MC using x-ray fluorescence (XRF) analysis of discrete surface soil samples at all three DUs was used in the field. The extent of MC established the final size of the three DUs by collecting step-out samples as described in the Final Work Plan/QAPP. An incremental sampling methodology (ISM) approach was also used for surface soil at each DU because this method provides data useable in assessing risks. Several discrete subsurface soil samples were collected at each DU to assess vertical MC distribution.

3.1.1 X-Ray Fluorescence Screening

Surface soil within the original DU boundaries was screened for lead in the field using an Olympus DELTA Professional handheld XRF analyzer. A grid was laid out across each DU, and discrete samples were collected from 0-6 inches bgs at each grid node. An approximate 53 by 20-foot grid was sampled at the 100-yard Firing Berm DU, and the Target Area DU was sampled on an approximate 38 by 19-foot grid. The Target Berm-Hillside DU was initially sampled on an approximate 38 by 20-foot grid during the first RI field mobilization in June 2019, which was halted before completion due to the discovery of material potentially presenting an explosive hazard (MPPEH) onsite. The Erie bomb squad determined the items to be inert munitions debris (MD) and removed them from the MRS. Upon re-mobilizing to continue RI field work, the Target

Berm-Hillside DU grid size was revised multiple times to efficiently delineate the full extent of the hillside and was ultimately expanded to approximately 120 by 125 feet.



CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	MS	12/4/2020
SCALE	1:3,600	CHK BY	JW	12/4/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	12/4/2020

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Camp O'Ryan RI Approach

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Figure 3-1

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Table 3-1. Summary of RI Samples

Sample Identification	Sample Collection Date	Sample Depth (inches bgs)	Media Type	Analytical Parameters	Comments
				Total Metals[1]	
INCREMENTAL SAMPLES					
100-Yard Firing Berm					
COR01IS01	7/7/2020	0-6	Soil	X	Primary
COR01IS02	7/7/2020	0-6	Soil	X	Duplicate
COR01IS03	7/7/2020	0-6	Soil	X	Triplicate
Target Area					
COR02IS01	7/8/2020	0-6	Soil	X	Primary
COR02IS02	7/8/2020	0-6	Soil	X	Duplicate
COR02IS03	7/8/2020	0-6	Soil	X	Triplicate
Target Berm Hillside					
COR03IS01	7/10/2020	0-6	Soil	X	Primary
COR03IS02	7/10/2020	0-6	Soil	X	Duplicate
COR03IS03	7/10/2020	0-6	Soil	X	Triplicate
Background Reference Area					
COR04IS01	7/20/2020	0-6	Soil	X	Primary
COR04IS02	7/20/2020	0-6	Soil	X	Duplicate
COR04IS03	7/20/2020	0-6	Soil	X	Triplicate
DISCRETE SAMPLES					
100-Yard Firing Berm					
COR01DA01A	7/8/2020	12 - 18	Soil	X	
COR01DB01A	7/8/2020	24 - 30	Soil	X	
COR01DB01B	7/8/2020	24 - 30	Soil	X	
COR01DA02A	7/8/2020	12 - 18	Soil	X	
COR01DB02A	7/8/2020	24 - 30	Soil	X	
COR01X39E	7/8/2020	0-6	Soil	X	TCLP (not analyzed per UFP-QAPP [associated ISM sample did not exceed USEPA RSL for lead])
Target Area					
COR02DA01A	7/10/2020	12 - 18	Soil	X	
COR02DA02A	7/10/2020	12 - 18	Soil	X	
COR02DA02B	7/10/2020	12 - 18	Soil	X	
COR02DB02A	7/10/2020	24 - 30	Soil	X	
COR02X01TCLP	7/10/2020	0-6	Soil	X	TCLP (not analyzed per UFP-QAPP [associated ISM sample did not exceed USEPA RSL for lead])
Target Berm Hillside					
COR03DA01A	7/10/2020	12 - 18	Soil	X	
COR03DB01A	7/10/2020	24 - 30	Soil	X	
COR03DA02A	7/10/2020	12 - 18	Soil	X	
COR03DA02B	7/10/2020	12 - 18	Soil	X	
COR03DB02A	7/10/2020	24 - 30	Soil	X	
COR03DA03A	7/10/2020	12 - 18	Soil	X	
COR03DB03A	7/10/2020	24 - 30	Soil	X	
COR03X01TCLP	7/10/2020	0-6	Soil	X	TCLP (not analyzed per UFP-QAPP [associated ISM sample did not exceed USEPA RSL for lead])
Sediment					
Target Berm Ponded					
COR05SED01A	7/20/2020	0-6	Sediment	X	
COR05SED02A	7/20/2020	0-6	Sediment	X	
COR05SED03A	7/20/2020	0-6	Sediment	X	
COR05SED04A	7/20/2020	0-6	Sediment	X	
COR05SED04(MS)	7/20/2020	0-6	Sediment	X	MS
COR05SED04(MSD)	7/20/2020	0-6	Sediment	X	MSD
COR05SED05A	7/20/2020	0-6	Sediment	X	
COR05SED06A	7/20/2020	0-6	Sediment	X	
COR05SED07A	7/20/2020	0-6	Sediment	X	
COR05SED07(AVS/SEM)	7/20/2020	0-6	Sediment	X	AVS/SEM
COR05SED07(Grain Size)	7/20/2020	0-6	Sediment	X	Grain Size
COR05SED08A	7/20/2020	0-6	Sediment	X	
Wetland Meadow					
COR06SED01A	7/20/2020	0-6	Sediment	X	
COR06SED02A	7/20/2020	0-6	Sediment	X	
COR06SED03A	7/20/2020	0-6	Sediment	X	
COR06SED04A	7/20/2020	0-6	Sediment	X	
COR06SED04(MS)	7/20/2020	0-6	Sediment	X	MS
COR06SED04(MSD)	7/20/2020	0-6	Sediment	X	MSD
COR06SED05A	7/20/2020	0-6	Sediment	X	
COR06SED06A	7/20/2020	0-6	Sediment	X	
COR06SED07A	7/20/2020	0-6	Sediment	X	
COR06SED07(AVS/SEM)	7/20/2020	0-6	Sediment	X	AVS/SEM
COR06SED07(Grain Size)	7/20/2020	0-6	Sediment	X	Grain Size
COR06SED08A	7/20/2020	0-6	Sediment	X	
FIELD DUPLICATES					
COR01DB01B	7/10/2020	24 - 30	Soil	X	Duplicate sample for COR01DB01A
COR02DA02B	7/10/2020	12 - 18	Soil	X	Duplicate sample for COR02DA02A
COR03DA02B	7/10/2020	12 - 18	Soil	X	Duplicate sample for COR03DA02A
COR05SED02B	7/20/2020	0-6	Sediment	X	Duplicate sample for COR05SED02A
COR06SED02B	7/20/2020	0-6	Sediment	X	Duplicate sample for COR06SED02A
EQUIPMENT BLANKS					
COR03EQB	7/10/2020		DI	X	2nd Mobilization
COR04IS00	7/21/2020		DI	X	3rd Mobilization

Notes:

[1] - Antimony, Copper, Lead, & Zinc, by USEPA SW-846 Method 6020A

bgs = below ground surface

MS/MSD = matrix spike/matrix spike duplicate

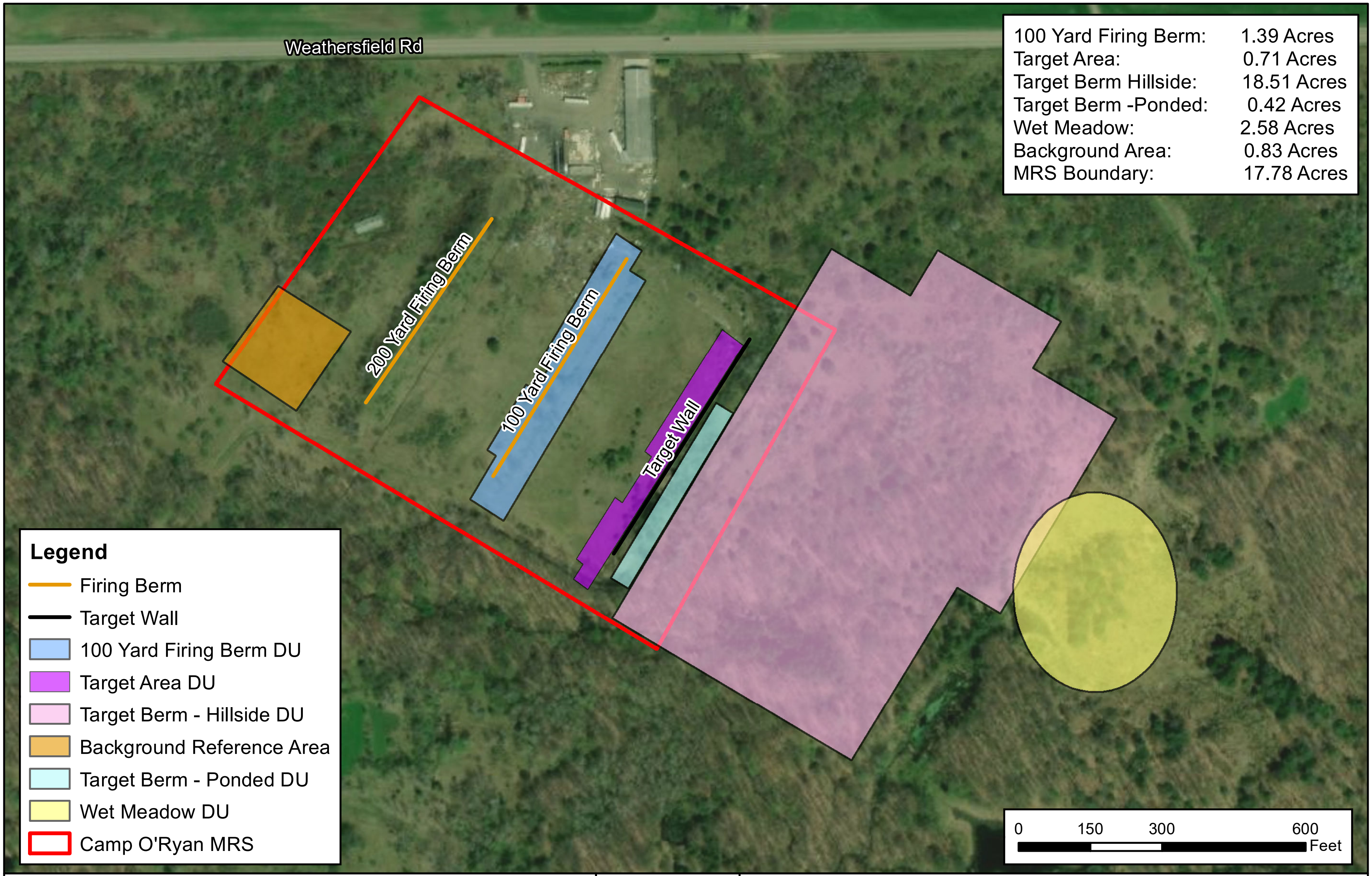
USEPA = United States Environmental Protection Agency

XRF = X-Ray Fluorescence

XRF analysis was performed primarily on perimeter samples to delineate the Target Berm-Hillside DU due to the presence of steep slopes and thick vegetation within much of the DU interior. Soil samples were collected using clean, disposable sampling spoons, placed in clear plastic zip-top bags, disaggregated/homogenized in the field by mechanical methods prior to analysis, and percent soil moisture recorded. Coarse material greater than 2mm in diameter, such as pebbles, bullet fragments, bullet casings, and broken glass, were removed from the sample before analysis and recorded in the field notes (**Appendix A**).

Each sample was analyzed by XRF four times, with each analysis performed on a different portion of the sample, following the guidelines of USEPA method 6200. The concentration of lead (in parts per million [ppm]) and ± error, as reported by the XRF analyzer, was recorded for each analysis. Due to the heterogeneous nature of metals distribution in soil matrices, lead results of the four replicates were averaged in the field to represent the final concentration for a single grid node. The highest recorded error of the four replicates was carried forward to represent the maximum potential error associated with any given replicate of the sample.

The DU boundary of the 100-yard firing berm was revised based on exceedances of the human health screening criterion for lead (63 mg/kg) observed along the DU boundary. An additional 11 step-out samples were taken along the same grid pattern as the DU until exceedances were no longer observed. This revised boundary was used for incremental sampling at the 100-yard Firing Berm (1.39 acres). The DU boundary of the Target Area was also revised based on exceedances of the human health screening criterion for lead observed along the DU boundary. An additional 14 step-out samples were taken along the same grid pattern as the DU until exceedances were no longer observed. The two northernmost step-out locations were not sampled due to debris from the various junk piles preventing the safe collection of the soil samples. This revised boundary was used for incremental sampling at the Target Area (0.71 acres). The DU boundary of the Target Berm-Hillside was revised based on exceedances of the human health screening criterion for lead observed along the DU boundary. An additional 43 step-out samples were taken along the same grid pattern as the DU until exceedances were no longer observed. The southwest portion of the border was limited in step-outs due to a steep ravine that inhibited safe passage to collect additional samples. The eastern boundary of this DU is bound by the Wet Meadow DU, where the saturated soil was too wet to feasibly perform XRF analysis, and sediment sampling was performed instead. This revised boundary was used for incremental sampling at the Target Berm-Hillside (18.51 acres). **Figure 3-2** shows the revised DU sizes and includes the additional DUs discussed in **Section 3.2**.



100 Yard Firing Berm:	1.39 Acres
Target Area:	0.71 Acres
Target Berm Hillside:	18.51 Acres
Target Berm -Ponded:	0.42 Acres
Wet Meadow:	2.58 Acres
Background Area:	0.83 Acres
MRS Boundary:	17.78 Acres

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	11/20/2020
SCALE	1:3,600	CHK BY	JW	11/20/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	AS	11/20/2020

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Camp O'Ryan Revised DUs

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Figure 3-2

3.1.2 Incremental Soil Sampling

Incremental samples (IS) were collected from each DU using a systematic random approach, XRF screening grids, and in accordance with the procedures outlined the UFP-QAPP standard operating procedures (SOPs; AECOM, 2019). Random numbers were generated in the field, using a random number generator, to select the location of primary, duplicate, and triplicate ISM samples. All IS were collected in 100% triplicate following the technical guidance outlined in the 2012 *Incremental Sampling Methodology* by the Interstate Technology & Regulatory Council (ITRC) Incremental Sampling Methodology Team (ITRC, 2012). The risk screening analysis is performed with the IS sample results.

Prior to IS collection, vegetation and other debris were cleared from the ground surface, and the area was scanned by the UXO technician using a magnetometer. Sample increments were collected using a standard cylindrical stainless steel soil probe. The IS from the 100-yard Firing Berm DU was comprised of 55 evenly spaced increments, the Target Area DU was comprised of 42 evenly spaced increments, and the Target Berm-Hillside DU was comprised of 36 evenly spaced increments with adjustments made for the large expanse of land and inaccessible terrain the DU spanned. Increments were collected from approximately 0-6 inches bgs and composited into individual 10-gallon plastic zipper-lock bags for laboratory analysis of small arms metals.

In addition to the DUs mentioned above, IS were collected in 100% triplicate from a background reference area not affected by historical training activities. The area sampled was representative of undisturbed media and of an appropriate size to adequately characterize background concentrations and be comparable to investigative samples. The location for background reference sample collection is outside of any range-related impacts and shown on **Figure 3-2**. The results of all ISM samples will be used in the risk assessment in the RI report.

3.1.3 Discrete Subsurface Soil Sampling

The vertical extent of contamination was conservatively characterized by collecting discrete subsurface soil samples from select areas where XRF results exceeded the human health screening criterion for lead. At the 100-yard Firing Berm DU, two locations were selected for discrete subsurface soil sampling based on elevated XRF results for lead:

- COR01DA01 (southwest of central 100-yard Firing Berm)
- COR01DA02 (northwest of central 100-yard Firing Berm)

At the Target Area DU, two locations were selected for discrete subsurface soil sampling based on elevated XRF results for lead:

- COR02DA01 (southeast of Target Area along target wall)
- COR02DA02 (northeast of Target Area along target wall)

At the Target Berm-Hillside DU, three locations were selected for discrete subsurface soil sampling based on elevated XRF results for lead:

- COR03DA01 (northwest corner of the DU)

- COR03DA02 (south portion of the DU)
- COR03DA03 (east portion of the DU)

With the exception of one location, a discrete sample was collected from two depths: 12-18 inches bgs ("DA" sample) and 24-30 inches bgs ("DB" sample). At COR03DA/DB01 the sample depth of 24-30 inches could not be reached due to refusal at a cobble layer, so the sample depth was limited to 25 inches bgs.

Each sampling zone was exposed by hand auger and/or shovel, and discrete samples were collected with a clean, disposable sampling spoon for laboratory analysis of MC. The 24-30 inches bgs samples were held at the laboratory pending the results of the shallow 12-18-inches bgs sample. Of the seven discrete sample locations at the three DUs, only three samples, one from each DU, exceeded the human health screening criterion for lead in the shallow 12-18-inches bgs sample; the deeper 24-30-inches bgs samples were analyzed accordingly. The deeper subsurface soil sample was also analyzed at COR03DB01A because XRF analysis showed ecological exceedance of antimony concentrations in the shallow sample and a higher lead concentration in the deeper sample compared to the shallow sample. Excess soil was returned to each sampling location at the level removed, and the ground surface returned to original grade. Samples were immediately stored in a cooler filled with ice until the cooler arrived at the lab for metals analysis by USEPA Method 6020A/CA-604+627 (lead, antimony, zinc, and copper).

3.1.4 Sample Identification

Soil samples collected at the MRS were identified using the procedures detailed in the UFP-QAPP (AECOM, 2019). Using indelible ink, each sample was labeled with a nine- to ten-character sampling code. The sampling code consisted of a three-character site identifier, two-digit DU number, one-to two-character sampling method code, two-digit sample location/type number, and one-character sample replicate code. Each component of the sample codes as shown in **Table 3-1** is described in the examples below:

COR01DA02A and **COR02IS02**

COR = Three-character site identifier for the Camp O'Ryan MRS

01 = Decision Unit identifier:

- 01 for the 100-yard Firing Berm DU
- 02 for the Target Area DU
- 03 for the Target Berm-Hillside DU
- 04 for the Background DU

DA = One- to two-character sampling method:

- X = discrete XRF surface soil sample
- DA = discrete 12-18 inches bgs subsurface soil sample
- DB = discrete 24-30 inches bgs subsurface soil sample
- IS = incremental surface soil sample

02 = Sample location/type:

- 01 – 86 for each discrete sample location
- For IS samples only:
    - 00 = equipment blank
    - 01 = primary sample
    - 02 = duplicate sample
    - 03 = triplicate sample

A = Discrete sample replicate:

- A – D for each replicate discrete sample

3.1.5 Decontamination of Sampling Equipment

Personnel donned suitable personal protective equipment to reduce personal exposure as required by the Site Safety and Health Plan (Appendix B of the Final RI Work Plan [AECOM, 2018]). Excess soil on equipment was scraped off at the sampling location. Equipment was rinsed at the sampling location with a spray bottle containing a Liquinox solution or low-sudsing non-phosphate detergent along with distilled water and scrubbed with a bristle brush or similar utensil. The equipment was rinsed with distilled water from a separate spray bottle followed by an analyte-free water rinse. Following decontamination, equipment was placed in a clean plastic zipper-lock bag to prevent contact with contaminated soil and/or surfaces.

3.1.6 Investigative Derived Waste

Soil investigation-derived waste was not generated during the sampling activities completed at the MRS. Rinse water generated from equipment decontamination activities was less than 1-liter per DU and discharged directly to the ground within the MRS per the procedures outlined in the UFP-QAPP (AECOM, 2019).

3.1.7 Quality Assurance / Quality Control

Quality Assurance (QA) / Quality Control (QC) samples collected during the RI consisted of duplicate samples, matrix spike (MS) / MS duplicate (MSD) samples, and equipment blanks. QA/QC sampling was conducted in accordance with specifications outlined in the UFP-QAPP.

Duplicates

Duplicate samples were collected at a rate of at least 1 per 10 samples. Duplicate samples were collected simultaneously from the same source under identical conditions, submitted to the laboratory as indistinguishable samples, and labeled accordingly. Because IS samples were collected in triplicate, duplicate QA/QC samples were unnecessary.

MS/MSD

MS/MSD samples were collected at a rate of 5% per mobilization per sample type. Sub-samples were pulled from the parent sample by the analytical laboratory for IS samples. Additional volume was collected for discrete subsurface soil samples from the same location as the parent sample. Labels for the extra volume were the same as the parent sample.

Equipment Blanks

Equipment blanks from the discrete subsurface soil sampler were collected at a rate of 5% per mobilization for samples collected with decontaminated, reusable equipment. Equipment blanks were collected by passing analyte-free deionized water over a decontaminated soil probe into sampling containers.

3.2 Sediment Area DUs Sampling Methodology

While the MRS sits on largely undeveloped land of mostly gently rolling, forested terrain comprising deciduous trees with patches of open grass fields, the USFWS NWI lists one wetland area adjacent to the original MRS boundary to the east (USFWS, 2020a). This wetland area was not anticipated to be affected by MC in source areas; however, step-out sampling at the Target Berm-Hillside DU extended into the wetland. This area was designated as the Wet Meadow DU through an approved NCR submitted during RI field work (**Appendix A**). **Figure 3-2** presents the location of the Wet Meadow DU in relation to the multiple MRS sites.

Additionally, a low-lying area that becomes temporarily inundated during and after precipitation events was observed east of the Target Area DU, between the target wall and the base of the Target Berm-Hillside DU. This regularly saturated area was designated as the Target Berm-Ponded DU through an approved NCR submitted during RI field work (**Appendix A**). **Figure 3-2** presents the location of the Target Berm-Ponded DU located within the MRS.

Step-out sampling from the Target Berm-Hillside DU indicates that soil from the DU area may have migrated toward both additional sediment DUs. As a result, sediment samples were collected from both areas on either side of the Target Berm-Hillside DU. **Table 3-1** summarizes the analytical samples collected.

3.2.1 Sediment Sampling

Eight discrete sediment samples were collected from each of the Target Berm-Ponded and Wet Meadow DUs in approximately evenly spaced distances from across the DUs (**Figure 3-2**). In addition, one sediment sample location at each DU was analyzed for Acid Volatile Sulfide(AVS)/Simultaneously Extracted Metals (SEM), total organic carbon (TOC), and grain size for use in the risk assessments. Sediment samples were collected using a clean, disposable sampling spoon from a depth of 0-6 inches bgs. Samples were immediately stored in a cooler filled with ice until the cooler arrived at the lab for metals analysis by USEPA Method 6020A/CA-604+627 (lead, antimony, zinc, and copper).

3.2.2 Sample Identification

Sediment samples collected at the Target Berm-Ponded and Wet Meadow DUs were identified using the USEPA procedures detailed in **Appendix A**. Using indelible ink, each sample was labeled with a seven- to nine-character sampling code. The sampling code consisted of a three-character site identifier, two-digit DU number, one-to two-character sampling method code, two-digit sample location/type number, and one-character sample replicate code. Each component of the sample code, is described in the examples below:

COR05SED01A

COR = Three-character site identifier for the Camp O'Ryan Rifle Range MRS

01 = Decision Unit identifier:

- 05 for the Target Berm-Ponded DU
- 06 for the Wet Meadow DU

SED = Three-character sampling method:

- SED = sediment sample

01 = Sample location/type:

- 01 – 08 for each discrete sediment sample location

3.2.3 Decontamination of Sampling Equipment

Personnel donned suitable personal protective equipment to reduce personal exposure as required by the Site Safety and Health Plan (Appendix B of the Final RI Work Plan [AECOM, 2018]). Disposable plastic spoons were used for sample collection; therefore, no decontamination was necessary for sediment sample collection.

3.2.4 Investigative Derived Waste

Surface water and sediment investigation-derived waste were not generated during the sampling activities completed at the Target Berm-Ponded and Wet Meadow DUs.

3.2.5 Quality Assurance / Quality Control

QA/QC samples collected during the RI consisted of duplicate samples, MS/MSD samples, and equipment blanks. QA/QC sampling was conducted in accordance with specifications outlined in the UFP-QAPP.

Duplicates

Duplicate samples were collected at a rate of at least 1 per 10 samples. Duplicate samples were collected simultaneously from the same source under identical conditions, submitted to the laboratory as indistinguishable samples, and labeled accordingly.

MS/MSD

MS/MSD samples were collected at a rate of 5% per mobilization per sample type. Sub-samples were pulled from the parent sample by the analytical laboratory for IS samples. Additional volume was collected for discrete sediment samples from the same location as the parent sample. Labels for the extra volume were the same as the parent sample.

Equipment Blanks

Equipment blanks were not collected from sediment sampling equipment because disposable spoons were used to collect samples.

3.3 Laboratory Analytical Methods

All soil and sediment samples were submitted to a DoD Environmental Laboratory Approval Program-certified laboratory that is also NYDEC-certified (Katahdin Analytical Services, Inc.) for all chemical analyses. Each sample was labeled and secured in a shipping cooler filled with ice. Samples were entered on the chain-of-custody form with the required analyses. Each cooler was sealed with the chain-of-custody form inside. Custody seals were signed, dated, and placed on opposite corners of the coolers prior to overnight shipment to the analytical laboratory. All laboratory procedures and analyses were conducted in accordance with the UFP-QAPP.

All IS and discrete samples were analyzed by the laboratory for:

- Small arms metals (antimony, copper, lead, and zinc) by USEPA Method SW-846 6020A|

Additionally, one discrete sediment sample at each wetland DU was analyzed by the laboratory for:

- TOC
- Grain Size
- AVS/SEM

3.4 Data Evaluation Methods

Each sample result was compared directly to the screening criteria (**Section 3.4.1**) for all MC parameters examined. The weight-of-evidence approach used in the assessment helped control decision errors. MC concentrations from all sample results and site conditions were considered to ensure additional information did not provide indications that conclusions may be in error. All data were reviewed, as described in **Section 4**, to determine their usability. Sampling locations and field conditions were assessed to ensure all samples were representative of MRS and background area conditions.

3.4.1 Human Health and Ecological Risk Screening Criteria

Discrete sample results for were compared to human health and ecological risk-based screening levels for soil and sediment, which are presented in **Table 3-2**. The lead exceedances of the human health value guided step-out decisions. All results were used to determine if a DU would be further assessed in a Human Health Risk Assessment (HHRA) and Screening Level Ecological Risk Assessment (SLERA).

MC concentrations in soil samples were also compared to site-specific Background Reference Area samples that were collected and analyzed during this RI using the same sampling techniques as the primary samples.

Table 3-2 Remedial Investigation Screening Levels

Analyte	Screening Levels			
	Soil Human Health (mg/kg)	Soil Ecological (mg/kg)	Sediment Human Health (mg/kg)	Sediment Ecological (mg/kg)
Antimony	3.1(1)	0.27(3)	14.6(1)	2(6)
Copper	50(2)	50(4)	1,460(1)	23(7)
Lead	63(2)	63(4)	63(1)	26(7)
Zinc	109(2)	109(4)	11,000(1)	63(7)

Notes:

(1) USEPA. 2020. USEPA's Residential Soil regional Screening Levels (RSLs) (November 2020), protective of a target hazard quotient of 0.1 and a target cancer risk of 1x10-6. For sediment, the recreator RSLs were calculated using the on-line calculator; an exposure frequency of 75 days/year and 1 hour/event was assumed. Same target thresholds were used as the soil. The lead screening level is not modified because it is a background level established by the New York State Remedial Program.

(2) NYSDEC 2010. DER-10/Technical Guidance for Site Investigation and Remediation. Final DEC Program Policy. May. Soil Cleanup Objectives for Unrestricted Use.

(3) USEPA. 2015. USEPA Region 4 Ecological Risk Assessment Supplemental Guidance Soil Screening Values for Hazardous Waste Sites.

(4) NYSDEC. 2006. New York Remedial Program Soil Cleanup Objectives for Restricted Use, Protection of Ecological Resources.

(5) MacDonald et al. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Arch. Environ. Contam. Toxicol. 39: 20-31.

(6) USEPA. 2006. EPA Region 3 Biological Technical Assistance Group (BTAG) Screening Values.

(7) Los Alamos National Laboratory, 2017. ECORISK Database Release 4.1 (September 2017). Minimum ESLs Reported for Birds and Mammals.

mg/kg = milligrams per kilogram

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4 Data Quality Assessment

Field samples were analyzed for small arms metals by Katahdin Analytical Services using SW-6020A. QA/QC samples were collected to evaluate the field collection methods and the laboratory analytical techniques for soil samples. No deviations from the UFP-QAPP requiring corrective action occurred. The full data validation report (DVR) is presented in **Appendix C**.

4.1 Data Validation and Verification

The following describes data QC parameters and criteria used during the RI. An analysis of the data in terms of precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS) is provided in **Section 4.2**. All laboratory data validation and verification activities were completed by Devon Chicoine and reviewed by the project chemist, Naoum Tavantzis. As appropriate, the subsections below also address the in-field XRF data obtained at Camp O'Ryan.

A Tier III DVR was prepared for each Sample Delivery Group as assigned by the laboratory (**Appendix C**). The validation process complied with the UFP-QAPP (AECOM, 2019) and DoD Quality Systems Manual to define the method quality objectives. Laboratory data were qualified according to protocols defined in the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data (USEPA, 2017). Issues identified during the data validation process resulted in the application of letter qualifiers to the data. These qualifiers were added to concentrations, when appropriate, to ensure reported concentrations were accurately represented. Usability of data for further analysis was based on review of analytical qualifiers and performed in accordance with the guidelines noted previously.

Holding Time Requirements

Samples are only representative of the area they were taken from for a specific length of time before sample preparation or analysis must begin. All samples must be placed in appropriate containers that are appropriately preserved (as applicable). The holding time for soil from sampling to analysis for SW-846 6020A is 6 months. Sediment samples analyzed for TOC have a holding time of 14 days and a holding time of 21 days for AVS/SEM. All samples were analyzed within required holding times for their respective method.

Calibration Criteria

All laboratory analyses require that a calibration curve be prepared to cover the appropriate concentration range based on the intended application and prior to establishing the linear dynamic range. Usually, this means the preparation of a calibration blank and mixed calibration standard solutions, with the lowest being at or above the limit of quantitation (LOQ) and the highest of not exceeding the anticipated linear dynamic range of the instrument. All calibration curves contained one calibration blank and five calibration standards at increasing concentrations with calibration correlation coefficients within control limits. All sample concentrations were within the linear range of the calibration curve. Continuing calibration blanks displayed detections for copper and lead greater than the detection limit (DL) but less than limit of detection (LOD). The associated positive field sample results were greater than five times the blank detections; no data qualifying action was required.

Laboratory Method Blank

A method blank is a sample of an analyte-free substance similar to the matrix of interest that is subjected to all of the sample digestion and analytical methodology applied to the samples. The purpose of the method blank is to check for contamination from within the laboratory that might be introduced during sample preparation and analysis that would adversely affect analytical results. During metals analysis, two method blanks (Blank ID: PBWNG29IMW2 [copper; 0.54 microgram per liter (µg/L) and lead; 0.2 µg/L and PBWNG21IMW2 [copper; 1.7 µg/L]) displayed detections greater than the DL but less than the LOD. During AVS/SEM analysis, one method blank (Blank ID: NH03ICS2 [mercury; 0.0000142 microgram mole per gram]) displayed detections greater than the DL but less than the LOD. The positive associated field sample result for sample COR04IS00 that was less than five times the blank detection for copper and lead and for sample COR06SED07A that was less than five times the blank detection for mercury were qualified U, bl, indicating the field sample result would be considered non-detect (ND) at the elevated reporting limit.

Equipment Blank

As per the UFP-QAPP, equipment blanks were to be collected at rate of 5%, with measurement performance criterion stating that all detections would be less than the LOD. The equipment blank was collected as discussed in **Section 3.1.7** and analyzed for MC. Copper was detected in the equipment blank; however, it was previously qualified due to method blank detection anomalies. Equipment blanks were not collected for discrete or XRF samples since these samples were collected using disposable single use spoons.

Laboratory Duplicate Samples

Laboratory duplicates are separate aliquots of a single field sample that are prepared and analyzed concurrently at the laboratory. The primary purpose of the laboratory duplicate is to check the precision of the laboratory analyst, the sample preparation methodology, and the analytical methodology. As per the UFP-QAPP, laboratory duplicates were to be prepared at a frequency of once per inorganic preparatory batch. Acceptable relative percent differences (RPDs) for laboratory duplicates are specified by the laboratory-specific control limits. All laboratory duplicates prepared were within QC limits.

Field Triplicates

Field triplicates of IS were collected at every DU for laboratory analysis to assess imprecision encountered in the sampling process and heterogeneity of sample media. Acceptable RPDs for discretely collected field duplicates are less than 50%. No anomalies were encountered in the field triplicates. Acceptable relative standard deviations (RSDs) between triplicates are less than 50%. Percent RSD ranged from 1.65% to 32.7%.

Laboratory Control Spike (LCS) Samples

A laboratory control spike (LCS) is an interference-free matrix spiked with known concentrations of specific analytes of interest. This analysis determines if the laboratory procedure is working within the established control limits. Similar to the method blank, an LCS is carried through the complete preparation and analytical procedure, utilizing recoveries of spiked analytes to determine accuracy. An LCS is to be performed once per preparation batch, or one per twenty field samples, whichever is greater. All field samples displayed LCS percent recoveries within the established control limits.

Matrix Spike/Matrix Spike Duplicates

An MS/MSD is a separate aliquot of a specified field sample that is spiked with known concentrations of analytes of interest at the laboratory. The MS/MSD is analyzed to determine if the laboratory procedure is working within the established control limits and if matrix interference is present. Percent recoveries of the spiked analytes are evaluated to determine accuracy within a given matrix. Comparison of the MS to the MSD will yield a precision measurement, or RPD, in a given matrix. An MS/MSD sample is to be collected at a rate of 5 percent and for each sample matrix. The MS/MSD pairs performed on parent samples COR01DA02A, COR02DA01A, COR03DA03A, COR01IS01, COR02IS02, COR03IS03, COR05SED04A, and COR06SED04A displayed percent recoveries and/or RPDs outside the established QC limits. The field sample results associated with the percent recovery greater than the upper control limit, indicating a positive bias, were qualified J+, m. The field sample results associated with the percent recovery less than the lower quality control limits, indicating a negative bias, were qualified J-,m. Sample results associated with a combination of high and low percent recoveries were qualified "J".

4.2 Data Usability - PARCCS

The Data Usability Assessment (DUA) is an evaluation at the conclusion of data collection activities that uses the results of both data verification and validation in the context of the overall project decisions or objectives. Using both quantitative and qualitative methods, the assessment determines whether project execution and the resulting data have met installation specific Data Quality Objectives (DQOs). Both sampling and analytical activities are considered to assess whether the collected data are of the right type, quality, and quantity to support the decision-making.

Data Quality Indicators (DQIs), PARCCS, are important components in assessing data usability. These DQIs were evaluated in the subsequent sections and demonstrate that the data presented in this RI report are of high quality. Although the RI data are considered reliable, some degree of uncertainty can be associated with the data collected. Specific factors that may contribute to the uncertainty of the data evaluation are described below. The DVR (**Appendix A**) presents explanations for all qualified data in greater detail.

Precision

Precision is the degree of agreement among repeated measurements of the same characteristic on the same sample or on separate samples collected as close as possible in time and place. Field sampling precision is measured with the field duplicate RPD; laboratory precision is measured with calibration verification, LCS pair and MS pair RPD.

Calibration verifications were performed routinely to ensure that instrument responses for all calibrated analytes were within established QC criteria. All calibration verifications analyzed at the appropriate frequency presented in the QAPP (AECOM, 2019).

LCS/LCS duplicate (LCSD) pairs were prepared by addition of known concentrations of each analyte in a matrix-free media known to be free of target analytes. LCS/LCSD pairs were analyzed for every analytical batch to demonstrate the ability of the laboratory to detect similar concentrations of a known quantity in matrix-free media. The LCS/LCSD samples were within the project established precision limits presented in the QAPP (AECOM, 2019).

An MS/MSD sample is to be collected at a rate of 5% and for each sample matrix. The MS/MSD pairs performed on parent samples COR01DA02A, COR02DA01A, COR03DA03A, COR01IS01, COR02IS02, COR03IS03, COR05SED04A, and COR06SED04A displayed percent recoveries and/or RPDs outside the established QC limits. MS pairs performed on soil displayed RPDs outside of control limits for lead and antimony. The positive associated field sample results were previously qualified due to MS/MSD percent recovery anomalies.

Field duplicate samples were collected at a rate of 10% to assess the overall sampling and measurement precision for this sampling effort. The field duplicate samples were analyzed for metals. The field duplicate samples were within the project-established precision limits presented in the QAPP (AECOM, 2019), with the exception of zinc for duplicate pair COR06SED02A/B. The relative percent difference was greater than the QC limit of 35%, at 88.9%. Associated results for the parent and duplicate sample were qualified as “J”. The “J” flag means that the associated numerical results are considered approximations of the actual sample concentrations.

A serial dilution is prepared by the laboratory after digestion for the metal analyses for each preparation batch by creating a 1:5 dilution of a digestate in water. The serial dilution result should be within 10% of the neat digest. Serial dilutions performed on field samples displayed recoveries above 10%. Three sample results were qualified “J” unless previously qualified due to MS/MSD percent recovery anomalies. The “J” flag means that the associated numerical results are considered approximations of the actual sample concentrations.

Accuracy

Accuracy is a measure of confidence in a measurement. The smaller the difference between the measurement of a parameter and its "true" or expected value, the more accurate the measurement. The more precise or reproducible the result, the more reliable or accurate the result. Accuracy is measured through percent recoveries in the LCS/LCSD, MS/MSD, and surrogate recoveries.

LCS/LCSD samples were prepared by addition of known concentrations of each analyte in a matrix-free media known to be free of target analytes. LCS/LCSD samples were analyzed for every analytical batch and demonstrated that the analytical system was in control during sample preparation and analysis.

MS/MSD samples were prepared, analyzed, and reported at a rate of 5%. MS/MSD samples demonstrated that the analytical system was in control for the matrix being tested, with a limited number of exceptions. MS pairs performed on soil displayed percent recoveries outside QC limits. The parent sample results associated with positive biases were qualified "J+". The qualified results should be considered usable as estimated with a positive bias. The parent sample results associated with the negative bias were positive and were qualified "J-". The qualified results should be considered usable as estimated with a negative bias. The parent sample results associated with a combination of high and low percent recoveries were qualified "J." The "J" flag means that the associated numerical results are considered approximations of the actual sample concentrations. In total, 84 field sample results, or less than 0.17%, were qualified during data validation due to MS/MSD percent recovery anomalies.

Representativeness

Representativeness is the measure of the degree to which data accurately and precisely represent a characteristic of a population, a parameter variation at a sampling point, a process condition, or an environmental condition. In other words, representativeness is the qualitative measurement that describes how well the analytical data characterize a specific area of interest. Several factors including selection of appropriate analytical procedures, sampling plan, matrix heterogeneity, and the specific procedures and protocols used to collect, preserve, and transport samples can all influence how representative the analytical results are for a given sampled area. It is imperative that field sampling and collection occur at appropriately designated locations that accurately represent the area of interest. For example, when sampling for MC, visual observances (small metal fragments or munition debris in surrounding area) in combination with designated sampling depths (e.g., 0-6, 12-24, and 24-30 inches bgs) and appropriate sample collection will help to ensure accurate representation of a specific area of interest. Thus, the sampled soil is known to be located within the MRS, at appropriate step out locations, and background area.

As described in **Section 3.1** of this report and in the UFP-QAPP, the MRS was divided into five DUs that reflect the distinct areas of potential contamination as indicated by site history, remaining physical evidence of the target areas, as well as the additional DU areas created during the field event. Thus, uniform distribution of MC across the MRS was considered unlikely and subdividing the MRS was considered appropriate. Samples from within each DU are considered representative of their DU and satisfactorily define the DU extent. Step-out sampling was conducted until concentrations fell below the action level or site conditions prevented sampling; therefore, the three soil DU boundaries were delineated appropriately and satisfactorily. Samples collected from the background area are considered representative of baseline conditions because the background area is in a location unaffected by site activities and is of similar land use. The number of discrete sediment samples was based on professional judgment and designed to be sufficiently spaced to delineate the distribution of metals MC in soil at the DU. The numbers and uniform spacing of ISM increments adhered to the UFP-QAPP requirements and were sufficiently large that the analytical results represent the DUs with confidence.

Use of the standard sampling protocols at each location ensured representativeness of the medium being sampled (subsurface soil, and sediment) because the protocols allow standardizing sample sizes that reliably achieve the targeted sample depths, and decontamination of samplers was simple, thus minimizing cross contaminating samples.

Field QC samples were collected to assess the representativeness of the data collected. Field duplicates were collected at a rate of 10% for all field samples, while MS/MSD samples were collected at a rate of 5%. All preservation techniques were followed by the field staff, and all technical and analytical holding times were met by the laboratory. The laboratory used approved standard methods in accordance with the QAPP (AECOM, 2018) for all analyses.

Instrument blanks and method blanks were prepared by the laboratory in each batch as a negative control. A number of instrument blanks and method blanks displayed detections greater than the DL for multiple target analytes. In total, 4 field sample results were qualified "U" during data validation due to a detection in the associated blank. The reported field sample result value was adjusted to be equal to the LOD. In some instances, when the qualified numerical result was greater than the LOD, the LOD would be elevated to the numerical result value. The results are usable as qualified but were considered to be false positives and are treated as non-detects by the project team.

XRF analyzers are factory calibrated; field calibration is not appropriate or possible. Calibration checks and analysis of standard reference material were conducted prior to XRF analysis (**Appendix A**). No calibration failures or deviations from expected standard concentrations were observed. Use of the standard sampling protocols at each location ensured representativeness of the medium being sampled (soil) because the protocols allow standardizing sample sizes that reliably achieve the targeted sample depths, and decontamination of samplers was simple, thus minimizing cross contaminating samples.

Equipment blanks were also collected for sediment and soil samples. There were no impacted field samples related to equipment blanks. Overall, the data are usable for evaluating the presence or absence of metals at the MRS. Sufficient usable data were obtained to meet the objectives of the RI.

Comparability

Comparability is the extent to which data from one study can be compared directly to either past data from the current project or data from another study. Using standardized sampling and analytical methods, units of reporting, and site selection procedures help ensure comparability. Standard field sampling and typical laboratory protocols were used during the RI and are considered comparable to ongoing investigations.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount of data expected under normal conditions. The laboratory provided data meeting system QC acceptance criteria for all samples tested. Project completeness was determined by evaluating the planned versus actual quantities of data. Percent completeness per parameter is as follows:

- Metals in soil by SW6020A at 100%
- Metals in sediment by SW6010C SEM-AVS at 100%
- TOC in sediment by Lloyd Kahn at 100%
- Grain Size in soil by D422 at 100%

Sensitivity

Sensitivity is the capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. Examples of QC measures for determining sensitivity include laboratory fortified blanks, a method DL (MDL) study, and calibration standards at the LOQ. In order to meet the needs of the data users, project data must meet the measurement performance criteria for sensitivity and project LOQs specified in the QAPP (AECOM, 2019). The laboratory provided the requested MDL studies provided applicable calibration standards at the LOQ. In order to achieve the DQOs for sensitivity outlined in the QAPP (AECOM, 2019), the laboratory reported all field sample results at the lowest possible dilution. Additionally, any analytes detected below the LOQ and above the DL were reported and qualified "J" as estimated values by the laboratory.

4.2.1 Field Audits/Corrective Actions

No independent field audit was conducted given that the field team was comprised of scientists skilled at the specific sampling methodology and had assisted in preparing the UFP-QAPP and SOPs. Additionally, the site photographs, standard field forms, and Daily Quality Control Reports (DQCR) show that the proper equipment was being used and that the QC samples were collected. These documents appear in **Appendix A** and **B**. The DQCRs were submitted daily to the AECOM project manager. The AECOM project manager reviewed all field documents for completeness and compliance with the UFP-QAPP.

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5 Remedial Investigation Results

This section details the results of the field investigation at the Camp O'Ryan MRS. Data from the RI combined with previous information were used to refine the preliminary CSM and inform recommendations for future site work. Results for each sampled matrix are discussed below, beginning with XRF for surface soil, followed by discrete subsurface soil, surface soil ISM, and sediment. The nature and extent of contamination across the entire MRS is summarized last.

All field activities were conducted as described in **Section 3** and per the UFP-QAPP, and data were validated as summarized in **Section 4.1**. The DVR and analytical data package are included in **Appendices C** and **D**, respectively. Per the DUA in **Section 4**, all collected data are useable for their intended purpose. Field forms appear in **Appendix A**, and the photograph log is included in **Appendix B**.

5.1 Field Activities and Conditions

Discrete soil samples were collected from the 100-yard Firing Berm DU, the Target Area DU, and the Target Berm-Hillside DU at the MRS and an adjacent Background Reference Area. Sediment samples were collected from the Target Berm-Ponded DU and the Wetland Area DU, which were added to the RI via NCRs submitted in June 2019 and July 2020, respectively (**Appendix A**). Sampling occurred in three mobilizations; the first mobilization occurred over a four-day period from 02 June through 06 June 2019. Sampling was halted upon the discovery of MPPEH onsite. Two MPPEH items were removed by the local police department and Erie Bomb Squad. These items were determined to be inert MD and were disposed of by local authorities. Field work resumed with a revised Site Safety and Health Plan in July 2020. At the soil DUs, sampling grids were laid out prior to initiating sampling activities. Grid spacing at the 100-yard Firing Range was 21 feet long by 53 feet wide; the Target Area DU grid was 19 feet long by 38 feet wide; and the Background Reference Area grid was 40 feet long by 45 feet wide. Grid spacing at the Target Berm-Hillside was 20 feet long by 38 feet wide during the first mobilization but was expanded to approximately 125 ft long by 120-foot-wide when the DU expanded across the entire hillside area.

5.2 XRF Screening Results

All soil DUs were screened for lead by handheld XRF prior to ISM sampling to evaluate the lateral extent of MC in soil and refine DU boundaries. Discrete surface soil samples were collected at each DU from 0-6 inches bgs along the sampling grid. Four replicate sample readings were analyzed for each sample; the results were averaged and compared to the human health screening criterion for lead to determine the need for step-out and discrete sampling. Sediment DUs were not screened using XRF due to their significant moisture.

5.2.1 100-yard Firing Berm DU

Initially, 44 samples were collected and analyzed for lead by XRF at the 100-yard Firing Berm DU. Five DU perimeter location samples exceeded the NY state human health criterion for lead (63 mg/kg); therefore, step-out samples were collected on the northern and western DU boundaries. An additional eleven samples were collected and analyzed along same-sized grid increments until exceedances were no longer observed. In total, 55 samples were collected and analyzed. Lead concentrations ranged from 13 ppm (grid #55) to 357 ppm (grid #34). A summary of XRF results are shown on **Table 5-1** and **Figure 5-1**.

5.2.2 Target Area DU

Initially, 30 samples were collected and analyzed for lead by XRF at the Target Area DU. Twenty (20) of the samples (including eight boundary samples) exceeded the human health criterion for lead (63 mg/kg); therefore, step-out samples were collected on the western boundary of the DU. Step-out sampling was not performed on the northern boundary because piles of rusted metal and debris precluded safe sampling. An additional 12 samples were collected and analyzed along same-sized grid increments until exceedances were no longer observed. In total, 42 samples were collected and analyzed. Lead results ranged from 14 ppm (grid #36) to 373 ppm (grid #14). A summary of XRF results in shown on **Table 5-2** and **Figure 5-2**.

5.2.3 Target Berm – Hillside DU

Initially, 26 samples were collected and analyzed for lead by XRF near the base of the hillside at the Target Berm-Hillside DU. Lead in all samples, exceeded the human health criterion (63 mg/kg). The grid area and spacing were increased during a second mobilization with step-out sampling focused on the DU perimeter because much of the DU interior was inaccessible due to expansive, dense vegetation and steep slopes across the hillside. The presence of the Wet Meadow DU to the east and a steep ravine to the south bound the DU in those directions.

Samples were collected and analyzed along uniform grid increments until exceedances were no longer observed. The final DU grid size used to delineate the Target Berm-Hillside was 120 feet wide by 125 feet long on the northern perimeter of the DU. In total, 75 samples were collected and analyzed to refine the DU area. Lead results for samples collected from this DU ranged from ND <13 (grid #85) to 6,051 ppm (grid #13). The area of the highest concentrations is directly adjacent to the low-lying base of the hillside, which became designated as its own DU due to its different type of habitat and media. These results are shown on **Figure 5-3**, and a summary of XRF results is shown on **Table 5-3**.

5.3 Incremental Sampling Results

At the 100-yard Firing Berm and Target Area , ISM samples were collected using the revised DU boundaries after XRF screening was complete. At the Target Berm – Hillside, ISM samples were collected using an adjusted grid to allow for efficient collection within the densely vegetated DU interior. The adjusted Target Berm – Hillside ISM grid is shown on **Figure 5-4**. Sample collection logs are included in **Appendix A**. All IS results are summarized in **Table 5-4** and **Figure 5-5.**

Table 5-1 Summary of Discrete XRF Lead Results in Surface Soil - 100 yd Firing Berm DU

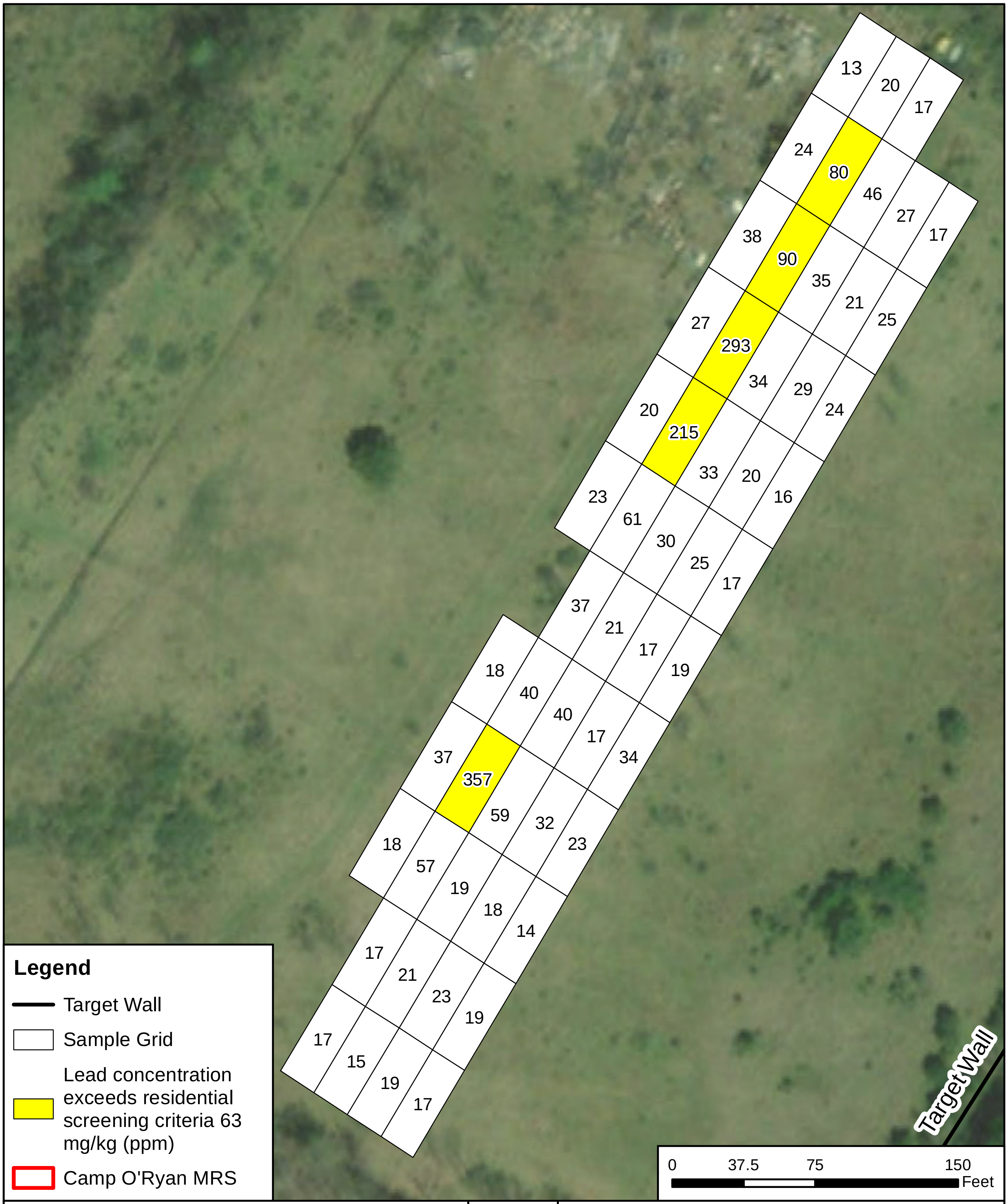
Sample ID	Moisture (%)	Average Lead Result (ppm)	Max Error (+/-)*	Notes
COR01X01	15	17	3	
COR01X02	16	19	3	
COR01X03	15	15	2	
COR01X04	16	24	3	
COR01X05	15	35	3	
COR01X06	19	19	3	
COR01X07	18	18	2	
COR01X08	18	17	2	
COR01X09	17	25	3	
COR01X10	17	26	3	
COR01X11	15	20	2	
COR01X12	15	24	3	
COR01X13	15	19	3	
COR01X14	15	33	3	
COR01X15	15	17	3	
COR01X16	15	18	2	
COR01X17	16	25	3	
COR01X18	16	21	2	
COR01X19	18	29	3	
COR01X20	15	21	4	
COR01X21	15	15	2	
COR01X22	17	21	2	
COR01X23	17	20	3	
COR01X24	17	60	3	
COR01X25	17	41	3	
COR01X26	18	21	2	
COR01X27	18	30	3	
COR01X28	18	33	3	
COR01X29	18	35	3	
COR01X30	19	35	3	
COR01X31	51	18	2	
COR01X32	17	18	3	
COR01X33	15	58	3	
COR01X34	19	357	7	
COR01X35	16	40	3	
COR01X36	16	37	3	
COR01X37	19	62	4	
COR01X38	18	215	7	
COR01X39	17	293	7	
COR01X40	18	91	4	
COR01X41	19	17	3	
COR01X42	16	28	3	
COR01X43	19	46	3	
COR01X44	15	81	4	
COR01X45	15	20	3	
COR01X46	18	17	2	
COR01X47	19	19	3	
COR01X48	17	37	3	
COR01X49	15	19	3	
COR01X50	15	24	3	
COR01X51	18	21	3	
COR01X52	18	27	3	
COR01X53	18	38	3	
COR01X54	19	24	3	
COR01X55	19	13	11	

Notes
* = Error: 2-sigma, 95% confidence
🟨 Sample meets or exceeds residential soil RBSL for lead
ppm = parts per million

Table 5-2. Summary of Discrete XRF Lead Results in Surface Soil - Target Area DU

Sample ID	Moisture (%)	Average Lead Result (ppm)	Max Error (+/-)*	Notes
COR02X01	18	18	2	
COR02X02	15	20	3	
COR02X03	15	98	4	
COR02X04	15	93	4	
COR02X05	16	78	4	
COR02X06	16	64	3	
COR02X07	15	78	3	
COR02X08	15	82	3	
COR02X09	15	190	3	
COR02X10	16	250	6	
COR02X11	16	171	6	
COR02X12	17	304	6	
COR02X13	17	243	6	
COR02X14	17	373	7	
COR02X15	17	305	7	1 bullet observed
COR02X16	17	16	2	
COR02X17	18	28	3	
COR02X18	16	155	5	
COR02X19	18	103	4	
COR02X20	17	42	3	
COR02X21	15	62	3	
COR02X22	15	42	3	
COR02X23	15	33	3	
COR02X24	12	46	3	2 bullets observed
COR02X25	17	86	4	
COR02X26	15	81	4	
COR02X27	12	30	3	
COR02X28	18	113	3	
COR02X29	15	215	6	
COR02X30	18	112	5	
COR02X31	15	20	3	
COR02X32	12	39	3	
COR02X33	12	28	3	
COR02X34	12	28	3	
COR02X35	12	20	3	
COR02X36	12	14	7	
COR02X37	16	32	3	
COR02X38	15	20	3	
COR02X39	19	38	3	
COR02X40	19	62	4	
COR02X41	17	32	3	
COR02X42	16	35	3	

Notes
* = Error: 2-sigma, 95% confidence
🟨 Sample meets or exceeds residential soil RBSL for lead
ppm = parts per million



CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	10/26/2020
SCALE	1:900	CHK BY	JW	10/26/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	10/26/2020

100-Yard Firing Berm DU XRF Results

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Figure 5-1

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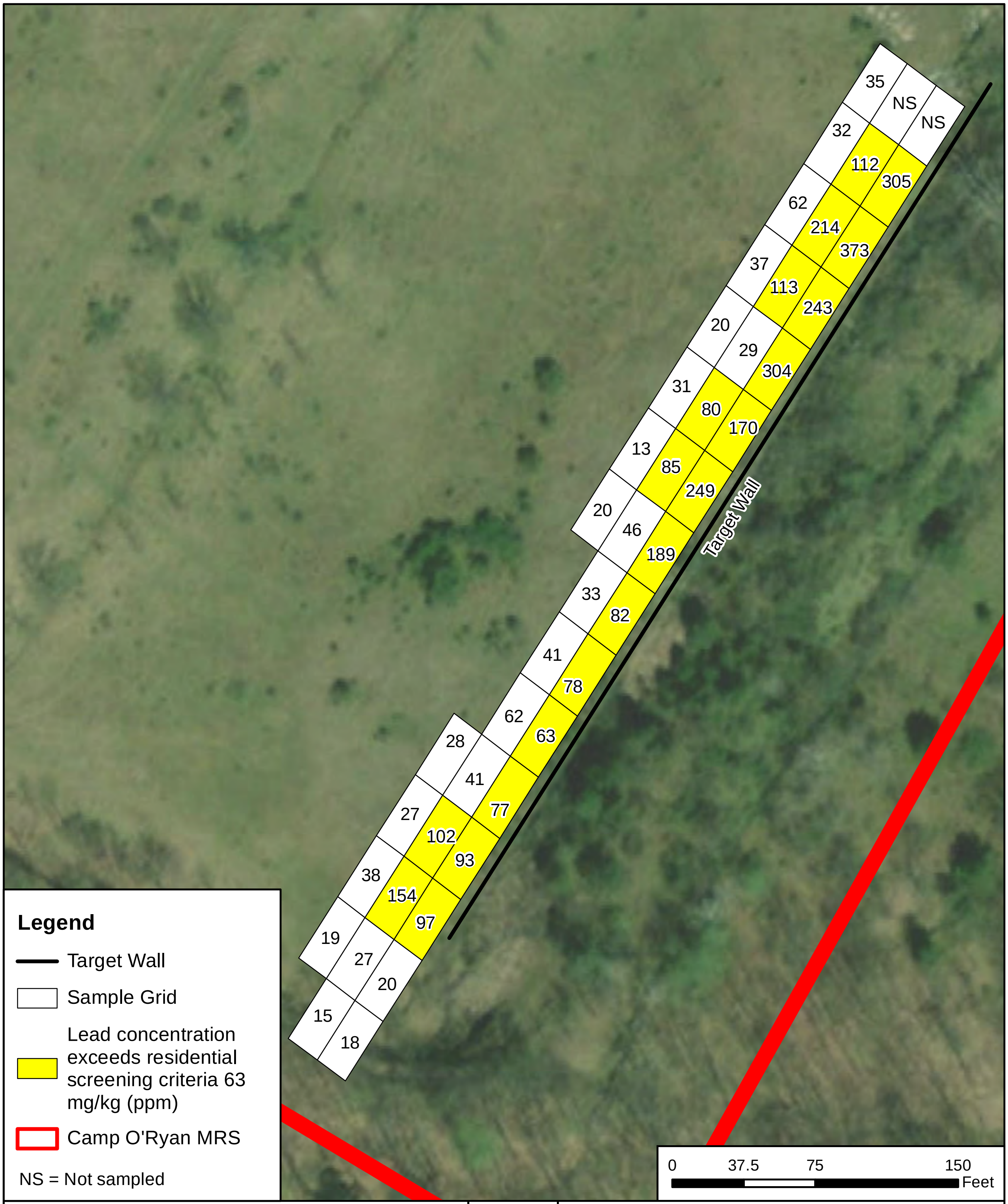
Table 5-3. Summary of Discrete XRF Lead Results in Surface Soil - Target Berm Hillside DU

Sample ID	Moisture (%)	Average Lead Result (ppm)	Max Error (+/-)*	Notes
COR03X01(a)	☒	☒	☒	
COR03X01(b)	13	834	14	
COR03X02	☒	☒	☒	
COR03X03	☒	☒	☒	
COR03X04	☒	☒	☒	
COR03X05	☒	☒	☒	
COR03X06	17	997	12	Sampled in First Mobilization 2019
COR03X07	17	946	12	Sampled in First Mobilization 2019
COR03X08	17	1,001	14	Sampled in First Mobilization 2019
COR03X09	18	985	13	Sampled in First Mobilization 2019
COR03X10(a)	17	969	14	Sampled in First Mobilization 2019
COR03X10(b)	13	50	4	
COR03X11(a)	16	2,708	32	Sampled in First Mobilization 2019
COR03X11(b)	13	435	10	
COR03X12	18	876	12	Sampled in First Mobilization 2019
COR03X13	15	6,051	60	Sampled in First Mobilization 2019
COR03X14	15	4,193	64	Sampled in First Mobilization 2019
COR03X15	18	862	12	Sampled in First Mobilization 2019
COR03X16	18	128	4	Sampled in First Mobilization 2019
COR03X17	18	376	8	Sampled in First Mobilization 2019
COR03X18	18	1,585	20	Sampled in First Mobilization 2019
COR03X19	15	5,286	100	Sampled in First Mobilization 2019
COR03X20(a)	15	4,979	69	Sampled in First Mobilization 2019
COR03X20(b)	13	65	5	
COR03X21(a)	15	4,197	45	Sampled in First Mobilization 2019
COR03X21(b)	13	487	5	
COR03X22	15	5,321	56	Sampled in First Mobilization 2019
COR03X23	15	1,025	14	Sampled in First Mobilization 2019
COR03X24	15	2,066	╲	Sampled in First Mobilization 2019
COR03X25	16	2,020	23	Sampled in First Mobilization 2019
COR03X26	17	589	9	Sampled in First Mobilization 2019
COR03X27	16	514	9	Sampled in First Mobilization 2019
COR03X28	16	307	6	Sampled in First Mobilization 2019
COR03X29	17	676	12	Sampled in First Mobilization 2019
COR03X30(a)	16	2,041	22	Sampled in First Mobilization 2019
COR03X30(b)	13	111	5	
COR03X31	12	189	6	
COR03X32	☒	☒	☒	
COR03X33	☒	☒	☒	
COR03X34	☒	☒	☒	
COR03X35	☒	☒	☒	
COR03X36	☒	☒	☒	
COR03X37	☒	☒	☒	
COR03X38	☒	☒	☒	
COR03X39	☒	☒	☒	
COR03X40	12	158	6	
COR03X41	12	144	6	
COR03X42	☒	☒	☒	
COR03X43	☒	☒	☒	
COR03X44	☒	☒	☒	
COR03X45	10	75	5	
COR03X46	10	306	8	
COR03X47	10	151	6	
COR03X48	10	399	9	
COR03X49	10	56	4	
COR03X50	11	49	3	
COR03X51	11	82	4	
COR03X52	11	116	5	
COR03X53	11	161	5	
COR03X54	11	30	3	
COR03X55	10	25	4	
COR03X56	10	24	3	
COR03X57	10	53	4	
COR03X58	10	27	3	
COR03X59	10	37	3	
COR03X60	10	41	4	
COR03X61	10	30	3	
COR03X62	☒	☒	☒	Unable to Sample- Dangerous Terrain
COR03X63	10	97	6	
COR03X64	10	30	4	
COR03X65	10	24	3	
COR03X66	10	33	4	
COR03X67	12	72	4	
COR03X68	12	34	3	
COR03X69	12	179	5	
COR03X70	12	344	8	
COR03X71	12	89	4	
COR03X72	12	141	6	
COR03X73	12	62	4	
COR03X74	12	115	5	
COR03X75	12	102	7	
COR03X76	12	28	4	
COR03X77	12	26	3	
COR03X78	12	41	4	
COR03X79	12	38	5	
COR03X80	12	87	5	
COR03X81	12	47	4	
COR03X82	12	60	4	
COR03X83	12	ND	22	
COR03X84	12	ND	16	
COR03X85	12	ND	13	
COR03X86	12	31	3	

Notes
* = Error: 2-sigma, 95% confidence
🟨 Sample meets or exceeds residential soil RBSL for lead
ppm = parts per million
☒ Area unable to be sampled due to dangerous terrain/health and safety concerns data not recorded
(a):Belonging to the original DU of the first field mobilization effort in 2019
(b):Belonging to the updated larger DU of the second field mobilization effort in 2020



CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	10/8/2020
SCALE	1:900	CHK BY	JW	10/8/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	10/8/2020

N

Target Area DU XRF Results

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Figure 5-2

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Table 5-4. Incremental Sampling Results Summary

		Location:	**100-Yard Firing Berm DU**											
		Sample ID:	**COR01IS01**				**COR01IS02**				**COR01IS03**			
		Sample Depth (inches bgs):	**0-6**				**0-6**				**0-6**			
		Date Collected:	**7/10/2020**				**7/10/2020**				**7/10/2020**			
Analyte	**Human Health Screening Level**	**Ecological Screening Level**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1	0.27	0.225	N			**0.285**				0.19			
Copper	50	50	30.8	N			28.7				29.2			
Lead	63	63	56.1	NA			**63**				38.5			
Zinc	109	109	93.3				96.3				95.6			

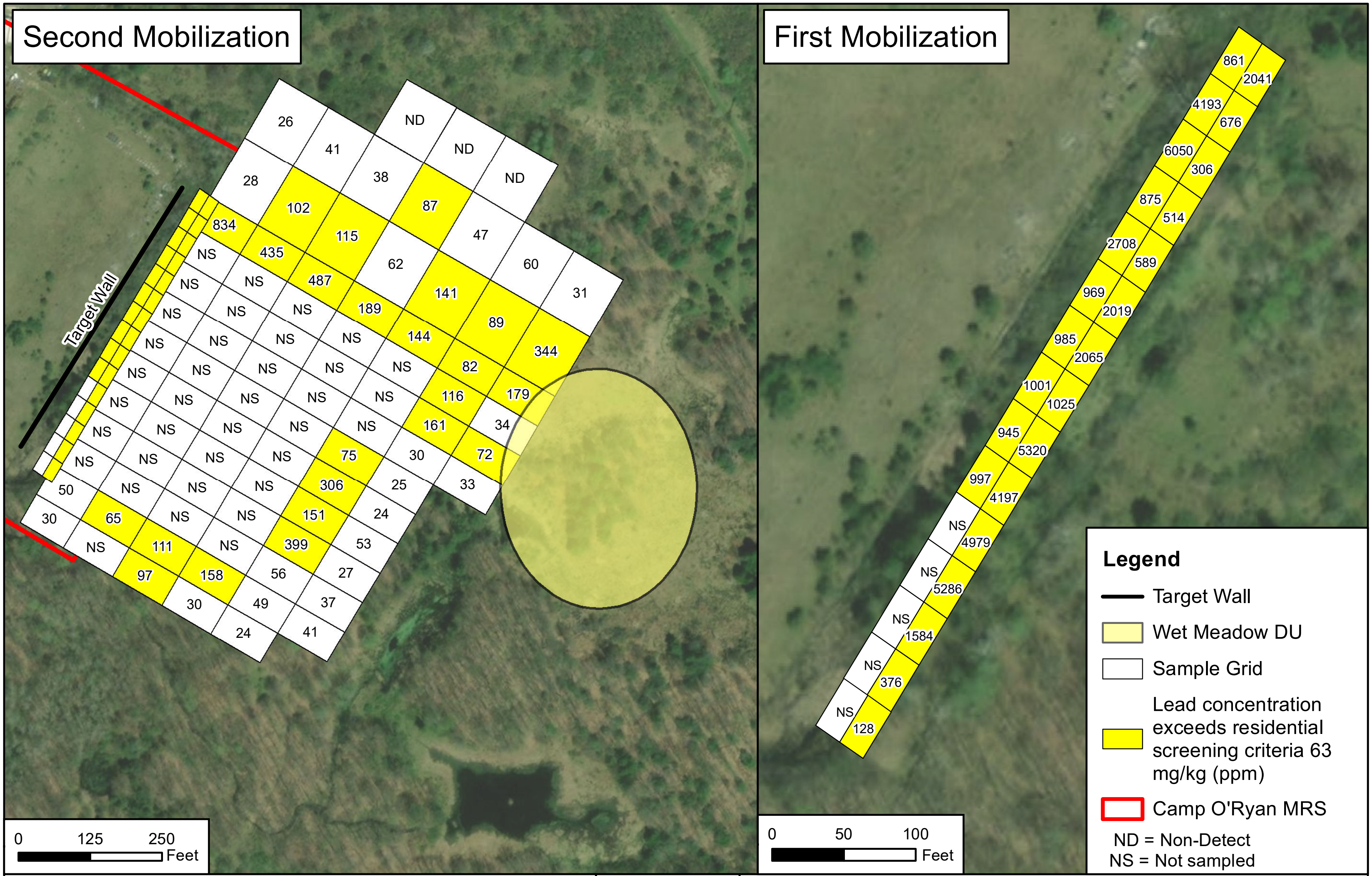
		Location:	**Target Area DU**											
		Sample ID:	**COR02IS01**				**COR02IS02**				**COR02IS03**			
		Sample Depth (inches bgs):	**0-6**				**0-6**				**0-6**			
		Date Collected:	**7/10/2020**				**7/10/2020**				**7/10/2020**			
Analyte	**Human Health Screening Level**	**Ecological Screening Level**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1	0.27	**0.293**				**0.327**	N			**0.293**			
Copper	50	50	33.6				31.9	N			39.9			
Lead	63	63	**82.9**				**98.7**	NEA			**72.1**			
Zinc	109	109	91.3				93.1				98.3			

		Location:	**Target Berm Hillside DU**											
		Sample ID:	**COR03IS01**				**COR03IS02**				**COR03IS03**			
		Sample Depth (inches bgs):	**0-6**				**0-6**				**0-6**			
		Date Collected:	**7/10/2020**				**7/10/2020**				**7/10/2020**			
Analyte	**Human Health Screening Level**	**Ecological Screening Level**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1	0.27	**0.425**				**0.725**				**0.429**	N		
Copper	50	50	24.9				41.4				36.0	NA		
Lead	63	63	**164**				**179**				**248**	NA		
Zinc	109	109	**119**				82.5				84.5	A		

		Location:	**Background Reference Area DU**											
		Sample ID:	**COR04IS01**				**CORIS0402**				**COR04IS03**			
		Sample Depth (inches bgs):	**0-6**				**0-6**				**0-6**			
		Date Collected:	**7/20/2020**				**7/20/2020**				**7/20/2020**			
Analyte	**Human Health Screening Level**	**Ecological Screening Level**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1	0.27	0.14				0.13				0.13			
Copper	50	50	17.0				19.1				16.0			
Lead	63	63	28.1				21.1				21.0			
Zinc	109	109	86.1				97.8				87.2			

Notes:

Bold = Sample exceeds Ecological Screening Level
🟨 Sample exceeds Human Health Screening Level
mg/kg = milligrams per kilogram
bgs = below ground surface
LQ = Laboratory qualifier (LQ flags available in lab report)
VQ = Validiation qualifier
RC = Reason Code
N = pre-digestion spiked sample recovery is not within control limits
A = post-digestion spiked sample recovery is not within control limits
E = reported value is estimated because of the presence of interference (as indicated by serial dilution)



CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	11/30/2020
SCALE	1:3,000	CHK BY	JW	11/30/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	LS	11/30/2020

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Target Berm - Hillside DU XRF Results

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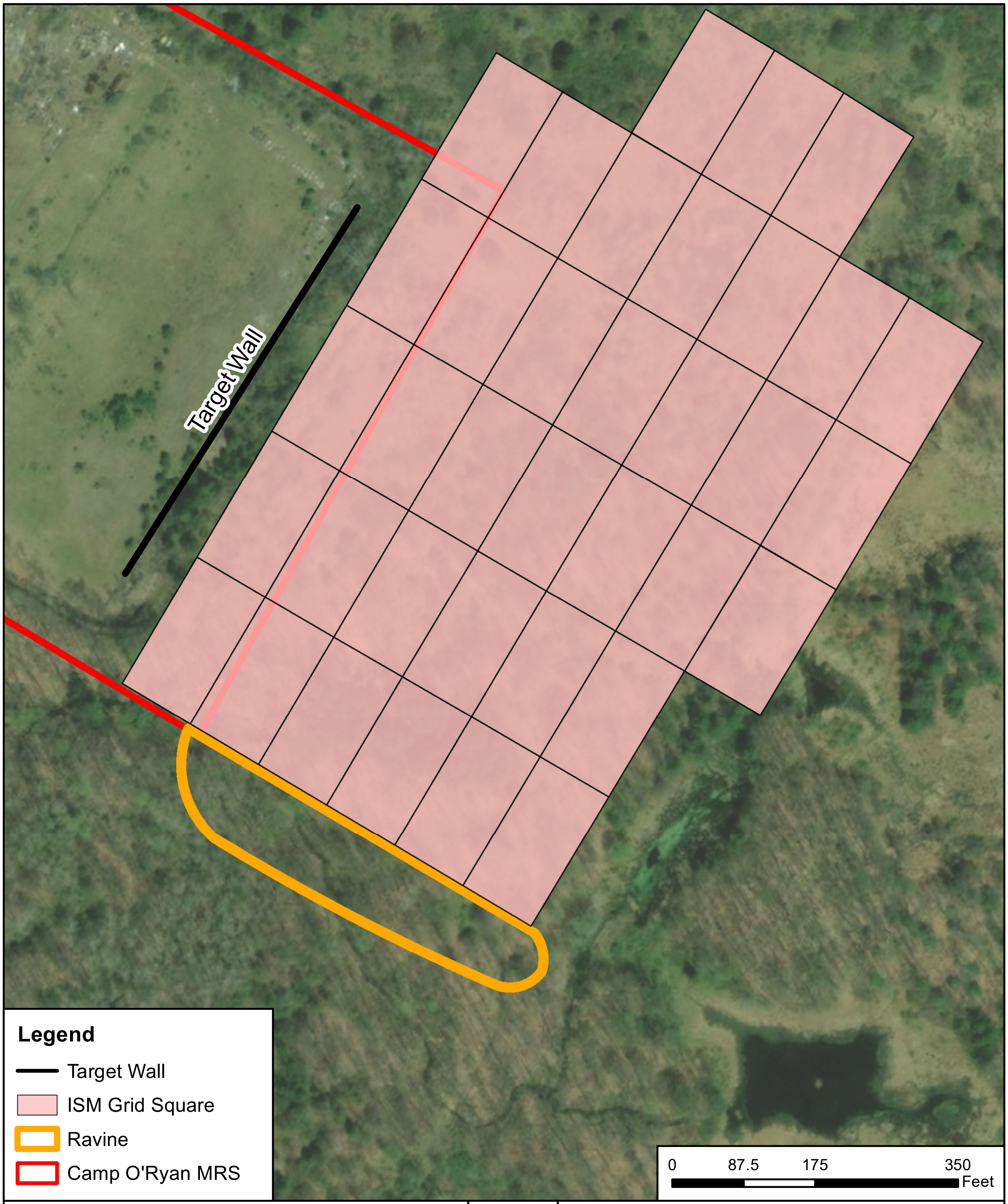
Figure 5-3



CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	11/30/2020
SCALE	1:2,100	CHK BY	JW	11/30/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	11/30/2020

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Target Berm - Hillside DU Adjusted ISM Grid

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Figure 5-4

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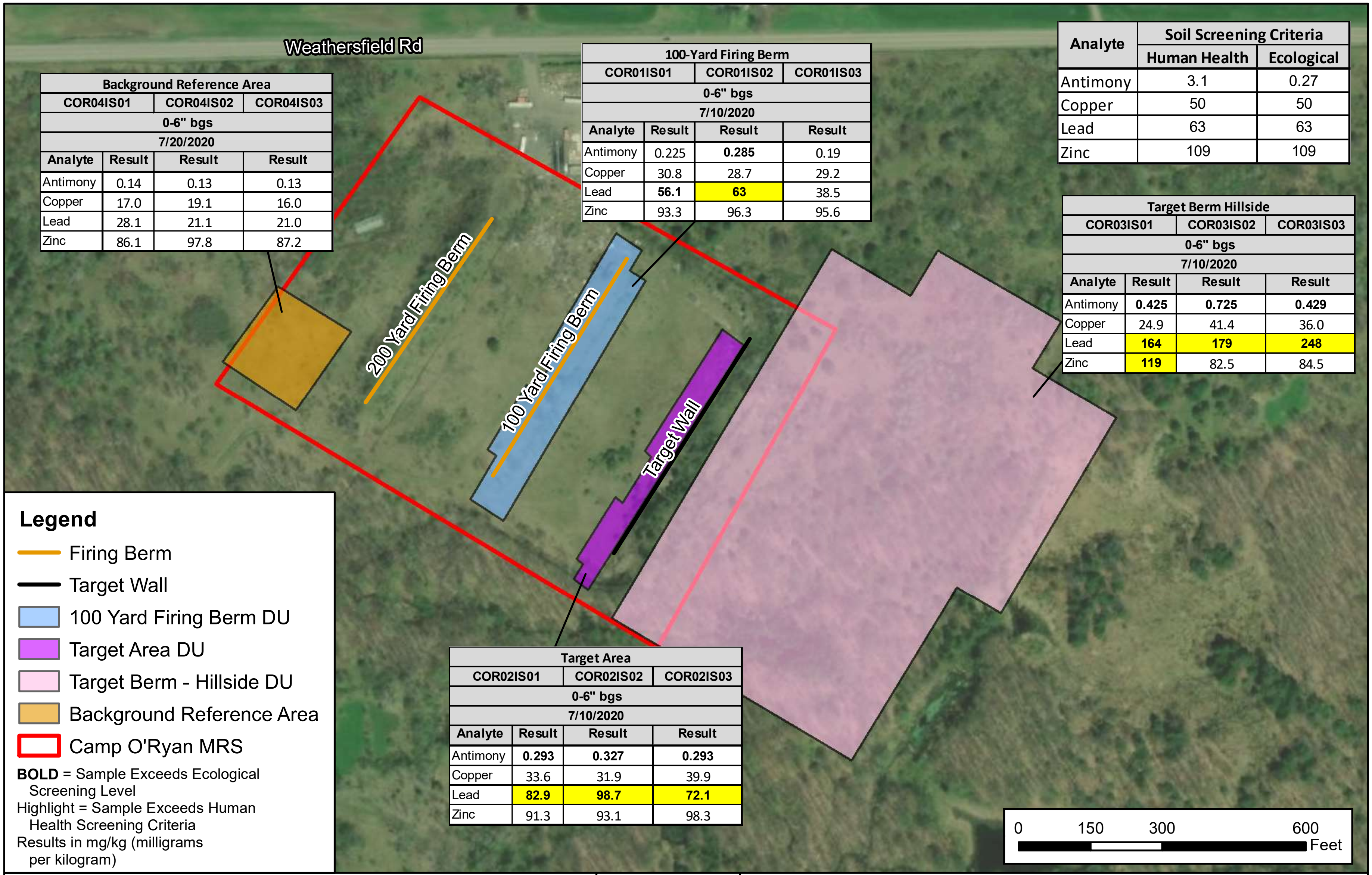

Background Reference Area			
	COR04IS01	COR04IS02	COR04IS03
	0-6" bgs		
	7/20/2020		
Analyte	Result	Result	Result
Antimony	0.14	0.13	0.13
Copper	17.0	19.1	16.0
Lead	28.1	21.1	21.0
Zinc	86.1	97.8	87.2

100-Yard Firing Berm			
	COR01IS01	COR01IS02	COR01IS03
	0-6" bgs		
	7/10/2020		
Analyte	Result	Result	Result
Antimony	0.225	**0.285**	0.19
Copper	30.8	28.7	29.2
Lead	**56.1**	**63**	38.5
Zinc	93.3	96.3	95.6

Analyte	Soil Screening Criteria	
	Human Health	Ecological
Antimony	3.1	0.27
Copper	50	50
Lead	63	63
Zinc	109	109

Target Berm Hillside			
	COR03IS01	COR03IS02	COR03IS03
	0-6" bgs		
	7/10/2020		
Analyte	Result	Result	Result
Antimony	**0.425**	**0.725**	**0.429**
Copper	24.9	41.4	36.0
Lead	**164**	**179**	**248**
Zinc	**119**	82.5	84.5

Target Area			
	COR02IS01	COR02IS02	COR02IS03
	0-6" bgs		
	7/10/2020		
Analyte	Result	Result	Result
Antimony	**0.293**	**0.327**	**0.293**
Copper	33.6	31.9	39.9
Lead	**82.9**	**98.7**	**72.1**
Zinc	91.3	93.1	98.3

Legend

- ▬ Firing Berm
- ▬ Target Wall
- ▨ 100 Yard Firing Berm DU
- ▨ Target Area DU
- ▨ Target Berm - Hillside DU
- ▨ Background Reference Area
- ☐ Camp O'Ryan MRS

BOLD = Sample Exceeds Ecological Screening Level

Highlight = Sample Exceeds Human Health Screening Criteria

Results in mg/kg (milligrams per kilogram)

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	12/4/2020
SCALE	1:3,600	CHK BY	JW	12/4/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	AS	12/4/2020

N

Camp O'Ryan ISM Results

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Figure 5-5

Background Reference

IS were collected in triplicate (COR04IS01, -02, and -03) from an approximately 1.24-acre Background Reference Area, west of the 200-yard Firing Berm, in an area unaffected by previous range activity (**Figure 5-5**). Each IS contained 30 increments of equal volume. Soil in this area was predominantly a silty clay loam (approximately 80% silt/clay, 10% sand, and 10% gravel) with a medium amount organic content (mostly consisting of roots) and 10% moisture content. No evidence of small arms range impact or debris were observed within the area or samples.

Antimony ranged from 0.13 to 0.14 mg/kg among triplicate samples. Copper ranged from 16.0 to 19.1 mg/kg. Lead concentrations ranged from 21.0 to 28.1 mg/kg. Zinc concentrations ranged from 86.1 mg/kg to 97.8 mg/kg. No results exceeded human health or ecological screening criteria (**Table 5-4**).

100-yard Firing Berm DU

ISM was applied to the revised 100-yard Firing Berm DU area (1.39 acres) established after XRF screening (**Figure 5-5**). IS were collected in triplicate (COR01IS01, -02, and -03); each IS contained 55 increments of equal volume. Soil was predominantly a silty clay loam (approximately 80% silt/clay, 10% sand, and 10% gravel) with a low amount organic content and 11% moisture content (**Appendix A**).

The maximum detection of antimony observed between replicates at the 100-yard Firing Berm was 0.285 mg/kg, which exceeds the ecological screening value of 0.27 mg/kg. Copper concentrations ranged from 28.7 to 30.8 mg/kg. The maximum concentration of lead was reported in sample COR01IS02, at 63 mg/kg, which equals the human health screening value of 63 mg/kg. Zinc concentrations were slightly elevated above background, with a maximum concentration of 96.3 mg/kg. No analytes exceeded human health screening criteria (**Table 5-4**).

Target Area DU

ISM was applied to the revised Target Area DU area (0.71 acres) established after XRF screening (**Figure 5-5**). IS were collected in triplicate (COR02IS01, -02, and -03); each IS contained 42 increments of equal volume. Soil was predominantly a silty clay loam (approximately 80% silt/clay, 5% sand, and 15% gravel) with a low amount organic content and 11% moisture content (**Appendix A**).

The maximum detection of antimony observed between replicates at the Target Area was 0.327 mg/kg, which exceeds the ecological screening value of 0.27 mg/kg. Copper concentrations ranged from 31.9 to 39.9 mg/kg. The maximum concentration of lead was reported in sample COR01IS02, at 98.7 mg/kg, which exceeds the human health screening criteria of 63 mg/kg. Zinc concentrations were slightly elevated above background, with a maximum concentration of 98.3 mg/kg. No analytes other than lead exceeded human health screening criteria (**Table 5-4**).

Target Berm-Hillside DU

ISM was applied to all accessible portions of the revised Target Berm-Hillside DU area (18.51 acres) established after XRF screening (**Figure 5-4**). IS were collected in triplicate (COR03IS01,

-02, and -03); each IS contained 36 increments of equal volume. Soil was predominantly a silty clay loam (approximately 75% silt/clay, 15% sand, and 15% gravel) with a medium amount organic content and 12% moisture content (**Appendix A**).

The maximum detection of antimony observed between replicates at the Target Berm-Hillside was 0.725 mg/kg, which exceeds the ecological screening value of 0.27 mg/kg (**Figure 5-5**). Copper concentrations ranged from 24.9 to 41.4 mg/kg. The maximum concentration of lead was reported in sample COR03IS03, at 248 mg/kg, which exceeds the human health screening value of 63 mg/kg. The maximum detection of zinc observed between replicates was of 119 mg/kg, which exceeds the human health screening value of 109 mg/kg. Antimony and copper did not exceed human health screening criteria (**Table 5-4**).

5.4 Discrete Subsurface Soil Results

Discrete subsurface soil samples were collected from the 100-yard Firing Berm, Target Area, and Target Berm-Hillside DUs. Samples were collected to assist in delineating the vertical extent of MC in soil at the DUs.

5.4.1 100-yard Firing Berm DU

At the 100-yard Firing Berm DU, subsurface soil samples were collected at the two locations with the highest XRF lead concentrations in surface soil. The XRF concentration of lead at grid #34 (COR01DA/B01A), located in the southwest portion of the original DU, was 357 ppm, and the concentration of lead at grid #39 (COR01DA/B02A), located at the northeast portion of the original DU, was 293 ppm (**Figure 5-6)**.

Concentrations of all MC in the 12- to 18-inches bgs subsurface soil sample at grid #34 did not exceed ecological or human health criteria. As a result, the deeper 24- to 30-inches bgs sample was not analyzed, and the location is considered vertically delineated. At grid #39, the lead concentration (502 mg/kg) exceeds human health criteria (63 mg/kg), and antimony (1.14 mg/kg) exceeded ecological screening criteria (0.27 mg/kg) in the 12- to 18-inches bgs sample. Due to these exceedances, the deeper 24- to 30-inches bgs sample was analyzed, and no MC concentrations exceeded any health or ecological screening criteria, successfully delineating the DU.

Table 5-5 and **Figure 5-6** present the results of discrete soil sampling at the 100-yard Firing Berm DU.

Table 5-5
Discrete Soil Sample Results
Camp O'Ryan Remedial Investigation

100-Yard Firing Berm DU

Sample ID:			**COR01DA01A (#34)**				**COR01DA02A (#39)**				**COR01DB02A (#39)**			
Decision Unit - XRF Location:			**100-Yard Berm**				**100-Yard Berm**				**100-Yard Berm**			
Media:			**Soil**				**Soil**				**Soil**			
Sample Depth (inches bgs):			**12 - 18**				**12 - 18**				**24-30**			
Date Collected:			**7/8/2020**				**7/8/2020**				**7/8/2020**			
Analyte	**Human Health Screening Level (mg/kg) Soil**	**Ecological Screening Level (mg/kg) Soil**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1	0.27	0.11				**1.14**	N		m	0.20			
Copper	50	50	20.8				23.3	NE		m	24.7			
Lead	63	63	16.5				**502**	NA		m	36.1			
Zinc	109	109	74.8				75.2	EA		s	87.4			

Target Area DU

Sample ID:			**COR02DA01A (#4)**				**COR02DA02A (#14)**				**COR02DA02B (#14)**				**COR02DB02A (#14)**			
Decision Unit - XRF Location:			**Target Area**				**Target Area**				**Target Area**				**Target Area**			
Media:			**Soil**				**Soil**				**Soil**				**Soil**			
Sample Depth (inches bgs):			**12 - 18**				**12 - 18**				**12 - 18**				**24-30**			
Date Collected:			**7/10/2020**				**7/10/2020**				**7/10/2020**				**7/10/2020**			
Analyte	**Human Health Screening Level (mg/kg) Soil**	**Ecological Screening Level (mg/kg) Soil**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)																		
Antimony	3.1	0.27	0.150	N			**0.341**				**0.276**				0.11	N	J	
Copper	50	50	24.4	NEA			28.2				24.1				24.2	E		
Lead	63	63	38	NA			**82.6**				57.8				19.3	NA		
Zinc	109	109	71.8	NEA			65.0				57.3				66.4	E		

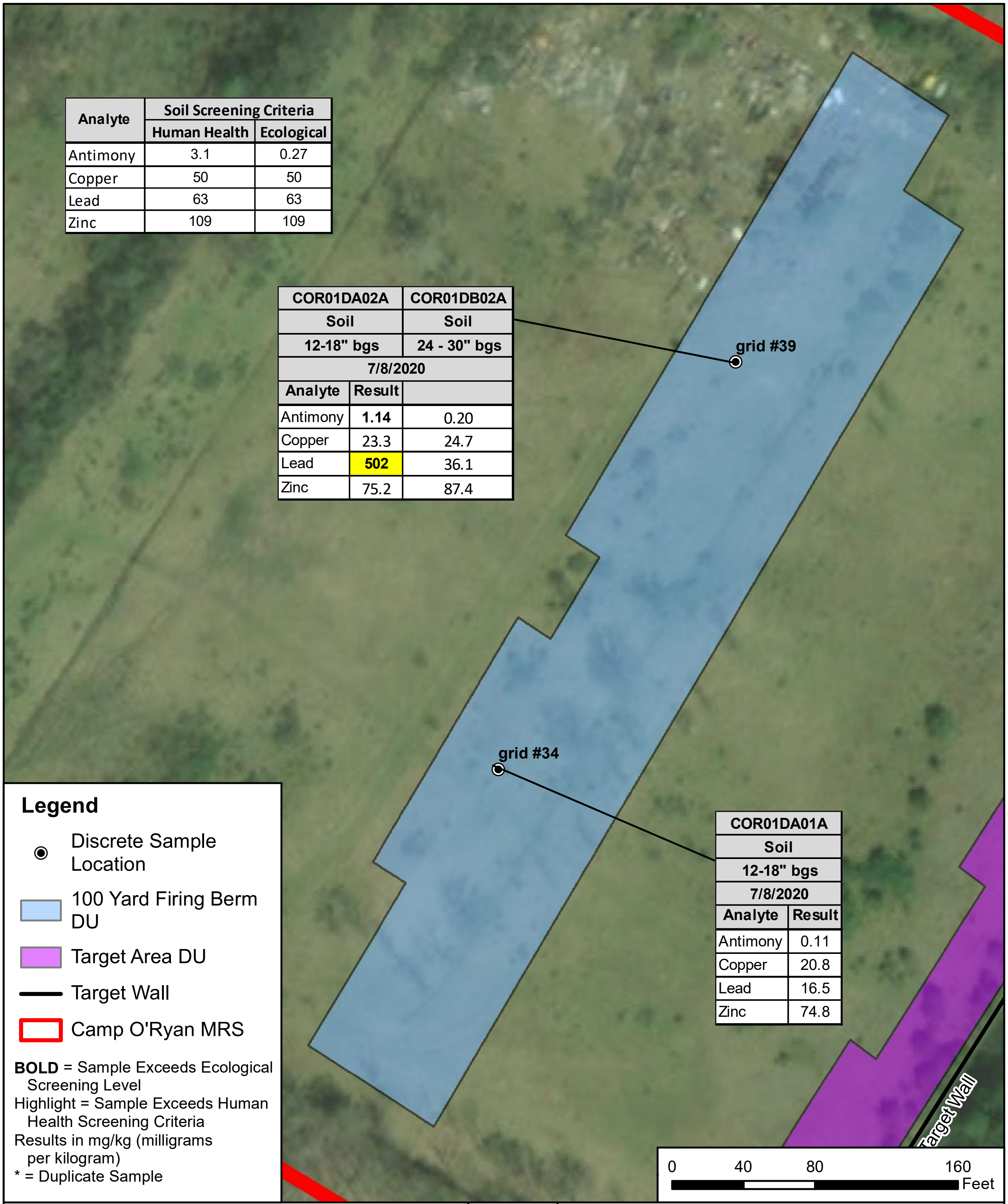
Target Berm Hillside DU

Sample ID:			**COR03DA01A (#1)**				**COR03DB01A (#1)**				**COR03DA02A (#40)**				**COR03DA02B (#40)**				**COR03DA03A (#46)**				**COR03DB03A (#46)**			
Decision Unit - XRF Location:			**Target Berm Hillside**				**Target Berm Hillside**				**Target Berm Hillside**				**Target Berm Hillside**				**Target Berm Hillside**				**Target Berm Hillside**			
Media:			**Soil**				**Soil**				**Soil**				**Soil**				**Soil**				**Soil**			
Sample Depth (inches bgs):			**12 - 18**				**24 - 25**				**12 - 18**				**24 - 30**				**12 - 18**				**24 - 30**			
Date Collected:			**7/9/2020**				**7/9/2020**				**7/10/2020**				**7/10/2020**				**7/10/2020**				**7/10/2020**			
Analyte	**Human Health Screening Level (mg/kg) Soil**	**Ecological Screening Level (mg/kg) Soil**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)																										
Antimony	3.1	0.27	**0.447**				**1.00**				0.13				0.11				0.236	N*			0.096	J		
Copper	50	50	29.4				**86.8**				15.8				19.6				15.2				28.8			
Lead	63	63	34.2				**393**				22.1	B			24.6	B			**90.7**	NA			17.1			
Zinc	109	109	78.4				**110**				55.8				58.1				62.6	N			82.8			

Notes:

Bold = Sample exceeds Ecological Screening Level
🟨 Sample exceeds Human Health Screening Level
mg/kg = milligrams per kilogram
bgs = below ground surface
LQ = laboratory qualifier (LQ flag descriptions available in lab report)
VQ = validiation qualifier
RC = reason code
NA = not applicable

A = post-digestion spiked sample recovery is not within control limits
B = analyte detected in the laboratory method blank
E = reported value is estimated because of the presence of interference (as indicated by serial dilution)
N = pre-digestion spiked sample recovery is not within control limits
* = the duplicate sample analysis relative percent difference (RPD) is not within control limits
J = estimated



Analyte	Soil Screening Criteria	
	Human Health	Ecological
Antimony	3.1	0.27
Copper	50	50
Lead	63	63
Zinc	109	109

	COR01DA02A	COR01DB02A
	Soil	Soil
	12-18" bgs	24 - 30" bgs
	7/8/2020	
Analyte	Result	
Antimony	**1.14**	0.20
Copper	23.3	24.7
Lead	502	36.1
Zinc	75.2	87.4

COR01DA01A	
Soil	
12-18" bgs	
7/8/2020	
Analyte	Result
Antimony	0.11
Copper	20.8
Lead	16.5
Zinc	74.8

Legend

- ◉ Discrete Sample Location
- 🟦 100 Yard Firing Berm DU
- 🟪 Target Area DU
- ━ Target Wall
- 🟥 Camp O'Ryan MRS

BOLD = Sample Exceeds Ecological Screening Level
Highlight = Sample Exceeds Human Health Screening Criteria
Results in mg/kg (milligrams per kilogram)
* = Duplicate Sample

0 40 80 160 Feet

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	12/4/2020
SCALE	1:960	CHK BY	JW	12/4/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	12/4/2020

N

100-Yard Firing Berm DU Discrete Results

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Figure 5-6

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5.4.2 Target Area DU

At the Target Area DU, subsurface soil samples were collected at two locations with elevated XRF lead concentrations in surface soil. The XRF concentration of lead at grid #4 (COR02DA/B01A), located in the southeast portion of the original DU, was 373 ppm, and the concentration of lead at grid #14 (COR02DA/B02A), located in the northeast portion of the original DU, was 93 ppm (**Figure 5-7**).

Concentrations of all MC in the 12- to 18-inches bgs subsurface soil sample at grid #4 did not exceed ecological or human health criteria. As a result, the deeper 24- to 30-inches bgs sample was not analyzed, and the location is considered vertically delineated. At grid #14, the lead concentration (82.6 mg/kg) exceeded human health criteria (63 mg/kg), and antimony (0.341 mg/kg) exceeded ecological screening criteria (0.27 mg/kg) in the 12- to 18-inches bgs sample. Due to these exceedances, the deeper 24- to 30-inches bgs sample was analyzed, and no MC concentrations exceeded any health or ecological screening criteria at this interval, successfully delineating the DU.

Table 5-5 and **Figure 5-7** present the results of discrete soil sampling at the Target Area DU.

5.4.3 Target Berm-Hillside DU

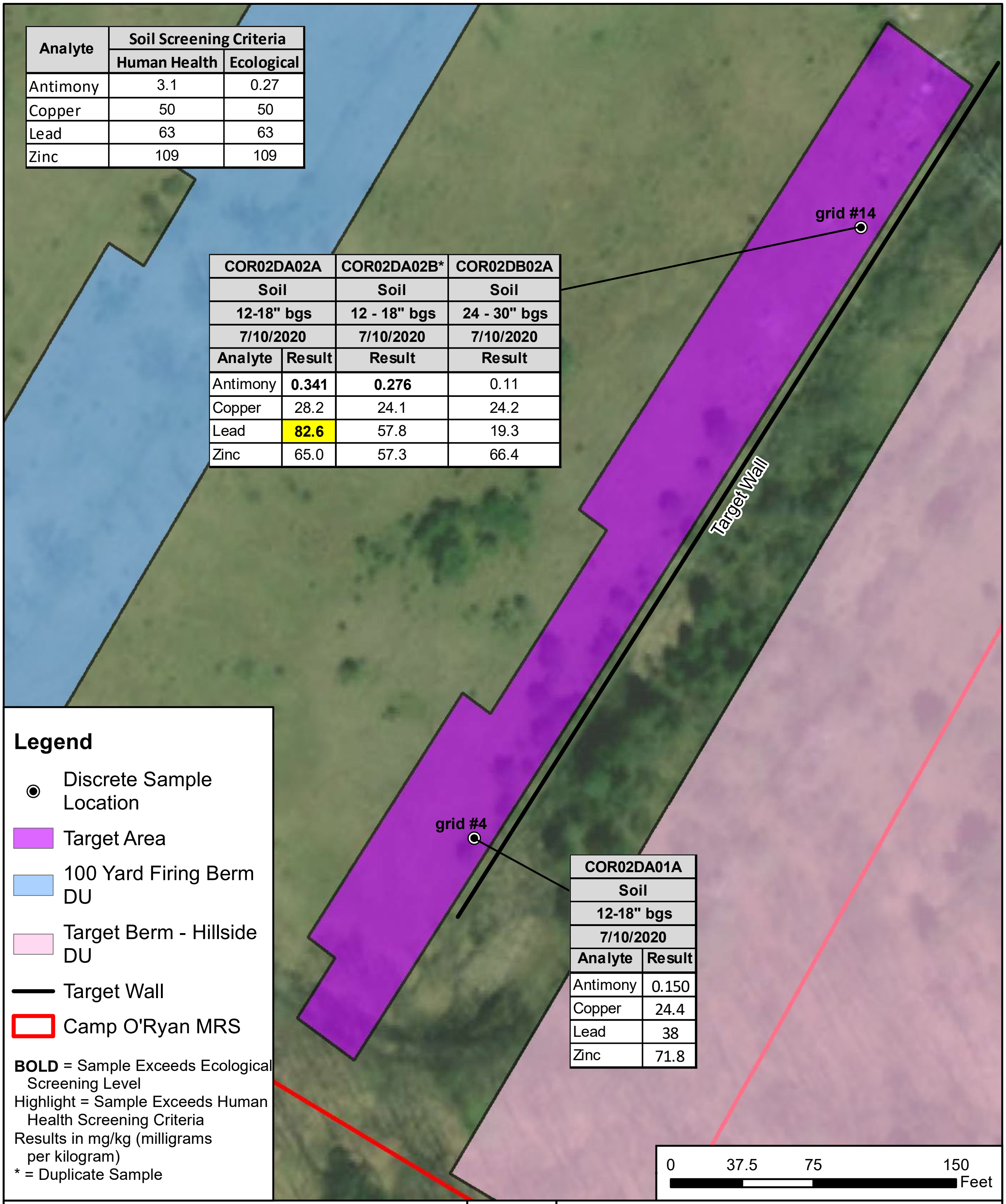
Subsurface soil samples were collected at the locations of three elevated XRF lead concentrations in surface soil to represent different portions of the DU (#1, #40 and #46). Results are shown on **Figure 5-8**, tabulated in **Table 5-5**, and summarized below.

At grid #1, located in the northwest portion of the DU, the lead concentration in surface soil via XRF analysis. Subsurface soil samples were collected at 12- to 18-inches bgs (COR03DA01A) and at the 24- to 30-inches bgs (COR03DB01A) soil layers; however, refusal was encountered at 25inches bgs due to a large cobble layer. However, sufficient soil was collected at that interval to be analyzed by the laboratory.

- The 12- to 18-inches bgs soil layer sample had lead, copper, and zinc concentrations below the ecological and human health screening criteria.
- Antimony (0.447 mg/kg) exceeded ecological screening criterion (0.27 mg/kg), and as a result, the deeper 24- to 30-incjes bgs sample was analyzed.
- Concentrations of copper (86.8 mg/kg), lead (393 mg/kg), and zinc (110 mg/kg) in the 24- to 30-inches bgs soil layer exceeded their respective human health screening criteria, and antimony (1.00 mg/kg) exceeded its ecological screening criterion.

Discrete sampling was completed at grid #40 (158 ppm lead concentration in the surface soil layer via XRF analysis) located in the southern portion of the DU. Subsurface soil samples were collected at 12- to 18-inches bgs (COR03DA02A) and at 24- to 30-inches bgs (COR03DB02A).

- No MC concentrations in the 12- to 18-inches bgs sample at grid #40 exceeded ecological or human health screening criteria. As a result, the deeper 24- to 30-inches bgs sample was not analyzed.



Analyte	Soil Screening Criteria	
	Human Health	Ecological
Antimony	3.1	0.27
Copper	50	50
Lead	63	63
Zinc	109	109

COR02DA02A		COR02DA02B*	COR02DB02A
Soil		Soil	Soil
12-18" bgs		12 - 18" bgs	24 - 30" bgs
7/10/2020		7/10/2020	7/10/2020
Analyte	Result	Result	Result
Antimony	**0.341**	**0.276**	0.11
Copper	28.2	24.1	24.2
Lead	**82.6**	57.8	19.3
Zinc	65.0	57.3	66.4

COR02DA01A	
Soil	
12-18" bgs	
7/10/2020	
Analyte	Result
Antimony	0.150
Copper	24.4
Lead	38
Zinc	71.8

Legend

- ◉ Discrete Sample Location
- 🟪 Target Area
- 🟦 100 Yard Firing Berm DU
- ▭ Target Berm - Hillside DU
- ━ Target Wall
- 🟥 Camp O'Ryan MRS

BOLD = Sample Exceeds Ecological Screening Level
Highlight = Sample Exceeds Human Health Screening Criteria
Results in mg/kg (milligrams per kilogram)
* = Duplicate Sample

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	11/30/2020
SCALE	1:900	CHK BY	JW	11/30/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	11/30/2020

Target Area DU Discrete Results

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Figure 5-7

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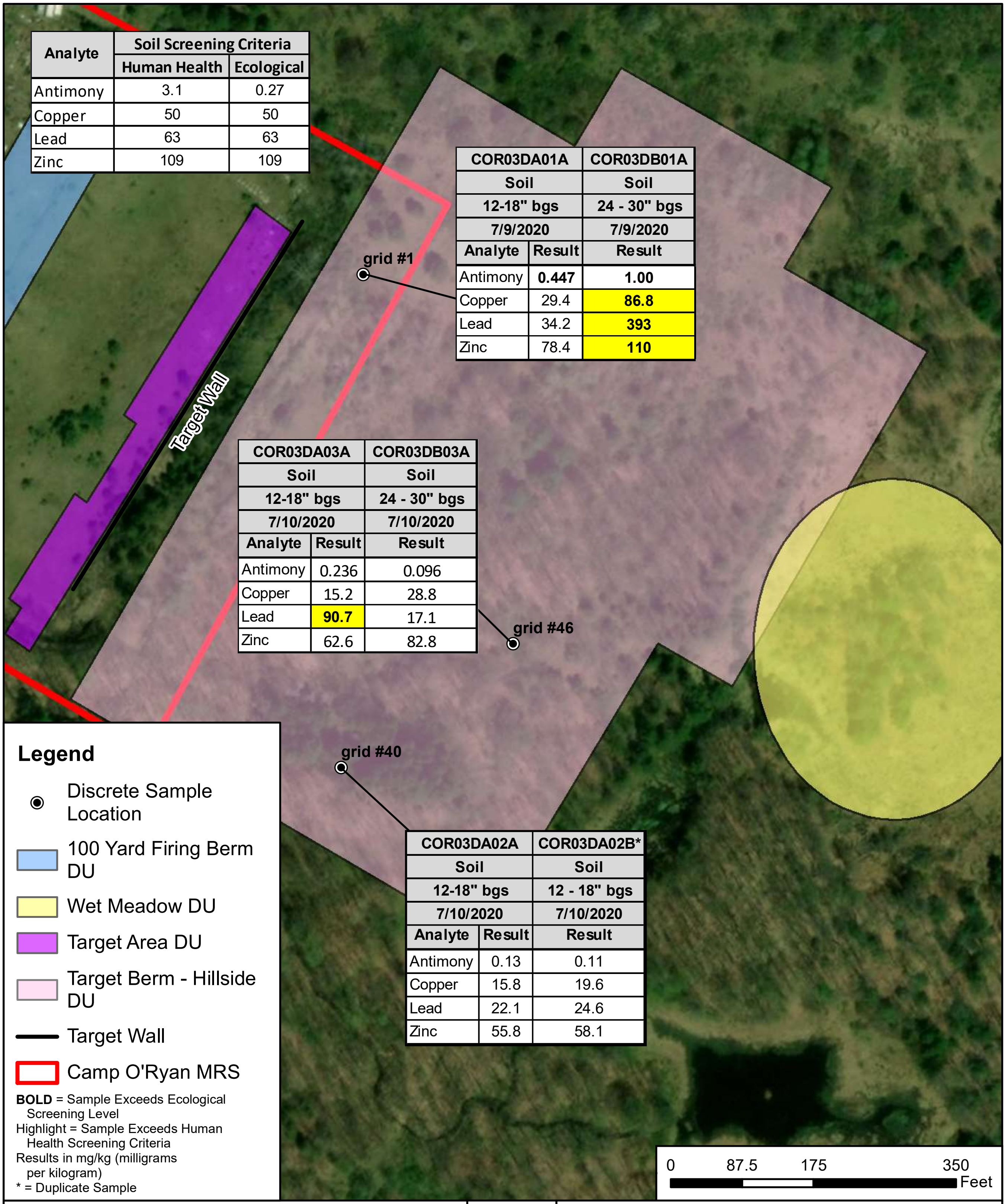

Analyte	Soil Screening Criteria	
	Human Health	Ecological
Antimony	3.1	0.27
Copper	50	50
Lead	63	63
Zinc	109	109

COR03DA01A		COR03DB01A
Soil		Soil
12-18" bgs		24 - 30" bgs
7/9/2020		7/9/2020
Analyte	Result	Result
Antimony	**0.447**	**1.00**
Copper	29.4	**86.8**
Lead	34.2	**393**
Zinc	78.4	**110**

COR03DA03A		COR03DB03A
Soil		Soil
12-18" bgs		24 - 30" bgs
7/10/2020		7/10/2020
Analyte	Result	Result
Antimony	0.236	0.096
Copper	15.2	28.8
Lead	**90.7**	17.1
Zinc	62.6	82.8

COR03DA02A		COR03DA02B*
Soil		Soil
12-18" bgs		12 - 18" bgs
7/10/2020		7/10/2020
Analyte	Result	Result
Antimony	0.13	0.11
Copper	15.8	19.6
Lead	22.1	24.6
Zinc	55.8	58.1

Legend

- ◉ Discrete Sample Location
- 🟦 100 Yard Firing Berm DU
- 🟨 Wet Meadow DU
- 🟪 Target Area DU
- ▭ Target Berm - Hillside DU
- ━ Target Wall
- 🟥 Camp O'Ryan MRS

BOLD = Sample Exceeds Ecological Screening Level
Highlight = Sample Exceeds Human Health Screening Criteria
Results in mg/kg (milligrams per kilogram)
* = Duplicate Sample

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	12/4/2020
SCALE	1:2,100	CHK BY	JW	12/4/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	12/4/2020

N

Target Berm- Hillside DU Discrete Results

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Figure 5-8

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Discrete sampling was also completed at grid #46 (306 ppm lead concentration in the surface soil layer via XRF analysis), located in the eastern portion of the DU. Subsurface soil samples were collected at 12- to 18-inches bgs (COR03DA03A) and at 24- to 30-inches bgs (COR03DB03A).

- The lead concentration (90.7 mg/kg) in soil from 12- to 18-inches bgs exceeded the human health screening criterion. No other MC in this soil layer exceeded ecological or human health screening criteria. As a result of the lead detection, the deeper 24- to 30-inches bgs sample was analyzed.

All MC concentrations in the 24- to 30-inches bgs soil layer were below ecological and human health screening criteria.

5.5 Discrete Sediment Samples

Discrete sediment samples were collected from two DUs that were added to the MRS as described in **Section 3.2.2**. Eight discrete sediment samples were collected at evenly spaced locations from each of the Target Berm-Ponded and Wet Meadow DUs. **Table 5-6** presents the results of the discrete sediment sampling.

5.5.1 Target Berm-Ponded DU

At the Target Berm-Ponded DU, eight discrete sediment samples were from south to north along the middle of the DU as shown in **Figure 5-9**. Lead exceeded its human health screening criterion (63 mg/kg) in every sample, with the highest concentration (2,780 mg/kg) recorded in the northern portion of the DU, at COR05SED07A. Additionally, antimony exceeded its human health screening criteria (14.6 mg/kg) in one sample. All MC concentrations exceeded ecological screening criteria in six of the eight samples, and at least one MC concentration exceeded ecological screening criteria in all eight samples.

5.5.2 Wet Meadow DU

At the Wet Meadow DU, eight discrete sediment samples were collected; a small grouping of trees in the center of the DU prevented sampling within the interior area (**Figure 5-10**). Of the eight samples collected, lead exceeded its human health screening criterion (63 mg/kg) in four samples. The highest concentration (154 mg/kg) was recorded at COR06SED04A, the eastern-most location. Antimony did not exceed ecological or human health screening criteria in any sample. Copper exceeded its ecological screening criterion in the same four samples in which lead exceeded the human health screening criterion. Zinc concentrations exceeded its ecological screening criterion in six sample locations.

Table 5-6. Discrete Sediment Sample Results Summary

Target Berm - Ponded DU

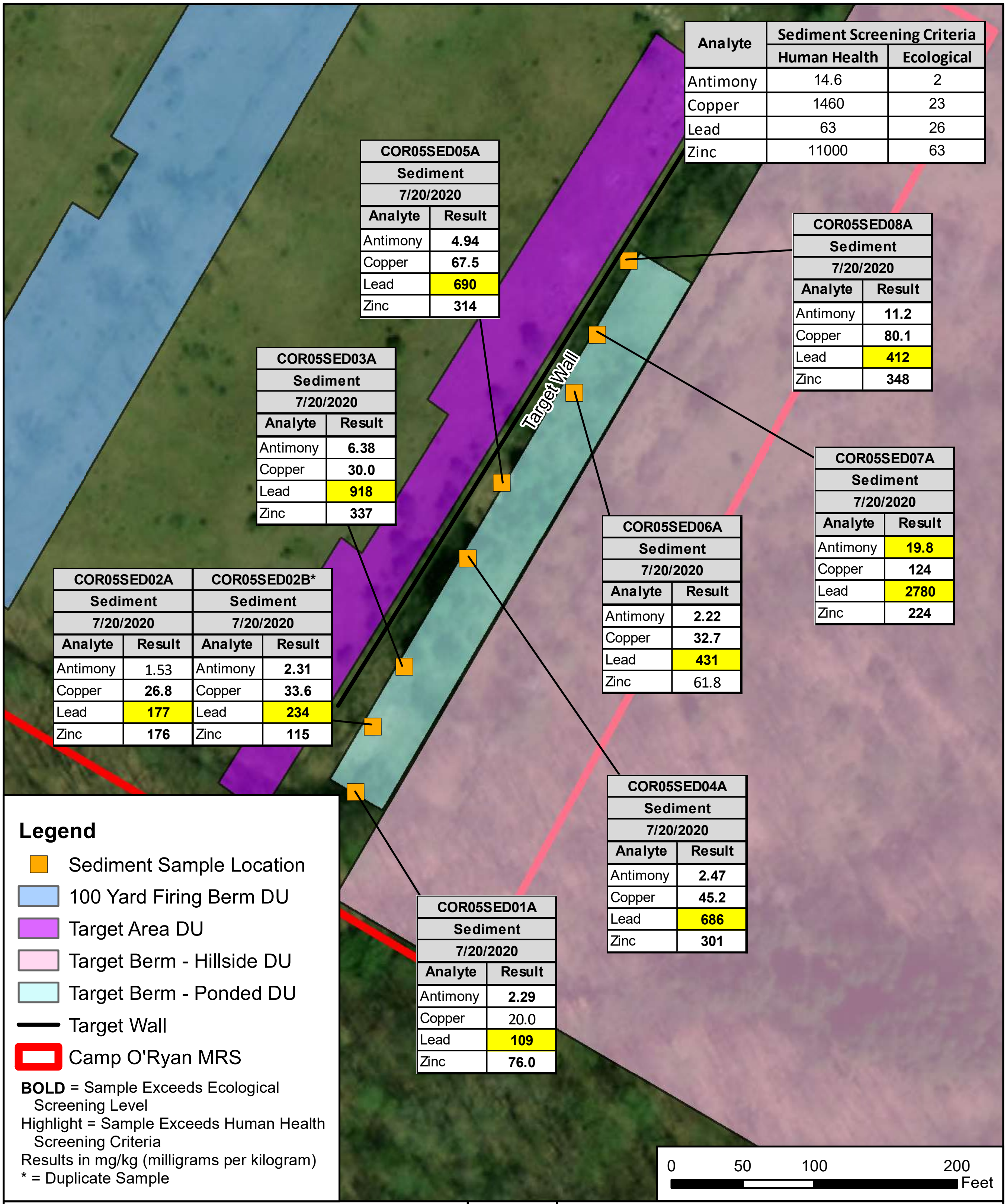
		Sample ID:	COR05SED01A				COR05SED02A				COR05SED02B				COR05SED03A				COR05SED04A				COR05SED05A				COR05SED06A				COR05SED07A				COR05SED08A			
		Media:	Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment			
		Sample Depth (inches bgs):	0-6				0-6				0-6				0-6				0-6				0-6				0-6				0-6				0-6			
		Date Collected:	7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020			
Analyte	Human Health Screening Level (mg/kg) Sediment	Ecological Screening Level (mg/kg) Sediment	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC
Total Metals by USEPA SW-846 Method 6020A (mg/kg)																																						
Antimony	14.6	2	**2.29**				1.53				**2.31**				**6.38**				**2.47**	N			**4.94**				**2.22**				**19.8**				**11.2**			
Copper	1460	23	20.0				**26.8**				**33.6**				**30.0**				**45.2**	A			**67.5**				**32.7**				**124**				**80.1**			
Lead	63	26	**109**				**177**				**234**				**918**				**686**	N*A			**690**				**431**				**2780**				**412**			
Zinc	11000	63	**76.0**				**176**				**115**				**337**				**301**	EA			**314**				61.8				**224**				**348**			

Wet Meadow DU

		Sample ID:	COR06SED01A				COR06SED02A				COR06SED02B				COR06SED03A				COR06SED04A				COR06SED05A				COR06SED06A				COR06SED07A				COR06SED08A			
		Media:	Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment			
		Sample Depth (inches bgs):	0-6				0-6				0-6				0-6				0-6				0-6				0-6				0-6				0-6			
		Date Collected:	7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020			
Analyte	Human Health Screening Level (mg/kg) Sediment	Ecological Screening Level (mg/kg) Sediment	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC
Total Metals by USEPA SW-846 Method 6020A (mg/kg)																																						
Antimony	14.6	2	0.14	J			0.800	J			1.2				0.81	J			1.7				0.37				0.38	J			0.17				0.14			
Copper	1460	23	7.67				**35**				**41.3**				**34.2**				**39.6**	A			19.6				**23.9**				8.75				10.4			
Lead	63	26	25.5				**153**				**153**				**119**				**154**	N*A			**36.0**				**73.2**				**27.0**				**32.3**			
Zinc	11000	63	36.3				**80.4**				**209**				**180**				**111**	A			**211**				**120**				**72.4**				60.8			

Notes:

Bold = Sample exceeds Ecological Screening Level
🟨 Sample exceeds Human Health Screening Level
mg/kg = milligrams per kilogram
µg/L = micrograms per liter
bgs = below ground surface
LQ = laboratory qualifier (LQ flag descriptions available in lab report)
VQ = validiation qualifier
RC = reason code
NA = not applicable
A = post-digestion spiked sample recovery is not within control limits
E = reported value is estimated because of the presence of interference (as indicated by serial dilution)
N = pre-digestion spiked sample recovery is not within control limits
J = estimated
* = the duplicate sample analysis relative percent difference (RPD) is not within control limits



Analyte	Sediment Screening Criteria	
	Human Health	Ecological
Antimony	14.6	2
Copper	1460	23
Lead	63	26
Zinc	11000	63

COR05SED05A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	**4.94**
Copper	**67.5**
Lead	**690**
Zinc	**314**

COR05SED08A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	**11.2**
Copper	**80.1**
Lead	**412**
Zinc	**348**

COR05SED03A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	**6.38**
Copper	**30.0**
Lead	**918**
Zinc	**337**

COR05SED07A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	**19.8**
Copper	**124**
Lead	**2780**
Zinc	**224**

COR05SED06A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	**2.22**
Copper	**32.7**
Lead	**431**
Zinc	61.8

COR05SED02A		COR05SED02B*	
Sediment		Sediment	
7/20/2020		7/20/2020	
Analyte	Result	Analyte	Result
Antimony	1.53	Antimony	**2.31**
Copper	**26.8**	Copper	**33.6**
Lead	**177**	Lead	**234**
Zinc	**176**	Zinc	**115**

COR05SED04A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	**2.47**
Copper	**45.2**
Lead	**686**
Zinc	**301**

COR05SED01A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	**2.29**
Copper	20.0
Lead	**109**
Zinc	**76.0**

Legend

- 🟧 Sediment Sample Location
- 🟦 100 Yard Firing Berm DU
- 🟪 Target Area DU
- ▢ Target Berm - Hillside DU
- ▢ Target Berm - Ponded DU
- — Target Wall
- 🟥 Camp O'Ryan MRS

BOLD = Sample Exceeds Ecological Screening Level
Highlight = Sample Exceeds Human Health Screening Criteria
Results in mg/kg (milligrams per kilogram)
* = Duplicate Sample

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	11/30/2020
SCALE	1:1,200	CHK BY	JW	11/30/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	11/30/2020

N

Target Berm- Ponded DU
Discrete Sediment Sample Results

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Figure 5-9

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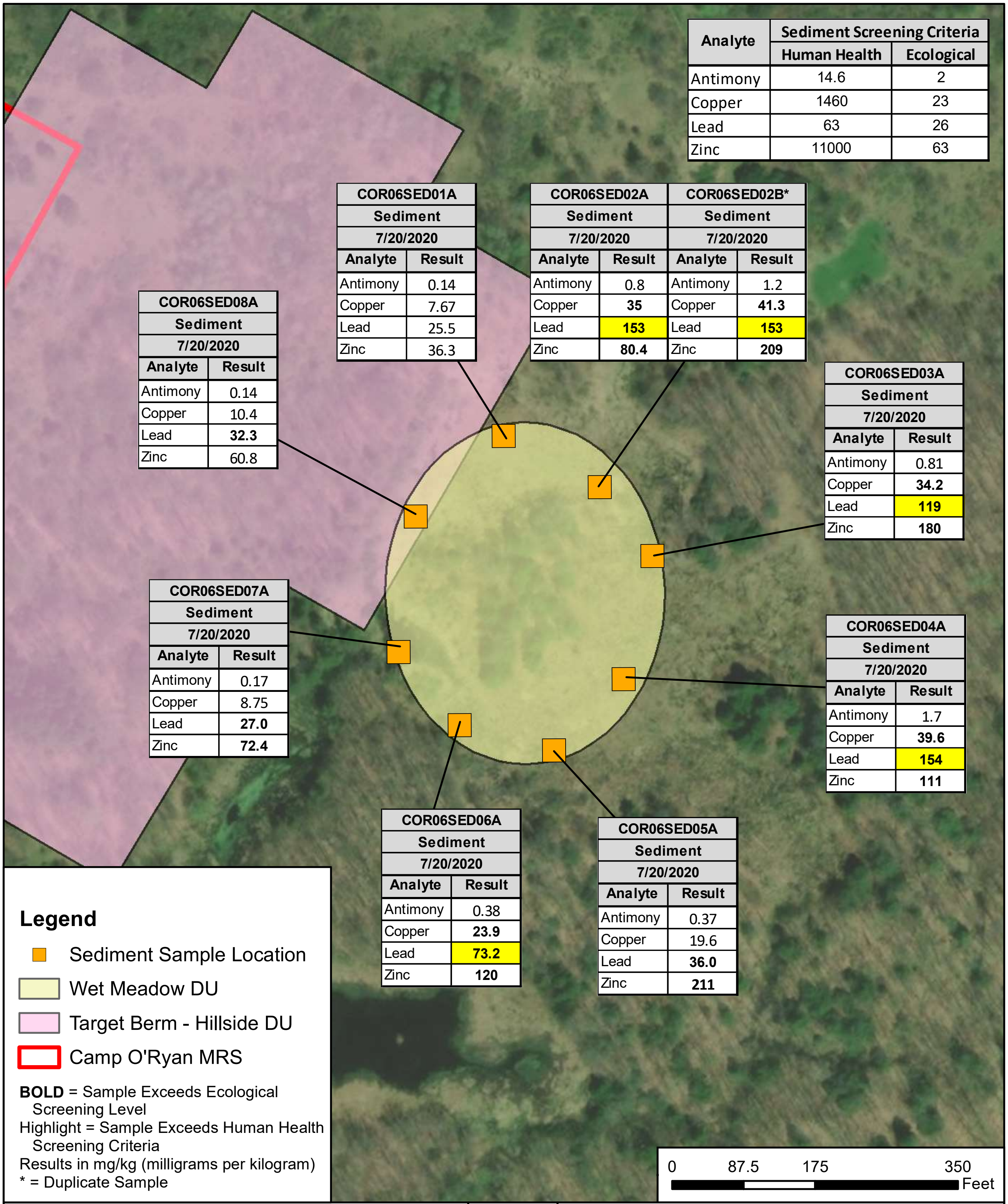

Analyte	Sediment Screening Criteria	
	Human Health	Ecological
Antimony	14.6	2
Copper	1460	23
Lead	63	26
Zinc	11000	63

COR06SED01A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	0.14
Copper	7.67
Lead	25.5
Zinc	36.3

COR06SED02A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	0.8
Copper	**35**
Lead	**153**
Zinc	**80.4**

COR06SED02B*	
Sediment	
7/20/2020	
Analyte	Result
Antimony	1.2
Copper	**41.3**
Lead	**153**
Zinc	**209**

COR06SED08A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	0.14
Copper	10.4
Lead	**32.3**
Zinc	60.8

COR06SED03A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	0.81
Copper	**34.2**
Lead	**119**
Zinc	**180**

COR06SED07A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	0.17
Copper	8.75
Lead	**27.0**
Zinc	**72.4**

COR06SED04A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	1.7
Copper	**39.6**
Lead	**154**
Zinc	**111**

COR06SED06A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	0.38
Copper	**23.9**
Lead	**73.2**
Zinc	**120**

COR06SED05A	
Sediment	
7/20/2020	
Analyte	Result
Antimony	0.37
Copper	19.6
Lead	**36.0**
Zinc	**211**

Legend

- 🟧 Sediment Sample Location
- 🟨 Wet Meadow DU
- 🟪 Target Berm - Hillside DU
- 🟥 Camp O'Ryan MRS

BOLD = Sample Exceeds Ecological Screening Level
Highlight = Sample Exceeds Human Health Screening Criteria
Results in mg/kg (milligrams per kilogram)
* = Duplicate Sample

CLIENT	Army National Guard				
PROJECT	RI through DD for Camp O'Ryan, NY MRS				
REVISION NO	0	GIS BY	GC	12/4/2020	
SCALE	1:2,100	CHK BY	JW	12/4/2020	
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	12/4/2020	

Wet Meadow DU Sediment Sample Results

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 5-10

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6 Contaminant Fate and Transport

This section discusses routes of migration and contaminant persistence for MC at the Camp O'Ryan Rifle Range MRS evaluated during this RI. A preliminary CSM presented in **Section 2.6** and **Figure 2-2** included an analysis of the MC source, potential routes of migration, and potential receptors based on previous investigations. The revised CSM is updated in this section based on RI findings (**Figure 6-1**).

6.1 Contaminant Migration

Data from the 2009 NYSDEC study indicated that total lead concentrations in soil were elevated at the 100-yard Firing Berm DU (90.9 mg/kg) as well as the Target Berm – Hillside DU (50,900 mg/kg) (NYSDEC, 2009). This data, along with information provided in other previous investigations describing historical training activities, guided the selection of DUs for RI sampling. RI soil sampling confirmed that small arms MC are present in soil at the 100-yard Firing Berm, Target Area, and Target Berm-Hillside as a result of historical training activities that would have caused fragmentation and pulverization of bullets. The lateral extent of MC in surface soil at those DUs was delineated via XRF analysis. XRF analysis indicates that affected soil is not likely migrating away from the source areas and is confined to the MRS. Local topography appears to isolate the source areas and helps prevent migration off of the MRS.

The vertical extent of MC generally decreased with depth at the DUs. At one Target Berm-Hillside location (grid #1, COR03DA01A/B01A), all metals MC concentrations at the 24- to 25-inches bgs depth increased compared to the shallower 12- to 24-inches bgs depth. This increase is likely due to mechanical movement of soil during active range use to fill in bullet pockets or the collection of bullet fragments against the hard cobble layer encountered at 25-inches bgs.

MC can be transported by surface runoff, and the Target Berm-Ponded DU appears to be an accumulation point behind the Target Area DU and downslope of the Target Berm-Hillside DU. This observation is supported by the MC results in sediment samples collected in this DU. The Wet Meadow DU is east and upslope of the Target Berm-Hillside DU, and because the Wet Meadow DU is at a higher elevation than the remainder of the MRS, topography likely precludes any MC migration via groundwater or surface runoff into the Wet Meadow. The minor MC found in sediment are probably the result of small amounts of overshot or ricochet into the area. Given the local topography and surface water flow, groundwater flow at this DU is likely to be to the northwest, towards the former range, and unlikely to contain MC. If shallow groundwater is discharging to the Wet Meadow, it is likely to be flowing to the meadow from the upslope southeast direction, beyond the MRS boundary, and would not likely contain MC.

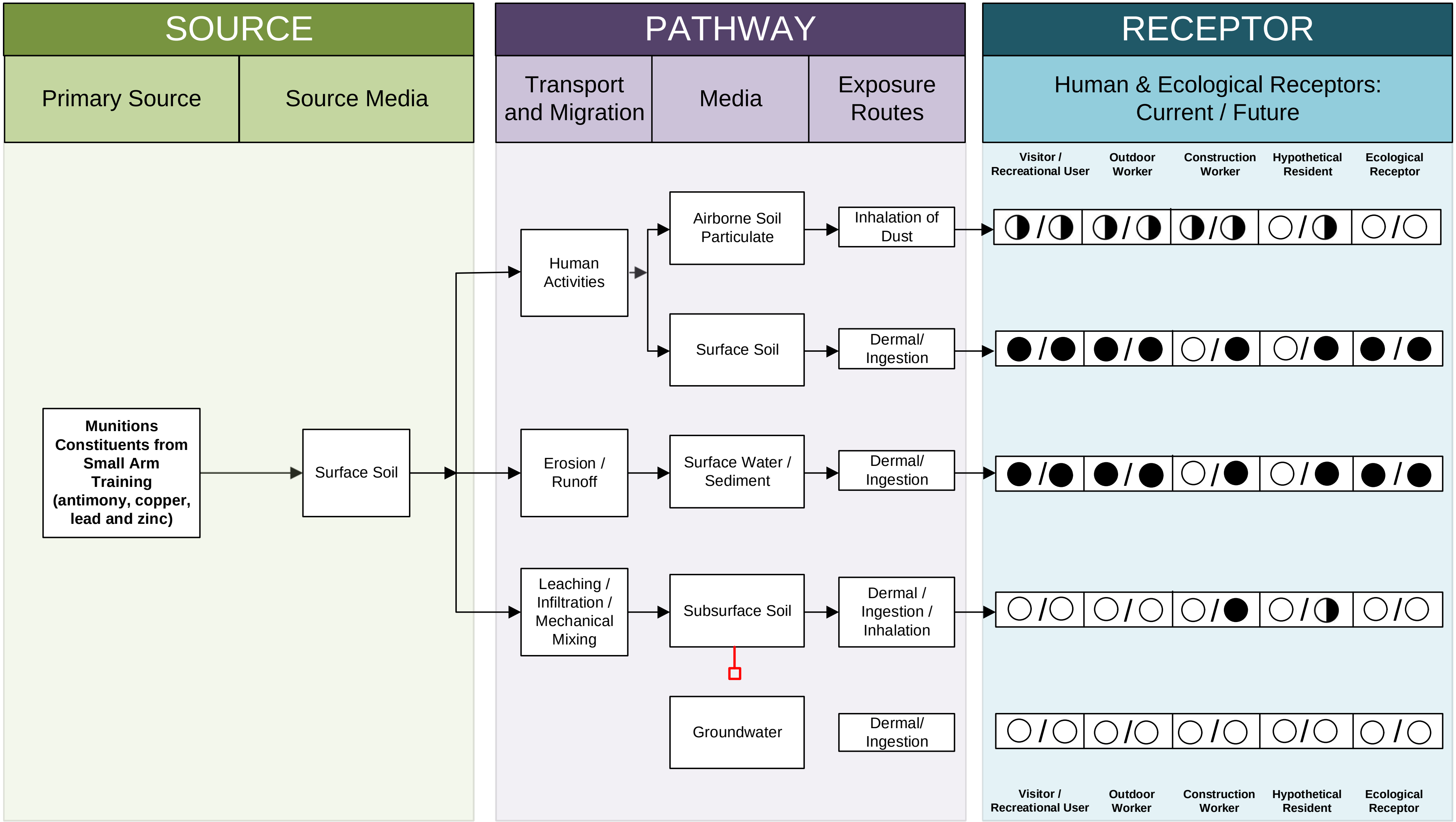
Although no surface water or groundwater was sampled as a part of this RI, surface water and shallow groundwater samples were collected within the adjacent Pistol Range and Maneuvering Area MRSs as a part of the 2011 Preliminary Site Investigation Report (Woods Hole Group, Inc., 2011; **Appendix I**). Total and dissolved lead concentrations were non-detect in all samples collected downgradient from the Camp O'Ryan MRS 2 Rifle Range except for one shallow groundwater duplicate sample, which had a total lead concentrations of 0.018 mg/L. This result is below the New York State Ambient Water Quality Standard for lead (0.025 mg/L; New York

State Ambient Water Quality Standards and Guidance Values, June 1998). Additionally, the associated parent field sample was non-detect (Woods Hole Group, Inc., 2011; **Appendix I**). These results indicate that MC is not migrating offsite from source areas within the Camp O'Ryan MRS 2 Rifle Range via groundwater or surface water.

The conclusion in the preliminary CSM that the groundwater pathway is likely incomplete is unchanged and is supported by data collected during the RI, i.e., subsurface samples collected at the locations of the highest lead concentrations in surface soil conservatively showed that subsurface impacts are likely limited to about 24 inches bgs. This conclusion is also supported by the surface water and shallow groundwater data from samples collected during the Preliminary Site Investigation (Woods Hole Group, Inc., 2011; **Appendix I**).

6.2 Contaminant Persistence

Typically, metals in soil form reaction products that become incorporated into soil minerals, precipitate as oxides or hydroxides, or form coatings on minerals (Oak Ridge National Laboratory, 1989). These forms of metals have low mobility in soils. The inherent insolubility of metals, coupled with their related high soil/water partition coefficients, indicate that the metals would be relatively immobile in DU soil and sediment. Given that elevated metals, lead in particular, are present in target feature soils but not in soil around the perimeters of the DUs indicate that they are not readily migrating.



	Visitor / Recreational User	Outdoor Worker	Construction Worker	Hypothetical Resident	Ecological Receptor
Inhalation of Dust	◐ / ◐	◐ / ◐	◐ / ◐	○ / ◐	○ / ○
Dermal/ Ingestion	● / ●	● / ●	○ / ●	○ / ●	● / ●
Dermal/ Ingestion	● / ●	● / ●	○ / ●	○ / ●	● / ●
Dermal / Ingestion / Inhalation	○ / ○	○ / ○	○ / ●	○ / ◐	○ / ○
Dermal/ Ingestion	○ / ○	○ / ○	○ / ○	○ / ○	○ / ○
	Visitor / Recreational User	Outdoor Worker	Construction Worker	Hypothetical Resident	Ecological Receptor

LEGEND

- Flow-Chart Stops
- Flow-Chart Continues
- Partial / Possible Flow
- ○ Incomplete Pathway
- ◐ Potentially Complete Pathway
- ● Complete Pathway

Figure 6-1
Revised Conceptual Site Model Diagram
Camp O'Ryan Rifle Range MRS, New York

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7 Risk Assessment

Analytical data generated from DU and background ISM soil samples, discrete subsurface soil samples, and sediment samples collected during the RI were compared with conservative risk-based screening criteria and background reference data to evaluate whether past small-arms training activities have resulted in contaminant releases exceeding human health or ecological screening criteria. The results of the screening determined whether further risk evaluation were necessary.

Three target feature DUs were identified as the area over which a receptor is likely to be exposed to potentially contaminated soil within the MRS (exposure area). These DUs are the 100-yard Firing Berm, Target Area, and Target Berm-Hillside. Also, a background reference area was identified at which ISM surface soil samples were collected to better compare areas with known historical training against an area where no impact is suspected. The ISM approach provided a surface soil data set where a reasonably unbiased and representative exposure point concentration of MC was used to evaluate potential receptor exposed to MC in surface soil at the DUs. Discrete subsurface soil samples were collected from 12-18 inches bgs and 24-30 inches bgs layers at DUs 1, 2, and 3; however, subsurface sample data were used to assess vertical extent of MC in soil, not risk. Discrete sediment samples were also collected from two sediment areas, the Target Berm-Ponded and Wet Meadow DUs, adjacent to target features and potentially affected by historical deposition of MC.

As a conservative approach for each DU, the maximum detected concentration of individual small arms MC in the samples were compared with human health and ecological screening criteria during the RI to determine if an HHRA and/or SLERA were necessary. The selection of human health and ecological screening criteria used during this RI is presented in **Section 3.4.1** and **Table 3-2**. Due to small arms MC exceedances of human health and ecological screening criteria, an HHRA and SLERA were conducted for the MRS. The HHRA and SLERA results are presented in this section, and supporting tables appear in **Appendices E** and **F**.

7.1 Human Health Risk Assessment

The objectives for the Camp O'Ryan MRS HHRA are to 1) conduct a site-specific, quantitative analysis of the MRS under current and future land use scenarios, 2) identify human health constituents of potential concern (COPCs) detected in affected environmental media, 3) evaluate potentially complete exposure pathways to current and future human receptors, and 4) determine the degree to which these exposures may pose adverse health effects. Results of the HHRA may be used to assess risk management options for the MRS, including possible further actions to address impacted media. A quantitative HHRA was completed as part of the RI to evaluate risks to human health potentially posed by COPCs in the affected media beneath and within the vicinity of the site that cannot be eliminated using screening criteria.

Analytical data were compared to the human health screening levels presented in **Table 3-2** to determine if past small arms training activities resulted in potential contamination above human health screening levels. Site-specific background reference samples were collected and analyzed for comparison purposes. Due to small arms MC exceedances of the human health screening criteria, each DU was evaluated further in an HHRA ("HH"). The following COPCs were identified at each DU:

Decision Unit/Media	Antimony	Copper	Lead	Zinc
100-yard Firing Berm DU Soil			HH	
Target Area DU Soil			HH	
Target Berm-Hillside DU Soil		HH	HH	HH
Target Berm-Ponded DU Sediment	HH		HH	
Wet Meadows DU Sediment			HH	

Blank cells indicate that screening level criteria was not exceeded and therefore not identified as a COPC for r the HHRA.

The HHRA risk-based screening results identified one or more COPCs for each DU. The New York State background SCO of 63 mg/kg was used to determine what DUs were carried forward for lead modeling because it represents unrestricted residential land use. Lead was identified as a COPC for all DUs.

The CSM represents the current/future exposed populations or scenarios for the MRS since the future land use is unlikely to change. The HHRA evaluated the following human receptors: outdoor worker, construction worker, site visitor/recreational user (child/adult), and hypothetical resident (child/adult). No off-site receptors were identified for the MRS; the RI indicates that off-site migration is minimal. The current exposure at the MRS consists of potential on-site receptors such as site visitors/recreational users (child/adult) and outdoor workers being exposed to MC in surface soil and sediment. Even though portions of the MRS are heavily vegetated (i.e., trees, shrubs and marshy areas), the site visitor/recreational user (child/adult) scenario was conservatively evaluated for soil and sediment exposure because access to the MRS is not restricted.

Soil-related exposure pathways for each receptor include incidental ingestion, dermal contact, and inhalation of wind-blown particulates from soil. The MC COPCs are not volatile, thus inhalation of vapors emanating from soil is an incomplete exposure pathway. Sediment-related exposure pathways for each receptor include incidental ingestion and dermal contact with MC in the marshy wetland areas of the MRS. Surface water and groundwater data were not available for this MRS.

The HHRA used a cumulative non-cancer hazard index (HI) of 1 when evaluating MC constituents for potential adverse health effects. If a receptor's cumulative HI exceeded 1, then the constituent non-cancer hazard results were segregated based on the target organ endpoint, and separate target organ-specific HIs were calculated. Only constituents that act on the same target organ are expected to be additive (USEPA 1991 and 1989). The HHRA non-cancer hazard results are presented in **Table 7-1**. These cumulative values represent exposure to antimony, copper, and zinc; lead is evaluated separately. Considering that the non-cancer HI for all COPCs were below the EPA target of 1 for every receptor, adverse health effects from exposure to MC metals for these DUs are not likely.

Table 7-1 Non-Cancer Hazard Results for Human Receptors

COPC and Exposure Area	Child Site Visitor/ Recreational User HI (unitless)	Adult Site Visitor/Recreational User HI (unitless)	Outdoor Worker HI (unitless)	Construction Worker HI (unitless)	Hypothetical Child Resident HI (unitless)	Hypothetical Adult Resident HI (unitless)
Target Berm-Hillside DU (ISM Surface Soil, 0 – 6 inches bgs)						
Copper	**0.004**	**0.0004**	**0.001**	**0.02**	**0.02**	**0.002**
Zinc	**0.001**	**0.0001**	**0.0004**	**0.001**	**0.006**	**0.0006**
Cumulative HI	**0.005**	**0.0005**	**0.001**	**0.02**	**0.02**	**0.002**
Target Berm-Ponded DU (Sediment)						
Antimony	**0.07**	**0.007**	**0.02**	**0.08**	**0.3**	**0.03**

Notes:
bgs = below ground surface; COPC = Constituent of Potential Concern; DU = Decision Unit; HI = hazard index; ISM = incremental sampling methodology
Results are rounded to one significant figure.
Red text = Indicated threshold has been exceeded
Black text = Indicated threshold has not been exceeded

The non-cancer hazard calculations for exposure to antimony, copper and zinc in soil were generated using the US Department of Energy (DOE) Risk Assessment Information System (RAIS) on-line risk calculator (DOE, 2020). Default exposure parameters provided in RAIS were used to generate the non-cancer hazard results for the on-site site visitor/recreational user (child/adult), outdoor worker, construction worker, and hypothetical resident scenarios. RAIS uses the most current exposure parameters that are available from USEPA resources (USEPA 2002, 2004, 2011, and 2014).

Because most human health effects data for lead are correlated with concentrations in the blood rather than an external dose, the standard USEPA (1989) cancer risk and non-cancer hazard approach for evaluating healthy effects cannot be applied to lead. The USEPA has developed the following two models to estimate the receptor blood lead (PbB) concentrations and what percentage of the exposed population may have PbB levels above the allowable PbB threshold:

- Adult Lead Methodology (ALM) (version date 6/14/17) model (USEPA, 2017b);
- Integrated Exposure Uptake Biokinetic ([IEUBK] win v1.1 build 11) model (USEPA, 2010).

Children are more vulnerable to lead poisoning than adults because their nervous systems are still developing. Children can be exposed to lead in their environment and prior to birth from lead in their mother's body. At lower levels of exposure, lead can decrease mental development, with effects on learning, intelligence and behavior. The USEPA ALM and IEUBK models are designed to estimate PbB levels for the fetus of a female worker (i.e., body burden from exposure to lead) and a hypothetical child receptor (age 0 to 7 years), respectively. The ALM model was used to evaluate soil exposure to the site visitor/recreational user (adult), outdoor worker, and future construction worker receptors. The IEUBK model was used to evaluate soil exposure to the hypothetical child resident and child site visitor/recreational user.

The Center for Disease Control and Prevention (CDC) has recommended a target blood lead level (BLL) of 5 micrograms per deciliter (µg/dL) to protect young children from potentially adverse neurological effects (CDC, 1991 and 2012). At the present time, USEPA and NYSDEC have not formally adopted the CDC-recommended BLL and continue to use a target BLL of 10 µg/dL (USEPA, 2020 and NYSDEC 2010). USEPA policy leaves the decision for selecting the allowable target BLL with each state or USEPA region (USEPA, 2016). The HHRA conducted a sensitivity analysis and evaluated lead exposure to both target BLLs, but the target BLL of 10 µg/dL was used for the HHRA conclusions.

In addition, the threshold for lead is to limit the risk to no more than a 5% probability for the receptor's population PbB concentrations to exceed the selected target BLL in the ALM and IEUBK models (USEPA, 2017 and 2010). If the probability of 5% is exceeded, then adverse health effects from exposure to lead are possible. The HHRA lead modeling results are presented in **Table 7-2**.

The HHRA non-cancer hazard and lead modeling results for each DU are summarized below:

<u>100-yd Firing Berm (DU 1):</u>

- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to surface soil (0- to 6-inches bgs).

<u>Target Area (DU 2):</u>

- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to surface soil (0- to 6-inches bgs).

<u>Target Berm-Hillside (DU 3):</u>

- Non-cancer hazard results indicated that adverse health effects are not likely for potential receptors exposed to copper and zinc in ISM surface soil (0- to 6-inches bgs).
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to surface soil (0- to 6-inches bgs).

<u>Target Berm-Ponded (DU 5):</u>

- Non-cancer hazard results indicated that adverse health effects are not likely for potential receptors exposed to antimony in sediment.
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are possible for the child site visitor/recreational user and hypothetical child resident.

<u>Wet Meadow (DU 6):</u>

- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to sediment.

Assuming a BLL of 10 µg/dL, unlimited use and unrestricted exposure closure of the MRS is not possible while concentrations of lead are present in the Target Berm-Ponded DU 5 sediment. The heavily vegetated and marshy terrain of sediment DUs 5 and 6 make access difficult under current site conditions for the young child receptors ages 0 to 6 years. Combined with conservative lead modeling assumptions, the sediment results are likely overestimated.

If USEPA and NYSDEC revised their policy for the target BLL (i.e., 10 µg/dL to 5 µg/dL), then adverse health effects are possible from exposure to surface soil for the child receptors at the Target Berm-Hillside DU (**Table 7-2**). Also, adverse health effects are possible for the outdoor worker, construction worker, and the child site visitor/recreational user from exposure to sediment at the Target Berm-Ponded DU.

Table 7-2 ALM and IEUBK Lead Model Results for On-Site HHRA Receptors

Receptor	USEPA Lead Model Used	Target BLL of 10 µg/dL			Target BLL of 5 µg/dL		
		PbB Fetus (ALM) PbB Child (IEUBK) (µg/dL)	Percent Probability Threshold (%)	Above Thresholds? (Yes/No)	PbB Fetus (ALM) PbB Child (IEUBK) (µg/dL)	Percent Probability Threshold (%)	Above Thresholds? (Yes/No)
100-yd Firing Berm DU 1 (ISM Surface Soil, 0-6 in bgs)							
Outdoor Worker	ALM	1.7	0.0001%	No	1.6	0.02%	No
Construction Worker	ALM	1.8	0.0003%	No	1.8	0.04%	No
Adult Site Visitor/Recreational User	ALM	1.5	0.00006%	No	1.5	0.01%	No
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	<10	0.001%	No	<5	0.3%	No
Target Area DU 2 (ISM Surface Soil, 0-6 in bgs)							
Outdoor Worker	ALM	1.8	0.0003%	No	1.7	0.03%	No
Construction Worker	ALM	2.1	0.001%	No	2.1	0.09%	No
Adult Site Visitor/Recreational User	ALM	1.6	0.0001%	No	1.6	0.01%	No
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	< 10	0.01%	No	< 5	1.16%	No
Target Berm Hillside DU 3 (ISM Surface Soil, 0-6 in bgs)							
Outdoor Worker	ALM	2.4	0.002%	No	2.1	0.09%	No
Construction Worker	ALM	3.0	0.01%	No	3.0	0.6%	No
Adult Site Visitor/Recreational User	ALM	1.7	0.0002%	No	1.7	0.03%	No
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	< 10	0.4%	No	**> 5**	**12%**	**Yes**
Target Berm Ponded DU 5 (Sediment)							
Outdoor Worker	ALM	5.2	0.3%	No	**5.2**	**6%**	**Yes**
Construction Worker	ALM	7.5	2%	No	**7.5**	**17%**	**Yes**
Adult Site Visitor/Recreational User	ALM	2.7	0.005%	No	2.7	0.3%	No

Receptor	**USEPA Lead Model Used**	**Target BLL of 10 µg/dL**			**Target BLL of 5 µg/dL**		
		PbB Fetus (ALM) **PbB Child (IEUBK)** **(µg/dL)**	**Percent Probability Threshold (%)**	**Above Thresholds? (Yes/No)**	**PbB Fetus (ALM)** **PbB Child (IEUBK)** **(µg/dL)**	**Percent Probability Threshold (%)**	**Above Thresholds? (Yes/No)**
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	**> 10**	**31%**	**Yes**	**> 5**	**84%**	**Yes**
Wet Meadow DU 6 (Sediment)							
Outdoor Worker	ALM	1.8	0.0003%	No	1.8	0.04%	No
Construction Worker	ALM	2	0.001%	No	2	0.07%	No
Adult Site Visitor/Recreational User	ALM	1.5	0.0001%	No	1.5	0.01%	No
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	< 10	0.60%	No	< 5	0.91%	No

Notes:

ALM = Adult Lead Methodology; bgs = below ground surface; BLL = blood lead level; DU = Decision Unit; EPC = exposure point concentration; IEUBK = Integrated Exposure Uptake Biokinetic; ISM = incremental sampling methodology; in = inches; ug/dL = micrograms per deciliter; mg/kg = milligrams per kilogram; PbB = blood lead concentration;
Red text = Indicated threshold has been exceeded

Black text = Indicated threshold has not been exceeded

USEPA. 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows®version (IEUBKwin v1.1 build 11) 32-bit version Office of Superfund Remediation and Technology Innovation, United States Environmental Protection Agency.

USEPA, 2017. Adult Lead Methodology (Version date 6/14/17).

7.2 Ecological Risk Assessment

The primary purpose of the SLERA is to identify constituents of potential ecological concern (COPECs) and assess the need and the level of effort necessary to perform further evaluation of the current and future site risk. The SLERA fulfills this purpose by: (1) identifying potential ecological receptors and habitats at the site; (2) determining which pathways are potentially complete; (3) evaluating if constituents of interest (COIs) present within complete exposure pathways have the potential to pose significant environmental risk; and (4) determining if this potential for risk warrants additional ecological risk characterization.

The SLERA was conducted in accordance with the following federal guidance:

- USEPA, 1997. *Ecological Risk Assessment Guidance for Superfund* (ERAGS).
- USEPA, 2001. *The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments.*
- USEPA, 2018. *Region 4 Ecological Risk Assessment Supplemental Guidance*.

Potential ecological exposure was evaluated under current conditions using recent analytical data collected in relevant exposure media (i.e., surface soil and sediment). Exposures were evaluated for the 100-yard Firing Berm, Target Area, and Target Berm-Hillside DUs. Aquatic and semi-aquatic ecological receptors were evaluated within an area with accumulated sediment from overland flow (Target Berm-Ponded DU) and for a wetland area (Wet Meadow DU) potentially impacted by overshot and ricochet during historical training activities. Overland flow and groundwater migration to the Wet Meadow is considered incomplete based on local topography and surface water flow.

The scope of the SLERA included Steps 1 and 2 of the 8-step ERAGS process – used to identify COPECs in potentially affected environmental media to support an SMDP regarding the need for further risk characterization and/or remediation. The list of COPECs was refined consistent with the initial stage of a Baseline Ecological Risk Assessment (BERA) Step 3 (referred to as Step 3a COPEC Refinement) to reduce uncertainty in the SLERA Step 1 and 2 conclusions and to refine the recommendations presented in the report by applying more realistic exposure assumptions.

Guided by an ecological CSM (ECSM), a conservative screening evaluation was conducted to assess potential risks related to surface soil (soil macroinvertebrates and terrestrial wildlife) and sediment (benthic macroinvertebrates and aquatic/semi-aquatic wildlife). If COIs were detected above wildlife-specific benchmarks, dose rate models (DRMs) were prepared to assess potential adverse effects to selected ecological receptors from incidental and dietary ingestion.

After Step 2 of the SLERA, the results of the risk characterization determined the following SMDPs:

- The information is not adequate to a make a decision at this point, and the ecological risk assessment continued to Step 3.
    - Surface soil – results of the direct contact evaluation and wildlife DRMs have indicated potential adverse effects for soil macroinvertebrates (Target Berm-

  - Hillside DU) and wildlife (100-yard Firing Berm, Target Area, and Target Berm-Hillside DUs).
  - Sediment – results of the direct contact evaluation and wildlife DRMs have indicated potential adverse effects for benthic macroinvertebrates and wildlife at both the Target Berm-Ponded and Wet Meadow DUs.
  - Groundwater to surface water – as previously discussed, the migration pathway from shallow groundwater within the MRS to the Wet Meadow DU is considered incomplete; however, there is no groundwater, porewater, or surface water data to evaluate receptors potentially impacted (i.e., benthic macroinvertebrates).
  - **Table 7-3** includes a summary of COPECs retained for the Step 3a COPEC Refinement within the BERA.

During BERA Step 3a, refinements were made to reduce uncertainty in both the direct contact evaluation and wildlife DRMs. The results for the refined direct contact evaluation and wildlife DRMs are summarized in **Tables 7-4** and **7-5**, respectively. The results of the SLERA, BERA Step 3a COPEC refinement, and consideration of the uncertainties present in the evaluation support the following SMDP for the MRS:

- "There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk" (USEPA, 1997).
  - Negligible Risk
    - Soil macroinvertebrate community
    - Benthic macroinvertebrate community (Wet Meadow DU)
    - Terrestrial wildlife community
    - Aquatic and semi-aquatic wildlife community
    - Groundwater to surface water pathway (see **Section 5.1** of **Appendix F**)
- "The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted" (USEPA, 1997).
    - Benthic macroinvertebrate community (Target Berm-Ponded DU)
- Constituents of Concern (COCs)
  - Lead was identified as a direct contact based COCs in sediment at the Target Berm-Ponded DU within the Camp O'Ryan Rifle Range MRS.

Table 7-3 COPECs Retained for BERA Step 3a

100-yard Firing Berm DU (Surface Soil)		**Target Area DU (Surface Soil)**		**Target Berm-Hillside DU (Surface Soil)**		**Target Berm-Ponded DU (Sediment)**		**Wet Meadow DU (Sediment)**	
Direct Contact (Table 3-1)	**Terrestrial Wildlfie (Table 3-2)**	**Direct Contact (Table 3-1)**	**Terrestrial Wildlfie (Table 3-2)**	**Direct Contact (Table 3-1)**	**Terrestrial Wildlfie (Table 3-2)**	**Direct Contact (Table 3-1)**	**Aquatic and Semi-Aquatic Wildlife (Table 3-2)**	**Direct Contact (Table 3-1)**	**Aquatic and Semi-Aquatic Wildlife (Table 3-2)**
No direct contact COPECs identified	American robin (lead)	No direct contact COPECs identified	American robin (lead) Short-tailed shrew (lead)	Zinc	American robin (lead and zinc) Red-tailed hawk (lead) Short-tailed shrew (antimony and lead)	Antimony Copper Lead Zinc	American robin (copper and lead) Red-tailed hawk (lead) Short-tailed shrew (copper and lead)	Antimony Copper Lead Zinc	American robin (copper and lead) Short-tailed shrew (copper)

Table 7-4 Refined Direct Contact Evaluation

COPEC	Detection Frequency [(1)]	Refined EPC	RSV	Source	Refined HQ
Target Berm-Hillside DU – Surface Soil (mg/kg)					
Zinc	3/3	146.97	930	LANL (2017)	<1
Target Berm-Ponded DU – Sediment (mg/kg)					
Antimony	8/8	10.6	25	USEPA (2018)	<1
Copper	8/8	77.18	149	USEPA (2018)	<1
Lead	8/8	1,983	128	USEPA (2018)	**15**
Zinc	8/8	304.6	459	USEPA (2018)	<1
Wet Meadow DU – Sediment (mg/kg)					
Antimony	8/8	0.958	25	USEPA (2018)	<1
Copper	8/8	31.7	149	USEPA (2018)	<1
Lead	8/8	115.3	128	USEPA (2018)	<1
Zinc	8/8	157.3	459	USEPA (2018)	<1

Notes:

COPEC = Constituent of Potential Ecological Concern; HQ = Hazard Quotient; LANL = Los Alamos National Laboratory; LOEC = Lowest Observed Effect Concentration; mg/kg = milligram per kilogram; RSV = Refined Screening Value (LOEC); USEPA = United States Environmental Protection Agency

(1) Detection frequency for sediment accounts for primary and field duplicate samples being combined prior to upper confidence limit calculation.

Table 7-5 Refined Wildlife Dose Rate Model Summary

COPEC	Surface Soil Refined EPC (mg/kg)	Sediment Refined EPC (mg/kg)	Modeled TP Conc. (mg/kg-dw)	Modeled SI Conc. (mg/kg-dw)	Modeled BI Conc. (mg/kg-dw)	Modeled SM Conc. (mg/kg-dw)	NOAEL/LOAEL HQ			
							AR	RTH	STS	RF
Terrestrial Exposure										
100-yard Firing Berm DU										
Lead	84.33	--	3.2	29	--	5.4	**3**/<1	--	--	--
Target Area DU										
Lead	118.23	--	3.9	38	--	6.4	**5**/<1	--	**1**/<1	--
Target Berm-Hillside DU										
Antimony	0.96	--	0.038	0.96	--	0.00190	(a)	(a)	**2**/<1	--
Lead	309.74	--	6.6	82	--	10.6	**11**/<1	**1**/<1	**3**/<1	--
Zinc	146.97	--	77.1	440	--	135	**1**/<1	--	--	--
Aquatic and Semi-Aquatic Exposure										
Target Berm-Ponded DU										
Copper	--	77.18	--	--	130	17.8	**5**/<1	--	**3**/<1	--
Lead	--	1,983	--	--	130.9	27.7	**31/1**	**7**/<1	**5**/<1	--
Wet Meadow DU										
Copper	--	31.7	--	--	102	15.2	**4**/<1	--	**2**/<1	--
Lead	--	115.3	--	--	7.6	6.3	**2**/<1	--	--	--

Notes:

Bold indicates an exceedance of wildlife TRV; -- = Not Evaluated; AR = American Robin; BI = Benthic Invertebrate; COI = Constituent of Interest; Conc. = Concentration; DU = Decision Unit; dw= dry weight; EPC = Exposure Point Concentration; HQ = Hazard Quotient; mg/kg = milligram per kilogram; NOAEL = No Observed Adverse Effects Level; RF = Red Fox; RTH = Red-Tailed Hawk; SI = Soil Invertebrate; SM = Small Mammal; STS = Short-Tailed Shrew; TP = Terrestrial Plant; (a) As indicated in USEPA (2007), insufficient data to derive a TRV for avian receptors

8 Munitions Response Site Prioritization Protocol

This section discusses application of the MRSPP for the Camp O'Ryan Rifle Range MRS (NYHQ-008-R-02). The MRSPP was applied in accordance with 32 Code of Federal Regulations (CFR) Part 179 and the guidance provided in the DoD MRSPP Primer (DoD, 2007). The MRSPP worksheet tables for the MRSs are included in **Appendix G**. In 2005, DoD published the MRSPP as a Federal Rule (32 CFR Part 179) to assign a relative risk priority to each defense site in the MMRP Inventory for response activities. These response activities are based on the overall conditions at the MRS taking into consideration various factors related to explosive safety and environmental hazards. The application of the MRSPP applies to all locations:

- That are or were owned, leased to, or otherwise possessed or used by DoD;
- That are known to or are suspected of containing MEC or MC; and
- That are included in the MMRP Inventory.

In assigning a relative priority for response activities, DoD generally considers MRSs posing the greatest hazard as being the highest priority. In the MMRP, the MRSPP priority will be one factor in determining the sequence in which munitions response actions are funded. The following sections are a brief summary of the modules of the MRSPP and the results of the evaluations for the Camp O'Ryan Rifle Range MRS (NYHQ-008-R-02).

8.1 Explosive Hazard Evaluation Module

The Explosive Hazard Evaluation (EHE) Module assesses the explosive hazards of a site based on the known or suspected presence of an explosive hazard, including small arms ranges. The EHE Module is composed of three factors, each of which has two to four data elements that are intended to assess the specific conditions at an MRS. Based on site-specific information, each data element is assigned a numeric score, and the sum of these values is the EHE Module score and is used to determine the corresponding EHE Module rating. The data elements are as follows:

- **Explosive Hazard Factor.** Has the data elements Munitions Type and Source of Hazard and constitutes 40% of the EHE Module score.
- **Accessibility Factor.** Has the data elements Location of Munitions, Ease of Access, and Status of Property and constitutes 40% of the EHE Module score.
- **Receptor Factor.** Has the data elements Population Density, Population Near Hazard, Types of Activities/Structures, and Ecological and/or Cultural Resources and constitutes 20 percent of the EHE Module score.

The Camp O'Ryan Rifle Range MRS (NYHQ-008-R-02) received the alternative EHE Module rating of No Known or Suspected Explosive Hazard. This module rating was based on the MRS being a small arms range, no MEC being identified at the MRS during the SI (Parsons, 2012), and having no sustained history of MEC use during training. While two MPPEH items were found during the RI field mobilization in 2019, no other items were encountered during the subsequent field mobilizations. The MRS contains the target wall of a former small arms range; bullet fragments, metal targets, and spent casings were observed during RI sampling activities.

The EHE Module rating is preliminary and is awaiting stakeholder input. The EHE Module worksheet tables are presented in **Appendix G** and summarized in **Section 8.4**.

8.2 Chemical Warfare Material Hazard Evaluation Module

The Chemical Warfare Materiel (CWM) Hazard Evaluation (CHE) Module provides an evaluation of the chemical hazards associated with the physiological effects of CWM. The CHE Module is used only when CWM in the form of MEC or MC are known or suspected of being present at an MRS. Like the EHE Module, the CHE Module has three factors, each of which has two to four data elements that are intended to assess the conditions at an MRS. These factors are as follows:

- **CWM Hazard Factor.** Has the data elements CWM Configuration and Sources of CWM and constitutes 40% of the CHE score.
- **Accessibility Factor.** Focuses on the potential for receptors to encounter the CWM known or suspected to be present on an MRS. This factor consists of the data elements Location of CWM, Ease of Access, and Status of Property and constitutes 40% of the CHE score.
- **Receptor Factor.** Focuses on the human and ecological populations that may be impacted by the presence of CWM. This factor has the data elements Population Density, Population Near Hazard, Types of Activities/Structures, and Ecological and/or Cultural Resources and constitutes 20% of the CHE score.

Similar to the EHE Module, each data element is assigned a numeric value, and the sum of these values is the CHE Module score, which is used to determine the corresponding CHE Module rating. If CWM is not known or suspected, then the CHE Module rating is No Known or Suspected CWM Hazard.

The MRS received the Alternative CHE Module rating of No Known or Suspected CWM Hazard due to the fact that no historical or physical evidence that indicated CWM was present at the MRS was found during SI or RI activities. The CHE Module ratings are preliminary and awaiting stakeholder input. The worksheet tables are presented in **Appendix G** and summarized in **Section 8.4**.

8.3 Health Hazard Evaluation Module

The Health Hazard Evaluation (HHE) Module provides a consistent DoD-wide approach for evaluating the relative risk to human health and the environment posed by contaminants (i.e., MC) present at an MRS. The module has three factors that are as follows:

- **Contamination Hazard Factor (CHF).** Evaluates potential risk posed by contaminants and contributes a level of High (H), Medium (M), or Low (L) based on Significant, Moderate, or Minimal contaminants present, respectively.
- **Migration Pathway Factor (MPF).** Assesses the potential for MC or incidental contaminants to migrate from an MRS and contributes a level of H, M, or L based on Evident, Potential, or Confined pathways, respectively.

- **Receptor Factor (RF).** Evaluates the presence of receptors that may be exposed and contributes a level of H, M, or L based on Identified, Potential, or Limited receptors, respectively.

The HHE builds on the DoD Relative Risk Site Evaluation framework that is used in the Installation Restoration Program. The CHF, MPF, and RF are based on quantitative evaluation of MC and/or CERCLA hazardous substances and a qualitative evaluation of pathways and human and ecological receptors in surface soil, groundwater, surface water, and sediment. The HHE does not address subsurface soils. In addition, the HHE does not consider air as a pathway because the risk through this medium from DoD MMRP sites with soil contamination is generally minimal.

The H, M, and L levels for the CHF, MPF, and RF are combined in a matrix to obtain composite three-letter combination levels that integrate considerations of all three factors. The three-letter combination levels are organized by frequency and the combination of the frequencies results in the HHE Module rating.

The Camp O'Ryan Rifle Range MRS (NYHQ-008-R-02) received the HMM media combination level for surface soil using data from the 2009 NYSDEC Site Investigation (NYSDEC, 2009) and from samples collected as a part of this RI. The MRS received the MLM media combination level for human endpoint sediment, and the MMM media combination level for ecological endpoint sediment using data from samples collected as a part of this RI. Using surface water and shallow groundwater metals concentrations from samples collected as a part of the 2011 Woods Hole Group Preliminary Site Investigation Report (Woods Hole Group, Inc., 2011), the Camp O'Ryan Rifle Range MRS also received the LLM media combination level for groundwater, the LLM media combination level for human endpoint surface water, and the LLM media combination level for ecological endpoint surface water.

Since the highest media level rating was HMM, it resulted in an HHE Module Rating of C. The HHE Module rating is based on the soil and sediment receptor factor being M because receptors have unrestricted access to sediment and soil at the MRS where MC have moved or can move. The HHE Module worksheet tables are presented in **Appendix G** and summarized in **Section 8.4**.

8.4 Munitions Response Site Prioritization Protocol Scores

In accordance with the DoD MRSPP Primer (DoD, 2007), the MRS is assigned an MRSPP Priority ranging from 1 to 8. Priority 1 indicates the highest potential hazard, and Priority 8 indicates the lowest potential hazard. Only a site with a potential Chemical Warfare Hazard can receive a Priority of 1. The priority is determined by selecting the highest rating from among the EHE, CHE, and HHE Modules. For example, if the EHE rating is 2, the CHE rating is 5, and the HHE rating is 4, the priority assigned would be 2. An alternative rating may be selected for the MRS if it meets the criteria. The priority will be used to determine the future funding sequence of the MRS for further munitions response action.

The overall MRSPP priority for the Camp O'Ryan Rifle Range MRS (NYHQ-008-R-02) is 4 based on the HHE Module rating. The HHE Module rating was C, which corresponds to an

MRSPP priority of 4. The CHE and EHE Module ratings were No Known or Suspected Hazard. The MRSPP priority score is summarized in **Table 8-1**.

Table 8-1. MRS Priority Summary

MRSPP Module	Factors			Module Total	Module Rating
	Hazard	Accessibility/ Migration	Receptor		
EHE Module	4	25	14	43	NKSH
CHE Module	0	0	0	0	NKSH
HHE Module	H	M	M	HMM	🟨 **C (4)**

Notes:

🟨 MRSPP priority

MRSPP = Munitions Response Site Prioritization Protocol

NKSH = No Known or Suspected Hazard

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9 Summary and Conclusions

This RI compiled and evaluated information and data relating to the potential contamination associated with the historical use of small arms training activities conducted at the Camp O'Ryan Rifle Range MRS. The sampling approach was designed to characterize the nature and extent of MC contamination in soil. For data interpretation purposes and for assessing risks, the MRS was divided into five DUs (100-yard Target Berm, Target Area, Target Berm-Hillside, Target Berm-Ponded, and Wet Meadow Area). The first three DUs are target features that could be source areas of potential contamination as indicated by site history and remaining physical evidence of the target areas. The Target Berm-Ponded and Wet Meadow Area DUs were identified during RI field work as a location where MC from the Target Berm-Hillside might accumulate or otherwise be present due historical training activities.

Field investigation activities included XRF screening of the target feature DUs to evaluate the lateral extent of MC, the collection of surface soil samples using ISM at the DUs for evaluating risks and collecting discrete subsurface soil samples from all DUs to delineate vertical extent of MC contamination. To determine if small arms metals were present within sediment areas abutting the east and west boundary of the Target Berm-Hillside DU, sediment samples were also collected. A soil reference area was also sampled to assess background conditions.

These data and information were evaluated and used to interpret the nature and extent of MC, evaluate potential exposures of receptors to MC, complete a risk-based screening for MC, and complete the MRSPP for the MRS.

9.1 Summary of Remedial Investigation Activities

The nature and extent of MC for each DU and the results of a HHRA and SLERA are summarized below. The extent of each DU was determined by screening discrete lead results in soil to a conservative human health screening levels. DUs with exceedances of screening levels for all four MC were then evaluated in an HHRA and SLERA.

9.1.1 100-yard Firing Berm DU

The data collected at the 100-yard Firing Berm DU were sufficient to delineate the lateral extent of small arms metals at the DU. Exceedances of the human health criterion for lead were observed in XRF screening results and resulted in step-out sampling that enlarged the DU area to 1.32 acres. ISM sample results indicate that lead is present in soil at the human health screening criterion for lead (**Table 5-4**). Subsurface soil sampling showed lead present above human health screening criteria and antimony present above ecological screening criteria in one 12- to 18-inches bgs interval sample. At the 24- to 30-inches bgs depth interval, all MC metals concentrations were below human and ecological screening criteria (**Table 5-5**).

9.1.2 Target Area DU

The data collected at the Target Area DU were sufficient to delineate the lateral extent of small arms metals at the DU. Exceedances of the human health criterion for lead were observed in XRF screening results and resulted in step-out sampling that enlarged the DU area to 0.71 acres. ISM sample results indicate that lead is present in soil above the human health screening criterion, and antimony is present above the ecological screening criterion (**Table 5-4**). Subsurface soil sampling showed lead present above its human health screening criterion and antimony present above its ecological screening criterion in the 12- to 18-inches bgs interval at one location. At the 24-30-inches bgs depth interval, all MC metals concentrations were below both human and ecological screening criteria **Table 5-5**.

9.1.3 Target Berm – Hillside DU

The data collected at the Target Berm-Hillside DU were sufficient to delineate the lateral extent of small arms metals at the DU. Exceedances of the human health criterion for lead were observed in XRF screening results across the hillside, with the highest concentrations present at the western boundary adjacent to the Target Berm – Ponded DU. Exceedances resulted in step-out sampling that enlarged the DU area to 18.51 acres . ISM sample results indicate that lead and zinc are present in soil above human health screening criteria, and antimony is present above its ecological screening criterion (**Table 5-4**). Subsurface soil sampling showed antimony present above its ecological screening criterion in the 12- to 18-inches bgs interval at one sample location. Results from the deeper sample showed lead, copper, and antimony concentrations present above human health screening criteria and antimony above ecological screening criterion; however, increase in MC concentrations is likely due to mechanical movement of soil during active range use to fill in bullet pockets or the collection of bullet fragments against a hard cobble layer encountered at 25 inches bgs. Lead was present above human health screening criterion in the 12- to 18-inches bgs interval sample at one other location (**Table 5-5**).

9.1.4 Target Berm – Ponded DU

The Target Berm – Ponded DU is a low-lying area that is frequently inundated during and after precipitation events between the target wall and the base of the Target Berm – Hillside DU. Eight sediment samples were collected in evenly spaced distances to represent the entire area. Each of the eight samples collected at the Target Berm – Ponded DU had concentrations of lead exceeding the human health screening criterion, and antimony exceeded human health screening criterion in the sample with the highest lead concentration. All MC concentrations exceeded ecological screening criteria in six of the eight sediment samples, and at least one MC concentration exceeded ecological screening criteria in all eight samples. **Table 5-6** presents the results of the sediment sampling at this location.

9.1.5 Wet Meadow DU

The Wet Meadow DU is a wetland area abutting the eastern edge of the Target Berm – Hillside DU. MC present within the Wet Meadow DU is presumably due to overshot and ricochet during historical training. Eight sediment samples were collected in evenly spaced distances to represent the entire area. Four of the eight samples had concentrations of lead above the human health screening criterion, and three samples had lead concentrations above ecological screening criterion. Copper and zinc concentrations exceeded ecological screening criterion in four and five samples, respectively. Antimony did not exceed human health or ecological screening criteria in any samples. **Table 5-6** presents the results of the sediment sampling at this location.

9.1.6 HHRA Results

For the HHRA, the risk-based screening and secondary lead screening evaluation determined the following:

- Lead is a surface soil ISM COPC for the 100-yd Firing Berm, Target Area, and Target Berm – Hillside DUs.
- Copper and zinc are surface soil ISM COPCs for the Target Berm – Hillside DU.
- Antimony and lead are sediment COPCs for the Target Berm – Ponded DU; additionally, lead is a sediment COPC for the Wet Meadow DU.
- The range of metals concentrations for the ISM COPC were above the background reference area ISM soil results, thus indicating that concentrations are likely site-related.

Soil-related exposure pathways include incidental ingestion, dermal contact, and inhalation of wind-blown particulates from soil. Sediment-related exposure pathways include incidental ingestion and dermal contact with MC in inundated areas of the MRS. The HHRA results are summarized below:

100-yd Firing Berm DU:
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to ISM surface soil (0 to 6 inches bgs).

Target Area DU:
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to ISM surface soil (0 to 6 inches bgs).

Target Berm – Hillside DU:
- Non-cancer hazard results indicated that adverse health effects are not likely for the any of the human receptors exposed to ISM surface soil (0 to 6 inches bgs).
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to ISM surface soil (0 to 6 inches bgs).

Target Berm – Ponded DU:
- Non-cancer hazard results indicated that adverse health effects are not likely for the any of the potential human receptors exposed to sediment.
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are possible for the child site visitor/recreational user and hypothetical child resident from exposure to sediment.
- The heavily vegetated and marshy terrain of the Target Berm-Ponded DU makes access to this DU difficult, especially for a young child receptor ages 0 to 6 years old; the lead modeling results for sediment are likely overestimated due to limited access and conservative modeling assumptions.

Wet Meadow DU:

- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to sediment.

No unacceptable risk to human receptors was determined at the 100-yard Firing Berm, Target Area, Target Berm-Hillside, and Wet Meadow DUs. However, adverse health effects are possible from exposure to lead in sediment for the child resident/child recreational user at the Target Berm-Ponded DU.

If the USEPA and NYSDEC revised their policy for the target BLL (i.e., 10 µg/dL to 5 µg/dL), then adverse health effects would be possible from exposure to soil for the child receptors at the Target Berm-Hillside DU. Adverse health effects would also be possible for the outdoor worker, construction worker, and the child resident/recreational user from exposure to sediment at Target Berm – Ponded DU at the lower target BLL.

9.1.7 SLERA Results

In the SLERA, potential ecological exposure was evaluated under current conditions using RI analytical data collected in relevant exposure media. The results of the SLERA, BERA Step 3a COPEC refinement, and consideration of the uncertainties present in the evaluation support the following SMDP for the MRS:

- "There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk" (USEPA, 1997).
    - Negligible Risk
        - Soil macroinvertebrate community
        - Benthic macroinvertebrate community (Wet Meadow DU)
        - Terrestrial wildlife community
        - Aquatic and semi-aquatic wildlife community
        - Groundwater to surface water pathway
- "The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted" (USEPA, 1997).
        - Benthic macroinvertebrate community (Target Berm - Ponded DU)
- COCs
    - Lead was identified as a direct contact based COCs in sediment at the Target Berm - Ponded DU within the Camp O'Ryan Rifle Range MRS.

9.2 Summary and Recommendations

The RI achieved the DQOs established based on the preliminary CSM and as documented in the QAPP. Based on the results of the RI, MC in soil and sediment within the MRS have been sufficiently characterized. MC does not appear to be migrating beyond the immediate vicinity of the target feature DUs with only minimal impact observed at the adjacent Wet Meadow DU. It is recommended that the MRS boundary be revised to include the expanded Target Berm – Hillside DU and the added Wet Meadow DU (**Figure 9-1**). The presence of unacceptable risks to human health at the Target Berm – Ponded DU warrants an FS for the Camp O'Ryan Rifle Range MRS 2. It was also determined that a potential exists for adverse ecological effects to the benthic macroinvertebrate community at this DU. The next steps after an FS would be to prepare a proposed plan to convey RI findings and any proposed action to the public, followed by a decision document to formally document the remediation plan at the MRS.

100 Yard Firing Berm:	1.39 Acres
Target Area:	0.71 Acres
Target Berm Hillside:	18.51 Acres
Target Berm -Ponded:	0.42 Acres
Wet Meadow:	2.58 Acres
Background Area:	0.83 Acres
Revised MRS Boundary:	42.21 Acres

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	11/20/2020
SCALE	1:3,600	CHK BY	JW	11/20/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	AS	11/20/2020

N

Camp O'Ryan Revised MRS Boundary

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 9-1

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Appendix A
Field Forms

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: 100 Yard Firing Berm (DU 01)

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB01X	01	A	6/3/19 MW	15	20	3	Avg=17.25
CB01X	01	B			15	2	
CB01X	01	C			18	3	
CB01X	01	D			16	2	
CB01X	02	A	6/3/19 MW	16	20	3	Avg=19
CB01X	02	B			19	2	
CB01X	02	C			19	2	
CB01X	02	D			18	3	
CB01X	03	A	6/3/19 MW	15	13	2	Avg=14.75
CB01X	03	B			16	2	
CB01X	03	C			16	2	
CB01X	03	D			14	2	
CB01X	04	A	6/3/19 MW	16	29	3	Avg=23.5
CB01X	04	B			28	3	
CB01X	04	C			20	2	
CB01X	04	D			17	2	
CB01X	05	A	6/3/19 MW	15	44	3	Avg=34.75
CB01X	05	B			31	3	
CB01X	05	C			32	3	
CB01X	05	D			32	3	
CB01X	06	A	6/3/19 MW	19	17	2	Avg=19
CB01X	06	B			20	3	
CB01X	06	C			19	3	
CB01X	06	D			20	3	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: 100 Yard Firing Berm (DU 01) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB01X	7	A	6/3/19 MW	18	18	2	Avg=17.75
CB01X	7	B			18	2	
CB01X	7	C			17	2	
CB01X	7	D			18	2	
CB01X	8	A	6/3/19 MW	16	15	2	Avg=16.75
CB01X	8	B			19	3	
CB01X	8	C			15	2	
CB01X	8	D			18	2	
CB01X	9	A	6/3/19	17	20	3	Avg=24.75
CB01X	9	B			26	3	
CB01X	9	C			28	3	
CB01X	9	D			25	3	
CB01X	10	A	6/3/19 MW	17	26	3	Avg=25.5
CB01X	10	B			28	3	
CB01X	10	C			23	2	
CB01X	10	D			25	3	
CB01X	11	A	6/3/19 MW	15	16	2	Avg= 19.75
CB01X	11	B			21	2	
CB01X	11	C			23	2	
CB01X	11	D			19	2	
CB01X	12	A	6/6/19 MW	15	24	3	Avg= 23.78
CB01X	12	B			21	3	
CB01X	12	C			27	2	
CB01X	12	D			23	3	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: 100 Yard Firing Berm (DU 01) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB01X	13	A	6/6/19 MW	15	13	2	Avg=18.5
CB01X	13	B			26	3	
CB01X	13	C			17	3	
CB01X	13	D			18	3	
CB01X	14	A	6/6/19 MW	15	27	3	Avg=32.75
CB01X	14	B			38	3	
CB01X	14	C			25	3	
CB01X	14	D			41	3	
CB01X	15	A	6/6/19 MW	15	22	3	Avg: 455.25
CB01X	15	B			15	2	
CB01X	15	C			15	2	
CB01X	15	D			17	2	
CB01X	16	A	6/6/19 MW	15	17	2	Avg=17.5
CB01X	16	B			12	2	
CB01X	16	C			21	2	
CB01X	16	D			20	2	
CB01X	17	A	6/6/19 MW	16	26	3	Avg=25.25
CB01X	17	B			26	3	
CB01X	17	C			27	2	
CB01X	17	D			22	2	
CB01X	18	A	6/6/19 MW	16	19	2	Avg=20.75
CB01X	18	B			19	2	
CB01X	18	C			27	2	
CB01X	18	D			18	2	

Location: 100 Yard Firing Berm (DU 01) - cont.

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB01X	19	A	6/6/19 mw	18	31	3	Avg=29
CB01X	19	B			24	3	
CB01X	19	C			24	3	
CB01X	19	D			37	3	
CB01X	20	A	6/3/19 MW	15	18	3	Avg=21
CB01X	20	B			25	4	
CB01X	20	C			19	3	
CB01X	20	D			22	3	
CB01X	21	A	6/3/19	15	10	2	Avg=15
CB01X	21	B			16	2	
CB01X	21	C			19	2	
CB01X	21	D			15	2	
CB01X	22	A	6/6/19 MW	17	20	2	Avg=21
CB01X	22	B			20	2	
CB01X	22	C			19	2	
CB01X	22	D			25	2	
CB01X	23	A	6/6/19 MW	17	22	3	Avg=19.5
CB01X	23	B			19	3	
CB01X	23	C			16	3	
CB01X	23	D			21	3	
CB01X	24	A	6/6/19 mw	17	57	3	Avg=59.75
CB01X	24	B			69	3	
CB01X	24	C			60	3	
CB01X	24	D			53	3	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: 100 Yard Firing Berm (DU 01) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB01X	25	A	6/6/19 MW	17	43	3	Avg=40.75
CB01X	25	B			42	3	
CB01X	25	C			41	3	
CB01X	25	D			37	3	
CB01X	26	A	6/6/19 MW	18	21	2	Avg=21.25
CB01X	26	B			20	2	
CB01X	26	C			20	2	
CB01X	26	D			25	2	
CB01X	27	A	6/6/19 MW	18	27	3	Avg=30.25
CB01X	27	B			25	2	
CB01X	27	C			38	3	
CB01X	27	D			31	3	
CB01X	28	A	6/6/19 MW	18	31	3	Avg=33
CB01X	28	B			34	3	
CB01X	28	C			42	3	
CB01X	28	D			25	3	
CB01X	29	A	6/8/19 MW	18	38	3	Avg=34.5
CB01X	29	B			40	3	
CB01X	29	C			27	3	
CB01X	29	D			33	3	
CB01X	30	A	6/3/19 MW	19	42	3	Avg= 35.25
CB01X	30	B			29	3	
CB01X	30	C			37	3	
CB01X	30	D			33	3	

Location: 100 Yard Firing Berm (DU 01) - cont.

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB01X	31	A	6/3/19 MW	15	18	2	Avg=17.5
CB01X	31	B			17	2	
CB01X	31	C			16	2	
CB01X	31	D			19	2	
CB01X	32	A	6/3/19 MW	17	15	2	Avg= 17.5
CB01X	32	B			22	3	
CB01X	32	C			17	3	
CB01X	32	D			16	2	
CB01X	33	A	6/3/19 MW	15	57	3	Avg=57.5
CB01X	33	B			58	3	
CB01X	33	C			54	3	
CB01X	33	D			61	3	
CB01X	34	A	6/3/19	19	372	7	Avg= 357.25
CB01X	34	B			398	7	
CB01X	34	C			318	6	
CB01X	34	D			341	7	
CB01X	35	A	6/3/19 MW	10	39	3	Avg=40.25
CB01X	35	B			44	3	
CB01X	35	C			38	3	
CB01X	35	D			40	3	
CB01X	36	A	6/3/19 MW	16	38	3	Avg=37
CB01X	36	B			34	3	
CB01X	36	C			37	3	
CB01X	36	D			39	3	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location:100 Yard Firing Berm (DU 01) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB01X	37	A	6/3/19 MW	19	60	4	Avg=61.75
CB01X	37	B			61	3	
CB01X	37	C			62	3	
CB01X	37	D			64	3	
CB01X	38	A	6/3/19 MW	18	195	5	Avg=215
CB01X	38	B			215	7	
CB01X	38	C			236	5	
CB01X	38	D			214	5	
CB01X	39	A	6/3/19 MW	17	341	7	Avg =293
CB01X	39	B			233	5	
CB01X	39	C			309	6	
CB01X	39	D			289	6	
CB01X	40	A	6/3/19	18	86	3	Avg=90.5
CB01X	40	B			99	4	
CB01X	40	C			93	3	
CB01X	40	D			84	3	
~~Step-out Samples (if necessary)~~ MW							
CB01X	41	A	6/3/19 MW	19	16	2	Avg= 17
CB01X	41	B			17	3	
CB01X	41	C			16	3	
CB01X	41	D			19	3	
CB01X	42	A	6/3/19 MW	16	25	3	Avg=27.75
CB01X	42	B			30	3	
CB01X	42	C			30	3	
CB01X	42	D			26	3	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location:100 Yard Firing Berm (DU 01) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB01X	43	A	6/3/19 MW	19	49	3	
CB01X	43	B			41	3	Avg=46
CB01X	43	C			49	3	
CB01X	43	D			45	3	
CB01X	44	A	6/3/19 MW	15	85	4	Avg=80.75
CB01X	44	B			82	4	
CB01X	44	C			77	3	
Step out CB01X	44	D			79	3	
CB01X	45	A	6/4/19 MW	15	23	3	Avg=20
CB01X	45	B			15	2	
CB01X	45	C			22	2	
CB01X	45	D			20	2	
CB01X	46	A	6/4/19 MW	18	14	2	Avg=17
CB01X	46	B			18	2	
CB01X	46	C			21	2	
CB01X	46	D			15	2	
CB01X	47	A	6/4/19 MW	19	17	2	Avg=18.5
CB01X	47	B			17	2	
CB01X	47	C			21	3	
CB01X	47	D			19	2	
CB01X	48	A	6/4/19 MW	17	34	3	Avg=37.25
CB01X	48	B			40	3	
CB01X	48	C			40	3	
CB01X	48	D			35	3	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: 100 Yard Firing Berm (DU 01) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB01X	49	A	6/4/19 MW	15	18	3	Avg = 18.5
CB01X	49	B			23	3	
CB01X	49	C			16	2	
CB01X	49	D			17	2	
CB01X	50	A	6/4/19 MW	15	26	3	Avg = 23.5
CB01X	50	B			24	3	
CB01X	50	C			23	3	
CB01X	50	D			21	3	
CB01X	51	A	6/4/19 MW	18	27	3	Avg = 20.75
CB01X	51	B			15	2	
CB01X	51	C			24	3	
CB01X	51	D			17	2	
CB01X	52	A	6/4/19 MW	18	25	2	Avg = 27.25
CB01X	52	B			33	3	
CB01X	52	C			25	3	
CB01X	52	D			26	3	
CB01X	53	A	6/4/19 MW	18	48	3	Avg = 38.25
CB01X	53	B			35	3	
CB01X	53	C			37	3	
CB01X	53	D			33	3	
CB01X	54	A	6/4/19 MW	19	23	3	Avg = 24.25
CB01X	54	B			26	3	
CB01X	54	C			25	3	
CB01X	54	D			23	3	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location:100 Yard Firing Berm (DU 01) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB01X	55	A	6/4/19 MW	19	23	3	Avg=13
CB01X	55	B			18	2	
CB01X	55	C			ND	11	
CB01X	55	D			11	2	
CB01X	56	A					
CB01X	56	B					
CB01X	56	C					
CB01X	56	D					
CB01X	57	A					
CB01X	57	B					
CB01X	57	C					
CB01X	57	D					
CB01X	58	A					
CB01X	58	B					
CB01X	58	C					
CB01X	58	D					
CB01X	59	A					
CB01X	59	B					
CB01X	59	C					
CB01X	59	D					
CB01X	60	A					
CB01X	60	B					
CB01X	60	C					
CB01X	60	D					

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Area (DU 02)

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB02X	01	A	6/5/19 MW	18	20	2	Avg=18.25
CB02X	01	B			17	2	
CB02X	01	C			17	2	
CB02X	01	D			19	2	
CB02X	02	A	6/5/19 MW	15	21	3	Avg=20
CB02X	02	B			23	3	
CB02X	02	C			16	3	
CB02X	02	D			20	3	
CB02X	03	A	6/5/19 MW	15	89	4	Avg=97.75
CB02X	03	B			97	4	
CB02X	03	C			107	4	
CB02X	03	D			98	4	
CB02X	04	A	6/5/19 MW	15	90	4	Avg=93
CB02X	04	B			107	4	
CB02X	04	C			86	4	
CB02X	04	D			89	4	
CB02X	05	A	6/5/19 MW	16	73	3	Avg=77.55
CB02X	05	B			74	3	
CB02X	05	C			85	4	
CB02X	05	D			79	3	
CB02X	06	A	6/5/19 MW	16	58	3	Avg=63.75
CB02X	06	B			69	3	
CB02X	06	C			64	3	
CB02X	06	D			64	3	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Area (DU 02) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB02X	7	A	6/6/19 mw	15	81	3	Avg=78
CB02X	7	B			73	3	
CB02X	7	C			69	3	
CB02X	7	D			89	3	
CB02X	8	A	6/6/19 mw	15	78	3	Avg=82.25
CB02X	8	B			71	3	
CB02X	8	C			89	3	
CB02X	8	D			91	3	
CB02X	9	A	6/6/19 mw	15	215	5	Avg=189.5
CB02X	9	B			216	5	
CB02X	9	C			130	4	
CB02X	9	D			197	5	
CB02X	10	A	6/6/19 mw	16	243	6	Avg=249.75
CB02X	10	B			246	6	
CB02X	10	C			213	6	
CB02X	10	D			297	6	
CB02X	11	A	6/6/19 mw	16	166	7	Avg=170.75
CB02X	11	B			174	5	
CB02X	11	C			172	5	
CB02X	11	D			171	5	
CB02X	12	A	6/6/19 mw	17	289	6	Avg=304.25
CB02X	12	B			298	6	
CB02X	12	C			306	6	
CB02X	12	D			324	6	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Area (DU 02) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB02X	13	A	6/6/19 MW	17	204	5	Avg=243.25
CB02X	13	B			256	6	
CB02X	13	C			244	6	
CB02X	13	D			249	5	
CB02X	14	A	6/6/19 MW	17	386	7	Avg= 373
CB02X	14	B			357	7	
CB02X	14	C			372	7	
CB02X	14	D			377	7	
CB02X	15	A	6/3/19 MW	17	331	7	1 bullet found
CB02X	15	B			298	6	
CB02X	15	C			290	6	Avg = 305.25
CB02X	15	D			302	6	
CB02X	16	A	6/3/19 MW	17	11	2	Avg=15.5
CB02X	16	B			19	2	
CB02X	16	C			18	2	
CB02X	16	D			14	2	
CB02X	17	A	6/3/19 MW	18	35	3	Avg= 27.75
CB02X	17	B			28	2	
CB02X	17	C			26	3	
CB02X	17	D			25	3	
CB02X	18	A	6/3/19 MW	16	135	4	Avg= 154.75
CB02X	18	B			183	5	
CB02X	18	C			142	4	
CB02X	18	D			159	4	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Area (DU 02) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB02X	19	A	6/3/19 MW	18	101	4	Avg = 102.5
CB02X	19	B			101	4	
CB02X	19	C			103	4	
CB02X	19	D			105	4	
CB02X	20	A	6/3/19 MW	17	45	3	Avg = 41.75
CB02X	20	B			52	3	
CB02X	20	C			37	3	
CB02X	20	D			33	3	
CB02X	21	A	6/3/19 MW	15	62	3	Avg = 62
CB02X	21	B			62	3	
CB02X	21	C			61	3	
CB02X	21	D			63	3	
CB02X	22	A	6/3/19 MW	15	48	3	Avg = 41.75
CB02X	22	B			38	3	
CB02X	22	C			42	3	
CB02X	22	D			39	3	
CB02X	23	A	6/3/19 MW	15	32	3	Avg = 33
CB02X	23	B			40	3	
CB02X	23	C			23	3	
CB02X	23	D			37	3	
CB02X	24	A	6/3/19 MW	12	44	3	2 bullets observed
CB02X	24	B			41	3	
CB02X	24	C			52	3	Avg = 46
CB02X	24	D			47	3	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Area (DU 02) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB02X	25	A	6/3/19 MW	17	70	3	Avg=85.75
CB02X	25	B			94	3	
CB02X	25	C			89	4	
CB02X	25	D			90	4	
CB02X	26	A	6/3/19 MW	15	80	4	Avg=80.75
CB02X	26	B			82	4	
CB02X	26	C			84	4	
CB02X	26	D			77	4	
CB02X	27	A	6/3/19 MW	12	23	3	Avg = 29.5
CB02X	27	B			29	3	
CB02X	27	C			37	3	
CB02X	27	D			29	3	
CB02X	28	A	6/3/19 MW	18	97	4	Avg = 113
CB02X	28	B			113	4	
CB02X	28	C			117	4	
CB02X	28	D			125	4	
CB02X	29	A	6/3/19 MW	15	223	4	Avg = 214.5
CB02X	29	B			206	5	
CB02X	29	C			210	5	
CB02X	29	D			219	5	
CB02X	30	A	6/3/19 MW	18	121	4	Avg = 112
CB02X	30	B			115	5	
CB02X	30	C			103	4	
CB02X	30	D			109	4	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Area (DU 02) - cont.

Step-out Samples (if necessary)							
ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB02X	31	A	6/7/19 MW	15%	21	3	Avg = 19.5
CB02X	31	B			30	3	
CB02X	31	C			12	3	
CB02X	31	D			15	3	
CB02X	32	A	↓	12	46	3	Avg = 38.5
CB02X	32	B			44	3	
CB02X	32	C			23	3	
CB02X	32	D			41	3	
CB02X	33	A		12	34	3	Avg = 27.75
CB02X	33	B			27	3	
CB02X	33	C			23	3	
CB02X	33	D			27	3	
CB02X	34	A		15	20	3	Avg = 28.25
CB02X	34	B			41	3	
CB02X	34	C			25	3	
CB02X	34	D			27	3	
CB02X	35	A		12	16	3	Avg = 20
CB02X	35	B			20	3	
CB02X	35	C			28	3	
CB02X	35	D			16	3	
CB02X	36	A		12	24	3	Avg = 13.75
CB02X	36	B			ND	<7	
CB02X	36	C			18	3	
CB02X	36	D			13	3	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Area (DU 02) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB02X	37	A	6/7/19 MW	16	34	3	Avg 31.75
CB02X	37	B			27	3	
CB02X	37	C			34	3	
CB02X	37	D			32	3	
CB02X	38	A		15	27	3	Avg= 20.25
CB02X	38	B			22	3	
CB02X	38	C			15	3	
CB02X	38	D			17	3	
CB02X	39	A		19	27	3	Avg= 37.50
CB02X	39	B			33	3	
CB02X	39	C			43	3	
CB02X	39	D			47	3	
CB02X	40	A		19	70	3	Avg= 62.25
CB02X	40	B			59	4	
CB02X	40	C			56	3	
CB02X	40	D			64	3	
CB02X	41	A		17	28	3	Avg= 32
CB02X	41	B			36	3	
CB02X	41	C			32	3	
CB02X	41	D			32	3	
CB02X	42	A		16	34	3	Avg=35
CB02X	42	B			44	3	
CB02X	42	C			31	3	
CB02X	42	D			29	3	

Day 1 Camp O'Ryan 6/03/19
Sunny 50°F

- 0800 - Field personnel arrive on site
- 0805 - Morning Tailgate Meeting
  - On-site: M. Wallace, L. Councell
- 0815 - Surveying area to identify safest path in.

0825 - Begin gridding 100ydDU
1100 - Finish gridding 100ydDU
1105 - Begin sampling XRF 100ydDU
1330: Finish Sampling XRF 100ydDU
1345: Return to car
- break for Lunch

1445: Resume Work
1450: Begin grid of Target Area DU
[NOTE: DEC rep on site from 11a-1p]
1555: Completed Grid of Target Area DU
- Begin XRF sampling

1700: Complete sampling for XRF
1705: Clean up Site/End of day TGM
1715: Field personnel leave site
1800: Arrive at hotel
- Begin XRF screening

☆Passed Cal check☆

MW

Scale: 1 square = ________

Rite in the Rain

6/4/19
Day 2: Camp O'Ryan Sunny 50°F

- 0800-Field Personnel Arrive on site
- 0805-Daily Tailgate Meeting
  - On-site: M. Wallace, L. Councell
- 0820: Set up to continue gridding of DU's
- 0830-Begin gridding Target Berm DU
- 0905-Determined Target Berm DU is not passible & soil sampling impossible due to ponded water
- 1000-DEC ON SITE
- 1030-NCR DRAFTED-VERBALLY AGREED by DEC
  - Target Berm DU to be split into separate DU's
    - Target-Hillside
    - Target-Ponded.

1100-Complete Step-outs @ 100yd firing berm DU
1400-Complete Step outs @ Target Area DU
1430-Begin gridding Target Hillside
1630-Complete gridding of target hillside
1645-Leave site.

MW 6/4/19

Scale: 1 square = ________

6/10/19

Day 3: Camp O'Ryan CLOUDY, RAINY, 70°

- 0730 - Field Personnel arrive on site.
  - M. Wallace, L. Councell
- 0735 - DTM, discussed exit strategy for possible severe weather this afternoon
- 0740 - Begin sampling Target - Hillside DU
  - L. Councell to begin clearing around nodes for discrete surface sampling
  - M. Wallace to XRF already collected samples & update grid w/ necessary step-outs.
- 0800 - XRF Cal Check - passed S/N 500397
- 1000 - Completed XRF screening of Target Area DU step outs
  - No exceedences found / No further stepouts
  - Target Area DU succesfully delineated.

1245 - Found possible UXO ☆ STOP WORK ORDERED ☆

1430 - Wyoming County Sherriff on-site

Sgt Dan Hummel

Wyoming County 585-786-8989

Scale: 1 square = ________

1445 - Device inspected by Sheriff
1500 - Wyoming County to Contact Eerie County Bomb Squad for help determining what type of device unidentified item is & how best to proceed
- Determined to be CS gas or smoke grenade
- 19-00-4510 - for complaints
↳ Wyoming County Sherriffs office.

- 1515 - Sgt Hummel leaves site
- 1530 - M. Wallace continue XRF
  - Cal check S/N 500397
    - passed

1610
- Eerie County bomb squad on-site
  - John Szczepanski: 716-858-2901
  - Erik Tamol: 585-322-6196
- 1615 escort bomb squad to site
- 1700 - Field team departs site

MW
6-4-14

Scale: 1 square =

Day 4: Camp O'Ryan

6/6/19
60's Fog

- 0915: Field personnel arrive on-site
  - M. Wallace, L. Councell
- 0930: DTM - discussed goals to complete & safety protocols

09:40: Begin collecting GPS points from completed DU's

12:35: Completed GPS & Flag pickup at 100yd Firing Berm DU & Target Area DU

12:45 - Field personnel leave site.

1500 - XRF resuming back at hotel
- passed cal check

MW 6/6/19

Scale: 1 square = ______

1445- Device inspected by Sheriff
1500- Wyoming County to Contact Eerie County Bomb Squad for help determining what type of device unidentified item is & how best to proceed
- Determined to be CS gas or smoke grenade
- 19-00-4510 - for complaints
↳ Wyoming County Sherriffs Office.

- 1515 - Sgt Hummel leaves site
- 1530 - M. Wallace continue XRF
    - Cal check S/N 500397
        - passed
- 1610 Eerie County bomb squad on-site
    - John Szczepanski: 716-858-2901
    - Erik Tamol: 585-322-6194
- 1615 escort bomb squad to site
- 1700 - Field team departs site

MW
6-4-19

7/6/2020 90's Sun

0745: Field team arrives on site
0800: Tailgate safety meeting
discussed heat, ticks, UXO
0830: Site walk to identify DU's
familiarize new workers with site
0930: Complete site walk
0945: Move to Target Berm Hillside DU
to clear area for sampling.
1235: Break for lunch/AC
1300: Investigate background area
1400: Begin reflagging target area
1500: Finish flagging Target area
1530: Begin flagging Target berm
1630: FIELD TEAM CLEANS UP SITE
-SUNDOWN TAILGATE
1645 - Field team departs site.

7/6

Scale: 1 square = ______

7/7/2020
90's Sunny

0800: AECOM FIELD TEAM
ARRIVES ON LIGHT

0815: Tailgate Safety meeting
-discussed heat/sun/storm
& slip, trips, & falls

0830: Continue gridding 100 yd
DU (DU01)

0930: Complete gridding/flaggi
100 yd berm DU (DU01)

0935: Water/shade break

0945: Begin ISM ~~sampling~~ on
100 yd target berm DU
↳ flagging

1145: Lunch/water break

1200: Gene Melnyk on site.

1220: Begin Sampling 100 yd Berm
DU01

1410: Gene Melnyk off-site

1415: finished ISM sampling the 100 yd
berm DU1

1420: water/heat break

1440: Begin flagging target area DU

1520: Complete flagging

1530: Sunset safety meeting
AECOM off site

Scale: 1 square = ________

Rite in the Rain

7/8/2020
SUNNY 90's

- 0700: AECOM ARRIVED ON SITE
- 0715: Tailgate Safety Meeting.
- 0730: Begin ISM Sampling
  Target Area DU
- 0900: Finish ISM sampling on
  Target Area
- 0905: Water break.
- 0910: Begin gridding Target Berm
  Hillside
- 1215: Break for lunch/water break

1230: Begin XRF scanning collected
samples.
 -passed cal check
 -ANTONIO & SHANNON CONTINUE
 FLAGGING / DISCRETE SOIL SAMPLING

1445 - Water / AC Break / Lightning break

1530 - Continue step out sampling
of Target Berm hillside.

1709: Begin discrete subsurface
sampling @ 100 yard berm

1830: Begin discrete sampling @
CORO1DA01A (# 34)
XRF ⊂ 1513

→

Scale: 1 square = ______

Rite in the Rain.

- 1735: Sampled COR01DB01A (#34)
  XRF = 29±4
- 1740: Sampled COR0DB01B (#34 dupe)
  XRF = 28±4
- 1750: Begin Sampling @ COR01DA02A (#39 MS/MSD)
  XRF = 43±4
- 1755: Begin Sampling @ COR01DB02A (#39 ~~MS/MSD~~ dw)
  XRF = 24±2
- 1800: Sampled COR01X39E (TCLP) 12-18 in
- 1830: Field team departs site

7/8/20

Scale: 1 square = ______

7/9/20
90's Sunny

0645 - AECOM TEAM
ARRIVES ON SITE
0650 - TAILGATE SAFETY MEETING
0710 - SITE WALK BACKSIDE OF PROPERTY
TO FIND A WAY IN
- SUCCESSFUL / Calibrate XRF
0730 - CONTINUE COLLECTING DISCRETE
SURFACE SAMPLES @ HILLSIDE BACKTOP
DU
1230: Target Hillside DU successfully
delineated
1235: Lunch / AC break
1245: Gene Melnyk on site
1430: Begin discrete sampling
Target Berm Hillside DU
1543 Collected COR03DA03A
12-18" @ node 46 (DU3) MS/MSD
1549 Collected COR03DB03A
24-30" @ node 46 (DU3)
1553 XRF 12-18" = 93 ± 5
24-30" = 13 ± 3
1615 ATTEMPT ISM SAMPLING, UNABLE
TO NAVIGATE W/O MAP / COORDINATES
ON PHONE.
1705: Gene Melnyk Left site

Scale: 1 square = ________

1708: Begin discrete subsurface sampling @ COR03DA01A 12-18" (#2) XRF = 46±4

1710: Begin discrete subsurface sampling @COR03~~DA01B~~ X01TCLP mw 12-18" (#2 ~~dupe~~ TCLP mw) XRF=59±5

1715: Begin discrete subsurface sampling @COR03DB01A (#2) 24-30" → refusal @25" due to packed large cobble XRF = 307±8

☆ able to collect enough soil for sample.

1800 Field team departs site

MW 7/10/20

Scale: 1 square = ______

/2020

0645: AECOM ARRIVES ONSITE 90°Sunny

0700: Tailgate safety meeting

0720: Begin ISM sampling

0930: Water/AC Break

0945: Continue ISM sampling
Target Backstop Hillside DU)

1230: Break for Lunch/AC

1300: Continue ISM sampling
Backstop DU

1500: Completed ISM sampling
of Hillside Backstop.

1505: AC/water break/calibrate XRF

1520: AECOM field team moves
to ~~Begin~~ Sampling discrete
subsurface samples on
Target Backstop Hillside
DU @ grid # 40

1550: Begin sampling @COR03DA02A
(# 40) 12-18" XRF =

1555: Sampled @COR03DA02B
(#40) 12-18" (dupe) XRF =

1559: Sampled @COR03DB02A
(#40) 24-30" XRF =

1600: Completed Sampling @
Target Hillside Backstop DU

Scale: 1 square = ________

Rite in the Rain

1615: AECOM Field team packs up
and moves to Target area
DU to complete discrete
Subsurface Sampling.

1620: Begin discrete Subsurface
sampling @ Target Area DU

1625: Sampled @ COR02DA01A
12-18" (#4) XRF = 39 ± 4

1630: TCLP sample collected @
COR02X01TCLP (#4)

1635: Attempted to dig/Auger to
24-30in depth @ grid #4.
refusal @ 24" due to
packed large cobble

1640: moved to grid #14 @ Target
area to begin discrete
Subsurface sampling.

1645: Collected sample @
COR02DA02A (#14) 12-18'
XRF = 59 ± 4

1650: Sampled COR02DA02B (#14)
12-18 (dupe) XRF = 57 ± 4

1655 Sampled @ COR02DB02A (#14)
24-30" XRF = 17 ± 3

1700: Sunset tailgate meeting
AECOM field staff leaves site.

Scale: 1 square

SARs Camp O'Ryan 7/20/20

Crew: Antonio, Samir, Greg (AECOM)
Visitors: Gene (NYSDEC), Bill (Shop), & John (ARNG)
Weather: Humid, cloudy, 79°F, sun

0615 Met in Hotel Lobby
- Discuss H&S of Travel

0700 Arrived on site
0705 Health & Safety Meeting
Discussed THA & DTM
0725 Site Walk
- Background area good
- Target Wall depression - no water
- Pathway clear

0750 Mob vehicles on pathway to background, start flagging Background nodes
0825 Start flagging ISM flags
0915 Prep ISM bags & labels
0930 Collected COR04IS01 Primary
1000 Collected COR04IS02 Duplicate
1030 Collected COR04IS03 Triplicate
1100 Decon ISM probes, pack up vehicles
1115 Mob to Target Wall DU
1122 Lunch Break

SARs Camp O'Ryan 7/20/20

Background DU GPS

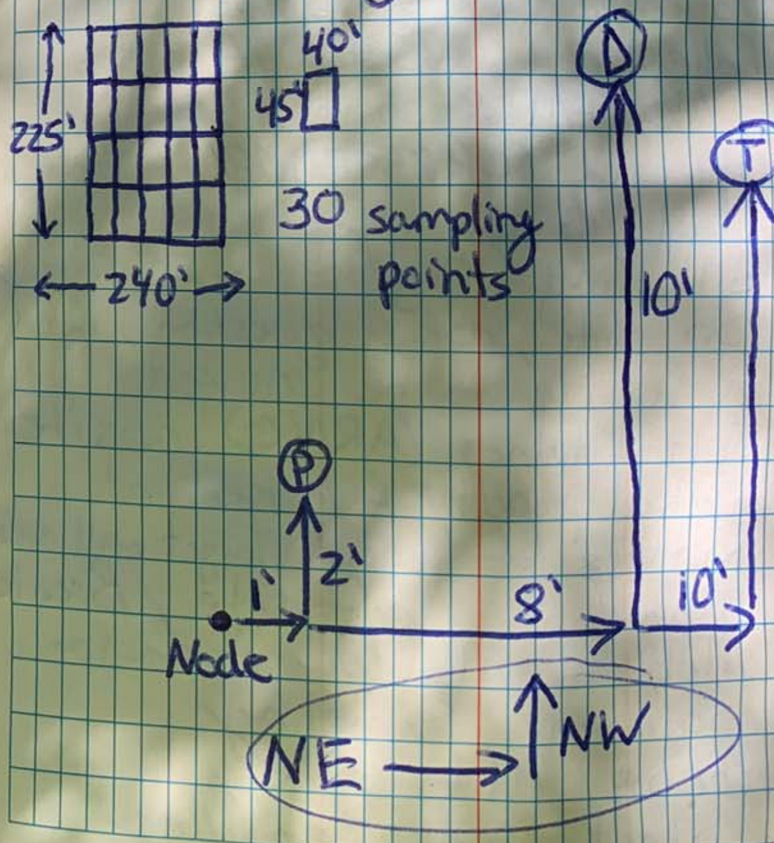
• BN -78.281408
42.683228

• BE -78.280847
42.682972

• BW -78.281842
42.682795

• BS -78.281271
42.682515

Background DU ISM

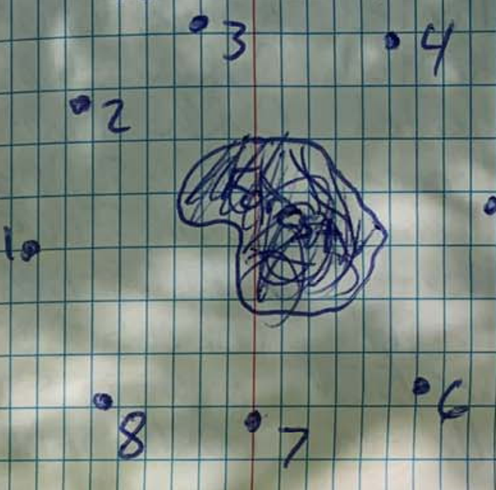


SARs Camp O'Ryan 7/20/20

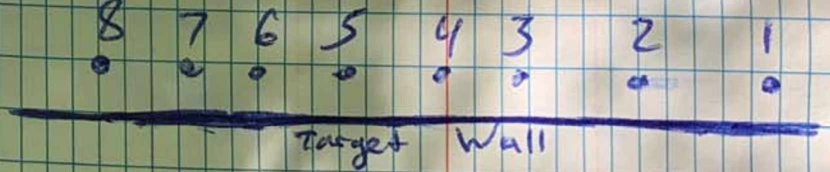
1040 Preping Sediment Bottleware
1220 Gene (NYSDEC) On Site
1238 Collected COR05SED01A TM
1244 Collected COR05SED02A TM
1245 Collected COR05SED02B TM
1250 Collected COR05SED03A TM
1310 Collected COR05SED04A MS/MSD
1315 Collected COR05SED05A TM
1320 Collected COR05SED06A TM
1325 Collected COR05SED07A TM
AVS/SEM & grain size
1334 Collected COR05SED08A TM
Total 13 Samples
→1300 Bill King (King Bros Shop Owners) on site, asked questions, needed a vehicle to be moved
1340 John Haines (ARNG) onsite walked property & looked at wettness of ponded Target wall area
1410 John Haines off site / Break
1435 Mob to Meadow Area for Sediment Sampling
1450 Gene off site, Start sed sampling

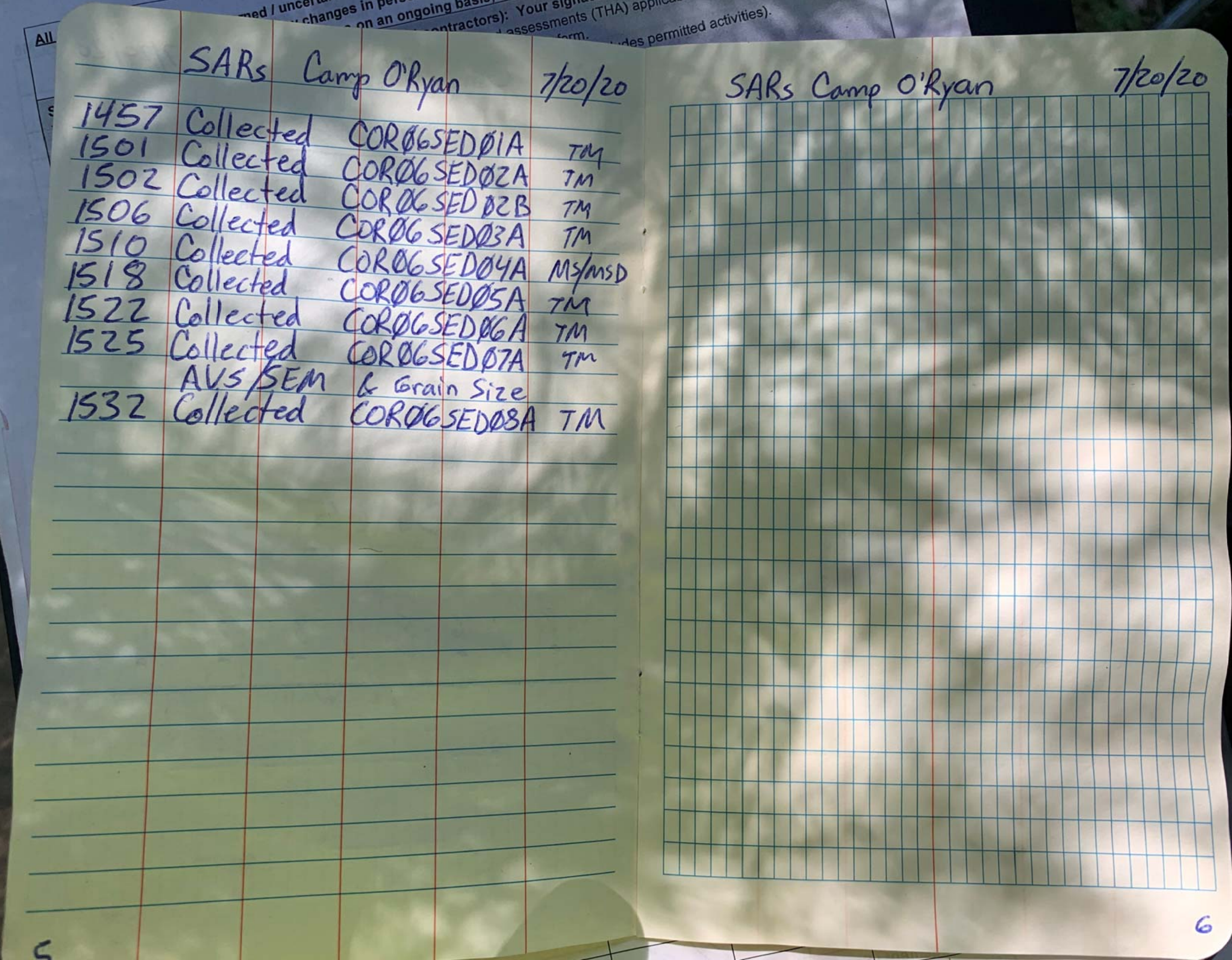
SARs Camp O'Ryan 7/20/20

DU 06



DU 05





SARs Camp O'Ryan 7/20/20

1457	Collected	COR06SED01A	TM
1501	Collected	COR06SED02A	TM
1502	Collected	COR06SED02B	TM
1506	Collected	COR06SED03A	TM
1510	Collected	COR06SED04A	MS/MSD
1518	Collected	COR06SED05A	TM
1522	Collected	COR06SED06A	TM
1525	Collected	COR06SED07A	TM
	AVS/SEM	& Grain Size	
1532	Collected	COR06SED08A	TM

SARs Camp O'Ryan 7/20/20

Date: 4 June 2019

AECOM Technical Services Inc.
Nonconformance and Corrective Action Report

Report Number: 01

Location: Camp O'Ryan MRS, NY

Project Title: Camp O'Ryan MRS Remedial Investigation

Contract Number: W9133L-14-D-001: DO 0006

Description of Nonconformance and Cause:	The Work Plan and Quality Assurance Project Plan (QAPP) includes soil sampling at three decision units (DUs) across the munitions response site (MRS); however, standing water has been observed across the low-lying, flatter portion of the Target Berm DU. This inundated area runs the entire length of the original DU and extends approximately 40-50 feet to the east from the base of the retaining wall. The inundated portion of the DU is not suitable for discrete X-Ray Fluorescence (XRF) screening/analysis. Also present within the inundated area are several areas of accumulated metal debris; these conditions combined with the saturated soil are not ideal for incremental sampling methodology (ISM) soil sampling either. Because there is a considerable difference between the nature of the dry soil on the sloped portion of the DU to the east and the saturated soil within the inundated area, the Target Berm DU will be subdivided into two new DUs and sampled separately.
Proposed Disposition:	The inundated area will be hereto forth referred to as the Target Berm – Ponded DU. Eight discrete samples, collected from the first 0-6 inches, will be collected from eight separate locations within this DU. Data from these samples will be used to assess risk within the DU. Discrete XRF samples will be collected and analyzed from dry soil along the perimeter of this DU to confirm extent of lead in soil. The sloped hillside that arises from the eastern boundary of the Ponded DU will be hereto forth referred to as the Target Berm – Hillside DU. Soil from this DU will be screened via XRF analysis and sampled via ISM as described in the Work Plan and QAPP; however, the DU location will be shifted to the east to include only the sloped, dry portions of the original DU and the hillside. Step-out samples may be collected to the extent of the MRS boundary, if necessary.

Submitted by: Joe Witte **Date:** 4 June 2019

Approved by: Jennifer Li

Actual Disposition approved by Project Manager:	To appropriately assess the original Target Berm DU area, the DU has been divided into two separate DUs. Saturated soil from the new Target Berm – Ponded DU will be sampled discretely, and soil at the new Target Berm – Hillside DU will be sampled via discrete XRF and ISM.
Implementation of Disposition assigned to:	Camp O'Ryan MRS RI field work staff: Meagen Wallace and Luke Councell

Date: 4 June 2019

Completed by: Joe Witte **Date:** 4 June 2019

Verified by: Jennifer Li **Date:** 4 June 2019

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	MS	6/5/2019
SCALE	1:2,400	CHK BY	JW	6/5/2019
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	6/5/2019

Camp O'Ryan Modified Target Berm DUs

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 1

Q:\Projects\ENV\GEARS\GEO\NGB IDIQ\NDNODS 6 SARs\900-Work\GIS\Other_Sites\NY_ORyan\1_MXD\Fig_ORyan_DUs_Ponded_Hillside_Additions.mxd

Date: 10 July 2020

AECOM Technical Services Inc.
Nonconformance and Corrective Action Report

Report Number: 02

Location: Camp O’Ryan MRS, NY

Project Title: Camp O’Ryan MRS Remedial Investigation

Contract Number: W9133L-14-D-001: DO 0006

Description of Nonconformance and Cause:	The Work Plan and Quality Assurance Project Plan (QAPP) includes soil sampling at three decision units (DUs) across the subject munitions response site (MRS). A fourth DU was added via NCR in 2019 to account for sediment and surface water (if present) at the Target Berm – Ponded Area DU. Additional modifications to sampling strategy are necessary to mitigate field conditions described below: 1. The Target Berm – Hillside DU has extended eastward as a result of surface soil sample concentrations exceeding the New York Remedial Program Soil Cleanup Objective for Unrestricted Use (63 parts per million). The eastern boundary of the Target Berm – Hillside DU abuts a wet meadow. The saturated soil in the meadow is too wet to feasibly perform discrete X-Ray Fluorescence (XRF) screening/analysis, and the meadow itself represents a distinctly different area/habitat than the Target Berm –Hillside DU. Because there is a considerable difference between the nature of the dry soil on the Target Berm – Hillside DU and the saturated soil within the inundated area, and the habitat types the two areas represent, the Target Berm – Hillside DU will be bound by the wet meadow to the east, and the meadow will become a DU unto itself (the Wet Meadow DU). The two DUs will be sampled separately. 2. Additionally, thick vegetation including dense briar and poison ivy/oak undergrowth with saplings greater than 5" diameter inhibit accessibility to various areas within the Target Berm Hillside DU. In order to mitigate safety hazards associated with traveling through the area, discrete subsurface sample locations will be selected based on available XRF data and evidence of high use areas; XRF analysis will only be performed on perimeter DU locations (inclusive of step outs) to reduce potential interaction with unsafe areas within the interior. 3. At the southernmost portion of the Target Berm – Hillside DU a steep ravine (slope gradient >45º) is present. The ravine precludes safe travel for sampling. The ravine will function as the southern boundary of the Target Berm – Hillside DU.
Proposed Disposition:	1. The Target Berm – Hillside DU will be sampled using ISM and discrete subsurface sampling as described in the Work Plan and QAPP. The Wet Meadow DU will serve as the eastern boundary to the Target Berm – Hillside DU. To assess the Wet Meadow DU, eight discrete surface soil/sediment samples will be collected from the first 0-6 inches from eight separate locations within this DU. Data from these samples will be used to assess risk within this new DU. 2. Interior Incremental Sample locations within the Target Berm – Hillside DU will not be analyzed via XRF to mitigate health and safety concerns associated with entering the thick underbrush. Discrete subsurface sample location selection will be informed by XRF data available as well as visible and historical evidence of former high use areas. Discrete subsurface sample locations will also be selected to represent the entirety of the expanded Target Berm – Hillside DU.

	3. The Target Berm – Hillside DU will be bounded to the south by the steep ravine to mitigate health and safety concerns associated with work on steep grade at height.

Submitted by: Joe Witte **Date:** 10 July 2020

Approved by: Jennifer Li

Actual Disposition approved by Project Manager:	The Target Berm – Hillside DU will be bound to the south by the steep ravine and to the east by the new Wet Meadow DU. The Wet Meadow DU will be sampled separately from the Target Berm Hillside DU. Interior XRF analysis will not be performed within the Target Berm – Hillside DU to mitigate safety hazards.
Implementation of Disposition assigned to:	Camp O'Ryan MRS RI field work staff: Meagen Wallace, Antonio Zarrelli and Shannon Linnane

Completed by: Joe Witte **Date:** 10 July 2020

Verified by: Jennifer Li **Date:** 10 July 2020

AECOM

Site ID: COR
Arrival Time:
Departure Time:

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/20/20
On-Site Personnel: A. Zarrelli, S. Khadka
Log Preparer: AZ
Sample ID: COR05SED01A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	90
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 2/2
Moisture (%)	80%
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments:
☒ Discrete – Depth interval: 0-6in - Sediment
XRF Result:
XRF Error:

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan / NY Date: 7/20/20
On-Site Personnel: A. Zarrelli, S. Khadka Log Preparer: AZ
Sample ID: COR0SSED024

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	90
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 2/2
Moisture (%)	80%
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ____________
☒ Discrete – Depth interval: 0-4 in – sediment
XRF Result: ____________
XRF Error: ____________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/20/20

On-Site Personnel: A. Zarrelli, S. Ichadka Log Preparer: AZ

Sample ID: COR0S SED 02B

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	90
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 2/2
Moisture (%)	80%
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: __________

☒ Discrete – Depth interval: 0-4in - sediment

XRF Result: __________

XRF Error: __________

Quality Control Samples

☒ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time:
Departure Time:

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/20/20
On-Site Personnel: A. Zarrelli, S. Khadka
Log Preparer: AZ
Sample ID: COR05 SED03A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	90
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 2/2
Moisture (%)	80%
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic Spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments:

☒ Discrete – Depth interval: 0-6in -sed

XRF Result:

XRF Error:

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time:
Departure Time:

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/20/20
On-Site Personnel: A. Zarrelli, S. Khadra
Log Preparer: AZ
Sample ID: COR05 SED04A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	90
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 2/2
Moisture (%)	80
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments:
☑ Discrete – Depth interval: 0-6in Sed
XRF Result:
XRF Error:

Quality Control Samples

☐ Duplicate ☒ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/20/20
On-Site Personnel: A. Zarrelli, S-Kadka Log Preparer: AZ
Sample ID: COR05SED05A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	90
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 2/2
Moisture (%)	80%
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic Spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ____________

☒ Discrete – Depth interval: 0-6 in - sed

XRF Result: ____________

XRF Error: ____________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

Site ID: COR
Arrival Time:
Departure Time:

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/20/20
On-Site Personnel: A. Zarrelli, S. Khadka
Log Preparer: AZ
Sample ID: COR05SED06A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	90
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 2/2
Moisture (%)	80
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments:
☑ Discrete – Depth interval: 0-6 in sed
XRF Result:
XRF Error:

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time:
Departure Time:

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/20/20
On-Site Personnel: A. Zarrelli, S. Khadka Log Preparer: AZ
Sample ID: COR05SED07A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	90
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 2/2
Moisture (%)	80
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments:

☒ Discrete – Depth interval: 0-6in - sed

XRF Result:

XRF Error:

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

☒ AVS/SEM ☒ GRAIN SIZE

Notes:

Site ID: COR
Arrival Time: ____
Departure Time: ____

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/20/20
On-Site Personnel: A.Zarrelli Log Preparer: AZ
Sample ID: COR05SED08A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	90
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 4/2
Moisture (%)	80
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic Spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ____

☒ Discrete – Depth interval: 0-6in - sed

XRF Result: ____

XRF Error: ____

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____
Departure Time: ____

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 07/20/20
On-Site Personnel: A. Zarrelli, S. Khadka
Log Preparer: AZ
Sample ID: COR06SED01A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	95
Sand (0.06 – 2 mm)	5
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	LOW / [✓ MED] / HIGH
Color	10.0YR 3/4
Moisture (%)	90%
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: ____

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ____

☒ Discrete – Depth interval: 0-6 in - sed

XRF Result: ____

XRF Error: ____

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan NY
Date: 7/20/20
On-Site Personnel: Azarelli, S. Kadka
Log Preparer: AZ
Sample ID: COR01SED021

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	95
Sand (0.06 – 2 mm)	5
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	LOW / [✓ MED] / HIGH
Color	10.0YR 3/4
Moisture (%)	90
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ____________

☒ Discrete – Depth interval: 0-6 in bgs - sed

XRF Result: ____________

XRF Error: ____________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time:
Departure Time:

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/20/20
On-Site Personnel: A. Zarrelli, S. Khadka Log Preparer: AZ
Sample ID: COR06SED02B

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	95
Sand (0.06 – 2 mm)	5
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	LOW / [✓ MED] / HIGH
Color	10.0YR 3/4
Moisture (%)	90
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic Spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments:
☒ Discrete – Depth interval: 0-6 in - Sed
XRF Result:
XRF Error:

Quality Control Samples

☒ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time:
Departure Time:

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 07/20/20
On-Site Personnel: A. Zarrelli, S. Khadka Log Preparer: AZ
Sample ID: COR 06 SED03A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	95
Sand (0.06 – 2 mm)	5
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	LOW / [✓ MED] / HIGH
Color	10.0YR 3/4
Moisture (%)	90
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments:
☒ Discrete – Depth interval: 0-4 in - sed
XRF Result:
XRF Error:

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____
Departure Time: ____

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/20/20
On-Site Personnel: A. Zarrelli, S. Kradka
Log Preparer: AZ
Sample ID: COR06SED04A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	95
Sand (0.06 – 2 mm)	5
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	LOW / [✓ MED] / HIGH
Color	10.0YR 3/4
Moisture (%)	90
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ____

☑ Discrete – Depth interval: 0-6 in - sed

XRF Result: ____

XRF Error: ____

Quality Control Samples

☐ Duplicate ☒ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____
Departure Time: ____

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan NY Date: 7/20/20
On-Site Personnel: A. Zarelli, S. Khade Log Preparer: AZ
Sample ID: COR06SED05A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	95
Sand (0.06 – 2 mm)	5
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	LOW / [✓ MED] / HIGH
Color	10.0YR 3/4
Moisture (%)	90
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ____
☑ Discrete – Depth interval: 0-6 in sed
XRF Result: ____
XRF Error: ____

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time:
Departure Time:

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/20/20
On-Site Personnel: A-Zanelli, Shradka
Log Preparer: AZ
Sample ID: COR065ED06A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	95
Sand (0.06 – 2 mm)	5
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	LOW / [✓ MED] / HIGH
Color	10.0 YR 3/4
Moisture (%)	90
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic Spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments:

☒ Discrete – Depth interval: 0-6 in sed.

XRF Result:

XRF Error:

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/20/20
On-Site Personnel: A. Zarrelli, S. Khadka Log Preparer: AZ
Sample ID: COR001 SED 07A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	95
Sand (0.06 – 2 mm)	5
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	LOW / [✓ MED] / HIGH
Color	10.0YR 3/4
Moisture (%)	90
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: Plastic Spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ____________

☒ Discrete – Depth interval: 0-4 in – Sed

XRF Result: ____________

XRF Error: ____________

Quality Control Samples

☐Duplicate ~~☒MS/MSDs~~ AZ ☐Field Blank ☐Equipment Blank ☐N/A

☒ AUS/SEM ☒ GRAIN SIZE

Notes:

Site ID: COR
Arrival Time: ____
Departure Time: ____

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/20/20
On-Site Personnel: A Zarrelli, S. Harden Log Preparer: AZ
Sample ID: COR06SED08A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	95
Sand (0.06 – 2 mm)	5
Gravel (2.64 mm)	0
Cobble (64 – 256 mm)	0
Organic Content	LOW / [✓ MED] / HIGH
Color	10.0YR 3/4
Moisture (%)	90%
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ____
☒ Discrete – Depth interval: 0-6in Sed.
XRF Result: ____
XRF Error: ____

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time:
Departure Time:

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/20/20
On-Site Personnel: A Zarrelli S. Kadka Log Preparer: AZ
Sample ID: COR04IS01

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	80
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	10
Cobble (64 – 256 mm)	
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 7/4
Moisture (%)	11
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☒ Incremental (always taken Triplicate)– No. of Increments: 30
☐ Discrete – Depth interval:
XRF Result:
XRF Error:

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time:
Departure Time:

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/20/20
On-Site Personnel: A. Zarrelli, Skuadka Log Preparer: AC
Sample ID: CORIS07

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	80
Sand (0.06 – 2 mm)	16
Gravel (2.64 mm)	10
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 7/4
Moisture (%)	11
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☒ Incremental (always taken Triplicate)– No. of Increments: 30
☐ Discrete – Depth interval:
XRF Result:
XRF Error:

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: __________
Departure Time: __________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/20/20
On-Site Personnel: A Zarrelli / S. Khadka Log Preparer: AZ
Sample ID: COR04IS03

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	80
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	10
Cobble (64 – 256 mm)	
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 7/4
Moisture (%)	11
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☒ Incremental (always taken Triplicate)– No. of Increments: 30
☐ Discrete – Depth interval: __________
XRF Result: __________
XRF Error: __________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

Wyoming County Sheriff's Office
POLICE REPORT
ALL OTHER NON-REPORTABLE

Complaint
19-004510

Report Date & Time
06/05/2019 14:08

INCIDENT

Address of Occurrence	District	Tract	Occ. Date & Time	Day of Week	Type of Premise
3060 WETHERSFIELD RD WETHERSFI		0	06/05/2019 14:08	Wednesday	

Clearance Status	Referred To	TT Mess#	TT Entry Date	TT Cancel#	TT Cancel Date
Closed					

Officers HUMMEL, DANIEL - DMH
TAMOL, ERIK - EWT

COMPLAINANT - 1

Last Name	First Name	MI	Ext	Birth Date	Race	Sex	Age	Juvenile	Arrested	Report
NATIONAL GAURD	ARMORY-ROCH							N	N	PR

Address	City	State	Zip
250 WEIDNER RD	ROCHESTER	NY	14624

Height	Weight	Hair	Eyes	Build	Complexion	Glasses	Scars/Marks/Tattoos

Contact Information

Home	Business
(585) 783-5351	(585) 783-5359

OTHER - 1

Last Name	First Name	MI	Ext	Birth Date	Race	Sex	Age	Juvenile	Arrested	Report
WALLACE	MEAGEN	R		06/20/1986			32	N	N	PR

Address	City	State	Zip
104 LADYSHORE LN Apt: C104	ROCKVILLE	MD	20850

Height	Weight	Hair	Eyes	Build	Complexion	Glasses	Scars/Marks/Tattoos

Contact Information

Mobile
(832) 871-8369

OTHER - 2

Last Name	First Name	MI	Ext	Birth Date	Race	Sex	Age	Juvenile	Arrested	Report
ERIE CO SHERIFF					Unknown	U		N	N	PR

Address	City	State	Zip
1 SHERIFF'S DR	ORCHARD PARK	NY	14127

Height	Weight	Hair	Eyes	Build	Complexion	Glasses	Scars/Marks/Tattoos

Contact Information

Business
(716) 858-2903

BUSINESS - 1

Last Name	First Name	MI	Ext	Birth Date	Race	Sex	Age	Juvenile	Arrested	Report
A.E. COM								N	N	PR

Address	City	State	Zip
12520 MILESTONE CENTER DR	GERMANTOWN	MD	20876

Height	Weight	Hair	Eyes	Build	Complexion	Glasses	Scars/Marks/Tattoos

Contact Information

Business
(301) 820-3000

NARRATIVE

[redacted]

Sergeant HUMMEL responded to 3060 Wethersfield Road in the Town of Wethersfield for a possible live hand grenade located on the property

Upon arrival, Sergeant HUMMEL interviewed Meagen R. WALLACE. WALLACE stated she is an

Environmental Scientist and is working for A.E. COM. She was assigned to this address to take soil samples as it was an old military shooting range of the Army National Guard. While checking the soil in the area, she located a couple of canisters that had alarmed her. She then called this agency for assistance.

WALLACE walked this officer through the dense vegetation to an area near a concrete wall. On the bank was an old canister with some type of top still attached. Without touching the container (all rust and muddy) this officer took several photographs of it. This officer was then shown a second canister that was different from the first one. This one was silver in color and appearance showed it had already been discharged. This officer took a couple of photographs of this canister also.

After walking back to the patrol vehicle, the Erie County Bomb Squad was called. The photographs were sent to them and was advised the silver canister posed no threat. It was not able to be determined from the pictures taken of the muddy and rusty canister if it had been discharged. They were going to send an officer to this location to check the canister out.

Sergeant HUMMEL advised Captain TAMOL of the incident and he was going to stay at this location until an officer from the Erie County Sheriff's Office arrived on scene.

Captain TAMOL was briefed by Sergeant HUMMEL in regards to the above complaint involving a hand grenade being located. HUMMEL advised a representative from the Erie County Sheriff's Office Explosive Unit would be responding shortly. HUMMEL then cleared the scene. TAMOL returned to the scene and met with Erie County Sheriff's Office Deputy John SZCZEPANSKI (#253). SZCZEPANSKI advised he was all set with TAMOL. SZCZEPANSKI advised he would remove the unknown type grenade in a fragmentation bag and the item will be destroyed by his agency on their next destruction day. No further action taken.

Captain E.W. TAMOL

AECOM

Site ID: COR
Arrival Time:
Departure Time:

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/20

On-Site Personnel: M. Wallace, A. Zarrelli, S. Linnane Log Preparer: M.W.

Sample ID: COR02DB02A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	85
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	5
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	5.0Y 7/2
Moisture (%)	12
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments:

☒ Discrete – Depth interval: 24-30"

XRF Result:

XRF Error:

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: __________
Arrival Time: __________
Departure Time: __________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/20
On-Site Personnel: M. Wallace, A. Zarrelli, S. Linnell Log Preparer: MW
Sample ID: COR03DA02B

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	85
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	5
Cobble (64 – 256 mm)	0
Organic Content	LOW / [✓ MED] / HIGH
Color	10.0YR 5/4
Moisture (%)	12
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ________
☒ Discrete – Depth interval: 12-18" (#40 grid dupe)
XRF Result: ________
XRF Error: ________

Quality Control Samples

☒ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: __________
Departure Time: __________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/20

On-Site Personnel: M. Wallace, A. Zarrelli, S. Linnane Log Preparer: M.W

Sample ID: COR03DB02A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	85
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	5
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / ~~MED~~ mw / HIGH
Color	2.5Y 7/4
Moisture (%)	12
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: __________

☒ Discrete – Depth interval: 24-30'' (#40 grid)

XRF Result: __________

XRF Error: __________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/20
On-Site Personnel: M.Wallace, A.Zarrelli, S.Limane Log Preparer: MW
Sample ID: COR03DA02A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	85
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	5
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 5/4
Moisture (%)	13
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: __________
☒ Discrete – Depth interval: 12-18" (#40 grid)
XRF Result: __________
XRF Error: __________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: ____________
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/20

On-Site Personnel: M. Wallace, A. Zarrelli, S. Linnane Log Preparer: MW

Sample ID: COR02DA02B

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	70
Sand (0.06 – 2 mm)	15
Gravel (2.64 mm)	15
Cobble (64 – 256 mm)	
Organic Content	[✓ LOW] / MED / HIGH
Color	5.0Y 7/2
Moisture (%)	11
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ________

☒ Discrete – Depth interval: 12-18" (#14 grid)

XRF Result: ________

XRF Error: ________

Quality Control Samples

☒ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/20
On-Site Personnel: M.Wallace, A.Zarrelli, S.Linnane Log Preparer: MW
Sample ID: COR02X01 TCLP

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	70
Sand (0.06 – 2 mm)	15
Gravel (2.64 mm)	15
Cobble (64 – 256 mm)	
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 6/4
Moisture (%)	12
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ____________
☑ Discrete – Depth interval: 12-18" (#4 grid)
XRF Result: ____________
XRF Error: ____________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A ☒ TCLP

Notes:

AECOM

Site ID: COR
Arrival Time: __________
Departure Time: __________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/20
On-Site Personnel: M. Wallace, A. Zarrelli, S. Linnam Log Preparer: MW
Sample ID: COR02DA02A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	
Sand (0.06 – 2 mm)	
Gravel (2.64 mm)	
Cobble (64 – 256 mm)	
Organic Content	LOW / MED / HIGH
Color	5.0Y 7/2
Moisture (%)	11
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: __________

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: __________
☒ Discrete – Depth interval: 12-18" (#14 grid)
XRF Result: __________
XRF Error: __________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: C0R
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/20
On-Site Personnel: M.Wallace, A.Zarrelli, S.Linnane Log Preparer: MW
Sample ID: COR02DA01A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	70
Sand (0.06 – 2 mm)	15
Gravel (2.64 mm)	15
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 7/4
Moisture (%)	11
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic Spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ____________
☒ Discrete – Depth interval: 12-18" (#4 grid)
XRF Result: ____________
XRF Error: ____________

Quality Control Samples

☐ Duplicate ☒ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/20
On-Site Personnel: M.Wallace, A.Zarrelli, S.Linnane Log Preparer: MW
Sample ID: COR01DA01A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	55
Sand (0.06 – 2 mm)	15
Gravel (2.64 mm)	30
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 7/4
Moisture (%)	12
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic Spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ____________
☒ Discrete – Depth interval: 12-18" (#34 grid)
XRF Result: ____________
XRF Error: ____________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/10/20
On-Site Personnel: M.Wallace, A.Farrelli, S.Linnane
Log Preparer: MW
Sample ID: COR01DB02A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	70
Sand (0.06 – 2 mm)	15
Gravel (2.64 mm)	15
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 4/4
Moisture (%)	14
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: __________
☒ Discrete – Depth interval: 24-30" (#39 grid)
XRF Result: __________
XRF Error: __________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ________
Departure Time: ________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/22
On-Site Personnel: M.Wallace, A.Farrelli, S.Linnane Log Preparer: MW
Sample ID: COR03DA01A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	45
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	45
Cobble (64 – 256 mm)	
Organic Content	[✓ LOW] / MED / HIGH
Color	5.0Y 4/2
Moisture (%)	16
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ________
☑ Discrete – Depth interval: 12-18" (#1 grid)
XRF Result: ________
XRF Error: ________

Quality Control Samples

☐Duplicate ☐MS/MSDs ☐Field Blank ☐Equipment Blank ☐N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/10/20
On-Site Personnel: M. Wallace, A. Zarrelli, S. Umm
Log Preparer: MW
Sample ID: COR01DA02A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	70
Sand (0.06 – 2 mm)	15
Gravel (2.64 mm)	15
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 7/4
Moisture (%)	12
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic Spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ____________
☒ Discrete – Depth interval: 12-18" (#39)
XRF Result: ____________
XRF Error: ____________

Quality Control Samples

☐ Duplicate ☒ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: C0R
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/10/20
On-Site Personnel: M-Wallace, A-Farrell, S.Linnane
Log Preparer: MW
Sample ID: C0R03DB014

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	80
Sand (0.06 – 2 mm)	15
Gravel (2.64 mm)	5
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 3/2
Moisture (%)	15
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ________
☑ Discrete – Depth interval: 24-30" (#1)

XRF Result: ________

XRF Error: ________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ___________
Departure Time: ___________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/20
On-Site Personnel: M. Wallace, A. Zarrelli, S. Linnane Log Preparer: MW
Sample ID: COR01DB01B

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	70
Sand (0.06 – 2 mm)	15
Gravel (2.64 mm)	15
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 4/4
Moisture (%)	12
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ___________
☒ Discrete – Depth interval: 24-30" (#34 grid)
XRF Result: ___________
XRF Error: ___________

Quality Control Samples

☒ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ___________
Departure Time: ___________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/10/20
On-Site Personnel: M.Wallace, A.Farrell, S.Linman
Log Preparer: MW
Sample ID: COR01DB01A

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	80
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	10
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 7/4
Moisture (%)	12
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ___________

☐ Discrete – Depth interval: 24-30" (#34)

XRF Result: ___________

XRF Error: ___________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/22
On-Site Personnel: M.Wallace, A.Zarrelli, S.Linven Log Preparer: MW
Sample ID: COR01X39E

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	80
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	10
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 7/4
Moisture (%)	11
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: __________
☒ Discrete – Depth interval: 24-30 (#39 grid)
XRF Result: __________
XRF Error: __________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A ☒ TCLP

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/10/20
On-Site Personnel: M.Wallace, A.Zarrelli, S.Linnan
Log Preparer: MW
Sample ID: COR03DB037

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	70
Sand (0.06 – 2 mm)	15
Gravel (2.64 mm)	15
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 7/2
Moisture (%)	12
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: __________
☒ Discrete – Depth interval: 24-30" (#46)
XRF Result: __________
XRF Error: __________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: C0R
Arrival Time: ______
Departure Time: ______

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/10/20

On-Site Personnel: M. Wallace, A. Farrelli, S. Linnane
Log Preparer: MW

Sample ID: COR03X01 TCLP

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	70
Sand (0.06 – 2 mm)	5
Gravel (2.64 mm)	25
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 3/2
Moisture (%)	14
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ______

☒ Discrete – Depth interval: 12-18" (#1) gnd

XRF Result: ______

XRF Error: ______

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A ☒ TCLP

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/10/20
On-Site Personnel: M.Wallace, A.Zarrell, S.Linnane
Log Preparer: MW
Sample ID: COR03DA034

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	70
Sand (0.06 – 2 mm)	15
Gravel (2.64 mm)	15
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 7/2
Moisture (%)	12
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: plastic Spoon

Sample Types

☐ Incremental (always taken Triplicate)– No. of Increments: ____________

☒ Discrete – Depth interval: 12-18" (#46 Grid).

XRF Result: ____________

XRF Error: ____________

Quality Control Samples

☐ Duplicate ☒ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan
Date: 7/10/20
On-Site Personnel: M. Wallace, A. Zarrelli, S. Linnane
Log Preparer: AW
Sample ID: COR03IS01

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	70
Sand (0.06 – 2 mm)	15
Gravel (2.64 mm)	15
Cobble (64 – 256 mm)	0
Organic Content	LOW / [✓ MED] / HIGH
Color	2.5Y 4/4
Moisture (%)	12
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: Soil probe

Sample Types

☒ Incremental (always taken Triplicate)– No. of Increments: 36
☐ Discrete – Depth interval: ________
XRF Result: ________
XRF Error: ________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A ☒ Primary

Notes:

AECOM

Site ID: COR
Arrival Time: ___________
Departure Time: ___________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/10/20
On-Site Personnel: M.Wallace, A.Zarrelli, S.Linnaw
Log Preparer: ___________
Sample ID: COR03IS02

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	70
Sand (0.06 – 2 mm)	15
Gravel (2.64 mm)	15
Cobble (64 – 256 mm)	0
Organic Content	LOW / [✓ MED] / HIGH
Color	2.5Y 4/4
Moisture (%)	12%
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: soil probe

Sample Types

☒ Incremental (always taken Triplicate)– No. of Increments: 3ue

☐ Discrete – Depth interval: ___________

XRF Result: ___________

XRF Error: ___________

Quality Control Samples

☒ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/10/20
On-Site Personnel: M.Wallace, A.Zarrelli, S.Linnane
Log Preparer: MW
Sample ID: COR01IS03

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	80
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	10
Cobble (64 – 256 mm)	
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 7/4
Moisture (%)	11
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: soil probe

Sample Types

☒ Incremental (always taken Triplicate)– No. of Increments: 55
☐ Discrete – Depth interval: ____________
XRF Result: ____________
XRF Error: ____________

Quality Control Samples

☐ Duplicate ~~☒ MS/MSDs~~ MW ☐ Field Blank ☐ Equipment Blank ☐ N/A ☒ triplicate

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/20
On-Site Personnel: M.Wallace, A.Zarrelli, S.Linnane Log Preparer: M.W
Sample ID: COR03IS03

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	70
Sand (0.06 – 2 mm)	15
Gravel (2.64 mm)	15
Cobble (64 – 256 mm)	
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 4/4
Moisture (%)	12
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: ______________________

Sample Types

☒ Incremental (always taken Triplicate)– No. of Increments: 30
☐ Discrete – Depth interval: __________
XRF Result: __________
XRF Error: __________

Quality Control Samples

☐ Duplicate ☒ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A ☒ Triplicate

Notes:

Site ID: COR
Arrival Time:
Departure Time:

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/20
On-Site Personnel: M-Wallace, A-Zarrelli, S.Linnane Log Preparer: MW
Sample ID: COR01IS02

Soil Sample Characterization

Grain Size (%)	~~80~~
Silt/Clay (<0.06 mm)	MW ~~10~~ 80
Sand (0.06 – 2 mm)	~~10~~ 10
Gravel (2.64 mm)	~~0~~ 10
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 7/4
Moisture (%)	11
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: Soil probe

Sample Types

☒ Incremental (always taken Triplicate)– No. of Increments: 55
☐ Discrete – Depth interval:
XRF Result:
XRF Error:

Quality Control Samples

☒ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/16/20
On-Site Personnel: M.Wallace, S.Livhaune, A.Zarrelli Log Preparer: MW
Sample ID: COR01IS01

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	80
Sand (0.06 – 2 mm)	10
Gravel (2.64 mm)	10
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 7/4
Moisture (%)	11
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: Soil probe

Sample Types

☒ Incremental (always taken Triplicate)– No. of Increments: 55

☐ Discrete – Depth interval: ________

XRF Result: ________

XRF Error: ________

Quality Control Samples

☐ Duplicate ☒ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A ☒ primary

Notes:

AECOM

Site ID: COR
Arrival Time: ___
Departure Time: ___

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/20

On-Site Personnel: M.Wallace, A.Zarrelli, S.Linvoni Log Preparer: ___

Sample ID: COR02IS02

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	80
Sand (0.06 – 2 mm)	5
Gravel (2.64 mm)	15
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 6/4
Moisture (%)	11
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: Soil probe

Sample Types

☒ Incremental (always taken Triplicate)– No. of Increments: 42

☐ Discrete – Depth interval: ___

XRF Result: ___

XRF Error: ___

Quality Control Samples

☒ Duplicate ☒ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY
Date: 7/10/20
On-Site Personnel: M.Wallace, A.Zarrelli, S.Linneman
Log Preparer: MW
Sample ID: COR02IS03

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	80
Sand (0.06 – 2 mm)	5
Gravel (2.64 mm)	15
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 6/4
Moisture (%)	11
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: Soil probe

Sample Types

☒ Incremental (always taken Triplicate)– No. of Increments: 42
☐ Discrete – Depth interval: ____________
XRF Result: ____________
XRF Error: ____________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A ☒ Triplicate

Notes:

AECOM

Site ID: COR
Arrival Time: ____________
Departure Time: ____________

Soil Sample Collection Log

Site Name/Location: Camp O'Ryan, NY Date: 7/10/20
On-Site Personnel: M.Wallace, A.Zarrelli, S.Linnane Log Preparer: AMW
Sample ID: COR02IS01

Soil Sample Characterization

Grain Size (%)	
Silt/Clay (<0.06 mm)	80
Sand (0.06 – 2 mm)	5
Gravel (2.64 mm)	15
Cobble (64 – 256 mm)	0
Organic Content	[✓ LOW] / MED / HIGH
Color	2.5Y 6/4
Moisture (%)	11
Bullets or Bullet Fragments?	YES / [✓ NO]

Sample Collection Tools Used: Soil probe

Sample Types

☒ Incremental (always taken Triplicate)– No. of Increments: 42
☐ Discrete – Depth interval: ________
XRF Result: ________
XRF Error: ________

Quality Control Samples

☐ Duplicate ☐ MS/MSDs ☐ Field Blank ☐ Equipment Blank ☐ N/A ☑ Primary

Notes:

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Berm (DU 03)

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
COR03X	1	A			703	12	
COR03X	1	B	7/8/20		843	13	
COR03X	1	C	MW	13	895	13	Avg = ~~831.75~~ 834
COR03X	1	D			896	14	
COR03X	10	A			64	4	
COR03X	10	B			45	4	Avg = 50
COR03X	10	C			40	4	
COR03X	10	D			51	4	
COR03X	11	A			MW 428	10	
COR03X	11	B			439	10	Avg = 434.75
COR03X	11	C			436	9	
COR03X	11	D			436	9	
COR03X	20	A			58	5	
COR03X	20	B			71	4	Avg = 64.5
COR03X	20	C			64	4	
COR03X	20	D			65	4	
COR03X	21	A			494	9	
COR03X	21	B			547	10	Avg = 486.75
COR03X	21	C			436	9	
COR03X	21	D			470	9	
COR03X	30	A			121	5	
COR03X	30	B			102	4	Avg = 111.25
COR03X	30	C			115	5	
COR03X	30	D			107	5	
COR03X	31	A			215	5	
COR03X	31	B			177	4	Avg = 189
COR03X	31	C			191	4	
COR03X	31	D			173	4	

MW

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

COR03X	40	A			108	5	
COR03X	40	B			204	6	
COR03X	40	C			148	6	
COR03X	40	D			172	6	
COR03X	41	A					
COR03X	41	B					
COR03X	41	C					
COR03X	41	D					
COR03X	42	A					
COR03X	42	B					
COR03X	42	C					
COR03X	42	D					

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Berm (DU 03) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB03X	31	A	7/8/20 MW	12	194	6	
CB03X	31	B			185	6	Avg = 188.75
CB03X	31	C			179	6	
CB03X	31	D			197	6	
CB03X	32	A					
CB03X	32	B					
CB03X	32	C					
CB03X	32	D					
CB03X	33	A					
CB03X	33	B					
CB03X	33	C					
CB03X	33	D					
CB03X	34	A					
CB03X	34	B					
CB03X	34	C					
CB03X	34	D					
CB03X	35	A					
CB03X	35	B					
CB03X	35	C					
CB03X	35	D					
CB03X	36	A					
CB03X	36	B					
CB03X	36	C					
CB03X	36	D					

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target ~~Berm~~ Hillside (DU ~~03~~ 04) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB03X	25	A	6/13/19 MW	16	3339	19	Avg=2019.75
CB03X	25	B			3139	19	
CB03X	25	C			2263	23	
CB03X	25	D			1938	20	
CB03X	26	A		17	600	9	Avg=589
CB03X	26	B			600	9	
CB03X	26	C			562	9	
CB03X	26	D			594	9	
CB03X	27	A		16	466	8	Avg=514
CB03X	27	B			465	8	
CB03X	27	C			495	8	
CB03X	27	D			630	9	
CB03X	28	A		14	322	6	Avg=306.75
CB03X	28	B			385	6	
CB03X	28	C			311	6	
CB03X	28	D			309	6	
CB03X	29	A		17	~~670~~ 460	8	Avg=676
CB03X	29	B			971	12	
CB03X	29	C			811	10	
CB03X	29	D			462	8	
CB03X	30	A		16	1912	20	Avg = 2041.25
CB03X	30	B			2199	22	
CB03X	30	C			2043	21	
CB03X	30	D			2011	19	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Berm (DU 03) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB03X	37	A					
CB03X	37	B					
CB03X	37	C					
CB03X	37	D					
CB03X	38	A					
CB03X	38	B					
CB03X	38	C					
CB03X	38	D					
CB03X	39	A					
CB03X	39	B					
CB03X	39	C					
CB03X	39	D					
CB03X	40	A	7/8/20	12	108	5	Avg = 158
CB03X	40	B			204	6	
CB03X	40	C			148	6	
CB03X	40	D			172	6	
CB03X	41	A	7/8/20	12	158	5	
CB03X	41	B			151	6	Avg 143.75
CB03X	41	C			125	5	
CB03X	41	D			141	5	
CB03X	42	A					
CB03X	42	B					
CB03X	42	C					
CB03X	42	D					

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Berm (DU 03) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB03X	43	A					
CB03X	43	B					
CB03X	43	C					
CB03X	43	D					
CB03X	44	A					
CB03X	44	B					
CB03X	44	C					
CB03X	44	D					
CB03X	45	A	7/8/20 MW	10	61	4	
CB03X	45	B			81	5	Avg = 74.75
CB03X	45	C			88	5	
CB03X	45	D			69	4	
Step-out Samples (if necessary)							
CB03X	46	A	7/8/20 MW	16	342	8	
CB03X	46	B			268	8	Avg = 305.75
CB03X	46	C			291	7	
CB03X	46	D			322	8	
CB03X	47	A	7/8/20 MW	10	153	6	
CB03X	47	B			139	5	Avg = 151.25
CB03X	47	C			158	6	
CB03X	47	D			155	6	
CB03X	48	A	7/8/20 MW	10	339	7	
CB03X	48	B			431	9	Avg = 399.25
CB03X	48	C			418	8	
CB03X	48	D			409	8	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Berm (DU 03) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB03X	49	A			33	4	
CB03X	49	B			58	4	Avg≈56.[illegible]
CB03X	49	C			65	4	
CB03X	49	D			69	4	
CB03X	50	A	7/8/20 MW	11	58	3	
CB03X	50	B			36	3	Avg=49.25
CB03X	50	C			52	3	
CB03X	50	D			51	3	
CB03X	51	A	7/8/20 MW	11	68	3	
CB03X	51	B			83	4	Avg=81.5
CB03X	51	C			79	4	
CB03X	51	D			96	4	
CB03X	52	A	7/8/20 MW	11	117	5	
CB03X	52	B			92	5	Avg=116.25
CB03X	52	C			135	5	
CB03X	52	D			121	5	
CB03X	53	A	7/8/20 MW	11	159	5	
CB03X	53	B			157	5	Avg=160.5
CB03X	53	C			163	5	
CB03X	53	D			163	5	
CB03X	54	A	7/8/20 MW	11	39	3	
CB03X	54	B			38	3	Avg=36
CB03X	54	C			35	3	
CB03X	54	D			40	3	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Berm (DU 03) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB03X	55	A	7/8/20 MW	10	21	3	
CB03X	55	B			26	4	
CB03X	55	C			25	3	Avg=25
CB03X	55	D			28	3	
CB03X	56	A	7/8/20 MW	10	27	3	
CB03X	56	B			18	3	Avg=24
CB03X	56	C			24	3	
CB03X	56	D			27	3	
CB03X	57	A	7/8/20 MW	10	60	4	
CB03X	57	B			49	4	Avg=53
CB03X	57	C			50	4	
CB03X	57	D			55	4	
CB03X	58	A	7/8/20 MW	10	25	3	
CB03X	58	B			30	3	Avg=27.25
CB03X	58	C			25	3	
CB03X	58	D			29	3	
CB03X	59	A	7/8/20 MW	10	36	3	Avg=37.25
CB03X	59	B			37	3	
CB03X	59	C			41	3	
CB03X	59	D			35	2	
CB03X	60	A	7/8/20 MW	10	39	3	
CB03X	60	B			49	4	Avg=4
CB03X	60	C			37	3	
CB03X	60	D			39	3	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Berm (DU 03) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CB03X	61	A	7/9/20 ww	10	29	3	
CB03X	61	B			31	3	Avg = 30
CB03X	61	C			34	3	
CB03X	61	D			26	3	
CB03X	62	A					
CB03X	62	B					UNABLE TO SAMPLE
CB03X	62	C					
CB03X	62	D					
CB03X	63	A			103	5	
CB03X	63	B			98	6	Avg = 96.75
CB03X	63	C			85	4	
CB03X	63	D			97	5	
CB03X	64	A			45	4	
CB03X	64	B			41	4	Avg = 30
CB03X	64	C			42	4	
CB03X	64	D			32	3	
CB03X	65	A			21	3	
CB03X	65	B			24	3	Avg = 23.5
CB03X	65	C			29	3	
CB03X	65	D			20	3	
CB03X	66	A			43	4	
CB03X	66	B			32	4	Avg = 33
CB03X	66	C			31	3	
CB03X	66	D			24	3	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Berm (DU 03) - cont.

ID			Date/ Initials	% Moist.	Lead (PPM)	Error (±)	Comments
CORO3X	67	A	7/9/20 MW	12	106	4	
CORO3X	67	B			62	4	Avg = 72
CORO3X	67	C			67	4	
CORO3X	67	D			95	4	
CORO3X	68	A			31	3	
CORO3X	68	B			36	3	Avg = 34
CORO3X	68	C			33	3	
CORO3X	68	D			42	3	
CORO3X	69	A			181	5	
CORO3X	69	B			184	5	Avg = 179
CORO3X	69	C			180	5	
CORO3X	69	D			171	5	
CORO3X	70	A			361	8	
CORO3X	70	B			256	6	
CORO3X	70	C			313	7	Avg = 343.75
CORO3X	70	D			445	8	
CORO3X	71	A			99	3	
CORO3X	71	B			86	4	
CORO3X	71	C			85	4	Avg = 88.5
CORO3X	71	D			84	4	
CORO3X	72	A			139	5	
CORO3X	72	B			137	6	Avg = 140.75
CORO3X	72	C			148	6	
CORO3X	72	D			139	5	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Berm (DU 03) - cont.

ID			Initials	Moist.	(PPM)	(±)	Comments
COR03X	73	A	7/9/20 MW	12	76	4	
COR03X	73	B			53	3	
COR03X	73	C			50	3	Avg = 61.5
COR03X	73	D			70	3	
COR03X	74	A			106	5	
COR03X	74	B			120	5	Avg = 114.75
COR03X	74	C			117	5	
COR03X	74	D			116	5	
COR03X	75	A			114	6	
COR03X	75	B			97	5	Avg = 102
COR03X	75	C			101	7	
COR03X	75	D			96	5	
COR03X	76	A			27	3	
COR03X	76	B			25	3	
COR03X	76	C			31	4	Avg = 28
COR03X	76	D			29	3	
COR03X	77	A			28	3	
COR03X	77	B			23	3	Avg 26.25
COR03X	77	C			26	3	
COR03X	77	D			28	3	
COR03X	78	A			41	4	
COR03X	78	B			46	3	Avg = 41.25
COR03X	78	C			46	4	
COR03X	78	D			38	4	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Berm (DU 03) - cont.

ID			Initials	Moist.	(PPM)	(±)	Comments
COR03X	79	A	7/9/20 MW	12	32	5	
COR03X	79	B			43	4	Avg= 37.5
COR03X	79	C			37	5	
COR03X	79	D			38	4	
COR03X	80	A			90	4	
COR03X	80	B			97	5	Avg= 86.5
COR03X	80	C			75	4	
COR03X	80	D			84	4	
COR03X	81	A			49	4	
COR03X	81	B			49	4	Avg=47
COR03X	81	C			47	4	
COR03X	81	D			43	4	
Step-out Samples (if necessary)							
COR03X	82	A			55	4	
COR03X	82	B			64	4	
COR03X	82	C			59	4	Avg= 59.5
COR03X	82	D			100	4	
COR03X	83	A			ND	13	
COR03X	83	B			ND	13	AVG=ND
COR03X	83	C			ND	22	
COR03X	83	D			N	13	
COR03X	84	A			ND	14	
COR03X	84	B			ND	13	AVG=ND
COR03X	84	C			ND	16	
COR03X	84	D			ND	16	

Soil Sample Collection Log
XRF Analysis
Camp O'Ryan, NY

Location: Target Berm (DU 03) - cont.

ID			Initials	Moist.	(PPM)	(±)	Comments
COR03X	85	A	7/8/20 MW	12	ND	13	
COR03X	85	B			ND	12	Avg = ND
COR03X	85	C			ND	12	
COR03X	85	D			ND	13	
COR03X	86	A			32	3	
COR03X	86	B			33	3	Avg = 30.75
COR03X	86	C			26	3	
COR03X	86	D			32	3	

Appendix B
Photographic Record

AECOM

PHOTOGRAPHIC RECORD

Client Name: Army National Guard	**Site Location:** Camp O'Ryan MRS 2, New York	**Project No.** 60519685

Photo No. 1

Location of Photo:
Target Berm - Hillside DU (western perimeter)

Description:
Potential UXO encountered near the western boundary of the Target Berm – Hillside DU

First Mobilization 2019

Photo No. 2

Location of Photo:
Target Berm – Hillside DU (foreground) & Target Berm – Ponded DU (background)

Description:
Sheriff's County Office staff inspecting the potential UXO

First Mobilization 2019

Photo No. 3

Location of Photo:
100 Yard Firing Berm DU

Description:
Field team measuring out grid for ISM sampling.

Second Mobilization 2020

Photo No. 4

Location of Photo:
100-yard Firing Berm DU

Description:
UXO technician using a Schonstedt magnetometer to clear area or anomalies prior to flagging and sampling.

Second Mobilization 2020

Client Name:	**Site Location:**	**Project No.**
Army National Guard	Camp O’Ryan MRS 2, New York	60519685

Photo No. 5

Location of Photo:
Wetland Meadow DU

Description:
Wetland Meadow DU east of Target Berm Hillside DU, facing East

Second Mobilization 2020

Photo No. 6

Location of Photo:
Target Berm Hillside DU

Description:
Field team cutting through dense vegetation at Target Berm Hillside DU

Second Mobilization 2020

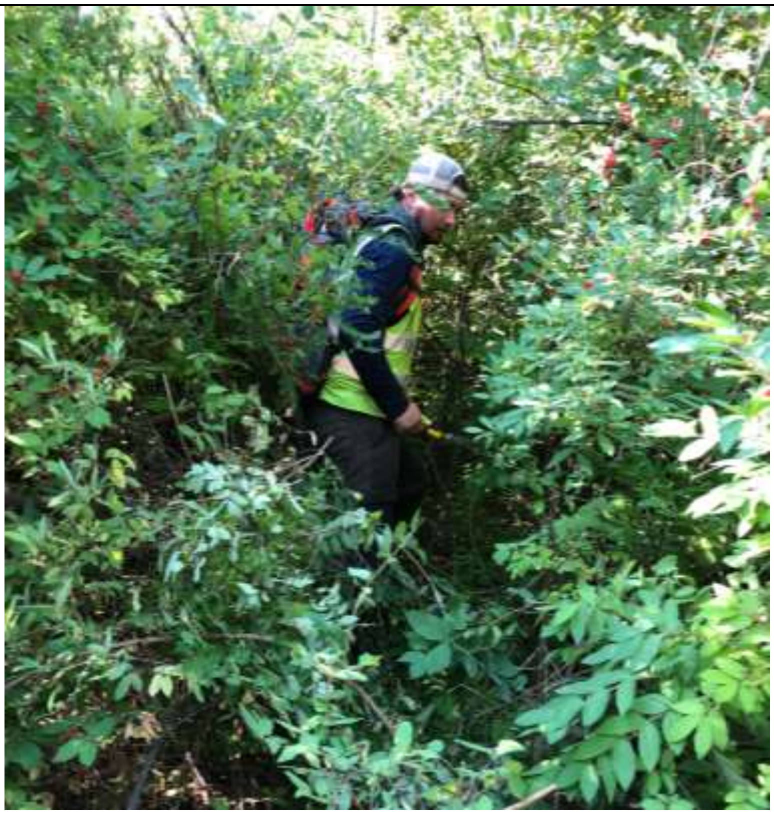


Photo No. 7

Location of Photo: Target Berm Hillside DU

Description: Collecting discrete surface samples for XRF analysis at the Target Berm Hillside DU at the edge of the steep ravine

Second Mobilization 2020

Photo No. 8

Location of Photo: Wet Meadow DU

Description: Field team removing flags and collecting GPS coordinates from Wet Meadow DU.

Third Mobilization 2020

Photo No. 9

Location of Photo: Background Reference Area DU

Description: ISM sampling flags and materials in the Background Reference Area DU.

Third Mobilization 2020

Photo No. 10

Location of Photo: Target Berm Hillside – Ponded DU

Description: Field team collecting sediment samples from the ponded area at the base of the Target Berm Hillside.

Third Mobilization 2020

Appendix C
Data Validation Report (on CD)

Appendix D
Laboratory Data Analytical Package
(on CD)

Prepared for: Army National Guard

Appendix E
Human Health Risk Assessment

AECOM

Final
Human Health Risk Assessment
Camp O’Ryan Rifle Range, New York

Munitions Response Site NYHQ-008-R-02
New York Army National Guard

Army National Guard

Contract No. W9133L-14-D-0001
Delivery Order No. 0006

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Table of Contents

Tables, Figures, and Attachments

Tables

Figures

Attachments

Acronyms and Abbreviations

AECOM	AECOM Technical Services, Inc.
ALM	Adult Lead Methodology
ARNG	Army National Guard
ATSDR	Agency of Toxic Substances and Disease Registry
bgs	below ground surface
BKSF	biokinetic slope factor
BLL	blood lead level
CDC	Centers for Disease Control and Prevention
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COPC	constituent of potential concern
CP	Commissioner Policy
CSM	conceptual site model
DER	Division of Environmental Remediation
DoD	Department of Defense
DOE	United States Department of Energy
DU	decision unit
EC	exposure concentration
EPC	exposure point concentration
g/day	grams per day
GM	Geometric Mean
HEAST	Health Effects Assessment Summary Tables
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
IEUBK	Integrated Exposure Uptake Biokinetic
in	inches
ISM	incremental sampling methodology
ITRC	Interstate Technology & Regulatory Council
LUC	Land Use Controls
MatPb	Mother's Blood Lead Concentration at Childbirth
MC	munitions constituents
MDC	maximum detected concentration
mg/day	milligrams per day
mg/kg	milligram per kilogram
mg/kg-day	milligram per kilogram per day

mg/m^3	milligrams per meters cubed
µg/day	micrograms per day
µg/dL	micrograms per deciliter
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per meters cubed
mm	millimeter
MMRP	military munitions response program
MRS	munitions response site
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCR	Non-Conformance Report
NDNODS	Non-Department of Defense, Non-Operational Defense Site
NYARNG	New York Army National Guard
NYSDEC	New York State Department of Environmental Conservation
Parsons	Parsons Infrastructure and Technology
PbB	blood lead
Pb/dL	lead per deciliter
QA/QC	quality assurance/quality control
RAGS	Risk Assessment Guidance for Superfund
RAIS	Risk Assessment Information System
RBSL	risk-based screening level
RfC	reference concentration
RfD	reference dose
RI	Remedial Investigation
RSL	regional screening level
SARA	Superfund Amendments and Reauthorization Act
SI	Site Inspection
SOP	standard operating procedure
THQ	target hazard quotient
UCL	upper confidence limit
UFP-QAPP	Uniform Federal Policy – Quality Assurance Project Plan
U.S.	United States
USEPA	United States Environmental Protection Agency
UU/UE	unlimited use and unrestricted exposure
XRF	X-ray Fluorescence
yd	yard

Executive Summary

This Human Health Risk Assessment (HHRA) was prepared as part of the Remedial Investigation (RI) report in support of the long-term management of the Non-Department of Defense (DoD), Non-Operational Defense Site (NDNODS) Camp O'Ryan Rifle Range (hereafter referred to as Camp O'Ryan) Munitions Response Site (MRS). Camp O'Ryan is located in Wethersfield, Wyoming County, New York and its Army Environmental Database Restoration Number is NYHQ-008-R-02. The Army National Guard (ARNG) determined an RI should be conducted due to the recommendations of past site investigations conducted for this NDNODS MRS under the Military Munitions Response Program (MMRP) Munitions Response Services.

The RI and HHRA meet the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. Also, New York State Department of Environmental Conservation (NYSDEC) risk-based screening levels and risk assessment guidance documents were integrated into the HHRA where possible to satisfy both federal and state programs.

The RI and HHRA evaluated the following three decision units (DUs) to characterize the nature and extent of munitions constituents (MC) contamination in soil berms at the 100-yard (yd) Firing Berm, Target Area, and Target Berm Area. Two additional DUs were added during the field events due to the discovery of two inundated areas: one on the west side of the Target Berm and one on the east side of the Target Berm. Two Non-Conformance Reports (NCRs) (one during the first mobilization event in June 2019 and another during the second mobilization event in July 2020) were approved to add sediment sampling at the two DUs, which are named the Target Berm Ponded DU and Wet Meadow DU. The name of the original Target Berm DU was revised to Target Berm Hillside DU to distinguish it from the ponded area. The RI has recommended that the MRS boundary be revised to include the expanded Target Berm Hillside area which extends beyond the original Camp O'Ryan MRS 2 Rifle Range boundary to the southeast. The hillside rises to approximately 1,905 ft at its highest point before plateauing at the Wet Meadow. Moving farther southeast beyond the revised MRS boundary the terrain continues to rise.

Field investigation activities included X-Ray fluorescence (XRF) screening of the 100-yard Firing Berm, Target Area, and the perimeter and step out areas of the Target Berm Hillside DUs, to evaluate the lateral extent of MC, and the collection surface soil samples using incremental sampling methodology (ISM) for evaluating risks. A background reference area adjacent to the MRS that was not affected by historical training activities was also sampled using ISM. Discrete subsurface samples were collected at depths of 12 to 18 inches (in) below ground surface (bgs) and 24-30 in bgs at select areas to determine the vertical extent of MC as part of the RI and were not used in this HHRA. However, discrete sediment samples were collected at both wetland DUs to aid in evaluating human health and ecological risks.

The HHRA evaluated whether constituents of potential concern (COPCs) attributable to past site activities have the potential to cause adverse health effects to human receptors within the area under investigation. Results of the HHRA may be used to develop risk management options for each DU, including possible further actions to address impacted surface soil and sediment where needed. Surface water samples were not collected due to shallow depth and expected settling of MC in sediment. Groundwater data was not available for this MRS.

The HHRA evaluated the following human receptors: outdoor worker, construction worker, site visitor/recreational user (child/adult), and hypothetical resident (child/adult). The future hypothetical resident was evaluated to explore the potential of unlimited use and unrestricted exposure (UU/UE) so that the ARNG would not have to implement any remedial action, restrictions, and/or land use controls (LUCs) to be protective of human health at the MRS.

The HHRA used a cumulative non-cancer hazard index (HI) of 1 when evaluating MC constituents for potential adverse health effects in the surface soil and sediment. If a receptor's cumulative HI exceeded 1, then the constituent non-cancer hazard results were segregated based on the target organ endpoint, and separate target organ-specific HIs were calculated. Only constituents that act on the same target organ are expected to be additive (United States [U.S.] Environmental Protection Agency [USEPA] 1991 and 1989). The HHRA non-cancer hazard results are presented in **Table ES-1**. These cumulative values represent exposure to antimony, copper, and zinc. Lead is evaluated separately.

Table ES-1 Non-Cancer Hazard Results for Human Receptors

COPC and Exposure Area	Construction Worker Hazard Index (unitless)	Outdoor Worker Hazard Index (unitless)	Child Site Visitor/ Recreational User Hazard Index (unitless)	Adult Site Visitor/ Recreational User Hazard Index (unitless)	Hypothetical Child Resident Hazard Index (unitless)	Hypothetical Adult Resident Hazard Index (unitless)
Target Berm Hillside DU 3 (ISM Surface Soil, 0 – 6 inches bgs)						
Copper	**0.02**	**0.001**	**0.004**	**0.0004**	**0.02**	**0.002**
Zinc	**0.001**	**0.0004**	**0.001**	**0.0001**	**0.006**	**0.0006**
Cumulative Hazard Index	**0.02**	**0.001**	**0.005**	**0.0005**	**0.02**	**0.002**
Target Berm Ponded DU 5 (Sediment)						
Antimony	**0.08**	**0.02**	**0.07**	**0.007**	**0.3**	**0.03**

Notes:
bgs = below ground surface; COPC = Constituent of Potential Concern; DU = Decision Unit; HI = hazard index; ISM = incremental sampling methodology
Results are rounded to one significant figure.
Black text = Indicated threshold has not been exceeded

The non-cancer hazard calculations for exposure to antimony, copper, and zinc in surface soil were generated using the U.S. Department of Energy (DOE) Risk Assessment Information System (RAIS) on-line risk calculator (DOE, 2020). Default exposure parameters provided in RAIS were used to generate the non-cancer hazard results for the on-site site visitor/ recreational user (child/adult), outdoor worker, construction worker, and hypothetical resident scenarios. RAIS uses the most current exposure parameters that are available from USEPA resources (USEPA 2002, 2004, 2011, and 2014).

Because most human health effects data for lead are correlated with concentrations in the blood rather than an external dose, the standard USEPA (1989) cancer risk and non-cancer hazard approach for evaluating healthy effects cannot be applied to lead. The USEPA has developed the following two models to estimate the receptor blood lead (PbB) concentrations and what percentage of the exposed population may have PbB levels above the allowable PbB threshold:

- Adult Lead Methodology (ALM) (version date 6/14/17) model (USEPA, 2017a);
- Integrated Exposure Uptake Biokinetic (IEUBK; win v1.1 build 11) model (USEPA, 2010).

Children are more vulnerable to lead poisoning than adults because their nervous systems are still developing. Children can be exposed to lead in their environment and prior to birth from lead in their mother's body. At lower levels of exposure, lead can decrease mental development, with effects on learning, intelligence, and behavior. The USEPA ALM and IEUBK models are designed to estimate PbB levels for the fetus of a female worker (i.e., body burden from exposure to lead) and a hypothetical child receptor (age 0 to 7 years), respectively. The ALM model was used to evaluate soil exposure to the site visitor/recreational user (adult), outdoor worker, and future construction worker receptors. The IEUBK model was used to evaluate soil exposure to the hypothetical child resident and child site visitor/recreational user.

The Center for Disease Control and Prevention (CDC) has recommended a target blood lead level (BLL) of 5 micrograms per deciliter (µg/dL) to protect young children from potentially adverse neurological effects (CDC, 1991 and 2012). At the present time, USEPA and NYSDEC have not formally adopted the CDC-recommended BLL and continue to use a target BLL of 10 µg/dL (USEPA, 2020 and NYSDEC 2010b). USEPA (2016) policy leaves the decision for selecting the allowable target BLL with each state or USEPA region. The HHRA conducted a sensitivity analysis and evaluated lead exposure to both target BLLs, but the target BLL of 10 µg/dL was used for the HHRA conclusions.

In addition, the threshold for lead is to limit the risk to no more than a 5% probability for the receptor's population PbB concentrations to exceed the selected target BLL in the ALM and IEUBK models (USEPA, 2017 and 2010). If the probability of 5% is exceeded, then adverse health effects from exposure to lead are possible.

The HHRA lead modeling results are presented in **Table ES-2.**

Table ES-2 ALM and IEUBK Lead Model Results for On-Site HHRA Receptors

Receptor	USEPA Lead Model Used	Target BLL of 10 µg/dL			Target BLL of 5 µg/dL		
		PbB Fetus (ALM) PbB Child (IEUBK) (µg/dL)	Percent Probability Threshold (%)	Above Thresholds? (Yes/No)	PbB Fetus (ALM) PbB Child (IEUBK) (µg/dL)	Percent Probability Threshold (%)	Above Thresholds? (Yes/No)
100-yd Firing Berm DU 1 (ISM Surface Soil, 0-6 in bgs)							
Outdoor Worker	ALM	1.7	0.0001%	No	1.6	0.02%	No
Construction Worker	ALM	1.8	0.0003%	No	1.8	0.04%	No
Adult Site Visitor/Recreational User	ALM	1.5	0.00006%	No	1.5	0.01%	No
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	< 10	0.001%	No	< 5	0.3%	No
Target Area DU 2 (ISM Surface Soil, 0-6 in bgs)							
Outdoor Worker	ALM	1.8	0.0003%	No	1.7	0.03%	No
Construction Worker	ALM	2.1	0.001%	No	2.1	0.09%	No
Adult Site Visitor/Recreational User	ALM	1.6	0.0001%	No	1.6	0.01%	No
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	< 10	0.01%	No	< 5	1.16%	No
Target Berm Hillside DU 3 (ISM Surface Soil, 0-6 in bgs)							
Outdoor Worker	ALM	2.4	0.002%	No	2.1	0.09%	No
Construction Worker	ALM	3	0.01%	No	3	0.60%	No
Adult Site Visitor/Recreational User	ALM	1.7	0.0002%	No	1.7	0.03%	No
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	< 10	0.40%	No	**> 5**	**12%**	**Yes**
Target Berm Ponded DU 5 (Sediment)							
Outdoor Worker	ALM	5.2	0.30%	No	**5.2**	**6%**	**Yes**
Construction Worker	ALM	7.5	2%	No	**7.5**	**17%**	**Yes**

Receptor	USEPA Lead Model Used	Target BLL of 10 µg/dL			Target BLL of 5 µg/dL		
		PbB Fetus (ALM) PbB Child (IEUBK) (µg/dL)	Percent Probability Threshold (%)	Above Thresholds? (Yes/No)	PbB Fetus (ALM) PbB Child (IEUBK) (µg/dL)	Percent Probability Threshold (%)	Above Thresholds? (Yes/No)
Adult Site Visitor/Recreational User	ALM	2.7	0.01%	No	2.7	0.30%	No
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	**> 10**	**31%**	**Yes**	**> 5**	**84%**	**Yes**
Wet Meadow DU 6 (Sediment)							
Outdoor Worker	ALM	1.8	0.0003%	No	1.8	0.04%	No
Construction Worker	ALM	2	0.001%	No	2	0.07%	No
Adult Site Visitor/Recreational User	ALM	1.5	0.0001%	No	1.5	0.01%	No
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	< 10	0.60%	No	< 5	0.9%	No

Notes:

ALM = Adult Lead Methodology; bgs = below ground surface; BLL = blood lead level; DU = Decision Unit; EPC = exposure point concentration; IEUBK = Integrated Exposure Uptake Biokinetic; ISM = incremental sampling methodology; in = inches; ug/dL = micrograms per deciliter; mg/kg = milligrams per kilogram; PbB = blood lead concentration;

Red text = Indicated threshold has been exceeded

Black text = Indicated threshold has not been exceeded

USEPA. 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows®version (IEUBKwin v1.1 build 11) 32-bit version Office of Superfund Remediation and Technology Innovation, United States Environmental Protection Agency.

USEPA, 2017. Adult Lead Methodology (Version date 6/14/17).

The HHRA results for the DUs are summarized below:

100-yd Firing Berm (DU 1)

- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to ISM surface soil (0-6 in bgs).

Target Area (DU 2)

- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to ISM surface soil (0-6 in bgs).

Target Berm Hillside (DU 3):

- Non-cancer hazard results indicated that adverse health effects are not likely for the any of the human receptors exposed to ISM surface soil (0-6 in bgs).
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to ISM surface soil (0-6 in bgs)

Target Berm-Ponded (DU 5):

- Non-cancer hazard results indicated that adverse health effects are not likely for the any of the potential human receptors exposed to sediment.
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are possible for the child site visitor/recreational user and hypothetical child resident from exposure to sediment.

Wet Meadow (DU 6)

- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to sediment.

No unacceptable risk to human receptors was determined at the 100-yard Firing Berm, Target Area, Target Berm-Hillside, and Wet Meadow DUs. However, adverse health effects are possible from exposure to lead in sediment for the child resident/child recreational user at the Target Berm-Ponded DU 5.

The heavily vegetated and marshy terrain of DU 5 and DU 6 makes access difficult under current site conditions for the hypothetical child resident and child site visitor/recreational user. Combined with conservative lead modeling assumptions, the Target Berm-Ponded DU and Wet Meadow DU sediment results are likely overestimated.

If USEPA and NYSDEC were to revise their policy regarding the target BLL (i.e., 10 µg/dL to 5 µg/dL), then adverse health effects are possible from exposure to surface soil for the child receptors at the Target Berm Hillside DU 3. Also, adverse health effects are possible for the outdoor worker, construction worker, and child site visitor/recreational user from exposure to sediment at Target Berm Ponded DU 5 (**Table ES-2**).

1 Introduction

This Human Health Risk Assessment (HHRA) was prepared as part of the Remedial Investigation (RI) report in support of the long-term management of the Non-Department of Defense (DoD), Non-Operational Defense Site (NDNODS) Camp O'Ryan Rifle Range Munitions Response Site (MRS; Army Environmental Database Restoration Number NYHQ-008-R-02), Wethersfield, Wyoming County, New York (**Figure 1**).

1.1 Regulatory Framework

Based on the results of a Site Inspection (SI) (Parsons Infrastructure and Technology Group [Parsons], 2012), the Army National Guard (ARNG) determined an RI should be conducted at this NDNODS MRS (also referred to as "Camp O'Ryan") in New York under the Military Munitions Response Program (MMRP) Munitions Response Services. The RI is being performed pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. Also, the HHRA was prepared pursuant to the requirements of the following guidance:

- National Oil and Hazardous Substances Pollution Contingency Plan (NCP) - as established in the United States (U.S.) Code of Federal Regulations (CFR) Part 40, Sections 300.120(d) and 300.400(e), 29 CFR, Subpart 1910.120 and
- U.S. Environmental Protection Agency's (USEPA's) Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual (Part A) and subsequent RAGS guidance documents (USEPA, 1989)
- USEPA lead models and guidance documents for CERCLA Superfund Sites available at https://www.epa.gov/superfund/lead-superfund-sites-guidance

Additionally, the following New York State Department of Environmental Conservation (NYSDEC) risk assessment guidance documents were integrated into the HHRA where possible to satisfy both federal and state programs:

- Commissioner Policy 51 (CP-51): Soil Cleanup Guidance (NYSDEC 2010a) and
- Division of Environmental Remediation (DER)-10/Technical Guidance for Site Investigation and Remediation (NYSDEC 2010b)

1.2 Project Purpose and Scope

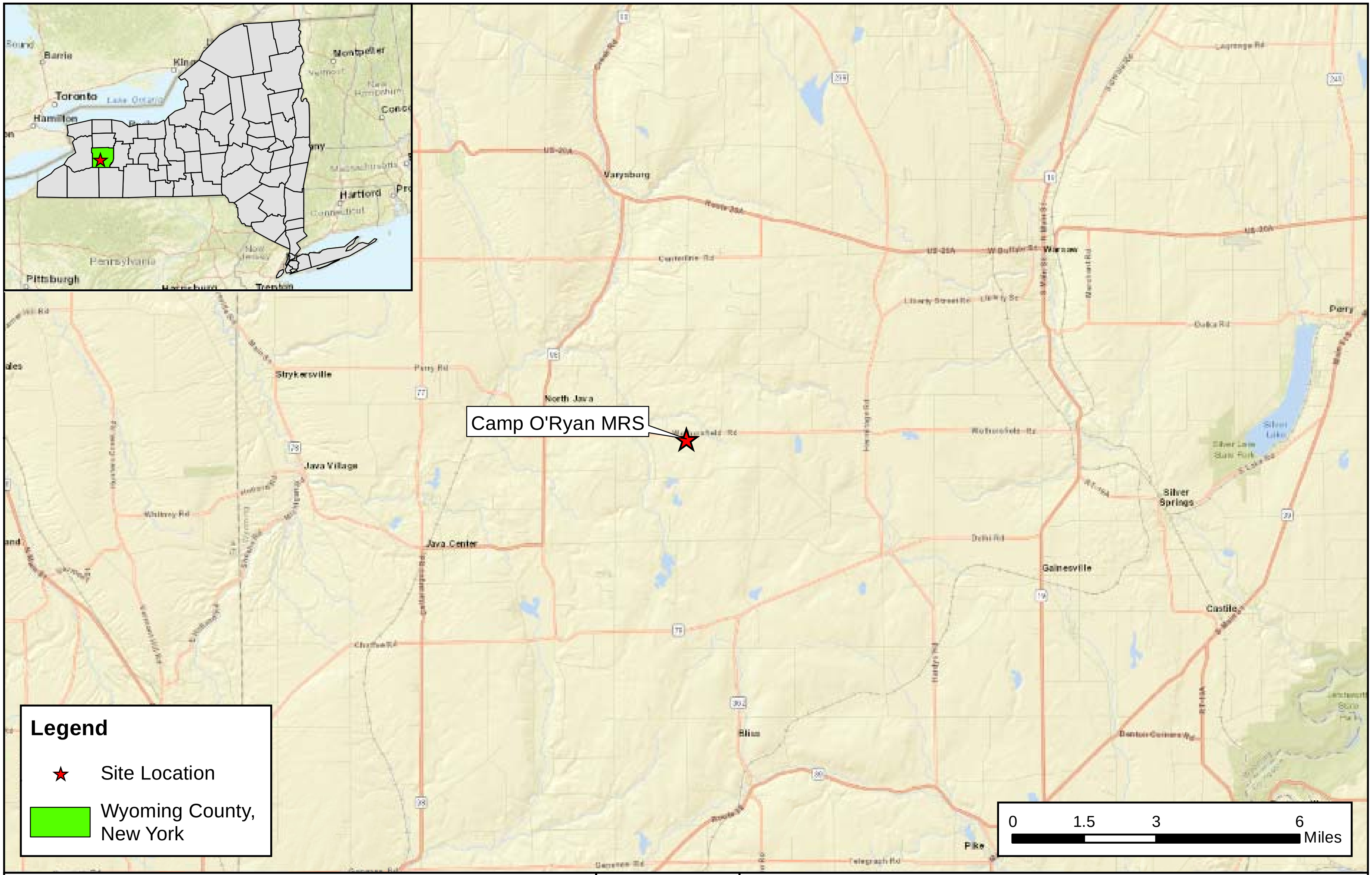
The overall objectives for the Camp O'Ryan HHRA are to 1) conduct a site-specific, quantitative analysis of the MRS under current and future land use scenarios, 2) identify human health constituents of potential concern (COPCs) detected in the affected environmental media, 3) evaluate potentially complete exposure pathways for applicable current and future human receptors, and 4) determine the degree to which these exposures may pose adverse health effects. The results of the HHRA may be used to assess risk management options for the MRS, including possible further actions to address impacted media.

The HHRA was aided using the following documents related to the MRS:

- Parsons (2012). *Final New York Site Inspection Report*.

- AECOM Technical Services, Inc. (AECOM) (2019). *Final Remedial Investigation Work Plan*. Camp O'Ryan Rifle Range, New York. Munitions Response NYHQ-008-R-02.
- AECOM (2020). *Remedial Investigation Report*. Camp O'Ryan Rifle Range, New York. Munitions Response Site NYHQ-008-R-02.

This HHRA was completed as part of the RI to evaluate risks to human health potentially posed by COPCs that cannot be eliminated using screening criteria in the affected media beneath and within the vicinity of the site.



CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	MS	11/20/2017
SCALE	1:190,080	CHK BY	JW	11/20/2017
SOURCE	ARNG; State of New York, ESRI & Partners	PM	LS	11/20/2017

N

Camp O'Ryan Munitions Response Site 2 Site Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 1

Q:\Projects\ENV\GEARS\GEO\NGB IDIQ\NDNODS 6 SARs\900-Work\GIS\Other_Sites\NY_ORyan\MXD\Work_Plan_Figures\Fig_1_ORyan_Site_Location.mxd

1.3 Report Organization

Brief descriptions of the document sections and appendices are as follows:

Section 1: Introduction. This section describes the authorization, project purpose and scope, and presents the report organization.

Section 2: Site Characterization. This section summarizes the MRS background, historical use, and environmental setting. The conceptual site model (CSM) developed for the MRS is also presented. The analytical data are reviewed, and the human health COPCs are identified.

Section 3: Exposure Assessment. This section identifies the human receptors that may be exposed to site-related COPCs in the affected media and the potential extent of human exposure that may occur under MRS-specific exposure scenarios.

Section 4: Toxicity Assessment. This section describes the relationship between the magnitude of exposure (dose or exposure concentration [EC]) and the incidence of adverse health effects associated with the identified COPCs.

Section 5: Risk Characterization. This section describes the nature and magnitude of potential human health risks in comparison with state and federal target risk levels.

Section 6: Uncertainty Analysis. This section discusses the uncertainties associated with each step of the HHRA.

Section 7: Summary and Conclusions. This section provides an overview of the findings of the HHRA for the DUs within the MRS.

Section 8: References. Section provides the references used to develop this document.

The following attachments are included with this HHRA appendix:

Attachment A: Sample Data Used in the HHRA

Attachment B: HHRA Risk Calculations

Attachment C: Lead Modeling

2 Site Characterization

This Section summarizes the MRS background, historical use, and environmental setting. A CSM developed for the MRS is also presented. The evaluation of the analytical data and risk-based screening to identify human health COPCs is described.

2.1 Background Information

Camp O'Ryan MRS 2 Rifle Range is a former small arms range of approximately 17.5 acres and is located in Wethersfield, Wyoming County, NY (**Figure 1**). The MRS consists of a former 200-yard (yd) range with 50 targets and firing berms, at distances of 100 and 200 yds, and an earthen impact berm (**Figure 2**). The MRS also includes a concrete retaining wall with target structures still intact. Small arms, including .30 caliber M1, were approved for use Camp O'Ryan MRS 2; additional potential munitions used include .22, .38, and .45 caliber, 5.56 millimeter (mm), and 7.62mm. The firing direction at the Camp O'Ryan MRS 2 was to the southeast. However, live-fire training no longer occurs at the MRS. The property is privately owned and administered by the Edward N. George Estate.

The RI and HHRA evaluated the following five decision units (DUs) to characterize the nature and extent of munitions constituents (MC) contamination in soil berms at the 100-yd Firing Berm, Target Area, Target Berm-Hillside, Target Berm-Ponded, and Wet Meadow The RI has recommended that the MRS boundary be revised to include the expanded Target Berm Hillside area which extends beyond the original Camp O'Ryan MRS 2 Rifle Range boundary to the southeast. The hillside rises to approximately 1,905 ft at its highest point before plateauing at the Wet Meadow. Moving farther southeast beyond the revised MRS boundary the terrain continues to rise. **Figure 2** presents the locations of the DUs and the background reference area.

Field investigation activities included X-Ray fluorescence (XRF) screening of the 100-yd Firing Berm, Target Area, and the perimeter and step out areas of the Target Berm Hillside DUs, to evaluate the lateral extent of MC, and the collection surface soil samples using incremental sampling methodology (ISM) for evaluating risks. A background reference area adjacent to the MRS that was not affected by historical training activities was also sampled using ISM.

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	MS	10/8/2020
SCALE	1:3,600	CHK BY	JW	10/8/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User		PM	LS	10/8/2020

N

Camp O'Ryan RI Approach

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2

S:\60519685-GRM2\900-Work\GIS\Other_Sites\NY_ORyan\1_MXD\RI_Figures\Fig_3-1_ORyan_MRS2_Rifle_Range_RI_Approach.mxd

Discrete subsurface samples were collected at depths of 12 to 18 inches (in) below ground surface (bgs) and 24 to 30 in bgs at select areas to determine the vertical extent of MC as part of the RI and were not used in the HHRA; however, discrete sediment samples were collected at both wetland DUs to aid in evaluating human health and ecological risks.

2.2 Site Location and Surrounding Land Use

The majority of the MRS is comprised of a cleared grassy field. The MRS contains mostly gently rolling, forested terrain comprising deciduous trees with patches of open grass fields. The boundary of the MRS is heavily vegetated with trees and shrubs, and the central portion of the MRS is less densely vegetated. The MRS is easily accessible off Wethersfield Road (Route 32).

Currently, the former rifle range is privately owned and administered by the Edward N. George Estate and is behind property owned by the King Brothers Masonry Contractors, which is a small parcel of 4.83 acres that lies to the north. Because the land is privately owned, there is potential that the MRS could be used for residential and/or recreational purposes in the future.

The surrounding land use is primarily farmland to the north, west, and southwest. The land is heavily vegetated with trees and shrubs to the south and east of Camp O'Ryan. Nearby water bodies include Java Lake, which is roughly 4 miles to the southwest, and Wethersfield Springs Pond roughly 4 miles to the east (Parsons, 2011). Two temporarily inundated areas, the Wet Meadow and Target Berm Ponded DUs, were identified on the MRS during the RI field activities. The Wet Meadow DU is located upslope of the Target Berm Hillside DU and other MRS MC source areas. Due to the Wet Meadow elevation and local topography, neither groundwater nor surface water from MC source areas is expected to migrate towards the Wet Meadow. Groundwater is anticipated to follow topography and surface water flow is away from the Wet Meadow to the northwest in the direction of other MRS features. If shallow groundwater is discharging to the Wet Meadow, it is likely to be flowing to the meadow from the upslope southeast direction, beyond the MRS boundary, and would not likely contain MC.

There are no groundwater wells within the Camp O'Ryan MRS 2. There are two domestic water wells approximately 0.25 miles from the MRS. Well number WO 430 is to the southeast with a total depth of 60 feet bgs, and a depth to water at about 15 feet bgs. Well number WO 868 is north of the MRS with a total depth of 275 feet bgs and a depth to water of about 50 feet bgs (Parsons, 2012).

2.3 Conceptual Site Model

The CSM (**Figure 3**) was generated using the findings in the SI (Parsons, 2012) and the site visit that was conducted during the RI. The CSM describes the potential physical, chemical, and biological processes that may transport contaminants from sources to receptors and provides the basis for evaluating potential risks to human health and the environment.

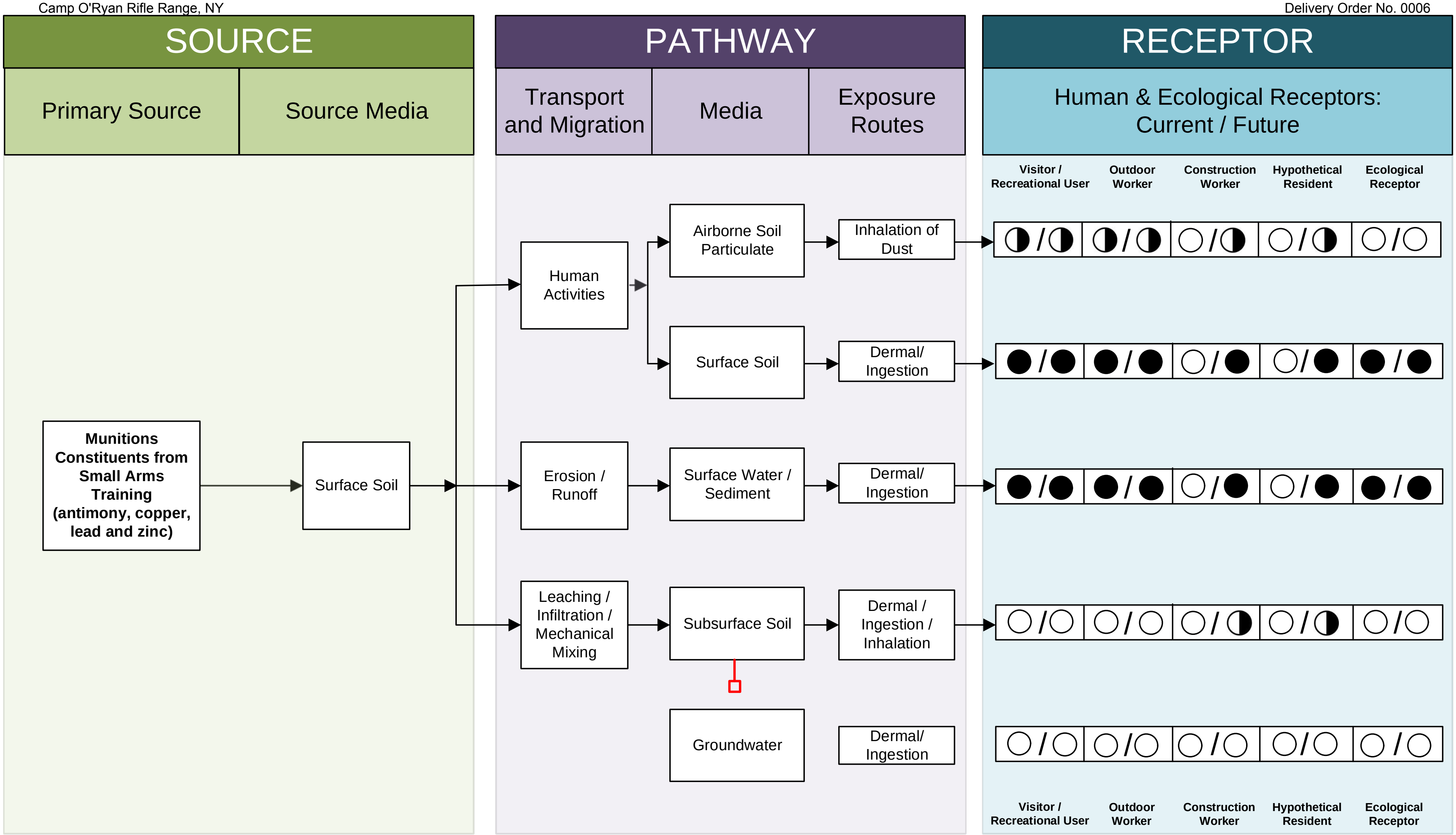
The CSM identifies the potentially complete exposure pathways that were quantified in the HHRA. Direct contact with surface soil (i.e., incidental ingestion, dermal contact and inhalation of dust) is the prevalent complete exposure pathway for human receptors at Camp O'Ryan MRS. Current exposure at the MRS is associated with MC in surface soil (antimony, copper, lead, and zinc) to potential receptors such as site visitors, recreational users, and workers (e.g., construction and outdoor maintenance). The area within the MRS is currently unused. Future land use is unlikely to significantly change.

A future hypothetical resident is also evaluated to explore the potential of unlimited use and unrestricted exposure (UU/UE) so that the ARNG would not have to implement any remedial action, restrictions, and/or LUCs to be protective of human health at the site.

MC deposited in surface soil as a result of firing activities at the MRS has limited potential to migrate from source areas (i.e., earthen berm composition and the concrete retaining wall). The heavily vegetated MRS limits the potential for stormwater runoff from significant rain events to transport suspended COPCs off-site. A potentially complete transport pathway from the soil DUs is surface runoff to the surface water and sediment of the Target Berm Ponded DU 5; migration to the Wet Meadow from the Target Berm Hillside DU is not anticipated because the Wet Meadow is upslope of the Target Berm Hillside DU. Also, the heavy vegetation and marshy conditions of the inundated DUs limit a receptor's access to their surface water and sediments.

A limited number of subsurface soil samples were collected for the sole purpose of assessing the vertical extent of MC in soil at biased locations with the highest lead detections in surface soil; therefore, the data are not representative of an entire DU. Risk assessment and post-RI decisions are based on surface soil and sediment conditions because these are the media most heavily affected by small arms training and most likely to result in human exposure. This is in accordance with the data quality objectives and decision points stated in the RI Uniform Federal Policy – Quality Assurance Project Plan (UFP-QAPP).

Small arms metals have a strong affinity to sorb to soil particles, particularly soils that are rich in organic matter or low in pH, and usually only migrate via physical transport pathways. Because of these chemical properties, they typically do not leach to groundwater, except where shallow groundwater exists less than 5 feet bgs. No monitoring wells have been installed within the vicinity of the MRS and depth to groundwater is currently unknown. The Target Berm-Ponded DU appears to be an accumulation point behind the Target Area DU and downslope of the Target Berm-Hillside DU rather than a groundwater-fed water body. Because the Wet Meadow DU is at a higher elevation than the remainder of the MRS, topography likely precludes any MC migration via groundwater or surface runoff into the Wet Meadow. The minor MC found in sediment is probably the result of small amounts of overshot or ricochet into the area. Given the local topography and surface water flow, groundwater flow at this DU is likely to be to the northwest, towards the former range and unlikely to contain MC. If shallow groundwater is discharging to the Wet Meadow, it is likely to be flowing to the meadow from the upslope southeast direction, beyond the MRS boundary, and would not likely contain MC.



	Visitor / Recreational User	Outdoor Worker	Construction Worker	Hypothetical Resident	Ecological Receptor
Inhalation of Dust	◐ / ◐	◐ / ◐	○ / ◐	○ / ◐	○ / ○
Dermal/ Ingestion	● / ●	● / ●	○ / ●	○ / ●	● / ●
Dermal/ Ingestion	● / ●	● / ●	○ / ●	○ / ●	● / ●
Dermal / Ingestion / Inhalation	○ / ○	○ / ○	○ / ◐	○ / ◐	○ / ○
Dermal/ Ingestion	○ / ○	○ / ○	○ / ○	○ / ○	○ / ○

LEGEND

Flow-Chart Stops
Flow-Chart Continues
Partial / Possible Flow
○ Incomplete Pathway
◐ Potentially Complete Pathway
● Complete Pathway

Figure 3
Revised Conceptual Site Model Diagram
Camp O'Ryan Rifle Range MRS, New York

2.4 Data Evaluation

The Camp O'Ryan MRS was broken into the following soil DUs: 100-yd Firing Berm (1 acre), Target Area (0.5 acres), and Target Berm Hillside (0.8 acres). Two additional DUs were added during the field events due to the discovery of two inundated areas; Target Berm Ponded and Wet Meadow DUs. A phased approach was used that included assessing the extent of MC soil contamination in the field using X-ray fluorescence (XRF) analysis of discrete soil samples at the 100-yd Firing Berm, Target Area and Target Berm Hillside DUs. The extent of MC in soil established the final size of soil DU.

Discrete soil samples were collected at each soil DU for the purposes of vertical and/or lateral delineation of MC in soil. The vertical extent of contamination was characterized by collecting discrete subsurface soil samples from select areas at each DU where XRF results exceeded the human health screening criterion for lead. Discrete subsurface soil samples were collected at depths ranging from 12 to 18 in bgs and 24 to 30 in bgs at the 100-yd Firing Berm, Target Area, and Target Berm Hillside DUs, to confirm the potential lateral extent of MC contamination in soil.

Incremental surface soil samples were collected from the 100-yd Firing Berm DU, Target Area DU, Target Berm Hillside DU, and a Background Reference Area using ISM. ISM uses a systematic random approach that is outlined in the UFP-QAPP standard operating procedures (SOPs; AECOM, 2019). The RI surface soil ISM data evaluated in this HHRA are presented in **Attachment A.** These data were used for risk-based screening and further characterization of surface soil exposure medium.

Discrete sediment samples were collected from the Target Berm Ponded and Wet Meadow DUs. The RI sediment data evaluated in this HHRA are presented in **Attachment A**. Parent sample and field duplicate pairs in the discrete sediment sample data sets were averaged to represent the sample and then used in exposure point concentration (EPC) concentration (e.g., upper confidence limit [UCL]) calculations. No surface water samples were collected. As noted in **Section 2.3**, groundwater is not a medium of concern at the MRS.

Quality assurance/quality control (QA/QC) procedures outlined in AECOM (2019 and 2020) were used to assess the precision and accuracy of analytical data. No rejected, "R"-flagged, data were identified, and all surface soil and sediment data were carried forward into the HHRA. Estimated values, "J"-flagged results, were treated as detected results.

2.5 Human Health Risk-Based Screening

Analytical data were compared to risk-based screening levels (RBSLs) to determine if past small arms training activities resulted in contamination exceeding human health screening levels. Site-specific background reference samples were collected and analyzed for comparison purposes. The human health RBSLs used for the RI and HHRA are presented in **Table 2-1**. Residential screening levels were selected for the risk-based screening to evaluate the potential for UU/UE and be protective of all scenarios evaluated in the HHRA.

Table 2-1. Remedial Investigation Screening Levels

Analyte	Risk-Based Screening Levels Soil Human Health (mg/kg)	Risk-Based Screening Levels Sediment Human Health (mg/kg)
Antimony	3.1$^{(1)}$	14.6$^{(1)}$
Copper	50$^{(2)}$	1,460$^{(1)}$
Lead	63$^{(2)}$	63$^{(1)}$
Zinc	109$^{(2)}$	11,000$^{(1)}$

Notes:

(1) USEPA's Residential Soil Regional Screening Levels (RSLs) (November 2020), protective of a target hazard quotient of 0.1 and a target cancer risk of 1x10-6. For sediment, the recreator RSLs were calculated using the on-line calculator; an exposure frequency of 75 days/year and 1 hour/event was assumed. Same target thresholds were used as the soil. The lead screening level is not modified because it is a background level established by the New York State Remedial Program.

(2) New York State Department of Environmental Conservation (NYSDEC), 2010. DER-10/Technical Guidance for Site Investigation and Remediation. Final DEC Program Policy. May. Soil Cleanup Objectives for Unrestricted Use.

mg/kg = milligram per kilogram

With the exception of antimony, NYSDEC soil cleanup objectives (SCOs) that are protective of unrestricted use were used to screen the soil (NYSDEC, 2010b). USEPA residential soil regional screening level (RSL) that is protective of a target cancer risk of 1E-06 and a target hazard quotient (THQ) of 0.1 (USEPA, 2020) was used to screen soil concentrations for antimony because a supplemental human health SCO was not available in CP-51 Soil Cleanup Guidance (NYSDEC, 2010a).

The lead SCO represents a rural soil background level for the State of New York (NYSDEC, 2010b). New York State background levels are incorporated into NYSDEC SCOs when unrestricted residential use is being evaluated. The lead soil background level of 63 milligram per kilogram (mg/kg) is more conservative than lead's risk-based SCO of 400 mg/kg.

NYSDEC does not provide human health sediment screening criteria; therefore, sediment screening levels were derived using the USEPA on-line RSL calculator (USEPA, 2020); RSLs that are protective of a child and adult recreational user scenario were derived assuming an exposure frequency of 75 days/year and an exposure time of 1 hour/event (U.S. Department of Energy [DOE], 2020). The remaining exposure parameters that were used were USEPA default values in the calculator (USEPA, 2020). Target cancer risk and THQ thresholds (i.e., 1E-06 and 0.1, respectively) used for the recreational user scenario are the same as those used for the residential soil RSL used for antimony. The sediment data for the Target Berm Ponded and Wet Meadow DUs were screened against the derived sediment screening levels identified in **Table 2-1**.

During risk-based screening, 95% UCLs were used to screen the ISM surface soil data per the Interstate Technology and Regulatory Council (ITRC) ISM guidance (ITRC, 2012). UCLs were calculated using ITRC's UCL calculator for ISM (set a confidence interval of 95%). This approach remains the most conservative because the 95% UCL for ISM samples collected in triplicate will always be higher than the maximum detected concentration (MDC) (ITRC, 2012). Sediment samples were screened using the MDCs.

The ISM surface soil (0 to 6 in bgs) risk-based screening identified lead as a COPC at the 100-yd Firing Berm DU 1 and Target Area DU 2. For the Target Berm Hillside DU 3, copper, lead, and zinc were identified as surface soil ISM COPCs. Screening results are shown in **Table 2-2**.

With the exception of zinc, the range of metals concentrations for the ISM COPCs were above the background reference area ISM soil results, thus indicating that concentrations are likely site related. The MDC for zinc at the Target Berm Hillside DU 3 was higher than the MDC for the Background Reference Area and, therefore, was retained as a soil COPC.

As shown in **Table 2-3**, antimony and lead were identified as sediment COPCs for the Target Berm Ponded DU 5, and lead was identified as a sediment COPC for the Wet Meadow DU 6.

Table 2-2. Risk-Based Screening and Summary Statistics ISM Surface Soil

COI	Detect Freq.	% Detect	Min Detect	Max Detect	Location of Max Detect	Range of BKG	UCL	RBSL (1)	COPC?
100-yd Firing Berm DU 1 (ISM Surface Soil, 0-6 in bgs), mg/kg									
Antimony	3/3	100	0.19	0.285	COR01IS02	0.13 - 0.14	0.35	3.1	No
Copper	3/3	100	28.7	30.8	COR01IS01	16 - 19.1	32.33	50	No
Lead	3/3	100	38.5	63	COR01IS02	21 – 28.1	84.33	63	**Yes**
Zinc	3/3	100	93.3	96.3	COR01IS02	86.1 - 97.8	99.02	109	No
Target Area DU 2 (ISM Surface Soil, 0-6 in bgs), mg/kg									
Antimony	3/3	100	0.293	0.327	COR02IS02	0.13 - 0.14	0.35	3.1	No
Copper	3/3	100	31.9	39.9	COR02IS03	16 - 19.1	45.74	50	No
Lead	3/3	100	72.1	98.7	COR02IS02	21 – 28.1	118.23	63	**Yes**
Zinc	3/3	100	91.3	98.3	COR02IS03	86.1 - 97.8	103.38	109	No
Target Berm Hillside DU 3 (ISM Surface Soil, 0-6 in bgs), mg/kg									
Antimony	3/3	100	0.425	0.725	COR03IS02	0.13 - 0.14	0.96	3.1	No
Copper	3/3	100	24.9	41.4	COR03IS02	16 - 19.1	55.27	50	**Yes**
Lead	3/3	100	164	248	COR03IS03	21 – 28.1	309.74	63	**Yes**
Zinc	3/3	100	82.5	119	COR03IS01	86.1 - 97.8	146.97	109	**Yes**

Notes:

(1) See **Table 2-1** for RBSLs

% = Percent
BKG = Background
COI = Constituent of Interest
COPC = Constituent of Potential Concern
DU = Decision Unit
Freq. = Frequency
in bgs = inches below ground surface
ISM = Incremental Sampling Methodology
mg/kg = milligrams per kilogram
RBSL = Risk-Based Screening Level
UCL = Upper Confidence Limit (Chebyshev 95%)

Table 2-3 Risk-Based Screening and Summary Statistics Sediment

COI	Detect Freq.	% Detect	Min Detect	Max Detect	Location of Max Detect	Range of BKG	RBSL [1]	COPC?
Target Berm Ponded DU 5 (Sediment, 0-6 in bgs), mg/kg								
Antimony	8/8	100	1.92	19.8	COR05SED07A	NC	14.6	**Yes**
Copper	8/8	100	20.0	124	COR05SED07A	NC	1,460	No
Lead	8/8	100	109	2,780	COR05SED07A	NC	63	**Yes**
Zinc	8/8	100	61.8	348	COR05SED08A	NC	11,000	No
Wet Meadow DU 6 (Sediment, 0-6 in bgs), mg/kg								
Antimony	8/8	100	0.14	1.7	COR06SED04A	NC	14.6	No
Copper	8/8	100	7.67	39.6	COR06SED04A	NC	1,460	No
Lead	8/8	100	25.5	154	COR06SED04A	NC	63	**Yes**
Zinc	8/8	100	36.3	211	COR06SED05A	NC	11,000	No

Notes:

(1) See **Table 2-1** for RBSLs
% = Percent
BKG = Background
COI = Constituent of Interest
COPC = Constituent of Potential Concern
DU = Decision Unit
Freq. = Frequency
in bgs = inches below ground surface
ISM = Incremental Sampling Methodology
mg/kg = milligrams per kilogram
NC = Not Collected
RBSL = Risk-Based Screening Level

In summary, the risk-based screening results identified the following:

- Lead is a surface soil ISM COPC for the 100-yd Firing Berm DU 1, Target Area DU 2, and Target Berm Hillside DU 3.
- Copper, lead, and zinc are surface soil ISM COPCs for the Target Berm Hillside DU 3.
- Antimony and lead are sediment COPCs for the Target Berm Ponded DU 5, and lead is a sediment COPC for the Wet Meadow DU 6.
- No groundwater or surface water data were collected at Camp O'Ryan; these media are not evaluated in the HHRA.

The surface soil and sediment media are evaluated further in the HHRA for all applicable DUs.

3 Exposure Assessment

This section describes the potential exposure scenarios for Camp O'Ryan, EPCs, non-cancer hazard calculations, and lead models used to estimate the potential adverse health effects from exposure to surface soil and sediment at the MRS. The surface soil and sediment COPCs being carried forward for further evaluation do not exhibit carcinogenic toxicity therefore only non-cancer hazard calculations were conducted in this HHRA.

3.1 Exposure Scenarios

This section discusses the human receptors identified during **Section 2 Site Characterization** that may be exposed to site-related human health COPCs in affected media and addresses the potential extent of their exposure under site-specific exposure scenarios.

The current exposure at the MRS consists of potential on-site receptors, such as workers and site visitors to the King Brothers Masonry facility, being exposed to MC in surface soil. There is potential for land redevelopment in the future, which may lead to subsurface soil COPC exposure for the future scenario evaluations. Even though portions of the site are heavily vegetated (i.e., trees, shrubs and marshy areas), a recreational user scenario was conservatively evaluated because access to the MRS is not restricted.

The CSM (**Figure 3**) represents the current/future exposed populations or scenarios for the MRS because the future land use is unlikely to significantly change. The following on-site receptors were evaluated in the HHRA: site visitor/recreational user (child/adult), outdoor worker, construction worker, and hypothetical resident (child/adult). No off-site receptors were identified for the MRS; the RI indicates that off-site migration is minimal. A brief description of each receptor is provided below:

On-Site Visitor/Recreational User (Child/Adult/Lifetime): A current/future on-site visitor/recreational user (i.e., an adult and young child, 0 to 6 years) is assumed to visit the MRS for 75 days per year (Risk Assessment Information System [RAIS] default value) and spend 1 hour per visit to explore areas of the MRS that are accessible (DOE, 2020).

For the lead modeling, the on-site adult visitor/recreational user is assumed to visit the MRS for 69 days per year (i.e., 2 days/week × 4.3 weeks/month × 8 month/year), with a weighted averaging time of 241 days per year (i.e., 7 days/week × 4.3 weeks/month × 8 months/year) to account for New York's climate (e.g., snowy or inclement weather). USEPA (2003) recommends time-weighting the exposure parameters for lead modeling when dealing with intermittent exposure scenarios. Potential adverse effects from lead in soil and sediment for the child site visitor/recreational user are conservatively estimated using the Integrated Exposure Uptake Biokinetic (IEUBK) model (Windows version 1.1, Build 11) (USEPA 2007 and 2010).

Soil-related exposure pathways for the adult and child receptor include incidental ingestion, dermal contact, and inhalation of wind-blown particulates from soil. The MC COPCs are not volatile, thus inhalation of vapors emanating from soil is an incomplete exposure pathway.

Sediment-related exposure pathways include incidental ingestion and dermal contact with MC in the marshy wetland areas of the MRS.

On-Site Outdoor Worker: The current/future on-site outdoor maintenance worker is assumed to work at the MRS for 225 days per year for 25 years with a soil ingestion rate of 100 milligrams per day (mg/day) for the non-cancer hazard calculations and a central tendency soil ingestion rate of 0.05 grams per day (g/day) for the lead modeling. These exposure parameters are USEPA standard default values for the outdoor worker (USEPA, 2014 and 2017). This scenario was evaluated because workers and visiting contractors at the King Brothers Masonry facility may access the MRS.

Soil-related exposure pathways include incidental ingestion, dermal contact, and inhalation of wind-blown particulates from soil. The MC COPCs are not volatile, thus inhalation of vapors emanating from soil is an incomplete exposure pathway.

Sediment-related exposure pathways include incidental ingestion and dermal contact with MC in the marshy wetland areas of the MRS.

On-Site Construction Worker: The future on-site construction worker is assumed to be involved in a year-long construction project (i.e., exposure frequency of 250 days per year and an averaging time of 365 days per year (USEPA, 2002). A higher soil ingestion rate of 330 mg/day was used for the non-cancer hazard calculations. USEPA (2017) lead guidance recommends using a higher central tendency soil ingestion rate of 0.1 g/day to account for excavation activities.

Soil-related exposure pathways include incidental ingestion, dermal contact, and inhalation of wind-blown particulates from soil. The MC COPCs are not volatile, thus inhalation of vapors emanating from soil is an incomplete exposure pathway. This scenario is also protective of a utility worker.

Sediment-related exposure pathways include incidental ingestion and dermal contact with MC in the marshy wetland areas of the MRS.

On-Site Hypothetical Resident (Child/Adult/Lifetime): The inclusion of a hypothetical future resident (i.e., an adult and young child, 0 to 6 years) was used to conservatively evaluate UU/UE for future risk management decision-making should the land use change. USEPA (2014) default exposure parameters were used in the non-cancer hazard calculations.

Soil-related exposure pathways include incidental ingestion, dermal contact, and inhalation of wind-blown particulates from soil. The MC COPCs are not volatile, thus inhalation of vapors emanating from soil is an incomplete exposure pathway.

Sediment-related exposure pathways include incidental ingestion and dermal contact with MC in the marshy wetland areas of the MRS.

Potential adverse effects from lead in soil for the hypothetical child resident are conservatively estimated using the IEUBK model (Windows version 1.1, Build 11) (USEPA 2007 and 2010). The ALM is not used to evaluate the hypothetical adult resident because it is assumed that the resident is living on-site, and the child resident is the more sensitive residential receptor.

3.2 Exposure Point Concentrations

The concentrations of COPCs that a receptor may come into contact with are referred to as EPCs. USEPA (1989) recommends using the lower of the MDC and the 95% UCL of the mean as the EPC in cases where the DU is reasonably defined. For lead, the mean concentration is used as the EPC (USEPA, 2007 and 2019b). Microsoft® Excel was used as the calculation tool to derive the mean concentrations.

The lead SCO of 63 mg/kg used in the risk-based screening (**Section 2.5**) represents a rural background level for the State of New York (NYSDEC, 2010b) and represents unrestricted residential land use; therefore it was used in **Table 3-1** to determine what DUs were carried forward for lead modeling.

Table 3-1 indicates that lead modeling is necessary for ISM surface soil (0 to 6 in bgs) at the 100-yd Firing Berm DU 1, Target Area DU 2, Target Berm Hillside DU 3, and sediment at the Target Berm Ponded DU 5 and Wet Meadow DU 6. USEPA recommends using the mean lead concentration as the EPC when running the USEPA lead models (USEPA, 2019b).

Table 3-2 presents the EPCs that were used in the HHRA.

3.3 Non-Cancer Hazard Calculations

The non-cancer hazard calculations for exposure to antimony and zinc in soil were generated using the DOE RAIS on-line risk calculator (DOE, 2020). Default exposure parameters provided in RAIS were used to generate the non-cancer hazard results for the on-site site visitor/recreational user (child/adult), outdoor worker, construction worker, and hypothetical resident scenarios. RAIS uses the most current exposure parameters that are available from USEPA resources (USEPA 2002, 2004, 2011, and 2014). **Attachment B** presents the exposure parameters used in RAIS on-line calculator for the soil and sediment non-cancer hazard calculations.

3.4 Lead Modeling

Because most human health effects data for lead are correlated with concentrations in the blood rather than an external dose, the standard USEPA (1989) cancer risk and non-cancer hazard approach for evaluating healthy effects cannot be applied to lead. The USEPA has developed the following two models to estimate the receptor blood lead (PbB) concentrations and what percentage of the exposed population may have PbB levels above the allowable PbB threshold:

- Adult Lead Methodology (ALM) (version date 6/14/17) model;
- IEUBK win v1.1 build 11) model.

The NYSDEC DER-10 guidance and USEPA RSL table currently uses an allowable blood lead level (BLL) of 10 µg/dL for their IEUBK-derived screening levels (NYSDEC, 2010b and USEPA, 2020). However, the more conservative lead SCO of 63 mg/kg was used in the risk-based screening. The Centers for Disease Control and Prevention (CDC) recommends a BLL of 5 µg/dL (CDC, 1991 and 2012). The HHRA evaluated both BLLs as part of a sensitivity analysis to determine how the lead modeling results would change if a target BLL of 5 µg/dL were to be adopted in the future.

Table 3-1 Lead Modeling Determination

Exposure Area	Exposure Medium	Sample Depth (inches bgs)	Sample Type	UCL or MDC (mg/kg)	Human Health Screening Level[(1)] (mg/kg)	Lead Modeling Required? (Yes/No)
100-Yard Firing Berm (DU 1)	Soil	0-6	ISM	84.33 (UCL)	63	Yes; UCL > SL
Target Area (DU 2)	Soil	0-6	ISM	118.23 (UCL)	63	Yes; UCL > SL
Target Berm Hillside (DU 3)	Soil	0-6	ISM	309.74 (UCL)	63	Yes; UCL > SL
Target Berm Ponded (DU 5)	Sediment	NA	Discrete	2,780 (MDC)	63	Yes; MDC > SL
Wet Meadow (DU 6)	Sediment	NA	Discrete	154 (MDC)	63	Yes; MDC > SL

Notes:

bgs = below ground surface; DU = Decision Unit; ISM = Incremental Sampling Methodology; MDC = maximum detected concentration; mg/kg = milligram per kilogram; NA = not applicable; SL = screening level; UCL = upper confidence limit

(1) NYSDEC 2020. New York Remedial Program Soil Cleanup Objectives for Unrestricted Use. Background concentration for Rural Area.

Table 3-2 Exposure Point Concentrations Used in the HHRA

Decision Unit/Exposure Medium	Antimony EPC (mg/kg)	EPC Type	Copper EPC (mg/kg)	EPC Type	Lead EPC (mg/kg)	EPC Type	Zinc EPC (mg/kg)	EPC Type
100-yd Firing Berm (DU 1)	N/A		N/A		53	MEAN	N/A	
Target Area (DU 2)	N/A		N/A		85	MEAN	N/A	
Target Berm Hillside DU 3 Surface Soil (ISM)	N/A		55.27	UCL	197	MEAN	146.97	UCL
Target Berm Ponded DU 5Sediment	10.6	UCL	N/A		779	MEAN	N/A	
Wet Meadow (DU 6)	N/A		N/A		78	MEAN	N/A	

Notes:

DU = decision unit; EPC = exposure point concentration; in bgs = inches below ground surface; ISM = incremental sampling methodology; MDC = maximum detected concentration; mg/kg = milligrams per kilogram; N/A = not applicable (not a COPC); UCL = upper confidence limit

4 Toxicity Assessment

Toxicity assessments provide the basis for evaluating what level of exposure may adversely affect human health. A toxicity assessment involves the following:

- Determining whether exposures to a constituent can increase the incidence of a specific adverse effect (e.g., cancer, kidney damage) in humans;
- Characterizing the nature and strength of evidence for causation; and
- Quantifying the relationship between the dose of the constituent and the incidence of adverse health effects in the exposed population.

The surface soil and sediment COPCs do not exhibit carcinogenic toxicity therefore only non-cancer hazard calculations were conducted in this HHRA.

4.1 Antimony, Copper, and Zinc Toxicity Assessment

Evaluation of noncarcinogenic effects is based on the assumption that noncarcinogenic toxicological effects of chemicals occur only after a threshold dose is achieved. The reference dose (RfD) was used to evaluate ingestion and dermal exposure pathways. The reference concentration (RfC) was used to evaluate the inhalation pathway and the estimates of the threshold dose (or concentration) at which the most sensitive human population may experience an observed adverse effect for that compound.

USEPA (1989) defines a chronic RfD/RfC as an estimate of a daily exposure level for the human population that is unlikely to result in deleterious effects during a lifetime (i.e., 70 years). A chronic RfD/RfC was used to evaluate the potential noncarcinogenic hazards associated with long-term chemical exposures. Chronic toxicity values were used for the following MRS receptors: on-site visitor/recreational user (adult/child), outdoor worker, and on-site hypothetical resident (adult/child).

Subchronic RfDs and RfCs have been developed for a few chemicals to characterize potential noncarcinogenic hazards associated with shorter term chemical exposures. USEPA defines subchronic exposure as periods ranging from 2 weeks to 7 years (USEPA 1989); this timeframe is applicable for the future on-site construction worker scenario. Therefore, subchronic toxicity values were used where available to estimate non-cancer hazards for the construction worker scenario.

Attachment B presents the non-cancer toxicity values and their sources that were used in the RAIS non-cancer hazard calculations.

4.2 Lead Toxicity Assessment

The increase in PbB concentrations at the MRS for each receptor is estimated using a linear biokinetic slope factor (BKSF). USEPA guidance recommends using a BKSF of 0.4 µg/dL per micrograms per day (µg/day) for the ALM (USEPA, 2017a). The estimated lead uptake is multiplied by the BKSF to determine the MRS related increase in PbB concentrations for each receptor.

The IEUBK model uses data from a variety of scientific studies of lead biokinetics, contact rates of children with contaminated media, and data on the presence and behavior of environmental lead to predict a plausible distribution or geometric mean (GM) of lead for a hypothetical child or population of children. From this distribution, the IEUBK model estimates the risk (i.e., probability) that the PbB concentration of an individual child or a population of children will exceed a specified BLL. Childhood PbB concentrations at or above 10 µg lead per deciliter (Pb/dL) present risks to children's health. Although the effects of lead exposure are a potential concern for all humans, young children (0 to 7 years old) are the most susceptible. Lead poisoning in young children can cause learning and behavioral problems, brain damage, mental retardation, anemia, liver and kidney damage, hearing loss, hyperactivity, developmental delays, other physical and mental problems, and in extreme cases, death (USEPA, 2019a).

Studies have demonstrated that there is no significant placental/fetal barrier for lead, since fetal blood lead values are either equal to or slightly less than maternal blood lead values (Goyer, 1990). The mother's PbB concentration at childbirth (MatPb) variable in the IEUBK model incorporates the impact of lead transferred from the mother to the fetus in utero. The lead concentration that is stored in the tissues of the newborn child in the IEUBK model is calculated by entering the maternal PbB value at the time of birth. The proposed GM value for the MatPb variable is estimated to be 0.6 µg/dL (USEPA, 2017b). USEPA (2017c) guidance also recommends that the IEUBK model be used for the 12-72 month age range, so changes to the MatPb variable have little impact on IEUBK results.

Attachment C presents the lead modeling input parameters that were used in the ALM and IEUBK modeling.

5 Risk Characterization

This section integrates the information developed in the exposure assessment and the toxicity assessment into an evaluation of the potential risks associated with exposure to COPCs. This section also addresses the nature and magnitude of potential human health risks in comparison to federal target risk levels for making risk management decisions.

5.1 Target Risk Levels

USEPA (1991) states that potential adverse health effects cannot be ruled out for non-cancer hazards if the cumulative hazard index (HI) is greater than 1 per target organ endpoint. If the total HI for all target organ endpoints combined exceeds 1, chemicals are segregated based on the target organ endpoint, and separate target organ-specific HIs are calculated. Only chemicals that act on the same target organ are expected to be additive (USEPA 1989).

Lead exposure was evaluated by comparing the estimated PbB concentrations to target BLLs of 10 µg/dL and 5 µg/dL for the young child resident and the fetus of a female worker (i.e., body burden from exposure to lead) receptor populations (USEPA, 2010 and 2019a). At the present time, USEPA and NYSDEC have not formally adopted the CDC-recommended target BLL of 5 µg/dL level and continue to use a target BLL of 10 µg/dL (USEPA, 2020 and NYSDEC 2010b). USEPA (2016) policy leaves the decision for selecting the allowable target BLL with each state or USEPA region. A sensitivity analysis was performed in the HHRA as part of the lead evaluation to determine how the lead modeling results would change if a target BLL of 5 µg/dL were used.

In addition, the threshold for lead is to limit the risk to no more than a 5% probability for the receptor's population PbB concentrations to exceed the selected target BLL in the ALM and IEUBK models (USEPA, 2017 and 2010). If the probability of 5% is exceeded, then adverse health effects from exposure to lead are possible.

The potential risks are only estimates and are based on intentionally conservative exposure and toxicity assumptions. Exceedance of any particular risk level does not imply that adverse health effects have already occurred or will occur. The estimates are an indication that additional evaluation or action may be warranted.

5.2 Non-Cancer Hazard Calculations and Results

To characterize potential noncarcinogenic effects, comparisons were made between projected intakes of substances over a specified time period and toxicity values, primarily RfDs and RfCs. The ratio of exposure to toxicity value is the hazard quotient (HQ). The HQ is calculated for each chemical and exposure pathway (ingestion and dermal) by dividing the chronic daily intake (CDI) by the RfD as follows:

Equation 1:

Non-cancer HQ (unitless) = CDI (milligrams per kilograms per day [mg/kg-day])/RfD (mg/kg-day)

For inhalation exposures, a similar comparison is made using the RfC and the adjusted EC:

Equation 2:

Non-cancer HQ (unitless) = EC (micrograms per meters cubed [µg/m$^{3]}$)/(RfC [milligrams per meters cubed mg/m^3] × 1000 µg/mg)

Estimated HQs for noncarcinogenic effects are generated on a chemical-by-chemical basis for each relevant pathway of exposure. The chemical-specific HQs are summed for all chemicals associated with a specific pathway to determine the pathway-specific HI. The HIs for all pathways are then summed to determine the total cumulative HI for the exposure scenario.

The HQ is not a statistical probability of a noncarcinogenic effect occurring. If the exposure level is less than the appropriate toxicity value (i.e., the HQ is less than 1), adverse health effects are not likely, even with a lifetime of exposure. Given the uncertainty of factors used in deriving RfDs and RfCs, an HQ greater than 1 may not indicate a higher risk of adverse effect than a HQ of 1 or less.

If the cumulative HI for an exposure scenario is greater than 1, the HI is segregated by critical effect and mechanism of action (USEPA 1989). HQs for chemicals that affect the same target organ endpoint are summed to derive target organ-specific HIs.

The RAIS non-cancer hazard calculations are provided in **Attachment B**. **Table 5-1** summarizes the potential non-cancer hazard results for Target Berm Hillside DU 3 surface soil and the Target Berm Ponded DU 5 sediment.

The cumulative HI results are all below the target HI of 1, therefore, a target organ endpoint analysis was not conducted. The highest cumulative HI was 0.3 for the future hypothetical child resident for the Target Berm Ponded DU sediment, where the COPC was antimony.

Table 5-1 Non-Cancer Hazard Results for Human Receptors

COPC and Exposure Area	Child Site Visitor/Recreational User Hazard Index (unitless)	Adult Site Visitor/Recreational User Hazard Index (unitless)	Outdoor Worker Hazard Index (unitless)	Construction Worker Hazard Index (unitless)	Hypothetical Child Resident Hazard Index (unitless)	Hypothetical Adult Resident Hazard Index (unitless)
Target Berm Hillside DU 3 (ISM Surface Soil, 0 – 6 inches bgs)						
Copper	**0.004**	**0.0004**	**0.001**	**0.02**	**0.02**	**0.002**
Zinc	**0.001**	**0.0001**	**0.0004**	**0.001**	**0.006**	**0.0006**
Cumulative Hazard Index	**0.005**	**0.0005**	**0.001**	**0.02**	**0.02**	**0.002**
Target Berm Ponded DU 5 (Sediment)						
Antimony	**0.07**	**0.007**	**0.02**	**0.08**	**0.3**	**0.03**

Notes:

bgs = below ground surface; COPC = Constituent of Potential Concern; DU = Decision Unit; HI = hazard index; ISM = incremental sampling methodology

Results are rounded to one significant figure.

Red text = Indicates where a threshold has been exceeded

Black text = Indicates where a threshold has not been exceeded

5.3 Lead Modeling Results

Table 5-2 summarizes the ALM and IEUBK lead modeling results for each receptor. The results for the target BLL of 10 µg/dL are presented here, and the target BLL of 5 µg/dL results are discussed in **Section 6, Uncertainty Assessment**. The ALM and IEUBK lead modeling results for each receptor at 100-yd Firing Berm DU 1, Target Area DU 2, Target Berm Hillside DU 3, and Wet Meadow DU 6 were below the probability threshold of 5%, Adverse health effects from exposure to lead in surface soil at DU 1, DU 2, and DU 3 and sediment at DU 6 are minimal.

The ALM results for the outdoor worker, construction worker, and adult recreational user/visitor were below the probability threshold of 5% for exposure to lead in sediment at the Target Berm Ponded DU 5. However, the IEUBK results for the child site visitor/recreational user and hypothetical child resident exceeded the probability threshold of 5% wherein 31% of the children's population is estimated to have PbB concentrations above the target BLL of 10 µg/dL for the Target Berm Ponded DU 5 sediment. Adverse health effects from exposure to lead in sediment are possible at DU 5.

Table 5-2 ALM and IEUBK Lead Model Results for On-Site Receptors

Receptor	USEPA Lead Model Used	Target BLL of 10 µg/dL			Target BLL of 5 µg/dL		
		PbB Fetus (ALM) PbB Child (IEUBK) (µg/dL)	Percent Probability Threshold (%)	Above Thresholds? (Yes/No)	PbB Fetus (ALM) PbB Child (IEUBK) (µg/dL)	Percent Probability Threshold (%)	Above Thresholds? (Yes/No)
100-yd Firing Berm DU 1 (ISM Surface Soil, 0-6 in bgs)							
Outdoor Worker	ALM	1.7	0.0001%	No	1.6	0.02%	No
Construction Worker	ALM	1.8	0.0003%	No	1.8	0.04%	No
Adult Site Visitor/Recreational User	ALM	1.5	0.00006%	No	1.5	0.01%	No
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	< 10	0.001%	No	< 5	0.3%	No
Target Area DU 2 (ISM Surface Soil, 0-6 in bgs)							
Outdoor Worker	ALM	1.8	0.0003%	No	1.7	0.03%	No
Construction Worker	ALM	2.1	0.001%	No	2.1	0.09%	No
Adult Site Visitor/Recreational User	ALM	1.6	0.0001%	No	1.6	0.01%	No
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	< 10	0.01%	No	< 5	1.16%	No
Target Berm Hillside DU 3 (ISM Surface Soil, 0-6 in bgs)							
Outdoor Worker	ALM	2.4	0.002%	No	2.1	0.09%	No
Construction Worker	ALM	3	0.01%	No	3	0.60%	No
Adult Site Visitor/Recreational User	ALM	1.7	0.0002%	No	1.7	0.03%	No
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	< 10	0.40%	No	**> 5**	**12%**	**Yes**
Target Berm Ponded DU 5 (Sediment)							
Outdoor Worker	ALM	5.2	0.30%	No	**5.2**	**6%**	**Yes**
Construction Worker	ALM	7.5	2%	No	**7.5**	**17%**	**Yes**

Receptor	USEPA Lead Model Used	Target BLL of 10 µg/dL			Target BLL of 5 µg/dL		
		PbB Fetus (ALM) PbB Child (IEUBK) (µg/dL)	Percent Probability Threshold (%)	Above Thresholds? (Yes/No)	PbB Fetus (ALM) PbB Child (IEUBK) (µg/dL)	Percent Probability Threshold (%)	Above Thresholds? (Yes/No)
Adult Site Visitor/Recreational User	ALM	2.7	0.01%	No	2.7	0.30%	No
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	**> 10**	**31%**	**Yes**	**> 5**	**84%**	**Yes**
Wet Meadow DU 6 (Sediment)							
Outdoor Worker	ALM	1.8	0.0003%	No	1.8	0.04%	No
Construction Worker	ALM	2	0.001%	No	2	0.07%	No
Adult Site Visitor/Recreational User	ALM	1.5	0.0001%	No	1.5	0.01%	No
Child Site Visitor/Recreational User and Hypothetical Resident	IEUBK	< 10	0.60%	No	< 5	0.9%	No

Notes:

ALM = Adult Lead Methodology; bgs = below ground surface; BLL = blood lead level; DU = Decision Unit; EPC = exposure point concentration; IEUBK = Integrated Exposure Uptake Biokinetic; ISM = incremental sampling methodology; in = inches; ug/dL = micrograms per deciliter; mg/kg = milligrams per kilogram; PbB = blood lead concentration;

Red text = Indicates where a threshold has been exceeded

Black text = Indicates where a threshold has not been exceeded

USEPA. 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows®version (IEUBKwin v1.1 build 11) 32-bit version Office of Superfund Remediation and Technology Innovation, United States Environmental Protection Agency.

USEPA, 2017a. Adult Lead Methodology (Version date 6/14/17).

6 Uncertainty Assessment

Uncertainties are inherent in every aspect of a quantitative risk assessment. Certain assumptions are made as part of the risk assessment process, and these assumptions may lead to an over- or underestimation of the actual risks associated with the site. The assumptions made for this HHRA were conservative, so an overestimation of the actual risks posed by MRS conditions is more likely.

This section provides information about the key assumptions, their inherent uncertainty and variability, and the impact of this uncertainty and variability on the estimates of potential risk.

6.1 Site Characterization Uncertainties

Source of Uncertainty: If the analytical methods used do not apply to some constituents that are present at the site, risk could be underestimated.

Effect on Risk/Hazard Estimates: Underestimate.

Potential Magnitude: Low.

Rationale for Assumptions: The RI field investigation was designed to address potential MC exposure from historical, site-related DoD activities at the MRS. Laboratory analytical methods were specifically selected to evaluate soil for small arms, MC constituents. The level of uncertainty is reduced due to the selected methods and quality assurance/quality control procedures that were used to assess the precision and accuracy of analytical data (AECOM, 2019).

Source of Uncertainty: 95% UCL concentrations, maximum concentrations, and generic screening levels were used to identify COPCs for the site.

Effect on Risk/Hazard Estimates: Overestimate.

Potential Magnitude: Moderate.

Rationale for Assumptions: USEPA (1989 and 2020) guidance recommends using conservative generic screening levels for COPC screening. Additionally, ITRC (2012) recommends using 95% UCL concentrations when screening ISM data because 95% UCLs will always be greater than the MDC when samples are collected in triplicate. All other data were screened using MDCs. Residential screening levels were used to identify COPCs to be protective of private use for the property. Also, the limits of detection were selected to be protective of RBSLs where possible; the laboratory was able to detect potential concentrations of constituents that may be COPCs at the site.

6.2 Exposure Assessment Uncertainties

Source of Uncertainty: Modeled concentrations were used to estimate concentrations in outdoor air (e.g., use of a particulate emission factor) as well as each receptor's PbB concentration from exposure to soil and sediment at the MRS. Generally, a higher level of uncertainty is associated with the modeled concentrations rather than the use of measured concentrations.

Effect on Risk/Hazard Estimates: Under- or overestimate.

Potential Magnitude: Low.

Rationale for Assumptions: Conservative model assumptions were used to estimate outdoor air concentrations for antimony, copper, and zinc (i.e., windblown particulates). Also, conservative model parameters were selected for the ALM and IEUBK lead models. Conservative modeling parameters tend to reduce the likelihood of underestimating the potential adverse health effects that may occur from incidentally ingesting soil and inhaling windblown particulates at the MRS.

Source of Uncertainty: Use of default construction worker exposure parameters.

Effect on Risk/Hazard Estimates: Overestimate.

Potential Magnitude: Moderate.

Rationale for Assumptions:

The USEPA (2002) default construction worker exposure parameters account for a long period of construction; however, the DUs are small areas (1 acre or less) that are not likely to require a lengthy construction job. It is likely that the construction worker non-cancer hazard and lead modeling results are overestimated.

Source of Uncertainty: Exposure assumptions for the Wetland DUs 5 and 6.

Effect on Risk/Hazard Estimates: Overestimate.

Potential Magnitude: Moderate.

Rationale for Assumptions:

The heavy vegetation and marshy terrain of sediment DUs 5 and 6 would likely inhibit child and adult site visitors/recreational users, workers, and hypothetical residents from accessing them. The HHRA conservatively evaluated the wetland DUs to quantify exposure, however unlikely. The property is privately owned; therefore, future land redevelopment of the inundated areas must be considered. The non-cancer hazard and lead modeling results for sediment at DU 5 and DU 6 are likely overestimated, at least when considering current site conditions.

6.3 Toxicity Assessment Uncertainties

Source of Uncertainty: RfDs are frequently derived from animal studies that have little quantitative bearing on potential adverse health effects in humans.

Effect on Risk/Hazard Estimates: Overestimate.

Potential Magnitude: Moderate.

Rationale for Assumptions: Since the fate and mechanism of action of a chemical may differ in animals and humans, the effects observed in animals may not be observed in humans, resulting in an overestimation of potential adverse health effects.

Source of Uncertainty: USEPA is in the process of phasing out the 1997 Health Effects Assessment Summary Tables (HEAST) as a source for toxicity values (USEPA, 1997). Until that process is complete, HEAST's chronic oral RfD for copper was used to estimate adverse health effects from exposure to soil for the site visitor/recreational user, outdoor worker, and hypothetical resident scenarios. Also, a chronic inhalation RfC for antimony whose source is from the Agency of Toxic Substances and Disease Registry (ATSDR) minimal risk levels (ATSDR, 2020) was used. With the exception of antimony, the subchronic oral RfDs for the construction worker also were from ATSDR (ATSDR, 2020). HEAST and ATSDR toxicity values are considered Tier 3 source values and have a higher level of uncertainty associated with them (USEPA, 2003).

Effect on Risk/Hazard Estimates: Under- or overestimate.

Potential Magnitude: Unknown.

Rationale for Assumptions: Provisional toxicity values are still undergoing intensive scientific review and have not been promulgated in USEPA's Integrated Risk Information System or the Provisional Peer Reviewed Toxicity Value database (Tier 1 and 2 sources). It is unknown if the non-cancer hazard results are under- or overestimated.

Source of Uncertainty: Evaluate the possibility that USEPA changes their target PbB threshold from 10 µg/dL to the CDC (2012) recommended PbB threshold of 5 µg/dL.

Effect on Risk/Hazard Estimates: Underestimate.

Potential Magnitude: Moderate.

Rationale for Assumptions: A sensitivity analysis was performed as part of the lead evaluation to determine how the lead modeling results would change if a target BLL of 5 µg/dL were used (**Table 5-2**). The IEUBK model results for soil exceeded the probability of 5% threshold for the child receptors (i.e., site visitor/recreational user and hypothetical resident) at Target Berm Hillside DU 3 (ISM surface soil).

The Target Berm Ponded DU 5 ALM results for sediment exceeded the probability threshold of 5% for the outdoor worker and construction worker, and the IEUBK model results for sediment exceeded the probability threshold of 5% for the child receptors (i.e., site visitor/recreational user and hypothetical resident).

If USEPA and/or NYSDEC were to accept the CDC's recommended PbB threshold, the lead modeling results indicate that adverse health effects would be possible from exposure to surface soil at the Target Berm Hillside DU 3 if the future land use changed to unrestricted residential use. Adverse health effects are possible for the child receptors, outdoor worker, and construction worker scenarios if exposed to sediment at DU 5. However, the sediment results are likely overestimated because the heavily vegetated and marshy terrain of DU 5 makes access difficult and future land redevelopment of the wetland area is unlikely.

6.4 Risk Characterization Uncertainties

Source of Uncertainty: Risk characterization uncertainties include possible synergistic or antagonistic effects of exposure to multiple constituents. The COPCs identified in the HHRA do not exhibit carcinogenic toxicity and a target organ analysis is conducted when a receptor's HI is greater than 1 to evaluate constituent-specific noncarcinogenic health effects..

Effect on Risk/Hazard Estimates: Under- or overestimate.

Potential Magnitude: Low.

Rationale for Assumptions: The noncarcinogenic evaluation did not warrant a target organ evaluation therefore the impact of synergistic health effects is low.

7 Conclusions and Recommendations

The HHRA has fulfilled the objective discussed in **Section 1 Introduction**, which was to evaluate whether COPCs attributable to past site activities have the potential to cause adverse health effects to human receptors within the area under investigation. Results of the HHRA may be used to develop risk management options for each DU, including possible further actions to address impacted soils and sediment where needed.

The HHRA non-cancer hazard and lead modeling results for the DUs are summarized below:

100-yd Firing Berm (DU 1)

- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to ISM surface soil (0-6 in bgs).

Target Area (DU 2)

- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to ISM surface soil (0-6 in bgs).

Target Berm Hillside (DU 3):

- Non-cancer hazard results indicated that adverse health effects are not likely for potential human receptors exposed to ISM surface soil (0-6 in bgs).
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for potential human receptors exposed to surface soil (0 to 6 in bgs).

Target Berm-Ponded (DU 5):

- Non-cancer hazard results indicated that adverse health effects are not likely for potential human receptors exposed to sediment.
- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are possible for the child site visitor/recreational user and hypothetical child resident.

Wet Meadow (DU 6)

- Lead modeling results, assuming a target BLL of 10 µg/dL, indicated that adverse health effects are not likely for the potential receptors exposed to sediment.

No unacceptable risk to human receptors was determined at the 100-yard Firing Berm, Target Area, Target Berm-Hillside, and Wet Meadow DUs. However, adverse health effects are possible from exposure to lead in sediment for the child resident/child recreational user at the Target Berm-Ponded DU 5.

The heavily vegetated and marshy terrain of DU 5 and DU 6 makes access difficult under current site conditions for the hypothetical child resident and child site visitor/recreational user.

Combined with conservative lead modeling assumptions, the Target Berm-Ponded DU 5 and Wet Meadow DU 6 sediment results are likely overestimated.

If USEPA and NYSDEC were to revise their policy regarding the target BLL (i.e., 10 µg/dL to 5 µg/dL), then adverse health effects are possible from exposure to surface soil for the child receptor at the Target Berm Hillside DU 3. Adverse health effects would also be possible for the outdoor worker, construction worker from exposure to soil and the child resident/recreational user exposed to sediment at Target Berm Ponded DU 5 at the lower target BLL.

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Attachment A

Sample Data Used in the HHRA

Attachment A - Table 1
ISM Soil Sample Results
Camp O'Ryan Remedial Investigation

Location:			**100-Yard Firing Berm (DU 1)**										
Sample ID:			**COR01IS01**				**COR01IS02**				**COR01IS03**			
Sample Depth (inches bgs):			**0-6**				**0-6**				**0-6**			
Date Collected:			**7/10/2020**				**7/10/2020**				**7/10/2020**			
Analyte	**Human Health Screening Level**	**Ecological Screening Level**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1	0.27	0.225	N			**0.285**				0.19			
Copper	50	50	30.8	N			28.7				29.2			
Lead	63	63	**56.1**	NA			**63**				38.5			
Zinc	109	109	93.3				96.3				95.6			

Location:			**Target Area (DU 2)**										
Sample ID:			**COR02IS01**				**COR02IS02**				**COR02IS03**			
Sample Depth (inches bgs):			**0-6**				**0-6**				**0-6**			
Date Collected:			**7/10/2020**				**7/10/2020**				**7/10/2020**			
Analyte	**Human Health Screening Level**	**Ecological Screening Level**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1	0.27	**0.293**				**0.327**	N			**0.293**			
Copper	50	50	33.6				31.9	N			39.9			
Lead	63	63	**82.9**				**98.7**	NEA			**72.1**			
Zinc	109	109	91.3				93.1				98.3			

Location:			**Target Berm Hillside (DU 3)**										
Sample ID:			**COR03IS01**				**COR03IS02**				**COR03IS03**			
Sample Depth (inches bgs):			**0-6**				**0-6**				**0-6**			
Date Collected:			**7/10/2020**				**7/10/2020**				**7/10/2020**			
Analyte	**Human Health Screening Level**	**Ecological Screening Level**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1	0.27	**0.425**				**0.725**				**0.429**	N		
Copper	50	50	24.9				41.4				36.0	NA		
Lead	63	63	**164**				**179**				**248**	NA		
Zinc	109	109	**119**				82.5				84.5	A		

Location:			**Background Reference Area**										
Sample ID:			**COR04IS01**				**CORIS0402**				**COR04IS03**			
Sample Depth (inches bgs):			**0-6**				**0-6**				**0-6**			
Date Collected:			**7/20/2020**				**7/20/2020**				**7/20/2020**			
Analyte	**Human Health Screening Level**	**Ecological Screening Level**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1	0.27	0.14				0.13				0.13			
Copper	50	50	17.0				19.1				16.0			
Lead	63	63	28.1				21.1				21.0			
Zinc	109	109	86.1				97.8				87.2			

Notes:

Bold = Sample exceeds Ecological Screening Level
🟨 Sample exceeds Human Health Screening Level
mg/kg = milligrams per kilogram
bgs = below ground surface
LQ = Laboratory qualifier (LQ flags available in lab report)
VQ = Validiation qualifier
RC = Reason Code
B = analyte detected in the laboratory method blank
J = estimated
U = non-detect
z = preparation/method blank anomaly
f = field duplicate imprecision

Attachment A - Table 2
Discrete Soil Sample Results
Camp O'Ryan Remedial Investigation

100-Yard Firing Berm DU 1

Sample ID:			**COR01DA01A (#34)**				**COR01DA02A (#39)**				**COR01DB02A (#39)**			
Decision Unit - XRF Location:			**100-Yard Berm**				**100-Yard Berm**				**100-Yard Berm**			
Media:			**Soil**				**Soil**				**Soil**			
Sample Depth (inches bgs):			**12 - 18**				**12 - 18**				**24-30**			
Date Collected:			**7/8/2020**				**7/8/2020**				**7/8/2020**			
Analyte	**Human Health Screening Level (mg/kg)**	**Ecological Screening Level (mg/kg)**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	3.1	0.27	0.11				**1.14**	N		m	0.20			
Copper	50	50	20.8				23.3	NE		m	24.7			
Lead	63	63	16.5				**502**	NA		m	36.1			
Zinc	109	109	74.8				75.2	EA		s	87.4			

Target Area DU 2

Sample ID:			**COR02DA01A (#4)**				**COR02DA02A (#14)**				**COR02DA02B (#14)**				**COR02DB02A (#14)**			
Decision Unit - XRF Location:			**Target Area**				**Target Area**				**Target Area**				**Target Area**			
Media:			**Soil**				**Soil**				**Soil**				**Soil**			
Sample Depth (inches bgs):			**12 - 18**				**12 - 18**				**12 - 18**				**24-30**			
Date Collected:			**7/10/2020**				**7/10/2020**				**7/10/2020**				**7/10/2020**			
Analyte	**Human Health Screening Level (mg/kg)**	**Ecological Screening Level (mg/kg)**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)																		
Antimony	3.1	0.27	0.150	N			**0.341**				**0.276**				0.11	N	J	
Copper	50	50	24.4	NEA			28.2				24.1				24.2	E		
Lead	63	63	38	NA			**82.6**				57.8				19.3	NA		
Zinc	109	109	71.8	NEA			65.0				57.3				66.4	E		

Target Berm Hillside DU 3

Sample ID:			**COR03DA01A (#1)**				**COR03DB01A (#1)**				**COR03DA02A (#40)**				**COR03DA02B (#40)**				**COR03DA03A (#46)**				**COR03DB03A (#46)**			
Decision Unit - XRF Location:			**Hillside Berm**				**Earthen Berm2**				**Earthen Berm2**				**Earthen Berm2**				**Earthen Berm2**				**Earthen Berm2**			
Media:			**Soil**				**Soil**				**Soil**				**Soil**				**Soil**				**Soil**			
Sample Depth (inches bgs):			**12 - 18**				**24 - 30**				**12 - 18**				**24 - 30**				**12 - 18**				**24 - 30**			
Date Collected:			**7/9/2020**				**7/9/2020**				**7/10/2020**				**7/10/2020**				**7/10/2020**				**7/10/2020**			
Analyte	**Human Health Screening Level (mg/kg)**	**Ecological Screening Level (mg/kg)**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)																										
Antimony	3.1	0.27	**0.447**				**1.00**				0.13				0.11				0.236	N*			0.096	J		
Copper	50	50	29.4				**86.8**				15.8				19.6				15.2				28.8			
Lead	63	63	34.2				**393**				22.1	B			24.6	B			**90.7**	NA			17.1			
Zinc	109	109	78.4				**110**				55.8				58.1				62.6	N			82.8			

Notes:

* = Field duplicate
Bold = Sample exceeds Ecological Screening Level
🟨 Sample exceeds Human Health Screening Level
mg/kg = milligrams per kilogram
bgs = below ground surface
LQ = laboratory qualifier (LQ flag descriptions available in lab report)
VQ = validiation qualifier
RC = reason code
NA = not applicable
U = non-detect
UJ = non-detect; reported DL is approximate and may be inaccurate or imprecise

A = post-digestion spiked sample recovery is not within control limits
B = analyte detected in the laboratory method blank
E = reported value is estimated because of the presence of interference (as indicated by serial dilution)
N = pre-digestion spiked sample recovery is not within control limits
* = the duplicate sample analysis relative percent difference (RPD) is not within control limits
J = estimated
J- = estimated, negative bias
J+ = estimated, positive bias
f = field duplicate imprecision
m = MS/MSD percent recovery anomaly
s = serial dilution anomaly
z = preparation/method blank anomaly

Attachment A - Table 3
Discrete Sediment Results
Camp O'Ryan Remedial Investigation

Target Berm-Ponded DU 5

		Sample ID:	COR05SED01A				COR05SED02A				COR05SED02B			
		Decision Unit - XRF Location:	Target Berm - Ponded DU 5											
		Media:	Sediment				Sediment				Sediment			
		Sample Depth (inches bgs):												
		Date Collected:	7/20/2020				7/20/2020				7/20/2020			
Analyte	Human Health Screening Level (mg/kg) Sediment	Ecological Screening Level (mg/kg) Sediment	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	14.6	2	**2.29**				1.53				**2.31**			
Copper	1460	23	20.0				**26.8**				**33.6**			
Lead	63	26	**109**				**177**				**234**			
Zinc	11000	63	**76.0**				**176**				**115**			

		Sample ID:	COR05SED03A				COR05SED04A				COR05SED05A			
		Decision Unit - XRF Location:												
		Media:	Sediment				Sediment				Sediment			
		Sample Depth (inches bgs):												
		Date Collected:	7/20/2020				7/20/2020				7/20/2020			
Analyte	Human Health Screening Level (mg/kg) Sediment	Ecological Screening Level (mg/kg) Sediment	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	14.6	2	**6.38**				**2.47**	N			**4.94**			
Copper	1460	23	**30.0**				**45.2**	A			**67.5**			
Lead	63	26	**918**				**686**	N*A			**690**			
Zinc	11000	63	**337**				**301**	EA			**314**			

		Sample ID:	COR05SED06A				COR05SED07A				COR05SED08A			
		Decision Unit - XRF Location:												
		Media:	Sediment				Sediment				Sediment			
		Sample Depth (inches bgs):												
		Date Collected:	7/20/2020				7/20/2020				7/20/2020			
Analyte	Human Health Screening Level (mg/kg) Sediment	Ecological Screening Level (mg/kg) Sediment	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	14.6	2	**2.22**				**19.8**				**11.2**			
Copper	1460	23	**32.7**				**124**				**80.1**			
Lead	63	26	**431**				**2780**				**412**			
Zinc	11000	63	61.8				**224**				**348**			

Wetland Meadow DU 6

		Sample ID:	COR06SED01A				COR06SED02A				COR06SED02B			
		Decision Unit - XRF Location:	Sediment Wetland Meadow DU 6											
		Media:	Sediment				Sediment				Sediment			
		Sample Depth (inches bgs):												
		Date Collected:	7/20/2020				7/20/2020				7/20/2020			
Analyte	Human Health Screening Level (mg/kg) Sediment	Ecological Screening Level (mg/kg) Sediment	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	14.6	2	0.14	J			0.8	J			1.2			
Copper	1460	23	7.67				**35**				**41.3**			
Lead	63	26	25.5				**153**				**153**			
Zinc	11000	63	36.3				**80.4**				**209**			

		Sample ID:	COR06SED03A				COR06SED04A				COR06SED05A			
		Decision Unit - XRF Location:												
		Media:	Sediment				Sediment				Sediment			
		Sample Depth (inches bgs):												
		Date Collected:	7/20/2020				7/20/2020				7/20/2020			
Analyte	Human Health Screening Level (mg/kg) Sediment	Ecological Screening Level (mg/kg) Sediment	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	14.6	2	0.81	J			1.7				0.37			
Copper	1460	23	**34.2**				**39.6**	A			19.6			
Lead	63	26	**119**				**154**	N*A			**36.0**			
Zinc	11000	63	**180**				**111**	A			211			

		Sample ID:	COR06SED06A				COR06SED07A				COR06SED08A			
		Decision Unit - XRF Location:												
		Media:	Sediment				Sediment				Sediment			
		Sample Depth (inches bgs):												
		Date Collected:	7/20/2020				7/20/2020				7/20/2020			
Analyte	Human Health Screening Level (mg/kg) Sediment	Ecological Screening Level (mg/kg) Sediment	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC
Total Metals by USEPA SW-846 Method 6020A (mg/kg)														
Antimony	14.6	2	0.38	J			0.17				0.14			
Copper	1460	23	**23.9**				8.75				10.4			
Lead	63	26	**73.2**				**27.0**				**32.3**			
Zinc	11000	63	**120**				**72.4**				60.8			

Notes:

* = Field duplicate
Bold = Sample exceeds Ecological Screening Level
🟨 Sample exceeds Human Health Screening Level
mg/kg = milligrams per kilogram
µg/L = micrograms per liter
bgs = below ground surface
LQ = laboratory qualifier (LQ flag descriptions available in lab report)
VQ = validiation qualifier
RC = reason code
NA = not applicable
U = non-detect
UJ = non-detect; reported DL is approximate and may be inaccurate or imprecise
A = post-digestion spiked sample recovery is not within control limits
B = analyte detected in the laboratory method blank
E = reported value is estimated because of the presence of interference (as indicated by serial dilution)
N = pre-digestion spiked sample recovery is not within control limits
J = estimated
J- = estimated, negative bias
J+ = estimated, positive bias
f = field duplicate imprecision
m = MS/MSD percent recovery anomaly
s = serial dilution anomaly
z = preparation/method blank anomaly

Attachment B

HHRA Risk Calculations

Site-specific Risk

Construction Worker Inputs

/HTML"Output to Spreadsheet

Site-specific Risk
Construction Worker for Soil - Unpaved Road Traffic Inputs

	Target Berm Hillside DU 3 (ISM Surface Soil, 0 – 6 inches bgs)		Target Berm Ponded DU 5 (Sediment)	
Variable	**Construction Worker Soil - Unpaved Default Value**	**Form-input Value**	**Construction Worker Soil - Unpaved Default Value**	**Form-input Value**
LR (length of road segment) ft	147.58077	897.9413938	147.58077	147.5807745
A (Dispersion Constant)	12.9351	12.9351	12.9351	12.9351
AR (surface area of contaminated road segment) m 2	274.21393	1668.428986	274.21393	274.2139339
WR (width of road segment) ft	20	20	20	20
B (Dispersion Constant)	5.7383	5.7383	5.7383	5.7383
C (Dispersion Constant)	71.7711	71.7711	71.7711	71.7711
distance (road length) km/day	0.04498	0.273692124	0.04498	0.044982552
FD Unitless Dispersion Correction Factor	0.185837208	0.18652721	0.185837208	0.18652721
Mdry (road surface material moisture content under dry, uncontrolled conditions) %	0.2	0.2	0.2	0.2
number of cars		10		10
number of trucks	-	5	-	5
p (days per year with at least .01" of precipitation) days/year		150		150
Q/Csr (inverse of the ratio of the 1-h. geometric mean air concentration to the emission flux along a straight road segment bisecting a square site (g/) g/m 2-s per kg/m\{super 3</s	23.01785	14.45074443	23.01785	23.0178503
s (road surface silt content) %	8.5	8.5	8.5	8.5
As (PEFsc - acres)	0.5	18.51	0.5	0.5
AFcw (skin adherence factor - construction worker) mg/cm 2	0.3	0.3	0.3	0.3
ATcw (averaging time - construction worker) days	365	168	365	168
BWcw (body weight - construction worker) kg	80	80	80	80
EDcw (exposure duration - construction worker) yr	1	1	1	1
EFcw (exposure frequency - construction worker) day/yr	250	120	250	120
ETcw (exposure time - construction worker) hr/day	8	8	8	8
IRScw (soil ingestion rate - construction worker) mg/day	330	330	330	330
LT (lifetime) yr	70	70	70	70
SAcw (surface area - construction worker) cm 2/day	3527	3527	3527	3527
tc (overall duration of construction) hours	8400	4032	8400	4032
Tt (overall duration of traffic) s	7200000	3456000	7200000	3456000
tons/car		2		2
tons/truck -	-	10	-	10

Site-Specific Risk
Hypothetical Resident Inputs

Variable	Resident Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	16.2302
A (VF Dispersion Constant)	11.911	11.911
A (VF Dispersion Constant - mass limit)	11.911	11.911
B (PEF Dispersion Constant)	18.7762	18.7762
B (VF Dispersion Constant)	18.4385	18.4385
B (VF Dispersion Constant - mass limit)	18.4385	18.4385
City (PEF Climate Zone) Selection	Default	Default
City (VF Climate Zone) Selection	Default	Default
C (PEF Dispersion Constant)	216.108	216.108
C (VF Dispersion Constant)	209.7845	209.7845
C (VF Dispersion Constant - mass limit)	209.7845	209.7845
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.194
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density - mass limit) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	1359344438
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	93.77
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	68.18
Q/C_{vol} (g/m^2-s per kg/m^3 - mass limit)	68.18	68.18
A_s (PEF acres)	0.5	0.5
A_s (VF acres)	0.5	0.5
A_s (VF mass-limit acres)	0.5	0.5
AF_{0-2} (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
AF_{2-6} (mutagenic skin adherence factor) mg/cm^2	0.2	0.2
AF_{6-16} (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
AF_{16-26} (mutagenic skin adherence factor) mg/cm^2	0.07	0.07
AF_{res-a} (skin adherence factor - adult) mg/cm^2	0.07	0.07
AF_{res-c} (skin adherence factor - child) mg/cm^2	0.2	0.2
AT_{res} (averaging time - resident carcinogenic)	365	365
BW_{0-2} (mutagenic body weight) kg	15	15
BW_{2-6} (mutagenic body weight) kg	15	15
BW_{6-16} (mutagenic body weight) kg	80	80
BW_{16-26} (mutagenic body weight) kg	80	80
BW_{res-a} (body weight - adult) kg	80	80
BW_{res-c} (body weight - child) kg	15	15
$DFS_{res-adj}$ (age-adjusted soil dermal factor) mg/kg	103390	103390
mg/kg	428260	428260
ED_{res} (exposure duration) years	26	26
ED_{0-2} (mutagenic exposure duration) years	2	2
ED_{2-6} (mutagenic exposure duration) years	4	4
ED_{6-16} (mutagenic exposure duration) years	10	10
ED_{16-26} (mutagenic exposure duration) years	10	10
ED_{res-a} (exposure duration - adult) years	20	20
ED_{res-c} (exposure duration - child) years	6	6
EF_{res} (exposure frequency) days/year	350	350

Variable	Resident Soil Default Value	Form-input Value
EF_{0-2} (mutagenic exposure frequency) days/year	350	350
EF_{2-6} (mutagenic exposure frequency) days/year	350	350
EF_{6-16} (mutagenic exposure frequency) days/year	350	350
EF_{16-26} (mutagenic exposure frequency) days/year	350	350
EF_{res-a} (exposure frequency - adult) days/year	350	350
EF_{res-c} (exposure frequency - child) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time) hours/day	24	24
ET_{2-6} (mutagenic exposure time) hours/day	24	24
ET_{6-16} (mutagenic exposure time) hours/day	24	24
ET_{16-26} (mutagenic exposure time) hours/day	24	24
ET_{res-a} (adult exposure time) hours/day	24	24
ET_{res-c} (child exposure time) hours/day	24	24
$IFS_{res-adj}$ (age-adjusted soil ingestion factor) mg/kg	36750	36750
mg/kg	166833.3	166833.3
IRS_{0-2} (mutagenic soil intake rate) mg/day	200	200
IRS_{2-6} (mutagenic soil intake rate) mg/day	200	200
IRS_{6-16} (mutagenic soil intake rate) mg/day	100	100
IRS_{16-26} (mutagenic soil intake rate) mg/day	100	100
IRS_{res-a} (soil intake rate - adult) mg/day	100	100
IRS_{res-c} (soil intake rate - child) mg/day	200	200
LT (lifetime) years	70	70
SA_{0-2} (mutagenic skin surface area) cm^2/day	2373	2373
SA_{2-6} (mutagenic skin surface area) cm^2/day	2373	2373
SA_{6-16} (mutagenic skin surface area) cm^2/day	6032	6032
SA_{16-26} (mutagenic skin surface area) cm^2/day	6032	6032
SA_{res-a} (skin surface area - adult) cm^2/day	6032	6032
SA_{res-c} (skin surface area - child) cm^2/day	2373	2373
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	4.69
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.5

Site-Specific Risk
Hypothetical Resident

Chemical	CAS Number	Mutagen?	VOC?	Chronic RfD (mg/kg-day)	RfD Ref	Chronic RfC (mg/m^3)	RfC Ref	SF_o(mg/kg-day)$^{-1}$	SF_o Ref	IUR (ug/m^3)$^{-1}$	IUR Ref	ABS_{gi}	ABS_{derm}	Volatilization Factor (m^3/kg)	DA	Particulate Emission Factor (m^3/kg)	Soil Saturation Concentration (mg/kg)	RBA	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)	H` and HLC Ref	Henry's Law Constant Used in Calcs (unitless)
Target Berm Hillside DU 3 (ISM Surface Soil, 0 – 6 inches bgs)																						
Copper	7440-50-8	No	No	4.00E-02	U	-	-	-	-	-	-	1.00E+00	-	-	-	1.36E+09	-	1.00E+00	-	-	-	-
Zinc and Compounds	7440-66-6	No	No	3.00E-01	I	-	-	-	-	-	-	1.00E+00	-	-	-	1.36E+09	-	1.00E+00	-	-	-	-
Target Berm Ponded DU 5 (Sediment)																						
Antimony (metallic)	7440-36-0	No	No	4.00E-04	I	3.00E-04	A	-		-		1.50E-01	-	-		1.36E+09	-	1.00E+00	-	-		-

Notes
A = ATSDR
H = HEAST
I = IRIS

Site-Specific Risk
Hypothetical Resident

Chemical	Normal Boiling Point BP (K)	BP Ref	Critical Temperature TC (K)	TC Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	Soil Concentration (mg/kg)	Child Ingestion Noncarcinogenic CDI (mg/kg-day)	Child Dermal Noncarcinogenic CDI (mg/kg-day)	Child Inhalation Noncarcinogenic CDI (mg/m^3)	Adult Ingestion Noncarcinogenic CDI (mg/kg-day)	Adult Dermal Noncarcinogenic CDI (mg/kg-day)	Adult Inhalation Noncarcinogenic CDI (mg/m^3)	Adjusted Ingestion Noncarcinogenic CDI (mg/kg-day)	Adjusted Dermal Noncarcinogenic CDI (mg/kg-day)
Target Berm Hillside DU 3 (ISM Surface Soil, 0 – 6 inches bgs)															
Copper	2.87E+03	U	5.12E+03	U	-	-	5.53E+01	7.07E-04	-	3.90E-08	6.62E-05	-	3.90E-08	2.14E-04	-
Zinc and Compounds	1.18E+03	U	3.17E+03	U	-	-	1.47E+02	1.88E-03	-	1.04E-07	1.76E-04	-	1.04E-07	5.69E-04	-
Target Berm Ponded DU 5 (Sediment)															
Antimony (metallic)	1.91E+03	U	5.07E+03	U	-	-	1.06E+01	1.36E-04	-	7.48E-09	1.27E-05	-	7.48E-09	4.10E-05	-

Notes
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Site-Specific Risk
Hypothetical Resident

Chemical	Adjusted Inhalation Noncarcinogenic CDI (mg/m^3)	Ingestion Carcinogenic CDI (mg/kg-day)	Dermal Carcinogenic CDI (mg/kg-day)	Inhalation Carcinogenic CDI (ug/m^3)	Child Ingestion HQ	Child Dermal HQ	Child Inhalation HQ	Child Total HI	Adult Ingestion HQ	Adult Dermal HQ	Adult Inhalation HQ	Adult Total HI	Adjusted Ingestion HQ	Adjusted Dermal HQ	Adjusted Inhalation HQ	Adjusted Total HI	Ingestion Risk	Dermal Risk	Inhalation Risk
Target Berm Hillside DU 3 (ISM Surface Soil, 0 – 6 inches bgs)																			
Copper	3.90E-08	7.95E-05	-	1.45E-05	1.77E-02	-	-	1.77E-02	1.66E-03	-	-	1.66E-03	5.35E-03	-	-	5.35E-03	-	-	-
Zinc and Compounds	1.04E-07	2.11E-04	-	3.85E-05	6.26E-03	-	-	6.26E-03	5.87E-04	-	-	5.87E-04	1.90E-03	-	-	1.90E-03	-	-	-
Target Berm Ponded DU 5 (Sediment)																			
Antimony (metallic)	7.48E-09	1.52E-05	-	2.78E-06	**3.39E-01**	-	2.49E-05	**3.39E-01**	3.18E-02	-	2.49E-05	3.18E-02	**1.03E-01**	-	2.49E-05	**1.03E-01**	-	-	-

Notes
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Site-Specific Risk
Hypothetical Resident

Chemical	Total Risk	Child Ingestion HQ	Child Dermal HQ	Child Inhalation HQ	Child Total HI	Adult Ingestion HQ	Adult Dermal HQ	Adult Inhalation HQ	Adult Total HI	Adjusted Ingestion HQ	Adjusted Dermal HQ	Adjusted Inhalation HQ	Adjusted Total HI	Ingestion Risk	Dermal Risk	Inhalation Risk	Total Risk
Target Berm Hillside DU 3 (ISM Surface Soil, 0 – 6 inches bgs)																	
Copper	-	100.0%	-	-	***100.0%***	100.0%	-	-	***100.0%***	100.0%	-	-	***100.0%***	-	-	-	***-***
Zinc and Compounds	-	100.0%	-	-	***100.0%***	100.0%	-	-	***100.0%***	100.0%	-	-	***100.0%***	-	-	-	***-***
Target Berm Ponded DU 5 (Sediment)																	
Antimony (metallic)	-	100.0%	-	0.0%	***100.0%***	99.9%	-	0.1%	***100.0%***	100.0%	-	0.0%	***100.0%***	-	-	-	***-***

Notes
A = ATSDR
H = HEAST
I = IRIS

Site-Specific Risk
Site Visitor/Recreational User Inputs

Variable	Recreator Soil/Sediment Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	16.2302
A (VF Dispersion Constant)	11.911	11.911
A (VF Dispersion Constant - mass limit)	11.911	11.911
B (PEF Dispersion Constant)	18.7762	18.7762
B (VF Dispersion Constant)	18.4385	18.4385
B (VF Dispersion Constant - mass limit)	18.4385	18.4385
City (PEF Climate Zone) Selection	Default	Default
City (VF Climate Zone) Selection	Default	Default
C (PEF Dispersion Constant)	216.108	216.108
C (VF Dispersion Constant)	209.7845	209.7845
C (VF Dispersion Constant - mass limit)	209.7845	209.7845
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.194
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density - mass limit) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	1359344438
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	93.77
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	68.18
Q/C_{vol} (g/m^2-s per kg/m^3 - mass limit)	68.18	68.18
A_s (PEF acres)	0.5	0.5
A_s (VF acres)	0.5	0.5
A_s (VF mass-limit acres)	0.5	0.5
AF_{0-2} (skin adherence factor) mg/cm^2	0.2	0.2
AF_{2-6} (skin adherence factor) mg/cm^2	0.2	0.2
AF_{6-16} (skin adherence factor) mg/cm^2	0.07	0.07
AF_{16-30} (skin adherence factor) mg/cm^2	0.07	0.07
AF_{rec-a} (skin adherence factor - adult) mg/cm^2	0.07	0.07
AF_{rec-c} (skin adherence factor - child) mg/cm^2	0.2	0.2
AT_{rec} (averaging time)	365	365
BW_{0-2} (body weight) kg	15	15
BW_{2-6} (body weight) kg	15	15
BW_{6-16} (body weight) kg	80	80
BW_{16-30} (body weight) kg	80	80
BW_{rec-a} (body weight - adult) kg	80	80
BW_{rec-c} (body weight - child) kg	15	15
$DFS_{rec-adj}$ (age-adjusted soil dermal factor) mg/kg	22155	22155
$DFSM_{rec-adj}$ (mutagenic age-adjusted soil dermal factor) mg/kg	91770	91770
ED_{rec} (exposure duration - recreator) years	26	26
ED_{0-2} (exposure duration) year	2	2
ED_{2-6} (exposure duration) year	4	4
ED_{6-16} (exposure duration) year	10	10
ED_{16-30} (exposure duration) year	10	10
ED_{rec-c} (exposure duration - child) years	6	6
EF_{rec} (exposure frequency) days/year	75	75
EF_{0-2} (exposure frequency) days/year	75	75
EF_{2-6} (exposure frequency) days/year	75	75
EF_{6-16} (exposure frequency) days/year	75	75
EF_{16-30} (exposure frequency) days/year	75	75

Variable	**Recreator Soil/Sediment Default Value**	**Form-input Value**
EF_{rec-a} (exposure frequency - adult) days/year	75	75
EF_{rec-c} (exposure frequency - child) days/year	75	75
ET_{rec} (exposure time - recreator) hours/day	1	1
ET_{0-2} (exposure time) hours/day	1	1
ET_{2-6} (exposure time) hours/day	1	1
ET_{6-16} (exposure time) hours/day	1	1
ET_{16-30} (exposure time) hours/day	1	1
ET_{rec-a} (adult exposure time) hours/day	1	1
ET_{rec-c} (child exposure time) hours/day	1	1
$IFS_{rec-adj}$ (age-adjusted soil ingestion factor) mg/kg	7875	7875
$IFSM_{rec-adj}$ (mutagenic age-adjusted soil ingestion factor) mg/kg	35750	35750
IRS_{0-2} (soil intake rate) mg/day	200	200
IRS_{2-6} (soil intake rate) mg/day	200	200
IRS_{6-16} (soil intake rate) mg/day	100	100
IRS_{16-30} (soil intake rate) mg/day	100	100
IRS_{rec-a} (soil intake rate - adult) mg/day	100	100
IRS_{rec-c} (soil intake rate - child) mg/day	200	200
LT (lifetime - recreator) years	70	70
SA_{0-2} (skin surface area) cm^2/day	2373	2373
SA_{2-6} (skin surface area) cm^2/day	2373	2373
SA_{6-16} (skin surface area) cm^2/day	6032	6032
SA_{16-30} (skin surface area) cm^2/day	6032	6032
SA_{rec-a} (skin surface area - adult) cm^2/day	6032	6032
SA_{rec-c} (skin surface area - child) cm^2/day	2373	2373
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	4.69
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.5

Site-Specific Risk
Site Visitor/
Recreational User

Chemical	CAS Number	Mutagen?	VOC?	Chronic RfD (mg/kg-day)	RfD Ref	Chronic RfC (mg/m^3)	RfC Ref	SF$_o$(mg/kg-day)$^{-1}$	SF$_o$ Ref	IUR (ug/m^3)$^{-1}$	IUR Ref	ABS$_{gi}$	ABS$_{derm}$	Volatilization Factor (m^3/kg)	DA	Particulate Emission Factor (m^3/kg)	Soil Saturation Concentration (mg/kg)	RBA	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)	H` and HLC Ref
Target Berm Hillside DU 3 (ISM Surface Soil, 0 – 6 inches bgs)																					
Copper	7440-50-8	No	No	4.00E-02	U	-	-	-	-	-	-	1.00E+00	-	-	-	1.36E+09	-	1.00E+00	-	-	
Zinc and Compounds	7440-66-6	No	No	3.00E-01	I	-	-	-	-	-	-	1.00E+00	-	-	-	1.36E+09	-	1.00E+00	-	-	
Target Berm Ponded DU 5 (Sediment)																					
Antimony (metallic)	7440-36-0	No	No	4.00E-04	I	3.00E-04	A	-	-	-	-	1.50E-01	-	-	-	1.36E+09	-	1.00E+00	-	-	

Notes
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H = HEAST
I = IRIS

Site-specific Risk
Recreator for Soil/Sediment

Site-Specific Risk
Site Visitor/
Recreational User

Chemical	Henry's Law Constant Used in Calcs (unitless)	Normal Boiling Point BP (K)	BP Ref	Critical Temperature TC (K)	TC Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	Soil Concentration (mg/kg)	Child Ingestion Noncarcinogenic CDI (mg/kg-day)	Child Dermal Noncarcinogenic CDI (mg/kg-day)	Child Inhalation Noncarcinogenic CDI (mg/m^3)	Adult Ingestion Noncarcinogenic CDI (mg/kg-day)	Adult Dermal Noncarcinogenic CDI (mg/kg-day)	Adult Inhalation Noncarcinogenic CDI (mg/m^3)	Adjusted Ingestion Noncarcinogenic CDI (mg/kg-day)
Target Berm Hillside DU 3 (ISM Surface Soil, 0 – 6 inches bgs)															
Copper	-	2.87E+03	U	5.12E+03	U	-	-	5.53E+01	1.51E-04	-	3.48E-10	1.42E-05	-	3.48E-10	4.59E-05
Zinc and Compounds	-	1.18E+03	U	3.17E+03	U	-	-	1.47E+02	4.03E-04	-	9.26E-10	3.77E-05	-	9.26E-10	1.22E-04
Target Berm Ponded DU 5 (Sediment)															
Antimony (metallic)	-	1.91E+03	U	5.07E+03	U	-	-	1.06E+01	2.90E-05	-	6.68E-11	2.72E-06	-	6.68E-11	8.80E-06

Notes
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Site-Specific Risk
Site Visitor/
Recreational User

Chemical	Adjusted Dermal Noncarcinogenic CDI (mg/kg-day)	Adjusted Inhalation Noncarcinogenic CDI (mg/m^3)	Ingestion Carcinogenic CDI (mg/kg-day)	Dermal Carcinogenic CDI (mg/kg-day)	Inhalation Carcinogenic CDI (ug/m^3)	Child Ingestion HQ	Child Dermal HQ	Child Inhalation HQ	Child Total HI	Adult Ingestion HQ	Adult Dermal HQ	Adult Inhalation HQ	Adult Total HI	Adjusted Ingestion HQ	Adjusted Dermal HQ	Adjusted Inhalation HQ	Adjusted Total HI	Ingestion Risk
Target Berm Hillside DU 3 (ISM Surface Soil, 0 – 6 inches bgs)																		
Copper	-	3.48E-10	1.70E-05	-	1.29E-07	3.79E-03	-	-	3.79E-03	3.55E-04	-	-	3.55E-04	1.15E-03	-	-	1.15E-03	-
Zinc and Compounds	-	9.26E-10	4.53E-05	-	3.44E-07	1.34E-03	-	-	1.34E-03	1.26E-04	-	-	1.26E-04	4.07E-04	-	-	4.07E-04	-
Target Berm Ponded DU 5 (Sediment)																		
Antimony (metallic)	-	6.68E-11	3.27E-06	-	2.48E-08	7.26E-02	-	2.23E-07	7.26E-02	6.81E-03	-	2.23E-07	6.81E-03	2.20E-02	-	2.23E-07	2.20E-02	-

Notes
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Site-specific Risk
Recreator for Soil/Sediment

Site-Specific Risk
Site Visitor/
Recreational User

Chemical	Dermal Risk	Inhalation Risk	Total Risk	Child Ingestion HQ	Child Dermal HQ	Child Inhalation HQ	Child Total HI	Adult Ingestion HQ	Adult Dermal HQ	Adult Inhalation HQ	Adult Total HI	Adjusted Ingestion HQ	Adjusted Dermal HQ	Adjusted Inhalation HQ	Adjusted Total HI	Ingestion Risk	Dermal Risk	Inhalation Risk	Total Risk
Target Berm Hillside DU 3 (ISM Surface Soil, 0 – 6 inches bgs)																			
Copper	-	-	-	100.0%	-	-	***100.0%***	100.0%	-	-	***100.0%***	100.0%	-	-	***100.0%***	-	-	-	**-**
Zinc and Compounds	-	-	-	100.0%	-	-	***100.0%***	100.0%	-	-	***100.0%***	100.0%	-	-	***100.0%***	-	-	-	**-**
Target Berm Ponded DU 5 (Sediment)																			
Antimony (metallic)	-	-	-	100.0%	-	0.0%	***100.0%***	100.0%	-	0.0%	***100.0%***	100.0%	-	0.0%	***100.0%***	-	-	-	**-**

Notes
A = ATSDR
H = HEAST
I = IRIS

Output generated 08OCT2020:15:05:26

Site-Specific Risk
Outdoor Worker Inputs

Variable	Outdoor Worker Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	16.2302
A (VF Dispersion Constant)	11.911	11.911
A (VF Dispersion Constant - mass limit)	11.911	11.911
B (PEF Dispersion Constant)	18.7762	18.7762
B (VF Dispersion Constant)	18.4385	18.4385
B (VF Dispersion Constant - mass limit)	18.4385	18.4385
City (PEF Climate Zone) Selection	Default	Default
City (VF Climate Zone) Selection	Default	Default
C (PEF Dispersion Constant)	216.108	216.108
C (VF Dispersion Constant)	209.7845	209.7845
C (VF Dispersion Constant - mass limit)	209.7845	209.7845
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.194
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm^3	1.5	1.5
p_b (dry soil bulk density - mass limit) g/cm^3	1.5	1.5
PEF (particulate emission factor) m^3/kg	1359344438	1359344438
p_s (soil particle density) g/cm^3	2.65	2.65
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	93.77
Q/C_{vol} (g/m^2-s per kg/m^3)	68.18	68.18
Q/C_{vol} (g/m^2-s per kg/m^3 - mass limit)	68.18	68.18
A_s (PEF acres)	0.5	0.5
A_s (VF acres)	0.5	0.5
A_s (VF mass-limit acres)	0.5	0.5
AF_{ow} (skin adherence factor - outdoor worker) mg/cm^2	0.12	0.12
AT_{ow} (averaging time - outdoor worker)	365	365
BW_{ow} (body weight - outdoor worker)	80	80
ED_{ow} (exposure duration - outdoor worker) yr	25	25
EF_{ow} (exposure frequency - outdoor worker) day/yr	225	225
ET_{ow} (exposure time - outdoor worker) hr	8	8
IRS_{ow} (soil ingestion rate - outdoor worker) mg/day	100	100
LT (lifetime) yr	70	70
SA_{ow} (surface area - outdoor worker) cm^2/day	3527	3527
T_w (groundwater temperature) Celsius	25	25
$Theta_a$ (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
$Theta_w$ (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U_m (mean annual wind speed) m/s	4.69	4.69
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.5

Site-Specific Risk
Outdoor Worker

Chemical	CAS Number	Mutagen?	VOC?	Chronic RfD (mg/kg-day)	RfD Ref	Chronic RfC (mg/m^3)	RfC Ref	Sfo (mg/kg-day)$^{-1}$	SF$_o$ Ref	IUR (ug/m^3)$^{-1}$	IUR Ref	ABS$_{gi}$	ABS$_{derm}$	Volatilization Factor (m^3/kg)	DA	Particulate Emission Factor (m^3/kg)	Soil Saturation Concentration (mg/kg)	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)	H` and HLC Ref	Henry's Law Constant Used in Calcs (unitless)	Normal Boiling Point BP (K)
Target Berm Hillside DU 3 (ISM Surface Soil, 0 – 6 inches bgs)																						
Copper	7440-50-8	No	No	4.00E-02	U	-	-	-	-	-	-	1.00E+00	-	-	-	1.36E+09	-	-	-	-	-	2.87E+03
Zinc and Compounds	7440-66-6	No	No	3.00E-01	I	-	-	-	-	-	-	1.00E+00	-	-	-	1.36E+09	-	-	-	-	-	1.18E+03
Target Berm Ponded DU 5 (Sediment)																						
Antimony (metallic)	7440-36-0	No	No	4.00E-04	I	3.00E-04	A	-	-	-	-	1.50E-01	-	-	-	1.36E+09	-	-	-	-	-	1.91E+03

Notes
A = ATSDR
CAS = Chemical Abstract Service
H = HEAST
I = IRIS
IUR = Inhalation Unit Risk
RfC = Reference Concentration
RfD = Reference Dose
Sfo = Oral Slope Factor
VOC = Volatile Organic Compound

Site-Specific Risk
Outdoor Worker

Chemical	BP Ref	Critical Temperature TC (K)	TC Ref	D_{ia} (cm^2/s)	D_{iw} (cm^2/s)	Soil Concentration (mg/kg)	Ingestion Noncarcinogenic CDI (mg/kg-day)	Dermal Noncarcinogenic CDI (mg/kg-day)	Inhalation Noncarcinogenic CDI (mg/m^3)	Ingestion Carcinogenic CDI (mg/kg-day)	Dermal Carcinogenic CDI (mg/kg-day)	Inhalation Carcinogenic CDI (ug/m^3)	Ingestion HQ	Dermal HQ	Inhalation HQ	Total HI	Ingestion Risk	Dermal Risk
Target Berm Hillside DU 3 (ISM Surface Soil, 0 – 6 inches bgs)																		
Copper	U	5.12E+03	U	-	-	5.53E+01	4.26E-05	-	8.35E-09	1.52E-05	-	2.98E-06	1.06E-03	-	-	1.06E-03	-	-
Zinc and Compounds	U	3.17E+03	U	-	-	1.47E+02	1.13E-04	-	2.22E-08	4.04E-05	-	7.93E-06	3.77E-04	-	-	3.77E-04	-	-
Target Berm Ponded DU 5 (Sediment)																		
Antimony (metallic)	U	5.07E+03	U	-	-	1.06E+01	8.17E-06	-	1.60E-09	2.92E-06	-	5.72E-07	2.04E-02	-	5.34E-06	2.04E-02	-	-

Notes
A = ATSDR
CAS = Chemical Abstract S
H = HEAST
I = IRIS
IUR = Inhalation Unit Risk
RfC = Reference Concentra
RfD = Reference Dose
Sfo = Oral Slope Factor
VOC = Volatile Organic Cor

Site-Specific Risk
Outdoor Worker

Chemical	Inhalation Risk	Total Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Total HI	Ingestion Risk	Dermal Risk	Inhalation Risk	Total Risk
Target Berm Hillside DU 3 (ISM Surface Soil, 0 – 6 inches bgs)										
Copper	-	-	100.0%	-	-	***100.0%***	-	-	-	**-**
Zinc and Compounds	-	-	100.0%	-	-	***100.0%***	-	-	-	**-**
Target Berm Ponded DU 5 (Sediment)										
Antimony (metallic)	-	-	100.0%	-	0.0%	***100.0%***	-	-	-	**-**

Notes
A = ATSDR
CAS = Chemical Abstract S
H = HEAST
I = IRIS
IUR = Inhalation Unit Risk
RfC = Reference Concentra
RfD = Reference Dose
Sfo = Oral Slope Factor
VOC = Volatile Organic Co

Attachment C

Lead Modeling

Attachment C
Table C-1
Adult Lead Methodology Model Parameters
O'Ryan Rifle Range, New York

Variable	Description of Variable	Units	Model Input Values	Notes
General Parameters				
PbS	Lead exposure point concentration (mean)	mg/kg	See Table Below	DU-Specific
$R_{fetal/maternal}$	Fetal/maternal lead blood (PbB) ratio	unitless	0.9	Model default[a]
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	
GSD_i	Geometric standard deviation PbB	unitless	1.8	
PbB_0	Baseline PbB concentration	µg/dL	0.6	
$AF_{S, D}$	Absorption fraction (same for soil and dust)	unitless	0.12	
PbBt	Target PbB level of concern	µg/dL	5 and 10	a and b
Receptor-Specific Parameters				
$IR_{S, D}$	**Soil ingestion rate (including soil-derived indoor dust)**			
	Future Outdoor Worker	grams/day	0.05	a
	Future Construction Worker	grams/day	0.1	c
	Site Visitor/Recreational User (Adult)	grams/day	0.05	a
$EF_{S, D}$	**Exposure frequency (same for soil and dust)**			
	Future Outdoor Worker	days/year	219	a
	Construction Worker	days/year	250	a
	Site Visitor/Recreational User (Adult)	days/year	69	d
$AT_{S, D}$	**Averaging time (same for soil and dust)**			
	Future Outdoor Worker	days/year	365	a
	Construction Worker	days/year	365	a
	Site Visitor/Recreational User (Adult)	days/year	241	d

Lead Exposure Point Concentrations (Means)

	PbS
100-yd Target Berm DU 1	
Surface Soil (ISM), 0-6 inches bgs	53
Target Area DU 2	
Surface Soil (ISM), 0-6 inches bgs	85
Target Berm Hillside DU 3	
Surface Soil (ISM), 0-6 inches bgs	197
Target Berm Ponded DU 5	
Sediment	779
Wet Meadow DU 6	
Sediment	78

Notes:

[a] EPA 2017 model default. Adult Lead Methodology (ALM), Version 6/14/2017.

[b] EPA Regional Screening Level (RSL) Table and User’s Guide, Dated May 2020.

[c] EPA 2011 recommended mean value for construction worker scenario.

[d] Site Visitor/Recreational User (Adult) visits the site 2 days/week x 4.3 weeks/month x 8 months with a weighted averaging time of 241 days/year (7 days/week x 4.3 weeks/month x 8 months).

ALM = Adult Lead Methodology
B = blood
DU = decision unit
Pb = lead
PbB = blood-lead concentration

EPA = U.S. Environmental Protection Agency
µg/dL = micrograms per deciliter
µg/day = micrograms per day
mg/kg = milligrams per kilogram

References:

EPA, 2011. Exposure Factors Handbook: 2011 Edition, National Center for Environmental Assessment, Office of Research and Development. EPA/600/R-09/052F, September.

EPA, 2017. Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters.

Attachment C

Table C-2

Adult Lead Methodology Model Results, Assuming Target Blood Lead Level of 10 ug/dL

O'Ryan Rifle Range, New York

Variable	Description of Variable (1)	Units	100-yd Firing Berm DU 1, ISM Surface Soil, 0-6 inches bgs		
			Outdoor Worker Scenario	Construction Worker Scenario	Adult Site Visitor / Recreational User Scenario
PbS	Soil/sediment lead concentration	µg/g or ppm	53	53	53
Rfetal/maternal	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSDi	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB0	Baseline PbB	µg/dL	0.6	0.6	0.6
IRS	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05	0.1	0.05
IRS+D	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--
WS	Weighting factor; fraction of IRS+D ingested as outdoor soil	--	--	--	--
KSD	Mass fraction of soil in dust	--	--	--	--
AFS, D	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12
EFS, D	Exposure frequency (same for soil and dust)	days/yr	219	250	69
ATS, D	Averaging time (same for soil and dust)	days/yr	256	365	241
PbBadult	PbB of adult worker, geometric mean	µg/dL	0.7	0.8	0.6
PbBfetal, 0.95	95th percentile PbB among fetuses of adult workers	µg/dL	1.7	1.8	1.5
PbBt	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	10.0	10.0	10.0
P(PbBfetal > PbBt)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.0001%	0.0003%	0.00006%

Notes:

(1) Risk results were derived using NHANES 2009-2014 data. See Table C-1 for variable sources.

bgs = below ground surface

days/yr = days per year

g/day = grams per day

ISM = incremental sampling methodology

µg/dL = micrograms per deciliter

µg/day = micrograms per day

µg/g = micrograms per gram

ppm = parts per million

PbB = blood-lead concentration

Attachment C
Table C-2
Adult Lead Methodology Model Results, Assuming Target Blood Lead Level of 10 ug/dL
O'Ryan Rifle Range, New York

			Target Area DU 2, ISM Surface Soil, 0-6 inches bgs		
Variable	Description of Variable (1)	Units	Outdoor Worker Scenario	Construction Worker Scenario	Adult Site Visitor / Recreational User Scenario
PbS	Soil/sediment lead concentration	µg/g or ppm	85	85	85
Rfetal/maternal	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSDi	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB0	Baseline PbB	µg/dL	0.6	0.6	0.6
IRS	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05	0.1	0.05
IRS+D	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--
WS	Weighting factor; fraction of IRS+D ingested as outdoor soil	--	--	--	--
KSD	Mass fraction of soil in dust	--	--	--	--
AFS, D	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12
EFS, D	Exposure frequency (same for soil and dust)	days/yr	219	250	69
ATS, D	Averaging time (same for soil and dust)	days/yr	256	365	241
PbBadult	PbB of adult worker, geometric mean	µg/dL	0.8	0.9	0.7
PbBfetal, 0.95	95th percentile PbB among fetuses of adult workers	µg/dL	1.8	2.1	1.6
PbBt	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	10.0	10.0	10.0
P(PbBfetal > PbBt)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.0003%	0.001%	0.0001%

Notes:
(1) Risk results were derived using NHANES 2009-2014 data. See Table C-1 for variable sources.
bgs = below ground surface
days/yr = days per year
g/day = grams per day
ISM = incremental sampling methodology
µg/dL = micrograms per deciliter
µg/day = micrograms per day
µg/g = micrograms per gram
ppm = parts per million
PbB = blood-lead concentration

Attachment C
Table C-2
Adult Lead Methodology Model Results, Assuming Target Blood Lead Level of 10 ug/dL
O'Ryan Rifle Range, New York

Variable	Description of Variable (1)	Units	Target Berm Hillside DU 3, ISM Surface Soil, 0-6 inches bgs		
			Outdoor Worker Scenario	Construction Worker Scenario	Adult Site Visitor / Recreational User Scenario
PbS	Soil/sediment lead concentration	µg/g or ppm	197	197	197
Rfetal/maternal	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSDi	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB0	Baseline PbB	µg/dL	0.6	0.6	0.6
IRS	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05	0.1	0.05
IRS+D	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--
WS	Weighting factor; fraction of IRS+D ingested as outdoor soil	--	--	--	--
KSD	Mass fraction of soil in dust	--	--	--	--
AFS, D	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12
EFS, D	Exposure frequency (same for soil and dust)	days/yr	219	250	69
ATS, D	Averaging time (same for soil and dust)	days/yr	256	365	241
PbBadult	PbB of adult worker, geometric mean	µg/dL	1.0	1.2	0.7
PbBfetal, 0.95	95th percentile PbB among fetuses of adult workers	µg/dL	2.4	3.0	1.7
PbBt	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	10.0	10.0	10.0
P(PbBfetal > PbBt)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.002%	0.01%	0.0002%

Notes:
(1) Risk results were derived using NHANES 2009-2014 data. See Table C-1 for variable sources.
bgs = below ground surface
days/yr = days per year
g/day = grams per day
ISM = incremental sampling methodology
µg/dL = micrograms per deciliter
µg/day = micrograms per day
µg/g = micrograms per gram
ppm = parts per million
PbB = blood-lead concentration

Attachment C
Table C-2
Adult Lead Methodology Model Results, Assuming Target Blood Lead Level of 10 ug/dL
O'Ryan Rifle Range, New York

			Target Berm Ponded DU 5, Sediment		
Variable	Description of Variable (1)	Units	Outdoor Worker Scenario	Construction Worker Scenario	Adult Site Visitor / Recreational User Scenario
PbS	Soil/sediment lead concentration	µg/g or ppm	779	779	779
Rfetal/maternal	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSDi	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB0	Baseline PbB	µg/dL	0.6	0.6	0.6
IRS	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.1	0.1	0.05
IRS+D	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--
WS	Weighting factor; fraction of IRS+D ingested as outdoor soil	--	--	--	--
KSD	Mass fraction of soil in dust	--	--	--	--
AFS, D	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12
EFS, D	Exposure frequency (same for soil and dust)	days/yr	219	250	69
ATS, D	Averaging time (same for soil and dust)	days/yr	256	365	241
PbBadult	PbB of adult worker, geometric mean	µg/dL	2.2	3.2	1.1
PbBfetal, 0.95	95th percentile PbB among fetuses of adult workers	µg/dL	5.2	7.5	2.7
PbBt	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	10.0	10.0	10.0
P(PbBfetal > PbBt)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.3%	2%	0.005%

Notes:
(1) Risk results were derived using NHANES 2009-2014 data. See Table C-1 for variable sources.
bgs = below ground surface
days/yr = days per year
g/day = grams per day
ISM = incremental sampling methodology
µg/dL = micrograms per deciliter
µg/day = micrograms per day
µg/g = micrograms per gram
ppm = parts per million
PbB = blood-lead concentration

Attachment C
Table C-2
Adult Lead Methodology Model Results, Assuming Target Blood Lead Level of 10 ug/dL
O'Ryan Rifle Range, New York

Variable	Description of Variable (1)	Units	Wet Meadow DU 6, Sediment		
			Outdoor Worker Scenario	Construction Worker Scenario	Adult Site Visitor/ Recreational User Scenario
PbS	Soil/sediment lead concentration	µg/g or ppm	78	78	78
Rfetal/maternal	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSDi	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB0	Baseline PbB	µg/dL	0.6	0.6	0.6
IRS	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.1	0.1	0.05
IRS+D	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--
WS	Weighting factor; fraction of IRS+D ingested as outdoor soil	--	--	--	--
KSD	Mass fraction of soil in dust	--	--	--	--
AFS, D	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12
EFS, D	Exposure frequency (same for soil and dust)	days/yr	219	250	69
ATS, D	Averaging time (same for soil and dust)	days/yr	256	365	241
PbBadult	PbB of adult worker, geometric mean	µg/dL	0.8	0.9	0.7
PbBfetal, 0.95	95th percentile PbB among fetuses of adult workers	µg/dL	1.8	2.0	1.5
PbBt	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	10.0	10.0	10.0
P(PbBfetal > PbBt)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.0003%	0.001%	0.0001%

Notes:
(1) Risk results were derived using NHANES 2009-2014 data. See Table C-1 for variable sources.
bgs = below ground surface
days/yr = days per year
g/day = grams per day
ISM = incremental sampling methodology
µg/dL = micrograms per deciliter
µg/day = micrograms per day
µg/g = micrograms per gram
ppm = parts per million
PbB = blood-lead concentration

Attachment C
Table C-3
Adult Lead Methodology Model Results, Assuming Target Blood Lead Level of 5 ug/dL
O'Ryan Rifle Range, New York

Variable	Description of Variable (1)	Units	100-yd Firing Berm DU 1, ISM Surface Soil, 0-6 inches bgs		
			Outdoor Worker Scenario	Construction Worker Scenario	Adult Site Visitor / Recreational User Scenario
PbS	Soil/sediment lead concentration	µg/g or ppm	53	53	53
Rfetal/maternal	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSDi	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB0	Baseline PbB	µg/dL	0.6	0.6	0.6
IRS	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05	0.1	0.05
IRS+D	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--
WS	Weighting factor; fraction of IRS+D ingested as outdoor soil	--	--	--	--
KSD	Mass fraction of soil in dust	--	--	--	--
AFS, D	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12
EFS, D	Exposure frequency (same for soil and dust)	days/yr	219	250	69
ATS, D	Averaging time (same for soil and dust)	days/yr	365	365	241
PbBadult	PbB of adult worker, geometric mean	µg/dL	0.7	0.8	0.6
PbBfetal, 0.95	95th percentile PbB among fetuses of adult workers	µg/dL	1.6	1.8	1.5
PbBt	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	5.0	5.0	5.0
P(PbBfetal > PbBt)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.02%	0.04%	0.01%

Notes:
(1) Risk results were derived using NHANES 2009-2014 data. See Table C-1 for variable sources.
bgs = below ground surface
days/yr = days per year
g/day = grams per day
ISM = incremental sampling methodology
µg/dL = micrograms per deciliter
µg/day = micrograms per day
µg/g = micrograms per gram
ppm = parts per million
PbB = blood-lead concentration

Attachment C
Table C-3
Adult Lead Methodology Model Results, Assuming Target Blood Lead Level of 5 ug/dL
O'Ryan Rifle Range, New York

Variable	Description of Variable (1)	Units	Target Area DU 2, ISM Surface Soil, 0-6 inches bgs		
			Outdoor Worker Scenario	Construction Worker Scenario	Adult Site Visitor / Recreational User Scenario
PbS	Soil/sediment lead concentration	µg/g or ppm	85	85	85
Rfetal/maternal	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSDi	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB0	Baseline PbB	µg/dL	0.6	0.6	0.6
IRS	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05	0.1	0.05
IRS+D	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--
WS	Weighting factor; fraction of IRS+D ingested as outdoor soil	--	--	--	--
KSD	Mass fraction of soil in dust	--	--	--	--
AFS, D	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12
EFS, D	Exposure frequency (same for soil and dust)	days/yr	219	250	69
ATS, D	Averaging time (same for soil and dust)	days/yr	365	365	241
PbBadult	PbB of adult worker, geometric mean	µg/dL	0.7	0.9	0.7
PbBfetal, 0.95	95th percentile PbB among fetuses of adult workers	µg/dL	1.7	2.1	1.6
PbBt	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	5.0	5.0	5.0
P(PbBfetal > PbBt)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.03%	0.09%	0.01%

Notes:
(1) Risk results were derived using NHANES 2009-2014 data. See Table C-1 for variable sources.
bgs = below ground surface
days/yr = days per year
g/day = grams per day
ISM = incremental sampling methodology
µg/dL = micrograms per deciliter
µg/day = micrograms per day
µg/g = micrograms per gram
ppm = parts per million
PbB = blood-lead concentration

Attachment C
Table C-3
Adult Lead Methodology Model Results, Assuming Target Blood Lead Level of 5 ug/dL
O'Ryan Rifle Range, New York

			Target Berm Hillside DU 3, ISM Surface Soil, 0-6 inches bgs			Target Berm Ponded DU 5, Sediment		
Variable	Description of Variable (1)	Units	Outdoor Worker Scenario	Construction Worker Scenario	Adult Site Visitor / Recreational User Scenario	Outdoor Worker Scenario	Construction Worker Scenario	Adult Site Visitor / Recreational User Scenario
PbS	Soil/sediment lead concentration	µg/g or ppm	197	197	197	779	779	779
Rfetal/maternal	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4	0.4	0.4	0.4
GSDi	Geometric standard deviation PbB	--	1.8	1.8	1.8	1.8	1.8	1.8
PbB0	Baseline PbB	µg/dL	0.6	0.6	0.6	0.6	0.6	0.6
IRS	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05	0.1	0.05	0.1	0.1	0.05
IRS+D	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--	--	--	--
WS	Weighting factor; fraction of IRS+D ingested as outdoor soil	--	--	--	--	--	--	--
KSD	Mass fraction of soil in dust	--	--	--	--	--	--	--
AFS, D	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12	0.12	0.12
EFS, D	Exposure frequency (same for soil and dust)	days/yr	219	250	69	219	250	69
ATS, D	Averaging time (same for soil and dust)	days/yr	365	365	241	256	365	241
PbBadult	PbB of adult worker, geometric mean	µg/dL	0.9	1.2	0.7	2.2	3.2	1.1
PbBfetal, 0.95	95th percentile PbB among fetuses of adult workers	µg/dL	2.1	3.0	1.7	5.2	7.5	2.7
PbBt	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	5.0	5.0	5.0	5.0	5.0	5.0
P(PbBfetal > PbBt)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.09%	0.6%	0.03%	6%	17%	0.3%

Notes:
(1) Risk results were derived using NHANES 2009-2014 data. See Table C-1 for variable sources.
bgs = below ground surface
days/yr = days per year
g/day = grams per day
ISM = incremental sampling methodology
µg/dL = micrograms per deciliter
µg/day = micrograms per day
µg/g = micrograms per gram
ppm = parts per million
PbB = blood-lead concentration

Attachment C
Table C-3
Adult Lead Methodology Model Results, Assuming Target Blood Lead Level of 5 ug/dL
O'Ryan Rifle Range, New York

Variable	Description of Variable (1)	Units	Wet Meadow DU 6, Sediment		
			Outdoor Worker Scenario	Construction Worker Scenario	Adult Site Visitor / Recreational User Scenario
PbS	Soil/sediment lead concentration	µg/g or ppm	78	78	78
Rfetal/maternal	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSDi	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB0	Baseline PbB	µg/dL	0.6	0.6	0.6
IRS	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.1	0.1	0.05
IRS+D	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--
WS	Weighting factor; fraction of IRS+D ingested as outdoor soil	--	--	--	--
KSD	Mass fraction of soil in dust	--	--	--	--
AFS, D	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12
EFS, D	Exposure frequency (same for soil and dust)	days/yr	219	250	69
ATS, D	Averaging time (same for soil and dust)	days/yr	256	365	241
PbBadult	PbB of adult worker, geometric mean	µg/dL	0.8	0.9	0.7
PbBfetal, 0.95	95th percentile PbB among fetuses of adult workers	µg/dL	1.8	2.0	1.5
PbBt	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	5.0	5.0	5.0
P(PbBfetal > PbBt)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.04%	0.1%	0.01%

Notes:
(1) Risk results were derived using NHANES 2009-2014 data. See Table C-1 for variable sources.
bgs = below ground surface
days/yr = days per year
g/day = grams per day
ISM = incremental sampling methodology
µg/dL = micrograms per deciliter
µg/day = micrograms per day
µg/g = micrograms per gram
ppm = parts per million
PbB = blood-lead concentration

Attachment C
Table C-4
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL
Lead in Soil, Child Resident
100-yd Firing Berm DU 1 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Lead Site-Specific Exposure Point Concentration for the Child Resident Scenario

Area	Medium	Value	Units
100-yd Firing Berm DU 1	Soil	53	mg/kg

IEUBK Model Parameters		Value	Units
Indoor air lead concentration (% of outdoor)		30 [a]	%
AIR (by year)			
Air Concentration			
Age (years) =	0 - 7	0.10 [a]	µg/m^3
Time Outdoors			
Age (years) =	0 - 1	1 [a]	hours/day
	1 - 2	2 [a]	hours/day
	2 - 3	3 [a]	hours/day
	3 - 7	4 [a]	hours/day
Ventilation Rate			
Age (years) =	0 - 1	2 [a]	m^3/day
	1 - 2	3 [a]	m^3/day
	2 - 5	5 [a]	m^3/day
	5 - 7	7 [a]	m^3/day
Lung Absorption		32 [a]	%
DIET (by year)			
Dietary Lead Intake			
Age (years) =	0 - 1	2.26 [a]	µg Pb/day
	1 - 2	1.96 [a]	µg Pb/day
	2 - 3	2.13 [a]	µg Pb/day
	3 - 4	2.04 [a]	µg Pb/day
	4 - 5	1.95 [a]	µg Pb/day
	5 - 6	2.05 [a]	µg Pb/day
	6 - 7	2.22 [a]	µg Pb/day
ALTERNATE DIET SOURCES (by food class)			
Concentration:			
	home-grown fruits	0 [a]	µg Pb/g
	home-grown vegetables	0 [a]	µg Pb/g
	fish from fishing	0 [a]	µg Pb/g
	game animals from hunting	0 [a]	µg Pb/g
Percent of food class:			
	home-grown fruits	0 [a]	%
	home-grown vegetables	0 [a]	%
	fish from fishing	0 [a]	%
	game animals from hunting	0 [a]	%
DRINKING WATER			
Lead Concentration in drinking water		4 [a]	µg/L

Attachment C
Table C-4
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL
Lead in Soil, Child Resident
100-yd Firing Berm DU 1 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Ingestion rate:				
Age (years) =	0 - 1	0.20	[a]	L/day
	1 - 2	0.50	[a]	L/day
	2 - 3	0.52	[a]	L/day
	3 - 4	0.53	[a]	L/day
	4 - 5	0.55	[a]	L/day
	5 - 6	0.58	[a]	L/day
	6 - 7	0.59	[a]	L/day
SOIL/DUST INGESTION				
Concentration:		Soil		
	soil	288	[a]	µg/g
	dust	200	[a]	µg/g
Soil/dust ingestion weighting factor (% soil)		45	[a]	%
Soil/dust ingestion:				
Age (years) =	0 - 1	0.085	[a]	g/day
	1 - 4	0.135	[a]	g/day
	4 - 5	0.100	[a]	g/day
	5 - 6	0.090	[a]	g/day
	6 - 7	0.085	[a]	g/day
SOIL/DUST MULTIPLE SOURCE ANALYSIS				
Fraction of indoor dust lead attributable to soil		0.70	[a]	unitless
Ratio of dust lead concentration to outdoor air lead concentration		100	[a]	µg Pb/g dust per µg Pb/m^3 air
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS				
Total lead absorption (at low intake):		Surface Soil		
	diet	50	[a]	%
	drinking water	50	[a]	%
	soil	30	[a]	%
	dust	30	[a]	%
	alternate source	0	[c]	%
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS (continued)				
Fraction of total net absorption at low intake rate that is attributable to non-saturable (passive) processes		0.2	[a]	unitless
ALTERNATE SOURCES OF LEAD				
Total lead intake:		Soil		
Age (years) =	0 - 7	0	[a]	µg/day
MATERNAL-TO-NEWBORN LEAD EXPOSURE				
Mothers blood lead concentration at childbirth		0.6	[b]	µg/dL
PLOTTING AND RISK ESTIMATION				
Geometric standard deviation (GSD) for blood lead		1.6	[a]	unitless

Attachment C
Table C-4
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL
Lead in Soil, Child Resident
100-yd Firing Berm DU 1 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Blood lead level (BLL) of concern	10	[c]	µg/dL
COMPUTATION OPTIONS			
Iteration time step for numerical integration	4	[a]	hours
PROBABILITY DISTRIBUTION PERCENT RESULTS			
Geometric mean	1	Calc	unitless
Age Range (User Designated)	12-72	[d]	months
Percent above allowable BLL	0.001	Calc	%

Notes:

[1] Young child = 0 - 7 years of age (12 - 72 months) (USEPA 2017b).
[a] IEUBK model default value (USEPA 2007 and 2010).
[b] USEPA (2017a) mothers blood lead concentration of 0.6 in childbirth (µg Pb/dL) was used.
[c] Blood lead level (BLL) threshold of 10 ug/dL was used (USEPA, 2020).
[d] USEPA (2017b) User designation of 12 - 72 months was used.

L/day = liters per day
Pb = lead
µg/m^3 = micrograms per cubic meter
µg/dL = micrograms per deciliter
µg/g = micrograms per gram
mg/kg = milligrams per kilogram

References:

USEPA. 2007. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Office of Superfund Remediation and Technology Innovation. EPA-540-K-01-005. OSWER #9285.7-42. May.
USEPA 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows® version (IEUBKwinv1.1 build 11) Dated February 2010.
USEPA. 2017a. Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. OLEM Directive 9285.6-56. May 17, 2017
USEPA 2017b. Recommendations for Default Age Range in the IEUBK Model. OLEM Directive 9200.2-177. November 15, 2017.
USEPA. 2020. Regional Screening Level (RSL) Table and User’s Guide, Dated November 2020.

Attachment C
Table C-5
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL
Lead in Soil, Child Resident
100-yd Firing Berm DU 1 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Lead Site-Specific Exposure Point Concentration for the Child Resident Scenario			
Area	**Medium**	**Value**	**Units**
100-yd Firing Berm DU 1	Soil	53	mg/kg
IEUBK Model Parameters		**Value**	**Units**
Indoor air lead concentration (% of outdoor)		30 [a]	%
AIR (by year)			
Air Concentration			
Age (years) =	0 - 7	0.10 [a]	µg/m^3
Time Outdoors			
Age (years) =	0 - 1	1 [a]	hours/day
	1 - 2	2 [a]	hours/day
	2 - 3	3 [a]	hours/day
	3 - 7	4 [a]	hours/day
Ventilation Rate			
Age (years) =	0 - 1	2 [a]	m^3/day
	1 - 2	3 [a]	m^3/day
	2 - 5	5 [a]	m^3/day
	5 - 7	7 [a]	m^3/day
Lung Absorption		32 [a]	%
DIET (by year)			
Dietary Lead Intake			
Age (years) =	0 - 1	2.26 [a]	µg Pb/day
	1 - 2	1.96 [a]	µg Pb/day
	2 - 3	2.13 [a]	µg Pb/day
	3 - 4	2.04 [a]	µg Pb/day
	4 - 5	1.95 [a]	µg Pb/day
	5 - 6	2.05 [a]	µg Pb/day
	6 - 7	2.22 [a]	µg Pb/day
ALTERNATE DIET SOURCES (by food class)			
Concentration:			
	home-grown fruits	0 [a]	µg Pb/g
	home-grown vegetables	0 [a]	µg Pb/g
	fish from fishing	0 [a]	µg Pb/g
	game animals from hunting	0 [a]	µg Pb/g
Percent of food class:			
	home-grown fruits	0 [a]	%
	home-grown vegetables	0 [a]	%
	fish from fishing	0 [a]	%
	game animals from hunting	0 [a]	%
DRINKING WATER			
Lead Concentration in drinking water		4 [a]	µg/L

Attachment C
Table C-5
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL
Lead in Soil, Child Resident
100-yd Firing Berm DU 1 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Ingestion rate:				
Age (years) =	0 - 1	0.20	[a]	L/day
	1 - 2	0.50	[a]	L/day
	2 - 3	0.52	[a]	L/day
	3 - 4	0.53	[a]	L/day
	4 - 5	0.55	[a]	L/day
	5 - 6	0.58	[a]	L/day
	6 - 7	0.59	[a]	L/day
SOIL/DUST INGESTION				
Concentration:		Soil		
	soil	288	[a]	µg/g
	dust	200	[a]	µg/g
Soil/dust ingestion weighting factor (% soil)		45	[a]	%
Soil/dust ingestion:				
Age (years) =	0 - 1	0.085	[a]	g/day
	1 - 4	0.135	[a]	g/day
	4 - 5	0.100	[a]	g/day
	5 - 6	0.090	[a]	g/day
	6 - 7	0.085	[a]	g/day
SOIL/DUST MULTIPLE SOURCE ANALYSIS				
Fraction of indoor dust lead attributable to soil		0.70	[a]	unitless
Ratio of dust lead concentration to outdoor air lead concentration		100	[a]	µg Pb/g dust per µg Pb/m^3 air
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS				
Total lead absorption (at low intake):		Surface Soil		
	diet	50	[a]	%
	drinking water	50	[a]	%
	soil	30	[a]	%
	dust	30	[a]	%
	alternate source	0	[c]	%
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS (continued)				
Fraction of total net absorption at low intake rate that is attributable to non-saturable (passive) processes		0.2	[a]	unitless
ALTERNATE SOURCES OF LEAD				
Total lead intake:		Soil		
Age (years) =	0 - 7	0	[a]	µg/day
MATERNAL-TO-NEWBORN LEAD EXPOSURE				
Mothers blood lead concentration at childbirth		0.6	[b]	µg/dL
PLOTTING AND RISK ESTIMATION				
Geometric standard deviation (GSD) for blood lead		1.6	[a]	unitless

Attachment C
Table C-5
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL
Lead in Soil, Child Resident
100-yd Firing Berm DU 1 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Blood lead level (BLL) of concern	5	[c]	µg/dL
COMPUTATION OPTIONS			
Iteration time step for numerical integration	4	[a]	hours
PROBABILITY DISTRIBUTION PERCENT RESULTS			
Geometric mean	1	Calc	unitless
Age Range (User Designated)	12-72	[d]	months
Percent above allowable BLL	0.3	Calc	%

Notes:

[1] Young child = 0 - 7 years of age (12 - 72 months) (USEPA 2017b).

[a] IEUBK model default value (USEPA 2007 and 2010).

[b] USEPA (2017a) mothers blood lead concentration of 0.6 in childbirth (µg Pb/dL) was used.

[c] Lower blood lead level (BLL) threshold of 10 ug/dL was used for uncertainty analysis.

[d] USEPA (2017b) User designation of 12 - 72 months was used.

L/day = liters per day
Pb = lead
µg/m^3 = micrograms per cubic meter
µg/dL = micrograms per deciliter
µg/g = micrograms per gram
mg/kg = milligrams per kilogram

References:

USEPA. 2007. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Office of Superfund Remediation and Technology Innovation. EPA-540-K-01-005. OSWER #9285.7-42. May.

USEPA 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows® version (IEUBKwinv1.1 build 11) Dated February 2010.

USEPA. 2017a. Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. OLEM Directive 9285.6-56. May 17, 2017

USEPA 2017b. Recommendations for Default Age Range in the IEUBK Model. OLEM Directive 9200.2-177. November 15, 2017.

USEPA. 2020. Regional Screening Level (RSL) Table and User’s Guide, Dated November 2020.

Attachment C
Table C-6
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL
Lead in Soil, Child Resident
Target Area DU 2 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Lead Site-Specific Exposure Point Concentration for the Child Resident Scenario			
Area	**Medium**	**Value**	**Units**
Target Area DU 2	Soil	85	mg/kg
IEUBK Model Parameters		**Value**	**Units**
Indoor air lead concentration (% of outdoor)		30 [a]	%
AIR (by year)			
Air Concentration			
Age (years) =	0 - 7	0.10 [a]	µg/m^{3}
Time Outdoors			
Age (years) =	0 - 1	1 [a]	hours/day
	1 - 2	2 [a]	hours/day
	2 - 3	3 [a]	hours/day
	3 - 7	4 [a]	hours/day
Ventilation Rate			
Age (years) =	0 - 1	2 [a]	m^{3}/day
	1 - 2	3 [a]	m^{3}/day
	2 - 5	5 [a]	m^{3}/day
	5 - 7	7 [a]	m^{3}/day
Lung Absorption		32 [a]	%
DIET (by year)			
Dietary Lead Intake			
Age (years) =	0 - 1	2.26 [a]	µg Pb/day
	1 - 2	1.96 [a]	µg Pb/day
	2 - 3	2.13 [a]	µg Pb/day
	3 - 4	2.04 [a]	µg Pb/day
	4 - 5	1.95 [a]	µg Pb/day
	5 - 6	2.05 [a]	µg Pb/day
	6 - 7	2.22 [a]	µg Pb/day
ALTERNATE DIET SOURCES (by food class)			
Concentration:			
	home-grown fruits	0 [a]	µg Pb/g
	home-grown vegetables	0 [a]	µg Pb/g
	fish from fishing	0 [a]	µg Pb/g
	game animals from hunting	0 [a]	µg Pb/g
Percent of food class:			
	home-grown fruits	0 [a]	%
	home-grown vegetables	0 [a]	%
	fish from fishing	0 [a]	%
	game animals from hunting	0 [a]	%
DRINKING WATER			
Lead Concentration in drinking water		4 [a]	µg/L

Attachment C
Table C-6
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL
Lead in Soil, Child Resident
Target Area DU 2 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Ingestion rate:				
Age (years) =	0 - 1	0.20	[a]	L/day
	1 - 2	0.50	[a]	L/day
	2 - 3	0.52	[a]	L/day
	3 - 4	0.53	[a]	L/day
	4 - 5	0.55	[a]	L/day
	5 - 6	0.58	[a]	L/day
	6 - 7	0.59	[a]	L/day
SOIL/DUST INGESTION				
Concentration:		Soil		
	soil	288	[a]	µg/g
	dust	200	[a]	µg/g
Soil/dust ingestion weighting factor (% soil)		45	[a]	%
Soil/dust ingestion:				
Age (years) =	0 - 1	0.085	[a]	g/day
	1 - 4	0.135	[a]	g/day
	4 - 5	0.100	[a]	g/day
	5 - 6	0.090	[a]	g/day
	6 - 7	0.085	[a]	g/day
SOIL/DUST MULTIPLE SOURCE ANALYSIS				
Fraction of indoor dust lead attributable to soil		0.70	[a]	unitless
Ratio of dust lead concentration to outdoor air lead concentration		100	[a]	µg Pb/g dust per µg Pb/m^3 air
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS				
Total lead absorption (at low intake):		Surface Soil		
	diet	50	[a]	%
	drinking water	50	[a]	%
	soil	30	[a]	%
	dust	30	[a]	%
	alternate source	0	[c]	%
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS (continued)				
Fraction of total net absorption at low intake rate that is attributable to non-saturable (passive) processes		0.2	[a]	unitless
ALTERNATE SOURCES OF LEAD				
Total lead intake:		Soil		
Age (years) =	0 - 7	0	[a]	µg/day
MATERNAL-TO-NEWBORN LEAD EXPOSURE				
Mothers blood lead concentration at childbirth		0.6	[b]	µg/dL
PLOTTING AND RISK ESTIMATION				
Geometric standard deviation (GSD) for blood lead		1.6	[a]	unitless

Attachment C
Table C-6
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL
Lead in Soil, Child Resident
Target Area DU 2 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Blood lead level (BLL) of concern	10	[c]	µg/dL
COMPUTATION OPTIONS			
Iteration time step for numerical integration	4	[a]	hours
PROBABILITY DISTRIBUTION PERCENT RESULTS			
Geometric mean	2	Calc	unitless
Age Range (User Designated)	12-72	[d]	months
Percent above allowable BLL	0.01	Calc	%

Notes:

[1] Young child = 0 - 7 years of age (12 - 72 months) (USEPA 2017b).

[a] IEUBK model default value (USEPA 2007 and 2010).

[b] USEPA (2017a) mothers blood lead concentration of 0.6 in childbirth (µg Pb/dL) was used.

[c] Blood lead level (BLL) threshold of 10 ug/dL was used (USEPA, 2020).

[d] USEPA (2017b) User designation of 12 - 72 months was used.

L/day = liters per day
Pb = lead
µg/m^3 = micrograms per cubic meter
µg/dL = micrograms per deciliter
µg/g = micrograms per gram
mg/kg = milligrams per kilogram

References:

USEPA. 2007. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Office of Superfund Remediation and Technology Innovation. EPA-540-K-01-005. OSWER #9285.7-42. May.

USEPA 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows® version (IEUBKwinv1.1 build 11) Dated February 2010.

USEPA. 2017a. Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. OLEM Directive 9285.6-56. May 17, 2017

USEPA 2017b. Recommendations for Default Age Range in the IEUBK Model. OLEM Directive 9200.2-177. November 15, 2017.

USEPA. 2020. Regional Screening Level (RSL) Table and User's Guide, Dated November 2020.

Attachment C
Table C-7
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL
Lead in Soil, Child Resident
Target Area DU 2 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Lead Site-Specific Exposure Point Concentration for the Child Resident Scenario

Area	Medium	Value	Units
Target Area DU 2	Soil	85	mg/kg

IEUBK Model Parameters		Value		Units
Indoor air lead concentration (% of outdoor)		30	[a]	%
AIR (by year)				
Air Concentration				
Age (years) =	0 - 7	0.10	[a]	$\mu g/m^3$
Time Outdoors				
Age (years) =	0 - 1	1	[a]	hours/day
	1 - 2	2	[a]	hours/day
	2 - 3	3	[a]	hours/day
	3 - 7	4	[a]	hours/day
Ventilation Rate				
Age (years) =	0 - 1	2	[a]	m^3/day
	1 - 2	3	[a]	m^3/day
	2 - 5	5	[a]	m^3/day
	5 - 7	7	[a]	m^3/day
Lung Absorption		32	[a]	%
DIET (by year)				
Dietary Lead Intake				
Age (years) =	0 - 1	2.26	[a]	µg Pb/day
	1 - 2	1.96	[a]	µg Pb/day
	2 - 3	2.13	[a]	µg Pb/day
	3 - 4	2.04	[a]	µg Pb/day
	4 - 5	1.95	[a]	µg Pb/day
	5 - 6	2.05	[a]	µg Pb/day
	6 - 7	2.22	[a]	µg Pb/day
ALTERNATE DIET SOURCES (by food class)				
Concentration:				
	home-grown fruits	0	[a]	µg Pb/g
	home-grown vegetables	0	[a]	µg Pb/g
	fish from fishing	0	[a]	µg Pb/g
	game animals from hunting	0	[a]	µg Pb/g
Percent of food class:				
	home-grown fruits	0	[a]	%
	home-grown vegetables	0	[a]	%
	fish from fishing	0	[a]	%
	game animals from hunting	0	[a]	%
DRINKING WATER				
Lead Concentration in drinking water		4	[a]	µg/L

Attachment C

Table C-7

Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL

Lead in Soil, Child Resident

Target Area DU 2 ISM Surface Soil (0-6 in bgs) Results

O'Ryan Rifle Range, New York

Ingestion rate:				
Age (years) =	0 - 1	0.20	[a]	L/day
	1 - 2	0.50	[a]	L/day
	2 - 3	0.52	[a]	L/day
	3 - 4	0.53	[a]	L/day
	4 - 5	0.55	[a]	L/day
	5 - 6	0.58	[a]	L/day
	6 - 7	0.59	[a]	L/day
SOIL/DUST INGESTION				
Concentration:		Soil		
	soil	288	[a]	µg/g
	dust	200	[a]	µg/g
Soil/dust ingestion weighting factor (% soil)		45	[a]	%
Soil/dust ingestion:				
Age (years) =	0 - 1	0.085	[a]	g/day
	1 - 4	0.135	[a]	g/day
	4 - 5	0.100	[a]	g/day
	5 - 6	0.090	[a]	g/day
	6 - 7	0.085	[a]	g/day
SOIL/DUST MULTIPLE SOURCE ANALYSIS				
Fraction of indoor dust lead attributable to soil		0.70	[a]	unitless
Ratio of dust lead concentration to outdoor air lead concentration		100	[a]	µg Pb/g dust per µg Pb/m^3 air
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS				
Total lead absorption (at low intake):		Surface Soil		
	diet	50	[a]	%
	drinking water	50	[a]	%
	soil	30	[a]	%
	dust	30	[a]	%
	alternate source	0	[c]	%
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS (continued)				
Fraction of total net absorption at low intake rate that is attributable to non-saturable (passive) processes		0.2	[a]	unitless
ALTERNATE SOURCES OF LEAD				
Total lead intake:		Soil		
Age (years) =	0 - 7	0	[a]	µg/day
MATERNAL-TO-NEWBORN LEAD EXPOSURE				
Mothers blood lead concentration at childbirth		0.6	[b]	µg/dL
PLOTTING AND RISK ESTIMATION				
Geometric standard deviation (GSD) for blood lead		1.6	[a]	unitless

Attachment C

Table C-7

Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL

Lead in Soil, Child Resident

Target Area DU 2 ISM Surface Soil (0-6 in bgs) Results

O'Ryan Rifle Range, New York

Blood lead level (BLL) of concern	5	[c]	µg/dL
COMPUTATION OPTIONS			
Iteration time step for numerical integration	4	[a]	hours
PROBABILITY DISTRIBUTION PERCENT RESULTS			
Geometric mean	2	Calc	unitless
Age Range (User Designated)	12-72	[d]	months
Percent above allowable BLL	1	Calc	%

Notes:

[1] Young child = 0 - 7 years of age (12 - 72 months) (USEPA 2017b).

[a] IEUBK model default value (USEPA 2007 and 2010).

[b] USEPA (2017a) mothers blood lead concentration of 0.6 in childbirth (µg Pb/dL) was used.

[c] Lower blood lead level (BLL) threshold of 10 ug/dL was used for uncertainty analysis.

[d] USEPA (2017b) User designation of 12 - 72 months was used.

L/day = liters per day

Pb = lead

µg/m^3 = micrograms per cubic meter

µg/dL = micrograms per deciliter

µg/g = micrograms per gram

mg/kg = milligrams per kilogram

References:

USEPA. 2007. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Office of Superfund Remediation and Technology Innovation. EPA-540-K-01-005. OSWER #9285.7-42. May.

USEPA 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows® version (IEUBKwinv1.1 build 11) Dated February 2010.

USEPA. 2017a. Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. OLEM Directive 9285.6-56. May 17, 2017

USEPA 2017b. Recommendations for Default Age Range in the IEUBK Model. OLEM Directive 9200.2-177. November 15, 2017.

USEPA. 2020. Regional Screening Level (RSL) Table and User’s Guide, Dated November 2020.

Attachment C
Table C-8
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL
Lead in Soil, Child Resident
Target Berm Hillside DU 3 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Lead Site-Specific Exposure Point Concentration for the Child Resident Scenario

Area	Medium	Value	Units
Target Berm Hillside DU 3	Soil	197	mg/kg

IEUBK Model Parameters		Value	Units
Indoor air lead concentration (% of outdoor)		30 [a]	%
AIR (by year)			
Air Concentration			
Age (years) =	0 - 7	0.10 [a]	µg/m^3
Time Outdoors			
Age (years) =	0 - 1	1 [a]	hours/day
	1 - 2	2 [a]	hours/day
	2 - 3	3 [a]	hours/day
	3 - 7	4 [a]	hours/day
Ventilation Rate			
Age (years) =	0 - 1	2 [a]	m^3/day
	1 - 2	3 [a]	m^3/day
	2 - 5	5 [a]	m^3/day
	5 - 7	7 [a]	m^3/day
Lung Absorption		32 [a]	%
DIET (by year)			
Dietary Lead Intake			
Age (years) =	0 - 1	2.26 [a]	µg Pb/day
	1 - 2	1.96 [a]	µg Pb/day
	2 - 3	2.13 [a]	µg Pb/day
	3 - 4	2.04 [a]	µg Pb/day
	4 - 5	1.95 [a]	µg Pb/day
	5 - 6	2.05 [a]	µg Pb/day
	6 - 7	2.22 [a]	µg Pb/day
ALTERNATE DIET SOURCES (by food class)			
Concentration:			
	home-grown fruits	0 [a]	µg Pb/g
	home-grown vegetables	0 [a]	µg Pb/g
	fish from fishing	0 [a]	µg Pb/g
	game animals from hunting	0 [a]	µg Pb/g
Percent of food class:			
	home-grown fruits	0 [a]	%
	home-grown vegetables	0 [a]	%
	fish from fishing	0 [a]	%
	game animals from hunting	0 [a]	%
DRINKING WATER			
Lead Concentration in drinking water		4 [a]	µg/L

Attachment C
Table C-8
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL
Lead in Soil, Child Resident
Target Berm Hillside DU 3 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Ingestion rate:				
Age (years) =	0 - 1	0.20	[a]	L/day
	1 - 2	0.50	[a]	L/day
	2 - 3	0.52	[a]	L/day
	3 - 4	0.53	[a]	L/day
	4 - 5	0.55	[a]	L/day
	5 - 6	0.58	[a]	L/day
	6 - 7	0.59	[a]	L/day
SOIL/DUST INGESTION				
Concentration:		Soil		
	soil	288	[a]	µg/g
	dust	200	[a]	µg/g
Soil/dust ingestion weighting factor (% soil)		45	[a]	%
Soil/dust ingestion:				
Age (years) =	0 - 1	0.085	[a]	g/day
	1 - 4	0.135	[a]	g/day
	4 - 5	0.100	[a]	g/day
	5 - 6	0.090	[a]	g/day
	6 - 7	0.085	[a]	g/day
SOIL/DUST MULTIPLE SOURCE ANALYSIS				
Fraction of indoor dust lead attributable to soil		0.70	[a]	unitless
Ratio of dust lead concentration to outdoor air lead concentration		100	[a]	µg Pb/g dust per µg Pb/m^3 air
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS				
Total lead absorption (at low intake):		Surface Soil		
	diet	50	[a]	%
	drinking water	50	[a]	%
	soil	30	[a]	%
	dust	30	[a]	%
	alternate source	0	[c]	%
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS (continued)				
Fraction of total net absorption at low intake rate that is attributable to non-saturable (passive) processes		0.2	[a]	unitless
ALTERNATE SOURCES OF LEAD				
Total lead intake:		Soil		
Age (years) =	0 - 7	0	[a]	µg/day
MATERNAL-TO-NEWBORN LEAD EXPOSURE				
Mothers blood lead concentration at childbirth		0.6	[b]	µg/dL
PLOTTING AND RISK ESTIMATION				
Geometric standard deviation (GSD) for blood lead		1.6	[a]	unitless

Attachment C
Table C-8
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL
Lead in Soil, Child Resident
Target Berm Hillside DU 3 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Blood lead level (BLL) of concern	10	[c]	µg/dL
COMPUTATION OPTIONS			
Iteration time step for numerical integration	4	[a]	hours
PROBABILITY DISTRIBUTION PERCENT RESULTS			
Geometric mean	3	Calc	unitless
Age Range (User Designated)	12-72	[d]	months
Percent above allowable BLL	0.4	Calc	%

Notes:

[1] Young child = 0 - 7 years of age (12 - 72 months) (USEPA 2017b).
[a] IEUBK model default value (USEPA 2007 and 2010).
[b] USEPA (2017a) mothers blood lead concentration of 0.6 in childbirth (µg Pb/dL) was used.
[c] Blood lead level (BLL) threshold of 10 ug/dL was used (USEPA, 2020).
[d] USEPA (2017b) User designation of 12 - 72 months was used.

L/day = liters per day
Pb = lead
µg/m^3 = micrograms per cubic meter
µg/dL = micrograms per deciliter
µg/g = micrograms per gram
mg/kg = milligrams per kilogram

References:

USEPA. 2007. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Office of Superfund Remediation and Technology Innovation. EPA-540-K-01-005. OSWER #9285.7-42. May.
USEPA 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows® version (IEUBKwinv1.1 build 11) Dated February 2010.
USEPA. 2017a. Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. OLEM Directive 9285.6-56. May 17, 2017
USEPA 2017b. Recommendations for Default Age Range in the IEUBK Model. OLEM Directive 9200.2-177. November 15, 2017.
USEPA. 2020. Regional Screening Level (RSL) Table and User’s Guide, Dated November 2020.

Attachment C
Table C-9
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL
Lead in Soil, Child Resident
Target Berm Hillside DU 3 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Lead Site-Specific Exposure Point Concentration for the Child Resident Scenario			
Area	**Medium**	**Value**	**Units**
Target Berm Hillside DU 3	Soil	197	mg/kg
IEUBK Model Parameters		**Value**	**Units**
Indoor air lead concentration (% of outdoor)		30 [a]	%
AIR (by year)			
Air Concentration			
Age (years) =	0 - 7	0.10 [a]	µg/m^3
Time Outdoors			
Age (years) =	0 - 1	1 [a]	hours/day
	1 - 2	2 [a]	hours/day
	2 - 3	3 [a]	hours/day
	3 - 7	4 [a]	hours/day
Ventilation Rate			
Age (years) =	0 - 1	2 [a]	m^3/day
	1 - 2	3 [a]	m^3/day
	2 - 5	5 [a]	m^3/day
	5 - 7	7 [a]	m^3/day
Lung Absorption		32 [a]	%
DIET (by year)			
Dietary Lead Intake			
Age (years) =	0 - 1	2.26 [a]	µg Pb/day
	1 - 2	1.96 [a]	µg Pb/day
	2 - 3	2.13 [a]	µg Pb/day
	3 - 4	2.04 [a]	µg Pb/day
	4 - 5	1.95 [a]	µg Pb/day
	5 - 6	2.05 [a]	µg Pb/day
	6 - 7	2.22 [a]	µg Pb/day
ALTERNATE DIET SOURCES (by food class)			
Concentration:			
	home-grown fruits	0 [a]	µg Pb/g
	home-grown vegetables	0 [a]	µg Pb/g
	fish from fishing	0 [a]	µg Pb/g
	game animals from hunting	0 [a]	µg Pb/g
Percent of food class:			
	home-grown fruits	0 [a]	%
	home-grown vegetables	0 [a]	%
	fish from fishing	0 [a]	%
	game animals from hunting	0 [a]	%
DRINKING WATER			
Lead Concentration in drinking water		4 [a]	µg/L

Attachment C
Table C-9
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL
Lead in Soil, Child Resident
Target Berm Hillside DU 3 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Ingestion rate:				
Age (years) =	0 - 1	0.20	[a]	L/day
	1 - 2	0.50	[a]	L/day
	2 - 3	0.52	[a]	L/day
	3 - 4	0.53	[a]	L/day
	4 - 5	0.55	[a]	L/day
	5 - 6	0.58	[a]	L/day
	6 - 7	0.59	[a]	L/day
SOIL/DUST INGESTION				
Concentration:		Soil		
	soil	288	[a]	µg/g
	dust	200	[a]	µg/g
Soil/dust ingestion weighting factor (% soil)		45	[a]	%
Soil/dust ingestion:				
Age (years) =	0 - 1	0.085	[a]	g/day
	1 - 4	0.135	[a]	g/day
	4 - 5	0.100	[a]	g/day
	5 - 6	0.090	[a]	g/day
	6 - 7	0.085	[a]	g/day
SOIL/DUST MULTIPLE SOURCE ANALYSIS				
Fraction of indoor dust lead attributable to soil		0.70	[a]	unitless
Ratio of dust lead concentration to outdoor air lead concentration		100	[a]	µg Pb/g dust per µg Pb/m^3 air
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS				
Total lead absorption (at low intake):		Surface Soil		
	diet	50	[a]	%
	drinking water	50	[a]	%
	soil	30	[a]	%
	dust	30	[a]	%
	alternate source	0	[c]	%
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS (continued)				
Fraction of total net absorption at low intake rate that is attributable to non-saturable (passive) processes		0.2	[a]	unitless
ALTERNATE SOURCES OF LEAD				
Total lead intake:		Soil		
Age (years) =	0 - 7	0	[a]	µg/day
MATERNAL-TO-NEWBORN LEAD EXPOSURE				
Mothers blood lead concentration at childbirth		0.6	[b]	µg/dL
PLOTTING AND RISK ESTIMATION				
Geometric standard deviation (GSD) for blood lead		1.6	[a]	unitless

Attachment C
Table C-9
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL
Lead in Soil, Child Resident
Target Berm Hillside DU 3 ISM Surface Soil (0-6 in bgs) Results
O'Ryan Rifle Range, New York

Blood lead level (BLL) of concern	5	[c]	µg/dL
COMPUTATION OPTIONS			
Iteration time step for numerical integration	4	[a]	hours
PROBABILITY DISTRIBUTION PERCENT RESULTS			
Geometric mean	3	Calc	unitless
Age Range (User Designated)	12-72	[d]	months
Percent above allowable BLL	12	Calc	%

Notes:

[1] Young child = 0 - 7 years of age (12 - 72 months) (USEPA 2017b).
[a] IEUBK model default value (USEPA 2007 and 2010).
[b] USEPA (2017a) mothers blood lead concentration of 0.6 in childbirth (µg Pb/dL) was used.
[c] Lower blood lead level (BLL) threshold of 10 ug/dL was used for uncertainty analysis.
[d] USEPA (2017b) User designation of 12 - 72 months was used.

L/day = liters per day
Pb = lead
µg/m^3 = micrograms per cubic meter

µg/dL = micrograms per deciliter
µg/g = micrograms per gram
mg/kg = milligrams per kilogram

References:

USEPA. 2007. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Office of Superfund Remediation and Technology Innovation. EPA-540-K-01-005. OSWER #9285.7-42. May.
USEPA 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows® version (IEUBKwinv1.1 build 11) Dated February 2010.
USEPA. 2017a. Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. OLEM Directive 9285.6-56. May 17, 2017
USEPA 2017b. Recommendations for Default Age Range in the IEUBK Model. OLEM Directive 9200.2-177. November 15, 2017.
USEPA. 2020. Regional Screening Level (RSL) Table and User’s Guide, Dated November 2020.

Attachment C
Table C-10
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL
Lead in Sediment, Child Resident
Target Berm Ponded DU 5 Discrete Sediment Sample Results
O'Ryan Rifle Range, New York

Lead Site-Specific Exposure Point Concentration for the Child Resident Scenario			
Area	**Medium**	**Value**	**Units**
Target Berm Ponded DU 5	Sediment	779	mg/kg

IEUBK Model Parameters		**Value**	**Units**
Indoor air lead concentration (% of outdoor)		30 [a]	%
AIR (by year)			
Air Concentration			
Age (years) =	0 - 7	0.10 [a]	μg/m^3
Time Outdoors			
Age (years) =	0 - 1	1 [a]	hours/day
	1 - 2	2 [a]	hours/day
	2 - 3	3 [a]	hours/day
	3 - 7	4 [a]	hours/day
Ventilation Rate			
Age (years) =	0 - 1	2 [a]	m^3/day
	1 - 2	3 [a]	m^3/day
	2 - 5	5 [a]	m^3/day
	5 - 7	7 [a]	m^3/day
Lung Absorption		32 [a]	%
DIET (by year)			
Dietary Lead Intake			
Age (years) =	0 - 1	2.26 [a]	μg Pb/day
	1 - 2	1.96 [a]	μg Pb/day
	2 - 3	2.13 [a]	μg Pb/day
	3 - 4	2.04 [a]	μg Pb/day
	4 - 5	1.95 [a]	μg Pb/day
	5 - 6	2.05 [a]	μg Pb/day
	6 - 7	2.22 [a]	μg Pb/day
ALTERNATE DIET SOURCES (by food class)			
Concentration:			
	home-grown fruits	0 [a]	μg Pb/g
	home-grown vegetables	0 [a]	μg Pb/g
	fish from fishing	0 [a]	μg Pb/g
	game animals from hunting	0 [a]	μg Pb/g
Percent of food class:			
	home-grown fruits	0 [a]	%
	home-grown vegetables	0 [a]	%
	fish from fishing	0 [a]	%
	game animals from hunting	0 [a]	%
DRINKING WATER			
Lead Concentration in drinking water		4 [a]	μg/L

Attachment C

Table C-10

Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL

Lead in Sediment, Child Resident

Target Berm Ponded DU 5 Discrete Sediment Sample Results

O'Ryan Rifle Range, New York

Ingestion rate:				
Age (years) =	0 - 1	0.20	[a]	L/day
	1 - 2	0.50	[a]	L/day
	2 - 3	0.52	[a]	L/day
	3 - 4	0.53	[a]	L/day
	4 - 5	0.55	[a]	L/day
	5 - 6	0.58	[a]	L/day
	6 - 7	0.59	[a]	L/day
SOIL/DUST INGESTION				
Concentration:		Soil		
	soil	288	[a]	µg/g
	dust	200	[a]	µg/g
Soil/dust ingestion weighting factor (% soil)		45	[a]	%
Soil/dust ingestion:				
Age (years) =	0 - 1	0.085	[a]	g/day
	1 - 4	0.135	[a]	g/day
	4 - 5	0.100	[a]	g/day
	5 - 6	0.090	[a]	g/day
	6 - 7	0.085	[a]	g/day
SOIL/DUST MULTIPLE SOURCE ANALYSIS				
Fraction of indoor dust lead attributable to soil		0.70	[a]	unitless
Ratio of dust lead concentration to outdoor air lead concentration		100	[a]	µg Pb/g dust per µg Pb/m^3 air
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS				
Total lead absorption (at low intake):		Surface Soil		
	diet	50	[a]	%
	drinking water	50	[a]	%
	soil	30	[a]	%
	dust	30	[a]	%
	alternate source	0	[c]	%
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS (continued)				
Fraction of total net absorption at low intake rate that is attributable to non-saturable (passive) processes		0.2	[a]	unitless
ALTERNATE SOURCES OF LEAD				
Total lead intake:		Soil		
Age (years) =	0 - 7	0	[a]	µg/day
MATERNAL-TO-NEWBORN LEAD EXPOSURE				
Mothers blood lead concentration at childbirth		0.6	[b]	µg/dL
PLOTTING AND RISK ESTIMATION				
Geometric standard deviation (GSD) for blood lead		1.6	[a]	unitless

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Table C-10
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL
Lead in Sediment, Child Resident
Target Berm Ponded DU 5 Discrete Sediment Sample Results
O'Ryan Rifle Range, New York

Blood lead level (BLL) of concern	10	[c]	µg/dL
COMPUTATION OPTIONS			
Iteration time step for numerical integration	4	[a]	hours
PROBABILITY DISTRIBUTION PERCENT RESULTS			
Geometric mean	8	Calc	unitless
Age Range (User Designated)	12-72	[d]	months
Percent above allowable BLL	31	Calc	%

Notes:

[1] Young child = 0 - 7 years of age (12 - 72 months) (USEPA 2017b).

[a] IEUBK model default value (USEPA 2007 and 2010).

[b] USEPA (2017a) mothers blood lead concentration of 0.6 in childbirth (µg Pb/dL) was used.

[c] Blood lead level (BLL) threshold of 10 ug/dL was used (USEPA, 2020).

[d] USEPA (2017b) User designation of 12 - 72 months was used.

L/day = liters per day
Pb = lead
µg/m^3 = micrograms per cubic meter
µg/dL = micrograms per deciliter
µg/g = micrograms per gram
mg/kg = milligrams per kilogram

References:

USEPA. 2007. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Office of Superfund Remediation and Technology Innovation. EPA-540-K-01-005. OSWER #9285.7-42. May.

USEPA 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows® version (IEUBKwinv1.1 build 11) Dated February 2010.

USEPA. 2017a. Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. OLEM Directive 9285.6-56. May 17, 2017

USEPA 2017b. Recommendations for Default Age Range in the IEUBK Model. OLEM Directive 9200.2-177. November 15, 2017.

USEPA. 2020. Regional Screening Level (RSL) Table and User’s Guide, Dated November 2020.

Attachment C
Table C-11
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL
Lead in Sediment, Child Resident
Target Berm Ponded DU 5 Discrete Sediment Sample Results
O'Ryan Rifle Range, New York

Lead Site-Specific Exposure Point Concentration for the Child Resident Scenario				
Area	**Medium**	**Value**		**Units**
Target Berm Ponded DU 5	Sediment	779		mg/kg
IEUBK Model Parameters		**Value**		**Units**
Indoor air lead concentration (% of outdoor)		30	[a]	%
AIR (by year)				
Air Concentration				
Age (years) =	0 - 7	0.10	[a]	µg/m^3
Time Outdoors				
Age (years) =	0 - 1	1	[a]	hours/day
	1 - 2	2	[a]	hours/day
	2 - 3	3	[a]	hours/day
	3 - 7	4	[a]	hours/day
Ventilation Rate				
Age (years) =	0 - 1	2	[a]	m^3/day
	1 - 2	3	[a]	m^3/day
	2 - 5	5	[a]	m^3/day
	5 - 7	7	[a]	m^3/day
Lung Absorption		32	[a]	%
DIET (by year)				
Dietary Lead Intake				
Age (years) =	0 - 1	2.26	[a]	µg Pb/day
	1 - 2	1.96	[a]	µg Pb/day
	2 - 3	2.13	[a]	µg Pb/day
	3 - 4	2.04	[a]	µg Pb/day
	4 - 5	1.95	[a]	µg Pb/day
	5 - 6	2.05	[a]	µg Pb/day
	6 - 7	2.22	[a]	µg Pb/day
ALTERNATE DIET SOURCES (by food class)				
Concentration:				
	home-grown fruits	0	[a]	µg Pb/g
	home-grown vegetables	0	[a]	µg Pb/g
	fish from fishing	0	[a]	µg Pb/g
	game animals from hunting	0	[a]	µg Pb/g
Percent of food class:				
	home-grown fruits	0	[a]	%
	home-grown vegetables	0	[a]	%
	fish from fishing	0	[a]	%
	game animals from hunting	0	[a]	%
DRINKING WATER				
Lead Concentration in drinking water		4	[a]	µg/L

Attachment C

Table C-11

Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL

Lead in Sediment, Child Resident

Target Berm Ponded DU 5 Discrete Sediment Sample Results

O'Ryan Rifle Range, New York

Ingestion rate:				
Age (years) =	0 - 1	0.20	[a]	L/day
	1 - 2	0.50	[a]	L/day
	2 - 3	0.52	[a]	L/day
	3 - 4	0.53	[a]	L/day
	4 - 5	0.55	[a]	L/day
	5 - 6	0.58	[a]	L/day
	6 - 7	0.59	[a]	L/day
SOIL/DUST INGESTION				
Concentration:		Soil		
	soil	288	[a]	µg/g
	dust	200	[a]	µg/g
Soil/dust ingestion weighting factor (% soil)		45	[a]	%
Soil/dust ingestion:				
Age (years) =	0 - 1	0.085	[a]	g/day
	1 - 4	0.135	[a]	g/day
	4 - 5	0.100	[a]	g/day
	5 - 6	0.090	[a]	g/day
	6 - 7	0.085	[a]	g/day
SOIL/DUST MULTIPLE SOURCE ANALYSIS				
Fraction of indoor dust lead attributable to soil		0.70	[a]	unitless
Ratio of dust lead concentration to outdoor air lead concentration		100	[a]	µg Pb/g dust per µg Pb/m^3 air
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS				
Total lead absorption (at low intake):		Surface Soil		
	diet	50	[a]	%
	drinking water	50	[a]	%
	soil	30	[a]	%
	dust	30	[a]	%
	alternate source	0	[c]	%
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS (continued)				
Fraction of total net absorption at low intake rate that is attributable to non-saturable (passive) processes		0.2	[a]	unitless
ALTERNATE SOURCES OF LEAD				
Total lead intake:		Soil		
Age (years) =	0 - 7	0	[a]	µg/day
MATERNAL-TO-NEWBORN LEAD EXPOSURE				
Mothers blood lead concentration at childbirth		0.6	[b]	µg/dL
PLOTTING AND RISK ESTIMATION				
Geometric standard deviation (GSD) for blood lead		1.6	[a]	unitless

Attachment C
Table C-11
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL
Lead in Sediment, Child Resident
Target Berm Ponded DU 5 Discrete Sediment Sample Results
O'Ryan Rifle Range, New York

Blood lead level (BLL) of concern	5	[c]	µg/dL
COMPUTATION OPTIONS			
Iteration time step for numerical integration	4	[a]	hours
PROBABILITY DISTRIBUTION PERCENT RESULTS			
Geometric mean	8	Calc	unitless
Age Range (User Designated)	12-72	[d]	months
Percent above allowable BLL	84	Calc	%

Notes:

[1] Young child = 0 - 7 years of age (12 - 72 months) (USEPA 2017b).
[a] IEUBK model default value (USEPA 2007 and 2010).
[b] USEPA (2017a) mothers blood lead concentration of 0.6 in childbirth (µg Pb/dL) was used.
[c] Lower blood lead level (BLL) threshold of 5 ug/dL was used for uncertainty analysis.
[d] USEPA (2017b) User designation of 12 - 72 months was used.

L/day = liters per day
Pb = lead
µg/m^3 = micrograms per cubic meter
µg/dL = micrograms per deciliter
µg/g = micrograms per gram
mg/kg = milligrams per kilogram

References:

USEPA. 2007. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Office of Superfund Remediation and Technology Innovation. EPA-540-K-01-005. OSWER #9285.7-42. May.
USEPA 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows® version (IEUBKwinv1.1 build 11) Dated February 2010.
USEPA. 2017a. Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. OLEM Directive 9285.6-56. May 17, 2017
USEPA 2017b. Recommendations for Default Age Range in the IEUBK Model. OLEM Directive 9200.2-177. November 15, 2017.
USEPA. 2020. Regional Screening Level (RSL) Table and User’s Guide, Dated November 2020.

Attachment C

Table C-12

Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL

Lead in Sediment, Child Resident

Wet Meadow DU 6 Discrete Sediment Sample Results

O'Ryan Rifle Range, New York

Lead Site-Specific Exposure Point Concentration for the Child Resident Scenario			
Area	**Medium**	**Value**	**Units**
Wet Meadow DU 6	Sediment	78	mg/kg
IEUBK Model Parameters		**Value**	**Units**
Indoor air lead concentration (% of outdoor)		30 [a]	%
AIR (by year)			
Air Concentration			
Age (years) =	0 - 7	0.10 [a]	µg/m^3
Time Outdoors			
Age (years) =	0 - 1	1 [a]	hours/day
	1 - 2	2 [a]	hours/day
	2 - 3	3 [a]	hours/day
	3 - 7	4 [a]	hours/day
Ventilation Rate			
Age (years) =	0 - 1	2 [a]	m^3/day
	1 - 2	3 [a]	m^3/day
	2 - 5	5 [a]	m^3/day
	5 - 7	7 [a]	m^3/day
Lung Absorption		32 [a]	%
DIET (by year)			
Dietary Lead Intake			
Age (years) =	0 - 1	2.26 [a]	µg Pb/day
	1 - 2	1.96 [a]	µg Pb/day
	2 - 3	2.13 [a]	µg Pb/day
	3 - 4	2.04 [a]	µg Pb/day
	4 - 5	1.95 [a]	µg Pb/day
	5 - 6	2.05 [a]	µg Pb/day
	6 - 7	2.22 [a]	µg Pb/day
ALTERNATE DIET SOURCES (by food class)			
Concentration:			
	home-grown fruits	0 [a]	µg Pb/g
	home-grown vegetables	0 [a]	µg Pb/g
	fish from fishing	0 [a]	µg Pb/g
	game animals from hunting	0 [a]	µg Pb/g
Percent of food class:			
	home-grown fruits	0 [a]	%
	home-grown vegetables	0 [a]	%
	fish from fishing	0 [a]	%
	game animals from hunting	0 [a]	%
DRINKING WATER			
Lead Concentration in drinking water		4 [a]	µg/L

Attachment C
Table C-12
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL
Lead in Sediment, Child Resident
Wet Meadow DU 6 Discrete Sediment Sample Results
O'Ryan Rifle Range, New York

Ingestion rate:				
Age (years) =	0 - 1	0.20	[a]	L/day
	1 - 2	0.50	[a]	L/day
	2 - 3	0.52	[a]	L/day
	3 - 4	0.53	[a]	L/day
	4 - 5	0.55	[a]	L/day
	5 - 6	0.58	[a]	L/day
	6 - 7	0.59	[a]	L/day
SOIL/DUST INGESTION				
Concentration:		Soil		
	soil	288	[a]	µg/g
	dust	200	[a]	µg/g
Soil/dust ingestion weighting factor (% soil)		45	[a]	%
Soil/dust ingestion:				
Age (years) =	0 - 1	0.085	[a]	g/day
	1 - 4	0.135	[a]	g/day
	4 - 5	0.100	[a]	g/day
	5 - 6	0.090	[a]	g/day
	6 - 7	0.085	[a]	g/day
SOIL/DUST MULTIPLE SOURCE ANALYSIS				
Fraction of indoor dust lead attributable to soil		0.70	[a]	unitless
Ratio of dust lead concentration to outdoor air lead concentration		100	[a]	µg Pb/g dust per µg Pb/m^3 air
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS				
Total lead absorption (at low intake):		Surface Soil		
	diet	50	[a]	%
	drinking water	50	[a]	%
	soil	30	[a]	%
	dust	30	[a]	%
	alternate source	0	[c]	%
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS (continued)				
Fraction of total net absorption at low intake rate that is attributable to non-saturable (passive) processes		0.2	[a]	unitless
ALTERNATE SOURCES OF LEAD				
Total lead intake:		Soil		
Age (years) =	0 - 7	0	[a]	µg/day
MATERNAL-TO-NEWBORN LEAD EXPOSURE				
Mothers blood lead concentration at childbirth		0.6	[b]	µg/dL
PLOTTING AND RISK ESTIMATION				
Geometric standard deviation (GSD) for blood lead		1.6	[a]	unitless

Attachment C
Table C-12
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 10 ug/dL
Lead in Sediment, Child Resident
Wet Meadow DU 6 Discrete Sediment Sample Results
O'Ryan Rifle Range, New York

Blood lead level (BLL) of concern	10	[c]	µg/dL
COMPUTATION OPTIONS			
Iteration time step for numerical integration	4	[a]	hours
PROBABILITY DISTRIBUTION PERCENT RESULTS			
Geometric mean	3	Calc	unitless
Age Range (User Designated)	12-72	[d]	months
Percent above allowable BLL	0.6	Calc	%

Notes:

[1] Young child = 0 - 7 years of age (12 - 72 months) (USEPA 2017b).
[a] IEUBK model default value (USEPA 2007 and 2010).
[b] USEPA (2017a) mothers blood lead concentration of 0.6 in childbirth (µg Pb/dL) was used.
[c] Blood lead level (BLL) threshold of 10 ug/dL was used (USEPA, 2020).
[d] USEPA (2017b) User designation of 12 - 72 months was used.

L/day = liters per day
Pb = lead
µg/m^3 = micrograms per cubic meter
µg/dL = micrograms per deciliter
µg/g = micrograms per gram
mg/kg = milligrams per kilogram

References:

USEPA. 2007. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Office of Superfund Remediation and Technology Innovation. EPA-540-K-01-005. OSWER #9285.7-42. May.
USEPA 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows® version (IEUBKwinv1.1 build 11) Dated February 2010.
USEPA. 2017a. Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. OLEM Directive 9285.6-56. May 17, 2017
USEPA 2017b. Recommendations for Default Age Range in the IEUBK Model. OLEM Directive 9200.2-177. November 15, 2017.
USEPA. 2020. Regional Screening Level (RSL) Table and User's Guide, Dated November 2020.

Attachment C
Table C-13
Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL
Lead in Sediment, Child Resident
Wet Meadow DU 6 Discrete Sediment Sample Results
O'Ryan Rifle Range, New York

Lead Site-Specific Exposure Point Concentration for the Child Resident Scenario			
Area	**Medium**	**Value**	**Units**
Wet Meadow DU 6	Sediment	78	mg/kg

IEUBK Model Parameters		**Value**	**Units**
Indoor air lead concentration (% of outdoor)		30 [a]	%
AIR (by year)			
Air Concentration			
Age (years) =	0 - 7	0.10 [a]	$\mu g/m^3$
Time Outdoors			
Age (years) =	0 - 1	1 [a]	hours/day
	1 - 2	2 [a]	hours/day
	2 - 3	3 [a]	hours/day
	3 - 7	4 [a]	hours/day
Ventilation Rate			
Age (years) =	0 - 1	2 [a]	m^3/day
	1 - 2	3 [a]	m^3/day
	2 - 5	5 [a]	m^3/day
	5 - 7	7 [a]	m^3/day
Lung Absorption		32 [a]	%
DIET (by year)			
Dietary Lead Intake			
Age (years) =	0 - 1	2.26 [a]	µg Pb/day
	1 - 2	1.96 [a]	µg Pb/day
	2 - 3	2.13 [a]	µg Pb/day
	3 - 4	2.04 [a]	µg Pb/day
	4 - 5	1.95 [a]	µg Pb/day
	5 - 6	2.05 [a]	µg Pb/day
	6 - 7	2.22 [a]	µg Pb/day
ALTERNATE DIET SOURCES (by food class)			
Concentration:			
	home-grown fruits	0 [a]	µg Pb/g
	home-grown vegetables	0 [a]	µg Pb/g
	fish from fishing	0 [a]	µg Pb/g
	game animals from hunting	0 [a]	µg Pb/g
Percent of food class:			
	home-grown fruits	0 [a]	%
	home-grown vegetables	0 [a]	%
	fish from fishing	0 [a]	%
	game animals from hunting	0 [a]	%
DRINKING WATER			
Lead Concentration in drinking water		4 [a]	µg/L

Attachment C

Table C-13

Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL

Lead in Sediment, Child Resident

Wet Meadow DU 6 Discrete Sediment Sample Results

O'Ryan Rifle Range, New York

Ingestion rate:				
Age (years) =	0 - 1	0.20	[a]	L/day
	1 - 2	0.50	[a]	L/day
	2 - 3	0.52	[a]	L/day
	3 - 4	0.53	[a]	L/day
	4 - 5	0.55	[a]	L/day
	5 - 6	0.58	[a]	L/day
	6 - 7	0.59	[a]	L/day
SOIL/DUST INGESTION				
Concentration:		Soil		
	soil	288	[a]	µg/g
	dust	200	[a]	µg/g
Soil/dust ingestion weighting factor (% soil)		45	[a]	%
Soil/dust ingestion:				
Age (years) =	0 - 1	0.085	[a]	g/day
	1 - 4	0.135	[a]	g/day
	4 - 5	0.100	[a]	g/day
	5 - 6	0.090	[a]	g/day
	6 - 7	0.085	[a]	g/day
SOIL/DUST MULTIPLE SOURCE ANALYSIS				
Fraction of indoor dust lead attributable to soil		0.70	[a]	unitless
Ratio of dust lead concentration to outdoor air lead concentration		100	[a]	µg Pb/g dust per µg Pb/m^3 air
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS				
Total lead absorption (at low intake):		Surface Soil		
	diet	50	[a]	%
	drinking water	50	[a]	%
	soil	30	[a]	%
	dust	30	[a]	%
	alternate source	0	[c]	%
BIOAVAILABILITY FOR GUT ABSORPTION PATHWAYS (continued)				
Fraction of total net absorption at low intake rate that is attributable to non-saturable (passive) processes		0.2	[a]	unitless
ALTERNATE SOURCES OF LEAD				
Total lead intake:		Soil		
Age (years) =	0 - 7	0	[a]	µg/day
MATERNAL-TO-NEWBORN LEAD EXPOSURE				
Mothers blood lead concentration at childbirth		0.6	[b]	µg/dL
PLOTTING AND RISK ESTIMATION				
Geometric standard deviation (GSD) for blood lead		1.6	[a]	unitless

Attachment C

Table C-13

Integrated Exposure Uptake Biokinetic (IEUBK) Model Results Using BLL of 5 ug/dL

Lead in Sediment, Child Resident

Wet Meadow DU 6 Discrete Sediment Sample Results

O'Ryan Rifle Range, New York

Blood lead level (BLL) of concern	5	[c]	µg/dL
COMPUTATION OPTIONS			
Iteration time step for numerical integration	4	[a]	hours
PROBABILITY DISTRIBUTION PERCENT RESULTS			
Geometric mean	2	Calc	unitless
Age Range (User Designated)	12-72	[d]	months
Percent above allowable BLL	1	Calc	%

Notes:

[1] Young child = 0 - 7 years of age (12 - 72 months) (USEPA 2017b).

[a] IEUBK model default value (USEPA 2007 and 2010).

[b] USEPA (2017a) mothers blood lead concentration of 0.6 in childbirth (µg Pb/dL) was used.

[c] Lower blood lead level (BLL) threshold of 5 ug/dL was used for uncertainty analysis.

[d] USEPA (2017b) User designation of 12 - 72 months was used.

L/day = liters per day
Pb = lead
µg/m^3 = micrograms per cubic meter
µg/dL = micrograms per deciliter
µg/g = micrograms per gram
mg/kg = milligrams per kilogram

References:

USEPA. 2007. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Office of Superfund Remediation and Technology Innovation. EPA-540-K-01-005. OSWER #9285.7-42. May.

USEPA 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows® version (IEUBKwinv1.1 build 11) Dated February 2010.

USEPA. 2017a. Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. OLEM Directive 9285.6-56. May 17, 2017

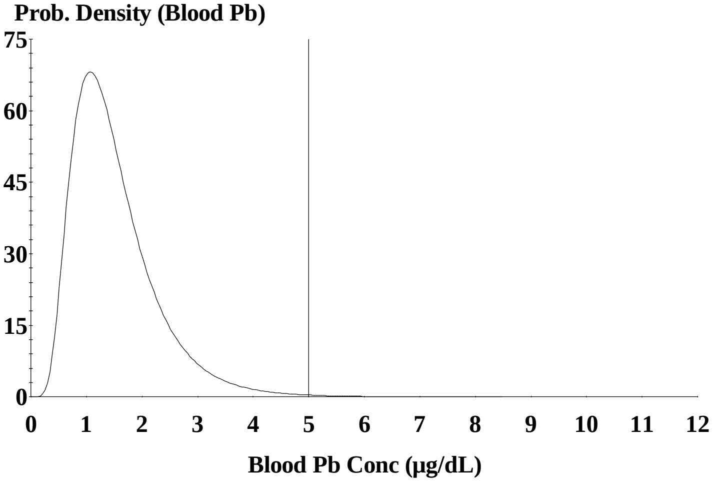
USEPA 2017b. Recommendations for Default Age Range in the IEUBK Model. OLEM Directive 9200.2-177. November 15, 2017.

USEPA. 2020. Regional Screening Level (RSL) Table and User’s Guide, Dated November 2020.

```
          LEAD MODEL FOR WINDOWS Version 1.1

==================================================================================
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==================================================================================

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age      Time       Ventilation       Lung        Outdoor Air
       Outdoors        Rate        Absorption       Pb Conc
       (hours)      (m³/day)          (%)       (µg Pb/m³)
------------------------------------------------------------------------
.5-1     1.000        2.000         32.000         0.100
1-2      2.000        3.000         32.000         0.100
2-3      3.000        5.000         32.000         0.100
3-4      4.000        5.000         32.000         0.100
4-5      4.000        5.000         32.000         0.100
5-6      4.000        7.000         32.000         0.100
6-7      4.000        7.000         32.000         0.100

****** Diet ******

Age    Diet Intake(µg/day)
-----------------------------------
.5-1     2.260
1-2      1.960
2-3      2.130
3-4      2.040
4-5      1.950
5-6      2.050
6-7      2.220

****** Drinking Water ******

Water Consumption:
Age    Water (L/day)
-----------------------------------
.5-1     0.200
1-2      0.500
2-3      0.520
3-4      0.530
4-5      0.550
5-6      0.580
6-7      0.590

Drinking Water Concentration: 4.000 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 47.100 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No
```

```
Age        Soil (µg Pb/g)      House Dust (µg Pb/g)
------------------------------------------------------------
.5-1            53.000            47.100
1-2             53.000            47.100
2-3             53.000            47.100
3-4             53.000            47.100
4-5             53.000            47.100
5-6             53.000            47.100
6-7             53.000            47.100

****** Alternate Intake ******

Age     Alternate (µg Pb/day)
-------------------------------------
.5-1     0.000
1-2      0.000
2-3      0.000
3-4      0.000
4-5      0.000
5-6      0.000
6-7      0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 0.600 µg Pb/dL

*******************************************
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
*******************************************

Year        Air              Diet             Alternate       Water
         (µg/day)         (µg/day)             (µg/day)     (µg/day)
------------------------------------------------------------------------------------
.5-1        0.021              1.096              0.000         0.388
1-2         0.034              0.948              0.000         0.967
2-3         0.062              1.034              0.000         1.010
3-4         0.067              0.995              0.000         1.034
4-5         0.067              0.957              0.000         1.079
5-6         0.093              1.008              0.000         1.141
6-7         0.093              1.093              0.000         1.162

 Year     Soil+Dust             Total              Blood
        (µg/day)          (µg/day)          (µg/dL)
-------------------------------------------------------------------
.5-1        1.230              2.735              1.5
1-2         1.948              3.897              1.6
2-3         1.956              4.062              1.5
3-4         1.965              4.060              1.4
4-5         1.464              3.567              1.2
5-6         1.321              3.563              1.1
6-7         1.249              3.597              1.0
```

IEUBK Distribution Probability Density



Cutoff = 5.000 µg/dl
Geo Mean = 1.389
GSD = 1.600
% Above = 0.321
% Below = 99.679

Age Range = User Designated: Ages 12 - 72 months

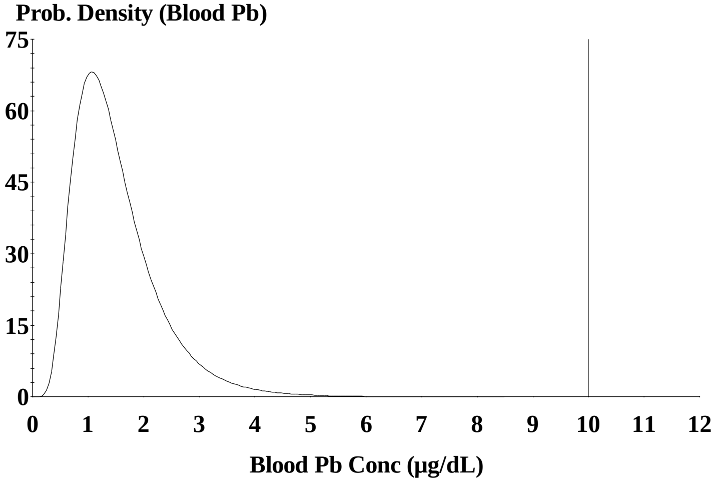
Run Mode = Research
Comment = ORyan-DU1_53_AL5

LEAD MODEL FOR WINDOWS Version 1.1

```
==================================================================================
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==================================================================================

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age      Time       Ventilation      Lung        Outdoor Air
       Outdoors        Rate       Absorption       Pb Conc
       (hours)      (m³/day)         (%)        (µg Pb/m³)
-------------------------------------------------------------------
.5-1     1.000        2.000         32.000         0.100
1-2      2.000        3.000         32.000         0.100
2-3      3.000        5.000         32.000         0.100
3-4      4.000        5.000         32.000         0.100
4-5      4.000        5.000         32.000         0.100
5-6      4.000        7.000         32.000         0.100
6-7      4.000        7.000         32.000         0.100

****** Diet ******

Age    Diet Intake(µg/day)
-----------------------------------
.5-1     2.260
1-2      1.960
2-3      2.130
3-4      2.040
4-5      1.950
5-6      2.050
6-7      2.220

****** Drinking Water ******

Water Consumption:
Age    Water (L/day)
-----------------------------------
.5-1     0.200
1-2      0.500
2-3      0.520
3-4      0.530
4-5      0.550
5-6      0.580
6-7      0.590

Drinking Water Concentration: 4.000 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 47.100 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No
```

```
Age        Soil (µg Pb/g)      House Dust (µg Pb/g)
-----------------------------------------------------
.5-1            53.000            47.100
1-2             53.000            47.100
2-3             53.000            47.100
3-4             53.000            47.100
4-5             53.000            47.100
5-6             53.000            47.100
6-7             53.000            47.100

****** Alternate Intake ******

Age     Alternate (µg Pb/day)
---------------------------------
.5-1     0.000
1-2      0.000
2-3      0.000
3-4      0.000
4-5      0.000
5-6      0.000
6-7      0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 0.600 µg Pb/dL

*****************************************
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
*****************************************

Year         Air              Diet            Alternate       Water
          (µg/day)         (µg/day)           (µg/day)      (µg/day)
---------------------------------------------------------------------------
.5-1        0.021            1.096            0.000         0.388
1-2         0.034            0.948            0.000         0.967
2-3         0.062            1.034            0.000         1.010
3-4         0.067            0.995            0.000         1.034
4-5         0.067            0.957            0.000         1.079
5-6         0.093            1.008            0.000         1.141
6-7         0.093            1.093            0.000         1.162

 Year     Soil+Dust            Total           Blood
         (µg/day)          (µg/day)         (µg/dL)
------------------------------------------------------------
.5-1        1.230            2.735            1.5
1-2         1.948            3.897            1.6
2-3         1.956            4.062            1.5
3-4         1.965            4.060            1.4
4-5         1.464            3.567            1.2
5-6         1.321            3.563            1.1
6-7         1.249            3.597            1.0
```

IEUBK Distribution Probability Density



Cutoff = 10.000 µg/dl
Geo Mean = 1.389
GSD = 1.600
% Above = 0.001
% Below = 99.999

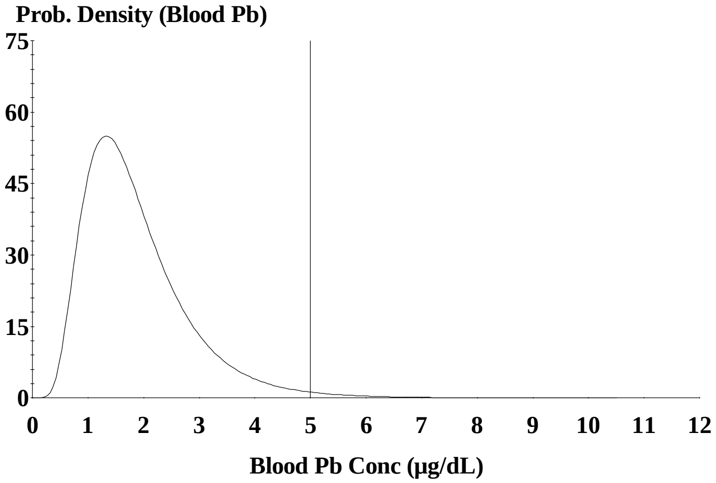
Age Range = User Designated: Ages 12 - 72 months

Run Mode = Research
Comment = ORyan-DU1_53_AL10

```
          LEAD MODEL FOR WINDOWS Version 1.1

==================================================================================
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==================================================================================

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age      Time      Ventilation      Lung       Outdoor Air
       Outdoors       Rate       Absorption      Pb Conc
       (hours)      (m³/day)        (%)       (µg Pb/m³)
---------------------------------------------------------------------
.5-1    1.000        2.000        32.000        0.100
1-2     2.000        3.000        32.000        0.100
2-3     3.000        5.000        32.000        0.100
3-4     4.000        5.000        32.000        0.100
4-5     4.000        5.000        32.000        0.100
5-6     4.000        7.000        32.000        0.100
6-7     4.000        7.000        32.000        0.100

****** Diet ******

Age    Diet Intake(µg/day)
-----------------------------------
.5-1    2.260
1-2     1.960
2-3     2.130
3-4     2.040
4-5     1.950
5-6     2.050
6-7     2.220

****** Drinking Water ******

Water Consumption:
Age    Water (L/day)
-----------------------------------
.5-1    0.200
1-2     0.500
2-3     0.520
3-4     0.530
4-5     0.550
5-6     0.580
6-7     0.590

Drinking Water Concentration: 4.000 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 69.500 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No
```

```
Age        Soil (µg Pb/g)      House Dust (µg Pb/g)
------------------------------------------------------
.5-1           85.000          69.500
1-2            85.000          69.500
2-3            85.000          69.500
3-4            85.000          69.500
4-5            85.000          69.500
5-6            85.000          69.500
6-7            85.000          69.500

****** Alternate Intake ******

Age     Alternate (µg Pb/day)
----------------------------------
.5-1    0.000
1-2     0.000
2-3     0.000
3-4     0.000
4-5     0.000
5-6     0.000
6-7     0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 0.600 µg Pb/dL

*****************************************
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
*****************************************

Year       Air            Diet          Alternate      Water
        (µg/day)        (µg/day)        (µg/day)     (µg/day)
-----------------------------------------------------------------------------
.5-1      0.021           1.088          0.000        0.385
1-2       0.034           0.939          0.000        0.958
2-3       0.062           1.026          0.000        1.002
3-4       0.067           0.988          0.000        1.027
4-5       0.067           0.953          0.000        1.075
5-6       0.093           1.005          0.000        1.137
6-7       0.093           1.090          0.000        1.158

 Year    Soil+Dust         Total          Blood
        (µg/day)        (µg/day)        (µg/dL)
-------------------------------------------------------------
.5-1      1.877           3.372          1.8
1-2       2.969           4.901          2.0
2-3       2.984           5.075          1.9
3-4       3.001           5.082          1.8
4-5       2.242           4.335          1.5
5-6       2.024           4.258          1.3
6-7       1.914           4.256          1.2
```

IEUBK Distribution Probability Density



Cutoff = 5.000 µg/dl
Geo Mean = 1.721
GSD = 1.600
% Above = 1.162
% Below = 98.838

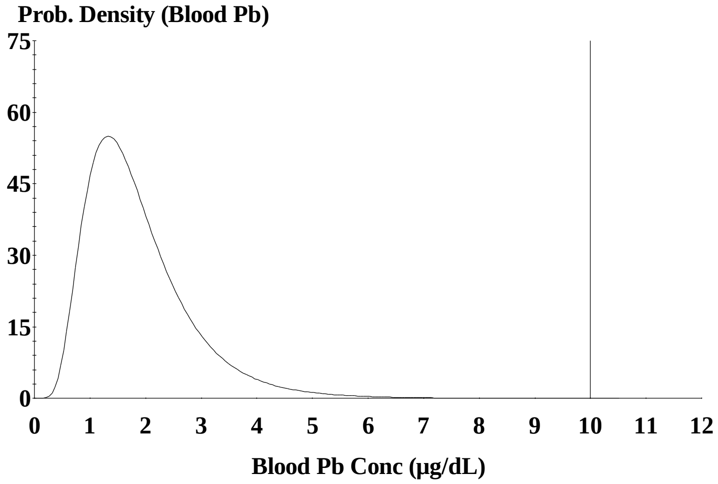
Age Range = User Designated: Ages 12 - 72 months

Run Mode = Research
Comment = ORyan-DU2_85_AL5

```
          LEAD MODEL FOR WINDOWS Version 1.1

==================================================================================
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==================================================================================

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age       Time       Ventilation        Lung        Outdoor Air
        Outdoors         Rate        Absorption       Pb Conc
        (hours)       (m³/day)          (%)        (µg Pb/m³)
----------------------------------------------------------------------
.5-1     1.000         2.000          32.000          0.100
1-2      2.000         3.000          32.000          0.100
2-3      3.000         5.000          32.000          0.100
3-4      4.000         5.000          32.000          0.100
4-5      4.000         5.000          32.000          0.100
5-6      4.000         7.000          32.000          0.100
6-7      4.000         7.000          32.000          0.100

****** Diet ******

Age     Diet Intake(µg/day)
-----------------------------------
.5-1     2.260
1-2      1.960
2-3      2.130
3-4      2.040
4-5      1.950
5-6      2.050
6-7      2.220

****** Drinking Water ******

Water Consumption:
Age     Water (L/day)
-----------------------------------
.5-1     0.200
1-2      0.500
2-3      0.520
3-4      0.530
4-5      0.550
5-6      0.580
6-7      0.590

Drinking Water Concentration: 4.000 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 69.500 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No
```

```
Age        Soil (µg Pb/g)      House Dust (µg Pb/g)
-----------------------------------------------------
.5-1           85.000          69.500
1-2            85.000          69.500
2-3            85.000          69.500
3-4            85.000          69.500
4-5            85.000          69.500
5-6            85.000          69.500
6-7            85.000          69.500

****** Alternate Intake ******

Age     Alternate (µg Pb/day)
----------------------------------
.5-1    0.000
1-2     0.000
2-3     0.000
3-4     0.000
4-5     0.000
5-6     0.000
6-7     0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 0.600 µg Pb/dL

*****************************************
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
*****************************************

Year        Air              Diet            Alternate       Water
         (µg/day)         (µg/day)          (µg/day)     (µg/day)
----------------------------------------------------------------------------
.5-1      0.021            1.088            0.000        0.385
1-2       0.034            0.939            0.000        0.958
2-3       0.062            1.026            0.000        1.002
3-4       0.067            0.988            0.000        1.027
4-5       0.067            0.953            0.000        1.075
5-6       0.093            1.005            0.000        1.137
6-7       0.093            1.090            0.000        1.158

 Year     Soil+Dust           Total            Blood
         (µg/day)         (µg/day)         (µg/dL)
-------------------------------------------------------------
.5-1      1.877            3.372            1.8
1-2       2.969            4.901            2.0
2-3       2.984            5.075            1.9
3-4       3.001            5.082            1.8
4-5       2.242            4.335            1.5
5-6       2.024            4.258            1.3
6-7       1.914            4.256            1.2
```

IEUBK Distribution Probability Density



Cutoff = 10.000 µg/dl
Geo Mean = 1.721
GSD = 1.600
% Above = 0.009
% Below = 99.991

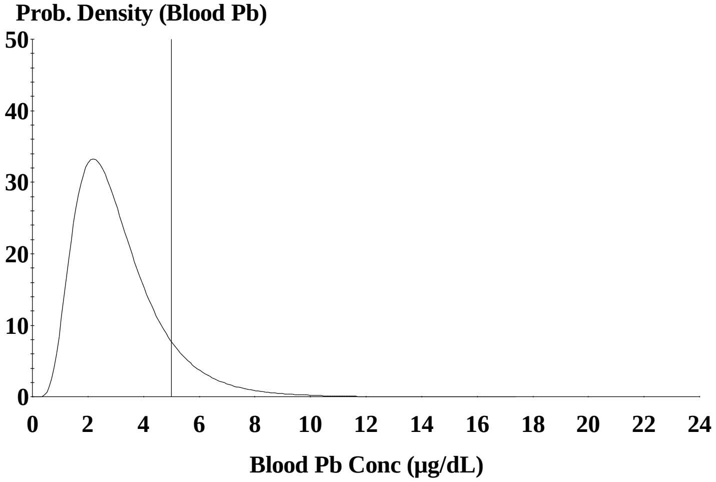
Age Range = User Designated: Ages 12 - 72 months

Run Mode = Research
Comment = ORyan-DU2_85_AL10

```
          LEAD MODEL FOR WINDOWS Version 1.1

==================================================================================
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==================================================================================

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age      Time       Ventilation      Lung        Outdoor Air
       Outdoors        Rate       Absorption       Pb Conc
       (hours)      (m³/day)         (%)        (µg Pb/m³)
----------------------------------------------------------------------
.5-1     1.000        2.000         32.000         0.100
1-2      2.000        3.000         32.000         0.100
2-3      3.000        5.000         32.000         0.100
3-4      4.000        5.000         32.000         0.100
4-5      4.000        5.000         32.000         0.100
5-6      4.000        7.000         32.000         0.100
6-7      4.000        7.000         32.000         0.100

****** Diet ******

Age     Diet Intake(µg/day)
-----------------------------------
.5-1     2.260
1-2      1.960
2-3      2.130
3-4      2.040
4-5      1.950
5-6      2.050
6-7      2.220

****** Drinking Water ******

Water Consumption:
Age     Water (L/day)
-----------------------------------
.5-1     0.200
1-2      0.500
2-3      0.520
3-4      0.530
4-5      0.550
5-6      0.580
6-7      0.590

Drinking Water Concentration: 4.000 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 147.900 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No
```

```
Age       Soil (µg Pb/g)     House Dust (µg Pb/g)
-----------------------------------------------------
.5-1         197.000          147.900
1-2          197.000          147.900
2-3          197.000          147.900
3-4          197.000          147.900
4-5          197.000          147.900
5-6          197.000          147.900
6-7          197.000          147.900

****** Alternate Intake ******

Age    Alternate (µg Pb/day)
---------------------------------
.5-1    0.000
1-2     0.000
2-3     0.000
3-4     0.000
4-5     0.000
5-6     0.000
6-7     0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 0.600 µg Pb/dL

*****************************************
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
*****************************************

Year       Air            Diet           Alternate      Water
        (µg/day)        (µg/day)          (µg/day)     (µg/day)
---------------------------------------------------------------------------
.5-1      0.021           1.061           0.000         0.376
1-2       0.034           0.912           0.000         0.930
2-3       0.062           1.000           0.000         0.977
3-4       0.067           0.966           0.000         1.004
4-5       0.067           0.939           0.000         1.059
5-6       0.093           0.993           0.000         1.124
6-7       0.093           1.079           0.000         1.147

 Year    Soil+Dust          Total           Blood
        (µg/day)        (µg/day)        (µg/dL)
------------------------------------------------------------
.5-1      4.071           5.529           3.0
1-2       6.404           8.280           3.4
2-3       6.465           8.504           3.2
3-4       6.523           8.560           3.0
4-5       4.911           6.976           2.5
5-6       4.446           6.656           2.1
6-7       4.213           6.531           1.9
```

IEUBK Distribution Probability Density



Cutoff = 5.000 µg/dl
Geo Mean = 2.845
GSD = 1.600
% Above = 11.507
% Below = 88.493

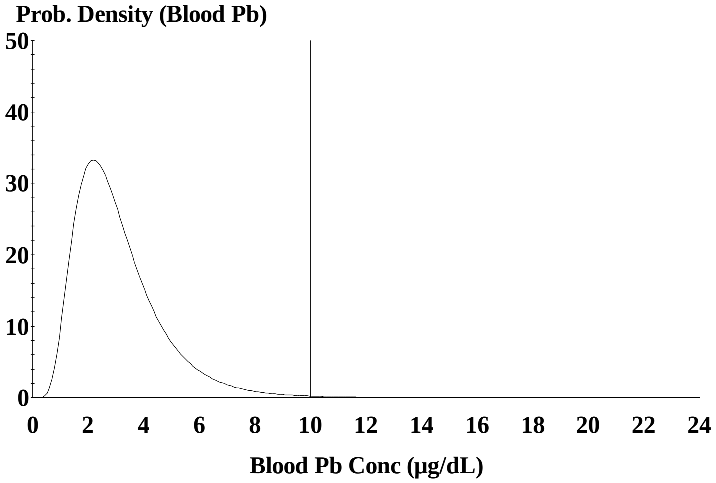
Age Range = User Designated: Ages 12 - 72 months

Run Mode = Research
Comment = ORyan-DU3_197-AL5

```
          LEAD MODEL FOR WINDOWS Version 1.1

==================================================================================
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==================================================================================

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age       Time       Ventilation       Lung       Outdoor Air
        Outdoors        Rate        Absorption      Pb Conc
        (hours)      (m³/day)          (%)        (µg Pb/m³)
--------------------------------------------------------------------
.5-1     1.000         2.000          32.000         0.100
1-2      2.000         3.000          32.000         0.100
2-3      3.000         5.000          32.000         0.100
3-4      4.000         5.000          32.000         0.100
4-5      4.000         5.000          32.000         0.100
5-6      4.000         7.000          32.000         0.100
6-7      4.000         7.000          32.000         0.100

****** Diet ******

Age     Diet Intake(µg/day)
-----------------------------------
.5-1     2.260
1-2      1.960
2-3      2.130
3-4      2.040
4-5      1.950
5-6      2.050
6-7      2.220

****** Drinking Water ******

Water Consumption:
Age     Water (L/day)
-----------------------------------
.5-1     0.200
1-2      0.500
2-3      0.520
3-4      0.530
4-5      0.550
5-6      0.580
6-7      0.590

Drinking Water Concentration: 4.000 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 147.900 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No
```

```
Age        Soil (µg Pb/g)      House Dust (µg Pb/g)
-----------------------------------------------------
.5-1           197.000         147.900
1-2            197.000         147.900
2-3            197.000         147.900
3-4            197.000         147.900
4-5            197.000         147.900
5-6            197.000         147.900
6-7            197.000         147.900

****** Alternate Intake ******

Age     Alternate (µg Pb/day)
----------------------------------
.5-1     0.000
1-2      0.000
2-3      0.000
3-4      0.000
4-5      0.000
5-6      0.000
6-7      0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 0.600 µg Pb/dL

*****************************************
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
*****************************************

Year        Air              Diet             Alternate       Water
         (µg/day)         (µg/day)             (µg/day)     (µg/day)
-----------------------------------------------------------------------------
.5-1       0.021            1.061            0.000         0.376
1-2        0.034            0.912            0.000         0.930
2-3        0.062            1.000            0.000         0.977
3-4        0.067            0.966            0.000         1.004
4-5        0.067            0.939            0.000         1.059
5-6        0.093            0.993            0.000         1.124
6-7        0.093            1.079            0.000         1.147

 Year     Soil+Dust            Total            Blood
        (µg/day)          (µg/day)          (µg/dL)
------------------------------------------------------------
.5-1       4.071            5.529            3.0
1-2        6.404            8.280            3.4
2-3        6.465            8.504            3.2
3-4        6.523            8.560            3.0
4-5        4.911            6.976            2.5
5-6        4.446            6.656            2.1
6-7        4.213            6.531            1.9
```

IEUBK Distribution Probability Density



Cutoff = 10.000 µg/dl
Geo Mean = 2.845
GSD = 1.600
% Above = 0.374
% Below = 99.626

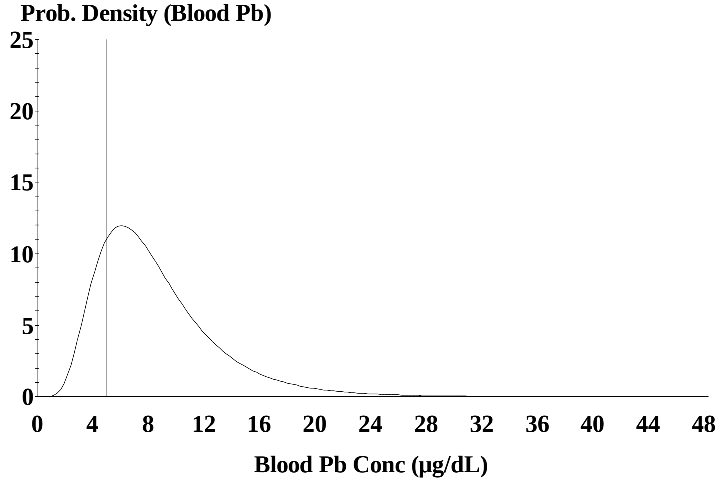
Age Range = User Designated: Ages 12 - 72 months

Run Mode = Research
Comment = ORyan-DU3_197-AL10

```
          LEAD MODEL FOR WINDOWS Version 1.1

==================================================================================
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==================================================================================

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age      Time       Ventilation       Lung        Outdoor Air
       Outdoors        Rate        Absorption       Pb Conc
       (hours)      (m³/day)          (%)        (µg Pb/m³)
--------------------------------------------------------------------
.5-1     1.000        2.000         32.000         0.100
1-2      2.000        3.000         32.000         0.100
2-3      3.000        5.000         32.000         0.100
3-4      4.000        5.000         32.000         0.100
4-5      4.000        5.000         32.000         0.100
5-6      4.000        7.000         32.000         0.100
6-7      4.000        7.000         32.000         0.100

****** Diet ******

Age    Diet Intake(µg/day)
-----------------------------------
.5-1     2.260
1-2      1.960
2-3      2.130
3-4      2.040
4-5      1.950
5-6      2.050
6-7      2.220

****** Drinking Water ******

Water Consumption:
Age    Water (L/day)
-----------------------------------
.5-1     0.200
1-2      0.500
2-3      0.520
3-4      0.530
4-5      0.550
5-6      0.580
6-7      0.590

Drinking Water Concentration: 4.000 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 555.300 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No
```

```
Age       Soil (µg Pb/g)     House Dust (µg Pb/g)
----------------------------------------------------
.5-1         779.000           555.300
1-2          779.000           555.300
2-3          779.000           555.300
3-4          779.000           555.300
4-5          779.000           555.300
5-6          779.000           555.300
6-7          779.000           555.300

****** Alternate Intake ******

Age     Alternate (µg Pb/day)
----------------------------------
.5-1    0.000
1-2     0.000
2-3     0.000
3-4     0.000
4-5     0.000
5-6     0.000
6-7     0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 0.600 µg Pb/dL

*****************************************
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
*****************************************

Year       Air             Diet            Alternate      Water
        (µg/day)         (µg/day)           (µg/day)     (µg/day)
--------------------------------------------------------------------------
.5-1      0.021            0.946            0.000        0.335
1-2       0.034            0.795            0.000        0.812
2-3       0.062            0.888            0.000        0.867
3-4       0.067            0.870            0.000        0.904
4-5       0.067            0.875            0.000        0.987
5-6       0.093            0.937            0.000        1.061
6-7       0.093            1.026            0.000        1.090

 Year    Soil+Dust          Total           Blood
       (µg/day)          (µg/day)         (µg/dL)
-------------------------------------------------------------
.5-1     14.002            15.304            8.1
1-2      21.563            23.204            9.4
2-3      22.141            23.957            8.8
3-4      22.669            24.510            8.5
4-5      17.658            19.586            7.0
5-6      16.198            18.289            5.8
6-7      15.457            17.666            5.1
```

IEUBK Distribution Probability Density



Cutoff = 5.000 µg/dl
Geo Mean = 7.907
GSD = 1.600
% Above = 83.524
% Below = 16.476

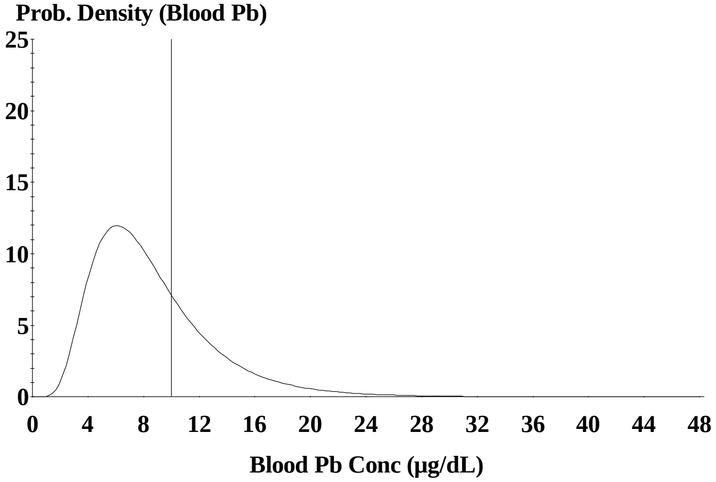
Age Range = User Designated: Ages 12 - 72 months

Run Mode = Research
Comment = 3ORyan779DU5

```
          LEAD MODEL FOR WINDOWS Version 1.1

==================================================================================
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==================================================================================

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age      Time      Ventilation       Lung        Outdoor Air
       Outdoors       Rate        Absorption       Pb Conc
       (hours)     (m³/day)          (%)        (µg Pb/m³)
----------------------------------------------------------------------
.5-1    1.000        2.000         32.000         0.100
1-2     2.000        3.000         32.000         0.100
2-3     3.000        5.000         32.000         0.100
3-4     4.000        5.000         32.000         0.100
4-5     4.000        5.000         32.000         0.100
5-6     4.000        7.000         32.000         0.100
6-7     4.000        7.000         32.000         0.100

****** Diet ******

Age    Diet Intake(µg/day)
-----------------------------------
.5-1    2.260
1-2     1.960
2-3     2.130
3-4     2.040
4-5     1.950
5-6     2.050
6-7     2.220

****** Drinking Water ******

Water Consumption:
Age    Water (L/day)
-----------------------------------
.5-1    0.200
1-2     0.500
2-3     0.520
3-4     0.530
4-5     0.550
5-6     0.580
6-7     0.590

Drinking Water Concentration: 4.000 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 555.300 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No
```

```
Age       Soil (µg Pb/g)     House Dust (µg Pb/g)
------------------------------------------------------
.5-1        779.000          555.300
1-2         779.000          555.300
2-3         779.000          555.300
3-4         779.000          555.300
4-5         779.000          555.300
5-6         779.000          555.300
6-7         779.000          555.300

****** Alternate Intake ******

Age     Alternate (µg Pb/day)
----------------------------------
.5-1    0.000
1-2     0.000
2-3     0.000
3-4     0.000
4-5     0.000
5-6     0.000
6-7     0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 0.600 µg Pb/dL

*****************************************
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
*****************************************

Year       Air             Diet            Alternate      Water
        (µg/day)         (µg/day)            (µg/day)     (µg/day)
-----------------------------------------------------------------------------
.5-1      0.021            0.946            0.000         0.335
1-2       0.034            0.795            0.000         0.812
2-3       0.062            0.888            0.000         0.867
3-4       0.067            0.870            0.000         0.904
4-5       0.067            0.875            0.000         0.987
5-6       0.093            0.937            0.000         1.061
6-7       0.093            1.026            0.000         1.090

 Year     Soil+Dust            Total           Blood
       (µg/day)          (µg/day)         (µg/dL)
-------------------------------------------------------------
.5-1      14.002           15.304           8.1
1-2       21.563           23.204           9.4
2-3       22.141           23.957           8.8
3-4       22.669           24.510           8.5
4-5       17.658           19.586           7.0
5-6       16.198           18.289           5.8
6-7       15.457           17.666           5.1
```

IEUBK Distribution Probability Density



Cutoff = 10.000 µg/dl
Geo Mean = 7.907
GSD = 1.600
% Above = 30.865
% Below = 69.135

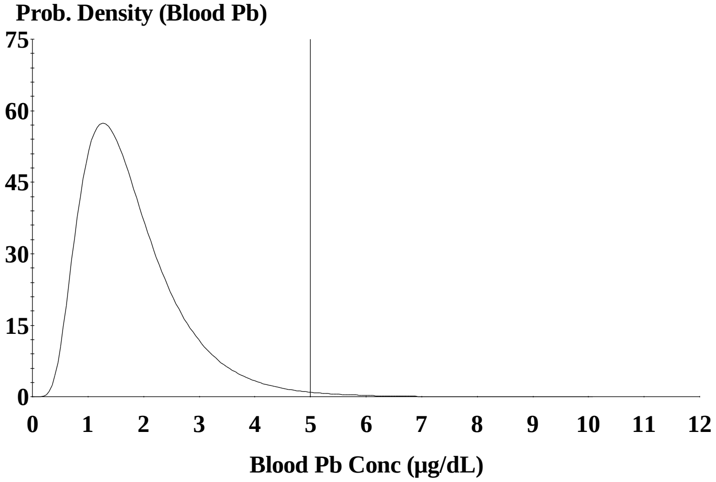
Age Range = User Designated: Ages 12 - 72 months

Run Mode = Research
Comment = ORyan-DU5_779-AL10

```
          LEAD MODEL FOR WINDOWS Version 1.1

==================================================================================
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==================================================================================

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age      Time      Ventilation      Lung       Outdoor Air
       Outdoors       Rate       Absorption      Pb Conc
       (hours)     (m³/day)         (%)       (µg Pb/m³)
------------------------------------------------------------------------
.5-1    1.000        2.000        32.000        0.100
1-2     2.000        3.000        32.000        0.100
2-3     3.000        5.000        32.000        0.100
3-4     4.000        5.000        32.000        0.100
4-5     4.000        5.000        32.000        0.100
5-6     4.000        7.000        32.000        0.100
6-7     4.000        7.000        32.000        0.100

****** Diet ******

Age    Diet Intake(µg/day)
-----------------------------------
.5-1    2.260
1-2     1.960
2-3     2.130
3-4     2.040
4-5     1.950
5-6     2.050
6-7     2.220

****** Drinking Water ******

Water Consumption:
Age    Water (L/day)
-----------------------------------
.5-1    0.200
1-2     0.500
2-3     0.520
3-4     0.530
4-5     0.550
5-6     0.580
6-7     0.590

Drinking Water Concentration: 4.000 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 64.600 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No
```

```
Age       Soil (µg Pb/g)     House Dust (µg Pb/g)
------------------------------------------------------
.5-1          78.000          64.600
1-2           78.000          64.600
2-3           78.000          64.600
3-4           78.000          64.600
4-5           78.000          64.600
5-6           78.000          64.600
6-7           78.000          64.600

****** Alternate Intake ******

Age     Alternate (µg Pb/day)
----------------------------------
.5-1    0.000
1-2     0.000
2-3     0.000
3-4     0.000
4-5     0.000
5-6     0.000
6-7     0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 0.600 µg Pb/dL

*****************************************
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
*****************************************

Year        Air            Diet          Alternate      Water
        (µg/day)        (µg/day)          (µg/day)     (µg/day)
------------------------------------------------------------------------------
.5-1       0.021           1.090           0.000        0.386
1-2        0.034           0.941           0.000        0.960
2-3        0.062           1.028           0.000        1.004
3-4        0.067           0.990           0.000        1.028
4-5        0.067           0.953           0.000        1.076
5-6        0.093           1.005           0.000        1.138
6-7        0.093           1.090           0.000        1.159

 Year     Soil+Dust          Total          Blood
        (µg/day)        (µg/day)       (µg/dL)
----------------------------------------------------------------
.5-1       1.737           3.233          1.8
1-2        2.747           4.683          2.0
2-3        2.761           4.854          1.8
3-4        2.775           4.860          1.7
4-5        2.072           4.168          1.5
5-6        1.870           4.107          1.3
6-7        1.769           4.112          1.2
```

IEUBK Distribution Probability Density



Cutoff = 5.000 µg/dl
Geo Mean = 1.649
GSD = 1.600
% Above = 0.912
% Below = 99.088

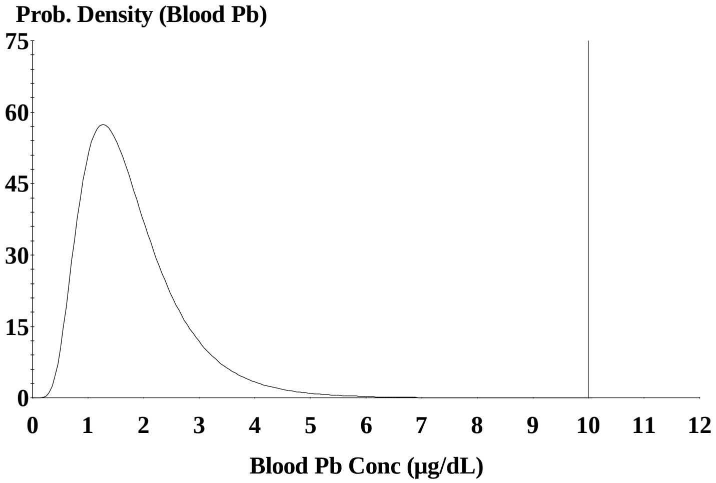
Age Range = User Designated: Ages 12 - 72 months

Run Mode = Research
Comment = ORyan-DU6_78_AL5

```
          LEAD MODEL FOR WINDOWS Version 1.1

==================================================================================
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==================================================================================

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age       Time       Ventilation       Lung        Outdoor Air
        Outdoors        Rate       Absorption        Pb Conc
        (hours)      (m³/day)         (%)         (µg Pb/m³)
----------------------------------------------------------------------
.5-1     1.000         2.000         32.000          0.100
1-2      2.000         3.000         32.000          0.100
2-3      3.000         5.000         32.000          0.100
3-4      4.000         5.000         32.000          0.100
4-5      4.000         5.000         32.000          0.100
5-6      4.000         7.000         32.000          0.100
6-7      4.000         7.000         32.000          0.100

****** Diet ******

Age    Diet Intake(µg/day)
-----------------------------------
.5-1     2.260
1-2      1.960
2-3      2.130
3-4      2.040
4-5      1.950
5-6      2.050
6-7      2.220

****** Drinking Water ******

Water Consumption:
Age    Water (L/day)
-----------------------------------
.5-1     0.200
1-2      0.500
2-3      0.520
3-4      0.530
4-5      0.550
5-6      0.580
6-7      0.590

Drinking Water Concentration: 4.000 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 64.600 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No
```

```
Age        Soil (µg Pb/g)     House Dust (µg Pb/g)
-----------------------------------------------------
.5-1          78.000          64.600
1-2           78.000          64.600
2-3           78.000          64.600
3-4           78.000          64.600
4-5           78.000          64.600
5-6           78.000          64.600
6-7           78.000          64.600

****** Alternate Intake ******

Age     Alternate (µg Pb/day)
----------------------------------
.5-1    0.000
1-2     0.000
2-3     0.000
3-4     0.000
4-5     0.000
5-6     0.000
6-7     0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 0.600 µg Pb/dL

*****************************************
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
*****************************************

Year       Air            Diet          Alternate      Water
        (µg/day)        (µg/day)         (µg/day)     (µg/day)
-----------------------------------------------------------------------------
.5-1      0.021           1.090           0.000       0.386
1-2       0.034           0.941           0.000       0.960
2-3       0.062           1.028           0.000       1.004
3-4       0.067           0.990           0.000       1.028
4-5       0.067           0.953           0.000       1.076
5-6       0.093           1.005           0.000       1.138
6-7       0.093           1.090           0.000       1.159

 Year    Soil+Dust          Total          Blood
       (µg/day)         (µg/day)        (µg/dL)
---------------------------------------------------------------
.5-1      1.737           3.233           1.8
1-2       2.747           4.683           2.0
2-3       2.761           4.854           1.8
3-4       2.775           4.860           1.7
4-5       2.072           4.168           1.5
5-6       1.870           4.107           1.3
6-7       1.769           4.112           1.2
```

IEUBK Distribution Probability Density



Cutoff = 10.000 µg/dl
Geo Mean = 1.649
GSD = 1.600
% Above = 0.006
% Below = 99.994

Age Range = User Designated: Ages 12 - 72 months

Run Mode = Research
Comment = ORyan-DU6_78_AL10

Appendix F
Screening Level Ecological Risk Assessment

AECOM

Final
Screening Level Ecological Risk Assessment (SLERA)

Camp O’Ryan Rifle Range, New York

Munitions Response Site NYHQ-008-R-02
New York Army National Guard

Army National Guard

Contract No. W9133L-14-D-0001
Delivery Order No. 0006

June 2021

Prepared for:
Army National Guard
NGB-AQ-W9133L
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Tables

Figures

Attachments

Acronyms and Abbreviations

%	Percent
ARNG	Army National Guard
ATSDR	Agency for Toxic Substances and Disease Registry
AUF	Area Use Factor
BAZ	Biologically Active Zone
BERA	Baseline Ecological Risk Assessment
bgs	Below Ground Surface
COC	Chemical of Concern
COI	Constituent of Interest
COPEC	Constituent of Potential Ecological Concern
DMNA	Division of Military and Naval Affairs, New York State
DRM	Dose Rate Model
DU	Decision Unit
dw	Dry Weight
ECSM	Ecological Conceptual Site Model
EDD	Estimated Daily Dose
EPC	Exposure Point Concentration
ERAGS	Ecological Risk Assessment Guidance for Superfund
ESV	Ecological Screening Value
ft	Foot or Feet
HQ	Hazard Quotient
in	Inch or Inches
ISM	Incremental Sampling Methodology
ITRC	Interstate Technology and Regulatory Council
LANL	Los Alamos National Laboratory
LOAEL	Lowest Observed Adverse Effect Level
LOEC	Lowest Observed Effect Concentration
mg/kg, bw-day	Milligrams per kilogram of body weight per day
MRS	Munitions Response Site
NDNODS	Non-Department of Defense, Non-Operational Defense Site
NOAEL	No Observed Adverse Effect Level
NOEC	No Observed Effect Concentration
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
NYARNG	New York Army National Guard
NYSDEC	New York State Department of Environmental Conservation
RI	Remedial Investigation
RSV	Refined Screening Value
SI	Site Inspection
SLERA	Screening Level Ecological Risk Assessment
SMDP	Scientific Management Decision Point

Acronyms and Abbreviations (continued)

T&E	Threatened and Endangered
TRV	Toxicity Reference Value
UCL	Upper Confidence Limit
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFS	United States Forestry Service
USFWS	United States Fish and Wildlife Service
XRF	X-ray Fluorescence

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Executive Summary

A Screening Level Ecological Risk Assessment (SLERA) was conducted for the Army National Guard (ARNG), Non-Department of Defense, Non-Operational Defense Site (NDNODS) Camp O’Ryan Rifle Range Munitions Response Site (MRS; Army Environmental Database Restoration Number NYHQ-008-R-02), located in Wethersfield, New York.

The primary purpose of the SLERA is to identify constituents of potential ecological concern (COPECs) and assess the need and the level of effort necessary to perform further evaluation of the current and future Site risk. The SLERA fulfills this purpose by: (1) identifying potential ecological receptors and habitats at the Site; (2) determining which pathways are potentially complete; (3) evaluating if constituents of interest (COIs) present within complete exposure pathways have the potential to pose significant environmental risk; and (4) to determine if this potential for risk warrants additional ecological risk characterization.

The SLERA was conducted in accordance with the following federal guidance:

- United States Environmental Protection Agency (USEPA). 1997. *Ecological Risk Assessment Guidance for Superfund* (ERAGS).
- USEPA. 2001. *The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments.*
- USEPA. 2018. *Region 4 Ecological Risk Assessment Supplemental Guidance*.

Potential ecological exposure was evaluated under current conditions using recent analytical data collected in relevant exposure media (i.e., surface soil and sediment). Exposures were evaluated for three soil source area decision units (DUs), referred to as the 100 Yard Firing Berm, Target Area, and Target Berm Hillside DUs. Aquatic and semi-aquatic ecological receptors were evaluated within an area with accumulated sediment from overland flow (Target Berm Ponded DU) and for a wetland area (Wet Meadow DU) likely affected by overshot or ricochet beyond the Target Berm-Hillside DU. Overland transport of COIs from the MRS is likely an incomplete pathway based on local topography.

The scope of the SLERA included Steps 1 and 2 of the 8-step ERAGS process – used to identify COPECs in potentially affected environmental media to support a scientific management decision point (SMDP) regarding the need for further risk characterization and/or remediation. The list of COPECs was refined consistent with the initial stage of a Baseline Ecological Risk Assessment (BERA) Step 3 (referred to as Step 3a COPEC Refinement) to reduce uncertainty in the SLERA Steps 1 and 2 conclusions and to refine the recommendations presented in this assessment by applying more realistic exposure assumptions.

Guided by an ecological conceptual site model (ECSM), a conservative screening evaluation was conducted to assess potential risks related in surface soil (soil macroinvertebrates and terrestrial wildlife) and sediment (benthic macroinvertebrates and aquatic/semi-aquatic wildlife). For COIs detected above wildlife-specific benchmarks, dose rate models (DRMs) were then prepared to assess potential adverse effects to selected ecological receptors from incidental and dietary ingestion.

After Step 2 of the SLERA, the results of the risk characterization determined the following SMDPs:

- The information is not adequate to a make a decision at this point and the ecological risk assessment continued to Step 3.
    - Surface soil – results of the direct contact evaluation and wildlife DRMs indicated potential adverse effects for soil macroinvertebrates (Target Berm Hillside DU) and wildlife (100-Yard Firing Berm, Target Area, and Target Berm Hillside DUs).
    - Sediment – results of the direct contact evaluation and wildlife DRMs indicated potential adverse effects for benthic macroinvertebrates and wildlife at both the Target Berm Ponded and Wet Meadow DUs.
    - Groundwater to surface water – as previously discussed, there is no groundwater, sediment porewater, or surface water data to evaluate receptors potentially impacted by this pathway (i.e., benthic macroinvertebrates); however, groundwater from COI source areas (e.g. the Target Berm Hillside DU) is unlikely to migrate to the Wet Meadow DU based on the latter's upgradient and elevated position. Additionally, the Target Berm Ponded DU appears to be a low-lying runoff accumulation point, not a groundwater-fed wetland.
    - **Table ES-1** includes a summary of COPECs retained for the Step 3a COPEC Refinement within the BERA.

During BERA Step 3a, refinements were made to reduce uncertainty in both the direct contact evaluation and wildlife DRMs. The results for the refined direct contact evaluation and wildlife DRMs are summarized in **Tables ES-2 and ES-3**, respectively. The results of the SLERA, BERA Step 3a COPEC refinement, and consideration of the uncertainties present in the evaluation support the following SMDP for the MRS:

- "There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk" (USEPA, 1997).
    - Negligible Risk
        - Soil macroinvertebrate community
        - Benthic macroinvertebrate community (Wet Meadow DU)
        - Terrestrial wildlife community
        - Aquatic and semi-aquatic wildlife community
        - Groundwater to surface water pathway
- The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted.
        - Benthic macroinvertebrate community (Target Berm Ponded DU)
        - Lead was identified as a direct contact constituent of concern (COC) in sediment at the Target Berm Ponded DU.

Table ES-1. COPECs Retained for BERA Step 3a

100 Yard Firing Berm DU (Surface Soil)		Target Area DU (Surface Soil)		Target Berm Hillside DU (Surface Soil)		Target Berm Ponded DU (Sediment)		Wet Meadow DU (Sediment)	
Direct Contact (Table 3-1)	**Terrestrial Wildlfie (Table 3-2)**	**Direct Contact (Table 3-1)**	**Terrestrial Wildlfie (Table 3-2)**	**Direct Contact (Table 3-1)**	**Terrestrial Wildlfie (Table 3-2)**	**Direct Contact (Table 3-1)**	**Aquatic and Semi-Aquatic Wildlife (Table 3-2)**	**Direct Contact (Table 3-1)**	**Aquatic and Semi-Aquatic Wildlife (Table 3-2)**
No direct contact COPECs identified	American robin (lead)	No direct contact COPECs identified	American robin (lead) Short-tailed shrew (lead)	Zinc	American robin (lead and zinc) Red-tailed hawk (lead) Short-tailed shrew (antimony and lead)	Antimony Copper Lead Zinc	American robin (copper and lead) Red-tailed hawk (lead) Short-tailed shrew (copper and lead)	Antimony Copper Lead Zinc	American robin (copper and lead) Short-tailed shrew (copper)

Table ES-2. Refined Direct Contact Evaluation

COPEC	Detection Frequency (1)	Refined EPC	RSV	Source	Refined HQ
Target Berm Hillside DU – Surface Soil (mg/kg)					
Zinc	3/3	146.97	930	LANL (2017)	<1
Target Berm Ponded DU – Sediment (mg/kg)					
Antimony	8/8	10.6	25	USEPA (2018)	<1
Copper	8/8	77.18	149	USEPA (2018)	<1
Lead	8/8	1,983	128	USEPA (2018)	**15**
Zinc	8/8	304.6	459	USEPA (2018)	<1
Wet Meadow DU – Sediment (mg/kg)					
Antimony	8/8	0.958	25	USEPA (2018)	<1
Copper	8/8	31.7	149	USEPA (2018)	<1
Lead	8/8	115.3	128	USEPA (2018)	<1
Zinc	8/8	157.3	459	USEPA (2018)	<1

Notes:

COPEC = Constituent of Potential Ecological Concern; HQ = Hazard Quotient; LANL = Los Alamos National Laboratory; LOEC = Lowest Observed Effect Concentration; mg/kg = milligram per kilogram; RSV = Refined Screening Value (LOEC); USEPA = United States Environmental Protection Agency

(1) Detection frequency for sediment accounts for primary and field duplicate samples being combined prior to UCL calculation.

Table ES-3. Refined Wildlife Dose Rate Model Summary

COPEC	Surface Soil Refined EPC (mg/kg)	Sediment Refined EPC (mg/kg)	Modeled TP Conc. (mg/kg-dw)	Modeled SI Conc. (mg/kg-dw)	Modeled BI Conc. (mg/kg-dw)	Modeled SM Conc. (mg/kg-dw)	NOAEL/LOAEL HQ			
							AR	RTH	STS	RF
Terrestrial Exposure										
100 Yard Firing Berm DU										
Lead	84.33	--	3.2	29	--	5.4	**3**/<1	--	--	--
Target Area DU										
Lead	118.23	--	3.9	38	--	6.4	**5**/<1	--	**1**/<1	--
Target Berm Hillside DU										
Antimony	0.96	--	0.038	0.96	--	0.00190	(a)	(a)	**2**/<1	--
Lead	309.74	--	6.6	82	--	10.6	**11**/<1	**1**/<1	**3**/<1	--
Zinc	146.97	--	77.1	440	--	135	**1**/<1	--	--	--
Aquatic and Semi-Aquatic Exposure										
Target Berm Ponded DU										
Copper	--	77.18	--	--	130	17.8	**5**/<1	--	**3**/<1	--
Lead	--	1,983	--	--	130.9	27.7	**31/1**	**7**/<1	**5**/<1	--
Wet Meadow DU										
Copper	--	31.7	--	--	102	15.2	**4**/<1	--	**2**/<1	--
Lead	--	115.3	--	--	7.6	6.3	**2**/<1	--	--	--

Notes:

Bold indicates an exceedance of wildlife TRV; -- = Not Evaluated; AR = American Robin; BI = Benthic Invertebrate; COI = Constituent of Interest; Conc. = Concentration; DU = Decision Unit; dw= dry weight; EPC = Exposure Point Concentration; HQ = Hazard Quotient; LOAEL = Lowest Observed Adverse Effect Level; mg/kg = milligram per kilogram; NOAEL = No Observed Adverse Effects Level; RF = Red Fox; RTH = Red-Tailed Hawk; SI = Soil Invertebrate; SM = Small Mammal; STS = Short-Tailed Shrew; TP = Terrestrial Plant; (a) As indicated in USEPA (2007), insufficient data to derive a TRV for avian receptors**.**

1 Introduction

A Screening Level Ecological Risk Assessment (SLERA) was conducted for the Army National Guard (ARNG), Non-Department of Defense, Non-Operational Defense Site (NDNODS) Camp O'Ryan Rifle Range Munitions Response Site (MRS; Army Environmental Database Restoration Number NYHQ-008-R-02), located in Wethersfield, New York (**Figure 1-1**).

The primary purpose of the SLERA is to identify constituents of potential ecological concern (COPECs) and assess the need and the level of effort necessary to perform further evaluation of the current and future Site risk. The SLERA fulfills this purpose by: (1) identifying potential ecological receptors and habitats at the Site; (2) determining which pathways are potentially complete; (3) evaluating if constituents of interest (COIs) present within complete exposure pathways have the potential to pose significant environmental risk; and (4) to determine if this potential for risk warrants additional ecological risk characterization.

The SLERA was conducted in accordance with the following federal guidance:

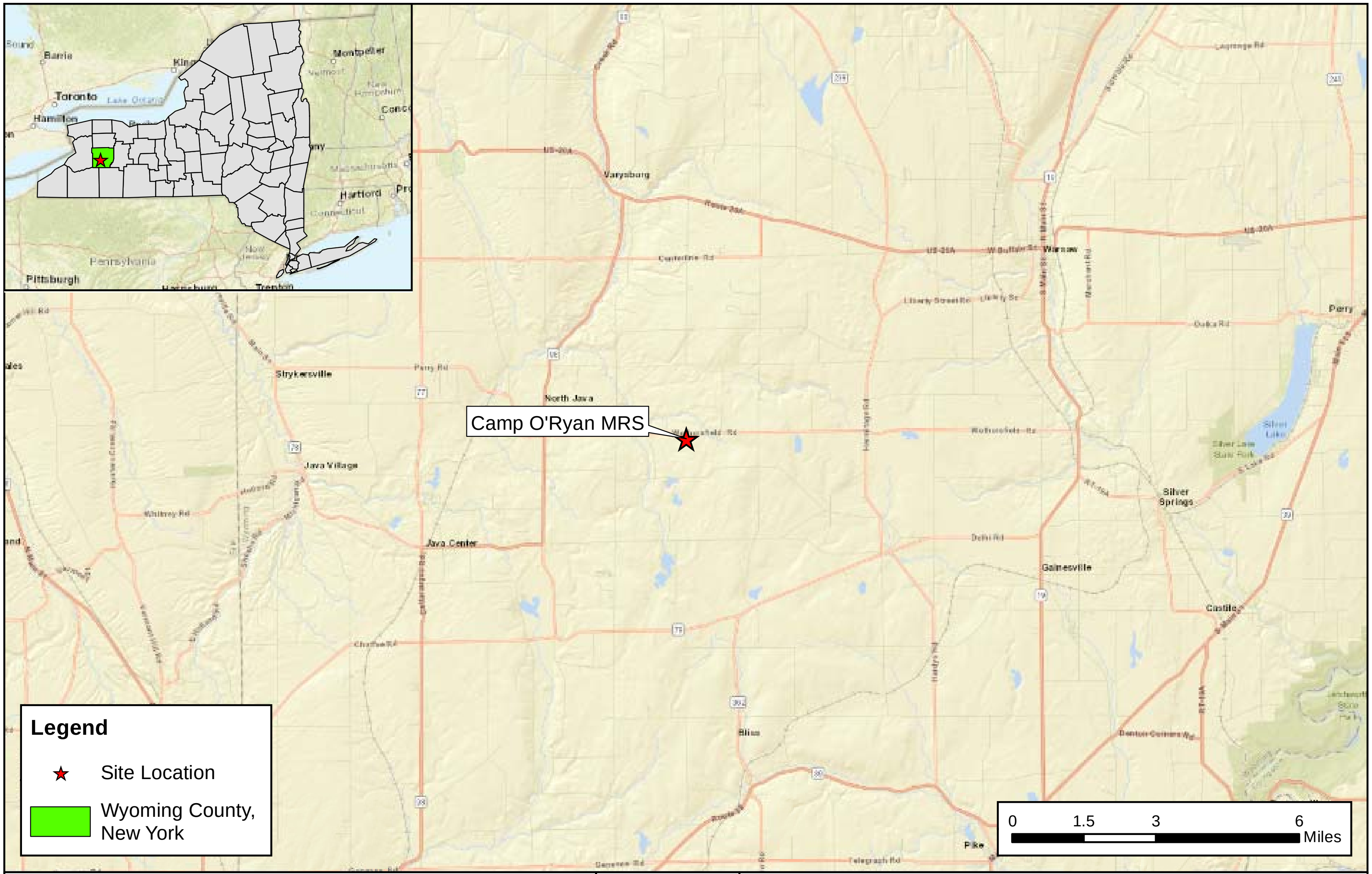
- United States Environmental Protection Agency (USEPA). 1997. *Ecological Risk Assessment Guidance for Superfund* (ERAGS).
- USEPA. 2001. *The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments.*
- USEPA. 2018. *Region 4 Ecological Risk Assessment Supplemental Guidance*.

The SLERA was informed primarily by the following documents related to the MRS:

- Parsons (2012). *Final New York Site Inspection Report*.
- AECOM (2019). *Final Remedial Investigation Work Plan*. Camp O'Ryan Rifle Range, New York. Munitions Response Site NYHQ-008-R-02.
- AECOM (2020). *Remedial Investigation Report*. Camp O'Ryan Rifle Range, New York. Munitions Response Site NYHQ-008-R-02.

Potential ecological exposure was evaluated under current conditions using recent analytical data collected in relevant exposure media (i.e., surface soil and sediment). Exposures were evaluated for the 100-yard Firing Berm, Target Area, and Target Berm-Hillside decision units (DUs). Aquatic and semi-aquatic ecological receptors were evaluated within an area with accumulated sediment from overland flow (Target Berm-Ponded DU) and for a wetland area (Wet Meadow DU) potentially impacted by overshot and ricochet during historical training activities.

The scope of the SLERA includes Steps 1 and 2 of the 8-step ERAGS process. Steps 1 and 2 were used to identify COPECs in potentially affected environmental media to support a scientific management decision point (SMDP) regarding the need for further risk characterization and/or remediation. The list of COPECs was refined consistent with the initial stage of a Baseline Ecological Risk Assessment (BERA) Step 3 (referred to as Step 3a COPEC Refinement) to reduce uncertainty in the SLERA Step 1 and 2 conclusions and to refine the recommendations presented in the report by applying more realistic exposure assumptions.



CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	MS	11/20/2017
SCALE	1:190,080	CHK BY	JW	11/20/2017
SOURCE	ARNG; State of New York, ESRI & Partners	PM	LS	11/20/2017

N

Site Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 1-1

Q:\Projects\ENV\GEARS\GEO\NGB IDIQ\NDNODS 6 SARs\900-Work\GIS\Other_Sites\NY_ORyan\MXD\Work_Plan_Figures\Fig_1_ORyan_Site_Location.mxd

The results of the SLERA and BERA Step 3a COPEC Refinement were used to reach one of the following conclusions:

- There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk;
- The information is not adequate to make a decision at this point, and the ecological risk assessment process will continue through Step 3; or
- The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted.

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2 Step 1: Screening Level Problem Formulation and Ecological Effects Evaluation

The following fundamental components were evaluated as part of Step 1 of the SLERA preliminary ecological screening assessment:

- Identify ecological setting and potential habitats
- Identify potential ecological receptors
- Identify constituents known or suspected to exist at the MRS
- Evaluate potential migration pathways that exist at the MRS
- Characterize fate and transport mechanisms
- Describe constituent ecotoxicological properties
- Confirm potentially complete migration pathways and ecological receptors that might exist at the MRS
- Identify assessment and measurement endpoints
- Identify conservative ecological screening benchmarks

2.1 Ecological Setting and Potential Habitats

The ecological setting of the MRS was characterized using information from the results of the remedial investigation (RI). Photographs taken during the RI are presented in **Appendix B** of the RI report. **Figure 2-1** presents a layout of the MRS. This information was supplemented with resources from the New York State Department of Environmental Conservation (NYSDEC), United States Forestry Service (USFS), United States Fish and Wildlife Service's (USFWS's) National Wetlands Inventory (NWI), Natural Resources Conservation Service (NRCS), and aerial imagery. Soils and potential habitats within or near the Site are summarized below.

2.1.1 Soils

The distribution of the three soil types occurring in the DUs is presented in **Table 2-1**. Based upon online NRCS soil mapping, there are three soil types present within the MRS – Williamson channery silt loam, 3 to 8 percent (%) slopes, Williamson channery silt loam, 8 to 15% slopes, and Volusia channery silt loam, 0 to 3% slopes. The Williamson channery silt loams are the predominant soil type across the MRS with the 3 to 8% slopes covering the majority of the DUs. The Volusia channery silt loams are associated with the Wet Meadow DU and portions that overlap with the backside of the Target Berm Hillside DU.

NRCS (2020) describes Williamson channery silt loams as moderately well drained, non-hydric silt loam. Depth to water within a typical profile is shallow and occurs from 14 to 23 inches (in) below ground surface (bgs) (NRCS, 2020). These soils are not typically flooded or exhibit ponding and have low water storage capacity within the profile.

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	9/29/2020
SCALE	1:3,600	CHK BY	JW	9/29/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	AS	9/29/2020

N

Site Layout

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1

The Volusia channery silt loams are similar to the Williamson channery silt loams except they have lower water capacity, less sand and stratified clays at depth (approximately 40 in bgs), and are somewhat poorly drained (NRCS, 2020). Volusia channery silt loams typically occur at base slopes, which corresponds to the location of the Wet Meadow DU where these soils primarily occur near the MRS. The Wet Meadow occurs at the base of slopes east of the MRS, not slopes within the MRS.

Table 2-1. Summary of Soil Types

Soil Type	Percent of Decision Unit (DU)	Description
100 Yard Firing Berm DU		
WsB	92.2	Williamson channery silt loam, 3 to 8 percent slopes – moderately well drained, non-hydric silt loam. Depth to water within a typical profile is shallow and occurs from 14 to 23 inches (in) below ground surface (bgs) (NRCS, 2020). These soils are not typically flooded or exhibit ponding and have low water storage capacity within the profile.
WsC	7.8	Williamson channery silt loam, 8 to 15 percent slopes – same as above, except occurs along steeper gradients/slopes.
Target Area DU		
WsB	84.4	See initial description above
WsC	15.6	See initial description above
Target Berm Hillside DU		
VoA	5.9	Volusia channery silt loam, 0 to 3 percent slopes – similar to the Williamson channery silt loams except have lower water capacity, less sand and stratified clays at depth (approximately 40 in bgs), and are somewhat poorly drained (NRCS, 2020). Volusia channery silt loams typically occur at base slopes.
WsB	87.4	See initial description above
WsC	6.7	See initial description above
Target Berm Ponded DU		
WsB	85.9	See initial description above
WsC	14.1	See initial description above
Wet Meadow DU		
VoA	100	See initial description above
Background Area DU		
WsB	96.1	See initial description above
WsC	3.9	See initial description above

2.1.2 Terrestrial Habitats

The MRS is located within the Northern Allegheny Plateau, Level III Ecoregion associated with the more general Mixed Wood Plains and Eastern Temperate Forests Level II and Level I Ecoregions, respectively (USEPA, 2013). This ecoregion is part of the greater High Allegheny Plateau that extends through parts of southern New York and northern Pennsylvania. As described by Nature Conservancy (2003), these regions are defined by high elevation hills that form plateaus (1,700 to 2,100 feet). Small streams cutting through hillside and combining into larger rivers is a primary landscape feature of this general ecosystem type.

Northern hardwood forests are the primary terrestrial habitats within High Allegheny Plateau. Canopy composition consists primarily of red maple (*Acer rubrum*), black cherry (*Prunus* *serotina*), American beech (*Fagus grandifolia*), multiple species of birch (*Betula spp.*), northern red oak (*Quercus rubra*), and white ash (*Fraxinus americana*) (Fike, 1999). Coniferous trees can make up to 25% of hardwood forests; portions of hardwood forests with 25-75% conifers are grouped under the sub-class hemlock (white pine)-northern hardwood (Fike, 1999).

2.1.3 Aquatic and Semi-Aquatic Habitats

Except for the Wet Meadow and ponded water at the base of the Target Berm Hillside, there are no aquatic or semi-aquatic habitats within or hydraulically connected to the MRS. NWI mapping shows the presence of a stream system near the northern and southern boundaries of the MRS (southern portion would not be connected via overland flow). These streams are based on 1995 infrared imagery and were not noted during any RI field activities or review of other aerial imagery. It is assumed for this SLERA that these features are intermittent or no longer present at the Site. Topography indicates that any flow within these areas is away from the Target Berm Hillside. Wetland areas within or nearby the MRS are discussed in **Section 2.1.4**.

2.1.4 Wetland Habitats

Based on NWI mapping, approximately 0.14 acres of freshwater forested/shrub wetland are located east of the MRS (also defined using 1995 infrared imagery). For the RI and SLERA this area is referred to as the Wet Meadow DU. This wetland does not appear to be connected to target feature areas within the MRS via overland flow; the wetlands are situated on the opposite side of a local ridge/hill. The elevation at the Wet Meadow is considerably higher than the adjacent MRS features, including the majority of the Target Berm Hillside. Due to the Wet Meadow elevation and local topography, neither groundwater nor surface water from COI source areas is expected to migrate towards the Wet Meadow. Groundwater is anticipated to follow topography. and surface water flow is away from the Wet Meadow to the northwest in the direction of other MRS features. If shallow groundwater is discharging to the Wet Meadow, it is likely to be flowing to the meadow from the upslope southeast direction. During RI field activities, the deepest portions of standing water were only a few inches. The wetland is a mixture of woody vegetation less than 6 feet (ft) tall (shrub, saplings, and/or stunted trees) and broad-leaved deciduous trees (USFWS, 2020a). This type of wetland is seasonally flooded with surface water remaining during the growing season; substrate remains saturated near the surface even during the absence of surface water (USFWS, 2020a).

2.1.5 Critical and Sensitive Habitats

No federal critical habitats are located within the direct vicinity of the MRS (USFWS, 2020b and 2020c). No "critical environmental areas" were noted for Wyoming County, New York by the NYSDEC (https://www.dec.ny.gov/permits/6184.html). Although no specific habitat was identified within or near the MRS, USFWS (2020c) indicated that endangered species (northern long-eared bat [*Myotis septentrionalis*]) and migratory birds (black-capped chickadee [*Poecile atricapillus practicus*] and bobolink [*Dolichonyx oryzivorous*]) have large ranges that may overlap the MRS. A thorough review of threatened and endangered (T&E) species is provided in **Section 2.2.2**.

2.2 Potential Ecological Receptors

Potential ecological receptors that might be expected to occur throughout the MRS were identified using habitat type and species information published in literature. This information was supported state resources published by the NYSDEC, such as *Checklist of Amphibians, Reptiles, Birds, and Mammals of New York State* (NYSDEC, 2019). The sections below include both commonly occurring wildlife and a review of sensitive habitats and applicable T&E species.

2.2.1 Commonly Occurring Wildlife

Groups of commonly occurring wildlife include soil macroinvertebrates, amphibians and reptiles, birds, and mammals. Wildlife likely to be encountered within or near the MRS are briefly discussed below:

- Soil and benthic macroinvertebrates
    - Soil macroinvertebrates can occupy any portion of the MRS with a defined soil layer (upland or wetland). Common terrestrial soil macroinvertebrates include macrofauna such as earthworms, woodlice, millipedes, and beetles; mesofauna including springtails, mites, and potworms; and microfauna such as nematodes.
    - Benthic macroinvertebrates could occur within the Target Berm Ponded DU or Wet Meadow DU. Common benthic macroinvertebrates include freshwater snails, crustaceans, beetles, and larval stages of many emergent aquatic insects (i.e. midges, dragonflies, damselflies, mosquitoes, blackflies, and mayflies).
- Amphibians and reptiles
    - The forest stands and wetlands within the MRS may provide habitat such as damp leaf litter, moist crevices within trees, fallen trees or logs, submerged structures, and/or banks that may be used by reptiles and amphibians.
    - Commonly occurring reptiles and amphibians may include the eastern American toad (*Anaxyrus* americanus), northern leopard frog (*Lithobates* pipiens), wood frog (*Lithobates* sylvaticus), common garter snake (*Thamnophis sirtalis sirtalis*), eastern hog-nosed snake (*Heterodon platyrhinos*), northern brownsnake (*Storeria dekayi dekayi*), northern ring-necked snake (*Diadophis punctatus edwardsii*), four-toed salamander (*Hemidactylium scutatum*), marbled salamander (*Ambystoma opacum*), eastern redback salamander (*Plethodon cinereus*), and spotted salamander (*Ambystoma maculatum*).
- Birds
    - Birds most likely to be found within the MRS would make use of interior forest stands, open grass/shrub areas, and/or nearby forested/shrub wetlands. Additionally, predatory birds may use tall canopy trees to hunt small birds and mammals feeding within the MRS.
    - Commonly occurring birds may include ruffed grouse (*Bonasa umbellus*), wild turkey (*Meleagris gallopavo*), red-tailed hawk (*Buteo jamaicensis*), turkey vulture (*Cathartes aura*), brown-headed cowbird (*Molothrus ater*), American crow

(*Corvus brachyrhynchos*), downy woodpecker (*Picoides pubescens*), eastern bluebird (*Sialis sialis*), and American robin (*Turdus migratorius*).

- Mammals
    - Common interior forest and mixed woodland species would likely enter the MRS and feed on ground vegetation/shrubs, soil invertebrates, and small mammals. Aquatic and semi-aquatic species would likely feed on vegetation or macroinvertebrates within the Wet Meadow DU.
    - Commonly occurring species may include white-tailed deer (*Odocoileus virginianus*), American black bear (*Ursus americanus*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), eastern coyote (*Canis latrans x Canis lycaon*), raccoon (*Procyon lotor*), eastern chipmunk (*Tamias striatus*), eastern gray squirrel (*Sciurus carolinensis*), American red squirrel (*Tamiasciurus hudsonicus*), striped skunk (*Mephitis mephitis*), and big brown bat (*Eptesicus fuscus*).

2.2.2 Threatened and Endangered Species

Both federal (USFWS, 2020c) and NYSDEC (https://www.dec.ny.gov/animals/7181.html) resources were queried to identify T&E species. Species listed by these sources are provided in **Table 2-2**. Rationale for the potential to occur at the MRS was supplemented by NatureServe Explorer (http://explorer.natureserve.org/index.htm) and NYSDEC wildlife factsheets and distribution maps.

Table 2-2. Summary of Threatened and Endangered Wildlife Species

Common Name	Scientific Name	Status	Potential to Occur at MRS?	Rationale
Invertebrates				
American burying beetle	*Nicrophorus americanus*	SE	Unlikely	Occurs within hardwood forests, but unlikely to occupy saturated soils. Currently thought to be extirpated from New York.
Arogos skipper	*Atrytone arogos*	SE	Unlikely	Primarily occurs within undisturbed prairies, grasslands, and bogs/fens.
Bog buckmoth	*Hemileuca spp.*	SE	Unlikely	Primarily occurs within bogs and fens.
Chittenango ovate amber snail	*Novisuccinea chittenangoensis*	SE	Unlikely	Only known to occur at the base of wet cliff walls near Chittenango Falls.
Clubshell	*Pleurobema clava*	SE	Unlikely	Requires small to medium-sized rivers and streams with sand/gravel substrate.
Dwarf wedgemussel	*Alasmidonta heterodon*	SE	Unlikely	Primarily occurs in medium to large freshwater rivers.
Fat pocketbook	*Potamilus capax*	SE	Unlikely	Primarily occurs in medium to large freshwater rivers.

Common Name	Scientific Name	Status	Potential to Occur at MRS?	Rationale
Grizzled skipper	*Pyrgus centaureae*	SE	Unlikely	Primarily occurs in spruce bogs and mountain meadows.
Hessel's hairstreak	*Callophrys hesseli*	SE	Unlikely	Occurs specifically in Atlantic white cedar swamps.
Karner blue butterfly	*Plebejus samuelis*	SE	Unlikely	Primarily occurs in dry, sandy scrub oak/pitch pine barrens or old field/savannah habitats.
Persius duskywing	*Erynnis persius*	SE	Unlikely	Known eastern habitats restricted to bogs, barrens, and savannahs.
Pine pinion moth	*Lithophane lepida lepida*	SE	Unlikely	Primarily occurs in pine/oak barrens.
Pink mucket	*Lampsilis abrupta*	SE	Unlikely	Primarily occurs in fast-flowing waters in medium to large rivers.
Rayed bean	*Villosa fabalis*	SE	Unlikely	Primarily occurs in small to medium rivers with riffle.
Regal fritillary	*Speyeria idalia*	SE	Unlikely	Primarily occurs in prairie-type habitats or bogs/fens.
Snuffbox	*Epioblasma triquetra*	SE	Unlikely	Primarily occurs in medium to large rivers with riffle.
Tomah mayfly	*Siphlonisca aerodromia*	SE	Unlikely	Primarily occurs in rivers with seasonal flooding.
Brook floater	*Alasmidonta varicosa*	ST	Unlikely	Primarily occurs in moderate to high moving streams with riffle.
Frosted elfin	*Callophrys irus*	ST	Unlikely	Primarily occurs in grassland, savanna, and pine barren habitats.
Green floater	*Lasmigona subviridis*	ST	Unlikely	Primarily occurs in small to medium, low-gradient streams.
Little bluet	*Enallagma minusculum*	ST	Unlikely	Primarily occurs in lakes and ponds.
Northeastern beach tiger beetle	*Cicindela dorsalis dorsalis*	ST	Unlikely	Requires sandy beaches and dunes for burrowing.
Pine barrens bluet	*Enallagma recurvatum*	ST	Unlikely	Primarily occurs in lakes and ponds within pine barrens.
Scarlet bluet	*Enallagma pictum*	ST	Unlikely	Primarily occurs in ponds associated with coastal plain.
Wavy-rayed lampmussel	*Lampsilis fasciola*	ST	Unlikely	Primarily occurs in small to medium rivers with riffle.
Amphibians and Reptiles				
Bog turtle	*Glyptemys muhlenbergii*	SE	Unlikely	Requires suitable wetland habitats near unfragmented riparian systems.

Common Name	Scientific Name	Status	Potential to Occur at MRS?	Rationale
Eastern cricket frog	*Acris crepitans*	SE	Unlikely	Requires suitable wetland habitat near ponds or slow-moving water.
Eastern massasauga	*Sistrurus catenatus*	SE	Unlikely	Occurs within grass/shrub dominated wetlands near forest edges. However, populations in New York limited to only two known isolated wetlands.
Eastern tiger salamander	*Ambystoma tigrinum*	SE	Unlikely	Occurrence within New York limited to Long Island.
Queensnake	*Regina septemvittata*	SE	Unlikely	Requires abundance of crayfish in moderate to fast-flowing streams.
Eastern mud turtle	*Kinosternon subrubrum*	SE	Unlikely	Occurrence within New York limited to Long Island.
Blanding's turtle	*Emydoidea blandingii*	ST	Unlikely	Occurrence limited to isolated locations within eastern New York.
Eastern fence lizard	*Sceloporus undulatus*	ST	Unlikely	Occurrence limited to isolated locations within eastern New York.
Timber rattlesnake	*Crotalus horridus*	ST	Unlikely	Primarily occurs within closed-canopy forests with rocky terrain.
Birds				
Black rail	*Laterallus jamaicensis*	SE	Unlikely	Occurrence within New York limited to Long Island.
Black tern	*Chlidonias niger*	SE	Unlikely	Breeding colonies located near wetlands associated with larger aquatic systems.
Eskimo curlew	*Numenius borealis*	SE	Unlikely	Primarily occurs within open habitats near coastal areas.
Golden eagle	*Aquila chrysaetos*	SE	Unlikely	Currently extirpated from the State of New York beyond occasional sightings.
Loggerhead shrike	*Lanius ludovicianus*	SE	Unlikely	Requires habitats with large pastures and no nesting populations in New York currently.
Peregrine falcon	*Falco peregrinus*	SE	Unlikely	Requires cliffs for nesting locations.
Piping plover	*Charadrius melodus*	SE	Unlikely	Occurrence within New York limited to Long Island.
Roseate tern	*Sterna dougallii*	SE	Unlikely	Occurrence within New York limited to Long Island.
Short-eared owl	*Asio flammeus*	SE	Unlikely	Primarily occurs in open grasslands and marshlands.

Common Name	Scientific Name	Status	Potential to Occur at MRS?	Rationale
Spruce grouse	*Falcipennis canadensis*	SE	Unlikely	Primarily occurs in boreal conifer forests.
Bald eagle	*Haliaeetus leucocephalus*	ST	Unlikely	Primarily occurs near larger bodies of water.
Common tern	*Sterna hirundo*	ST	Unlikely	Primarily occurs in sandy beaches, grassy uplands, or rocky inland shores.
Henslow's sparrow	*Ammodramus henslowii*	ST	Unlikely	Primarily occurs in grasslands or agricultural areas.
King rail	*Laterallus jamaicensis*	ST	Unlikely	Primarily occurs within marshes and swamps.
Least bittern	*Ixobrychus exilis*	ST	Unlikely	Primarily occurs within marshes and swamps.
Least tern	*Sternula antillarum*	ST	Unlikely	Primarily occurs in open, sandy or gravel beach areas.
Northern harrier	*Circus cyaneus*	ST	Unlikely	Primarily occurs within marshes or open grass areas/agricultural fields.
Pied-billed grebe	*Podilymbus podiceps*	ST	Unlikely	Requires emergent vegetation within standing water.
Red knot	*Calidris canutus*	ST	Unlikely	Primarily occurs on tidal flats or beaches.
Sedge wren	*Cistothorus platensis*	ST	Unlikely	Primarily occurs in wet fields/meadows or marshes with an abundance of sedges and grasses.
Upland sandpiper	*Bartramia longicauda*	ST	Unlikely	Primarily occurs in grasslands or agricultural areas.
Mammals				
Allegheny woodrat	*Neotoma magister*	SE	Unlikely	Requires rocky substrate with boulders for burrowing activities.
Eastern cougar	*Felis concolor*	SE	Unlikely	Currently extirpated from the State of New York.
Indiana bat	*Myotis sodalis*	SE	Unlikely	Distribution limited to central and eastern New York.
Northern long-eared bat	*Myotis septentrionalis*	FE	Unlikely	Species listed by USFWS (2020c) in all parts of range, but no critical habitat noted near MRS.
Gray wolf	*Canis lupus*	SE	Unlikely	Currently extirpated from the State of New York.
Canada lynx	*Lynx canadensis*	ST	Unlikely	Currently extirpated from the State of New York.

Notes: E = Endangered; R = Rare; SC = Special Concern; T = Threatened (if not preceded by an "S" or "F", state and federal designation assumed to be the same)

2.3 Potential Source Areas and Constituents of Interest

Because of past ARNG actions at or surrounding the MRS, the primary COIs are metals associated with small arms training. The subsections below summarize the historical context of the MRS and findings of the RI.

2.3.1 Facility History

Camp O'Ryan was located on 376 acres and used by the New York ARNG (NYARNG) from 1949 to 1974 and then again from 1989 to 1994 (Parsons, 2011). The property was previously owned and developed by the United States Army Corps of Engineers (USACE) and sold to Edward George, who leased it back to the USACE in 1949.

From 1949 to 1974, training areas at the camp included a rifle range, a pistol range, and a tank driver training course and structures at the site included a range storage building, a field latrine, and a mess hall. Camp O'Ryan was reactivated as a training area in 1989 and was used until November 1994.

The parcel of land the former mess hall occupied was subdivided from the original training camp and sold by the estate of Edward George, the property owner, in 1999. The former mess hall is currently owned and occupied by King Brothers Masonry Contractors. The ranges were used by NYARNG units stationed in New York bases, including Batavia, Buffalo, Dunkirk, Jamestown, Medina, and Rochester (Parsons, 2011).

2.3.2 Current Investigations

As determined by the SI (Parsons, 2012), potential COIs at the MRS include metals (antimony, copper, lead, and zinc). The potential source is direct releases to soil from past range activities. A total of five DUs were evaluated for this SLERA and are presented in **Figure 2-1**.

The RI identified three DUs initially: the 100 Yard Firing Berm DU, Target Area DU, and Target Berm DU. Based on observations made during the RI, the Target Berm DU was divided into two separate DUs (Target Berm Ponded DU and Target Berm Hillside DU). Standing water was observed across the low-lying, flatter portion of the original Target Berm DU. This inundated area runs the entire length of the original DU and extends approximately 40 to 50 ft to the east from the base of the retaining wall. Due to the considerable difference between the nature of the dry soil on the sloped portion of the DU to the east and the sediment within the inundated area, the Target Berm DU was subdivided into two DUs and sampled separately. The fifth DU was added during the RI contains a wetland located behind the Target Berm Hillside DU (referred to as the Wet Meadow DU). The Wet Meadow DU was investigated to evaluate the wetland for potential overshot and ricochet during historical training.

The DUs investigated during the RI are presented in **Figure 2-1**. During the RI field activities, handheld x-ray fluorescence (XRF) analyzers were used as a preliminary screening method to establish refined DU boundaries for surface soil sampling using an incremental sampling methodology (ISM). ISM was used to provide a more confident estimate of the exposure point concentration (EPC) in surface soil. Due to saturated conditions, XRF screening was not be used within the Target Berm Ponded and Wet Meadow DUs. At these DUs discrete sediment samples were collected to evaluate potential impacts to ecological receptors. Soil samples from a Background Reference Area within the western corner of the MRS boundary (area unimpacted by activities) were also collected using ISM sampling (**Figure 2-1**).

2.4 Identification and Evaluation of Migration Pathways

An ecological conceptual site model (ECSM) was developed to depict the source areas, exposure media, and migration pathways used to identify significant exposure pathways for evaluation in the SLERA (**Figure 2-2**). The ECSM includes the following information:

- Potential source area(s)
- Potential migration pathways
- Exposure media
- Complete and incomplete exposure pathways for potential ecological receptors via the following exposure routes:
    - Direct contact/absorption
    - Direct or incidental ingestion of substrate
    - Ingestion of prey and plant dietary items

Potential Source Area(s)

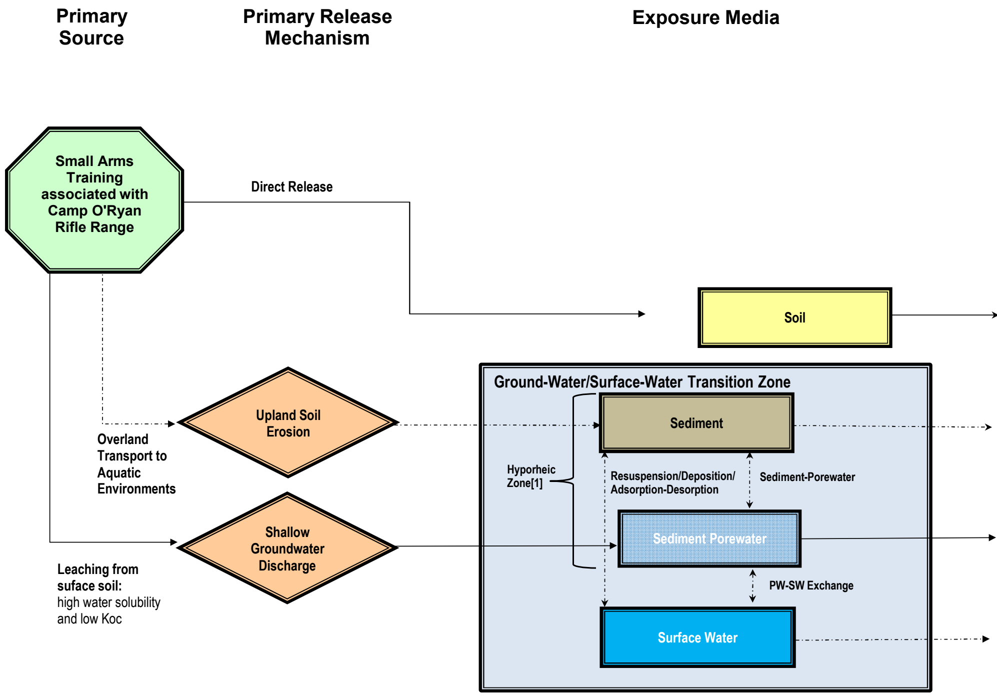
The five DUs have been identified within the MRS as being impacted or likely impacted by historical small arm range training activities. Currently, the MRS is no longer used for training purposes and the source areas are related solely to historical impacts.

Potential Migration Pathway(s)

The evaluation and identification of potentially complete migration pathways is one of the primary goals of a SLERA (USEPA, 1997). As defined, a "migration pathway" is the pathway by which a constituent travels from a source to receptors. A pathway can involve multiple media such as erosion of soil from upland to wetland areas. Historical direct releases to soil and subsequent erosion/dissolution into surface water and groundwater represent the primary release mechanisms within the MRS.

Migration pathways evaluated in this SLERA include:

- Erosion of surface soil
    - COIs deposited in surface soil as a result of firing activities at the MRS have limited potential to migrate from the source areas (i.e., earthen berm composition and target area retaining wall). Additionally, the peak of the Target Berm Hillside DU is elevated between 50 to 100 ft higher than the Target Area DU. The elevated hillside prevents any runoff from the MRS from entering the Wet Meadow DU. Eroded soil from the Target Berm Hillside DU that would have been impacted by overshot (western facing portion of hillside) likely settles within the Target Berm Ponded DU at the base of the retaining wall.



Exposure Routes | **Potential Ecological Receptors**

	Soil Macroinvertebrates	Benthic Macroinvertebrates	Avian/Mammalian Carnivores	Avian/Mammalian Invertivore	Avian/Mammalian Herbivore
Direct Contact/Absorption	●	☒	☐	☐	☐
Direct Ingestion	●	☒	☒	☒	☒
Incidental Ingestion	--	☒	●	●	☐
Prey and Plant Dietary Items	--	☒	●	●	☐
Direct Contact/Absorption	☒	●	☐	☐	☐
Direct Ingestion	☒	●	☒	☒	☒
Incidental Ingestion	--	--	●	●	☐
Prey Items	--	--	●	●	☐
Direct Contact/Absorption	☒	●	☒	☒	☒
Direct Ingestion	☒	●	☒	☒	☒
Incidental Ingestion	--	--	☒	☒	☒
Prey Items	--	--	☒	☒	☒
Direct Contact/Absorption	☒	●	☐	☐	☐
Direct Ingestion	☒	●	☐	☐	☐
Incidental Ingestion	--	--	☐	☐	☐
Prey Items	--	--	☐	☐	☐

NOTES:

[1] The hyporheic zone is defined as a "latticework of underground habitats through the sediments associated with the interstitial waters in the substrate beneath and adjacent to moving surface-waters" (USEPA, 2008).

REFERENCES:

USEPA. 2008. ECO Update/Ground Water Forum Issue Paper: Evaluating Ground-Water/Surface-Water Transition Zones in Ecological Risk Assessments. Publication 9285.6-17 EPA-540-R-06-072. July 2008.

LEGEND:

——→	CONTAMINANT MIGRATION PATHWAY
-·-·-·→	POTENTIAL CONTAMINANT MIGRATION PATHWAY
●	POTENTIAL COMPLETE PRIMARY EXPOSURE PATHWAY
☐	EXPOSURE PATHWAY IS COMPLETE OR POTENTIALLY COMPLETE AND INSIGNIFICANT
--	SIGNIFICANCE OF EXPOSURE PATHWAY IS UNCERTAIN
☒	INCOMPLETE EXPOSURE PATHWAY

Figure 2-2
Ecological Conceptual Site Model
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

    - Given the MRS topography and range orientation, stormwater runoff from significant rain events is unlikely to transport suspended COIs to the Wet Meadow DU east of the MRS. Transport of soil from impacted soil areas remains within the MRS and is likely only accumulated behind the retaining wall (Target Berm Ponded DU).

- Groundwater discharge to the Wet Meadow Area DU
    - Because the Wet Meadow DU is located at a higher elevation than the remainder of the MRS, topography likely precludes any COI migration via groundwater or surface runoff into the Wet Meadow. The limited COIs found in sediment is related to dissolution from small amounts of overshot or ricochet into the area. Given the local topography and surface water flow, groundwater flow at this DU is likely to be to the northwest, towards the former range and unlikely to contain COIs due to limited solubility. If groundwater discharge to the Wet Meadow DU occurs as upwelling within the groundwater-surface water (GW-SW) transitional zone or hyporheic zone (HZ), then it is likely to be flowing to the meadow from the upslope southeast direction, beyond the MRS boundary and would not likely contain MRS-related COIs.
    - USEPA (2008a) defines the GW-SW transition zone as "a region beneath the bottom of a surface-water body where conditions change from a ground-water dominated to surface-water dominated system within the substrate." The transitional zone also includes the HZ, which represents the interface of groundwater, sediment, sediment porewater, and surface water. USEPA (2008a) defines the HZ as a "latticework of underground habitats through the sediments associated with the interstitial waters in the substrate beneath and adjacent to moving surface-waters."
    - There are no wells installed within the vicinity of the MRS and depth to groundwater is currently unknown – the only wells within 0.25 miles had depths to water of 15 and 60 ft bgs (AECOM, 2020). As previously discussed, shallow groundwater from COI source areas is not expected to discharge to the Wet Meadow DU because of the DUs relative elevation and topography. Groundwater transport pathways are considered incomplete but were qualitatively evaluated during this SLERA as a conservative measure and will be discussed within **Section 2.7** of this SLERA.

2.5 Fate and Transport Characteristics

This sub-section discusses constituent fate and transport processes in potentially affected media within or near the MRS.

2.5.1 Terrestrial Media

Site-related COIs detected in terrestrial media (i.e., surface soils) include metals (i.e., antimony, copper, lead, and zinc). Within soil, metals can be found in multiple states including dissolved in soil solution, adsorbed on inorganic soil constituents, precipitated as solids, or present in the structure of primary and secondary minerals (Shuman, 1991).

Additionally, the fate and transport of a metal in soil depends significantly on the chemical form and speciation of the metal (USEPA, 1992). Once in the soil, metals are initially adsorbed, and then subjected to adsorption reactions. The adsorption of metals is associated with pH, redox potential, clay content, soil organic matter, iron and manganese oxides, and carbonate content. Adsorption results in metals being transformed into different chemical forms that vary with respect to bioavailability, mobility, and toxicity.

2.5.2 Aquatic and Semi-Aquatic Media

Metals partition between solid and liquid phases in aquatic and semi-aquatic environments. Partitioning is based on the available ligands and the strength of the potential metal-ligand complexes. The release of metals from solid phases to liquid phases governs the bioavailability and toxicity of metals. Metals are subjected to biogeochemical processes and conditions that influence their partitioning, including the redox state of sediment and pH of the interstitial water. The microbial degradation of organic matter influences redox conditions across the sediment-surface water interface (Baker, 1994; Stumm and Morgan, 1981; in Charriau et al., 2011). Generally, metal mobility increases at low pH and decreases as pH increases, at which point greater sorption occurs (USEPA, 2007a)

As a result of this partitioning, the bioavailability and toxicity of metals in aquatic and semi-aquatic media is associated with the exchangeable fraction of metals in the dissolved phase rather than the total phase metal concentration (USEPA, 2007a). The majority of metals in porewater are complexed by colloids, and do not exist as freely dissolved metal-ion complexes (Burgess et al., 1996). Therefore, concentrations of metals measured in filtered porewater samples more accurately represent the dissolved fraction of metals, which is bioavailable and can be incorporated into the tissues of benthic invertebrates rather than bulk sediment concentrations (USEPA, 2005).

Within this SLERA, aquatic and semi-aquatic potentially impacted media include sediment porewater, surface water, and sediment. Erosion of impacted soils to the Wet Meadow DU is unlikely because the Wet Meadow DU is at a higher elevation than the remainder of the MRS. If groundwater discharge has occurred, it would likely be flowing from the upslope southeast portion of the area outside of the MRS and moving towards the MRS making introduction of COIs within impacted media from source areas within the MRS to the Wet Meadow DU unlikely.

Limited COIs found in sediment at the Wet Meadow DU is likely the result of small amounts of overshot and ricochet into the area.

2.5.3 Biota

Bioaccumulation represents the potential for a constituent to accumulate in the tissues of an organism. In those instances where bioaccumulation exceeds the ability of an organism to metabolize those constituents, toxic effects can potentially be observed. Wildlife ingesting prey with body burdens of lipophilic compounds may also experience adverse effects when accumulation reaches a threshold level. The purpose of evaluating bioaccumulation potential is to describe the potential of constituents to bioaccumulate in tissues and potentially exert a toxic effect and/or expose upper trophic wildlife receptors through ingestion pathways.

Heavy metals identified at the MRS are known to bioaccumulate, but not biomagnify (USEPA, 2000). In contrast to our COIs, other metals not under investigation – such as, mercury (including methylmercury) – both bioaccumulate and biomagnify. The implications of biomagnification are that even a low concentration of a metal in environmental media or dietary items can result in an increased dosage for upper trophic levels that may potentially exert adverse effects. Metals, such as lead, can bioaccumulate in prey to a point where the concentrations may become a significant source of dietary metal to their predators.

2.6 Ecotoxicological Profiles

This section summarizes the general ecotoxicological effects associated with the four Site-related COIs: antimony, copper, lead, and zinc. The toxicity of metals depends on the solubility and bioavailability of the particular metal. It is assumed that the water-soluble fraction in all media exhibits the greatest potential for adverse ecological risk because it is directly available for uptake by organisms. Descriptions of ecotoxicity for each COI are presented below.

2.6.1 Antimony

Antimony is a semi-metallic element that shares some chemical properties with lead, arsenic, and bismuth (USEPA, 2008b). The trivalent form of antimony is considered more toxic than the pentavalent form. Ingested antimony is absorbed slowly and is reported as a gastrointestinal irritant; the toxic effects of antimony in mammals involve cardiovascular changes (USEPA, 2008b). Observed changes include degeneration of the myocardium, arterial hypotension, heart dysfunction, arrhythmia, and altered electrocardiogram patterns (USEPA, 2008b). Toxicity studies related to plant and avian wildlife are limited; therefore, screening values and toxicity benchmarks are generally based solely on mammals (USEPA, 2008b). Within aquatic systems, antimony is generally not listed with other metals as an important bioaccumulative compound (USEPA, 2000).

2.6.2 Copper

Copper is a naturally occurring element which can be found in all environmental media: air, soil, sediment, and water. In soils, copper may be present as soluble compounds including nitrates, sulfates, and chlorides, and insoluble compounds such as oxides, hydroxides, carbonates, and sulfides (USEPA, 2008b). Soluble copper compounds strongly sorb to particles of organic matter, clay, soil, or sand, and demonstrate low mobility in soils (USEPA, 2008b). Insoluble copper is also effectively immobile in soils. Copper is an important bioaccumulative compound within aquatic environments (USEPA, 2000). The primary route of exposure to copper for animals is through ingestion. In mammals, copper can increase cell permeability in erythrocytes to lysis and inhibition of intracellular enzymes; thus, copper poisoning can lead to oxidative stress in erythrocytes and to accelerated loss of intracellular glutathione (USEPA, 2008b). Additional symptoms of acute copper toxicity in mammals include sporadic fever, tachycardia, hypotension, oliguria, uremia, coma, cardiovascular collapse, and death (USEPA, 2008b). Chronic copper poisoning in mammals may induce nausea, vomiting, epigastric pain, dizziness, jaundice, and general debility (USEPA, 2008b).

2.6.3 Lead

Lead is a naturally occurring element which can be found in all environmental media: air, soil, sediment, and water and is released to the environment from many industrial processes (USEPA, 2008b). Lead is strongly sorbed to soil and sediments at a rate correlated to grain size and organic content and tends to combine with a variety of complexing species. Lead is not considered an essential nutrient for plants, birds, or mammals (USEPA, 2008b). Lead uptake in wildlife depends on exposure time, aqueous concentration, pH, temperature, salinity, and diet. When released to soil, lead is normally converted from soluble lead compounds to relatively insoluble sulfate or phosphate derivatives (USEPA, 2008b). In terrestrial wildlife, lead exposure may cause birth abnormalities and premature death. For aquatic organisms, all life stages are sensitive to the toxic effects of lead, particularly embryos. Lead is an important bioaccumulative compound within aquatic environments (USEPA, 2000). Gill, liver, kidney, and erythrocytes accumulate lead from aqueous sources in proportion to the time and concentration of exposure (Sample et al., 1996).

2.6.4 Zinc

Zinc is found in almost all minerals and an abundant element in the earth's crust; elemental zinc is not found in the environment but instead occurs in compounds in the 2+ oxidation state, often as zinc sulfide or zinc oxide (USEPA, 2008b). Most zinc in soil stays bound to soil particles and does not dissolve readily into water. Zinc is an important bioaccumulative compound within aquatic environments (USEPA, 2000). Zinc is essential in the diet of most animals, but harmful effects can begin at elevated levels. Overexposure to zinc in the diet can cause stomach cramps, anemia, and changes in cholesterol levels (Agency for Toxic Substances and Disease Registry [ATSDR], 2005). Additionally, zinc salts adversely affect tissues, interfere with the metabolism of other ions such as copper, calcium, and iron, and inhibit erythrocyte production and function (USEPA, 2008b). Mammalian studies have shown vomiting, depressed growth rate, purgation, and ataxia (USEPA, 2008b). Zinc excess in avian species is associated with decreased body weight, gizzard and pancreatic lesions, and biochemical changes (USEPA, 2008b).

2.7 Exposure Routes and Receptors Not Evaluated

This section provides the rationale for exposure routes and receptors not selected for further evaluation.

2.7.1 Plants

Metals are the only COIs being evaluated during the SLERA. Vegetation was omitted in the SLERA because the published plant ecological screening values (ESVs) for metals are derived from studies typically conducted with crop species exposed to soils dosed with highly soluble metal salts which are likely to over-estimate metals bioavailability experienced in the field. Hence, those ESVs are of limited value in risk-based decision making. Of the potential ecological receptors that are present at the Site, plants are not the most sensitive to the potential effects of Site-related COIs (Suter et al., 2000). For example, unlike herbicides, the toxic and bioaccumulative effects of Site-related metals on plants may be mitigated by biotransformation and/or sequestration in root tissues. Uncertainty regarding the evaluation of the on-Site plant community is discussed in **Section 5** of this SLERA.

2.7.2 Herbivorous Wildlife

In selecting wildlife ESVs used in the SLERA, all wildlife receptors were considered regardless of feeding guild or dietary composition (including herbivores). Therefore, the use of more sensitive ESVs based on invertivorous wildlife during COPEC identification is indirectly protective of herbivorous wildlife. Additionally, bioaccumulation models used to estimate uptake of Site COIs from soil to plants shows less bioaccumulation into terrestrial plants (Bechtel-Jacobs, 1998 and USEPA, 2007b) than soil invertebrates (Sample et al., 1998 and USEPA, 2007b). Bioaccumulation of metals in soil invertebrates represents the largest potential dietary source of antimony, copper, lead, and zinc (See **Table 3-2**). Thus, the conclusions drawn from modeling estimated concentrations of COIs in soil invertebrates and ingestion by invertivorous wildlife is indirectly protective of herbivorous wildlife.

2.7.3 Piscivorous Wildlife

Fish were not observed during sediment sampling conducted within the Wet Meadow DU for the RI (AECOM, 2020). Only a few inches of standing water were present in the Wet Meadow DU during RI sampling. Due to a lack of prey item source, piscivorous wildlife were not evaluated during this SLERA.

2.7.4 Amphibians

A standardized ecotoxicological methodology has not been established, and currently, there are very few established methods to evaluate the toxicity of chemical stressors for amphibians. Also, existing ecotoxicological methods are unlikely to accurately characterize ecotoxicological effects to amphibians in support of a SLERA (Johnson et al., 2017). Ecotoxicological data for amphibians are limited. The majority of the available ecotoxicological data on amphibians are from acute exposures in aquatic test systems (Johnson et al., 2017). Because of the conservatism in the SLERA, acute ecotoxicological data will not support SLERA assessment and measurement endpoints. Additionally, surrogate species cannot be used to accurately evaluate impacts to amphibians. Definitive comparisons with surrogate species are difficult to achieve because of variability in study design (Birge et al., 2000 and Johnson et al., 2017).

2.7.5 Water Column Community

The water column community was not explicitly evaluated within this SLERA. Dissolution of metals from resuspended sediment could expose water column organisms to unacceptable concentrations of COIs within the Wet Meadow DU. ESVs used within this SLERA to evaluate benthic macroinvertebrate exposure in surface water are indirectly protective of the water column community. For some COIs (antimony), water column organisms (daphnids and fish) were considered during the development of chronic ESVs for surface water (Suter and Tsao, 1996).

2.7.6 Surface Water to Groundwater Migration Pathway

Surface water and groundwater data were not available for this MRS, therefore quantitative analysis of these exposure routes could not be evaluated. However, as previously discussed, qualitative analysis indicates that this migration pathway is incomplete due to the groundwater levels at nearby off-Site wells measuring greater than 10ft bgs and limited detections of COIs within discrete, subsurface soil used for vertical delineation within the RI. Additionally, due to the local topography, neither groundwater nor surface water from COI source areas is expected to migrate towards the Wet Meadow DU where surface water and groundwater exchange could possibly occur with the HZ. Groundwater is anticipated to follow surface topography and surface water flow is away from the Wet Meadow to the northwest in the direction of other MRS features. If shallow groundwater discharges to the Wet Meadow DU, it likely flows to the DU from the upslope southeast direction.

2.8 Receptors of Concern and Exposure Routes Selected for Evaluation

Based on the evaluation of the chemical and fate and transport characteristics of COIs, direct contact exposures to soil, sediment, sediment porewater, and surface water are the primary routes of exposure to ecological receptors within and near the MRS. Although sediment porewater and surface water data are not available for this SLERA, these media were used to develop the ECSM and are relevant for the evaluation of aquatic and semi-aquatic exposure. Additionally, wildlife ingestion exposure pathways are also relevant due to the potential for COIs to bioaccumulate from environmental media (i.e., soil/sediment into the tissues of prey items).

Selection of potential receptors was driven by the availability of data in potentially affected habitats within and near the MRS. Given that direct contact and dietary exposure to metals are the primary exposure pathways/routes to ecological receptors, receptors of concern identified for evaluation in the SLERA include the following:

- Soil macroinvertebrate community
- Benthic macroinvertebrate community
- Terrestrial wildlife
    - Mammalian invertivore: Short-tailed shrew (*Blarina brevicauda*)
    - Mammalian carnivore: Red fox (*Vulpes vulpes*)
    - Avian invertivore: American robin (*Turdus migratorious*)

  - Avian carnivore: Red-tailed hawk (*Buteo jamaicensis*)
- Aquatic and semi-aquatic wildlife
  - For the Target Berm Ponded DU and Wet Meadow DU, terrestrial wildlife receptors will be retained to assess the potential bioaccumulation of COIs in prey items from sediment. Given the proximity to nearby terrestrial habitats and limited/fluctuating surface water, receptors are likely to feed on benthic invertebrates or small mammals within these DUs.

Summaries of exposure pathways and rationale for selected sensitive receptor groups are presented in the following sub-sections.

2.8.1 Soil Macroinvertebrates

Soil macroinvertebrates are the most susceptible to the effects of COIs because of their sedentary nature and direct exposure to terrestrial soil. As a result of this exposure, soil macroinvertebrates are sensitive to both acute and chronic changes in soil quality. Exposure routes for soil macroinvertebrates include:

- Direct contact/absorption of soil
- Direct/incidental ingestion of soil

Soil macroinvertebrates such as earthworms can incorporate COIs into their tissues through feeding in soil and leaf litter, in addition to burrowing in affected soils. Because earthworms and other soil macroinvertebrates are relatively immobile, these species can potentially be exposed to a maximum constituent concentration in soil during the course of their lifetime (Suter et al., 1995).

Soil macroinvertebrates penetrate and exploit the surface soil layer to varying depths, which results in varying degrees of exposure. For example, epigeic species such as arthropods can be found at the surface layer in leaf litter. Whereas epi-endogeic species such as the European earthworm (*Lumbricus rubellus*), primarily reside near or at the surface, create horizontal burrows to feed and reproduce, and are found at soil depths of approximately 8 in bgs (Sackett et al. 2012). Anecic earthworm species such as the common earthworm (*L. terrestris*) create permanent vertical burrows in soil, which contain leaf litter and soil mixed from different depths of the profile and can extend to depths of 6.5 ft bgs (Scharenbroch and Johnston, 2011). *L. terrestris* will feed on leaves on the soil surface that they drag into the burrows. However, most exposure occurs within the biologically active zone (BAZ), which operationally extends to a depth of approximately 12 in bgs (USEPA, 2015). Within this SLERA, exposure pathways to soil macroinvertebrates are considered complete and greatest within surface soil.

2.8.2 Benthic Macroinvertebrates

Similar to soil macroinvertebrates, benthic macroinvertebrates are sensitive to both acute and chronic changes in sediment quality due to their sedentary nature. Exposure routes for benthic macroinvertebrates include:

- Direct contact/absorption of sediment, sediment porewater, and surface water

- Direct/incidental ingestion of sediment, sediment porewater, and surface water

Benthic macroinvertebrates are generally sedentary and susceptible to adverse changes in sediment and sediment porewater quality. Additionally, USEPA (2008a) indicates that benthic and epibenthic communities (e.g., invertebrate larvae, worms, fish and bivalves) spend part or all of their life cycle in contact with the sediments and groundwater that comprise the GW-SW transitional zone. For benthic macroinvertebrates, exposure occurs within the BAZ, which operationally extends from the surface water interface to a depth of approximately 6 in bgs for freshwater sediment (USEPA, 2015). Upon establishing the two DUs where standing water was observed during RI field efforts, stakeholders agreed that sediment would be sampled for MC evaluation. Within this SLERA, exposure pathways to benthic macroinvertebrates are considered complete and greatest within sediment.

2.8.3 Birds and Mammals

Exposure routes for birds and mammals include:

- Ingestion of prey items
- Incidental ingestion of soil (terrestrial)
- Incidental ingestion sediment (aquatic and semi-aquatic)
- Direct/incidental ingestion of surface water (aquatic and semi-aquatic)

A significant proportion of the biological activity occurs within the top 0-12 in for soil and 0-6 in for sediment (USEPA, 2015); although, fossorial mammals can be encountered at depths reaching 2 ft (USEPA, 2018). Based on likelihood of exposure and availability of surface soil and sediment data, exposure pathways to wildlife are considered complete and greatest within the 0 to 6 in interval. Wildlife receptors selected for the exposure evaluation are discussed in the following subsections.

2.8.3.1 Short-tailed Shrew

The short-tailed shrew occupies a range of habitat types, including wetlands and uplands, and is reported to occur in both forested and open habitats (Sample and Suter, 1994). Short-tailed shrews are active on the ground surface, in leaf litter, and below the ground surface. A well-developed leaf litter layer protects shrews from moisture and temperature extremes. Earthworms are reported to be the most important food item. Millipedes, slugs, snails, and insect larvae are also important prey items. Shrew will also prey on vertebrates when other food is not available and have shown sensitivity to bioaccumulative chemicals (USEPA, 1993). Additionally, the shrew is a common prey item for owls, raptors, fox, and other carnivores (USEPA, 1993). The short-tailed shrew is expected to occupy all areas of the MRS with a complete exposure pathway to surface soil. Within this SLERA, the short-tailed shrew was evaluated assuming bioaccumulation of COIs into prey items (soil and benthic macroinvertebrates) from surface soil/sediment and incidental ingestion of substrate.

2.8.3.2 Red Fox

Foxes prefer a habitat mosaic over homogeneous forested stands or open areas. The red fox is characterized as an old field or edge-species since it is commonly found in areas of forests interspersed with fields, cropland and/or grasslands. The fox has a wide dietary range but is predominantly carnivorous feeding mainly on rabbits and mice (USEPA, 1993). Lesser amounts of mammals, birds, snakes, invertebrates, and plant material are consumed. The red fox is expected to occupy all areas of the MRS with a complete exposure pathway to surface soil/sediment. Within this SLERA, the red fox was evaluated assuming bioaccumulation of COIs into prey items (small mammals) from surface soil/sediment and incidental ingestion of substrate.

2.8.3.3 American Robin

American robins can be found in closed canopy forests, woodlands, fields, and residential areas. During the summer, they are most commonly observed foraging in cleared areas with short-stature herbs. The diet of the American robin includes fruits and insects. The diet varies seasonally such that invertebrates dominate the diet in the spring, whereas fruits dominate in the fall/winter (USEPA, 1993). The American robin could potentially occupy all areas within the MRS and is susceptible to localized impacts in soil/sediment. Within this SLERA, the American robin was initially evaluated assuming bioaccumulation of COIs into prey items (soil/benthic macroinvertebrates) from surface soil and incidental ingestion of substrate.

2.8.3.4 Red-tailed Hawk

Red-tailed hawks occupy a wide variety of open to semi-open habitats including coniferous, deciduous and mixed woodlands, woodland edges, grasslands, parklands, and agricultural fields with scattered trees (USEPA, 1993). Red-tailed hawks primarily consume small mammals such as meadow voles and short-tailed shrews, but also consume birds, reptiles, and some insects. The red-tailed hawk could potentially feed in any part of the MRS. The forests surrounding the MRS provide ample locations for nesting or perching and access to a variety of habitat areas. The red-tailed hawk is expected to occupy all areas of the MRS with a complete exposure pathway to surface soil/sediment. Within this SLERA, the red-tailed hawk was evaluated assuming bioaccumulation of COIs into prey items (small mammals) from surface soil/sediment and incidental ingestion of substrate.

2.9 Assessment and Measurement Endpoints

An assessment endpoint is an explicit expression of the environmental value that is to be protected. Because of the nature of potential contaminants and the receptors of concern (macroinvertebrates, birds, and mammals), general assessment endpoints of maintenance of the upland, terrestrial community (MRS) and nearby aquatic and semi-aquatic communities (Shaw Brook and wetlands) composition are selected.

Measurement endpoints are the measurable ecological characteristics that are related to the assessment endpoints. Measurement endpoints were selected based on their direct relationship to the maintenance of the respective receptor populations. Hence, potential adverse effects on survival, reproduction, and growth are selected as the measurement endpoints. The assessment endpoint(s) and their associated measurement endpoint for the representative receptors are shown below in **Table 2-3**.

Table 2-3. Assessment and Measurement Endpoints

Assessment Endpoint(s)	Measurement Endpoint
Macroinvertebrate Community	
Survival, growth, and reproduction of the soil macroinvertebrate community.	Comparison of COI concentrations in soil to ecotoxicity benchmarks for soil macroinvertebrates.
Survival, growth, and reproduction of the benthic macroinvertebrate community.	Comparison of COI concentrations in sediment and surface water to ecotoxicity benchmarks for benthic macroinvertebrates.
Avian Community	
Survival, growth, and reproduction of the avian invertivore community.	Comparison of modeled daily doses to a toxicity reference value (TRV).
Survival, growth, and reproduction of the avian carnivore community.	Comparison of modeled daily dose to a TRV.
Mammalian Community	
Survival, growth, and reproduction of the mammalian invertivore community.	Comparison of modeled daily doses to a TRV.
Survival, growth, and reproduction of the mammalian carnivore community.	Comparison of modeled daily doses to a TRV.

2.10 Ecological Screening Benchmarks

The concentrations of COIs were compared to their respective chronic ESVs to identify direct contact COPECs and COIs requiring further wildlife-based dose rate modeling. The screening-level effects evaluation establishes constituent exposure concentrations that represent thresholds for adverse effects. Values representing no observed effect concentrations (NOECs) and no observed adverse effects levels (NOAELs) used as ESVs are presented in **Table 2-4**.

- NYSDEC (2006) and (2014) were reviewed prior to ESV selection for soil and sediment, respectively. The sediment ESVs presented below corresponded to the NYSDEC (2014) ESVs for copper, lead, and zinc when rounded to two significant digits (no antimony sediment ESV). Soil ESVs selected from USEPA (2008) were retained because some COIs (copper and zinc) were developed after the release of the NYSDEC (2006) guidance or were not considered representative of the ecological receptors being evaluated within this SLERA (NYSDEC [2006] uses plants to derive lead's soil benchmark).

Table 2-4. Ecological Screening Values

COI	Soil ESVs (mg/kg)				Sediment ESVs (mg/kg)			
	DC		WL		DC		WL	
Antimony	78	(a)	0.27	(a)	2	(b)	45	(c)
Copper	80	(a)	28	(a)	31.6	(b)	23	(c)
Lead	1,700	(a)	11	(a)	35.8	(b)	26	(c)
Zinc	120	(a)	46	(a)	121	(b)	63	(c)

Notes:

COI = Constituent of Interest; DC = Direct Contact (soil/benthic invertebrate ESV); ESV = Ecological Screening Value; mg/kg = milligram per kilogram; WL = Wildlife (minimum of mammalian and avian ESVs)

(a) USEPA, 2008. Ecological Soil Screening Level (Eco-SSL) Guidance and Documents. Published and revised from 2003-2008. https://www.epa.gov/risk/ecological-soil-screening-level-eco-ssl-guidance-and-documents

(b) USEPA, 2006. Biological Technical Assistance Group (BTAG) Freshwater Screening Values. USEPA Region 3. https://www.epa.gov/risk/biological-technical-assistance-group-btag-screening-values

(c) Los Alamos National Laboratory, 2017. ECORISK Database Release 4.1 (September 2017). Minimum ESLs Reported for Birds and Mammals.

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3 Step 2: Screening Level Exposure Estimate and Risk Calculation

This section describes the methodology used to conduct screening-level exposure estimates and risk calculations for selected receptor categories, consistent with SLERA Step 2 of ERAGS (USEPA, 1997). This phase of the SLERA uses the results of the screening-level problem formulation and ecological effects evaluation in Step 1 to estimate exposure and characterize risk. This section:

- Identifies exposure areas
- Describes the data used to characterize ecological exposure
- Presents the screening level exposure estimates
- Describes the screening level calculation and risk characterization process
- Specifies the criteria for COPEC selection
- Presents the SMDP

3.1 Exposure Areas

The exposure area is a location within which an exposed ecological receptor can reasonably be assumed to move about and where contact with an environmental medium is equally possible at all points within the exposure area. All soil DUs were each treated as separate exposure areas because impacts of historical range activities are isolated to each DU or the DU exhibits unique characteristics (e.g., surface water/sediment present) within the MRS. **Figure 2-1** identifies the exposure areas considered in the SLERA.

3.2 Data Used to Characterize Ecological Exposure

The surface soil and sediment data used in this SLERA were collected in Summer 2020 to and are representative of the nature and extent of the COIs related to former range activity. **Attachment A** presents the data used to evaluate potential ecological receptors. Quality assurance/quality control procedures per the RI UFP-QAPP were used to assess the precision and accuracy of analytical data (i.e., metals).

For surface soil, incremental samples were collected from three DUs (100-Yard Firing Berm, Target Area, and Target Berm Hillside DUs) and analyzed in triplicate to provide representative EPCs. Procedures used to collect ISM surface soil samples (0 to 6 in bgs) are discussed in within the RI. Biased, discrete subsurface soil samples were also collected for the purposes of vertical source delineation. Additionally, ISM surface soil samples were collected in triplicate from a background reference area at the western MRS boundary that was not affected by historical training activities. The area sampled was representative of undisturbed media and of an appropriate size to adequately characterize background concentrations. Background samples are presented for general comparison and not used during SLERA Step 2 to reach a SMDP. Discrete sediment samples were collected in even increments at the Target Berm Ponded and Wet Meadow

DUs. Sediment samples were collected from the 0-to 6-in surface sediment horizon. Surface water samples were not collected during the RI field investigation due to very shallow conditions.

Based on guidance provided by the Interstate Technology and Regulatory Council (ITRC, 2012) for the ISM, upper confidence limits (UCLs) for the surface soil datasets were used to screen data and provide a conservative estimate on the true mean. UCLs were calculated using ITRC's UCL calculator for ISM (set at a confidence interval of 95 percent [%]). Per the UFP-QAPP, only ISM samples were used to evaluate potential ecological risks within surface soil. Maximum detected concentrations for the discrete sediment samples were used to evaluate impacts within the Target Berm Ponded and Wet Meadow DUs.

3.3 Screening Level Exposure Estimate

The preliminary exposure estimate presents the most conservative exposure scenario based on the most conservative exposure assumptions. For surface soil, UCLs as described above were used to evaluate exposure since the 95% UCL will always be higher than the maximum detection for an ISM sample collected in triplicate (ITRC, 2012). Therefore, the 95% UCL, rather than the maximum detected concentration, is the surface soil EPC considered in the SLERA. Maximum detected concentrations were retained as the EPCs for sediment. These conservative EPCs are protective of wildlife with small home ranges and sedentary organisms (e.g., earthworms and benthic macroinvertebrates).

Preliminary exposure assumptions are presented below for each receptor category:

- Direct Contact Evaluation (Soil Macroinvertebrates)
    - A direct contact evaluation compares 95% UCL COI concentrations measured in surface soil to conservative direct contact ESVs known to be protective of soil macroinvertebrates.
- Direct Contact Evaluation (Benthic Macroinvertebrates)
    - A direct contact evaluation compares maximum detected COI concentrations measured in sediment to conservative direct contact ESVs known to be protective of benthic macroinvertebrates.
- Preliminary Wildlife Screening (Birds and Mammals)
    - For both avian and mammalian terrestrial receptors, 95% UCL COI concentrations in surface soil were compared to ESVs protective of wildlife. Exceedances of ESVs protective of wildlife require additional modeling to estimate the potential risk for each wildlife receptor.
    - For both avian and mammalian aquatic and semi-aquatic receptors, maximum detected COI concentrations in sediment and surface water were compared to ESVs protective of wildlife (based on direct exposure/bioaccumulative effects and dietary ingestion only, respectively). Exceedances of ESVs protective of wildlife require additional modeling to estimate the potential risk for each wildlife receptor.
- Dose Rate Modeling (Birds and Mammals)
    - A dose rate model (DRM) was used to generate a total estimated daily dose (EDD_{total}) of each COI experienced by each selected receptor. EDD_{total} was compared against a TRV to assess the potential for ecological risk. EDD_{total} consists of the sum of doses obtained from diet (EDD_{diet}) and the incidental ingestion of the

substrate, i.e., soil or sediment ($EDD_{substrate}$). The contribution of surface water was considered negligible with prey items consisting of each receptors' primary source of dietary water.

- Dietary composition for wildlife receptors was assumed to consist of 100% of the most contaminated prey item. Wildlife DRMs based on 95% UCL (surface soil) and maximum detected (sediment) COI concentrations assumed an area use factor (AUF) of 100%; this represents the worst-case exposure scenario for wildlife and assumes that receptors continuously forage at the 95% UCL or maximum detected COI concentration.
- EDD_{total} for each constituent was compared to conservative TRVs for that constituent. TRVs constitute threshold effects concentrations derived from published toxicity test data. Two TRVs were used including the NOAEL and the Lowest Observed Adverse Effect Level (LOAEL). The NOAEL and LOAEL are daily dose levels normalized to the body weight of the test animals, e.g., milligrams of chemical per kilogram of body weight per day (mg/kg, bw-day). Within a single study and endpoint (e.g., growth or reproduction), the NOAEL represents the highest tested concentration that did not result in the adverse effect, and the LOAEL represents the lowest tested concentration that did result in the adverse effect. Of these TRVs, the NOAEL is the conservative estimate of a safe exposure level, and the LOAEL is a more realistic estimate of exposures that may pose a risk to the receptor.
- Additional details of DRMs and wildlife TRVs used in the SLERA are presented in **Attachment B**.

3.4 Screening Level Risk Calculations and Risk Characterization

Potential risks associated with the ecological exposure estimates are expressed as a hazard quotient (HQ), which represents the ratio of the EPC to the ESV for direct contact pathways or the calculated EDD to the TRV for wildlife ingestion pathways.

Based on the magnitude of the HQs, potential risks may be interpreted as follows:

- A HQ less than 1 based on a NOEC or NOAEL indicates that potential risk is not expected because the estimated exposure has not been demonstrated to cause adverse ecological effects (USEPA, 1997) and
- A HQ greater than or equal to 1 based on a NOEC or NOAEL indicates some potential for risk and further refinements should be made to reduce uncertainty.

This decision criterion reflects the abundance of caution adopted for the SLERA evaluation. LOAEL-based TRVs are provided in **Attachment B** for reference in SLERA Step 2 but are not used for interpreting risk characterization results until BERA Step 3a.

The preliminary exposure estimate results for all receptors are summarized below. **Table 3-1** presents the direct contact evaluation and preliminary wildlife screening of surface soil and sediment. **Table 3-2** summarizes the DRM results for surface soil and sediment COIs exceeding wildlife screening values for all relevant receptors. Full DRM results, explanation of model parameters, and wildlife TRVs can be found in **Attachment B, Tables 1 through 12**.

Based on the evaluation of 95% UCL COI concentrations in surface soil, the following COPECs were identified within the MRS:

- 100-Yard Firing Berm DU
    - No COPECs were identified for soil macroinvertebrates
    - COPECs for terrestrial wildlife
        - Lead (American robin HQ = 3)
- Target Area DU
    - No COPECs were identified for soil macroinvertebrates
    - COPECs for terrestrial wildlife
        - Lead (short-tailed shrew and American robin HQ = 1 and 5, respectively)
- Target Berm Hillside DU
    - COPECs for soil macroinvertebrates
        - Zinc (HQ = 1)
    - COPECs for terrestrial wildlife
        - Antimony (short-tailed shrew HQ = 2)
        - Lead (red-tailed hawk, short-tailed shrew, and American robin HQ = 1, 3, and 11, respectively)
        - Zinc (American robin HQ = 1)

Based on the evaluation of maximum detected COI concentrations in sediment the following COPECs were identified within and near the MRS:

- Target Berm Ponded DU
    - COPECs for benthic macroinvertebrates
        - Antimony (HQ = 10)
        - Copper (HQ = 4)
        - Lead (HQ = 78)
        - Zinc (HQ = 3)

Table 3-1. Direct Contact Evaluation and Preliminary Wildlife Screening

COI	**Detect Frequency**	**Min. Detect**	**Max. Detect**	**Location of Max. Detect**	**Range of BKG$^{(1)}$**	**EPC**		**ESV$^{(2)}$**		**Direct Contact**		**Proceed to Wildlife DRM?**
						Value	Type	DC	WL	HQ	COPEC	
Surface Soil (mg/kg)												
100 Yard Firing Berm DU												
Antimony	3/3	0.19	0.285	COR01IS02	0.13 – 0.14	0.35	UCL	78	0.27	0.004	No	**Yes**
Copper	3/3	28.7	30.8	COR01IS01	16 – 19.1	32.33	UCL	80	28	0.4	No	**Yes**
Lead	3/3	38.5	63	COR01IS02	21 – 28.1	84.33	UCL	1,700	11	0.05	No	**Yes**
Zinc	3/3	93.3	96.3	COR01IS02	86.1 – 97.8	99.02	UCL	120	46	0.8	No	**Yes**
Target Area DU												
Antimony	3/3	0.293	0.327	COR02IS02	0.13 – 0.14	0.35	UCL	78	0.27	0.004	No	**Yes**
Copper	3/3	31.9	39.9	COR02IS03	16 – 19.1	45.74	UCL	80	28	0.6	No	**Yes**
Lead	3/3	72.1	98.7	COR02IS02	21 – 28.1	118.23	UCL	1,700	11	0.07	No	**Yes**
Zinc	3/3	91.3	98.3	COR02IS03	86.1 – 97.8	103.38	UCL	120	46	0.9	No	**Yes**
Target Berm Hillside DU												
Antimony	3/3	0.425	0.725	COR03IS02	0.13 – 0.14	0.96	UCL	78	0.27	0.01	No	**Yes**
Copper	3/3	24.9	41.4	COR03IS02	16 – 19.1	55.27	UCL	80	28	0.7	No	**Yes**
Lead	3/3	164	248	COR03IS03	21 – 28.1	309.74	UCL	1,700	11	0.2	No	**Yes**
Zinc	3/3	82.5	119	COR03IS01	86.1 – 97.8	146.97	UCL	120	46	**1**	**Yes**	**Yes**
Sediment (mg/kg)												
Target Berm Ponded DU												
Antimony	9/9	1.53	19.8	COR05SED07A	N/A	19.8	MDC	2	45	**10**	**Yes**	No
Copper	9/9	20	124	COR05SED07A	N/A	124	MDC	31.6	23	**4**	**Yes**	**Yes**
Lead	9/9	109	2780	COR05SED07A	N/A	2780	MDC	35.8	26	**78**	**Yes**	**Yes**
Zinc	9/9	61.8	348	COR05SED08A	N/A	348	MDC	121	63	**3**	**Yes**	**Yes**
Wet Meadow DU												
Antimony	9/9	0.14	1.7	COR06SED04A	N/A	1.7	MDC	2	45	0.9	No	No
Copper	9/9	7.67	41.3	COR06SED02B	N/A	41.3	MDC	31.6	23	**1**	**Yes**	**Yes**
Lead	9/9	25.5	154	COR06SED04A	N/A	154	MDC	35.8	26	**4**	**Yes**	**Yes**
Zinc	9/9	36.3	211	COR06SED05A	N/A	211	MDC	121	63	**2**	**Yes**	**Yes**

Notes:
BKG = Background; COI = Constituent of Interest; COPEC = Constituent of Potential Ecological Concern; DC = Direct Contact; DRM = Dose Rate Model; DU = Decision Unit; EPC = Exposure Point Concentration; HQ = Hazard Quotient; Max. = Maximum; MDC = Maximum Detected Concentration; mg/kg = milligram per kilogram; Min. = Minimum; N/A = Not Applicable; UCL = Upper Confidence Limit (Chebyshev 95%); WL = Wildlife; (1) Background samples are shown for reference and are not used in COPEC selection; (2) Sources for ESVs are presented in **Table 2-4**.

Table 3-2. Wildlife Dose Rate Model Summary

COI	Surface Soil EPC (mg/kg)	Sediment EPC (mg/kg)	Modeled TP Conc. (mg/kg-dw)	Modeled SI Conc. (mg/kg-dw)	Modeled BI Conc. (mg/kg-dw)	Modeled SM Conc. (mg/kg-dw)	NOAEL HQ			
							AR	RTH	STS	RF
Terrestrial Exposure										
100 Yard Firing Berm DU										
Antimony	0.35	--	0.015	0.35	--	0.00074	(a)	(a)	<1	<1
Copper	32.33	--	7.7	13.4	--	15.2	<1	<1	<1	<1
Lead	84.33	--	3.2	29	--	5.4	**3**	<1	<1	<1
Zinc	99.02	--	61.9	386	--	129	<1	<1	<1	<1
Target Area DU										
Antimony	0.35	--	0.015	0.35	--	0.00074	(a)	(a)	<1	<1
Copper	45.74	--	8.8	14.6	--	16.2	<1	<1	<1	<1
Lead	118.23	--	3.9	38	--	6.4	**5**	<1	**1**	<1
Zinc	103.38	--	63.4	392	--	129	<1	<1	<1	<1
Target Berm Hillside DU										
Antimony	0.96	--	0.038	0.96	--	0.00190	(a)	(a)	**2**	<1
Copper	55.27	--	9.5	15.4	--	16.8	<1	<1	<1	<1
Lead	309.74	--	6.6	82	--	10.6	**11**	**1**	**3**	<1
Zinc	146.97	--	77.1	440	--	135	**1**	<1	<1	<1
Aquatic and Semi-Aquatic Exposure										
Target Berm Ponded DU										
Copper	--	124	--	--	149	19.4	**6**	<1	**4**	<1
Lead	--	2780	--	--	183.5	33.0	**43**	**9**	**8**	<1
Zinc	--	348	--	--	351	151.8	<1	<1	<1	<1
Wet Meadow DU										
Copper	--	41.3	--	--	110	15.9	**4**	<1	**3**	<1
Lead	--	154	--	--	10.2	7.4	**2**	<1	<1	<1
Zinc	--	211	--	--	330	142.1	<1	<1	<1	<1

Notes:
Bold indicates an exceedance of wildlife TRV; -- = Not Evaluated; AR = American Robin; BI = Benthic Invertebrate; COI = Constituent of Interest; Conc. = Concentration; DU = Decision Unit; dw= dry weight; EPC = Exposure Point Concentration; HQ = Hazard Quotient; mg/kg = milligram per kilogram; NOAEL = No Observed Adverse Effects Level; RF = Red Fox; RTH = Red-Tailed Hawk; SI = Soil Invertebrate; SM = Small Mammal; STS = Short-Tailed Shrew; TP = Terrestrial Plant; (a) As indicated in USEPA (2007), insufficient data to derive a TRV for avian receptors.

  - COPECs for aquatic and semi-aquatic wildlife
    - Copper (short-tailed shrew and American robin HQ = 4 and 6, respectively)
    - Lead (red-tailed hawk, short-tailed shrew, and American robin HQ = 9, 8, and 43, respectively)
- Wet Meadow DU
  - COPECs for benthic macroinvertebrates
    - Copper (HQ = 1)
    - Lead (HQ = 4)
    - Zinc (HQ = 2)
  - COPECs for aquatic and semi-aquatic wildlife
    - Copper (short-tailed shrew and American robin HQ = 3 and 4, respectively)
    - Lead (American robin HQ = 2)

3.5 Scientific Management Decision Point

The SMDP is a determination made at the culmination of the SLERA process that states whether there is sufficient information to make a decision regarding risk management strategies (USEPA, 1997). The SMDP rendered at the end of the preliminary risk calculation does not set a clean-up goal. As stated in USEPA (1997), one of the following conclusions is reached after Step 2:

- There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk;
- The information is not adequate to a make a decision at this point and the ecological risk assessment will continue to Step 3; or
- The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted.

Based on the results of the direct contact evaluation and wildlife DRMs, the following SMDPs have been reached:

- The information is not adequate to a make a decision at this point and the ecological risk assessment continued to Step 3.
  - Surface soil – results of the direct contact evaluation and wildlife DRMs have indicated potential adverse effects for soil macroinvertebrates (Target Berm Hillside DU) and wildlife (100-Yard Firing Berm, Target Area, and Target Berm Hillside DUs).
  - Sediment – results of the direct contact evaluation and wildlife DRMs have indicated potential adverse effects for benthic macroinvertebrates and wildlife at both the Target Berm Ponded and Wet Meadow DUs.
  - **Table 3-3** includes a summary of COPECs retained for the Step 3a COPEC Refinement within the BERA.

Table 3-3. COPECs Retained for BERA Step 3a

100 Yard Firing Berm DU (Surface Soil)		Target Area DU (Surface Soil)		Target Berm Hillside DU (Surface Soil)		Target Berm Ponded DU (Sediment)		Wet Meadow DU (Sediment)	
Direct Contact (Table 3-1)	**Terrestrial Wildlfie (Table 3-2)**	**Direct Contact (Table 3-1)**	**Terrestrial Wildlfie (Table 3-2)**	**Direct Contact (Table 3-1)**	**Terrestrial Wildlfie (Table 3-2)**	**Direct Contact (Table 3-1)**	**Aquatic and Semi-Aquatic Wildlife (Table 3-2)**	**Direct Contact (Table 3-1)**	**Aquatic and Semi-Aquatic Wildlife (Table 3-2)**
No direct contact COPECs identified	American robin (lead)	No direct contact COPECs identified	American robin (lead) Short-tailed shrew (lead)	Zinc	American robin (lead and zinc) Red-tailed hawk (lead) Short-tailed shrew (antimony and lead)	Antimony Copper Lead Zinc	American robin (copper and lead) Red-tailed hawk (lead) Short-tailed shrew (copper and lead)	Copper Lead Zinc	American robin (copper and lead) Short-tailed shrew (copper)

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4 Step 3a: Constituents of Potential Ecological Concern Refinement

SLERA Steps 1 and 2 were used to select COPECs and evaluate ecological risk under a conservative, "worst-case" scenario. SLERA Steps 1 and 2 were also used to identify which constituents can be eliminated from further consideration and those that should be evaluated further.

Because of the conservative assumptions used during SLERA Steps 1 and 2, some of the COPECs retained for BERA Step 3a COPEC refinement might pose negligible risk. Step 3a represents a sub-tier of Step 3 and is designed to refine the list of COPECs by considering additional factors. By conducting a refined exposure evaluation, Step 3a can reduce the list of COPECs and determine if there are COPECs that truly warrant further evaluation with a BERA and/or remediation. Furthermore, BERA Step 3a can focus on the potential risk drivers and portions of the MRS where the likelihood of adverse ecological effects is greatest.

4.1 Step 3a COPEC Refinement Approach

The BERA Step 3a refinements are discussed below:

- Refined direct contact evaluation for soil macroinvertebrates
    - Refined ESVs
        - The ESVs for zinc was refined to represent a lowest observed effect concentration (LOEC). Los Alamos National Laboratory's (LANL) ecotoxicity database was queried for LOEC-based screening levels applicable to soil macroinvertebrates (LANL, 2017). A refined ESV of 930 mg/kg, established for earthworms, was selected to further evaluate direct contact with zinc in soil during BERA Step 3a.
- Refined direct contact evaluation for benthic macroinvertebrates
    - Refined sediment EPC
        - For all COPECs, a 95% UCL was calculated with ProUCL 5.1 (USEPA, 2016). The ProUCL output is included with **Attachment C**. Prior to calculating UCLs, field duplicates were averaged with their primary sample to determine a representative concentration for that location.
        - Refined EPCs of 10.6, 77.18, 1,983, 304.6 mg/kg were selected to evaluate impact of antimony, copper, lead, and zinc on benthic macroinvertebrates within sediment of the Target Berm Ponded DU, respectively, during BERA Step 3a.
        - Refined EPCs of 0.958, 31.7, 115.3, 157.3 mg/kg were selected to evaluate impact of antimony, copper, lead, and zinc on benthic macroinvertebrates within sediment of the Wet Meadow DU, respectively, during BERA Step 3a.

  - Refined ESVs
    - The ESVs for antimony, copper, lead, and zinc were refined to represent a LOEC. A refined screening value (RSV) representing a probable effect concentration was selected from USEPA (2018) for antimony, copper, lead, and zinc in sediment. These RSVs represents a level above which adverse effects are frequently observed. RSVs of 25, 149, 128, and 459 mg/kg were selected to evaluate direct contact with antimony, copper, lead, and zinc in sediment, respectively, during BERA Step 3a.
- Refined DRMs for birds and mammals
  - Refined EPC
    - The same procedure outlined for the sediment direct contact evaluation was retained to determine refined EPCs for copper and lead in sediment.
    - The EPCs used during Step 2 of the terrestrial DRMs were retained during Step 3a for all soil DUs.
    - Refined EPCs of 77.18 and 1,983 mg/kg were selected to evaluate the impact of copper and lead, respectively, on aquatic and semi-aquatic wildlife within the Target Berm Ponded DU, respectively, during BERA Step 3a.
    - Refined EPCs of 31.7 and 115.3 mg/kg were selected to evaluate the impact of copper and lead, respectively, on aquatic and semi-aquatic wildlife within the Wet Meadow DU, respectively, during BERA Step 3a.
  - Selection of LOAEL-based TRVs
    - During the selection of wildlife TRVs within the SLERA, preference was given to the most conservative NOAEL TRV. NOAEL-based TRVs were used to protect wildlife species at the individual level. This may be appropriate to protect T&E species where the loss of one individual may have an adverse effect on the survival of the population. However, the conservative use of NOAEL-based TRVs may overestimate risk to populations of non-endangered species.
    - For BERA Step 3a, refinements were made to include a LOAEL TRV based on representative effects, primarily growth and reproduction. LOAEL TRVs represent the lowest observed concentration at which measurable effects within an endpoint (i.e. growth or reproduction) would be expected for an individual receptor. LOAEL–based TRVs were used in Step 3, in conjunction with the NOAEL-based TRVs, to establish a range of risk for ecological resources for consideration by risk managers in making risk management decisions for the site.

Refined wildlife receptor profiles, aquatic bioaccumulation models, and wildlife dose rate models are included in **Attachment B, Tables 13 through 16**. Terrestrial bioaccumulation models and estimated tissue EPCs presented in **Attachment B, Tables 2 through 4** are still applicable since no change in the surface soil EPCs or bioaccumulation factors occurred between SLERA Step 2 and BERA Step 3a. Although not used during SLERA Step 2 risk characterization or SMDP selection, LOAEL TRVs were presented in **Attachment B, Table 7**. Additionally, since the DRMs used during Step 2 included LOAEL HQs, the Step 2 terrestrial DRMs presented in **Attachment B, Tables 8 through 10** are still applicable for use within BERA Step 3a. Therefore, the only BERA Step 3a DRM refinement tables included in **Attachment B, Tables 13 through 16** are for aquatic and semi-aquatic exposure.

4.2 Refined Risk Calculations and Risk Characterization

The refined exposure estimates represent a more realistic exposure scenario based on the comparisons of refined COPEC EPCs to refined direct contact ESVs, DRM assumptions, and wildlife TRVs. A refined characterization of potential risks is presented below based on these exposure assumptions to focus the list of COPECs and exposure pathways that may warrant further evaluation.

Results of the refined direct contact evaluation and refined wildlife DRMs are summarized in **Tables 4-1 and 4-2** and discussed below**.**

Based on the evaluation of 95% UCL COPEC concentrations in surface soil, the following refined COPECs were retained during BERA Step 3a:

- 100-Yard Firing Berm DU
    - Soil macroinvertebrates did not require further evaluation during BERA Step 3a
    - No refined COPECs identified for terrestrial wildlife during BERA Step 3a
        - NOAEL HQs are the same as reported during SLERA Step 2
        - No LOAEL HQs > 1
- Target Area DU
    - Soil macroinvertebrates did not require further evaluation during BERA Step 3a
    - No refined COPECs identified for terrestrial wildlife during BERA Step 3a
        - NOAEL HQs are the same as reported during SLERA Step 2
        - No LOAEL HQs > 1
- Target Berm Hillside DU
    - No refined COPECs identified for soil macroinvertebrates during BERA Step 3a
        - No refined HQ > 1
    - No refined COPECs identified for terrestrial wildlife during BERA Step 3a
        - NOAEL HQs are the same as reported during SLERA Step 2
        - No LOAEL HQs > 1

Table 4-1. Refined Direct Contact Evaluation

COPEC	Detection Frequency (1)	Refined EPC	RSV	Source	Refined HQ
Target Berm Hillside DU – Surface Soil (mg/kg)					
Zinc	3/3	146.97	930	LANL (2017)	<1
Target Berm Ponded DU – Sediment (mg/kg)					
Antimony	8/8	10.6	25	USEPA (2018)	<1
Copper	8/8	77.18	149	USEPA (2018)	<1
Lead	8/8	1,983	128	USEPA (2018)	**15**
Zinc	8/8	304.6	459	USEPA (2018)	<1
Wet Meadow DU – Sediment (mg/kg)					
Antimony	8/8	0.958	25	USEPA (2018)	<1
Copper	8/8	31.7	149	USEPA (2018)	<1
Lead	8/8	115.3	128	USEPA (2018)	<1
Zinc	8/8	157.3	459	USEPA (2018)	<1

Notes:

COPEC = Constituent of Potential Ecological Concern; HQ = Hazard Quotient; LANL = Los Alamos National Laboratory; LOEC = Lowest Observed Effect Concentration; mg/kg = milligram per kilogram; RSV = Refined Screening Value (LOEC); USEPA = United States Environmental Protection Agency

(1) Detection frequency for sediment accounts for primary and field duplicate samples being combined prior to UCL calculation.

Table 4-2. Refined Wildlife Dose Rate Model Summary

COPEC	Surface Soil Refined EPC (mg/kg)	Sediment Refined EPC (mg/kg)	Modeled TP Conc. (mg/kg-dw)	Modeled SI Conc. (mg/kg-dw)	Modeled BI Conc. (mg/kg-dw)	Modeled SM Conc. (mg/kg-dw)	NOAEL/LOAEL HQ			
							AR	RTH	STS	RF
Terrestrial Exposure										
100 Yard Firing Berm DU										
Lead	84.33	--	3.2	29	--	5.4	**3**/<1	--	--	--
Target Area DU										
Lead	118.23	--	3.9	38	--	6.4	**5**/<1	--	**1**/<1	--
Target Berm Hillside DU										
Antimony	0.96	--	0.038	0.96	--	0.00190	(a)	(a)	**2**/<1	--
Lead	309.74	--	6.6	82	--	10.6	**11**/<1	**1**/<1	**3**/<1	--
Zinc	146.97	--	77.1	440	--	135	**1**/<1	--	--	--
Aquatic and Semi-Aquatic Exposure										
Target Berm Ponded DU										
Copper	--	77.18	--	--	130	17.8	**5**/<1	--	**3**/<1	--

COPEC	Surface Soil Refined EPC (mg/kg)	Sediment Refined EPC (mg/kg)	Modeled TP Conc. (mg/kg-dw)	Modeled SI Conc. (mg/kg-dw)	Modeled BI Conc. (mg/kg-dw)	Modeled SM Conc. (mg/kg-dw)	NOAEL/LOAEL HQ			
							AR	RTH	STS	RF
Lead	--	1,983	--	--	130.9	27.7	**31/1**	**7**/<1	**5**/<1	--
Wet Meadow DU										
Copper	--	31.7	--	--	102	15.2	**4**/<1	--	**2**/<1	--
Lead	--	115.3	--	--	7.6	6.3	**2**/<1	--	--	--

Notes:

Bold indicates an exceedance of wildlife TRV; -- = Not Evaluated; AR = American Robin; BI = Benthic Invertebrate; COI = Constituent of Interest; Conc. = Concentration; DU = Decision Unit; dw= dry weight; EPC = Exposure Point Concentration; HQ = Hazard Quotient; mg/kg = milligram per kilogram; LOAEL = Lowest Observed Adverse Effects Level; NOAEL = No Observed Adverse Effects Level; RF = Red Fox; RTH = Red-Tailed Hawk; SI = Soil Invertebrate; SM = Small Mammal; STS = Short-Tailed Shrew; TP = Terrestrial Plant; (a) As indicated in USEPA (2007), insufficient data to derive a TRV for avian receptors**.**

Based on the evaluation of 95% UCL COPEC concentrations in sediment the following refined COPECs were retained during BERA Step 3a:

- Target Berm Ponded DU
    - The following refined COPECs were identified for benthic macroinvertebrates during BERA Step 3a
        - Lead (Refined HQ = 15, exceedances of refined ESV at all but one sample location)
    - No refined COPECs identified for aquatic and semi-aquatic wildlife during BERA Step 3a
        - Although refined NOAEL HQs for American robin (copper and lead), red-tailed hawk (lead), and short-tailed shrew (copper and lead) > 1, no LOAEL HQs > 1.
- Wet Meadow DU
    - No refined COPECs identified for benthic macroinvertebrates during BERA Step 3a
        - No refined HQs > 1
    - No refined COPECs identified for aquatic and semi-aquatic wildlife during BERA Step 3a
        - Although refined NOAEL HQs for American robin (copper and lead) and short-tailed shrew (copper) > 1, no LOAEL HQs > 1

4.3 Step 3a COPEC Refinement Summary

Based on the results of the refined direct contact evaluation and refined wildlife DRMs, the following BERA Step 3a conclusions have been reached:

- Surface soil
    - Within all soil DUs, the refined EPCs in surface soil were below the RSVs for soil macroinvertebrates. Although some NOAEL HQs exceeded 1 for wildlife receptors, LOAEL HQs for the American robin, short-tailed shrew, and red-shouldered hawk did not exceed 1 in any soil DU.
    - As discussed in **Section 4.1**, the conservative use of NOAEL TRVs may overestimate risk to populations of non-endangered species. Within both soil DUs, no T&E species (birds and mammals) have been noted to occur based on available habitat within the MRS. The lack of LOAEL TRV exceedances indicates that measurable, adverse effects are unlikely to occur for an individual receptor.
    - Based on the summary above, adverse, population-level impacts to terrestrial wildlife and soil macroinvertebrates are unlikely to occur at either the 100 Yard Firing Berm, Target Area, and Target Berm Hillside DUs.

- Sediment
    - The refined EPC for lead in sediment exceeded the RSV for benthic macroinvertebrates at the Target Berm Ponded DU. The RSV was exceeded in all but one sample location.
    - As discussed in **Section 4.1**, the conservative use of NOAEL TRVs may overestimate risk to populations of non-endangered species. Within the Wetland Area DU, no T&E species (birds and mammals) have been noted to occur based on available habitat within the MRS. The lack of LOAEL TRV exceedances indicates that measurable, adverse effects are unlikely to occur for an individual receptor.
    - Based on the summary above, adverse, population-level impacts to aquatic and semi-aquatic wildlife are unlikely. However, repeated exceedances of the refined ESV for lead indicate that adverse effects may occur for benthic macroinvertebrates within the Target Berm Ponded DU.

The results of the Step 3a COPEC Refinement (presented above) and will be used with the Uncertainty Analysis (see **Section 5**) to reach a final SMDP. The final SMDP and further recommendations (if applicable) will be presented in **Section 6**.

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5 Uncertainty Analysis

An uncertainty analysis was performed to identify assumptions and procedures that may result in uncertainty in the estimation of exposure or the characterization of risk. Uncertainty in the SLERA is assessed with respect to the following:

- Effects and exposure assessment and
- Risk characterization.

Assumptions and other factors that tend to overestimate, underestimate, or have an unknown effect on the findings of the primary phases of the SLERA are presented and discussed in the following sections.

5.1 Exposure and Effects Assessment

Sources of uncertainty associated with the effects and exposure assessment made in the SLERA are listed below:

- COI bioavailability
    - Magnitude – minimal (overestimate)
    - Rationale – chemical analyses measured the total levels of the constituents rather than the bioavailable toxic forms. By using total concentrations, this assessment assumes that the entire fraction is bioavailable and toxic. This is likely a very conservative assumption that varies in magnitude from constituent to constituent. It is also likely that, to some degree, constituents adsorb to fine-grained particles and/or complex with organic ligands. Such actions may change the chemical speciation of the constituent to a less toxic form or reduce the concentrations of bioavailable chemicals. Hence, the use of the total concentrations to estimate exposure does not take into account these changes in speciation or reductions in toxicity and, therefore, likely overestimates risk when compared to toxicological benchmarks derived from more bioavailable and toxic forms.
- Evaluation of T&E species
    - Magnitude – low (underestimate)
    - Rationale – within **Section 2.2** federal and state T&E species were reviewed for potential to occur within the MRS based on habitat availability. Although some species exhibit a preference for habitats within or near the MRS (i.e., eastern massasauga), NYSDEC distribution maps did not indicate any isolated populations within the vicinity of the Site. Vegetation within the MRS was noted as abundant and no stressed plants were observed during the RI field activities (AECOM, 2020). However, both federal and state resources indicated that no critical habitats for T&E species were located within the MRS (see **Section 2.1.5**).
- Selection of ESVs
    - Magnitude – minimal (under/overestimate)

  - Rationale – ESVs presented in SLERA Step 2 are selected to identify conditions that are not expected to lead to adverse ecological harm so that COIs can be eliminated from further evaluation due to a lack of potential risks. Therefore, the screening benchmarks are highly conservative (to avoid eliminating a COI that may cause a risk), do not reflect Site-specific conditions, and cannot account for potentially antagonistic or synergistic effects between different compounds. Refinements made during BERA Step 3a were used to minimize uncertainty generated during SLERA Step 2 screening by using LOEC- and LOAEL-based benchmarks when available.

- Groundwater to Surface Water Migration Pathway
  - Magnitude – minimal (underestimate)
  - Rationale – As discussed in **Section 2.4**, the HZ represents the interface of groundwater, sediment, sediment porewater, and surface water. Concentrations of metals measured in filtered porewater samples, rather than in bulk sediment, most accurately represents the dissolved fraction of metals, which is bioavailable and can be incorporated into the tissues of benthic macroinvertebrates (USEPA, 2005). Currently, there is neither groundwater, sediment porewater, or surface water data available to evaluate migration of COIs from source areas within the MRS to the Wet Meadow DU; however, the elevation at the Wet Meadow is considerably higher than the adjacent MRS features, including the majority of the Target Berm Hillside DU. Due to the elevation and local topography, groundwater from COI source areas is not expected to migrate towards the Wet Meadow. Groundwater is anticipated to follow topography and surface water flow is away from the Wet Meadow to the northwest in the direction of other MRS features. The mobility of metals through the vadose zone via dissolution is fairly limited. Additionally, discrete subsurface samples collected for vertical delineation showed that subsurface impacts were not noted beyond 24 in bgs. Additionally, refined benchmarks protective of benthic macroinvertebrates in sediment were not exceeded by refined EPCs of metals in BERA Step 3a. Although a noted uncertainty within this SLERA, based on our current understanding of the MRS, further evaluation of the GW to SW pathway should not be required to remain protective of aquatic and semi-aquatic ecological communities within the Wet Meadow DU.

5.2 Risk Characterization

Sources of uncertainty associated with the risk characterization made in the SLERA are listed below:

- Synergistic and Antagonistic Effects
  - Magnitude – minimal (under/overestimate)
  - Rationale – ecological receptors at the Site may be exposed to more than one contaminant. This raises the possibility that synergistic or antagonistic interactions might occur. However, data are generally not adequate to permit any

quantitative adjustment in toxicity values or risk calculations based on interactions between different compounds. If any of the COPECs act by a similar mode of action, total risks could be higher than estimated. Conversely, if the COPECs act antagonistically, total risks could be lower than estimated.

- Application of HQs
    - Magnitude – minimal (overestimate)
    - Rationale – the application of HQs to quantify potential ecological risk has certain limitations, although the USEPA recommends this approach for the screening-level risk calculation. One of the advantages is that the procedure intentionally overestimates risks to "ensure that potential ecological threats are not overlooked" (USEPA, 1997). However, the HQ method does limit the information obtained because it provides only a single point of comparison for the exposure-response relationship.
- Incomplete Characterization
    - Magnitude – low (under/overestimate)
    - Rationale – Given the use of conservative assumptions regarding exposure (e.g., sampling within locations likely to be impacted) and potential toxicological effects, it is unlikely that the potential for ecological risks from Site-related constituents went undetected in the SLERA process. Conversely, there is some probability for a false positive (that is, overestimating risk when risk is not present).

5.3 Summary of Uncertainty

In general, conservative estimates or assumptions were made for most parameters associated with ecological exposures and effects in SLERA Steps 1 and 2. More realistic refinements were made during BERA Step 3a COPEC refinement to reduce uncertainties in the final conclusions. Therefore, confidence is high that the conclusions regarding the potential for adverse ecological harm are adequately conservative to quantify potential risks to soil macroinvertebrates, benthic macroinvertebrates, birds, and mammals.

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6 Conclusions and SMDP Recommendation

The primary purpose of the SLERA was to identify site related COPECs in surface soil and sediment within and near the MRS and assess the need and the level of effort necessary to perform further evaluation of the current and future site risk. The potential for risks was evaluated by comparing relevant data to conservative ESVs and using conservative DRMs designed to assess potential risks to wildlife receptors. The SMDP based on the results of the completed SLERA (i.e., Steps 1 and 2) indicated that several receptors and COPECs in surface soil and sediment warranted further evaluation in BERA Step 3a COPEC Refinement.

BERA Step 3a represents a sub-tier of Step 3 and is designed to refine the list of COPECs identified in the conservative evaluation conducted in Steps 1 and 2 by considering additional site-specific factors. Only COPECs, pathways, and receptors retained in Step 3a would be subject to additional evaluation within a full BERA.

The results of the SLERA, BERA Step 3a COPEC Refinement, and consideration of the uncertainties present in the evaluation support the following SMDP for the MRS:

- "There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk" (USEPA, 1997).
    - Negligible Risk
        - Soil macroinvertebrate community
        - Benthic macroinvertebrate community (Wet Meadow DU)
        - Terrestrial wildlife community
        - Aquatic and semi-aquatic wildlife community
        - Groundwater to surface water pathway (see **Section 5.1**)
- "The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted" (USEPA, 1997).
        - Benthic macroinvertebrate community (Target Berm Ponded DU)
- Constituents of Concern (COCs)
    - Lead was identified as a direct contact based COCs in sediment at the Target Berm Ponded DU within the Camp O'Ryan Rifle Range MRS.

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Attachment A

Sample Data Evaluated

Table 1. Incremental Sampling Results Summary

Location:	100-Yard Firing Berm (DU 1)											
Sample ID:	COR01IS01				COR01IS02				COR01IS03			
Sample Depth (inches bgs):	0-6				0-6				0-6			
Date Collected:	7/10/2020				7/10/2020				7/10/2020			
Analyte	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)												
Antimony	0.225	N			0.285				0.19			
Copper	30.8	N			28.7				29.2			
Lead	56.1	NA			63				38.5			
Zinc	93.3				96.3				95.6			

	Target Area (DU 2)											
	COR02IS01				COR02IS02				COR02IS03			
	0-6				0-6				0-6			
	7/10/2020				7/10/2020				7/10/2020			
Analyte	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)												
Antimony	0.293				0.327	N			0.293			
Copper	33.6				31.9	N			39.9			
Lead	82.9				98.7	NEA			72.1			
Zinc	91.3				93.1				98.3			

	Target Berm Hillside (DU 3)											
	COR03IS01				COR03IS02				COR03IS03			
	0-6				0-6				0-6			
	7/10/2020				7/10/2020				7/10/2020			
Analyte	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)												
Antimony	0.425				0.725				0.429	N		
Copper	24.9				41.4				36.0	NA		
Lead	164				179				248	NA		
Zinc	119				82.5				84.5	A		

	Background Reference Area (DU 4)											
	COR04IS01				CORIS0402				COR04IS03			
	0-6				0-6				0-6			
	7/20/2020				7/20/2020				7/20/2020			
Analyte	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**	**Result**	**LQ**	**VQ**	**RC**
Total Metals by USEPA SW-846 Method 6020A (mg/kg)												
Antimony	0.14				0.13				0.13			
Copper	17.0				19.1				16.0			
Lead	28.1				21.1				21.0			
Zinc	86.1				97.8				87.2			

Notes:

mg/kg = milligrams per kilogram
bgs = below ground surface
LQ = Laboratory qualifier (LQ flags available in lab report)
VQ = Validiation qualifier
RC = Reason Code
B = analyte detected in the laboratory method blank
J = estimated
U = non-detect
N = pre-digestion spiked sample recovery is not within limits
A = post-digestion spiked sample recovery is not within control limits
E = reported value is estimated because of the presence of interference (as indicated by serial dilution)
z = preparation/method blank anomaly
f = field duplicate imprecision

Table 2. Discrete Sediment Sampling Results Summary

Sediment Target Berm-Ponded DU 5

Sample ID:	COR05SED01A				COR05SED02A				COR05SED02B				COR05SED03A				COR05SED04A				COR05SED05A				COR05SED06A				COR05SED07A				COR05SED08A			
Decision Unit - XRF Location:	Target Berm - Ponded DU 5																																			
Media:	Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment			
Sample Depth (inches bgs):																																				
Date Collected:	7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020			
Analyte	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC
Total Metals by USEPA SW-846 Method 6020A (mg/kg)																																				
Antimony	2.29				1.53				2.31				6.38				2.47	N			4.94				2.22				19.8				11.2			
Copper	20.0				26.8				33.6				30.0				45.2	A			67.5				32.7				124				80.1			
Lead	109				177				234				918				686	N*A			690				431				2780				412			
Zinc	76.0				176				115				337				301	EA			314				61.8				224				348			

Sediment Wetland Meadow DU 6

	COR06SED01A				COR06SED02A				COR06SED02B				COR06SED03A				COR06SED04A				COR06SED05A				COR06SED06A				COR06SED07A				COR06SED08A			
	Sediment Wetland Meadow DU 6																																			
	Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment				Sediment			
	7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020				7/20/2020			
Analyte	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC	Result	LQ	VQ	RC
Total Metals by USEPA SW-846 Method 6020A (mg/kg)																																				
Antimony	0.14	J			0.8	J			1.2				0.81	J			1.7				0.37				0.38	J			0.17				0.14			
Copper	7.67				35				41.3				34.2				39.6	A			19.6				23.9				8.75				10.4			
Lead	25.5				153				153				119				154	N*A			36.0				73.2				27.0				32.3			
Zinc	36.3				80.4				209				180				111	A			211				120				72.4				60.8			

Notes:

* = Field duplicate
mg/kg = milligrams per kilogram
µg/L = micrograms per liter
bgs = below ground surface
LQ = laboratory qualifier (LQ flag descriptions available in lab report)
VQ = validiation qualifier
RC = reason code
NA = not applicable
U = non-detect
UJ = non-detect; reported DL is approximate and may be inaccurate or imprecise
A = post-digestion spiked sample recovery is not within control limits
B = analyte detected in the laboratory method blank
E = reported value is estimated because of the presence of interference (as indicated by serial dilution)
N = pre-digestion spiked sample recovery is not within control limits
J = estimated
J- = estimated, negative bias
J+ = estimated, positive bias
f = field duplicate imprecision
m = MS/MSD percent recovery anomaly
s = serial dilution anomaly

Attachment B

Dose Rate Models, Toxicity Reference Values, and Step 3a Refinements

Table 1
Life History Parameters and Ingestion Rates
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Representative Species			Home Range (ha)	Home Range Reference	Area Use Factor (AUF)	Body Weight (kg wet weight)	Dietary Composition					Ingestion Rates						
												Food		Water		Substrate		
Common Name	Scientific Name	Food-web classification					Plant Material	Invert.	Small Mammals	Fish	References	kg dry weight/day	Reference	Liters/day	Reference	% of Dry Intake	kg dry weight/day	Reference
Avian Receptors																		
American robin	*Turdus migratorius*	Terrestrial invertivore	0.42	Sample and Suter (1994)	1	0.077		100%			USEPA (1993)	0.012	Nagy (2001) (a)	--	Negligible (b)	10.4%	0.00120	Beyer et al. (1994) (c)
Red-tailed hawk	*Buteo jamaicensis*	Terrestrial carnivore	233	Sample and Suter (1994)	1	1.13			100%		USEPA (1993)	0.090	Nagy (2001) (d)	--	Negligible (b)	5.7%	0.00512	USEPA (2007)
Mammalian Receptors																		
Short-tailed shrew	*Blarina brevicauda*	Terrestrial invertivore	0.39	Sample and Suter (1994)	1	0.015		100%			USEPA (1993)	0.002	Nagy (2001) (f)	--	Negligible (b)	3.0%	0.00006	USEPA (2007)
Red fox	*Vulpes vulpes*	Terrestrial carnivore	407	Sample and Suter (1994)	1	4.5			100%		USEPA (1993)	0.170	Nagy (2001) (g)	--	Negligible (b)	2.8%	0.00477	Beyer et al. (1994)

Notes:

ha = hectare; invert. = invertebrates; kg = kilogram; % = percent; USEPA = United States Environmental Protection Agency

(a) Estimated food ingestion rate (kg/day dry weight) for insectivorous birds = (0.540*[Body Weight in kg*1000]^0.705)/1000

(b) For terrestrial receptors, the contribution of surface water was considered negligible with prey items consisting of each receptors primary source of dietary water.

(c) Estimated based on a soil consumption rate of woodcock of 10.4% (Beyer et al., 1994).

(d) Estimated food ingestion rate (kg/day dry weight) for carnivorous birds = (0.849*[Body Weight in kg*1000]^0.663)/1000

(e) For aquatic and semi-aquatic receptors, ingestion rate of surface water from the site (if available) was modeled based on the following equations developed by Caulder and Braun (1983) and as presented in Sample and Suter (1994):

Water ingestion rate (L/day) for birds = 0.059*(Body Weight in kg)^0.67

Water ingestion rate (L/day) for mammals = 0.099*(Body Weight in kg)^0.90

(f) Estimated food ingestion rate (kg/day dry weight) for mammalian insectivores = (0.373*[Body Weight in kg*1000]^0.622)/1000

(g) Estimated food ingestion rate (kg/day dry weight) for mammalian carnivores = (0.153*[Body Weight in kg*1000]^0.834)/1000

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Table 2
Soil Bioaccumulation Factors and Estimated Concentrations in Prey Items (100 Yard Firing Berm DU)
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	log K_{ow}	95% UCL Soil EPC (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Terrestrial Plants			Soil Invertebrates			Small Mammals		
			BAF_{plants}	Estimated Concentration	Reference	$BAF_{invertebrates}$	Estimated Concentration	Reference	$BAF_{mammals}$	Estimated Concentration	Reference
Metals											
Antimony	N/A	0.35	Regression	0.015	USEPA (2007) (a)	1.00	0.35	USEPA (2007) (b)	Modeling	0.00074	USEPA (2007) (c)
Copper	N/A	32.33	Regression	7.7	Bechtel-Jacobs (1998) (a)	Regression	13.4	Sample et al. (1998a) (d)	Regression	15.2	Sample et al. (1998b) (e)
Lead	N/A	84.33	Regression	3.2	Bechtel-Jacobs (1998) (a)	Regression	29	Sample et al. (1998a) (d)	Regression	5.4	Sample et al. (1998b) (e)
Zinc	N/A	99.02	Regression	61.9	Bechtel-Jacobs (1998) (a)	Regression	386	Sample et al. (1998a) (d)	Regression	129	Sample et al. (1998b) (e)

Notes:

BAF = Bioaccumulation Factor; EPC = Exposure Point Concentration; kg = kilogram; K_{ow} = n-octanol/water partitioning coefficient; log = base-10; mg = milligram; UCL = Upper Confidence Limit; USEPA = United States Environmental Protection Agency

(a) Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Chemical	BO	B1	Data Source for Model
Antimony	-3.233	0.937	USEPA (2007)
Copper	0.669	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Zinc	1.575	0.555	Bechtel-Jacobs (1998)

(b) Not available; bioaccumulation factor is assumed to be 1.0 USEPA (2007)

(c) USEPA (2007) suggests using a diet-to-beef model presented in Baes et al. (1984) for inorganics without established uptake models, where:
$BAF_{soil\text{-}to\text{-}beef}$ = $BAF_{soil\text{-}to\text{-}diet\ (plant)}$ x 50 (cattle food intake) x F_f (diet-to-biota factor)
Diet-to-biota factors presented in Baes et al. (1984) are listed below:

Chemical	F_f
Antimony	0.001

(d) Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Chemical	BO	B1	Data Source for Model
Copper	1.675	0.264	Sample et al. (1998a)
Lead	-0.218	0.807	Sample et al. (1998a)
Zinc	4.449	0.328	Sample et al. (1998a)

(e) Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]).
If multiple trophic-based models were presented, the best fitting model was applied. Slopes (B1) and intercepts (B0) are as follows:

Chemical	BO	B1	Data Source for Model
Copper	2.1042	0.1783	Sample et al. (1998b)
Lead	-0.6114	0.5181	Sample et al. (1998b)
Zinc	4.2479	0.1324	Sample et al. (1998b)

References:

Bechtel Jacobs Company LLC. 1998. Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants. Bechtel Jacobs Company LLC, Oak Ridge, TN. BJC/OR-133

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G.W. Suter, II, and T.L. Ashwood. 1998a. Development and Validation of Bioaccumulation Models for Earthworms. Oak Ridge National Laboratory, Oak Ridge TN. 93 pp. ES/ER/TM-220.

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, and G.W. Suter, II. 1998b. Development and Validation of Bioaccumulation Models for Small Mammals. Oak Ridge National Laboratory, Oak Ridge TN. 89 pp. ES/ER/TM-219.

USEPA. 2007. Guidance for Developing Ecological Soil Screening Levels. Office of Solid Waste and Emergency Response, Washington, D.C. November. OSWER Directive 92857-55.

Table 3
Soil Bioaccumulation Factors and Estimated Concentrations in Prey Items (Target Area Berm DU)
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	log K_{ow}	95% UCL Soil EPC (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Terrestrial Plants			Soil Invertebrates			Small Mammals		
			BAF_{plants}	Estimated Concentration	Reference	$BAF_{invertebrates}$	Estimated Concentration	Reference	$BAF_{mammals}$	Estimated Concentration	Reference
Metals											
Antimony	N/A	0.35	Regression	0.015	USEPA (2007) (a)	1.00	0.35	USEPA (2007) (b)	Modeling	0.00074	USEPA (2007) (c)
Copper	N/A	45.74	Regression	8.8	Bechtel-Jacobs (1998) (a)	Regression	14.6	Sample et al. (1998a) (d)	Regression	16.2	Sample et al. (1998b) (e)
Lead	N/A	118.23	Regression	3.9	Bechtel-Jacobs (1998) (a)	Regression	38	Sample et al. (1998a) (d)	Regression	6.4	Sample et al. (1998b) (e)
Zinc	N/A	103.38	Regression	63.4	Bechtel-Jacobs (1998) (a)	Regression	392	Sample et al. (1998a) (d)	Regression	129	Sample et al. (1998b) (e)

Notes:

BAF = Bioaccumulation Factor; EPC = Exposure Point Concentration; kg = kilogram; K_{ow} = n-octanol/water partitioning coefficient; log = base-10; mg = milligram; UCL = Upper Confidence Limit; USEPA = United States Environmental Protection Agency

(a) Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Chemical	BO	B1	Data Source for Model
Antimony	-3.233	0.937	USEPA (2007)
Copper	0.669	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Zinc	1.575	0.555	Bechtel-Jacobs (1998)

(b) Not available; bioaccumulation factor is assumed to be 1.0 USEPA (2007)

(c) USEPA (2007) suggests using a diet-to-beef model presented in Baes et al. (1984) for inorganics without established uptake models, where:

$BAF_{soil\text{-}to\text{-}beef}$ = $BAF_{soil\text{-}to\text{-}diet\ (plant)}$ x 50 (cattle food intake) x F_f (diet-to-biota factor)

Diet-to-biota factors presented in Baes et al. (1984) are listed below:

Chemical	F_f
Antimony	0.001

(d) Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Chemical	BO	B1	Data Source for Model
Copper	1.675	0.264	Sample et al. (1998a)
Lead	-0.218	0.807	Sample et al. (1998a)
Zinc	4.449	0.328	Sample et al. (1998a)

(e) Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]).
If multiple trophic-based models were presented, the best fitting model was applied. Slopes (B1) and intercepts (B0) are as follows:

Chemical	BO	B1	Data Source for Model
Copper	2.1042	0.1783	Sample et al. (1998b)
Lead	-0.6114	0.5181	Sample et al. (1998b)
Zinc	4.2479	0.1324	Sample et al. (1998b)

References:

Bechtel Jacobs Company LLC. 1998. Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants. Bechtel Jacobs Company LLC, Oak Ridge, TN. BJC/OR-133

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G.W. Suter, II, and T.L. Ashwood. 1998a. Development and Validation of Bioaccumulation Models for Earthworms. Oak Ridge National Laboratory, Oak Ridge TN. 93 pp. ES/ER/TM-220.

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, and G.W. Suter, II. 1998b. Development and Validation of Bioaccumulation Models for Small Mammals. Oak Ridge National Laboratory, Oak Ridge TN. 89 pp. ES/ER/TM-219.

USEPA. 2007. Guidance for Developing Ecological Soil Screening Levels. Office of Solid Waste and Emergency Response, Washington, D.C. November. OSWER Directive 92857-55.

Table 4
Soil Bioaccumulation Factors and Estimated Concentrations in Prey Items (Target Berm Hillside DU)
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	log K_{ow}	95% UCL Soil EPC (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Terrestrial Receptors (mg/kg, dry weight)								
			Terrestrial Plants			Soil Invertebrates			Small Mammals		
			BAF_{plants}	Estimated Concentration	Reference	$BAF_{invertebrates}$	Estimated Concentration	Reference	$BAF_{mammals}$	Estimated Concentration	Reference
Metals											
Antimony	N/A	0.96	Regression	0.038	USEPA (2007) (a)	1.00	0.96	USEPA (2007) (b)	Modeling	0.00190	USEPA (2007) (c)
Copper	N/A	55.27	Regression	9.5	Bechtel-Jacobs (1998) (a)	Regression	15.4	Sample et al. (1998a) (d)	Regression	16.8	Sample et al. (1998b) (e)
Lead	N/A	309.74	Regression	6.6	Bechtel-Jacobs (1998) (a)	Regression	82	Sample et al. (1998a) (d)	Regression	10.6	Sample et al. (1998b) (e)
Zinc	N/A	146.97	Regression	77.1	Bechtel-Jacobs (1998) (a)	Regression	440	Sample et al. (1998a) (d)	Regression	135	Sample et al. (1998b) (e)

Notes:

BAF = Bioaccumulation Factor; EPC = Exposure Point Concentration; kg = kilogram; K_{ow} = n-octanol/water partitioning coefficient; log = base-10; mg = milligram; UCL = Upper Confidence Limit; USEPA = United States Environmental Protection Agency

(a) Plant tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Chemical	BO	B1	Data Source for Model
Antimony	-3.233	0.937	USEPA (2007)
Copper	0.669	0.394	Bechtel-Jacobs (1998)
Lead	-1.328	0.561	Bechtel-Jacobs (1998)
Zinc	1.575	0.555	Bechtel-Jacobs (1998)

(b) Not available; bioaccumulation factor is assumed to be 1.0 USEPA (2007)

(c) USEPA (2007) suggests using a diet-to-beef model presented in Baes et al. (1984) for inorganics without established uptake models, where:

$BAF_{soil\text{-}to\text{-}beef} = BAF_{soil\text{-}to\text{-}diet\ (plant)}$ x 50 (cattle food intake) x F_f (diet-to-biota factor)

Diet-to-biota factors presented in Baes et al. (1984) are listed below:

Chemical	F_f
Antimony	0.001

(d) Soil invertebrate tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]). Slopes (B1) and intercepts (B0) are as follows:

Chemical	BO	B1	Data Source for Model
Copper	1.675	0.264	Sample et al. (1998a)
Lead	-0.218	0.807	Sample et al. (1998a)
Zinc	4.449	0.328	Sample et al. (1998a)

(e) Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]).
If multiple trophic-based models were presented, the best fitting model was applied. Slopes (B1) and intercepts (B0) are as follows:

Chemical	BO	B1	Data Source for Model
Copper	2.1042	0.1783	Sample et al. (1998b)
Lead	-0.6114	0.5181	Sample et al. (1998b)
Zinc	4.2479	0.1324	Sample et al. (1998b)

References:

Bechtel Jacobs Company LLC. 1998. Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants. Bechtel Jacobs Company LLC, Oak Ridge, TN. BJC/OR-133

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G.W. Suter, II, and T.L. Ashwood. 1998a. Development and Validation of Bioaccumulation Models for Earthworms. Oak Ridge National Laboratory, Oak Ridge TN. 93 pp. ES/ER/TM-220.

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, and G.W. Suter, II. 1998b. Development and Validation of Bioaccumulation Models for Small Mammals. Oak Ridge National Laboratory, Oak Ridge TN. 89 pp. ES/ER/TM-219.

USEPA. 2007. Guidance for Developing Ecological Soil Screening Levels. Office of Solid Waste and Emergency Response, Washington, D.C. November. OSWER Directive 92857-55.

Table 5
Biota Sediment Accumulation Factors and Estimated Concentrations in Prey Items (Target Berm Ponded DU)
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	log K_{ow}	Maximum Sediment EPC (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Aquatic and Semi-Aquatic Receptors (mg/kg, dry weight)					
			Aquatic Life Stage Benthic Invertebrates			Small Mammals		
			$BSAF_{invertebrates}$	Estimated Concentration	Reference	$BSAF_{mammals}$	Estimated Concentration	Reference
Metals								
Copper	N/A	124	95% UPL	149	Bechtel and Jacobs (1998) (a)	Regression	19.36866	Sample et al. (1998) (c)
Lead	N/A	2780	0.066	183.5	Bechtel and Jacobs (1998) (b)	Regression	33.0	Sample et al. (1998) (c)
Zinc	N/A	348	95% UPL	351	Bechtel and Jacobs (1998) (a)	Regression	151.8	Sample et al. (1998) (c)

Notes:

BSAF = Biota Sediment Accumulation Factor; EPC = Exposure Point Concentration; kg = kilogram; K_{ow} = n-octanol/water partitioning coefficient; log = base-10; mg = milligram;
USEPA = United States Environmental Protection Agency

(a) 95% upper prediction limit (UPL) of regressions calculated by Bechtel and Jacobs(1998); calculated according to Appendix A in Bechtel and Jacobs (1998)

(b) Median BSAF for non-depurated invertebrates determined by Bechtel and Jacobs (1998)

(c) Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]).
If multiple trophic-based models were presented, the best fitting model was applied. Slopes (B1) and intercepts (B0) are as follows:

Chemical	BO	B1	Data Source for Model
Copper	2.1042	0.1783	Sample et al. (1998)
Lead	-0.6114	0.5181	Sample et al. (1998)
Zinc	4.2479	0.1324	Sample et al. (1998)

References:

Bechtel Jacobs Company LLC. 1998. Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation. Bechtel Jacobs Company LLC, Oak Ridge, TN. BJC/OR-112

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, and G.W. Suter, II. 1998. Development and Validation of Bioaccumulation Models for Small Mammals. Oak Ridge National Laboratory, Oak Ridge TN. 89 pp. ES/ER/TM-219.

Table 6
Biota Sediment Accumulation Factors and Estimated Concentrations in Prey Items (Wetland Meadow DU)
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	log K_{ow}	Maximum Sediment EPC (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Aquatic and Semi-Aquatic Receptors (mg/kg, dry weight)					
			Aquatic Life Stage Benthic Invertebrates			Small Mammals		
			$BSAF_{invertebrates}$	Estimated Concentration	Reference	$BSAF_{mammals}$	Estimated Concentration	Reference
Metals								
Copper	N/A	41.3	95% UPL	110	Bechtel and Jacobs (1998) (a)	Regression	15.9	Sample et al. (1998) (c)
Lead	N/A	154	0.066	10.2	Bechtel and Jacobs (1998) (b)	Regression	7.4	Sample et al. (1998) (c)
Zinc	N/A	211	95% UPL	330	Bechtel and Jacobs (1998) (a)	Regression	142.1	Sample et al. (1998) (c)

Notes:

BSAF = Biota Sediment Accumulation Factor; EPC = Exposure Point Concentration; kg = kilogram; K_{ow} = n-octanol/water partitioning coefficient; log = base-10; mg = milligram;
USEPA = United States Environmental Protection Agency

(a) 95% upper prediction limit (UPL) of regressions calculated by Bechtel and Jacobs(1998); calculated according to Appendix A in Bechtel and Jacobs (1998)

(b) Median BSAF for non-depurated invertebrates determined by Bechtel and Jacobs (1998)

(c) Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]).
If multiple trophic-based models were presented, the best fitting model was applied. Slopes (B1) and intercepts (B0) are as follows:

Chemical	BO	B1	Data Source for Model
Copper	2.1042	0.1783	Sample et al. (1998)
Lead	-0.6114	0.5181	Sample et al. (1998)
Zinc	4.2479	0.1324	Sample et al. (1998)

References:

Bechtel Jacobs Company LLC. 1998. Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation. Bechtel Jacobs Company LLC, Oak Ridge, TN. BJC/OR-112

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, and G.W. Suter, II. 1998. Development and Validation of Bioaccumulation Models for Small Mammals. Oak Ridge National Laboratory, Oak Ridge TN. 89 pp. ES/ER/TM-219.

Table 7
Toxicity Reference Values
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	Avian Receptors				Mammalian Receptors			
	Chronic NOAEL (mg/kg-bw/d)	Source	Chronic LOAEL (mg/kg-bw/d)	Source	Chronic NOAEL (mg/kg-bw/d)	Source	Chronic LOAEL (mg/kg-bw/d)	Source
Metals								
Antimony	N/A	USEPA Eco-SSL; Insufficient data to derive a TRV	N/A	USEPA Eco-SSL; Insufficient data to derive a TRV	0.059	USEPA Eco-SSL; Highest bounded NOAEL lower than the lowest bounded LOAEL	2.76	USEPA Eco-SSL; Geometric Mean (LOAEL)
Copper	4.05	USEPA Eco-SSL; Highest bounded NOAEL lower than the lowest bounded LOAEL	34.9	USEPA Eco-SSL; Geometric Mean (LOAEL)	5.60	USEPA Eco-SSL; Highest bounded NOAEL lower than the lowest bounded LOAEL	82.7	USEPA Eco-SSL; Geometric Mean (LOAEL)
Lead	1.63	USEPA Eco-SSL; Highest bounded NOAEL lower than the lowest bounded LOAEL	44.6	USEPA Eco-SSL; Geometric Mean (LOAEL)	4.7	USEPA Eco-SSL; Highest bounded NOAEL lower than the lowest bounded LOAEL	186.4	USEPA Eco-SSL; Geometric Mean (LOAEL)
Zinc	66.1	USEPA Eco-SSL; Geometric Mean (NOAEL)	171.4	USEPA Eco-SSL Geometric Mean (LOAEL)	75.4	USEPA Eco-SSL; Geometric Mean (NOAEL)	297.6	USEPA Eco-SSL Geometric Mean (LOAEL)

Notes:

-- Appropriate data are not available from published literature to derive NOAEL and LOAEL values.

bw/d = body weight per day; kg = kilogram; LOAEL = Lowest Observable Adverse Effect Level; mg = milligram; N/A = Not Applicable; NOAEL = No Observable Adverse Effect Level; TRV = toxicity reference value

References:

USEPA Eco-SSLs available at https://www.epa.gov/risk/ecological-soil-screening-level-eco-ssl-guidance-and-documents

Table 8
Terrestrial Dose Rate Model Output (100 Yard Firing Berm DU)
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	95% UCL EPC (mg/kg, dry weight)	American robin (mg/kg bw-day)						TRV (mg/kg bw-dw)			
		Diet				Substrate	Total Dose^c	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
		Plant Material	Invert.	Small Mammals	Dose$_{diet}$^{a}	Dose$_{substrate}$^{b}					
Metals											
Antimony	0.35	0.00E+00	5.25E-02	0.00E+00	5.25E-02	5.46E-03	5.79E-02	N/A	--	N/A	--
Copper	32.33	0.00E+00	2.00E+00	0.00E+00	2.00E+00	5.04E-01	2.51E+00	4.05	<1	34.9	<1
Lead	84.33	0.00E+00	4.32E+00	0.00E+00	4.32E+00	1.31E+00	5.63E+00	1.63	**3**	44.6	<1
Zinc	99.02	0.00E+00	5.79E+01	0.00E+00	5.79E+01	1.54E+00	5.94E+01	66.1	<1	171.4	<1

Analyte	95% UCL EPC (mg/kg, dry weight)	Red-tailed hawk (mg/kg bw-day)						TRV (mg/kg bw-dw)			
		Diet				Substrate	Total Dose^c	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
		Plant Material	Invert.	Small Mammals	Dose$_{diet}$^{a}	Dose$_{substrate}$^{b}					
Metals											
Antimony	0.35	0.00E+00	0.00E+00	5.86E-05	5.86E-05	1.58E-03	1.64E-03	N/A	--	N/A	--
Copper	32.33	0.00E+00	0.00E+00	1.21E+00	1.21E+00	1.46E-01	1.36E+00	4.05	<1	34.9	<1
Lead	84.33	0.00E+00	0.00E+00	4.29E-01	4.29E-01	3.82E-01	8.11E-01	1.63	<1	44.6	<1
Zinc	99.02	0.00E+00	0.00E+00	1.02E+01	1.02E+01	4.48E-01	1.07E+01	66.1	<1	171.4	<1

Analyte	95% UCL EPC (mg/kg, dry weight)	Short-tailed shrew (mg/kg bw-day)						TRV (mg/kg bw-dw)			
		Diet				Substrate	Total Dose^c	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
		Plant Material	Invert.	Small Mammals	Dose$_{diet}$^{a}	Dose$_{substrate}$^{b}					
Metals											
Antimony	0.35	0.00E+00	4.69E-02	0.00E+00	4.69E-02	1.41E-03	4.83E-02	0.059	<1	2.76	<1
Copper	32.33	0.00E+00	1.79E+00	0.00E+00	1.79E+00	1.30E-01	1.92E+00	5.6	<1	82.7	<1
Lead	84.33	0.00E+00	3.86E+00	0.00E+00	3.86E+00	3.39E-01	4.20E+00	4.7	<1	186.4	<1
Zinc	99.02	0.00E+00	5.18E+01	0.00E+00	5.18E+01	3.98E-01	5.21E+01	75.4	<1	297.6	<1

Analyte	95% UCL EPC (mg/kg, dry weight)	Red fox (mg/kg bw-day)						TRV (mg/kg bw-dw)			
		Diet				Substrate	Total Dose^c	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
		Plant Material	Invert.	Small Mammals	Dose$_{diet}$^{a}	Dose$_{substrate}$^{b}					
Metals											
Antimony	0.35	0.00E+00	0.00E+00	2.79E-05	2.79E-05	3.71E-04	3.99E-04	0.059	<1	2.76	<1
Copper	32.33	0.00E+00	0.00E+00	5.77E-01	5.77E-01	3.43E-02	6.11E-01	5.6	<1	82.7	<1
Lead	84.33	0.00E+00	0.00E+00	2.04E-01	2.04E-01	8.94E-02	2.94E-01	4.7	<1	186.4	<1
Zinc	99.02	0.00E+00	0.00E+00	4.87E+00	4.87E+00	1.05E-01	4.97E+00	75.4	<1	297.6	<1

Notes:

bw/d = body weight per day; COPEC = Chemical of Potential Ecological Concern; EPC = Exposure Point Concentration; Invert. = Invertebrates;
kg = kilogram; LOAEL = Lowest Observable Adverse Effect Level; mg = milligram; N/A = Not Available; NOAEL = No Observable Adverse Effect Level;
TRV = toxicity reference value; -- = not evaluated

(a) Dietary dose calculated as:

$$EDD_{diet} = \frac{IR_{diet} \times \sum(B[S]AF \times C_{soil} \times DF_i) \times AUF}{BW}$$

(b) Substrate dose calculated as:

$$EDD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

(c) Total dose calculated as:

$$EDD_{total} = EDD_{diet} + EDD_{substrate}$$

Where:

EDD_{diet} = Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet} = Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF = Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
C_{soil} = COPEC concentration in soil (mg COPEC/kg soil, dry weight)
DF_i = Dietary fraction of food item *i*
AUF = Area use factor accounts for receptor home range
BW = Body weight of the receptor, wet weight
$EDD_{substrate}$ = Dose of COPEC obtained from substrate (mg COPEC/kg receptor body weight-day)
$IR_{substrate}$ = Incidental Ingestion rate of substrate (kg substrate ingested per day, dry weight)
$C_{substrate}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table 9
Terrestrial Dose Rate Model Output (Target Area Berm DU)
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	95% UCL EPC (mg/kg, dry weight)	American robin (mg/kg bw-day)						TRV (mg/kg bw-dw)			
		Diet				Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
		Plant Material	Invert.	Small Mammals	$Dose_{diet}$[a]	$Dose_{substrate}$[b]					
Metals											
Antimony	0.35	0.00E+00	5.25E-02	0.00E+00	5.25E-02	5.46E-03	5.79E-02	N/A	--	N/A	--
Copper	45.74	0.00E+00	2.20E+00	0.00E+00	2.20E+00	7.13E-01	2.91E+00	4.05	<1	34.9	<1
Lead	118.23	0.00E+00	5.67E+00	0.00E+00	5.67E+00	1.84E+00	7.52E+00	1.63	**5**	44.6	<1
Zinc	103.38	0.00E+00	5.87E+01	0.00E+00	5.87E+01	1.61E+00	6.03E+01	66.1	<1	171.4	<1

Analyte	95% UCL EPC (mg/kg, dry weight)	Red-tailed hawk (mg/kg bw-day)						TRV (mg/kg bw-dw)			
		Diet				Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
		Plant Material	Invert.	Small Mammals	$Dose_{diet}$[a]	$Dose_{substrate}$[b]					
Metals											
Antimony	0.35	0.00E+00	0.00E+00	5.86E-05	5.86E-05	1.58E-03	1.64E-03	N/A	--	N/A	--
Copper	45.74	0.00E+00	0.00E+00	1.29E+00	1.29E+00	2.07E-01	1.50E+00	4.05	<1	34.9	<1
Lead	118.23	0.00E+00	0.00E+00	5.11E-01	5.11E-01	5.35E-01	1.05E+00	1.63	<1	44.6	<1
Zinc	103.38	0.00E+00	0.00E+00	1.03E+01	1.03E+01	4.68E-01	1.07E+01	66.1	<1	171.4	<1

Analyte	95% UCL EPC (mg/kg, dry weight)	Short-tailed shrew (mg/kg bw-day)						TRV (mg/kg bw-dw)			
		Diet				Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
		Plant Material	Invert.	Small Mammals	$Dose_{diet}$[a]	$Dose_{substrate}$[b]					
Metals											
Antimony	0.35	0.00E+00	4.69E-02	0.00E+00	4.69E-02	1.41E-03	4.83E-02	0.059	<1	2.76	<1
Copper	45.74	0.00E+00	1.96E+00	0.00E+00	1.96E+00	1.84E-01	2.15E+00	5.6	<1	82.7	<1
Lead	118.23	0.00E+00	5.07E+00	0.00E+00	5.07E+00	4.75E-01	5.55E+00	4.7	**1**	186.4	<1
Zinc	103.38	0.00E+00	5.25E+01	0.00E+00	5.25E+01	4.16E-01	5.29E+01	75.4	<1	297.6	<1

Analyte	95% UCL EPC (mg/kg, dry weight)	Red fox (mg/kg bw-day)						TRV (mg/kg bw-dw)			
		Diet				Substrate	Total Dose[c]	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
		Plant Material	Invert.	Small Mammals	$Dose_{diet}$[a]	$Dose_{substrate}$[b]					
Metals											
Antimony	0.35	0.00E+00	0.00E+00	2.79E-05	2.79E-05	3.71E-04	3.99E-04	0.059	<1	2.76	<1
Copper	45.74	0.00E+00	0.00E+00	6.14E-01	6.14E-01	4.85E-02	6.62E-01	5.6	<1	82.7	<1
Lead	118.23	0.00E+00	0.00E+00	2.44E-01	2.44E-01	1.25E-01	3.69E-01	4.7	<1	186.4	<1
Zinc	103.38	0.00E+00	0.00E+00	4.90E+00	4.90E+00	1.10E-01	5.01E+00	75.4	<1	297.6	<1

Notes:

bw/d = body weight per day; COPEC = Chemical of Potential Ecological Concern; EPC = Exposure Point Concentration; Invert. = Invertebrates; kg = kilogram; LOAEL = Lowest Observable Adverse Effect Level; mg = milligram; N/A = Not Available; NOAEL = No Observable Adverse Effect Level; TRV = toxicity reference value; -- = not evaluated

(a) Dietary dose calculated as:

$$EDD_{diet} = \frac{IR_{diet} \times \sum(B[S]AF \times C_{soil} \times DF_i) \times AUF}{BW}$$

(b) Substrate dose calculated as:

$$EDD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

(c) Total dose calculated as:

$$EDD_{total} = EDD_{diet} + EDD_{substrate}$$

Where:

EDD_{diet} = Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet} = Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF = Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
C_{soil} = COPEC concentration in soil (mg COPEC/kg soil, dry weight)
DF_i = Dietary fraction of food item *i*
AUF = Area use factor accounts for receptor home range
BW = Body weight of the receptor, wet weight
$EDD_{substrate}$ = Dose of COPEC obtained from substrate (mg COPEC/kg receptor body weight-day)
$IR_{substrate}$ = Incidental Ingestion rate of substrate (kg substrate ingested per day, dry weight)
$C_{substrate}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table 10
Terrestrial Dose Rate Model Output (Target Berm Hillside DU)
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	95% UCL EPC (mg/kg, dry weight)	American robin (mg/kg bw-day)						TRV (mg/kg bw-dw)			
		Diet				Substrate	Total Dose^{c}	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
		Plant Material	Invert.	Small Mammals	Dose$_{diet}^{a}$	Dose$_{substrate}^{b}$					
Metals											
Antimony	0.96	0.00E+00	1.44E-01	0.00E+00	1.44E-01	1.50E-02	1.59E-01	N/A	--	N/A	--
Copper	55.27	0.00E+00	2.31E+00	0.00E+00	2.31E+00	8.62E-01	3.17E+00	4.05	<1	34.9	<1
Lead	309.74	0.00E+00	1.23E+01	0.00E+00	1.23E+01	4.83E+00	1.72E+01	1.63	**11**	44.6	<1
Zinc	146.97	0.00E+00	6.59E+01	0.00E+00	6.59E+01	2.29E+00	6.82E+01	66.1	**1**	171.4	<1

Analyte	95% UCL EPC (mg/kg, dry weight)	Red-tailed hawk (mg/kg bw-day)						TRV (mg/kg bw-dw)			
		Diet				Substrate	Total Dose^{c}	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
		Plant Material	Invert.	Small Mammals	Dose$_{diet}^{a}$	Dose$_{substrate}^{b}$					
Metals											
Antimony	0.96	0.00E+00	0.00E+00	1.51E-04	1.51E-04	4.35E-03	4.50E-03	N/A	--	N/A	--
Copper	55.27	0.00E+00	0.00E+00	1.33E+00	1.33E+00	2.50E-01	1.58E+00	4.05	<1	34.9	<1
Lead	309.74	0.00E+00	0.00E+00	8.42E-01	8.42E-01	1.40E+00	2.24E+00	1.63	**1**	44.6	<1
Zinc	146.97	0.00E+00	0.00E+00	1.08E+01	1.08E+01	6.65E-01	1.14E+01	66.1	<1	171.4	<1

Analyte	95% UCL EPC (mg/kg, dry weight)	Short-tailed shrew (mg/kg bw-day)						TRV (mg/kg bw-dw)			
		Diet				Substrate	Total Dose^{c}	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
		Plant Material	Invert.	Small Mammals	Dose$_{diet}^{a}$	Dose$_{substrate}^{b}$					
Metals											
Antimony	0.96	0.00E+00	1.29E-01	0.00E+00	1.29E-01	3.86E-03	1.33E-01	0.059	**2**	2.76	<1
Copper	55.27	0.00E+00	2.06E+00	0.00E+00	2.06E+00	2.22E-01	2.29E+00	5.6	<1	82.7	<1
Lead	309.74	0.00E+00	1.10E+01	0.00E+00	1.10E+01	1.25E+00	1.23E+01	4.7	**3**	186.4	<1
Zinc	146.97	0.00E+00	5.89E+01	0.00E+00	5.89E+01	5.91E-01	5.95E+01	75.4	<1	297.6	<1

Analyte	95% UCL EPC (mg/kg, dry weight)	Red fox (mg/kg bw-day)						TRV (mg/kg bw-dw)			
		Diet				Substrate	Total Dose^{c}	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
		Plant Material	Invert.	Small Mammals	Dose$_{diet}^{a}$	Dose$_{substrate}^{b}$					
Metals											
Antimony	0.96	0.00E+00	0.00E+00	7.19E-05	7.19E-05	1.02E-03	1.09E-03	0.059	<1	2.76	<1
Copper	55.27	0.00E+00	0.00E+00	6.35E-01	6.35E-01	5.86E-02	6.94E-01	5.6	<1	82.7	<1
Lead	309.74	0.00E+00	0.00E+00	4.01E-01	4.01E-01	3.28E-01	7.30E-01	4.7	<1	186.4	<1
Zinc	146.97	0.00E+00	0.00E+00	5.13E+00	5.13E+00	1.56E-01	5.28E+00	75.4	<1	297.6	<1

Notes:

bw/d = body weight per day; COPEC = Chemical of Potential Ecological Concern; EPC = Exposure Point Concentration; Invert. = Invertebrates;
kg = kilogram; LOAEL = Lowest Observable Adverse Effect Level; mg = milligram; N/A = Not Available; NOAEL = No Observable Adverse Effect Level;
TRV = toxicity reference value; -- = not evaluated

(a) Dietary dose calculated as:

$$EDD_{diet} = \frac{IR_{diet} \times \sum(B[S]AF \times C_{soil} \times DF_{i}) \times AUF}{BW}$$

(b) Substrate dose calculated as:

$$EDD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

(c) Total dose calculated as:

$$EDD_{total} = EDD_{diet} + EDD_{substrate}$$

Where:

EDD_{diet} = Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet} = Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF = Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
C_{soil} = COPEC concentration in soil (mg COPEC/kg soil, dry weight)
DF_{i} = Dietary fraction of food item *i*
AUF = Area use factor accounts for receptor home range
BW = Body weight of the receptor, wet weight
$EDD_{substrate}$ = Dose of COPEC obtained from substrate (mg COPEC/kg receptor body weight-day)
$IR_{substrate}$ = Incidental Ingestion rate of substrate (kg substrate ingested per day, dry weight)
$C_{substrate}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table 11
Aquatic and Semi-Aquatic Dose Rate Model Output (Target Berm Ponded DU)
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	Maximum Sediment EPC (mg/kg, dry weight)	Maximum Water EPC (mg/L)$^{(1)}$	American robin (mg/kg bw-day)						TRV (mg/kg bw-dw)			
			Diet			Water	Substrate	Total Dose^{d}	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
			Invert.	Small Mammals	Dose$_{diet}^{a}$	Dose$_{water}^{b}$	Dose$_{substrate}^{c}$					
Metals												
Copper	124	--	2.23E+01	0.00E+00	2.23E+01	--	1.93E+00	2.42E+01	4.05	**6**	34.9	<1
Lead	2780	--	2.75E+01	0.00E+00	2.75E+01	--	4.33E+01	7.09E+01	1.63	**43**	44.6	**2**
Zinc	348	--	5.26E+01	0.00E+00	5.26E+01	--	5.43E+00	5.80E+01	66.1	<1	171.4	<1

Analyte	Maximum Sediment EPC (mg/kg, dry weight)	Maximum Water EPC (mg/L)$^{(1)}$	Red-tailed hawk (mg/kg bw-day)						TRV (mg/kg bw-dw)			
			Diet			Water	Substrate	Total Dose^{d}	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
			Invert.	Small Mammals	Dose$_{diet}^{a}$	Dose$_{water}^{b}$	Dose$_{substrate}^{c}$					
Metals												
Copper	124	--	0.00E+00	1.54E+00	1.54E+00	--	5.61E-01	2.10E+00	4.05	<1	34.9	<1
Lead	2780	--	0.00E+00	2.62E+00	2.62E+00	--	1.26E+01	1.52E+01	1.63	**9**	44.6	<1
Zinc	348	--	0.00E+00	1.21E+01	1.21E+01	--	1.58E+00	1.36E+01	66.1	<1	171.4	<1

Analyte	Maximum Sediment EPC (mg/kg, dry weight)	Maximum Water EPC (mg/L)$^{(1)}$	Short-tailed shrew (mg/kg bw-day)						TRV (mg/kg bw-dw)			
			Diet			Water	Substrate	Total Dose^{d}	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
			Invert.	Small Mammals	Dose$_{diet}^{a}$	Dose$_{water}^{b}$	Dose$_{substrate}^{c}$					
Metals												
Copper	124	--	1.99E+01	0.00E+00	1.99E+01	--	4.99E-01	2.04E+01	5.6	**4**	82.7	<1
Lead	2780	--	2.46E+01	0.00E+00	2.46E+01	--	1.12E+01	3.58E+01	4.7	**8**	186.4	<1
Zinc	348	--	4.70E+01	0.00E+00	4.70E+01	--	1.40E+00	4.84E+01	75.4	<1	297.6	<1

Analyte	Maximum Sediment EPC (mg/kg, dry weight)	Maximum Water EPC (mg/L)$^{(1)}$	Red fox (mg/kg bw-day)						TRV (mg/kg bw-dw)			
			Diet			Water	Substrate	Total Dose^{d}	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
			Invert.	Small Mammals	Dose$_{diet}^{a}$	Dose$_{water}^{b}$	Dose$_{substrate}^{c}$					
Metals												
Copper	124	--	0.00E+00	7.33E-01	7.33E-01	--	1.31E-01	8.65E-01	5.6	<1	82.7	<1
Lead	2780	--	0.00E+00	1.25E+00	1.25E+00	--	2.95E+00	4.20E+00	4.7	<1	186.4	<1
Zinc	348	--	0.00E+00	5.75E+00	5.75E+00	--	3.69E-01	6.12E+00	75.4	<1	297.6	<1

Notes:

bw/d = body weight per day; COPEC = Chemical of Potential Ecological Concern; EPC = Exposure Point Concentration; Invert. = Invertebrates; kg = kilogram; L = liter;
LOAEL = Lowest Observable Adverse Effect Level; mg = milligram; N/A = Not Available; NOAEL = No Observable Adverse Effect Level;
TRV = toxicity reference value; -- = not evaluated

(1) During preliminary wildlife screening, no dietary water COPECs were identified. Potential impact of Site-related constituents from direct ingestion of water considered negligible.

(a) Dietary dose calculated as:

$$EDD_{diet} = \frac{IR_{diet} \times \sum(B[S]AF \times C_{sed} \times DF_i) \times AUF}{BW}$$

(b) Water dose calculated as:

$$EDD_{water} = \frac{IR_{water} \times C_{water} \times AUF}{BW}$$

(c) Substrate dose calculated as:

$$EDD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

(d) Total dose calculated as:

$$EDD_{total} = EDD_{diet} + EDD_{water} + EDD_{substrate}$$

Where:

EDD$_{diet}$ = Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR$_{diet}$ = Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF = Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
C$_{sed}$ = COPEC concentration in sediment (mg COPEC/kg dry weight)
DF$_{i}$ = Dietary fraction of food item *i*
AUF = Area use factor accounts for receptor home range
BW = Body weight of the receptor, wet weight
C$_{water}$ = COPEC concentration in water (mg COPEC/L water)
IR$_{water}$ = Ingestion rate of water (L water per day)
EDD$_{water}$ = Dose of COPEC obtained from water (mg COPEC/kg receptor body weight-day)
EDD$_{substrate}$ = Dose of COPEC obtained from substrate (mg COPEC/kg receptor body weight-day)
IR$_{substrate}$ = Incidental Ingestion rate of substrate (kg substrate ingested per day, dry weight)
C$_{substrate}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table 12
Aquatic and Semi-Aquatic Dose Rate Model Output (Wetland Meadow DU)
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	Maximum Sediment EPC (mg/kg, dry weight)	Maximum Water EPC (mg/L)$^{(1)}$	American robin (mg/kg bw-day)						TRV (mg/kg bw-dw)			
			Diet			Water	Substrate	Total Dose^{d}	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
			Invert.	Small Mammals	Dose$_{diet}$^{a}	Dose$_{water}$^{b}	Dose$_{substrate}$^{c}					
Metals												
Copper	41.3	--	1.64E+01	0.00E+00	1.64E+01	--	6.44E-01	1.71E+01	4.05	**4**	34.9	<1
Lead	154	--	1.52E+00	0.00E+00	1.52E+00	--	2.40E+00	3.93E+00	1.63	**2**	44.6	<1
Zinc	211	--	4.94E+01	0.00E+00	4.94E+01	--	3.29E+00	5.27E+01	66.1	<1	171.4	<1

Analyte	Maximum Sediment EPC (mg/kg, dry weight)	Maximum Water EPC (mg/L)$^{(1)}$	Red-tailed hawk (mg/kg bw-day)						TRV (mg/kg bw-dw)			
			Diet			Water	Substrate	Total Dose^{d}	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
			Invert.	Small Mammals	Dose$_{diet}$^{a}	Dose$_{water}$^{b}	Dose$_{substrate}$^{c}					
Metals												
Copper	41.3	--	0.00E+00	1.26E+00	1.26E+00	--	1.87E-01	1.45E+00	4.05	<1	34.9	<1
Lead	154	--	0.00E+00	5.86E-01	5.86E-01	--	6.97E-01	1.28E+00	1.63	<1	44.6	<1
Zinc	211	--	0.00E+00	1.13E+01	1.13E+01	--	9.55E-01	1.22E+01	66.1	<1	171.4	<1

Analyte	Maximum Sediment EPC (mg/kg, dry weight)	Maximum Water EPC (mg/L)$^{(1)}$	Short-tailed shrew (mg/kg bw-day)						TRV (mg/kg bw-dw)			
			Diet			Water	Substrate	Total Dose^{d}	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
			Invert.	Small Mammals	Dose$_{diet}$^{a}	Dose$_{water}$^{b}	Dose$_{substrate}$^{c}					
Metals												
Copper	41.3	--	1.47E+01	0.00E+00	1.47E+01	--	1.66E-01	1.49E+01	5.6	**3**	82.7	<1
Lead	154	--	1.36E+00	0.00E+00	1.36E+00	--	6.19E-01	1.98E+00	4.7	<1	186.4	<1
Zinc	211	--	4.42E+01	0.00E+00	4.42E+01	--	8.48E-01	4.50E+01	75.4	<1	297.6	<1

Analyte	Maximum Sediment EPC (mg/kg, dry weight)	Maximum Water EPC (mg/L)$^{(1)}$	Red fox (mg/kg bw-day)						TRV (mg/kg bw-dw)			
			Diet			Water	Substrate	Total Dose^{d}	TRV$_{NOAEL}$	HQ$_{NOAEL}$	TRV$_{LOAEL}$	HQ$_{LOAEL}$
			Invert.	Small Mammals	Dose$_{diet}$^{a}	Dose$_{water}$^{b}	Dose$_{substrate}$^{c}					
Metals												
Copper	41.3	--	0.00E+00	6.03E-01	6.03E-01	--	4.38E-02	6.47E-01	5.6	<1	82.7	<1
Lead	154	--	0.00E+00	2.79E-01	2.79E-01	--	1.63E-01	4.43E-01	4.7	<1	186.4	<1
Zinc	211	--	0.00E+00	5.38E+00	5.38E+00	--	2.24E-01	5.60E+00	75.4	<1	297.6	<1

Notes:

bw/d = body weight per day; COPEC = Chemical of Potential Ecological Concern; EPC = Exposure Point Concentration; Invert. = Invertebrates; kg = kilogram; L = liter;
LOAEL = Lowest Observable Adverse Effect Level; mg = milligram; N/A = Not Available; NOAEL = No Observable Adverse Effect Level;
TRV = toxicity reference value; -- = not evaluated

(1) During preliminary wildlife screening, no dietary water COPECs were identified. Potential impact of Site-related constituents from direct ingestion of water considered negligible.

(a) Dietary dose calculated as:

$$EDD_{diet} = \frac{IR_{diet} \times \sum(B[S]AF \times C_{sed} \times DF_i) \times AUF}{BW}$$

(b) Water dose calculated as:

$$EDD_{water} = \frac{IR_{water} \times C_{water} \times AUF}{BW}$$

(c) Substrate dose calculated as:

$$EDD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

(d) Total dose calculated as:

$$EDD_{total} = EDD_{diet} + EDD_{water} + EDD_{substrate}$$

Where:

EDD_{diet} = Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet} = Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF = Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
C_{sed} = COPEC concentration in sediment (mg COPEC/kg dry weight)
DF_i = Dietary fraction of food item *i*
AUF = Area use factor accounts for receptor home range
BW = Body weight of the receptor, wet weight
C_{water} = COPEC concentration in water (mg COPEC/L water)
IR_{water} = Ingestion rate of water (L water per day)
EDD_{water} = Dose of COPEC obtained from water (mg COPEC/kg receptor body weight-day)
$EDD_{substrate}$ = Dose of COPEC obtained from substrate (mg COPEC/kg receptor body weight-day)
$IR_{substrate}$ = Incidental Ingestion rate of substrate (kg substrate ingested per day, dry weight)
$C_{substrate}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table 13
Biota Sediment Accumulation Factors and Estimated Concentrations in Prey Items (Target Berm Ponded DU)
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	log K_{ow}	Maximum Sediment EPC (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Aquatic and Semi-Aquatic Receptors (mg/kg, dry weight)					
			Aquatic Life Stage Benthic Invertebrates			Small Mammals		
			$BSAF_{invertebrates}$	Estimated Concentration	Reference	$BSAF_{mammals}$	Estimated Concentration	Reference
Metals								
Copper	N/A	77.18	95% UPL	130	Bechtel and Jacobs (1998) (a)	Regression	17.8	Sample et al. (1998) (c)
Lead	N/A	1983	0.066	130.9	Bechtel and Jacobs (1998) (b)	Regression	27.7	Sample et al. (1998) (c)

Notes:

BSAF = Biota Sediment Accumulation Factor; EPC = Exposure Point Concentration; kg = kilogram; K_{ow} = n-octanol/water partitioning coefficient; log = base-10; mg = milligram; USEPA = United States Environmental Protection Agency

(a) 95% upper prediction limit (UPL) of regressions calculated by Bechtel and Jacobs(1998); calculated according to Appendix A in Bechtel and Jacobs (1998)

(b) Median BSAF for non-depurated invertebrates determined by Bechtel and Jacobs (1998)

(c) Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]).
If multiple trophic-based models were presented, the best fitting model was applied. Slopes (B1) and intercepts (B0) are as follows:

Chemical	BO	B1	Data Source for Model
Copper	2.1042	0.1783	Sample et al. (1998)
Lead	-0.6114	0.5181	Sample et al. (1998)

References:

Bechtel Jacobs Company LLC. 1998. Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation. Bechtel Jacobs Company LLC, Oak Ridge, TN. BJC/OR-112

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, and G.W. Suter, II. 1998. Development and Validation of Bioaccumulation Models for Small Mammals. Oak Ridge National Laboratory, Oak Ridge TN. 89 pp. ES/ER/TM-219.

Table 14
Biota Sediment Accumulation Factors and Estimated Concentrations in Prey Items (Wetland Meadow DU)
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	log K_{ow}	Maximum Sediment EPC (mg/kg, dry weight)	Estimated Concentrations in Dietary Items of Aquatic and Semi-Aquatic Receptors (mg/kg, dry weight)					
			Aquatic Life Stage Benthic Invertebrates			Small Mammals		
			$BSAF_{invertebrates}$	Estimated Concentration	Reference	$BSAF_{mammals}$	Estimated Concentration	Reference
Metals								
Copper	N/A	31.7	95% UPL	102	Bechtel and Jacobs (1998) (a)	Regression	15.2	Sample et al. (1998) (c)
Lead	N/A	115.3	0.066	7.6	Bechtel and Jacobs (1998) (b)	Regression	6.3	Sample et al. (1998) (c)

Notes:

BSAF = Biota Sediment Accumulation Factor; EPC = Exposure Point Concentration; kg = kilogram; K_{ow} = n-octanol/water partitioning coefficient; log = base-10; mg = milligram; USEPA = United States Environmental Protection Agency

(a) 95% upper prediction limit (UPL) of regressions calculated by Bechtel and Jacobs(1998); calculated according to Appendix A in Bechtel and Jacobs (1998)

(b) Median BSAF for non-depurated invertebrates determined by Bechtel and Jacobs (1998)

(c) Small mammal tissue concentrations (mg/kg dry weight) calculated based on regression models, where ln([tissue]) = B0 + B1(ln[soil]).
If multiple trophic-based models were presented, the best fitting model was applied. Slopes (B1) and intercepts (B0) are as follows:

Chemical	BO	B1	Data Source for Model
Copper	2.1042	0.1783	Sample et al. (1998)
Lead	-0.6114	0.5181	Sample et al. (1998)

References:

Bechtel Jacobs Company LLC. 1998. Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation. Bechtel Jacobs Company LLC, Oak Ridge, TN. BJC/OR-112

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, and G.W. Suter, II. 1998. Development and Validation of Bioaccumulation Models for Small Mammals. Oak Ridge National Laboratory, Oak Ridge TN. 89 pp. ES/ER/TM-219.

Table 15
Aquatic and Semi-Aquatic Dose Rate Model Output (Target Berm Ponded DU)
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	Refined Sediment EPC (mg/kg, dry weight)	Refined Water EPC (mg/L)(1)	American robin (mg/kg bw-day)						TRV (mg/kg bw-dw)			
			Diet			Water	Substrate	Total Dose[d]	$\text{TRV}_{\text{NOAEL}}$	HQ_{NOAEL}	$\text{TRV}_{\text{LOAEL}}$	HQ_{LOAEL}
			Invert.	Small Mammals	$\text{Dose}_{\text{diet}}$[a]	$\text{Dose}_{\text{water}}$[b]	$\text{Dose}_{\text{substrate}}$[c]					
Metals												
Copper	77.18	--	1.95E+01	0.00E+00	1.95E+01	--	1.20E+00	2.07E+01	4.05	**5**	34.9	<1
Lead	1983	--	1.96E+01	0.00E+00	1.96E+01	--	3.09E+01	5.05E+01	1.63	**31**	44.6	**1**

Analyte	Refined Sediment EPC (mg/kg, dry weight)	Refined Water EPC (mg/L)(1)	Red-tailed hawk (mg/kg bw-day)						TRV (mg/kg bw-dw)			
			Diet			Water	Substrate	Total Dose[d]	$\text{TRV}_{\text{NOAEL}}$	HQ_{NOAEL}	$\text{TRV}_{\text{LOAEL}}$	HQ_{LOAEL}
			Invert.	Small Mammals	$\text{Dose}_{\text{diet}}$[a]	$\text{Dose}_{\text{water}}$[b]	$\text{Dose}_{\text{substrate}}$[c]					
Metals												
Copper	77.18	--	0.00E+00	1.41E+00	1.41E+00	--	3.49E-01	1.76E+00	4.05	<1	34.9	<1
Lead	1983	--	0.00E+00	2.20E+00	2.20E+00	--	8.98E+00	1.12E+01	1.63	**7**	44.6	<1

Analyte	Refined Sediment EPC (mg/kg, dry weight)	Refined Water EPC (mg/L)(1)	Short-tailed shrew (mg/kg bw-day)						TRV (mg/kg bw-dw)			
			Diet			Water	Substrate	Total Dose[d]	$\text{TRV}_{\text{NOAEL}}$	HQ_{NOAEL}	$\text{TRV}_{\text{LOAEL}}$	HQ_{LOAEL}
			Invert.	Small Mammals	$\text{Dose}_{\text{diet}}$[a]	$\text{Dose}_{\text{water}}$[b]	$\text{Dose}_{\text{substrate}}$[c]					
Metals												
Copper	77.18	--	1.75E+01	0.00E+00	1.75E+01	--	3.10E-01	1.78E+01	5.6	**3**	82.7	<1
Lead	1983	--	1.75E+01	0.00E+00	1.75E+01	--	7.97E+00	2.55E+01	4.7	**5**	186.4	<1

Notes:

bw/d = body weight per day; COPEC = Chemical of Potential Ecological Concern; EPC = Exposure Point Concentration; Invert. = Invertebrates; kg = kilogram; L = liter; LOAEL = Lowest Observable Adverse Effect Level; mg = milligram; N/A = Not Available; NOAEL = No Observable Adverse Effect Level; TRV = toxicity reference value; -- = not evaluated

(1) During preliminary wildlife screening, no dietary water COPECs were identified. Potential impact of Site-related constituents from direct ingestion of water considered negligible.

(a) Dietary dose calculated as:

$$EDD_{diet} = \frac{IR_{diet} \times \sum(B[S]AF \times C_{sed} \times DF_i) \times AUF}{BW}$$

(b) Water dose calculated as:

$$EDD_{water} = \frac{IR_{water} \times C_{water} \times AUF}{BW}$$

(c) Substrate dose calculated as:

$$EDD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

(d) Total dose calculated as:

$$EDD_{total} = EDD_{diet} + EDD_{water} + EDD_{substrate}$$

Where:

EDD_{diet} = Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet} = Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF = Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
C_{sed} = COPEC concentration in sediment (mg COPEC/kg dry weight)
DF_i = Dietary fraction of food item *i*
AUF = Area use factor accounts for receptor home range
BW = Body weight of the receptor, wet weight
C_{water} = COPEC concentration in water (mg COPEC/L water)
IR_{water} = Ingestion rate of water (L water per day)
$\text{EDD}_{\text{water}}$ = Dose of COPEC obtained from water (mg COPEC/kg receptor body weight-day)
$\text{EDD}_{\text{substrate}}$ = Dose of COPEC obtained from substrate (mg COPEC/kg receptor body weight-day)
$\text{IR}_{\text{substrate}}$ = Incidental Ingestion rate of substrate (kg substrate ingested per day, dry weight)
$\text{C}_{\text{substrate}}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Table 16
Aquatic and Semi-Aquatic Dose Rate Model Output (Wetland Meadow DU)
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Analyte	Refined Sediment EPC (mg/kg, dry weight)	Refined Water EPC (mg/L)$^{(1)}$	American robin (mg/kg bw-day)						TRV (mg/kg bw-dw)			
			Diet			Water	Substrate	Total Dose^{d}	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
			Invert.	Small Mammals	$Dose_{diet}$^{a}	$Dose_{water}$^{b}	$Dose_{substrate}$^{c}					
Metals												
Copper	31.7	--	1.53E+01	0.00E+00	1.53E+01	--	4.94E-01	1.58E+01	4.05	**4**	34.9	<1
Lead	115.3	--	1.14E+00	0.00E+00	1.14E+00	--	1.80E+00	2.94E+00	1.63	**2**	44.6	<1

Analyte	Refined Sediment EPC (mg/kg, dry weight)	Refined Water EPC (mg/L)$^{(1)}$	Short-tailed shrew (mg/kg bw-day)						TRV (mg/kg bw-dw)			
			Diet			Water	Substrate	Total Dose^{d}	TRV_{NOAEL}	HQ_{NOAEL}	TRV_{LOAEL}	HQ_{LOAEL}
			Invert.	Small Mammals	$Dose_{diet}$^{a}	$Dose_{water}$^{b}	$Dose_{substrate}$^{c}					
Metals												
Copper	31.7	--	1.36E+01	0.00E+00	1.36E+01	--	1.27E-01	1.38E+01	5.6	**2**	82.7	<1
Lead	115.3	--	1.02E+00	0.00E+00	1.02E+00	--	4.64E-01	1.48E+00	4.7	<1	186.4	<1

Notes:

bw/d = body weight per day; COPEC = Chemical of Potential Ecological Concern; EPC = Exposure Point Concentration; Invert. = Invertebrates; kg = kilogram; L = liter; LOAEL = Lowest Observable Adverse Effect Level; mg = milligram; N/A = Not Available; NOAEL = No Observable Adverse Effect Level; TRV = toxicity reference value; -- = not evaluated

(1) During preliminary wildlife screening, no dietary water COPECs were identified. Potential impact of Site-related constituents from direct ingestion of water considered negligible.

(a) Dietary dose calculated as:

$$EDD_{diet} = \frac{IR_{diet} \times \sum(B[S]AF \times C_{sed} \times DF_i) \times AUF}{BW}$$

(b) Water dose calculated as:

$$EDD_{water} = \frac{IR_{water} \times C_{water} \times AUF}{BW}$$

(c) Substrate dose calculated as:

$$EDD_{substrate} = \frac{IR_{substrate} \times C_{substrate} \times AUF}{BW}$$

(d) Total dose calculated as:

$$EDD_{total} = EDD_{diet} + EDD_{water} + EDD_{substrate}$$

Where:

EDD_{diet} = Dose of COPEC obtained from the diet (mg COPEC/kg receptor body weight-day)
IR_{diet} = Ingestion rate of food (kg food ingested per day, dry weight)
B(S)AF = Bioaccumulation factor (BAF) or biota-sediment accumulation factor (BSAF), specific to prey type and COPEC (kg substrate/kg food, dry weight)
C_{sed} = COPEC concentration in sediment (mg COPEC/kg dry weight)
DF_i = Dietary fraction of food item *i*
AUF = Area use factor accounts for receptor home range
BW = Body weight of the receptor, wet weight
C_{water} = COPEC concentration in water (mg COPEC/L water)
IR_{water} = Ingestion rate of water (L water per day)
EDD_{water} = Dose of COPEC obtained from water (mg COPEC/kg receptor body weight-day)
$EDD_{substrate}$ = Dose of COPEC obtained from substrate (mg COPEC/kg receptor body weight-day)
$IR_{substrate}$ = Incidental Ingestion rate of substrate (kg substrate ingested per day, dry weight)
$C_{substrate}$ = COPEC concentration in substrate (mg COPEC/kg substrate, dry weight)

Attachment C

ProUCL 5.1 Output

Attachment C
ProUCL 5.1 Output
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

UCL Statistics for Uncensored Full Data Sets			
User Selected Options			
e/Time of Computation	ProUCL 5.110/6/2020 11:29:37 AM		
From File	WorkSheet.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
f Bootstrap Operations	2000		
Conc (tb-ponded_sd_antimony)			
General Statistics			
Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	1.92	Mean	6.403
Maximum	19.8	Median	3.705
SD	6.263	Std. Error of Mean	2.214
Coefficient of Variation	0.978	Skewness	1.72
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
Normal GOF Test			
Shapiro Wilk Test Statistic	0.767	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.251	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	10.6	95% Adjusted-CLT UCL (Chen-1995)	11.48
		95% Modified-t UCL (Johnson-1978)	10.82
Gamma GOF Test			
A-D Test Statistic	0.57	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.728	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.272	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.299	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.565	k star (bias corrected MLE)	1.061
Theta hat (MLE)	4.091	Theta star (bias corrected MLE)	6.032
nu hat (MLE)	25.04	nu star (bias corrected)	16.98
MLE Mean (bias corrected)	6.403	MLE Sd (bias corrected)	6.215
		Approximate Chi Square Value (0.05)	8.66

Attachment C
ProUCL 5.1 Output
Screening Level Ecological Risk Assessment
Camp O'Ryan Rifle Range, New York

Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	7.208
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	12.56	95% Adjusted Gamma UCL (use when n<50)	15.08
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.882	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.257	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.652	Mean of logged Data	1.504
Maximum of Logged Data	2.986	SD of logged Data	0.862
Assuming Lognormal Distribution			
95% H-UCL	17.87	90% Chebyshev (MVUE) UCL	11.9
95% Chebyshev (MVUE) UCL	14.51	97.5% Chebyshev (MVUE) UCL	18.12
99% Chebyshev (MVUE) UCL	25.21		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	10.04	95% Jackknife UCL	10.6
95% Standard Bootstrap UCL	9.732	95% Bootstrap-t UCL	16.61
95% Hall's Bootstrap UCL	27.26	95% Percentile Bootstrap UCL	10.07
95% BCA Bootstrap UCL	10.84		
90% Chebyshev(Mean, Sd) UCL	13.05	95% Chebyshev(Mean, Sd) UCL	16.06
97.5% Chebyshev(Mean, Sd) UCL	20.23	99% Chebyshev(Mean, Sd) UCL	28.44
Suggested UCL to Use			
95% Student's-t UCL	10.6		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Conc (tb-ponded_sd_copper)			
General Statistics			
Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	20	Mean	53.71
Maximum	124	Median	38.95

Attachment C
ProUCL 5.1 Output
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SD	35.04	Std. Error of Mean	12.39
Coefficient of Variation	0.652	Skewness	1.301
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
Normal GOF Test			
Shapiro Wilk Test Statistic	0.861	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.226	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	77.18	95% Adjusted-CLT UCL (Chen-1995)	80.17
		95% Modified-t UCL (Johnson-1978)	78.13
Gamma GOF Test			
A-D Test Statistic	0.362	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.23	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.296	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.119	k star (bias corrected MLE)	2.033
Theta hat (MLE)	17.22	Theta star (bias corrected MLE)	26.42
nu hat (MLE)	49.91	nu star (bias corrected)	32.53
MLE Mean (bias corrected)	53.71	MLE Sd (bias corrected)	37.67
		Approximate Chi Square Value (0.05)	20.49
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	18.11
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	85.27	95% Adjusted Gamma UCL (use when n<50)	96.45
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.204	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.996	Mean of logged Data	3.815
Maximum of Logged Data	4.82	SD of logged Data	0.61
Assuming Lognormal Distribution			

95% H-UCL	98.5	90% Chebyshev (MVUE) UCL	88.18
95% Chebyshev (MVUE) UCL	104	97.5% Chebyshev (MVUE) UCL	126
99% Chebyshev (MVUE) UCL	169.1		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	74.09	95% Jackknife UCL	77.18
95% Standard Bootstrap UCL	72.1	95% Bootstrap-t UCL	92.12
95% Hall's Bootstrap UCL	85.07	95% Percentile Bootstrap UCL	74.54
95% BCA Bootstrap UCL	80		
90% Chebyshev(Mean, Sd) UCL	90.87	95% Chebyshev(Mean, Sd) UCL	107.7
97.5% Chebyshev(Mean, Sd) UCL	131.1	99% Chebyshev(Mean, Sd) UCL	177
Suggested UCL to Use			
95% Student's-t UCL	77.18		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Conc (tb-ponded_sd_lead)			
General Statistics			
Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	109	Mean	778.9
Maximum	2780	Median	558.5
SD	851.3	Std. Error of Mean	301
Coefficient of Variation	1.093	Skewness	2.295
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
Normal GOF Test			
Shapiro Wilk Test Statistic	0.715	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.31	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1349	95% Adjusted-CLT UCL (Chen-1995)	1535
		95% Modified-t UCL (Johnson-1978)	1390

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ProUCL 5.1 Output
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Gamma GOF Test			
A-D Test Statistic	0.346	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.19	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.3	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.34	k star (bias corrected MLE)	0.921
Theta hat (MLE)	581.3	Theta star (bias corrected MLE)	845.9
nu hat (MLE)	21.44	nu star (bias corrected)	14.73
MLE Mean (bias corrected)	778.9	MLE Sd (bias corrected)	811.7
		Approximate Chi Square Value (0.05)	7.076
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	5.788
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	1622	95% Adjusted Gamma UCL (use when n<50)	1983
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.973	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.161	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.691	Mean of logged Data	6.24
Maximum of Logged Data	7.93	SD of logged Data	0.977
Assuming Lognormal Distribution			
95% H-UCL	2870	90% Chebyshev (MVUE) UCL	1575
95% Chebyshev (MVUE) UCL	1942	97.5% Chebyshev (MVUE) UCL	2451
99% Chebyshev (MVUE) UCL	3451		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1274	95% Jackknife UCL	1349
95% Standard Bootstrap UCL	1254	95% Bootstrap-t UCL	2224
95% Hall's Bootstrap UCL	3441	95% Percentile Bootstrap UCL	1334
95% BCA Bootstrap UCL	1523		
90% Chebyshev(Mean, Sd) UCL	1682	95% Chebyshev(Mean, Sd) UCL	2091
97.5% Chebyshev(Mean, Sd) UCL	2659	99% Chebyshev(Mean, Sd) UCL	3774
Suggested UCL to Use			
95% Adjusted Gamma UCL	1983		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			

Attachment C
ProUCL 5.1 Output
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Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Conc (tb-ponded_sd_zinc)			
General Statistics			
Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	61.8	Mean	225.9
Maximum	348	Median	262.5
SD	117.4	Std. Error of Mean	41.52
Coefficient of Variation	0.52	Skewness	-0.472
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
Normal GOF Test			
Shapiro Wilk Test Statistic	0.868	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.239	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	304.6	95% Adjusted-CLT UCL (Chen-1995)	286.8
		95% Modified-t UCL (Johnson-1978)	303.4
Gamma GOF Test			
A-D Test Statistic	0.617	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.262	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.296	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.043	k star (bias corrected MLE)	1.985
Theta hat (MLE)	74.25	Theta star (bias corrected MLE)	113.8
nu hat (MLE)	48.68	nu star (bias corrected)	31.76
MLE Mean (bias corrected)	225.9	MLE Sd (bias corrected)	160.3
		Approximate Chi Square Value (0.05)	19.88
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	17.54
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	360.9	95% Adjusted Gamma UCL (use when n<50)	409
Lognormal GOF Test			

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Shapiro Wilk Test Statistic	0.828	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.247	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.124	Mean of logged Data	5.247
Maximum of Logged Data	5.852	SD of logged Data	0.693
Assuming Lognormal Distribution			
95% H-UCL	492.1	90% Chebyshev (MVUE) UCL	407.3
95% Chebyshev (MVUE) UCL	486.2	97.5% Chebyshev (MVUE) UCL	595.7
99% Chebyshev (MVUE) UCL	810.6		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	294.2	95% Jackknife UCL	304.6
95% Standard Bootstrap UCL	290.1	95% Bootstrap-t UCL	295.7
95% Hall's Bootstrap UCL	277.4	95% Percentile Bootstrap UCL	288.4
95% BCA Bootstrap UCL	284.4		
90% Chebyshev(Mean, Sd) UCL	350.5	95% Chebyshev(Mean, Sd) UCL	406.9
97.5% Chebyshev(Mean, Sd) UCL	485.2	99% Chebyshev(Mean, Sd) UCL	639
Suggested UCL to Use			
95% Student's-t UCL	304.6		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			
Conc (wet-meadow_sd_antimony)			
General Statistics			
Total Number of Observations	8	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	0.14	Mean	0.589
Maximum	1.7	Median	0.375
SD	0.551	Std. Error of Mean	0.195
Coefficient of Variation	0.935	Skewness	1.345
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			

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For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
Normal GOF Test			
Shapiro Wilk Test Statistic	0.831	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.958	95% Adjusted-CLT UCL (Chen-1995)	1.008
		95% Modified-t UCL (Johnson-1978)	0.973
Gamma GOF Test			
A-D Test Statistic	0.401	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.729	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.204	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.299	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.431	k star (bias corrected MLE)	0.978
Theta hat (MLE)	0.411	Theta star (bias corrected MLE)	0.602
nu hat (MLE)	22.89	nu star (bias corrected)	15.64
MLE Mean (bias corrected)	0.589	MLE Sd (bias corrected)	0.595
		Approximate Chi Square Value (0.05)	7.709
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	6.354
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	1.194	95% Adjusted Gamma UCL (use when n<50)	1.449
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.908	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.189	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.966	Mean of logged Data	-0.918
Maximum of Logged Data	0.531	SD of logged Data	0.954
Assuming Lognormal Distribution			
95% H-UCL	2.081	90% Chebyshev (MVUE) UCL	1.19
95% Chebyshev (MVUE) UCL	1.464	97.5% Chebyshev (MVUE) UCL	1.844
99% Chebyshev (MVUE) UCL	2.591		
Nonparametric Distribution Free UCL Statistics			

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Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.909	95% Jackknife UCL	0.958
95% Standard Bootstrap UCL	0.888	95% Bootstrap-t UCL	1.246
95% Hall's Bootstrap UCL	1.075	95% Percentile Bootstrap UCL	0.92
95% BCA Bootstrap UCL	0.936		
90% Chebyshev(Mean, Sd) UCL	1.173	95% Chebyshev(Mean, Sd) UCL	1.437
97.5% Chebyshev(Mean, Sd) UCL	1.805	99% Chebyshev(Mean, Sd) UCL	2.526
Suggested UCL to Use			
95% Student's-t UCL	0.958		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Conc (wet-meadow_sd_copper)			
General Statistics			
Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	7.67	Mean	22.78
Maximum	39.6	Median	21.75
SD	13.31	Std. Error of Mean	4.704
Coefficient of Variation	0.584	Skewness	0.139
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
Normal GOF Test			
Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.199	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	31.7	95% Adjusted-CLT UCL (Chen-1995)	30.77
		95% Modified-t UCL (Johnson-1978)	31.74
Gamma GOF Test			
A-D Test Statistic	0.46	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.21	**Kolmogorov-Smirnov Gamma GOF Test**	

5% K-S Critical Value	0.296	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.899	k star (bias corrected MLE)	1.895
Theta hat (MLE)	7.859	Theta star (bias corrected MLE)	12.02
nu hat (MLE)	46.38	nu star (bias corrected)	30.32
MLE Mean (bias corrected)	22.78	MLE Sd (bias corrected)	16.55
		Approximate Chi Square Value (0.05)	18.75
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	16.49
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	36.85	95% Adjusted Gamma UCL (use when n<50)	41.91
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.877	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.188	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.037	Mean of logged Data	2.944
Maximum of Logged Data	3.679	SD of logged Data	0.677
Assuming Lognormal Distribution			
95% H-UCL	47.52	90% Chebyshev (MVUE) UCL	39.97
95% Chebyshev (MVUE) UCL	47.61	97.5% Chebyshev (MVUE) UCL	58.21
99% Chebyshev (MVUE) UCL	79.03		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	30.52	95% Jackknife UCL	31.7
95% Standard Bootstrap UCL	29.96	95% Bootstrap-t UCL	31.94
95% Hall's Bootstrap UCL	29.26	95% Percentile Bootstrap UCL	30.13
95% BCA Bootstrap UCL	30.18		
90% Chebyshev(Mean, Sd) UCL	36.9	95% Chebyshev(Mean, Sd) UCL	43.29
97.5% Chebyshev(Mean, Sd) UCL	52.16	99% Chebyshev(Mean, Sd) UCL	69.59
Suggested UCL to Use			
95% Student's-t UCL	31.7		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

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Conc (wet-meadow_sd_lead)			
General Statistics			
Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	25.5	Mean	77.5
Maximum	154	Median	54.6
SD	56.46	Std. Error of Mean	19.96
Coefficient of Variation	0.728	Skewness	0.546
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
Normal GOF Test			
Shapiro Wilk Test Statistic	0.815	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.269	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	115.3	95% Adjusted-CLT UCL (Chen-1995)	114.5
		95% Modified-t UCL (Johnson-1978)	116
Gamma GOF Test			
A-D Test Statistic	0.629	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.27	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.297	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.084	k star (bias corrected MLE)	1.386
Theta hat (MLE)	37.18	Theta star (bias corrected MLE)	55.92
nu hat (MLE)	33.35	nu star (bias corrected)	22.18
MLE Mean (bias corrected)	77.5	MLE Sd (bias corrected)	65.83
		Approximate Chi Square Value (0.05)	12.47
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	10.68
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	137.8	95% Adjusted Gamma UCL (use when n<50)	161
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.846	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.242	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	

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Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.239	Mean of logged Data	4.092
Maximum of Logged Data	5.037	SD of logged Data	0.783
Assuming Lognormal Distribution			
95% H-UCL	192.4	90% Chebyshev (MVUE) UCL	143.3
95% Chebyshev (MVUE) UCL	173	97.5% Chebyshev (MVUE) UCL	214.2
99% Chebyshev (MVUE) UCL	295.3		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	110.3	95% Jackknife UCL	115.3
95% Standard Bootstrap UCL	108.4	95% Bootstrap-t UCL	120.8
95% Hall's Bootstrap UCL	105.5	95% Percentile Bootstrap UCL	109.7
95% BCA Bootstrap UCL	112.7		
90% Chebyshev(Mean, Sd) UCL	137.4	95% Chebyshev(Mean, Sd) UCL	164.5
97.5% Chebyshev(Mean, Sd) UCL	202.2	99% Chebyshev(Mean, Sd) UCL	276.1
Suggested UCL to Use			
95% Student's-t UCL	115.3		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Conc (wet-meadow_sd_zinc)			
General Statistics			
Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	36.3	Mean	117
Maximum	211	Median	115.5
SD	60.09	Std. Error of Mean	21.25
Coefficient of Variation	0.513	Skewness	0.27
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
Normal GOF Test			

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Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.146	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	157.3	95% Adjusted-CLT UCL (Chen-1995)	154.1
		95% Modified-t UCL (Johnson-1978)	157.6
Gamma GOF Test			
A-D Test Statistic	0.186	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.719	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.153	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.296	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.792	k star (bias corrected MLE)	2.453
Theta hat (MLE)	30.86	Theta star (bias corrected MLE)	47.7
nu hat (MLE)	60.67	nu star (bias corrected)	39.25
MLE Mean (bias corrected)	117	MLE Sd (bias corrected)	74.72
		Approximate Chi Square Value (0.05)	25.9
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	23.19
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	177.4	95% Adjusted Gamma UCL (use when n<50)	198.1
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.956	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.182	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.592	Mean of logged Data	4.625
Maximum of Logged Data	5.352	SD of logged Data	0.593
Assuming Lognormal Distribution			
95% H-UCL	213.8	90% Chebyshev (MVUE) UCL	194.2
95% Chebyshev (MVUE) UCL	228.4	97.5% Chebyshev (MVUE) UCL	275.9
99% Chebyshev (MVUE) UCL	369.2		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	152	95% Jackknife UCL	157.3

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95% Standard Bootstrap UCL	150.2	95% Bootstrap-t UCL	161.2
95% Hall's Bootstrap UCL	161.8	95% Percentile Bootstrap UCL	150.9
95% BCA Bootstrap UCL	151.8		
90% Chebyshev(Mean, Sd) UCL	180.8	95% Chebyshev(Mean, Sd) UCL	209.6
97.5% Chebyshev(Mean, Sd) UCL	249.7	99% Chebyshev(Mean, Sd) UCL	328.4
Suggested UCL to Use			
95% Student's-t UCL	157.3		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Appendix G

Munitions Response Site Prioritization Protocol Tables

Table A

MRS Background Information

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

Munitions Response Site Name: Camp O'Ryan MRS 2 Rifle Range, AEDB-R # NYHQ-008-R-02

Component: Army National Guard Directorate

Installation/Property Name: JFHQ-New York

Location (City, County, State): Wethersfield, Wyoming County, New York

Site Name/Project Name (Project No.): Camp O′Ryan MRS 2 Rifle Range RI, WW9133L-14-D-0001 DO#0006

Date Information Entered/Updated: 26 May 2021

Point of Contact (Name/Phone): Mark Leeper (ARNG), (703) 607-7986

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

Camp O'Ryan MRS 2 Rifle Range is a former small arms range of approximately 42.2 acres (formerly 17.5 acres) located in Wethersfield, Wyoming County, New York. The area outside of the Camp O'Ryan MRS 2, within the former Camp O'Ryan, was used by NYARNG for both company and squad level training including maneuver practicing and camping. The MRS was operational between 1949 and 1974 and again from 1989 through 1994. The firing direction at the Camp O'Ryan MRS 2 was to the southeast. The MRS consists of a former 200-yard range with 50 targets and firing berms at distances of 100 and 200 yards, and a hillside impact berm. The MRS also includes a concrete retaining wall with target structures still intact. Small arms, including .30 caliber M1, were approved for use Camp O'Ryan MRS 2; additional potential munitions used include .22, .38, and .45 caliber, 5.56mm and 7.62mm. Additionally, two MPPEH devices, possibly C5-Tear Gas grenades were found at the base of the hillside impact berm. There is no documented history of sustained tear gas grenade use for training or any other activities at the MRS.

Description of Pathways for Human and Ecological Receptors:

MC deposited in surface soil as a result of firing activities at the MRS has limited potential to migrate from source areas (i.e., 100-yard Firing Berm, Target Area and Target Berm Hillside) to beyond the Camp O'Ryan MRS 2 Rifle Range MRS boundary. Surface water bodies present within the MRS during the field sampling events were too shallow to be sampled, so sediment from the areas was sampled and analyzed to evaluate potential historic migration of MC metals.

MC metals have a strong affinity to sorb to soil particles, particularly soils that are rich in organic matter or high in pH, and usually only migrate via physical transport pathways. Because of these chemical properties, they typically do not leach to groundwater except where shallow groundwater exists less than 5 feet below ground surface (bgs). Two domestic water wells exist approximately 0.25 miles from the MRS. Water depth in well number WO 430 to the southeast is 15 feet bgs (Parsons, 2012). Water depth in well number WO 868 north of the MRS is 50 feet bgs (NYSDEC, 2018). The RI conservatively uses a groundwater depth of 15 feet bgs for evaluation. Groundwater is not anticipated to be affected by munitions activities; however, groundwater depth is unclear at the MRS.

The primary exposure pathways between MC and receptors are expected to be limited to direct exposure to potentially contaminated soil at source areas. RI activities examined if soil with elevated concentrations of MC has migrated from these source areas, including an assessment of sediment in two DUs with shallow standing water.

Description of Receptors (Human and Ecological):

The MRS comprises a privately-owned parcel consisting mostly of forest land. The central portion of the MRS is densely vegetated. While the MRS sits on largely undeveloped land which contains mostly gently rolling, forested terrain comprising deciduous trees with patches of open grass fields, the USFWS National Wetland Inventory lists one potential wetland area within the MRS (USFWS, 2020). This wetland area exists east of the Target Berm Hillside DU. State and federal resources were queried to identify threatened and endangered (T&E) species within Wyoming County. The species listed include plants, invertebrates, amphibians, reptiles, birds, and mammals. Although no specific critical habitat was identified within or near the MRS, USFWS (2020c) indicated that endangered species (northern long-eared bat [Myotis septentrionalis]) and migratory birds (black-capped chickadee [Poecile atricapillus practicus] and bobolink [Dolichonyx oryzivorous]) have large ranges that may overlap the MRS. New York State also lists numerous threatened and endangered species with known ranges or locations within the vicinity of the MRS, including species of mollusks, insects, fish, amphibians, reptiles, birds, and mammals (NYSDEC, 2015). Preferential habitat quality exists at the MRS and its surrounding areas (e.g., fluvial), but ecological receptors are anticipated to be minimally exposed to MC within the MRS or in surrounding areas.

A small portion of the MRS is located on the subdivided parcel owned by King Brothers Masonry Contracting and is used primarily for debris storage; the remainder of the revised MRS is part of a larger, undeveloped and forested swath of land. Given these conditions, there is potential for the following receptors: outdoor worker, construction worker, site visitor/recreational user (child/adult), and hypothetical future resident (child/adult).

100 Yard Firing Berm:	1.39 Acres
Target Area:	0.71 Acres
Target Berm Hillside:	18.51 Acres
Target Berm -Ponded:	0.42 Acres
Wet Meadow:	2.58 Acres
Background Area:	0.83 Acres
Revised MRS Boundary:	42.21 Acres

CLIENT	Army National Guard			
PROJECT	RI through DD for Camp O'Ryan, NY MRS			
REVISION NO	0	GIS BY	GC	11/20/2020
SCALE	1:3,600	CHK BY	JW	11/20/2020
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	AS	11/20/2020

N

Camp O'Ryan Revised MRS 2 Boundary

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure G-1

Table 1

EHE Module: Munitions Type Data Element Table

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

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

Classification	Description	Score
Sensitive	• UXO that are considered most likely to function upon any interaction with exposed persons (e.g., submunitions, 40mm high-explosive [HE] grenades, white phosphorus [WP] munitions, high-explosive antitank [HEAT] munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions). • Hand grenades containing energetic filler. • Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard.	30

High explosive (used or damaged)	• UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered “sensitive.”
	• DMM containing a high-explosive filler that have:
	  • Been damaged by burning or detonation
	  • Deteriorated to the point of instability.
		25

Pyrotechnic (used or damaged)	• UXO containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades).
	• DMM containing a pyrotechnic filler other than white phosphorus (e.g., flares, signals, simulators, smoke grenades) that have:
	  • Been damaged by burning or detonation
	  • Deteriorated to the point of instability.
		20

High explosive (unused)	• DMM containing a high-explosive filler that:
	  • Have not been damaged by burning or detonation
	  • Are not deteriorated to the point of instability.
		15

Propellant	• UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor).
	• DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are:
	  • Damaged by burning or detonation
	  • Deteriorated to the point of instability.
		15

Bulk secondary high explosives, pyrotechnics, or propellant	• DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). • DMM that are bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10

Pyrotechnic (not used or damaged)	• DMM containing a pyrotechnic filler (i.e., red phosphorus), other than white phosphorus filler, that:
	  • Have not been damaged by burning or detonation
	  • Are not deteriorated to the point of instability.
		10

Practice	• UXO that are practice munitions that are not associated with a sensitive fuze.
	• DMM that are practice munitions that are not associated with a sensitive fuze and that have not:
	  • Been damaged by burning or detonation
	  • Deteriorated to the point of instability.
		5

Riot control	• UXO or DMM containing a riot control agent filler (e.g., tear gas).	**3**
Small arms	• Used munitions or DMM that are categorized as small arms ammunition. (Physical evidence or historical evidence that no other types of munitions [e.g., grenades, subcaliber training rockets, demolition charges] were used or are present on the MRS is required for selection of this category.)	2
Evidence of no munitions	• Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	**3**

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

The MRS was used for small arms training between 1949 and 1974 and from 1989 through 1994; Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm) ammunition were used (Parsons, 2012). Based on the Army Policy Memorandum dated 20 February 2009, small arms do not present a unique explosive hazard. Two MPPEH devices identified as potential C5-Tear Gas grenades were found during the RI. There is no history of sustained training with tear gas grenades at the MRS and no other items were discovered during the RI. As the only documented munitions-related activities at the MRS were small arms training and the CHE received an alternative rating of no known or suspected CWM hazard, the MRS does not present an explosive hazard. The alternate score of No Known or Suspected Explosive Hazard has been assigned to the EHE module (Table

Table 2

EHE Module: Source of Hazard Data Element Table

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

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

Classification	Description	Score
Former range	• The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include impact or target areas and associated buffer and safety zones.	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).	**1**

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

The MRS is a former small arms range that was used between 1949 and 1974 and again from 1989 through 1994; Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm) ammunition were used (Parsons, 2012). As a result of delineating MC in soil the MRS boundary was revised to include an area that was part of a larger training and maneuvering area. Two MPPEH devices identified by Eerie County Bomb Squad as possibly as C5-Tear Gas grenades were found at the Target Berm Hillside DU. There is no documented use of historical training with tear gas grenades at the MRS.

Table 3

EHE Module: Location of Munitions Data Element Table

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

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

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

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

During the RI, two MPPEH items were discovered on the surface at the Target Berm Hillside DU. The Eerie County Bomb Squad identified the items as possible C5-Tear Gas grenades. Bullets and bullet fragments were also observed on the ground surface at the Target Area DU. Analytical results from the RI showed elevated levels of small arms metals MC in the 100-yard Firing Berm, Target Area, Target Berm Hillside, Target Berm Ponded and Wetland Area DUs soil and sediment compared to background and human health screening criteria (RI report, Section 5.4).

Table 4

EHE Module: Ease of Access Data Element Table

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

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

Classification	Description	Score
No barrier	- There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	<u>**10**</u>
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).	<u>**10**</u>

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

Access to the MRS is not restricted (RI report, Section 2.3).

Table 5

EHE Module: Status of Property Data Element Table

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

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

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

The MRS is privately-owned (RI report, Section 2.2).

Table 6

EHE Module: Population Density Data Element Table

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

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

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

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

The MRS is located in the City of Wethersfield, which is part of Wyoming County, New York.
The population density for the Town of Windham is 71 people per square mile of land area. (AECOM [2019] WP, Table 2).

Table 7

EHE Module: Population Near Hazard Data Element Table

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

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

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

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

Numerous residential properties and farms are located within a 2-mile radius of the MRS, and King Brothers Masonry Contractors are the commercial property owners of the land the land within the MRS. The former mess hall structure used by the MRS is now the commercial building for the King Brothers business. (AECOM [2019] WP, Chapter 1.2, and Google Earth, 2020).

Table 8

EHE Module: Types of Activities/Structures Data Element Table

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

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

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

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

The current land use includes both undeveloped and commercial land uses. Numerous residential and commercial properties / farms surround the MRS, and access to the MRS land itself is owned and occupied by King Brothers Masonry Contractors. (RI Report, Section 2.1).

Table 9

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

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

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

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

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

There are no known cultural resources located within the MRS (RI Report, Section 2.3.7). Forested areas, which may provide habitat for ecological receptors, are present within the MRS. No federal critical habitats are located within the direct vicinity of the MRS. Although no specific habitat was identified within or near the MRS, USFWS indicated that endangered species (northern long-eared bat [Myotis septentrionalis]) and migratory birds (black-capped chickadee [Poecile atricapillus practicus] and bobolink [Dolichonyx oryzivorous]) have large ranges that may overlap the MRS. New York State also lists numerous threatened and endangered species with known ranges or locations within the vicinity of the MRS, including species of mollusks, insects, fish, amphibians, reptiles, birds, and mammals MRS (RI Report, Section 2.3.7)

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	3	**4**
Source of Hazard	Table 2	1	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	10	**25**
Ease of Access	Table 4	10	
Status of Property	Table 5	5	
Receptor Factor Data Elements			
Population Density	Table 6	1	**14**
Population Near Hazard	Table 7	5	
Types of Activities/Structures	Table 8	5	
Ecological and/or Cultural Resources	Table 9	3	
EHE MODULE TOTAL			**43**

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	**No Known or Suspected Explosive Hazard**

Note: Although two MPPEH items were observed at the MRS during the RI, there is no documented history of training with tear gas grenades at the MRS and no other items were observed during subsequent field mobilizations. The MRS was only historically used for small arms training.

Table 11

CHE Module: CWM Configuration Data Element Table

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

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

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

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

There is no historical evidence that CWM were used, stored, or disposed on the MRS (Parsons SIR, Chapter 4, Section 4.1.1).

Tables 12 through 19 are Intentionally Omitted According to Army Guidance

Table 20

Determining the CHE Module Rating

DIRECTIONS:

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

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

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

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

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's groundwater and their **comparison values** (from Appendix B) 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 (∝g/L)	Comparison Value (∝g/L)	Ratios
Total Lead	18	15	1.2
Dissolved Lead	Not detected	15	NA
CHF Scale	**CHF Value**	**Sum The Ratios**	1.2
CHF > 100	**H (High)**	$$\text{CHF} = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

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

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)	**L**

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)	**M**

No Known or Suspected Groundwater MC Hazard ☐

Groundwater was not sampled as a part of the RI. The metals concentrations used in this table are from shallow groundwater samples collected from downgradient areas of adjacent MRSs as a part of the Woods Hole Group 2011 Preliminary Site Investigation Report.

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) 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 (∝g/L)	Comparison Value (∝g/L)	Ratios
Total Lead	Not detected	15	NA
Dissolved Lead	Not detected	15	NA
CHF Scale	**CHF Value**	**Sum The Ratios**	0
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS**: Record **the CHF Value** from above in the box to the right (maximum value = H)		**L**

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 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)	**L**

Receptor Factor

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

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

Surface water was not sampled as a part of the RI. The metals concentrations used in this table are surface water samples collected from downgradient areas of adjacent MRSs as a part of the Woods Hole Group 2011 Preliminary Site Investigation Report.

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the site'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 human endpoints present in the sediment, select the box at the bottom of the table.

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
Antimony	19.8	31	0.638
Copper	124	3100	0.040
Lead	2780	400	6.95
Zinc	348	23000	0.015
CHF Scale	**CHF Value**	**Sum The Ratios**	7.643
CHF > 100	**H (High)**	**CHF =** $\sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS**: Record **the CHF Value** from above in the box to the right (maximum value = H)		**M**

Migratory Pathway Factor

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

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to 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)	**L**

Receptor Factor

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

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

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

Sediment samples were collected at both sediment areas in evenly spaced increments which represent the scope of each DU (RI Report, Section 3.2). Antimony and lead concentrations exceeded their respective NYSDEC human health screening criterion; lead also exceeded its MRSPP comparison value.

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.

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

Contaminant	Maximum Concentration (∝g/L)	Comparison Value (∝g/L)	Ratios
Total Lead	Note detected	2.5	NA
Dissolved Lead	Not detected	2.5	NA

CHF Scale	CHF Value	Sum The Ratios	0
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

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

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

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)	**L**

Receptor Factor

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

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

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

Surface water was not sampled as a part of the RI. The metals concentrations used in this table are surface water samples collected from adjacent MRSs as a part of the Woods Hole Group 2011 Preliminary Site Investigation Report.

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's 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.

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
Antimony	19.8	2.00	9.9
Copper	124	31.6	3.29
Lead	2780	35.8	77.65
Zinc	348	121.0	2.87
CHF Scale	**CHF Value**	**Sum The Ratios**	93.71
CHF > 100	**H (High)**	$\text{CHF} = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS**: Record **the CHF Value** from above in the box to the right (maximum value = H)		**M**

Migratory Pathway Factor

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

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

Receptor Factor

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

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

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

Sediment samples were collected from two areas in evenly spaced increments that are representative of each decision unit (RI Report, Section 3.2). Sediment sample concentrations for each MC analyte exceed DoD ecological comparison values (RI Report, Section 5.4). The RI SLERA concluded that there is negligible risk to the benthic macroinvertebrate community and the aquatic and semiaquatic wildlife community at the Wetland Meadow DU, but there is potential risk for adverse ecological effects from direct contact based lead COCs in sediment at the Target Berm Ponded DU (RI Report, Appendix F).

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 (mg/kg)**	**Comparison Value (mg/kg)**	**Ratios**
Antimony	328 (2009 NYSDEC Data)	31	10.58
Copper	5,530 (2009 NYSDEC Data)	3100	1.78
Lead	50,900 (2009 NYSDEC Data)	400	127.25
Zinc	119 (2020 AECOM Data)	23000	0.005
CHF Scale	**CHF Value**	**Sum The Ratios**	139.615
CHF > 100	**H (High)**	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS**: Record **the CHF Value** from above in the box to the right (maximum value = H)		**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)	**M**

Receptor Factor

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

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

No Known or Suspected Surface Soil MC Hazard ☐

Surface soil samples were analyzed for MC metals (antimony, copper, zinc and lead). Although no surface soil samples collected during the 2020 RI exhibited MC concentrations that exceeded DoD comparison values, discrete surface soil samples collected during the 2009 NYSDEC investigation did. MC deposited in surface soil as a result of firing activities at the MRS has limited potential to migrate from source areas (i.e., subsurface soil, adjacent sediment). Given the MRS topography, range orientation, and heavy vegetation, stormwater runoff from significant rain events is unlikely to transport suspended MC off site.

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

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

Note: Do not add ratios from different media.

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard, Migration Pathway, and Receptor Factors** for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the 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
Groundwater (Table 21)	**L**	**L**	**M**	**L-L-M**	**F**
Surface Water/Human Endpoint (Table 22)	**L**	**L**	**M**	**L-L-M**	**F**
Sediment/Human Endpoint (Table 23)	**M**	**L**	**M**	**M-L-M**	**E**
Surface Water/Ecological Endpoint (Table 24)	**L**	**L**	**M**	**L-L-M**	**F**
Sediment/Ecological Endpoint (Table 25)	**M**	**M**	**M**	**M-M-M**	**D**
Surface Soil (Table 26)	**H**	**M**	**M**	**H-M-M**	**C**

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 media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE Module Rating	**C**

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				**4**	

Appendix H
Additional Sampling Procedures

S-9 SEDIMENT SAMPLING FOR GRAIN SIZE, AVS/SEM, AND TOC ANALYSIS STANDARD OPERATING PROCEDURE

1.0 Scope and Application

The purpose of this standard operating procedure (SOP) is to delineate protocols for sampling sediments for grain size, Acid Volatile Sulfide (AVS) /Simultaneously Extracted Metals (SEM) and total organic carbon (TOC) analysis. TOC is the amount of carbon bound in an organic compound. TOC concentration is calculated by subtracting total inorganic carbon (TIC) from total carbon (TC).

The term AVS represents the amount of sulfide in sediments available for binding heavy metals, and the term SEM represents the amount of certain metals in sediment that could be available to plants and animals. The metals in this program include cadmium, copper, lead, nickel, and zinc; additional metals can also be requested for analysis, depending on program needs. *The exact list of metals must be specified on the Chain-of-Custody (COC) records.*

The following is a simplified summary of the AVS/SEM evaluation.

- If AVS > ΣSEM, a non-bioavailability of metals in the sediment investigation area is indicated (i.e., a ΣSEM/AVS ratio less than or equal to 1).
- If AVS ≤ ΣSEM, the potential for bioavailability of heavy metals into the aquatic biota system is indicated (i.e., a ΣSEM/AVS ratio greater than 1).
- If there are low values of ΣSEM [< 1 micromole per gram (µmole/g)], little potential for bioavailability is indicated (McGrath *et al.*, 2002).

These calculated concentrations of metal mixtures in sediment are protective of the presence of benthic organisms. This procedure can be applied to the collection of sediment samples from areas of deposition such as streams, rivers, ditches, lakes, ponds, and lagoons. Sediments include solid matter derived from rocks or biological materials that are suspended in or settled from water. Sediment samples indicate the amount of contamination adsorbed on sediment particles. It is, therefore, important to collect a representative sample.

The following procedure is for use in wadeable waterways.

2.0 Material

a. Sample bottles
b. Rubber boots/waders
c. Safety knife
d. Personal protective equipment (PPE)
e. Hand-held global positioning system (GPS)
f. Field logbook
g. Camera
h. Numbered stake(s) and/or survey flag(s)
i. Nitrile gloves

j. Sediment coring device and/or sample jar
k. Permanent marker

3.0 Procedure

a. Collect surface water samples prior to sediment sampling. See appropriate surface water sampling SOP (1-3).

b. Mark the sampling location on a site map and collect a GPS point of the location. Photograph (optional, recommended) and describe each location, and place a numbered stake above the visible high water mark on the bank closest to the sampling location, and/or mark adjacent trees with a surveyor's flagging. The photographs and description must be adequate to allow the sampling station to be relocated at some future date.

c. Put on the appropriate PPE before sampling (refer to the site safety and health plan).

d. Use a properly decontaminated sampler to collect sediment samples. Decontaminate sampler following procedures described in decontamination SOP (S-8) for organic and inorganic analysis.

e. Collect only the top 5 cm centimeters (2 inches) of sediment.

f. Samples should be collected from an area or areas (for sufficient sample volume) identified on the stream where fine sediment has accumulated, and which may constitute an adequate ecological habitat.

g. In water deeper than knee-deep, the grain size, AVS/SEM, and TOC samples should be collected using a larger diameter coring device (2 to 3") by taking a core and putting it directly into the sample container repeatedly until sufficient sample volume has been collected.

h. In water shallower than knee-deep, the grain size, AVS/SEM, and TOC samples should be collected directly into the sampling containers.

i. Utilizing clean Nitrile gloves slowly advance the clean sample equipment or open sample jar through the water and to the top of the sediment located under the water at the sediment/water interface.

j. Using a very slow push and twist method, advance the core or sample jar through the sediment approximately 2 inches, no greater than 3 inches, and then stop.

k. Taking care to minimize loss of sediment and pore water, seal jar so as to minimize headspace.

l. If not using a sample jar, seal the sample equipment in an attempt to create sufficient vacuum in the equipment to hold the contained sediment/water during removal of the sample. Remove the sample equipment using a very slow pull and twist method while taking care not to fully remove the sampler from the location until the equipment can be capped at both ends to avoid sample loss. This activity should be completed quickly to avoid loss of sediment as sampler is extracted from the location. Often a rubber stopper can be used on the bottom end of the sampler as it can be effectively placed quickly. Transfer to sample jar minimizing headspace.

m. Avoid mixing sediments because the trace metal speciation in the sediments will be altered if aerobic and anaerobic sediments are mixed (Bufflap and Allen, 1995). If another sediment sample is to be taken, use clean gloves and sampling equipment, and take the sample from a location upstream of the first sample.

n. Decontaminate equipment according to the Decontamination SOP.

o. Dispose of all sampling wastes in properly labeled containers.

4.0 Sample Processing, Handling, Packing, Storing, and Shipping

a. Seal the sample container with zero headspace in an inert environment (ideally, under saturated conditions) to minimize exposure to oxygen.

b. Place sediment samples not immediately shipped for overnight delivery in sealed airtight glass jars or cores and refrigerate them < 6°C.

5.0 Precautions

a. Both surface water and sediment samples are to be collected at the same location.

b. Take the surface water sample first. Sediment sampling usually results in disturbance of the sediments which may influence the analytical results of the surface water samples.

c. Wear gloves when collecting sediment samples. Be sure to consult the site safety and health plan for the proper dermal and respiratory protection prior to collecting any samples.

d. Higher levels of PPE may be required by the site safety and health plan.

e. Collect samples first from those areas that are suspected of being the least contaminated (i.e. reference locations), thus minimizing the risk of cross contamination.

f. When collecting multiple samples from a location sample downstream areas first moving in an upstream direction.

6.0 References

Bufflap W.E., and H.E. Allen, 1995. *Sediment Interstitial Water Collection Methods: A Review.* Water Research 29:65-177.

EPA, 2001. *Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual*. EPA-823-B-01-002.

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Region 4
U.S. Environmental Protection Agency
Science and Ecosystem Support Division
Athens, Georgia

OPERATING PROCEDURE

Title: **Sediment Sampling**

Effective Date: August 21, 2014

Number: SESDPROC-200-R3

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Revision History

The top row of this table shows the most recent changes to this controlled document. For previous revision history information, archived versions of this document are maintained by the SESD Document Control Coordinator on the SESD local area network (LAN).

History	Effective Date
SESDPROC-200-R3, *Sediment Sampling*, replaces SESDPROC-200-R2. **General:** Corrected any typographical, grammatical, and/or editorial errors. Throughout the document mention of quality system or SESD quality system was replaced with Field Branches Quality System or FBQS. **Cover Page:** Changed the Enforcement and Investigations Branch Chief from Archie Lee to Acting Chief, John Deatrick. Changed the Ecological Assessment Branch Chief from Bill Cosgrove to Acting Chief, Laura Ackerman. Changed the FQM from Liza Montalvo to Bobby Lewis. **Revision History:** Changes were made to reflect the current practice of only including the most recent changes in the revision history. Throughout the document: any reference to “Percent Moisture” was changed to “Percent Solids.”	August 21, 2014
SESDPROC-200-R2, *Sediment Sampling*, replaces SESDPROC-200-R1.	September 8, 2010
SESDPROC-200-R1, *Sediment Sampling*, replaces SESDPROC-200-R0.	November 1, 2007
SESDPROC-200-R0, *Sediment Sampling*, Original Issue	February 05, 2007

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1 General Information

1.1 Purpose

This document describes general and specific procedures, methods and considerations to be used and observed when collecting sediment samples for field screening or laboratory analysis.

1.2 Scope/Application

The procedures contained in this document are to be used by field investigators when collecting and handling sediment samples in the field. On the occasion that SESD field investigators determine that any of the procedures described in this section are inappropriate, inadequate or impractical and that another procedure must be used to obtain a sediment sample, the variant procedure will be documented in the field log book, along with a description of the circumstances requiring its use. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

1.3 Documentation/Verification

This procedure was prepared by persons deemed technically competent by SESD management, based on their knowledge, skills and abilities and has been tested in practice and reviewed in print by a subject matter expert. The official copy of this procedure resides on the SESD local area network (LAN). The Document Control Coordinator (DCC) is responsible for ensuring the most recent version of the procedure is placed on the LAN and for maintaining records of review conducted prior to its issuance.

1.4 References

International Air Transport Authority (IATA). Dangerous Goods Regulations, Most Recent Version

SESD Operating Procedure for Control of Records, SESDPROC-004, Most Recent Version

SESD Operating Procedure for Sample and Evidence Management, SESDPROC-005, Most Recent Version

SESD Operating Procedure for Logbooks, SESDPROC-010, Most Recent Version

SESD Operating Procedure for Field Sampling Quality Control, SESDPROC-011, Most Recent Version

SESD Operating Procedure for Equipment Inventory and Management, SESDPROC-104, Most Recent Version

SESD Operating Procedure for Field Equipment Cleaning and Decontamination, SESDPROC-205, Most Recent Version

SESD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC, SESDPROC-206, Most Recent Version

SESD Operating Procedure for Packaging, Marking, Labeling and Shipping of Environmental and Waste Samples, SESDPROC-209, Most Recent Version

Title 49 Code of Federal Regulations, Pts. 171 to 179, Most Recent Version

United States Environmental Protection Agency (US EPA). 2001. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. Region 4 Science and Ecosystem Support Division (SESD), Athens, GA

US EPA. Analytical Support Branch Laboratory Operations and Quality Assurance Manual. Region 4 SESD, Athens, GA, Most Recent Version

US EPA. Safety, Health and Environmental Management Program Procedures and Policy Manual. Region 4 SESD, Athens, GA, Most Recent Version

United States Office of Occupational Health and Safety (US OSHA). 1981. Final Regulation Package for Compliance with DOT Regulations in the Shipment of Environmental Laboratory Samples (PM-273), Memo from David Weitzman, Work Group Chairman, US EPA. April 13, 1981.

1.5 General Precautions

1.5.1 Safety

Proper safety precautions must be observed when collecting sediment samples. Refer to the SESD Safety, Health and Environmental Management Program (SHEMP) Procedures and Policy Manual and any pertinent site-specific Health and Safety Plans (HASPs) for guidelines on safety precautions. These guidelines should be used to complement the judgment of an experienced professional. Address chemicals that pose specific toxicity or safety concerns and follow any other relevant requirements, as appropriate.

1.5.2 Procedural Precautions

The following precautions should be considered when collecting sediment samples.

- Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.
- Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party.
- If samples are transported by the sampler, they will remain under his/her custody or be secured until they are relinquished.
- Shipped samples shall conform to all U.S. Department of Transportation (DOT) rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179), and/or International Air Transportation Association (IATA) hazardous materials shipping requirements found in the current edition of IATA’s Dangerous Goods Regulations.
- Documentation of field sampling is done in a bound logbook.
- Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.
- All shipping documents, such as air bills, bills of lading, etc., shall be retained by the project leader and stored in a secure place.

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2 Special Sampling Considerations

2.1 Sediment Samples for Volatile Organic Compounds Analysis

If samples are to be analyzed for volatile organic compounds (VOCs), they should be collected in a manner that minimizes disturbance of the sample. The sample for VOC analysis should be collected directly from the sample device, if possible, before it is emptied into the pan. It may not be possible to do this with certain types of sediment sampling equipment, such as the Ponar dredge. In cases such as these, the VOC aliquots should be collected from the dredge contents immediately after they have been deposited in the pan and prior to any mixing. The sample shall be placed in the appropriate container (En Core® Sampler or other Method 5035 compatible container) with no headspace. ***Samples for VOC analysis are not homogenized***. Preservatives may be required for some samples with certain variations of Method 5035. Consult the method description below in Section 2.2, Sediment Sampling (Method 5035) or the principal analytical chemist to determine if preservatives are necessary.

In some cases, the sediment may be soft and not lend itself to collection by plunging En Core® Samplers or syringe samplers into the sample matrix. In these cases, it is appropriate to open the sample device, i.e., the En Core® Sampler barrel or syringe, prior to sample collection, and to carefully place the sediment in the device, filling it fully with the required volume of sample.

2.2 Sediment Sampling (Method 5035)

The following sampling protocol is recommended for site investigators assessing the extent of VOCs in sediments at a project site. Because of the large number of options available, careful coordination between field and laboratory personnel is needed. The specific sampling containers and sampling tools required will depend upon the detection levels and intended data use. Once this information has been established, selection of the appropriate sampling procedure and preservation method best applicable to the investigation can be made.

2.2.1 Equipment

Sediment for VOC analyses may be retrieved using any of the SESD sediment sampling methods described in Sections 3 through 6 of this procedure. Once the sediment has been obtained, the En Core® Sampler, syringes, stainless steel spatula, standard 2-oz. sediment VOC container, or pre-prepared 40 ml vials may be used/required for sub-sampling. The specific sample containers and the sampling tools required will depend upon the data quality objectives established for the site or sampling investigation. The various sub-sampling methods are described below.

2.2.2 Sampling Methodology - Low Concentrations

When the total VOC concentration in the sediment is expected to be less than 200 µg/kg, the samples may be collected directly with the En Core® Sampler or syringe. If using the syringes, the sample must be placed in the sample container (40 ml pre-prepared vial) immediately to reduce volatilization losses. The 40 ml vials should contain 10 ml of organic-free water for an un-preserved sample or approximately 10 ml of organic-free water and a preservative. It is recommended that the 40 ml vials be prepared and weighed by the laboratory (commercial sources are available which supply preserved and tared vials). When sampling directly with the En Core® Sampler, the vial must be immediately capped and locked.

A sediment sample for VOC analysis may also be collected with conventional sampling equipment. A sample collected in this fashion must either be placed in the final sample container (En Core® Sampler or 40 ml pre-prepared vial) immediately or the sample may be immediately placed into an intermediate sample container with no head space. If an intermediate container (usually 2-oz. sediment jar) is used, the sample must be transferred to the final sample container (En Core® Sampler or 40 ml pre-prepared vial) as soon as possible, not to exceed 30 minutes.

NOTE: After collection of the sample into either the En Core® Sampler or other container, the sample must immediately be stored in an ice chest and cooled.

Sediment samples may be prepared for shipping and analysis as follows:

En Core® Sampler - the sample shall be capped, locked, and secured in a plastic bag.

Syringe - Add about 3.7 cc (approximately 5 grams) of sample material to 40-ml pre-prepared containers. Secure the containers in a plastic bag. Do not use a custody seal on the container; place the custody seal on the plastic bag. Note: When using the syringes, it is important that no air is allowed to become trapped behind the sample prior to extrusion, as this will adversely affect the sample.

Stainless Steel Laboratory Spatulas - Add between 4.5 and 5.5 grams (approximate) of sample material to 40 ml containers. Secure the containers in a plastic bag. Do not use a custody seal on the container; place the custody seal on the plastic bag.

2.2.3 Sampling Methodology - High Concentrations

Based upon the data quality objectives and the detection level requirements, this high level method may also be used. Specifically, the sample may be packed into a single 2-oz. glass container with a screw cap and septum seal. The sample container must be filled quickly and completely to eliminate head space. Sediments containing high total VOC concentrations may also be collected as described in Section 2.2.2, Sampling Methodology - Low Concentrations, and preserved using 10 ml methanol.

2.2.4 Special Techniques and Considerations for Method 5035

Effervescence

If low concentration samples effervesce from contact with the acid preservative, then either a test for effervescence must be performed prior to sampling, or the investigators must be prepared to collect each sample both preserved or un-preserved as needed, or all samples must be collected unpreserved.

To check for effervescence, collect a test sample and add to a pre-preserved vial. If preservation (acidification) of the sample results in effervescence (rapid formation of bubbles) then preservation by acidification is not acceptable, and the sample must be collected un-preserved.

If effervescence occurs and only pre-preserved sample vials are available, the preservative solution may be placed into an appropriate hazardous waste container and the vials triple rinsed with organic-free water. An appropriate amount of organic-free water, equal to the amount of preservative solution, should be placed into the vial. The sample may then be collected as an un-preserved sample. Note that the amount of organic free water placed into the vials will have to be accurately measured.

Sample Size

While this method is an improvement over earlier ones, field investigators must be aware of an inherent limitation. Because of the extremely small sample size, sample representativeness for VOCs may be reduced compared to samples with larger volumes collected for other constituents. The sampling design and objectives of the investigation should take this into consideration.

Holding Times

Sample holding times are specified in the USEPA Region 4 Analytical Support Branch Laboratory Operations and Quality Assurance Manual (ASBLOQAM), Most Recent Version. Field investigators should note that the holding time for an un-preserved VOC sediment sample is 48 hours. Arrangements should be made to ship the sediment VOC samples to the laboratory by overnight delivery the day they are collected so the laboratory may preserve and/or analyze the sample within 48 hours of collection.

Percent Solids

Samplers must ensure that the laboratory has sufficient material to determine percent solids in the VOC sediment sample to correct the analytical results to dry weight. If other analyses requiring percent solids determination are being performed upon the sample, these results may be used. If not, a separate sample (minimum of 2 oz.) for percent solids determination will be required.

Safety

Methanol is a toxic and flammable liquid. Therefore, methanol must be handled with all required safety precautions related to toxic and flammable liquids. Inhalation of methanol vapors must be avoided. Vials should be opened and closed quickly during the sample preservation procedure. Methanol must be handled in a ventilated area. Use protective gloves when handling the methanol vials. Store methanol away from sources of ignition such as extreme heat or open flames. The vials of methanol should be stored in a cooler with ice at all times.

Shipping

Methanol and sodium bisulfate are considered dangerous goods, therefore shipment of samples preserved with these materials by common carrier is regulated by the U.S. Department of Transportation and the International Air Transport Association (IATA). The rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179) and the current edition of the IATA Dangerous Goods Regulations must be followed when shipping methanol and sodium bisulfate. Consult the above documents or the carrier for additional information. Shipment of the quantities of methanol and sodium bisulfate used for sample preservation falls under the exemption for small quantities. A summary of the requirements for shipping samples follows. Refer to the code for a complete review of the requirements.

1. The maximum volume of methanol or sodium bisulfate in a sample container is

limited to thirty (30) ml.

2. The sample container must not be full of methanol.

3. The sample container must be stored upright and have the lid held securely in place. Note that the mechanism used to hold the cap in place must be able to be completely removed so weight is not added to the sample container, as specified in Method 5035.

4. Sample containers must be packed in an absorbent material capable of absorbing spills from leaks or breakage of the sample containers.

5. The maximum sample shuttle weight must not exceed 64 pounds.

6 The maximum volume of methanol or sodium bisulfate per shipping container is 500 ml.

7 The shipper must mark the sample shuttle in accordance with shipping dangerous goods in acceptable quantities.

8. The package must not be opened or altered until no longer in commerce.

The following summary table lists the options available for compliance with SW846 Method 5035. The advantages and disadvantages are noted for each option. SESD's goal is to minimize the use of hazardous material (methanol and sodium bisulfate) and minimize the generation of hazardous waste during sample collection.

Table 1: Method 5035 Summary

OPTION	**PROCEDURE**	**ADVANTAGES**	**DISADVANTAGES**
1	Collect 2 – 40 ml vials with ~5 grams of sample and 1 – 2 oz. glass w/septum lid for screening and % solids	Screening conducted by lab	Presently a 48 hour holding time for unpreserved samples
2	Collect 3 EnCore® Samplers and 1 – 2oz. glass w/septum lid for screening and % solids	Lab conducts all preservation/preparation procedures	Presently a 48 hour holding time for preparation of samples
3	Collect 2 – 40 ml vials with 5 grams of sample and preserve w/methanol or sodium bisulfate, and 1 – 2 oz. glass w/septum lid for screening and % solids	High level VOC samples may be composited Longer holding time	Hazardous materials used in field
4	Collect 1 – 2 oz. glass w/septum lid for analysis and % solids	Lab conducts all preservation/preparation procedures	May have significant VOC loss

2.3 Special Precautions for Trace Contaminant Sediment Sampling

- A clean pair of new, non-powdered, disposable gloves will be worn each time a different location is sampled and the gloves should be donned immediately prior to sampling. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised.
- Sample containers with samples suspected of containing high concentrations of contaminants shall be stored separately. All background samples shall be collected and placed in separate ice chests or shipping containers. Sample collection activities shall proceed progressively from the least suspected contaminated area to the most suspected contaminated area if sampling devices are to be reused. Samples of waste or highly contaminated media must not be placed in the same ice chest as environmental (i.e., containing low contaminant levels) or background samples.
- If possible, one member of the field sampling team should take all the notes and photographs, fill out tags, etc., while the other members collect the samples.

- Samplers must use new, verified and certified-clean disposable or non-disposable equipment cleaned according to procedures contained in SESD Operating Procedure for Field Equipment Cleaning and Decontamination, SESDPROC-205, or SESD Operating Procedure for Field Cleaning and Decontamination at the FEC, SESDPROC-206, for collection of samples for trace metals or organic compound analyses.

2.4 Sample Homogenization

1. If sub-sampling of the primary sample is to be performed in the laboratory, transfer the entire primary sample directly into an appropriate, labeled sample container(s). Proceed to step 5

2. If sub-sampling the primary sample in the field or compositing multiple primary samples in the field, place the sample into a glass or stainless steel homogenization container and mix thoroughly. Each aliquot of a composite sample should be of the same volume.

3. All sediment samples must be thoroughly mixed to ensure that the sample is as representative as possible of the sample media. ***Samples for VOC analysis are not homogenized.*** The most common method of mixing is referred to as quartering. The quartering procedure should be performed as follows:

    - The material in the sample pan should be divided into quarters and each quarter should be mixed individually.
    - Two quarters should then be mixed to form halves.
    - The two halves should be mixed to form a homogenous matrix.

    This procedure should be repeated several times until the sample is adequately mixed. If round bowls are used for sample mixing, adequate mixing is achieved by stirring the material in a circular fashion, reversing direction, and occasionally turning the material over.

4. Place the sample into an appropriate, labeled container(s) using the alternate shoveling method and secure the cap(s) tightly. Threads on the container and lid should be cleaned to ensure a tight seal when closed.

5. Return any unused sample material back to the location from which the sample was collected.

2.5 Quality Control

If possible, a control sample should be collected from an area not affected by the possible contaminants of concern and submitted with the other samples. The control sample should be collected at an upstream location in the same stream or conveyance from which the primary samples area collected. Equipment blanks should be collected if equipment is field cleaned and re-used on-site or if necessary to document that low-level contaminants were not introduced by sampling tools.

2.6 Records

Information generated or obtained by SESD personnel will be organized and accounted for in accordance with SESD records management procedures found in SESD Operating Procedure for Control of Records, SESDPROC-004. Field notes, recorded in a bound field logbook, will be generated, as well as chain-of-custody documentation in accordance with SESD Operating Procedure for Logbooks, SESDPROC-010 and SESD Procedure for Sample and Evidence Management, SESDPROC-005.

3 General Considerations

3.1 General

The sediment sampling techniques and equipment described in the following Sections 4, 5 and 6 of this procedure document are designed to minimize effects on the chemical and physical integrity of the sample. If the procedures in this section are followed, a representative sample of the sediment should be obtained.

3.2 Equipment Selection Considerations

The physical location of the investigator when collecting a sample may dictate the equipment to be used. Wading is the preferred method for reaching the sampling location, particularly if the stream has a noticeable current (is not impounded). However, wading may disrupt bottom sediments causing biased results; therefore, the samples should be collected facing upstream. If the stream is too deep to wade, the sediment sample may be collected from a platform such as a boat or a bridge.

To collect a sediment sample from a water body or other surface water conveyance, a variety of methods can be used:

- Scoops and spoons
- Dredges (Ponar, Young)
- Coring Devices (tubes, Shelby tubes, Ogeechee Sand Pounders®, and augers)
- Vibracore® (Electronic Vibratory Core Tube Driver)

Regardless of the method used, precautions should be taken to insure that the sample collected is representative of the water body or conveyance. These methods are discussed in the following paragraphs.

4 Stainless Steel Scoops and Spoons

4.1 Wading

If the conveyance is dry or is a wadeable surface water body, the easiest way to collect a sediment sample is by using a stainless steel scoop or spoon. If the conveyance is dry, the sediment is accessed directly and is collected using either the stainless steel scoop or spoon. If the conveyance is a wadeable stream or other water body, the method is accomplished by wading into the surface water body and while facing upstream (into the current), scooping the sample along the bottom of the surface water body in the upstream direction. Excess water may be removed/drained from the scoop or spoon. However, this may result in the loss of some fine-grained particle size material associated with the substrate being sampled. Care should be taken to minimize the loss of this fine-grained material. Aliquots of the sample thus collected are then placed in a glass pan and homogenized according to the quartering method described in Section 2.4.

4.2 Bank/Platform Sampling

In surface water bodies that are too deep to wade, but less than eight feet deep, a stainless steel scoop or spoon attached to a piece of conduit can be used either from the banks, if the surface water body is narrow, or from a boat. Again, care should be taken to minimize the loss of the fine particle sizes. The sediment is placed into a glass pan and mixed according to the quartering method described in Section 2.4.

5 Dredges

5.1 General Considerations

Dredges provide a means of collecting sediment from surface water bodies that are too deep to access with a scoop and conduit. They are most useful when collecting softer, finer-grained substrates comprised of silts and clays but can also be used to collect sediments comprised of sands and gravel, although sample recovery in these materials may be less than complete.

Free, vertical clearance is required to use any of the dredges. Dredges, attached to ropes, are lowered vertically from the sampling platform (boat, bridge, etc.) to the substrate being sampled beneath the deployment point.

5.2 Ponar Dredge

The Ponar dredge has side plates and a screen on the top of the sample compartment and samples a 0.05 m^2 surface area. The screen over the sample compartment permits water to pass through the sampler as it descends thus reducing turbulence around the dredge. The Ponar dredge is easily operated by one person and is one of the most effective samplers for general use on most types of substrates.

The Ponar dredge is deployed in its open configuration. It is lowered gently from the sampling platform to the substrate below the platform. After the dredge lands on the substrate, the rope is tugged upward, closing the dredge and capturing the sample. The dredge is then hauled to the surface, where it is opened to acquire the sample.

5.3 Mini-Ponar Dredge

The Mini-Ponar dredge is a smaller, much lighter version of the Ponar dredge and samples a 0.023 m^2 surface area. It is used to collect smaller sample volumes when working in industrial tanks, lagoons, ponds, and shallow water bodies. It is a good device to use when collecting sludge and sediment containing hazardous constituents because the size of the dredge makes it more amenable to field cleaning. Its use and operation are the same as described in Section 5.2, Ponar Dredge, above.

5.4 Young Grab

The Young grab sampler is a stainless steel clamshell-type grab sampler similar to a Ponar dredge**.** It is a clamshell-type sampler with a scissors closing action typically used for marine and estuarine sediment sampling. The Young grab sampler is one of the most consistently performing grab sampling devices for sediment sampling in both offshore marine sediments, as well as estuarine sediments. The Young sampler comes in two sizes, 0.1 m^2 and 0.04 m^2. The 0.1 m^2 is typically used when a larger volume of sediment is needed for chemistry and particle size. The 0.04 m^2 is typically used for marine benthic macroinvertebrate sampling and has become the standard grab sampler used by NOAA, USGS and USEPA.

The Young sampler is lowered to the substrate to be sampled with a cable or rope that has a catch that is released when tension is taken off the cable or rope. When the sample device is pulled up, the scissors action of the arms close the clamshell and grabs the sample.

The major difference in the Young grab sampler and other grab samplers is a square or rectangular frame attached to the device which prevents it from penetrating too deeply into soft sediments. In harder substrates, weights may be added to the frame in order to hold the grab in place to prevent collection of a “shallow” sample. A tripod frame can also be attached to the frame surrounding the Young grab sampler. The wire or rope that the grab is raised and lowered with passes through an opening in the top of the tripod and prevents the device from landing sideways or at an angle when there are strong currents or there is lateral movement of the sampling vessel during grab sampling operations.

The draw back to the Young grab sampler is that due to the weight and size of the frame, a ship with an “A” frame or a boat with a davit is required in order to raise and lower the sampler.

6 Sediment Coring Devices

6.1 General

Core samplers are used to sample vertical columns of sediment. They are particularly useful when a historical picture of sediment deposition is desired since they preserve the sequential layering of the deposit. They are also particularly useful when it is desirable to minimize the loss of material at the sediment-water interface. Many types of coring devices have been developed, depending on the depth of water from which the sample is to be obtained, the nature of the bottom material and the length of core to be collected. They vary from hand-driven push tubes to electronic vibrational core tube drivers. These methods are described below in the following sections.

Coring devices are particularly useful in pollutant monitoring because turbulence created by descent through the water is minimal, thus the fines at the sediment-water interface are only minimally disturbed; the sample is withdrawn intact, permitting the removal of only those layers of interest; core liners manufactured of glass or Teflon® can be purchased, thus reducing possible sample interferences; and the samples are easily delivered to the lab for analysis in the tube in which they were collected.

The disadvantage of coring devices is that a relatively small surface area and sample size is obtained, often necessitating repetitive sampling in order to obtain the required amount of material for analysis. Because it is believed that this disadvantage is offset by the advantages, coring devices are recommended in sampling sediments for trace organic compounds or metals analyses.

6.2 Manually Deployed Push Tubes

In shallow, wadeable waters, or for diver-collected samples, the direct use of a core liner or tube manufactured of Teflon®, plastic, or glass is recommended for the collection of sediment samples. Plastic tubes are principally used for collection of samples for physical parameters such as particle size analysis and, in some instances, are acceptable when inorganic constituents are the only parameter of concern. Their use can also be extended to deep waters when SCUBA diving equipment is utilized. Teflon® or plastic is preferred to glass since they are unbreakable, reducing the possibility of sample loss or personal injury. Stainless steel push tubes are also acceptable and provide a better cutting edge and higher strength than Teflon®. The use of glass or Teflon® tubes eliminates any possible interference due to metals contamination from core barrels, cutting heads, and retainers. The tube should be approximately 12-inches in length if only recently deposited sediments (8 inches or less) are to be sampled. Longer tubes should be used when the depth of the substrate exceeds 8 inches. Soft or semi-consolidated sediments such as mud and clays have a greater adherence to the inside of the tube and thus can be sampled with larger diameter tubes. Because coarse or unconsolidated sediments, such as sands and gravel, tend to fall out of the tube, a smaller diameter push tube is normally required to obtain a sample. In extreme cases, where sample retention in the tube is problematic, core-catchers or end caps made of Teflon® should be employed. A tube about two-inches in diameter is usually the best size. The wall thickness of the tube should be about 1/3-inch for Teflon® plastic, or glass. The inside wall may be filed down at the bottom of the tube to provide a cutting edge to facilitate entry of the liner into the substrate.

Caution should be exercised not to disturb the bottom sediments when the sample is obtained by wading in shallow water (always work facing upstream and working from downstream up). The core tube is pushed into the substrate until four inches or less of the tube is above the sediment-water interface. When sampling hard or coarse substrates, a gentle rotation of the tube while it is being pushed will facilitate greater penetration and decrease core compaction. The top of the tube is then capped to provide suction and reduce the chance of losing the sample. A Teflon® plug or end cap, or a sheet of Teflon® held in place by a rubber stopper or cork may be used. After capping, the tube is slowly extracted with the suction and adherence of the sediment keeping the sample in the tube. Before pulling the bottom part of the tube and core above the water surface, it too should be capped. An alternative to the coring device is the Shelby tube. The Shelby tube has a gravity check valve at the top of the tube where an auger handle attaches. This check valve allows air and water to escape as the tube is advanced. Once the tube is to the desired depth, the check valve will close automatically forming suction on the tube; thus, holding the sample inside.

When extensive core sampling is required, such as a cross-sectional examination of a streambed with the objective of profiling both the physical and chemical contents of the sediment, complete cores are desirable. A strong coring tube such as one made from aluminum, steel or stainless steel is needed to penetrate the sediment and underlying clay or sands. To facilitate complete core collection and retention, it is recommended that the corer (like a Shelby tube) have a check valve built into the driving head which allows water and air to escape from the cutting core, thus creating a partial vacuum, helping to hold the sediment core in the tube. The corer is attached to a standard auger extension and handle, allowing it to be corkscrewed into the sediment from a boat or while wading. The coring tube is easily detached and the intact sediment core is removed with an extraction device.

Before extracting the sediment from the coring tubes, the clear supernatant above the sediment-water interface in the core should be decanted from the tube. This is accomplished by simply turning the core tube to its side, and gently pouring the liquid out until fine sediment particles appear in the waste liquid. The loss of some of the fine sediments usually occurs with this technique.

6.3 Ogeechee Sand Pounders® and Gravity Cores

In deeper, non-wadeable water bodies, sediment cores may be collected from a bridge or a boat using different coring devices such as Ogeechee Sand Pounders®, gravity cores and vibrating coring devices. All three devices utilize a core barrel with a core liner tube system. The core liner can be removed from the core barrel and replaced with a clean core liner, as needed, after each sample. Liners are made of stainless steel, Teflon® or plastic. The type of core liner and its composition should be based on the contaminants to be evaluated.

Ogeechee Sand Pounders® and gravity cores are hand-held devices that use a standard size 2-inch diameter core barrel. The core tube and liner are interchangeable between the two units. The Ogeechee® uses a slide-hammer mechanism attached to the core head that allows the sampler to pound the core tube into the sediment. The Ogeechee® is good for sandy, more consolidated sediments. The gravity core uses a guiding fin mechanism with a built-in gravity-type check valve. The gravity core is placed in the water and released at the surface to free fall to the bottom. The fin mechanism keeps the core tube upright and free from spinning in the water column as it descends. The core tube stabs the bottom, forcing the sediment into the tube. Both coring devices are equipped with removable nose pieces on the core barrel and disposable core catchers for the liner tubes. The core catchers are designed to cap the liner tube to avoid loss of the core when retrieved from the bottom. The gravity core can be modified to attach a slide hammer mechanism, similar to the Ogeechee®, to further pound the core into the sediment further if deemed necessary.

Sediment cores collected from most hand operated coring devices can suffer from either spreading or compaction when driven into the sediment, depending on the softness of the sediment. Spreading occurs when the sediment is pushed or moved to the side during the advancement of the core tube. Compaction occurs when the sediment is being pushed downward as the core tube is advanced. Both phenomena can affect the physical integrity of the core sample. For instance, the core tube may be advanced through the sediment to a depth of 36 inches, but upon examination of the recovered core, there is only 24 inches of sediment in the core tube.

6.4 Vibratory Core Tube Drivers (Vibracore®)

Vibratory Core Tube Drivers (Vibracore®) facilitate sampling of soft or loosely consolidated, saturated sediments, with minimal compaction or spreading, using lined or unlined core tubes. It is designed for use with core tubes having nominal diameters ranging from 2-inches to 4-inches OD. The Vibracore® uses an electric motor to create vibration ranges from approximately 6,000 RPM to 8,000 RPM (100 Hz to 133 Hz) depending on the resistance afforded by the sediment; the greater the resistance, the higher the frequency. The actual vibrational displacement of the Vibracore® is on the order of a few tens of thousandths of an inch, so essentially no mixing of the sediment within the tube occurs. The vibrational energy tends to re-orient the sediment particles at the lower end of the core tube, causing them to move out of the way of the advancing wall of the core tube and into a more efficient (i.e. denser) packing. This action advances the core tube with minimal compaction of the sediment.

7 Diving

7.1 General

Sediment samples can also be obtained from large streams and open water bodies such as ponds, lakes, estuarine bodies and open ocean environments by divers. Using a variety of the above mentioned methods, divers can directly access the substrate and collect sediment samples. Depending upon the sampling methods used and the required analyses, the samples may be collected directly into the containers from the substrate or they may be returned, in bulk, to the bank or other sampling platform for processing and sample container allocation.

Appendix I

Previous Investigation Data (on CD)

Excerpt from Parsons 2012 New York SI Report

4.25 CAMP O'RYAN MRS 2 RIFLE RANGE (NYHQ-008-R-02)

4.25.1 Site Description

Camp O'Ryan MRS 2 Rifle Range is a former small arms range. The former range is approximately 17.5 acres and is located in Wethersfield, Wyoming County. Camp O'Ryan MRS 2 Rifle Range was operational between 1949 and 1974 and possibly again from 1989 through 1994. Currently, the MRS is undeveloped forested land that is privately owned.

Based on the historical documents, Camp O'Ryan was divided into three MRSs: Camp O'Ryan MRS 1 Pistol Range, Camp O'Ryan MRS 2 Rifle Range and Camp O'Ryan MRS 3 Maneuvering Area. The firing direction was to the southeast. Small arms, .30 caliber M1, were approved for use Camp O'Ryan MRS 2 Rifle Range. Additional potential munitions used were small arms (.22, .30, .38, and .45 caliber, 5.56mm and 7.62mm).

The MRS boundary and acreage presented in the PA for Camp O'Ryan was for all three MRSs combined. Based on historical documents, the MRS was split and the MRS boundaries were revised. The Camp O'Ryan MRS 2 Rifle Range is approximately 17.5 acres based on the MRS boundary revision. The MRS boundary is shown in Figure 4.25-1.

NYSDEC adequately assessed the Camp O'Ryan MRS 2 Rifle Range during previous investigations (Woods Hole Group, Inc., 2011 and NYSDEC, 2009); therefore, no fieldwork was completed at this MRS.

As documented in the approved HRR/WP, the SI approach for the Camp O'Ryan MRS 2 Rifle Range MRS did not include field work. See Section 4.25.3 for the results from the previous investigations.

4.25.2 Camp O'Ryan MRS 2 Rifle Range - ROE Issues

Fieldwork was not planned at Camp O'Ryan MRS 2 Rifle Range; therefore, ROEs were not requested for the site.

4.25.3 Camp O'Ryan MRS 2 Rifle Range - Previous Investigations

On August 27, 2007, NYSDEC collected and analyzed 12 soil samples at a berm. None of the total lead concentrations exceeded the comparative screening values (NYSDEC, 2008).

The NYSDEC Site Investigation Report Camp O'Ryan Rifle Range Gainesville, NY summarized the November 5, 2008. NYSDEC collected surface soil samples from the firing berm area, as well as the berm behind the targets A total of 15 samples had elevated levels of lead, the highest concentrations were at the target area. The report provided figures with the sample location and range features of the rifle range (See Appendix I). Additional discussion of these results is provided in section 4.25.4.

Figure 4.25-1
Camp O'Ryan MRS 2 Rifle Range (Aerial)
AEDB-R # NYHQ-008-R-01
Wyoming County, New York

PARSONS

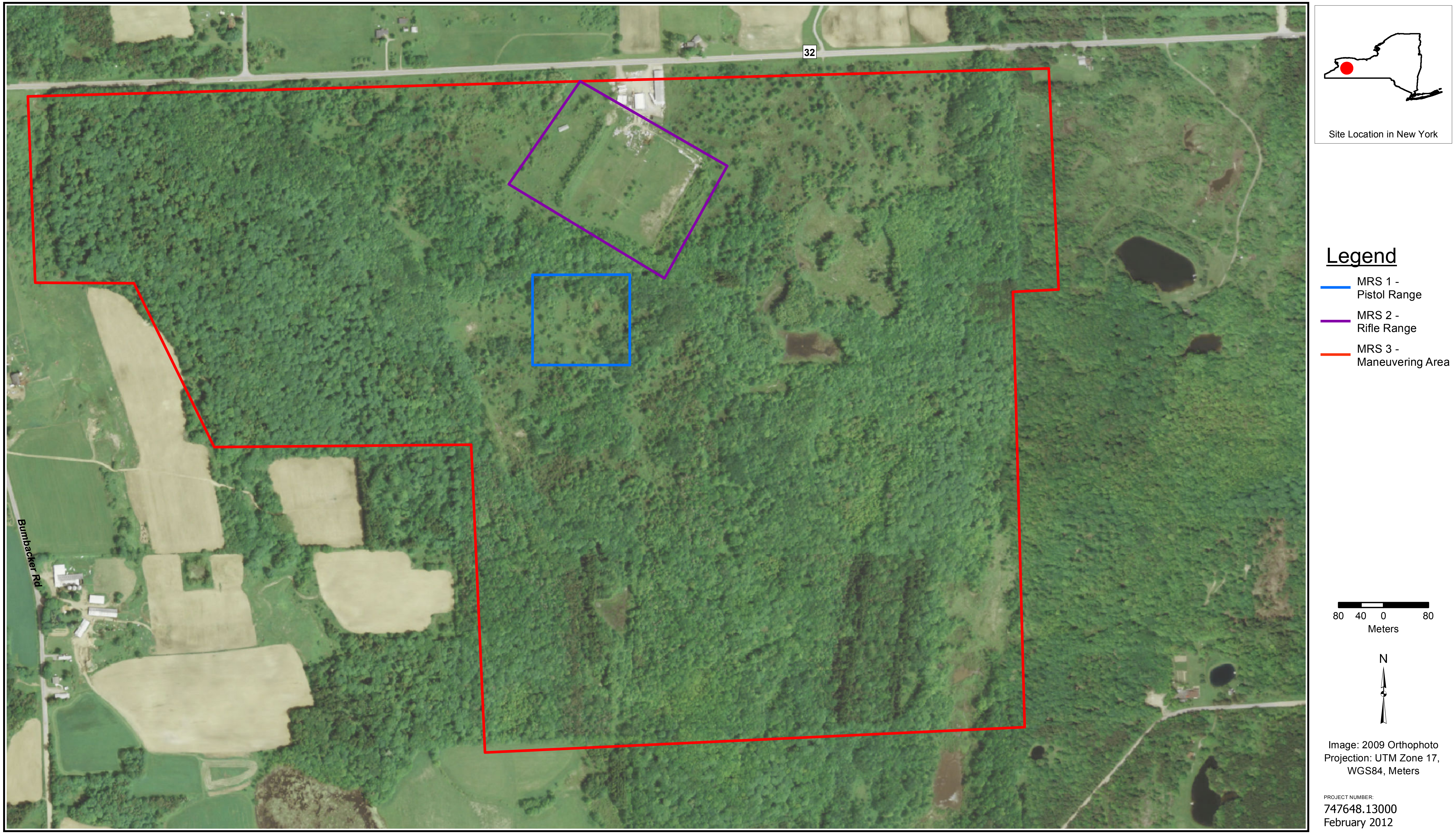


Image: 2009 Orthophoto
Projection: UTM Zone 17, WGS84, Meters

PROJECT NUMBER:
747648.13000
February 2012

4.25.4 Camp O'Ryan MRS 2 Rifle Range - Munitions Constituents Sampling and Analytical Results

In the 2008 investigation, NYSDEC collected thirty surface soil samples from the MRS and one ambient surface soil sample was collected outside the MRS. Samples were biased to areas most likely to have the highest concentration of MC (e.g., firing berm and the target berm).

Thirteen of the 30 biased surface soil samples were collected from the firing berm and 17 biased surface soil samples were collected from the target berm. In addition, one ambient surface soil sample was collected from a location outside the area of former range operations, north of the MRS along Wethersfield Road. The sample locations are presented on Figure 4.25-2. The sample rationale and coordinates are provided in Table 4.25-1. The analytical results for the surface soil samples are presented in Tables 4.25-2 and Appendix B.

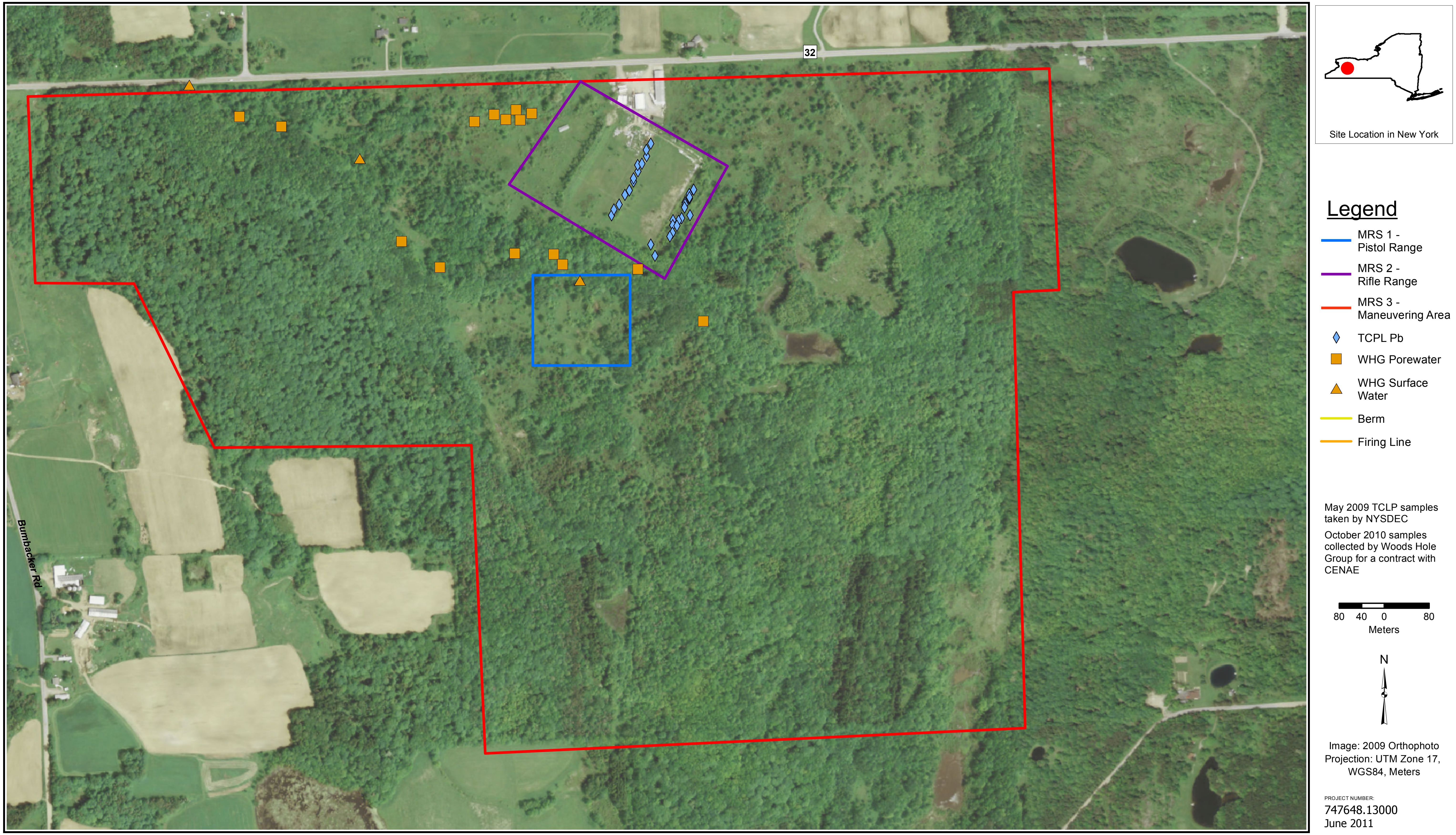
During the Site Investigation the field team observed what looked like target poles attached to a cement retaining wall. As well as a hill, that looked like a target berm, behind the wall where targets were located. Samples NF908-11020-01 through NF908-11020-13 were collected at the firing berm and samples NF908-11020-14 through NF908-11020-30 were collected at the target berm. One ambient surface soil sample, NF908-11020-31, was collected north of the MRS, outside of the MRS boundaries.

The detected ambient concentrations, for surface soil as shown in Table 4.25-3, were used to represent the background concentrations of metals at Camp O'Ryan MRS 2 Rifle Range. The maximum detected concentration of a given MC, when compared to applicable ambient and screening concentrations, was used to evaluate whether or not MC contamination is present. At this MRS, human health screening criteria were applied in the screening evaluation consistent with the CSM presented in Section 4.25.5.

The detected concentrations of antimony, copper, and lead are reported in Table 4.25-3. The maximum detected concentration of antimony (328 mg/kg), copper (5,530 mg/kg) and lead (50,900 mg/kg) in the biased surface soil samples exceeded the calculated background concentration (the concentration in the ambient surface soil sample; not detected, 32.7 mg/kg, 121 mg/kg, respectively). The maximum detected concentrations of antimony, copper, and lead also exceeded the human health screening values (31 mg/kg, 50 mg/kg, 400 mg/kg, respectively) (Table 4.25-3). Based on the analytical results presented in this report, an impact to human health due to exposure to antimony, copper or lead in the surface soil at the MRS is possible.

PARSONS

Figure 4.25-2
Camp O'Ryan MRS 2 Rifle Range (Aerial)
AEDB-R # NYHQ-008-R-01
Wyoming County, New York



May 2009 TCLP samples taken by NYSDEC

October 2010 samples collected by Woods Hole Group for a contract with CENAE

Image: 2009 Orthophoto
Projection: UTM Zone 17, WGS84, Meters

PROJECT NUMBER:
747648.13000
June 2011

Table 4.25-1
Sample Locations and Rationale
Camp O'Ryan MRS 2 Rifle Range MRS

Sample ID	Sample Coordinates (1)		Medium	Analyses	Potential Munitions	Rationale
	Latitude	Longitude				
NF908-11020-01	42.68216	-78.2797	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the firing berm.
NF908-11020-02	42.68225	-78.2797	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the firing berm.
NF908-11020-03	42.68233	-78.2795	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the firing berm.
NF908-11020-04	42.68248	-78.2794	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the firing berm.
NF908-11020-05	42.68255	-78.2793	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the firing berm.
NF908-11020-06	42.68269	-78.2792	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the firing berm.
NF908-11020-07	42.68274	-78.2792	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the firing berm.
NF908-11020-08	42.68285	-78.2791	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the firing berm.
NF908-11020-09	42.68295	-78.2791	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the firing berm.
NF908-11020-10	42.68297	-78.279	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the firing berm.
NF908-11020-11	42.68309	-78.2789	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the firing berm.
NF908-11020-12	42.68319	-78.2789	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the firing berm.
NF908-11020-13	42.68329	-78.2788	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the firing berm.
NF908-11020-14	42.68253	-78.2779	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.

Table 4.25-1
Sample Locations and Rationale
Camp O'Ryan MRS 2 Rifle Range MRS

Sample ID	Sample Coordinates [(1)]		Medium	Analyses	Potential Munitions	Rationale
	Latitude	Longitude				
NF908-11020-15	42.68246	-78.278	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-16	42.68239	-78.278	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-17	42.68241	-78.278	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-18	42.68233	-78.2781	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-19	42.6823	-78.2781	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-20	42.68225	-78.2781	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-21	42.68212	-78.278	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-22	42.68208	-78.2782	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-23	42.68204	-78.2783	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-24	42.68205	-78.2784	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-25	42.68197	-78.2784	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-26	42.68196	-78.2783	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-27	42.68185	-78.2784	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-28	42.68179	-78.2785	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.

Table 4.25-1
Sample Locations and Rationale
Camp O'Ryan MRS 2 Rifle Range MRS

Sample ID	Sample Coordinates (1)		Medium	Analyses	Potential Munitions	Rationale
	Latitude	Longitude				
NF908-11020-29	42.68149	-78.2788	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-30	42.68167	-78.2789	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at the target berm.
NF908-11020-31	N/A	N/A	Soil	Antimony, Copper, Lead	Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm)	Collected at random along Wethersfield Road in front of the MRS boundary.

(1)World Geodetic System (WGS) 84.

Table 4.25-2
SUMMARY OF ANALYTICAL RESULTS FOR CAMP O'RYAN MRS 2 RIFLE RANGE SOIL SAMPLES COLLECTED BY NYSDEC IN NOVEMBER 2008

Sample ID		**NF908-11020-01**	**NF908-11020-02**	**NF908-11020-03**	**NF908-11020-04**	**NF908-11020-05**	**NF908-11020-06**	**NF908-11020-07**	**NF908-11020-08**	**NF908-11020-09**	**NF908-11020-10**	**NF908-11020-11**	**NF908-11020-12**	**NF908-11020-13**	**NF908-11020-14**	**NF908-11020-15**	**NF908-11020-16**	**NF908-11020-17**	**NF908-11020-18**	**NF908-11020-19**	**NF908-11020-20**	**NF908-11020-21**	**NF908-11020-22**	**NF908-11020-23**	**NF908-11020-24**	**NF908-11020-25**	**NF908-11020-26**	**NF908-11020-27**	**NF908-11020-28**	**NF908-11020-29**	**NF908-11020-30**	**NF908-11020-31***
Date		**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**	**11/5/2008**
Lab Sample ID		**908-344-001**	**908-344-002**	**908-344-003**	**908-344-004**	**908-344-005**	**908-344-006**	**908-344-007**	**908-344-008**	**908-344-009**	**908-344-010**	**908-344-011**	**908-344-012**	**908-344-013**	**908-344-014**	**908-344-015**	**908-344-016**	**908-344-017**	**908-344-018**	**908-344-019**	**908-344-020**	**908-344-021**	**908-344-022**	**908-344-023**	**908-344-024**	**908-344-025**	**908-344-026**	**908-344-027**	**908-344-028**	**908-344-029**	**908-344-030**	**908-344-031**
	Units																															
Metals -																																
Antimony	mg/kg	3.64 U	3.64 U	3.64 U	3.64 U	3.64 U	3.64 U	3.64 U	3.64 U	3.64 U	3.64 U	3.64 U	3.64 U	3.64 U	3.64 U	3.64 U	3.64 U	6.12	39.2	13.8	36	16.1	48	47.1	7.6	62.3	42.7	20.1	328	3.64 U	3.64 U	3.64 U
Copper	mg/kg	141	69.4	54.9	40.5	60.6	29.1	31.4	33.2	34.9	82.3	353	260	54.4	71.4	122	32.9	82.8	566	108	220	145	453	95.3	84.4	141	90.2	5,530	242	48.5	155	32.7
Lead	mg/kg	20.1	18	36.1	39.7	25.7	25.8	37.3	46.8	1930	49.4	90.9	33.9	46.8	24.6	969	182	704	4,470	351	4,420	1530	8,980	9,990	829	6,000	7,430	4,790	50,900	68.6	48.5	121

U - Analyte was analyzed but not detected above the limit of detection (LOD).
* - Ambient sample.

Table 4.25-3
Comparison of Site Soil Concentrations to Background and Screening Criteria
Camp O'Ryan MRS 2 Rifle Range MRS

Analyte	**Units**	**Mean Detected Ambient Concentration** (1)	**Maximum Detected Site Concentration** (1)	**Exceeds Background Concentration?**	**Human Screening Value**	**Exceeds Human Health Screening Value?**
Metals						
Antimony	mg/kg	Not detected	328	**Yes**	31(2)	**Yes**
Copper	mg/kg	32.7	5,530	**Yes**	50(3)	**Yes**
Lead	mg/kg	121	50,900	**Yes**	400(4)	**Yes**

(1) See Table 4.25-3 for analytical results.

(2) New York Remedial Program Soil Cleanup Objectives value not available. Used USEPA Regional Screening Level (RSL) Summary Table for Residential Soil November 2011. (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/pdf/master_sl_table_run_NOV2011.pdf).).

(3) New York Remedial Program Soil Cleanup Objectives for Unrestricted Use (http://www.dec.ny.gov/regs/15507.html).

(4) New York Remedial Program Soil Cleanup Objectives for Restricted Use (Table 375-6.8(b). http://www.dec.ny.gov/regs/15507.html.

4.25.5 Camp O'Ryan MRS 2 Rifle Range - Updated Conceptual Site Model

The CSM presented in the Final HRR/WP (Parsons, 2011a) for the Camp O'Ryan MRS 2 Rifle Range was updated based on the results of the NYSDEC Site Investigation. The CSM for this MRS (Table 4.25-4) describes the physical profile, including geology, topography, soil classification and climate, potential release mechanisms, and land use and ecological exposure profiles together with the current understanding of the site. Figure 4.25-3 presents the CSM for current and potential future receptors in graphical form pursuant to EM 1110 1 1200 (USACE, 2003).

Table 4.25-4
Conceptual Site Model Diagram for Camp O'Ryan MRS 2 Rifle Range MRS

Profile Type	MRS Characterization
Facility Profile	Location and Area: Wethersfield, Wyoming County, in western part of New York approximately 45 miles east-southeast of Buffalo, NY.
	Structures: There are no structures located in the MRS.
	Security: There are no barriers preventing access to any part of the MRS.
Physical Profile	Climate: Temperature varies from the 70s in the summer to the 30s in the winter. The warmest month of the year is July, with an average maximum temperature of 77.2° F. The coldest month of the year is January, with an average minimum temperature of 11.7° F. The annual average precipitation is 43.4 inches with rainfall evenly distributed throughout the year. The wettest month of the year is September, with an average rainfall of 4.6 inches (IDcide, 2011d).
	Geology: The Camp O'Ryan MRS 2 Rifle Range is on the northern margin of the Appalachian Plateaus physiographic province in southwestern New York. Devonian rocks are at the surface or subcrop glacial deposits in the vicinity of the Camp O'Ryan MRS. These Paleozoic sediments are deeply eroded, particularly by geologically recent glaciations (Olcott 1995). Continental-scale glaciers covered most of the northern United States episodically over the last 1.8 million years. New York has been covered by ice multiple times including the last advance approximately 22,000 years ago. Glaciers scoured and removed soil and soft weathered surface rocks as they moved, and polished the hard bedrock surface below the ice. A variety of landforms were left behind when the glaciers eventually receded approximately 10,000 years ago (Skehan, 2008). As the ice melted, the sediment load was dropped in place as unsorted till or was redistributed as outwash by the vast amounts of meltwater released by the glacier. Till is a mixture of silt, gravel, and boulders of various sizes in a clay matrix. The glacial outwash sediments, deposited by streams and rivers of meltwater in front of the receding glaciers (glaciofluvial deposits), tend to be graded from coarse to fine with increasing distance from the glacier. Meltwater could also be impounded in lakes that were dammed either by the ice or by glacial sediments. Lake plains, terraces and beaches were left in place when the dammed water found a lower outlet (Olcott, 1995). The "Finger Lakes" northwest of the MRS are of glacial origin.
	Topography: The Camp O'Ryan MRS 2 Rifle Range is located in an area that has a downward regional slope from the southeast to northwest on a glacial lake plain that is incised by streams to produce a rolling surface within the MRS. Elevations range from approximately 1745 feet above sea level in the northwest corner of the MRS to 1810 feet above sea level in the southeast corner (Figure 4.25-4) (USGS, 1995a).

Profile Type	MRS Characterization
	Soil: The soil in the Camp O'Ryan MRS 2 Rifle Range predominantly is moderately well drained Williamson channery silt loam on a glacial lake plain. The material is derived from glacial lake deposits or eolian (windblown) deposits with a high content of silt and fine sand. A typical soil profile is channery silt loam from 0 to 17 inches; silt loam from 17 to 41 inches; and stratified silt loam to very fine sand to clay from 41 to 60 inches (NRCS, 2011).
	Hydrogeology: Coarse-grained glacial outwash, ice contact and alluvial deposits form the productive sand and gravel aquifers of the surficial aquifer system. Yield from sand and gravel aquifers depends on thickness and grain size of deposits. Higher yields may be obtained where deposits are hydraulically connected to an adjacent body of surface water. Groundwater well depths generally range from 10 to 120 feet and could exceed 500 feet below land surface (Olcott, 1995). Major consolidated bedrock aquifers in the vicinity of the Camp O'Ryan MRS 2 Rifle Range are in Devonian age limestone formations at or near the surface. Little primary porosity or permeability remains in rocks following the lithification process. Groundwater in limestone aquifers is stored in solution cavities that are interconnected through very complex dissolution channels resulting in highly variable yields. Wells commonly yield 10 to 30 gpm although yields of 1000 gpm have been reported from carbonate aquifers in New York. Aquifers generally are unconfined in the upper 200 feet (Olcott, 1995). There are no groundwater wells within the Camp O'Ryan MRS as shown on Figure 4.25-5. There are two domestic water wells at approximately 0.25 miles from the MRS. Well number WO 430 to the southeast is 60 feet below land surface and the water depth is 15 feet. Well number WO 868 is north of the MRS. Well depth is 275 feet below land surface and the water depth is 50 feet.
	Hydrology: There are no surface water bodies within MRS 2 – Rifle Range.
	Vegetation: The majority of the MRS is heavily vegetated with trees and shrubs. The central portion of the MRS is less densely vegetated.
	Cultural, Archeological, and Historical Resources: There are no historic or cultural resources at Camp O'Ryan MRS 2 Rifle Range. Additionally, there are no National Historic Landmarks located in Wyoming County, NY (NPS, 2011a, b).
	Wetlands: No wetlands are present within MRS 1 (USFWS, 2011c).
	Demographics: The total population in Wethersfield is 912 based on the 2000 to 2009 State and County QuickFacts estimate from the U.S. Census Bureau. The population density of Wethersfield is not available. The 2010 population density of Wyoming County is 71.1 persons per square mile (U.S. Census Bureau, 2012)
Ecological Profile	Habitat Type: The area is forested. No critical habitats are present.
	Ecological Receptors: Forested areas, which may provide habitat for ecological receptors, are present within the MRS. There are no federally-listed (T&E species that occur in Wyoming County; therefore, no T&E species are listed to occur at Camp O'Ryan MRS (USFWS, 2011b).
	Degree of Disturbance: Low disturbance. The MRS is undeveloped, forested land.
Land Use and Exposure Profile	Current Land Use: Undeveloped forested land.
	Current Potential Receptors: Current receptors include site visitors/recreational users and ecological receptors.

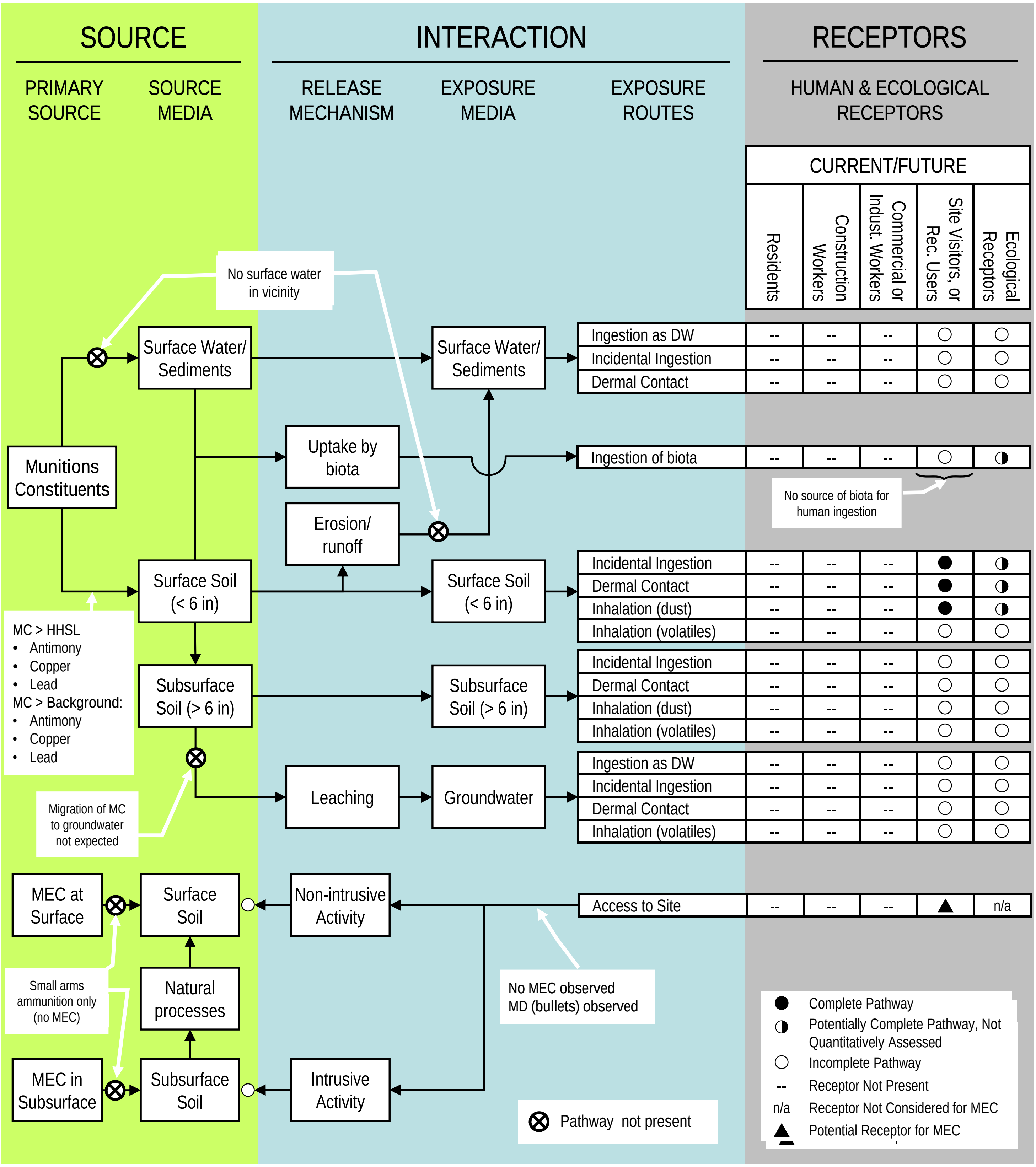
Profile Type	MRS Characterization
	Potential Future Land Use: Same as current land use.
	Potential Future Receptors: Same as current receptors.
Munitions/Release Profile	Munitions Type(s): Small arms general: .22, .30, .38 caliber cartridge, .45 caliber cartridge and 5.56mm and 7.62mm (Table 3-4). As a conservative measure, the common types and calibers of ammunition that could have been used during the range use era were included. No MD observed.
	Release Mechanisms: Residual munitions released from historical training activities as well as natural processes, such as erosion or frost heave processes. If MD items were present, MC could be released to the soil via corrosion, degradation, or weathering of bullets or casings.
	Maximum Probable Penetration Depth: Training activities included small arms; maximum probable penetration depth is land surface and shallow subsurface (< 12").
	MEC Density: Small arms ammunition is not classified as MEC; therefore, no explosive safety hazards are anticipated. MEC are assumed not to be present at ranges where munitions use was limited to small arms ammunition. No MEC were observed.
	Munitions Debris: Associated with the small arms listed above.
	Associated Munitions Constituents: MC of interest includes antimony, copper, and lead (Table 3-4).
	Transport Mechanisms/Migration Routes: MC metals and some explosives can adsorb to or form complexes with soil particles or organic matter in soil. This makes these compounds generally less likely to be transported by water via leaching or runoff. Because explosives are organic compounds, they also are subject to biological or chemical degradation over time, which results in these compounds being less persistent in the environment than MC metals. Based on these properties, while antimony, copper, and lead are present in surface soil, the migration of MC metals to groundwater is not expected at this MRS. The same rationale applies with respect to the migration of MC metals to surface water and sediment (where present). MC metals are not anticipated to have migrated to surface water/sediment based on their chemical/physical properties and the distance between the potential source and the surface water in the vicinity of the MRS. Based on the limited amount of contaminated surface soil anticipated, contaminated dust is not expected to migrate off-site.
	Pathway Analysis: The historic use of the site resulted in the release of MC to site surface soil. In surface soil, based on the presence of MC above background concentrations and human health criteria, complete exposure pathways are present for site visitors are through direct contact (i.e., incidental ingestion, dermal contact, and inhalation of suspended particulates) (Figure 4.25-3). There also is the potential for exposure to these compounds in subsurface soil; however, these subsurface pathways are incomplete for the site visitors because it is unlikely for the receptors to expose themselves to subsurface soil for anticipated non-intrusive activities. The surface water exposure pathways are incomplete for site visitors since no surface water is located within this MRS. The groundwater exposure pathways are incomplete for site visitors because migration of MC to groundwater is not expected. The ingestion of biota exposure pathway for site visitors at the MRS is incomplete because there are no sources of biota for human ingestion. MEC/MD were not observed at the MRS.

FIGURE 4.25-3 CONCEPTUAL SITE MODEL DIAGRAM

Site/MRS Name: NEW YORK – Camp O'Ryan MRS 2 Rifle Range Range

Completed By: PARSONS

Date Completed: April 11, 2012

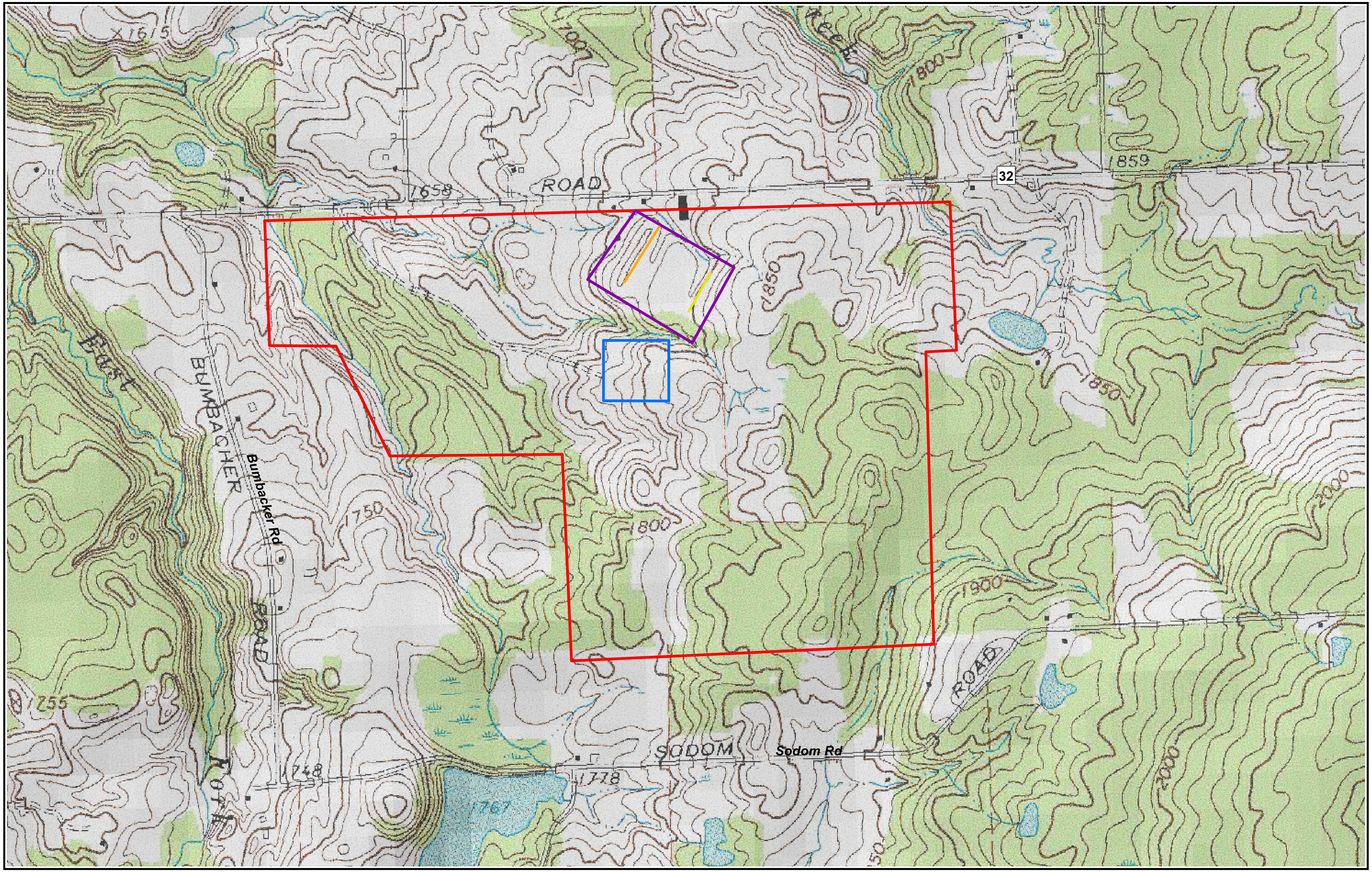


Exposure Media	Exposure Routes	Residents	Construction Workers	Commercial or Indust. Workers	Site Visitors, or Rec. Users	Ecological Receptors
Surface Water/ Sediments	Ingestion as DW	--	--	--	○	○
	Incidental Ingestion	--	--	--	○	○
	Dermal Contact	--	--	--	○	○
Uptake by biota	Ingestion of biota	--	--	--	○	◑
Surface Soil (< 6 in)	Incidental Ingestion	--	--	--	●	◑
	Dermal Contact	--	--	--	●	◑
	Inhalation (dust)	--	--	--	●	◑
	Inhalation (volatiles)	--	--	--	○	○
Subsurface Soil (> 6 in)	Incidental Ingestion	--	--	--	○	○
	Dermal Contact	--	--	--	○	○
	Inhalation (dust)	--	--	--	○	○
	Inhalation (volatiles)	--	--	--	○	○
Groundwater	Ingestion as DW	--	--	--	○	○
	Incidental Ingestion	--	--	--	○	○
	Dermal Contact	--	--	--	○	○
	Inhalation (volatiles)	--	--	--	○	○
	Access to Site	--	--	--	▲	n/a

● Complete Pathway
◑ Potentially Complete Pathway, Not Quantitatively Assessed
○ Incomplete Pathway
-- Receptor Not Present
n/a Receptor Not Considered for MEC
▲ Potential Receptor for MEC

Figure 4.25-4
Camp O'Ryan MRS 2 Rifle Range (Topographic)
AEDB-R # NYHQ-008-R-01
Wyoming County, New York

PARSONS




Site Location in New York

Legend

- MRS 1 - Pistol Range
- MRS 2 - Rifle Range
- MRS 3 - Maneuvering Area
- Berm
- Firing Line

Contour Interval 10 Feet

Image: USGS 7.5' Topo Quadrangles, Date 1966
Projection: UTM Zone 17, WGS84, Meters

PROJECT NUMBER:
747648.13000
February 2012

Figure 4.25-5
Camp O'Ryan MRS 2 Rifle Range - Water Wells Within 1-Mile Buffer
AEDB-R # NYHQ-008-R-01
Wyoming County, New York

PARSONS

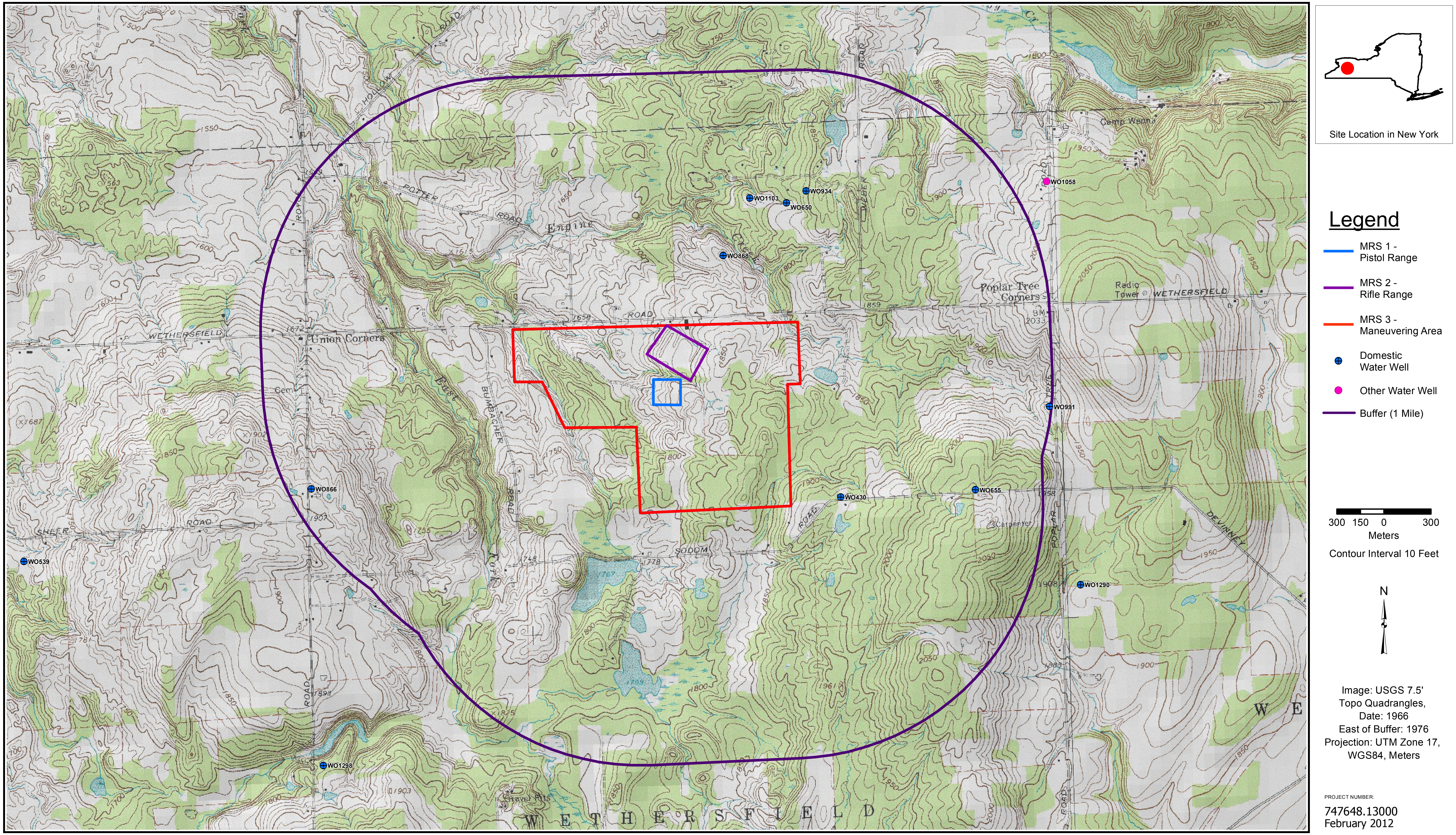


Image: USGS 7.5' Topo Quadrangles, Date: 1966
East of Buffer: 1976
Projection: UTM Zone 17, WGS84, Meters

PROJECT NUMBER:
747648.13000
February 2012

4.25.6 Camp O'Ryan MRS 2 Rifle Range - Summary and Conclusions

The 17.5-acre Camp O'Ryan MRS 2 Rifle Range is located on a privately-owned parcel that is located in an undeveloped, forested area. The MRS is a former target range that was operational between 1949 and 1974 and possibly again from 1989 through 1994. The NYSDEC field work included the collection of surface soil samples within the site boundary. The sample collection focused on the suspected firing berm and target berm. No MEC were observed.

4.25.6.1 Military Munitions

During the NYSDEC site investigation, no MEC were observed. The MRS is a confirmed small arms range where only small arms munitions were fired. Small arms munitions are not considered to be MEC. This type of munition does not contain fuzes or explosives that might present a residual hazard. No unanticipated MEC were found within the MRS during previous site visits, nor have any been reported. ***No explosive hazards are expected*** at the MRS; therefore, ***no explosive safety risk*** is considered to be present at the MRS.

4.25.6.2 Munitions Constituents (MC)

Thirty biased surface soil samples were collected in locations expected to have the greatest likelihood of residual MC, if any. Site-specific ambient surface soil samples also was collected. The samples were analyzed for the small arms indicator metals (antimony, copper, and lead).

The maximum detected concentration of antimony, copper, and lead in the biased surface soil samples exceeded the calculated background concentration and the human health screening value. An unacceptable human health risk via exposure to antimony, copper or lead in surface soil is possible.

4.25.7 Camp O'Ryan MRS 2 Rifle Range - Recommendations

Based on the NYSDEC Site Investigation analytical results and the HRR, the Camp O'Ryan MRS 2 Rifle Range MRS is recommended for **Remedial Investigation/Feasibility Study**. Immediate munitions removal actions are not warranted at this time. This recommendation is based on the following:

- Antimony, copper, and lead were detected in the biased surface soil samples collected. The maximum detected concentration of antimony, copper, and lead in the biased surface soil samples were detected at the samples collected from the target berm. The samples exceeded the calculated background and the human health screening values for these three metals. Based on the analytical results presented in this report, an impact to human health due to exposure to antimony, copper or lead in the surface soil is possible at this MRS.

2012 Parsons SI Report Appendix F- MRSPP Tables

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: Camp O'Ryan MRS 2 Rifle Range, AEDB-R # NYHQ-008-R-02

Component: Army National Guard Directorate

Installation/Property Name: JFHQ-New York

Location (City, County, State): Town of Wethersfield, Wyoming County, New York

Site Name (RMIS ID)/Project Name (Project No.): ARNG MRS Site Inspection Eastern Region, Contract # W912DR-09-D-0002

Date Information Entered/Updated: 4 April 2012

Point of Contact (Name/Phone): John Haines (703-607-7986)

Project Phase (check only one):

☐PA	☑ SI	☐ RI	☐FS	☐ RD
☐ RA-C	☐ RP	☐ 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 munitions, if known) or munitions constituents (by type, if known) known or suspected to be present): The Camp O'Ryan MRS 2 was a 17.5-acre former small arms range that was operational between 1949 and 1974 and again from 1989 through 1994. Small arms (.22, .30, .38 caliber cartridge, .45 caliber cartridge and 5.56mm and 7.62mm) ammunition were used at the MRS. The NYSDEC assessed the Camp O'Ryan MRS 2 Rifle Range under previous investigations. The NYSDEC investigation included the collection of surface soil samples within the site boundary. The sample collection focused on the suspected firing berm and impact berm on the MRS. Therefore, no fieldwork was completed at this MRS for this SI. The MRS is currently primarily undeveloped, forested land.

Description of Pathways for Human and Ecological Receptors: Direct release of MC from munitions activities within the MRS would be primarily to surface soil. Groundwater would not have been directed by affected by munitions activities. Surface water or sediment is not present on the MRS.

Description of Receptors (Human and Ecological): Potential human receptors include site visitors or recreational users. There are no known federal T&E species on site. The MRS does contain undeveloped forested land which provides habitat for a variety of terrestrial species.

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 hazard.	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, pyrotechnics, 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).	**2**

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

The MRS was used for small arms training between 1949 and 1974 and again from 1989 through 1994. Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm) ammunition were used on the MRS (Parsons SIR, Chapter 4, Section 4.25.1). Based on the Army Policy Memorandum dated 20 February 2009, small arms do not present a unique explosive hazard. As the only munitions-related activities on this MRS were small arms ammunition and the CHE received an alternative module rating of no known or suspected CWM hazard, the MRS does not present an explosive hazard. The alternate score of No Known or Suspected Explosive Hazard has been assigned to the EHE module (Table 10).

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 hazard 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).	**1**

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

The MRS is a former small arms range that was used between 1949 and 1974 and again from 1989 through 1994 Small Arms (.22, .30, .38, and .45 caliber, and 5.56mm and 7.62mm) ammunition were used on the MRS (Parsons SIR, Chapter 4, Section 4.25.1).

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).	**1**

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

Field activities (visual survey and MC sampling) were not conducted as part of the SI as NYSDEC assessed the MRS under previous investigations. No MEC was found during the NYSDEC investigations; however the firing berm and impact berm were present at that time (Parsons SIR Chapter 4, Section 4.25.1 and 4.25.3).

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*** classification in the space provided.

There are no access restrictions to this MRS (Parsons SIR, Chapter 4, Table 4.25-4).

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*** classification in the space provided.

The MRS is privately-owned (Parsons SIR Chapter 4, Section 4.25.1).

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).	**1**

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

The MRS is located within the town of Wethersfield, Wyoming County, New York. The 2010 population density of Wethersfield is not available. The 2010 population density of Wyoming County is 71.1 persons per square mile (Parsons SIR Chapter 4, Table 4.25-4).

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*** classification in the space provided.

There are no inhabited structures on the MRS. There are more than 26 inhabited structures located within a 2-mile radius of the MRS (Parsons SIR, Chapter 4, Table 4.25-4, Figure 4.25-1 and Google Earth, 2012).

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/structure classifications at the MRS.

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

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

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

The MRS is primarily undeveloped forested land. Scattered residential, commercial and agricultural land uses are found within a 2-mile radius of the MRS (Parsons SIR, Chapter 4, Table 4.25-4, Figure 4.23-1 and Google Earth, 2012).

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*** classification in the space provided.

According to available information, cultural resources are not present on the MRS. There are no known federal T&E species on site. The MRS contains forested areas which provide habitat for a variety of terrestrial species (Parsons SIR, Chapter 4, Table 4.25-4 and Figure 4.25-1).

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	**2**	**3**
Source of Hazard	Table 2	**1**	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	**1**	**16**
Ease of Access	Table 4	**10**	
Status of Property	Table 5	**5**	
Receptor Factor Data Elements			
Population Density	Table 6	**1**	**14**
Population Near Hazard	Table 7	**5**	
Types of Activities/ Structures	Table 8	**5**	
Ecological and /or Cultural Resources	Table 9	**3**	
		EHE MODULE TOTAL	**33**

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	**No Known or Suspected Explosive Hazard**

Small arms are the only munitions known to have been used on the MRS, and small arms do not present a unique explosive hazard [Army Guidance SAIE (ESOH) Memorandum February 2009], therefore the MRS does not present a unique explosive hazard. Per guidance from ARNG the EHE module has been rated "No Known or Suspected Explosive Hazard".

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 **<u>the single highest score</u>** from above in the box to the right (maximum score = 30).	**<u>0</u>**

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

There is no historical evidence that CWM were used, stored, or disposed of at Camp O'Ryan MRS 2 (Parsons SIR Chapter 4 Section 4.25-1).

Tables 12-19 are intentionally omitted according to ARNG Guidance

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	**No Known or Suspected CWM Hazard**

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's groundwater and their **comparison values** (from Appendix B) 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 (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	**CHF Value**	**Sum The Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

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

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

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the 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 ☑

Groundwater was not sampled and is not expected to be contaminated (Parsons SIR Chapter 4,Table 4.25-4).

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) 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 (µg/L)	Comparison Value (µg/L)	Ratios
CHF Scale	**CHF Value**	**Sum The Ratios**	
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

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

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

Migratory Pathway Factor

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

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to 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 (Human Endpoint) MC Hazard ☑

Surface water was not sampled. Surface water is not present on the MRS (Parsons SIR, Chapter 4, Table 4.25-4).

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the site'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 human endpoints present in the sediment, select the box at the bottom of the table.

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

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

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

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water 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 surface water 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 ☑

Sediment was not sampled. Sediment is not present on the MRS (Parsons SIR, Chapter 4, Table 4.25-4).

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.

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

Contaminant	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios
CHF Scale	**CHF Value**	**Sum the Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

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

Migratory Pathway Factor

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

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to 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 ☑

Surface water was not sampled. Surface water is not present on the MRS (Parsons SIR, Chapter 4, Table 4.25-4).

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

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

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

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water 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 surface water 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 ☑

Sediment was not sampled. Sediment is not present on the MRS (Parsons SIR, Chapter 4, Table 4.25-4).

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 (mg/kg)	Comparison Value (mg/kg)	Ratio
Antimony	328	31	10.58
Copper	5,530	3,100	1.78
Lead	50,900	400	127.25
CHF Scale	**CHF Value**	**Sum the Ratios**	139.61
CHF > 100	**H (High)**	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**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).	**M**

Receptor Factor

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

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

No Known or Suspected Surface Soil MC Hazard ☐

Surface soil samples were collected during the 2008 NYSDEC Site Investigation. These samples were analyzed for MC metals (antimony, copper and lead) and explosives (Parsons SIR, Chapter 4, Table 4.23-4). One explosive (PETN) was detected in the soil samples (0.11 mg/kg). There is no MRSPP comparison value for PETN in surface soil in Appendix B-1 of the MRSPP Primer. MPF is rated M given available information. RF is rated M given the current land use and limited access restrictions.

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)	**H**	**M**	**M**	**HMM**	**C**

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 media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE MODULE RATING	**C**

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	**4**	

Excerpts from 2011 Parsons Historical Records Review

3.3.1.4 During the 9 October 2008 PA site visit, evidence of the former rifle range was observed. No MEC or MD was observed. Photographs taken during the site visit were included in the PA. The following range features were observed:

- A berm, approximately 200 feet long by 50 feet wide and 15 feet tall, with small concrete monuments. The concrete monuments, approximately 6 inches by 12 inches with two, 1-inch diameter fitting, were on top of the berm. The berm orientation was north to south and likely was used as an observation platform.
- A large concrete bunker, 50 feet long by 15 feet wide, and 25 feet tall, probably was used for ammunition storage.
- A series of partially underground tunnels running from east and west of the bunker were observed. Historical documentation noted that the tunnels were installed to connect targets to the firing lines and to one another.
- Several earthen and concrete target berms in a row with steel mounts for targets. Based on the location of the target berms, the firing occurred from west to east.

3.3.1.5 The data gap identified based on the PA findings includes the exact dates of use.

3.3.2 Historical Records Review Findings

3.3.2.1 Parsons reviewed and validated the information in the PA; however, no additional research in support of the HRR was necessary other than obtaining data on site characteristics.

3.3.2.2 The information collected, reviewed, and assessed was determined to be relevant and of sufficient quantity and quality to support SI planning and execution. No significant data gaps remain for this MRS. The exact dates of use are still unknown; however, this unknown is not considered a significant data gap since the range layout, orientation, and location are known. An appropriate technical approach was developed based on the data available. All supporting documentation is provided in Appendices A-C of this report.

3.3.2.3 A 1953 aerial image was investigated to determine whether current residential properties located at the southern MRS boundary were present (Figure 3-3b). The residential properties were built post-1953; therefore, they were not present during range use.

3.4 CAMP O'RYAN (NYHQ-008-R-01)

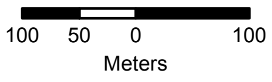
3.4.0.1 The NYARNG used Camp O'Ryan as a small arms training range. The former range is located in the Town of Wethersfield, Wyoming County. Camp O'Ryan was operational between 1949 and 1974 and again from 1989 through 1994. No documentation was located to indicate if the pistol and rifle ranges were reactivated in 1989. In 1989, Camp O'Ryan was reactivated for infantry training (Malcolm Pirnie, 2009a).

Figure 3-3b
Camp Blauvelt (1953 Historical Aerial)
AEDB-R # NYHQ-007-R-01
Rockland County, New York

PARSONS

Legend

🟥 MRS Boundary



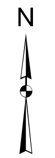


Image: USGS
1953 Aerial Photo
Projection: UTM Zone 18,
WGS84, Meters

PROJECT NUMBER:
747648.13000
July 2011

3.4.0.2 Based on the Parsons HRR (see subchapter 3.4.2), Camp O'Ryan was divided into three MRSs: Camp O'Ryan MRS 1 Pistol Range, Camp O'Ryan MRS 2 Rifle Range and Camp O'Ryan MRS 3 Maneuvering Area. Current land use at the MRS 1 Pistol Range consists of undeveloped, forested land (Google Earth, 2011). Land use at the MRS 3 Maneuvering Area includes predominantly undeveloped forest land and one farm structure on the northern border of the MRS (Google Earth, 2011). Both USACE and NYSDEC sampled Camp O'Ryan MRS 2 Rifle Range under previous investigations (Appendix K), MRS 2 will not be a focus of this SI Investigation. The Camp O'Ryan MRSs do not have physical addresses. The MRS locations are shown on Figure 3-4.

3.4.1 Preliminary Assessment Findings

3.4.1.1 Critical sources for the 2009 Draft PA (Malcolm Pirnie, 2009a) included interviews, a real estate report, and a site visit.

3.4.1.2 Camp O'Ryan was used as a small arms rifle range, including a tank maneuvering training, from approximately 1949 through 1974.

3.4.1.3 The following critical sources were used (Malcolm Pirnie, 2009a) to determine range specific information (i.e., history, range location, range layout, and munitions type):

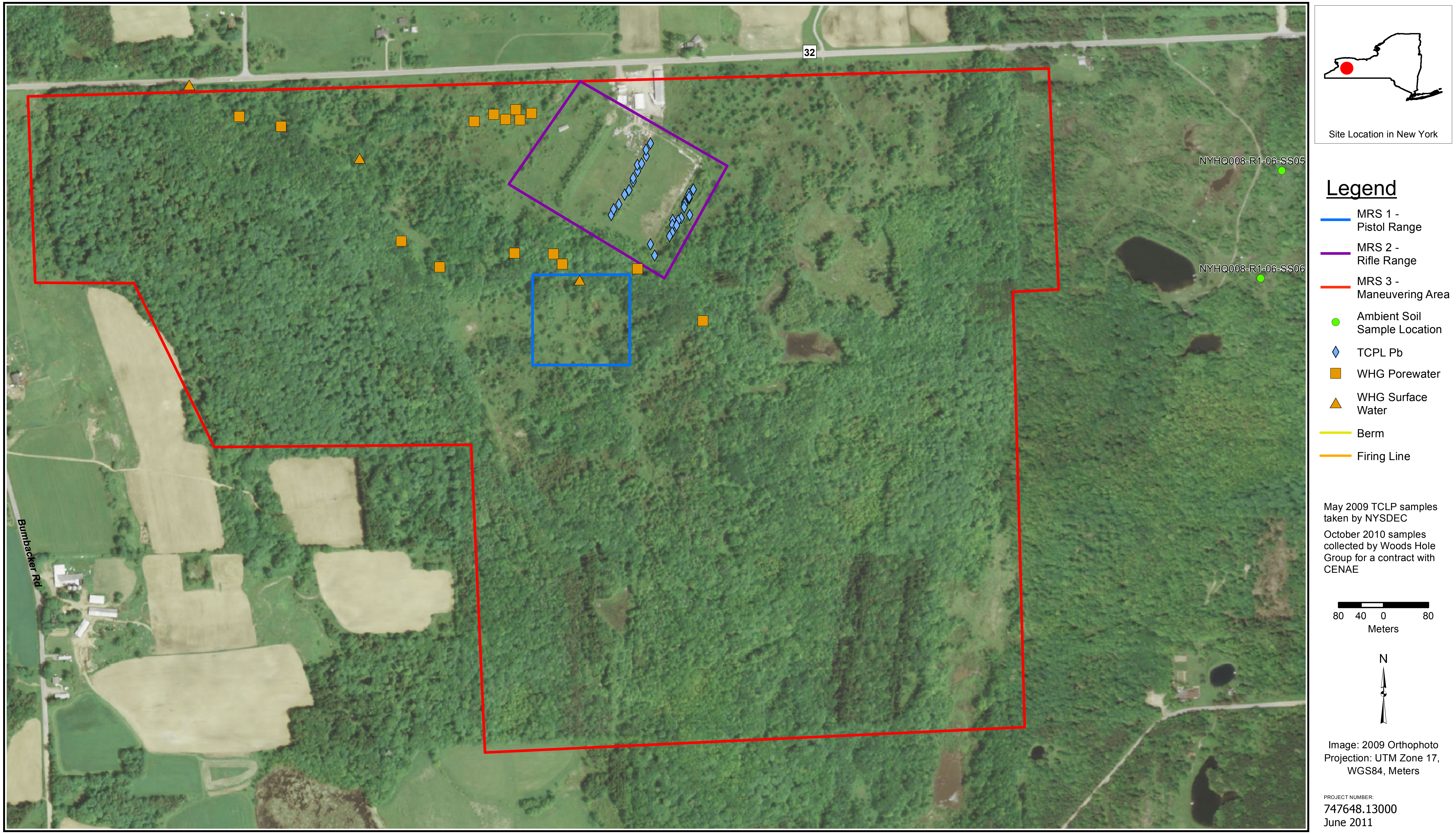
- **Warren Gordon, Chief, Real Estate Division, Camp O'Ryan Wethersfield, NY 22 December 1986 (NY0186):** This set of documents included leases, maps, photographs, memorandums and correspondence letters. These documents provided information on range location, range orientation and size, soil survey data, and a letter of NYSDEC investigation at Camp O'Ryan. A memorandum indicated the dates of range operation were from 1949 to 1974. A map illustrated range layout. The rifle range was located north of the pistol range and the tank driving training area was located in the western portion of Camp O'Ryan. A NGB memorandum document indicated that the range had 50 targets with 100 and 200 yard firing lines (Malcolm Pirnie, 2009a).
- **Telephone call to Wyoming Historical Society 19 June 2008:** No pertinent information was obtained (Malcolm Pirnie, 2009a).
- **Telephone call to Wethersfield Tax Assessor's Office 19 June 2008 and 20 June 2008:** This office provided information on the site location, ownership, and current land use (Malcolm Pirnie, 2009a).

3.4.1.4 The 13 October 2008 PA site visit was conducted from the road and the site was snow covered on the day of the site visit. The site team; therefore, could not confirm the presence or absence of range features or MEC or MD. Photographs taken during the site visit were included in the PA.

3.4.1.5 No data gaps regarding the range were identified.

Figure 3-4
Camp O'Ryan (Aerial)
AEDB-R # NYHQ-008-R-01
Wyoming County, New York

PARSONS



May 2009 TCLP samples taken by NYSDEC

October 2010 samples collected by Woods Hole Group for a contract with CENAE

Image: 2009 Orthophoto
Projection: UTM Zone 17, WGS84, Meters

PROJECT NUMBER:
747648.13000
June 2011

3.4.2 Historical Records Review Findings

3.4.2.1 During the Parsons HRR, the following data sources were accessed: USGS aerial images, NYSDEC and USACE. Communication with NYSDEC and USACE personnel also was conducted. The MRS was divided into three MRSs based on the Parsons HRR Findings; Camp O'Ryan MRS 1 Pistol Range, Camp O'Ryan MRS 2 Rifle Range, Camp O'Ryan MRS 3 Maneuvering Area. The discussion below summarizes the findings from the HRR.

3.4.2.2 A newspaper article indicated that tear gas was used during a training demonstration. The demonstration backfired and the wind shifted and the gas was carried into a crowd of spectators. The article provided information on training practices at Camp O'Ryan. Based on the DOA "Interim Guidance for Chemical Warfare Material (CWM) Responses" (April 2009) tear gas is not a chemical agent or chemical warfare materiel (DOA, 2009).

3.4.2.3 A 1968 Courier Express newspaper article included photographs of National Guardsmen during a parade, pistol maintenance, and range practice. The article provided information on training practices at Camp O'Ryan.

3.4.2.4 A historical aerial photograph, 1954, was obtained from NYSDEC. The aerial image illustrated range features and their locations. Range features included the rifle range berms possible burial areas, and burn pits.

3.4.2.5 The NYSDEC Site Investigation Report Camp O'Ryan Rifle Range Gainesville, NY summarized the 5 November 2008 investigation at Camp O'Ryan. The investigation focused on the rifle range portion of Camp O'Ryan. NYSDEC collected surface soil samples from the firing berm area and from the berm behind where the targets were located. The samples were analyzed for total metal lead analyses. A total of 15 samples had elevated levels of Total Metals Lead, the highest concentrations were at the impact area. The report provided figures with the sample location and range features of the rifle range (See Appendix B, NYHQ00082).

3.4.2.6 Woods Hole Group produced a report, October 2010 Preliminary Site Investigation Report Former Camp O'Ryan (FUDS Property No. C0NY1132) Wethersfield, New York, for USACE New England District. Part of the Preliminary Site Investigation (See Appendix B, NYHQ00219) included surface and shallow groundwater sampling at Camp O'Ryan. The surface water and pore water samples were analyzed for explosives, perchlorate, VOC, SVOC, and lead (total and dissolved). The sampling event focused on the northern portion of MRS 3. The surface water samples collected from the stream and the shallow groundwater samples were nondetect for the compounds that were being analyzed. The only detectable result was for a total lead (0.018 mg/L) in a duplicate field sample for shallow groundwater samples. The associated parent field sample was nondetect. The level of detection was below NYSDEC Technical and Operational Guideline Series. The report also provided site background information, figures including sample locations, and lab results for all samples.

3.4.2.7 The information collected, reviewed, and assessed was determined to be relevant and of sufficient quantity and quality to support SI planning and execution. No significant data gaps remain. A map depicting the NYSDEC and USACE investigations completed is included on Figure 3-4. All supporting documentation is provided in Appendices A-C of this report.

Excerpts from 2009 Malcolm Pirnie State/Territory Inventory Report

6.0 CAMP O'RYAN

6.1 Camp O'Ryan Summary

6.1.1 Camp O'Ryan Overview and Description

Camp O’Ryan is located on private property in Wethersfield, NY. As shown on Figure ES-1, the Town of Wethersfield is approximately 45 miles east-southeast of Buffalo, NY, in Wyoming County. The only NDNODS eligible MRS identified at this site is a former small arms range. The area where the range was located is primarily wooded and no evidence of a former range was observed from the roadway during the site field visit.

6.1.2 Camp O'Ryan Data Collection and Coordination

Each NDNODS is unique in terms of the amount and quality of data regarding each MRS, as well as the depth of experience and knowledge of the personnel available for interviews. The data collection team attempted to contact as many applicable offices and review as many record repositories as possible. The specific records reviewed and the personnel interviewed are provided in Appendix A.

This range was identified by the NGB. Various documents describing this range, including a real estate planning report and NYARNG correspondence, were obtained from the NYARNG JFHQ during the in-brief. The site location was obtained from a 1971 highway map, which shows Camp O’Ryan located between Wethersfield Road, Bumbacher Road, and Sodom Road.

At the request of the NYARNG POC, the property owner was not contacted. Therefore, the site visit was conducted from the road. A windshield survey field site visit was conducted on 13 October 2008. The property was mainly wooded; therefore, visual inspection from the road was limited (refer to Figure 6-1). No evidence of a former range was found during the site visit. During the site visit, the field team took field notes and photographs. Refer to Section 6.5 for the photograph log.

6.1.3 Camp O'Ryan Critical Data Sources

The critical data source for Camp O'Ryan is a 1987 Real Estate Planning Report, prepared by the DA (NY0186), that contains background and range usage information, a description of the range, and a range location map. An interview with the Wethersfield Tax Assessor's Office confirmed the site location.

6.2 Camp O'Ryan MRS Data

Table 6-1 provides a brief summary of each MRS associated with Camp O'Ryan.

Table 6-1: MRS Ownership Use And Access Restriction Table

MRS Name	MRS Number	Status	Owner	Current Use	Land Use and Access Restrictions	Acreage
Camp O'Ryan	RRNY000004	Transferred	Private	Undeveloped	NA	376.00
					Total Acreage	**376.00**

6.2.1 Camp O'Ryan Summary

Camp O'Ryan (also known as the North Java Rifle Range, the Wethersfield Training Area and the Wethersfield Target Range and Maneuver Area) was located on 376 acres and was used by the NYARNG from 1949 to 1974 and then again from 1989 to 1994. From 1949 to 1974, training areas at the camp included a rifle range, a pistol range, and a tank driver training course and structures at the site included a range storage building, a field latrine, and a mess hall. The ranges, which were used by NYARNG units stationed in Batavia, Buffalo, Dunkirk, Jamestown, Medina, and Rochester, had 50 targets with 100 and 200 yard firing lines.

Camp O'Ryan was reactivated as a training area in 1989 and was used until 23 November 1994 when the lease was terminated. In a 1989 letter to the property owner, the NYARNG indicated that they planned on using the camp for infantry training maneuvers including the setup and use of bivouac areas and field fortifications, off-road driver training, and communication exercises. It is unknown if the ranges were also reactivated in 1989. According to a 1986 NYARNG letter, the existing ranges did not meet the requirements of AR 385-63 (Range Safety) for the following reasons: 1) The maximum range of the M-16 extended past the property boundary; 2) Due to the topography of the area, berms or baffles would be required before the area could be used as a firing range; and 3) The property would have to be fenced to prevent unauthorized access. The 1989 NYARNG letter to the property owner also indicated that in order for the ranges to be reactivated a safety analysis would need to be conducted and approved. No documentation was obtained during the data collection activities that confirmed that a safety analysis was ever conducted.

On 9 July 2007, the NYSDEC sent a letter to the property owner indicating that Camp O'Ryan had a history of contamination due to the range and from the possible on-site burial of wastes. The letter did not specify which range nor what types of wastes were allegedly buried. Therefore, NYSDEC was requesting access to the property in order to perform an inspection and conduct sampling. According to the NYARNG POC, as of the date of the in-brief (1 July 2008), the owner had not granted access to the NYSDEC. As of 19 November 2008, Camp O'Ryan was also not listed in NYSDEC's Environmental Site Remediation Database.

The exact boundary of the range is unknown and a site layout map is not available. The site boundary shown on Figure 6-1 is based on the Camp O'Ryan boundary shown in the Real Estate Planning Report. No evidence of the former ranges were observed during the 13 October 2008 site visit. It should be noted that the site visit was conducted from the road and visibility was limited since the majority of the site is wooded. An abandoned white building was visible from the road; its use is unknown. The site location is shown on Figure 6-1 and a photograph log is included in Section 6.5. All supporting documents and interview logs are provided in Appendix C of this report.

6.3 Camp O'Ryan Summary Tables

The following tables summarize the Inventory Data Requirements per 10 U.S.C. 2710 for Camp O'Ryan.

Table 6-2: POC Table

NDNODS Name	Title	Last Name	First Name	POC Title	POC Org
Camp O'Ryan	Mr.	Jensen	Peter	Environmental Program Manager	NYARNG
Phone	518-786-4548		**Address**	JFHQ – NY	
DSN				New York State Division of Military and Naval Affairs	
Fax				330 Old Niskayuna Road	
Email	peter.jensen1@us.army.mil			Latham, New York	

The Camp O'Ryan MRS Table provides detailed information on the MRS(s) included in the inventory.

Table 6-3: MRS Table

NDNODS Name	MRS Name	Status
Camp O'Ryan	Camp O'Ryan	Transferred

Range Description

This MRS contained both a pistol and rifle range that was associated with a former NYARNG training camp known as Camp O'Ryan (RRNY000004). Camp O'Ryan was used by the NYARNG from 1949 to 1974 and again from 1989 to 1994. It appears the the small arms ranges were only active from 1949 to 1974, The majority of this MRS, which consists of 376 acres in Wethersfield, NY, is wooded. The site is bounded by Wethersfield Road to the north, Bumbacher Road to the west, and privately owned farmland to the south and east.

MRS ID

RRNY000004

UTM Zone	UTM X	UTM Y	Construction Year
17	722894.84	4728851.37	1949
Topography	**Vegetation**	**Soil Type**	
Gently Rolling	Forest	Silt/Silty-Clay	
Current Use	**Start Year**		
Undeveloped	1994		

Historic Uses	Start Year	End Year
Training Area/Maneuver Area	1949	1974
Small Arms	1949	1974

UTM = Universal Transverse Mercator

The Camp O'Ryan Munitions Table provides detailed information on the munitions used on this MRS.

Table 6-4: Munitions Table

NDNODS Name	MRS Name	
Camp O'Ryan	Camp O'Ryan	
Munitions Description	**Start Year**	**End Year**
Small Arms	1949	1974

The Camp O'Ryan Ownership Table provides detailed information on MRS ownership.

Table 6-5: Ownership Table

NDNODS Name	MRS Name			
Camp O'Ryan	Camp O'Ryan			
Ownership	**Ownership Description**	**Type**	**Start Year**	**End Year**
Private	This MRS is privately-owned undeveloped property.	Transfer	1994	NA

The Camp O'Ryan Land Use Restrictions Table provides information on MRS land use restrictions.

Table 6-6: Land Use Restrictions Table

NDNODS Name	MRS Name		
Camp O'Ryan	Camp O'Ryan		
Restriction Type	**Restriction**	**Restriction Description**	**Public Access**
NA	NA	There are no barriers preventing access to any part of this MRS.	UPA

PUBLIC ACCESS DEFINITIONS:

NPA = No Public Access: The public does not have any access to the MRS.
LPA = Limited Public Access: The public does have some access to the MRS, but that access doesn't involve any digging, only surface access, such as livestock grazing or use as a wildlife preserve or refuge.
RPA = Restricted Public Access: The public does have some access to the MRS and that access may involve some surface disturbance, such as agricultural use, forestry, recreation, and vehicle or supply storage facility use.
UPA = Unrestricted Public Access: There are no restrictions on the use of the MRS (excavation is allowed).

The Camp O'Ryan Demographics Table provides information on MRS demographics.

Table 6-7: Demographics Table

NDNODS Name	MRSName	Type	Name	State	Country
Camp O'Ryan	Camp O'Ryan	City	Wethersfield	New York	USA

The Camp O'Ryan Environmental and Cultural Resources Stewardship Table provides information on environmental and cultural resources associated with the MRS.

Table 6-8: Environmental and Cultural Resources Stewardship Table

NDNODS Name	MRS Name
Camp O'Ryan	Camp O'Ryan
Special Status Species	**Cultural Resources**
According to the NYSDEC Environmental Resource Mapper, there are no threatened or endangered species on this MRS.	According to the website for the National Register of Historic Places, there are no known cultural resources on this MRS.

Groundwater Depth (feet)	Constituent Flag	UXO Density	Drinking Water Potential
15	Unknown	NA	Potential
Final Remedy in Place Year	**SWMU Number**	**IRP Number**	
NA	NA	NA	

SWMU = Solid waste management unit

6.4 Camp O'Ryan Notes

There are no additional notes for Camp O'Ryan.

6.5 Camp O'Ryan Interview and Photograph Logs

Table 6-9: Interviews

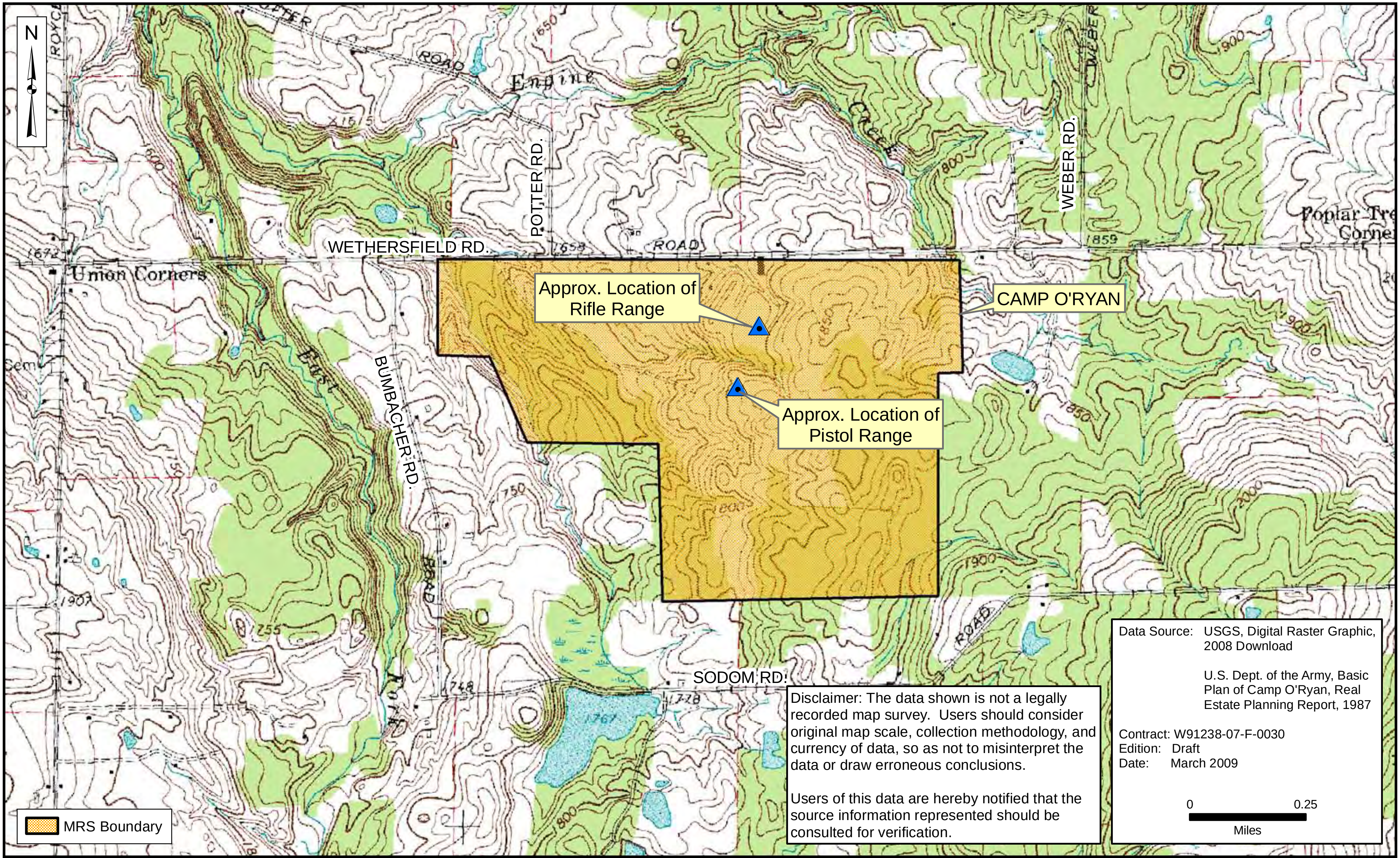
Name	Title	Interview
No Interviews Conducted.		

Photograph 1: View south from Wethersfield Road, between Weber Road and Potter Road, showing abandoned building (13 October 2008)
Camp O'Ryan (RRNY000004)

Photograph 2: View south towards trail leading into the woods from Wethersfield Road, near Potter Road (13 October 2008)
Camp O'Ryan (RRNY000004)

Photograph 3: View east from Bumbacher Road, looking toward location of Camp O'Ryan beyond the tree line (13 October 2008)
Camp O'Ryan (RRNY000004)

Photograph 3: View north from Sodom Road, looking toward location of Camp O'Ryan in the distance (13 October 2008)
Camp O'Ryan (RRNY000004)



Data Source: USGS, Digital Raster Graphic, 2008 Download

U.S. Dept. of the Army, Basic Plan of Camp O'Ryan, Real Estate Planning Report, 1987

Contract: W91238-07-F-0030
Edition: Draft
Date: March 2009

Disclaimer: The data shown is not a legally recorded map survey. Users should consider original map scale, collection methodology, and currency of data, so as not to misinterpret the data or draw erroneous conclusions.

Users of this data are hereby notified that the source information represented should be consulted for verification.

National Guard Bureau
Non-DoD Owned Non-Operational Defense Sites Inventory
New York

Figure 6-1
Camp O'Ryan (RRNY000004)

NYSDEC 2009 Site Investigation Report

NEW YORK STATE DEPARTMENT
OF
ENVIRONMENTAL CONSERVATION

SITE INVESTIGATION REPORT
CAMP O'RYAN RIFLE RANGE
GAINESVILLE, NEW YORK

May 2009

Table of Contents

Section

Attachments:

1.0 Background

Camp O'Ryan is located in Gainesville, NY, Wyoming County, designated as tax parcel SBL-106.2-61.1.

Land Lease # 30-075, dated May 26, 1949 and expiring on June 30, 1974 (Attachment 1), indicates that the Camp O'Ryan site was leased by Edward N. George, Jr., to the War Department, Corps of Engineers, New York District, for use as a target range, maneuver area, camp site, and general government purposes.

This 375 acre site remains in the ownership of the Edward N. George Estate. There are no security fences or posted signs. There are a few remaining buildings from past use of the site. A small parcel of the site (4.83 acres, SBL-106.2-61.2) was sold to King Brothers Masonry Contractors at 3060 Wethersfield Road, Gainesville, NY.

According to the NYS Division of Military and Naval Affairs (DMNA), the types of activities which occurred at the site included firing small arms and vehicular maneuvers (Attachment 2). The small arms fired non-explosive ordnances (bullets). The unfired small arms typically do not represent a safety hazard. According to DMNA, there were no explosive ordnances used at the site (grenades, mines, etc.). Additionally, DMNA indicated that the site is not large enough to have been used for firing large caliber explosive shells (cannons, tank cannons, etc.). During firing practice, military personnel would typically be very concerned with locating and removing unfired munitions. There were no tanks used on the property. Drivers were trained on site using other large wheeled vehicles.

In July 2008, the U.S. Army Corps of Engineers proposed this property for inclusion in the Federal Defense Environmental Restoration Program - Formerly Used Defense Sites (DERP-FUDS). This property has since been accepted into the DERP-FUDS program.

On September 2, 2008, the DEC obtained a Temporary License Agreement for entry to Camp O'Ryan (Attachment 3).

2.0 Purpose

The purpose of this report is to summarize the November 5, 2008 investigation at Camp O'Ryan, located in Gainesville, NY, Wyoming County, and present the results of the sampling program. This investigation was initiated as per the New York State Department of Environmental Conservation (NYSDEC) November 2008 Visual Site Inspection and Sediment and Surface Soil Sampling Work Plan for the Camp O'Ryan Rifle Range in Gainesville, NY. This Work Plan specified the investigation to report potential lead contamination and any visual records of possible alleged on-site disposal.

This NYSDEC Sampling Work Plan was carried out by staff from the Division of Solid & Hazardous Materials (DSHM), with assistance from DMNA staff. Sampling locations were selected based on the likely configuration of the former rifle range (Attachments 4 and 5).

3.0 Sampling Locations

A total of thirty-one (31) samples were collected (Attachment 5). Thirteen (13) samples were collected from the firing berm area; the remaining seventeen (17) were collected from the hill area behind where the targets would have been located. One (1) control sample was collected at random along Wethersfield Road in front of the King Brothers' property.

4.0 Sample Analysis

The Total Metals Lead analyses were conducted at the NYSDEC DER Laboratory in Troy, NY. The TCLP analyses were conducted at a National Environmental Laboratory Accreditation Program (NELAP) approved contract laboratory.

A total of fifteen (15) samples with elevated levels of Total Metals Lead were chosen to be analyzed for TCLP Lead (See Attachment 8).

5.0 Field Results

The following are the general field conditions documented by NYSDEC staff on November 5, 2008:

- Weather conditions: Sunny, light wind, 70° F
- Time sampling started: 10 a.m.
- Time sampling ended: 2 p.m.
- Names of NYSDEC: Anthony Lopes, Thomas Corbett, Kevin Glaser
- Names of any others present and affiliation: Peter Jensen, Environmental Branch Chief, DMNA

No areas of visible on-site spillage (dark soil/discoloration/lack of vegetation) were noted.

No areas of alleged disposal, unfired munitions, or other items of potential military origin were noted.

There was what looked like target poles attached to the cement retaining wall extending parallel to and directly in front of the impact berm (see Attachment 4).

Possible conically shaped impact zones were noted in the hill behind the cement retaining wall where the targets were located. Samples 15 through 28 were taken from this hillside area (impact berm). A few were taken directly from the impact zones, some from the area at the bottom of the slope where some surface water was present. All these samples, 15 through 28, had high Total Lead values. Eleven (11) had high TCLP Lead values (Attachment 8).

6.0 References

The following documents were reviewed and/or used in the preparation of this Site Investigation Report:

1. NYSDEC Division of Water, "Standard Operating Procedure (SOP): Sampling Equipment Decontamination/Cleaning," September 2004.
2. NYSDEC "Analytical Service Protocol (ASP) Exhibit C - Target Compound Lists (TCLs) and Contract Required Quantitation Limits (CRQLs)," July 2005.
3. NYSDEC "Analytical Service Protocol (ASP) Exhibit B - Reporting and Deliverables Requirements," July 2005.
4. NYSDEC DS&HM, Bureau of Pesticides Management, "Field Sampling Standard Operating Procedure (SOP) For Sediment."
5. NYSDEC DS&HM, Bureau of Pesticides Management, "Field Sampling Standard Operating Procedure (SOP) For Surface Soil."
6. NYSDEC DS&HM, Bureau of Pesticides Management, "Field Sampling Standard Operating Procedure (SOP) For Decontamination."
7. NYSDEC "Visual Site Inspection and Sediment and Surface Soil Sampling Work Plan for the Camp O'Ryan Rifle Range in Gainesville, NY," November 2008.

7.0 Signatories

James Strickland, P.E.
Environmental Engineer 3
Regional Hazardous Materials Engineer

Anthony Lopes, P.E.
Environmental Engineer 2
Plan Preparer & Project Manager

Attachment 1

Land Lease, # 30-075

Attachment 1

The supplies and services to be obtained by this instrument are authorized by, are for the [illegible] to the purposes set forth [illegible]

WAR DEPARTMENT
Corps of Engineers
~~XXXXXXXXXXXXXXXXX~~
NEW YORK DISTRICT

EXP: 6-30-74

Lease No. W. 30-075 ENG 4278

2191405 908-6674 P-421-05 S30-075

$1400 pa

LAND LEASE

BETWEEN

EDWARD N. GEORGE, JR, ALSO KNOWN AS (ED DON GEORGE)

and

THE UNITED STATES OF AMERICA

1. THIS LEASE, made and entered into this 26th day of May in the year one thousand nine hundred and forty-nine by and between EDWARD N. GEORGE, JR. ALSO KNOWN AS ED DON GEORGE

whose address is 300 Main Street, Buffalo, New York

and whose interest in the property hereinafter described is that of fee simple owner for himself, his heirs, executors, administrators, successors, and assigns, hereinafter called Lessor, and THE UNITED STATES OF AMERICA, hereinafter called the Government:

WITNESSETH: The parties hereto for the considerations hereinafter mentioned convenant and agree as follows:

2. The Lessor hereby leases to the Government the following described premises, viz:

All that tract or parcel of land situate in the town of Wethersfield, County of Wyoming and State of New York bounded and described as follows:

Beginning at the northwest corner of lot No. 47 in said town in the North Java - Wethersfield Springs Highway; running thence east along the north line of said lot 34.26 chains; thence south 20.43 chains; thence west 4.86 chains; thence south 38.76 chains to the south line of said lot No. 47; thence west 29.19 chains to the southwest corner of lot No. 47; thence continuing west 15.37 chains along the south line of lot No. 55; thence north 26.03 chains; thence west 23.42 chains; thence northwest to a point 16.71 chains south of the north line of lot No. 55; thence west to a point 9.81 chains east of the west line of lot No. 55; thence north 16.71 chains to the north line of lot No. 55 and said highway; thence east about 50 chains along said north line of lot No. 55 to the place of beginning; containing approximately 375.72 acres.

to be used for the following purpose: Target Range, Maneuver Area, Camp Site and other Government purposes.

Thomas
Attorney

ENG FORM 856
REV 1 JUL 45

3. TO HAVE AND TO HOLD the said premises for the term beginning May 26, 1949 through June 30, 194[illegible] provided that unless and until the Government shall give notice of termination in accordance with provision 6 hereof, this lease shall remain in force thereafter from year to year without further notice; provided further that adequate appropriations are available from year to year for the payment of rentals; and provided further that this lease shall in no event extend beyond

June 30, 1974

4. The Government shall pay the Lessor rent at the following rate: Nineteen Hundred Dollars ($1,900.00) per annum until June 30, 19[illegible] and Fourteen Hundred Dollars ($1,400.00) per annum thereafter
Payment shall be made at the end of each calendar month by the Finance Officer, United States Army, Brooklyn Army Base, 58th Street and First Avenue, Brooklyn, New York

~~5. The Government shall have the right, during the existence of this lease to~~ attach fixtures, and erect structures or signs, in or upon the premises ~~hereby leased,~~ which fixtures and structures, or signs, so placed in, ~~upon or attached~~ to the said premises shall be and remain the property ~~of the Government~~ and may be removed or otherwise disposed of by ~~the Government.~~

6. The Government may terminate this lease at any time by giving thirty (30) days notice in writing to the Lessor, and no rental shall accrue after the effective date of termination.

7. Any notice under the terms of this lease shall be in writing signed by a duly authorized representative of the party giving such notice, and if given by the Government shall be addressed to the Lessor at [illegible] Main Street, Buffalo, New York

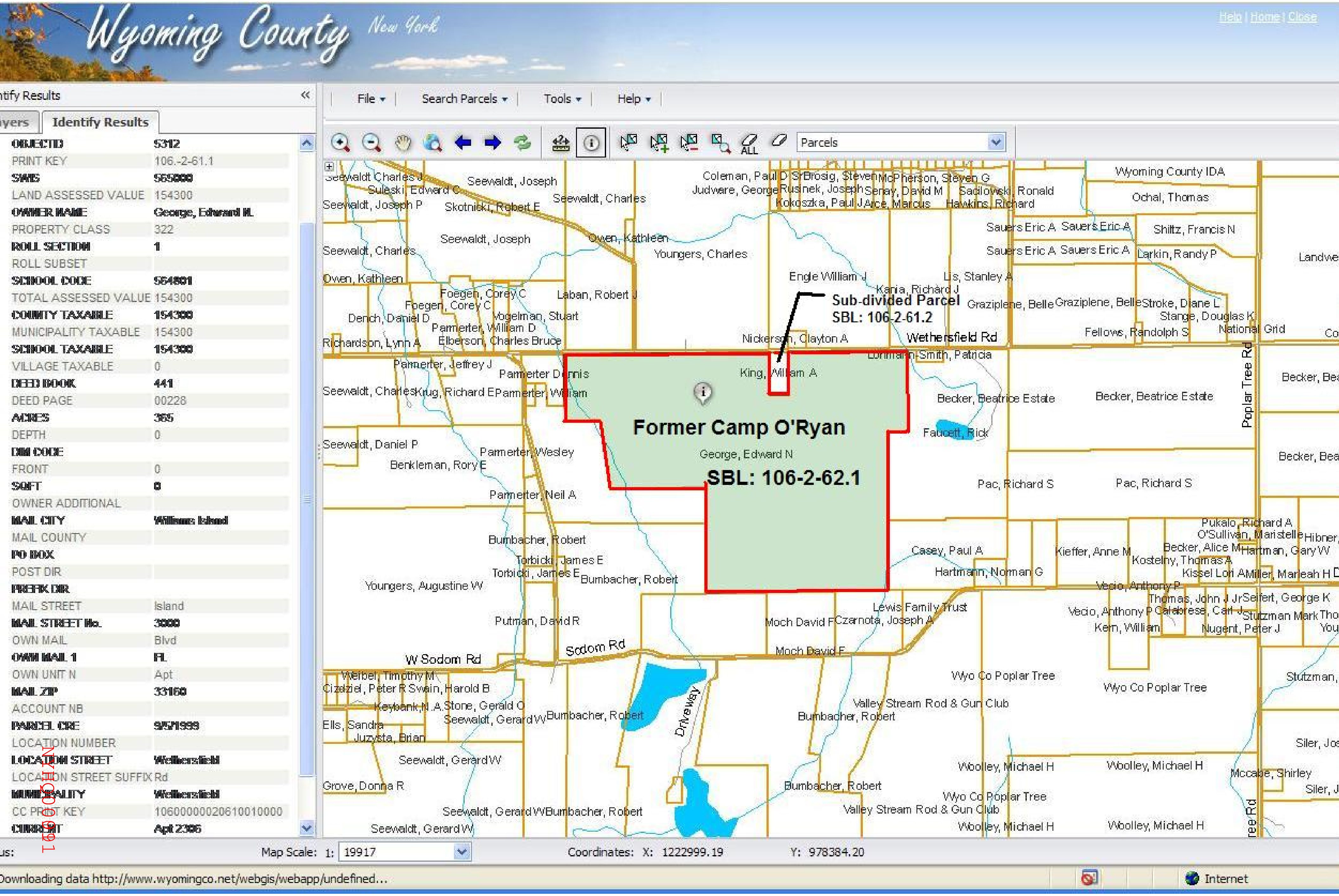
and if given by the Lessor shall be addressed to The District Engineer, New York District, Corps of Engineers, [illegible] Wall Street, New York 5, New York.

8. The Lessor warrants that he has not employed any person to solicit or secure this lease upon any agreement for a commission, percentage, brokerage, or contingent fee. Breach of this warranty shall give the Government the right to annul the lease, or, in its discretion, to deduct from the rental the amount of such commission, percentage, brokerage, or contingent fees. This warranty shall not apply to commissions payable by lessors upon contracts or leases secured or made through bona fide established commercial or selling agencies maintained by the Lessor for the purpose of securing business.

9. No Member of or Delegate to Congress or Resident Commissioner shall be admitted to any share or part of this lease or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this lease if made with a corporation for its general benefit.

10. The Government shall have the right, during the existence of this lease to make alterations, attach fixtures, and erect additions, structures or signs, including but not limited to buildings, target ranges, concrete butts, tank traps, walks, and landing strips, in or upon the premises hereby leased, which fixtures, additions, or structures so placed in, upon, or attached to the said premises shall be and remain the property of the Government and may be removed or otherwise disposed of by the Government at its sole option. The Government shall also have the right to cut and remove trees, remove top soil, take off sand and gravel, revise the contours and ground levels of the land, and, in general, take such further action affecting the land as it may desire. The Lessor recognizes that the rental above stipulated includes an amount sufficient to compensate him for any damages that may be inflicted upon the premises during the Government's occupancy, and accordingly agrees that the erection of the fixtures, additions, and structures and the damage to the land shall not be deemed to constitute waste, and waives all claims for damages arising directly or indirectly therefrom; nor shall the Government be obligated to remove all or any of the property so attached to or erected on the demised premises or to restore the premises to the condition existing at the commencement of this lease; provided, however, that if the Government exercises its option, as herein contained, to effect an earlier termination of the lease, then in such event the Government shall place the house and barn on the property at the time of leasing in a condition reasonably suitable for occupancy and use for dairy farming, deterioration due to fair wear and tear, and damages by the elements, or by circumstances over which the Government has no control, excepted.

11. The Lessor shall have the right, during the term of this lease, to cut and remove trees from the demised premises, provided that such cutting and removal of trees shall be accomplished only at such times and in such quantities as may be agreeable to the Officer in Charge of the premises. The Lessor shall also be permitted to remove and retain trees which are cut down by the Government, provided that such trees are not required by the Government, and provided further that removal of such trees shall be accomplished only at such times and in such amounts as may be agreeable to the Officer in Charge of the premises.



OBJECTID 5312
PRINT KEY 106.-2-61.1
SWIS 565000
LAND ASSESSED VALUE 154300
OWNER NAME George, Edward N.
PROPERTY CLASS 322
ROLL SECTION 1
ROLL SUBSET
SCHOOL CODE 564801
TOTAL ASSESSED VALUE 154300
COUNTY TAXABLE 154300
MUNICIPALITY TAXABLE 154300
SCHOOL TAXABLE 154300
VILLAGE TAXABLE 0
DEED BOOK 441
DEED PAGE 00228
ACRES 365
DEPTH 0
DIM CODE
FRONT 0
SQFT 0
OWNER ADDITIONAL
MAIL CITY Williams Island
MAIL COUNTY
PO BOX
POST DIR
PREFIX DIR
MAIL STREET Island
MAIL STREET No. 3000
OWN MAIL Blvd
OWN MAIL 1 FL
OWN UNIT N Apt
MAIL ZIP 33160
ACCOUNT NB
PARCEL CRE 9/5/1999
LOCATION NUMBER
LOCATION STREET Wethersfield
LOCATION STREET SUFFIX Rd
MUNICIPALITY Wethersfield
CC PRINT KEY 106000000206100100000
CURRENT Apt 2306

Downloading data http://www.wyomingco.net/webgis/webapp/undefined...

Attachment 2

NYS Division of Military and Naval Affairs (DMNA) Site Summary

Attachment 2

STATE OF NEW YORK
DIVISION OF MILITARY AND NAVAL AFFAIRS
330 OLD NISKAYUNA ROAD
LATHAM, NEW YORK 12110-3514

DAVID A. PATERSON
GOVERNOR
COMMANDER IN CHIEF

JOSEPH J. TALUTO
MAJOR GENERAL
THE ADJUTANT GENERAL

Direct Telephone: (518) 786-4540
E-mail: Robert.Conway1@us.army.mil

July 21, 2008

Legal Affairs

Annette M. Sansone, Esq.
Assistant Regional Attorney
N.Y.S. Department of Environmental
Conservation – Region 9
270 Michigan Avenue
Buffalo, NY 14203-2999

Re: Camp O'Ryan, Wethersfield, New York

Dear Ms. Sansone:

Enclosed please find a memorandum from Mr. Peter Jenson, this agency's Environmental Compliance Branch Chief, regarding the history of uses by the New York Army National Guard of the site formerly known as Camp O'Ryan in Wethersfield, Wyoming County, New York. Please provide a copy of the enclosed memorandum to Mr. James G. Strickland, P.E., in your region's Division of Solid and Hazardous Materials.

If you or Mr. Strickland have any questions regarding the enclosed memorandum or wish to coordinate a site visit, please contact Mr. Jenson at his work telephone number, (518) 786-4548, or at his e-mail address: peter.jensen1@us.army.mil. Please feel free contact me also if you have any follow-up questions regarding this matter.

Thank you for your cooperation and assistance in this matter.

Sincerely,

Robert G. Conway, Jr.
Counsel

Encl.

cc: Mr. Jenson, DMNA, MNFE-EC

STATE OF NEW YORK
DIVISION OF MILITARY AND NAVAL AFFAIRS
330 OLD NISKAYUNA ROAD
LATHAM, NEW YORK 12110-3514

DAVID A. PATERSON
GOVERNOR
COMMANDER IN CHIEF

JOSEPH J. TALUTO
MAJOR GENERAL
THE ADJUTANT GENERAL

MEMORANDUM

FROM: Mr. Peter Jensen, Environmental Compliance Branch Chief, Facilities Management and Engineering Directorate, Division of Military and Naval Affairs PJ

TO: Mr. James G. Strickland, P.E., Regional Hazardous Materials Engineer, New York State Department of Environmental Conservation, Region 9

SUBJECT: Site Formerly Known as Camp O'Ryan in the Town of Wethersfield, Wyoming County, New York

DATE: 16 July 2008

1. A review of Division of Military and Naval Affairs (DMNA) files indicate that there was a land lease, dated 26 May 1949, between the U.S Army Corps of Engineers, New York District, and Mr. Edward George, the owner of the land formerly known as Camp O'Ryan. The lease indicated that the 375-acre site would be used for existing target ranges (reportedly built by the U.S. Army Corps of Engineers during World War II when the property was owned by the Federal government), maneuver area training and as a camp site. The lease expired on 30 June 1974. DMNA staff could not locate any records relating to military activities, by the New York Army National Guard (NYARNG) or any other State or Federal military organization, conducted on this site prior to 1949. It is this agency's understanding that during World War II, the U.S. Army Corps of Engineers (ACOE) owned and initially developed this training site and later sold it to Mr. George after World War II and in 1949 Mr. George leased it back to the ACOE.

2. While DMNA staff were unable to find any lease agreements between Mr. George and the NYARNG during the time period of 1949 through 1974, it is possible that NYARNG units may have used the site for small arms training (pistols, rifles and machine guns) using non-explosive munitions (bullets) fired into dirt berms. The site is not large enough to be used for field artillery firing, battle tank firing and maneuvers, or other similar weapons systems that utilize explosive munitions requiring large, closed impact areas and safety buffer zones. Further, military training involving explosive

munitions is not conducted on private (even if leased) property due to the possibility of unexploded munitions ("dud" rounds) becoming embedded or lost during firing exercises on the property, access to which is cannot be permanently restricted. As a result, there is no likelihood that there are unexpended explosive munitions on the Camp O'Ryan site related to any NYARNG training activities. However, it is possible that there are unexpended small arms munitions (bullets and blank rounds) on the site but these items pose no active danger to the public.

3. Some local community members have voiced concerns over anecdotal reports from civilians of burials of suspected hazardous materials on site in the past. The burying or controlled burning of trash and garbage generated during military training sessions at Camp O'Ryan is certainly possible during the years prior to the environmental regulations enacted during the 1970s. DMNA has no records or anecdotal evidence of any disposal activities involving hazardous materials at Camp O'Ryan. Further, it is highly unlikely that any State or Federal agency would dispose of hazardous material on a privately owned site to which access was and is even today not restricted or fenced.

4. The NYARNG periodically did use the site in the late 1980s and in the early 1990s as a local training area (LTA). Training activities conducted on LTAs normally include land navigation and wheeled-vehicle (e.g., small, ¼ ton "pick-up" trucks) driver training.

5. The NYARNG does not have the capability to conduct a munitions clearance sweep of the site but is willing to have an agency representative on site to assist New York State Department of Environmental Conservation - Region 9 personnel by ensuring their safety during any environmental sampling activities.

6. This year (2008) the National Guard Bureau in coordination with the ACOE is placing Camp O'Ryan on the Formerly Used Defense Site (FUDS) list to enable the U.S. Department of Defense to determine what if any environmental remediation may be necessary at the site as a result of Federal or State National Guard military training. FUDS sites eventually will be remediated with Federal funds.

Copy to:

Annette Sansone, Esq., NYS DEC-Region 9
DMNA Legal Affairs Office

Attachment 3

Temporary License Agreement for Entry to Camp O'Ryan

Attachment # 3

TEMPORARY LICENSE AGREEMENT

THIS AGREEMENT is made as of this 2ND day of Sept., 2008, between Trust Under Will of Edward N. George, Jr. ("Licensor"), Donald E. George, Edward N. George, III, James R. George, Trustees and the New York State Department of Environmental Conservation ("DEC"), the New York State Division of Military and Naval Affairs ("DMNA") and representatives or contractors acting on behalf of or retained by DEC and/or DMNA (collectively, "Licensee").

WHEREAS, Licensor is the owner of certain real property in the town of Wethersfield, County of Wyoming, State of New York known as Camp O'Ryan and described as Tax Map Parcel No. SBL-106.2-61.1 (hereinafter referred to as the "Property"); and

WHEREAS, Licensee has reason to believe that the Property was at one time leased to the United States Army Corps of Engineers ("USACOE") and that the Property was at one time used as a rifle range and for maneuvers by DMNA; and

WHEREAS, Licensee is investigating allegations of possible lead contamination and unexpended munitions on the Property which Licensee believes require further investigation; and

WHEREAS, Licensee has requested authorization to access the Property in order to inspect the Property, take soil and water samples and undertake precautionary measures which may be necessitated by the presence of any unexpended munitions to ensure the safety of investigators; and

WHEREAS, Licensee has requested permission to enter the Property for the purpose of investigating either actual or suspected sources of pollution or contamination; and

WHEREAS, Licensor is willing to grant a temporary license for such entry and activities, subject to the terms and conditions hereinafter set forth;

NOW, THEREFORE, the parties hereto, without admitting any issues of fact or law or any liability or responsibility, for good and valuable consideration of the mutual promises set forth below, the adequacy of which is hereby acknowledged, agree as follows:

1) Licensor represents and warrants to Licensee that, as of the date of this Agreement, it is the sole owner of record of the Property. This provision shall survive expiration or termination of this Agreement.

2) Licensor grants, without covenant or warranty except as set forth in paragraph 1 above, to Licensee a temporary license to access the Property for the purpose of investigating whether unexpended munitions are on the Property and the background concentration and existence, nature, quantity, extent, condition and location of any contamination that may be on the Property. Activities undertaken by Licensee in connection with such investigation (hereinafter, the "Work") may consist of, but are not limited to, the collection of soil and water samples and management of Impacted Materials (as that term is defined in paragraph 8 below). Sample collection may be performed utilizing hand operated equipment, drill rigs, direct push sampling equipment, and/or other necessary equipment needed to collect the samples.

3) That the Work performed by Licensee and/or its agents upon the Property shall be done consistent with a work plan approved by DEC, as may be modified from time to time at DEC's direction. Licensee shall provide a copy of the work plan and any revisions thereof to Licensor prior to commencing the activities called for by the work plan or any revisions thereof as soon as practicable, but no later than the time for providing notice pursuant to paragraph 6 below.

4) This License is granted solely for the purposes described above.

5) Licensee agrees to comply with all laws, regulations and ordinances applicable to it in connection with performing the Work at its sole cost and expense.

6) At least 5 days prior to commencement of any of the Work Licensee shall notify Licensor of the dates and times when Work will be done and the precise locations of

the Work at the Property. Licensee agrees that Licensor may have a representative present who may observe the performance of the Work. Licensee will provide notice to the designated representative for Licensor identified in paragraph 14 below when all Work is complete.

7) Licensee shall be responsible for identifying the location of all utility lines in the areas where the Work is to be performed, although Licensor agrees to provide Licensee with any information it possesses regarding said utility lines. Licensee shall assume full responsibility to assure that the Work shall not disrupt any utility or service and the liability for any such disruption shall be on Licensee. Licensee shall obtain any necessary utility permits and approvals, including any approvals from governmental agencies prior to performing the Work and shall provide copies of any necessary approvals to Licensor.

8) All laboratory and field equipment samples, purge water, soil cuttings, and other material generated during the Work ("Impacted Materials") shall be properly handled, stored and disposed by Licensee at Licensee's expense. Any manifest required to transport or dispose of Impacted Materials shall be signed by Licensee as the generator.

9) Licensee agrees that the Work shall be performed by Licensee in a manner which shall not harm persons or property. Any Impacted Materials which are stored on the Property shall be managed by Licensee in a manner which avoids any hazards and any exacerbation or creation of environmental risks or harm.

10) Licensee shall provide copies of reports and data generated in connection with the Work to Licensor as soon as reasonably possible.

11) Nothing contained in this Agreement shall obligate Licensor to pay any costs or expenses for the Work to be performed under this Agreement by or on behalf of Licensee.

12) When the Work is complete, or upon termination of this License pursuant to paragraph 14 below, whichever occurs first, Licensee will fully restore and repair any areas of the Property which are damaged directly or indirectly in any manner by Licensee, its

contractors, subcontractors or anyone under the direction or control of Licensee and/or by vehicles, machinery or equipment owned or operated by or on behalf of Licensee. Such restoration and repair shall be completed within 30 calendar days of completion of the Work or termination of this Agreement, whichever comes first. If weather and site conditions impede Licensee's ability to satisfy the 30-day deadline, then Licensee shall complete the necessary restoration and repairs within 30 calendar days of the time when weather and site conditions cease to impede the performance of such restoration and repairs.

13) The effective date of this Agreement shall be the date it is executed by Licensor and the Licensee.

14) This Agreement shall terminate the earlier of (a) December 31, 2008; (b) the date on which Licensee provides Licensor with notice that the Work is complete; or (c) upon 30 days' written notice of revocation provided by Licensor to Licensee. Any such notice shall be delivered personally or by certified mail to the following:

For Licensor:

Brenda J. Joyce, Esq.
Jaeckle Fleischmann & Mugel, LLP
12 Fountain Plaza
Buffalo, New York 14202

For Licensee:

Annette M. Sansone
Assistant Regional Attorney
New York State Department of Environmental Conservation
Office of General Counsel, Region 9
270 Michigan Avenue
Buffalo, New York 14203-2999

15) It is understood and agreed that no vested right in the Property is hereby granted or conveyed, and that the license hereby given is subject to any and all encumbrances, conditions, restrictions, and reservations upon or under which Licensor holds the Property. Licensor agrees to apprise Licensee of any such encumbrances, conditions, restrictions, and

reservations at the earliest possible time, but in any event before the Licensee's entry upon the Property.

16) The rights, privileges, duties, and obligations of the parties hereto under this Agreement shall be binding upon and inure to the benefit of the heirs, executors, administrators, successors, and assigns of said parties, respectively. This Agreement is solely for the benefit of said parties and their successors and assigns and may not be enforced by, nor shall it be construed for the benefit of, any third party.

17) This Agreement contains the sole and entire agreement between the parties, and cannot be altered or amended except by the written consent of both parties with reference to this Agreement.

18) Notwithstanding any provisions to the contrary in this Agreement, neither party hereto shall waive any privilege or any other defenses that it may have based upon any information, oral or otherwise, disclosed, revealed, given to either party by the other or otherwise made known as a result of the activities arising from the Agreement.

19) Nothing in this Agreement in any way estops, bars, or otherwise prevents the parties hereto from asserting any and all claims against each other or against any third party regarding the environmental conditions on or around the Property, and nothing herein shall be construed as a waiver of any cause of action, claim, demand, or defense the parties hereto might otherwise have under statutory law, common law or otherwise against each other or against any third party.

20) Licensor represents to Licensee that the execution, acknowledgement and delivery of this Agreement and the performance of its obligations hereunder have been duly authorized by Licensor and that the person signing has the authority to sign and deliver this Agreement on its behalf and thereby bind Licensor to the same. Licensee represents to Licensor that the execution, acknowledgement and delivery of this Agreement and the performance of its

obligations hereunder have been duly authorized by Licensee and that the person signing has the authority to sign and deliver this Agreement on its behalf and thereby bind Licensee to the same.

21) In case one or more of the provisions contained in this Agreement, or any application thereof, shall be invalid, illegal or unenforceable in any respect, the validity, legality and enforceability of the remaining provisions contained herein and any other application thereof shall not in any way be affected or impaired thereby.

22) This Agreement shall be governed by and construed in accordance with the laws of the State of New York.

23) This Agreement may be modified or amended only in writing executed by Licensor and Licensee.

24) This Agreement may be executed in counterparts, each of which shall constitute one instrument.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement the date and year noted below.

TRUST UNDER WILL OF EDWARD N.
GEORGE, JR.

DATED: July 22, 2008

By: Edw N

Edward N. George III, Trustee
In his capacity as Trustee and on behalf of
Donald E. George, Trustee, and James R.
George, Trustee

DATED: 08/01/08

NEW YORK STATE DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

By: Nancy W Lussier

Nancy Lussier
Director, Division of Management and Budget

DATED: Sept. 2, 2005

NEW YORK STATE DIVISION OF MILITARY
AND NAVAL AFFAIRS

By:____________________________
Joseph J. Taluto
Major General, NY Army National Guard
The Adjutant General

864905

Attachment 4

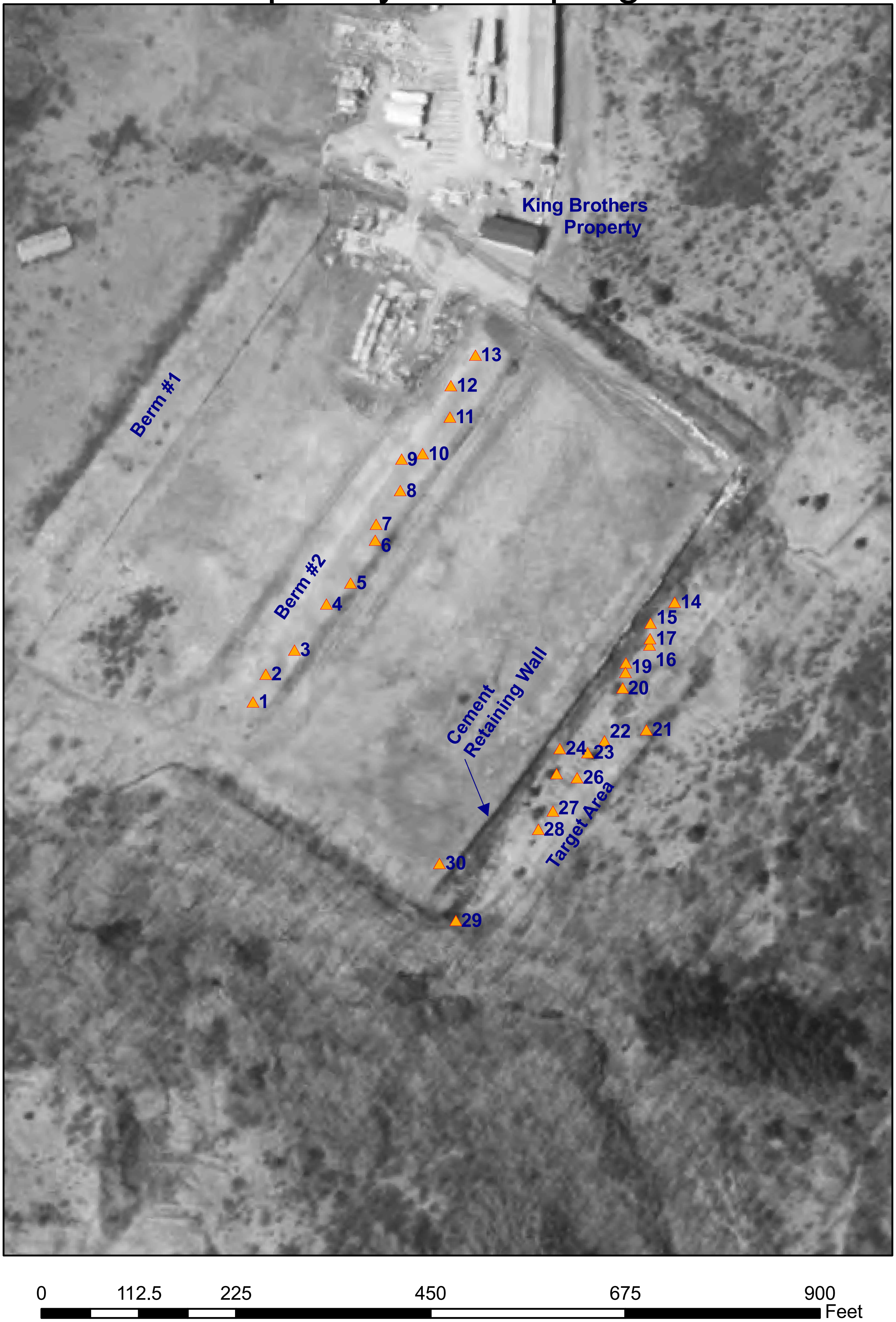
Aerial Photo of Camp O'Ryan Showing Target Area

Attachment 4 - Aerial Photo of Camp O'Ryan Showing Target Area

Attachment 5

Sample Locations/Plot GPS Data

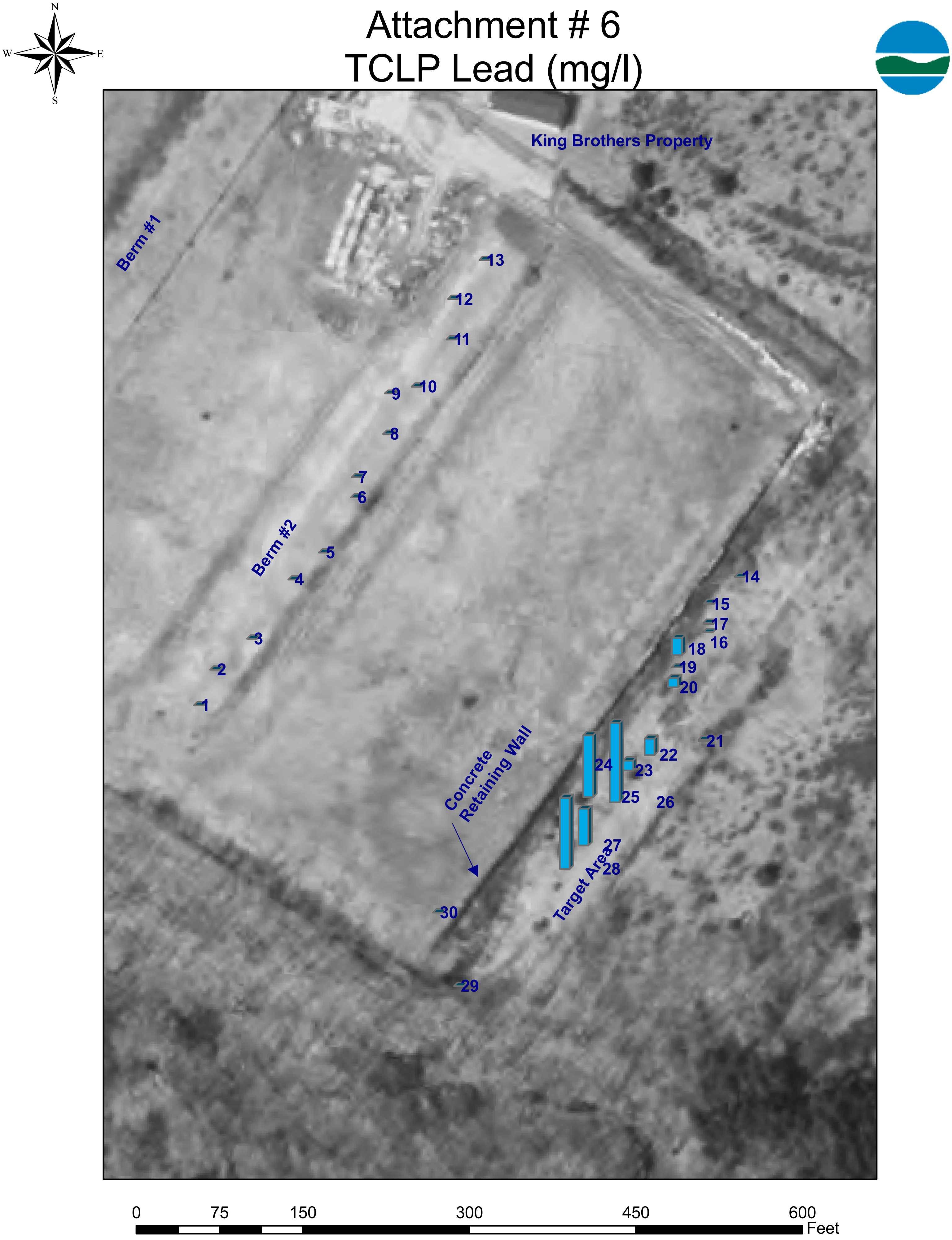
Attachment # 5
Camp O'Ryan Sampling Plot



Attachment 6

TCLP Pb Bar Graph

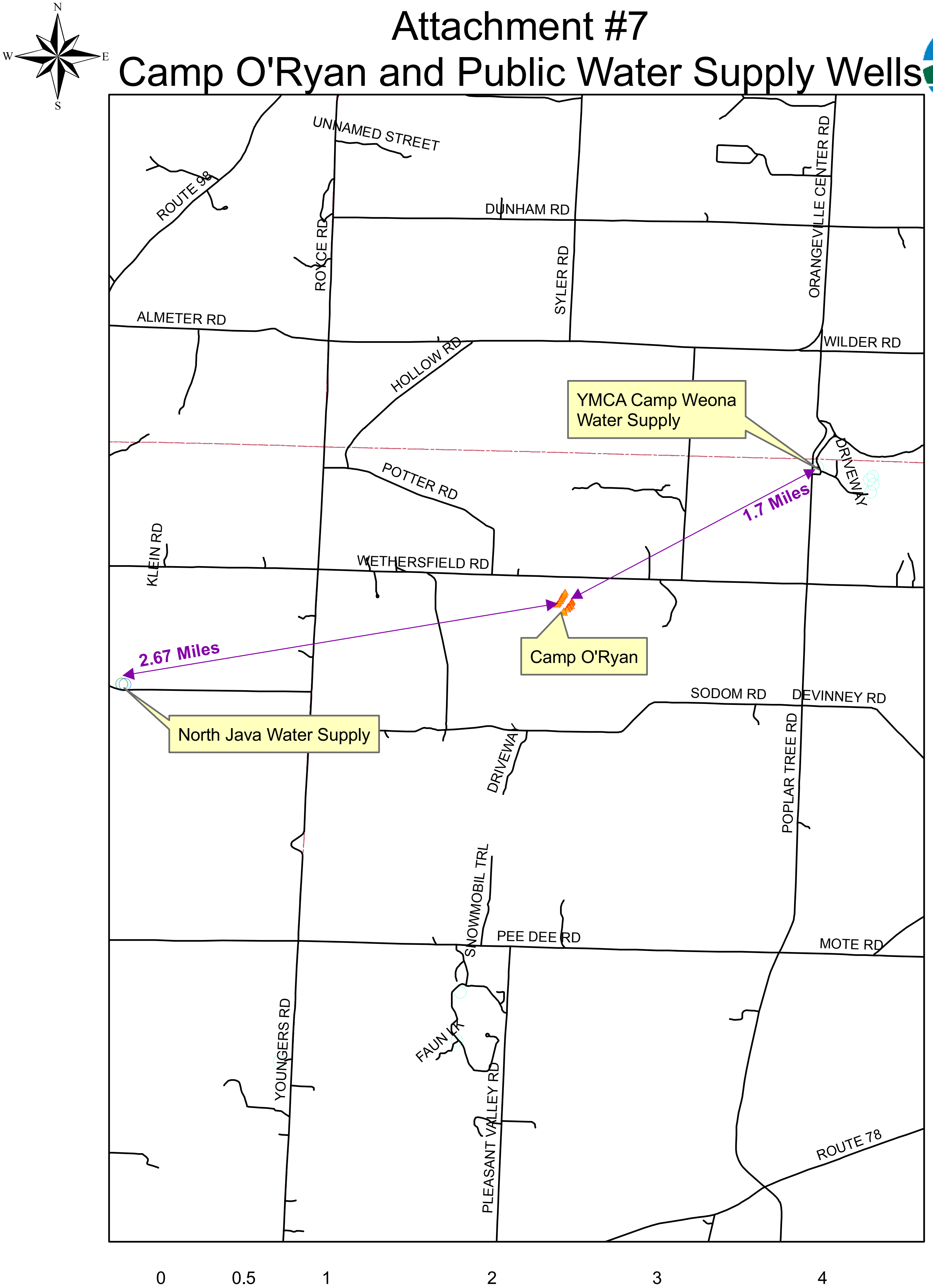
Attachment # 6
TCLP Lead (mg/l)



Attachment 7

Location to Public Water Supply Wells

Attachment #7
Camp O'Ryan and Public Water Supply Wells



Attachment 8

Table of GPS Coordinates/Total Pb/TCLP Pb Results

GPS Coordinates/Total Pb/TCLP Pb

Attachment # 8

N	x	y	Total Pb mg/kg	TCLP Pb - mg/l
1	-78.2797	42.68216	20.1	
2	-78.27965	42.68225	18	
3	-78.27953	42.68233	36.1	
4	-78.2794	42.68248	39.7	
5	-78.2793	42.68255	25.7	
6	-78.2792	42.68269	25.8	
7	-78.2792	42.68274	37.3	
8	-78.2791	42.68285	46.8	
9	-78.2791	42.68295	1930	0.025
10	-78.27901	42.68297	49.4	
11	-78.2789	42.68309	90.9	
12	-78.2789	42.68319	33.9	
13	-78.2788	42.68329	46.8	
14	-78.2779	42.68253	24.6	
15	-78.278	42.68246	969	8.8
16	-78.278	42.68239	182	0.016
17	-78.278	42.68241	704	14
18	-78.2781	42.68233	4470	170
19	-78.2781	42.6823	351	0.31
20	-78.27811	42.68225	4420	93
21	-78.278	42.68212	1530	14
22	-78.27818	42.68208	8980	160
23	-78.27825	42.68204	9990	96
24	-78.27837	42.68205	829	1.1
25	-78.27838	42.68197	6000	610
26	-78.27829	42.68196	7430	780
27	-78.27839	42.68185	4790	360
28	-78.27845	42.68179	50900	700
29	-78.27879	42.68149	68.6	
30	-78.27887	42.68167	48.5	

Attachment 9

Laboratory Sample Summary Results - Total Metals

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A
625 Broadway, 11th Floor
Albany, New York 12233-7015
Phone: (518) 402-9625 • **Fax:** (518) 402-9020 / (518) 402-9627
Website: www.dec.ny.gov

Alexander B. Grannis
Commissioner

Division of Environmental Remediation Laboratory Analytical Report

The case narrative and analytical reports for the King Brothers site are attached.

Case Narrative

Site Name: King Brothers Site Date received: 12/09/08

For sample delivery group(s): 344-01

<u>The following problems were noted during water sample analysis</u>:

Continuing Calibration Verifications - when the CCV did not pass, usually Thalium and Cadmium had recoveries that were greater than the upper limit and Arsenic had recoveries that were less than the lower limit. This appeared to have no impact on the reported results.

In the method blank associated with these samples, 'B' levels (amount below NELAC PTRL but above MDL) for Arsenic, Chromium, and Manganese were present. Iron was present at low, but detectable level ~154mg/Kg.

Any reported results for these elements, may be higher than the actual concentrations.

<u>Please Note</u>:

On the accompanying chain-of-custody there was 32 samples identified. The lab received only 31 samples - NF908-11020-32 was not accounted for by the lab or the courier.

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-01
SDG:344-01
Lab Sample ID:908-344-001
Matrix:SOIL

Wt (g) of sample=	0.52	Solids ratio =	1.39		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10200			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	7.52			PM
7440-39-3	Barium	41.3			PM
7440-41-7	Beryllium	0.34	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	3730			PM
7440-47-3	Chromium	11.7			PM
7440-48-4	Cobalt	4.34			PM
7440-50-8	Copper	141			PM
7439-89-6	Iron	21300			PM
7439-92-1	Lead	20.1			PM
7439-95-4	Magnesium	3520			PM
7439-96-5	Manganese	491			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.46	B		PM
7440-02-0	Nickel	17			PM
7440-09-7	Potassium	1190			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	65.8			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	53.3			PM
7440-62-2	Vanadium	15.9			PM
7440-66-6	Zinc	86.8			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-02
SDG:344-01
Lab Sample ID:908-344-002
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.29		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	8570			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	5.58			PM
7440-39-3	Barium	34.5			PM
7440-41-7	Beryllium	0.297	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	37200			PM
7440-47-3	Chromium	10.9			PM
7440-48-4	Cobalt	4.06			PM
7440-50-8	Copper	69.4			PM
7439-89-6	Iron	19900			PM
7439-92-1	Lead	18			PM
7439-95-4	Magnesium	4930			PM
7439-96-5	Manganese	424			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.55	B		PM
7440-02-0	Nickel	17.5			PM
7440-09-7	Potassium	1250			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	89.6			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	60.6			PM
7440-62-2	Vanadium	13.3			PM
7440-66-6	Zinc	63.5			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-03
SDG:344-01
Lab Sample ID:908-344-003
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.34		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10700			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	6.56			PM
7440-39-3	Barium	43.7			PM
7440-41-7	Beryllium	0.289	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	7860			PM
7440-47-3	Chromium	15.2			PM
7440-48-4	Cobalt	5.33			PM
7440-50-8	Copper	54.9			PM
7439-89-6	Iron	24000			PM
7439-92-1	Lead	36.1			PM
7439-95-4	Magnesium	6120			PM
7439-96-5	Manganese	512			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	2.06	B		PM
7440-02-0	Nickel	21.4			PM
7440-09-7	Potassium	1470			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	150			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	86.3			PM
7440-62-2	Vanadium	17.4			PM
7440-66-6	Zinc	90.9			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-04
SDG:344-01
Lab Sample ID:908-344-004
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.44		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9030			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	6.34			PM
7440-39-3	Barium	44.5			PM
7440-41-7	Beryllium	0.301	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	6460			PM
7440-47-3	Chromium	10			PM
7440-48-4	Cobalt	4.12			PM
7440-50-8	Copper	40.5			PM
7439-89-6	Iron	19500			PM
7439-92-1	Lead	39.7			PM
7439-95-4	Magnesium	4610			PM
7439-96-5	Manganese	426			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.75	B		PM
7440-02-0	Nickel	15.2			PM
7440-09-7	Potassium	1350			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	68.8			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	59.7			PM
7440-62-2	Vanadium	14.7			PM
7440-66-6	Zinc	92.1			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-05
SDG:344-01
Lab Sample ID:908-344-005
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.37		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	12000			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	7.73			PM
7440-39-3	Barium	54.3			PM
7440-41-7	Beryllium	0.304	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	4390			PM
7440-47-3	Chromium	12.3			PM
7440-48-4	Cobalt	4.77			PM
7440-50-8	Copper	60.6			PM
7439-89-6	Iron	22700			PM
7439-92-1	Lead	25.7			PM
7439-95-4	Magnesium	3720			PM
7439-96-5	Manganese	663			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.76	B		PM
7440-02-0	Nickel	16.2			PM
7440-09-7	Potassium	1370			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	78.7			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	100			PM
7440-62-2	Vanadium	18.8			PM
7440-66-6	Zinc	92.1			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-06
SDG:344-01
Lab Sample ID:908-344-006
Matrix:SOIL

Wt (g) of sample=	0.50	Solids ratio =	1.4		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10100			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	7.01			PM
7440-39-3	Barium	42.6			PM
7440-41-7	Beryllium	0.26	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	3950			PM
7440-47-3	Chromium	10.7			PM
7440-48-4	Cobalt	3.16			PM
7440-50-8	Copper	29.1			PM
7439-89-6	Iron	20700			PM
7439-92-1	Lead	25.8			PM
7439-95-4	Magnesium	3200			PM
7439-96-5	Manganese	414			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.64	B		PM
7440-02-0	Nickel	14.1			PM
7440-09-7	Potassium	1070			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	72.8			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	89.2			PM
7440-62-2	Vanadium	16.8			PM
7440-66-6	Zinc	89.2			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-07
SDG:344-01
Lab Sample ID:908-344-007
Matrix:SOIL

Wt (g) of sample=	0.53	Solids ratio =	1.43		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9380			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	6.48			PM
7440-39-3	Barium	38.2			PM
7440-41-7	Beryllium	0.315	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	3520			PM
7440-47-3	Chromium	9.83			PM
7440-48-4	Cobalt	3.49			PM
7440-50-8	Copper	31.4			PM
7439-89-6	Iron	20200			PM
7439-92-1	Lead	37.3			PM
7439-95-4	Magnesium	3020			PM
7439-96-5	Manganese	472			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.63	B		PM
7440-02-0	Nickel	13.7			PM
7440-09-7	Potassium	982			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	53.7			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	56.2			PM
7440-62-2	Vanadium	14.8			PM
7440-66-6	Zinc	77.9			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-08
SDG:344-01
Lab Sample ID:908-344-008
Matrix:SOIL

Wt (g) of sample=	0.52	Solids ratio =	1.36		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9400			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	6.54			PM
7440-39-3	Barium	40.1			PM
7440-41-7	Beryllium	0.284	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	4020			PM
7440-47-3	Chromium	10.8			PM
7440-48-4	Cobalt	4.42			PM
7440-50-8	Copper	33.2			PM
7439-89-6	Iron	21400			PM
7439-92-1	Lead	46.8			PM
7439-95-4	Magnesium	3650			PM
7439-96-5	Manganese	479			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.72	B		PM
7440-02-0	Nickel	16.1			PM
7440-09-7	Potassium	1350			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	72.6			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	77.6			PM
7440-62-2	Vanadium	15.1			PM
7440-66-6	Zinc	83.6			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-09
SDG:344-01
Lab Sample ID:908-344-009
Matrix:SOIL

Wt (g) of sample=	0.53	Solids ratio =	1.37		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9470			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	8.08			PM
7440-39-3	Barium	40			PM
7440-41-7	Beryllium	0.293	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	3880			PM
7440-47-3	Chromium	10.8			PM
7440-48-4	Cobalt	3.53			PM
7440-50-8	Copper	34.9			PM
7439-89-6	Iron	21500			PM
7439-92-1	Lead	1930			PM
7439-95-4	Magnesium	3550			PM
7439-96-5	Manganese	362			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.74	B		PM
7440-02-0	Nickel	15.7			PM
7440-09-7	Potassium	1270			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	76			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	83			PM
7440-62-2	Vanadium	16.3			PM
7440-66-6	Zinc	80.8			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-10
SDG:344-01
Lab Sample ID:908-344-010
Matrix:SOIL

Wt (g) of sample=	0.53	Solids ratio =	1.35		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	11600			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	8.56			PM
7440-39-3	Barium	46.9			PM
7440-41-7	Beryllium	0.331	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	3520			PM
7440-47-3	Chromium	12.2			PM
7440-48-4	Cobalt	4.34			PM
7440-50-8	Copper	82.3			PM
7439-89-6	Iron	24000			PM
7439-92-1	Lead	49.4			PM
7439-95-4	Magnesium	3820			PM
7439-96-5	Manganese	522			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.7	B		PM
7440-02-0	Nickel	16.2			PM
7440-09-7	Potassium	1560			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	85.6			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	93.5			PM
7440-62-2	Vanadium	18.1			PM
7440-66-6	Zinc	152			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-11
SDG:344-01
Lab Sample ID:908-344-011
Matrix:SOIL

Wt (g) of sample=	0.52	Solids ratio =	1.31		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	8790			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	6.99			PM
7440-39-3	Barium	39.9			PM
7440-41-7	Beryllium	0.289	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	2940			PM
7440-47-3	Chromium	9.88			PM
7440-48-4	Cobalt	3.58			PM
7440-50-8	Copper	353			PM
7439-89-6	Iron	20100			PM
7439-92-1	Lead	90.9			PM
7439-95-4	Magnesium	3110			PM
7439-96-5	Manganese	516			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.54	B		PM
7440-02-0	Nickel	13.9			PM
7440-09-7	Potassium	939			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	59.9			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	69.1			PM
7440-62-2	Vanadium	13.7			PM
7440-66-6	Zinc	246			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-12
SDG:344-01
Lab Sample ID:908-344-012
Matrix:SOIL

Wt (g) of sample=	0.52	Solids ratio =	1.2		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10100			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	4.82			PM
7440-39-3	Barium	41.4			PM
7440-41-7	Beryllium	0.278	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	18300			PM
7440-47-3	Chromium	10.2			PM
7440-48-4	Cobalt	3.61			PM
7440-50-8	Copper	260			PM
7439-89-6	Iron	22000			PM
7439-92-1	Lead	33.9			PM
7439-95-4	Magnesium	4130			PM
7439-96-5	Manganese	811			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.58	B		PM
7440-02-0	Nickel	14.4			PM
7440-09-7	Potassium	1450			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	82.1			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	83.5			PM
7440-62-2	Vanadium	15.3			PM
7440-66-6	Zinc	346			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-13
SDG:344-01
Lab Sample ID:908-344-013
Matrix:SOIL

Wt (g) of sample=	0.50	Solids ratio =	1.33		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10700			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	8.81			PM
7440-39-3	Barium	43.5			PM
7440-41-7	Beryllium	0.286	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	3710			PM
7440-47-3	Chromium	11.1			PM
7440-48-4	Cobalt	4.11			PM
7440-50-8	Copper	54.4			PM
7439-89-6	Iron	23200			PM
7439-92-1	Lead	46.8			PM
7439-95-4	Magnesium	3870			PM
7439-96-5	Manganese	770			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	2.09	B		PM
7440-02-0	Nickel	18.6			PM
7440-09-7	Potassium	1380			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	70.9			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	84			PM
7440-62-2	Vanadium	17.3			PM
7440-66-6	Zinc	166			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-14
SDG:344-01
Lab Sample ID:908-344-014
Matrix:SOIL

Wt (g) of sample=	0.54	Solids ratio =	1.26		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10200			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	7.45			PM
7440-39-3	Barium	44			PM
7440-41-7	Beryllium	0.354	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	9970			PM
7440-47-3	Chromium	11.7			PM
7440-48-4	Cobalt	4.68			PM
7440-50-8	Copper	71.4			PM
7439-89-6	Iron	24100			PM
7439-92-1	Lead	24.6			PM
7439-95-4	Magnesium	7690			PM
7439-96-5	Manganese	587			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	2.22	B		PM
7440-02-0	Nickel	18.8			PM
7440-09-7	Potassium	1390			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	74.3			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	64.1			PM
7440-62-2	Vanadium	16			PM
7440-66-6	Zinc	225			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-15
SDG:344-01
Lab Sample ID:908-344-015
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.27		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	11000			PM
7440-36-0	Antimony	9.07			PM
7440-38-2	Arsenic	5.97			PM
7440-39-3	Barium	46.8			PM
7440-41-7	Beryllium	0.275	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	6040			PM
7440-47-3	Chromium	11			PM
7440-48-4	Cobalt	3.63			PM
7440-50-8	Copper	122			PM
7439-89-6	Iron	21700			PM
7439-92-1	Lead	969			PM
7439-95-4	Magnesium	4840			PM
7439-96-5	Manganese	794			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.12	B		PM
7440-02-0	Nickel	13.4			PM
7440-09-7	Potassium	1400			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	86.4			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	106			PM
7440-62-2	Vanadium	18.8			PM
7440-66-6	Zinc	71.9			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-16
SDG:344-01
Lab Sample ID:908-344-016
Matrix:SOIL

Wt (g) of sample=	0.53	Solids ratio =	1.21		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	8840			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	4.95			PM
7440-39-3	Barium	36.7			PM
7440-41-7	Beryllium	0.252	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	22500			PM
7440-47-3	Chromium	9.99			PM
7440-48-4	Cobalt	4			PM
7440-50-8	Copper	32.9			PM
7439-89-6	Iron	20700			PM
7439-92-1	Lead	182			PM
7439-95-4	Magnesium	7410			PM
7439-96-5	Manganese	514			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	0.985	B		PM
7440-02-0	Nickel	14.5			PM
7440-09-7	Potassium	1280			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	98.2			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	74.4			PM
7440-62-2	Vanadium	15.5			PM
7440-66-6	Zinc	48.4			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-17
SDG:344-01
Lab Sample ID:908-344-017
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.33		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	11200			PM
7440-36-0	Antimony	6.12	B		PM
7440-38-2	Arsenic	7.42			PM
7440-39-3	Barium	48.5			PM
7440-41-7	Beryllium	0.382	B		PM
7440-43-9	Cadmium	0.236	B		PM
7440-70-2	Calcium	4780			PM
7440-47-3	Chromium	14.2			PM
7440-48-4	Cobalt	7.79			PM
7440-50-8	Copper	82.8			PM
7439-89-6	Iron	23200			PM
7439-92-1	Lead	704			PM
7439-95-4	Magnesium	4510			PM
7439-96-5	Manganese	922			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.34	B		PM
7440-02-0	Nickel	22.2			PM
7440-09-7	Potassium	1420			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	94.8			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	79.1			PM
7440-62-2	Vanadium	18.9			PM
7440-66-6	Zinc	72.3			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-18
SDG:344-01
Lab Sample ID:908-344-018
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.23		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9890			PM
7440-36-0	Antimony	39.2			PM
7440-38-2	Arsenic	6.82			PM
7440-39-3	Barium	31.7			PM
7440-41-7	Beryllium	0.308	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	4800			PM
7440-47-3	Chromium	11.6			PM
7440-48-4	Cobalt	6.44			PM
7440-50-8	Copper	566			PM
7439-89-6	Iron	20200			PM
7439-92-1	Lead	4470			PM
7439-95-4	Magnesium	4040			PM
7439-96-5	Manganese	530			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.3	B		PM
7440-02-0	Nickel	18.7			PM
7440-09-7	Potassium	1320			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	90.5			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	80.9			PM
7440-62-2	Vanadium	16.1			PM
7440-66-6	Zinc	174			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-19
SDG:344-01
Lab Sample ID:908-344-019
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	6.7		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	3670			PM
7440-36-0	Antimony	13.8			PM
7440-38-2	Arsenic	12			PM
7440-39-3	Barium	61.6			PM
7440-41-7	Beryllium	0.14	U		PM
7440-43-9	Cadmium	0.355	B		PM
7440-70-2	Calcium	42900			PM
7440-47-3	Chromium	6.84			PM
7440-48-4	Cobalt	1.58	U		PM
7440-50-8	Copper	108			PM
7439-89-6	Iron	21700			PM
7439-92-1	Lead	351			PM
7439-95-4	Magnesium	2690			PM
7439-96-5	Manganese	669			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	2.65	B		PM
7440-02-0	Nickel	18.6			PM
7440-09-7	Potassium	770			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	272			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	57.3			PM
7440-62-2	Vanadium	7.72			PM
7440-66-6	Zinc	94.5			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-20
SDG:344-01
Lab Sample ID:908-344-020
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.26		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10000			PM
7440-36-0	Antimony	36			PM
7440-38-2	Arsenic	6.41			PM
7440-39-3	Barium	32.1			PM
7440-41-7	Beryllium	0.315	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	2570			PM
7440-47-3	Chromium	12			PM
7440-48-4	Cobalt	6.21			PM
7440-50-8	Copper	220			PM
7439-89-6	Iron	22500			PM
7439-92-1	Lead	4420			PM
7439-95-4	Magnesium	3550			PM
7439-96-5	Manganese	506			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.28	B		PM
7440-02-0	Nickel	19.8			PM
7440-09-7	Potassium	1250			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	79.2			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	87.5			PM
7440-62-2	Vanadium	17.6			PM
7440-66-6	Zinc	108			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-21
SDG:344-01
Lab Sample ID:908-344-021
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.35		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9820			PM
7440-36-0	Antimony	16.1			PM
7440-38-2	Arsenic	5.93			PM
7440-39-3	Barium	37.7			PM
7440-41-7	Beryllium	0.309	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	11100			PM
7440-47-3	Chromium	11.3			PM
7440-48-4	Cobalt	5.83			PM
7440-50-8	Copper	145			PM
7439-89-6	Iron	21000			PM
7439-92-1	Lead	1530			PM
7439-95-4	Magnesium	7110			PM
7439-96-5	Manganese	422			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.18	B		PM
7440-02-0	Nickel	18.3			PM
7440-09-7	Potassium	1410			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	105			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	83.7			PM
7440-62-2	Vanadium	15.4			PM
7440-66-6	Zinc	83.8			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-22
SDG:344-01
Lab Sample ID:908-344-022
Matrix:SOIL

Wt (g) of sample=	0.52	Solids ratio =	1.17		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	8680			PM
7440-36-0	Antimony	48			PM
7440-38-2	Arsenic	5.21			PM
7440-39-3	Barium	27.1			PM
7440-41-7	Beryllium	0.243	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	25800			PM
7440-47-3	Chromium	10.1			PM
7440-48-4	Cobalt	4.77			PM
7440-50-8	Copper	453			PM
7439-89-6	Iron	18800			PM
7439-92-1	Lead	8980			PM
7439-95-4	Magnesium	7380			PM
7439-96-5	Manganese	395			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.18	B		PM
7440-02-0	Nickel	15.2			PM
7440-09-7	Potassium	1490			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	112			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	92.4			PM
7440-62-2	Vanadium	14.8			PM
7440-66-6	Zinc	117			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-23
SDG:344-01
Lab Sample ID:908-344-023
Matrix:SOIL

Wt (g) of sample=	0.54	Solids ratio =	1.17		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	6290			PM
7440-36-0	Antimony	47.1			PM
7440-38-2	Arsenic	4.47			PM
7440-39-3	Barium	17.1			PM
7440-41-7	Beryllium	0.182	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	30200			PM
7440-47-3	Chromium	7.96			PM
7440-48-4	Cobalt	4.68			PM
7440-50-8	Copper	95.3			PM
7439-89-6	Iron	17000			PM
7439-92-1	Lead	9990			PM
7439-95-4	Magnesium	6310			PM
7439-96-5	Manganese	296			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.08	B		PM
7440-02-0	Nickel	13.6			PM
7440-09-7	Potassium	887			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	99.1			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	80.5			PM
7440-62-2	Vanadium	12			PM
7440-66-6	Zinc	52			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-24
SDG:344-01
Lab Sample ID:908-344-024
Matrix:SOIL

Wt (g) of sample=	0.53	Solids ratio =	1.34		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	12400			PM
7440-36-0	Antimony	7.6	B		PM
7440-38-2	Arsenic	8.79			PM
7440-39-3	Barium	53.1			PM
7440-41-7	Beryllium	0.402	B		PM
7440-43-9	Cadmium	0.16	B		PM
7440-70-2	Calcium	8120			PM
7440-47-3	Chromium	13			PM
7440-48-4	Cobalt	6.68			PM
7440-50-8	Copper	84.4			PM
7439-89-6	Iron	23800			PM
7439-92-1	Lead	829			PM
7439-95-4	Magnesium	5210			PM
7439-96-5	Manganese	546			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.45	B		PM
7440-02-0	Nickel	19.2			PM
7440-09-7	Potassium	1200			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	94.9			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	80			PM
7440-62-2	Vanadium	19.3			PM
7440-66-6	Zinc	97.2			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-25
SDG:344-01
Lab Sample ID:908-344-025
Matrix:SOIL

Wt (g) of sample=	0.53	Solids ratio =	1.26		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9380			PM
7440-36-0	Antimony	62.3			PM
7440-38-2	Arsenic	5.38			PM
7440-39-3	Barium	33.4			PM
7440-41-7	Beryllium	0.266	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	10500			PM
7440-47-3	Chromium	10.1			PM
7440-48-4	Cobalt	4.71			PM
7440-50-8	Copper	141			PM
7439-89-6	Iron	19200			PM
7439-92-1	Lead	6000			PM
7439-95-4	Magnesium	5560			PM
7439-96-5	Manganese	445			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.42	B		PM
7440-02-0	Nickel	14.7			PM
7440-09-7	Potassium	1070			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	92			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	86.6			PM
7440-62-2	Vanadium	16.1			PM
7440-66-6	Zinc	80.5			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-26
SDG:344-01
Lab Sample ID:908-344-026
Matrix:SOIL

Wt (g) of sample=	0.54	Solids ratio =	1.18		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	7140			PM
7440-36-0	Antimony	42.7			PM
7440-38-2	Arsenic	4.51			PM
7440-39-3	Barium	20.4			PM
7440-41-7	Beryllium	0.224	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	13100			PM
7440-47-3	Chromium	8.5			PM
7440-48-4	Cobalt	4.92			PM
7440-50-8	Copper	90.2			PM
7439-89-6	Iron	18700			PM
7439-92-1	Lead	7430			PM
7439-95-4	Magnesium	5450			PM
7439-96-5	Manganese	386			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.89	B		PM
7440-02-0	Nickel	15.1			PM
7440-09-7	Potassium	878			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	78.9			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	74.8			PM
7440-62-2	Vanadium	13.4			PM
7440-66-6	Zinc	65.8			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-27
SDG:344-01
Lab Sample ID:908-344-027
Matrix:SOIL

Wt (g) of sample=	0.53	Solids ratio =	1.27		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	7750			PM
7440-36-0	Antimony	20.1			PM
7440-38-2	Arsenic	4.62			PM
7440-39-3	Barium	29			PM
7440-41-7	Beryllium	0.235	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	3740			PM
7440-47-3	Chromium	9.08			PM
7440-48-4	Cobalt	4.63			PM
7440-50-8	Copper	5530			PM
7439-89-6	Iron	17400			PM
7439-92-1	Lead	4790			PM
7439-95-4	Magnesium	3080			PM
7439-96-5	Manganese	455			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	0.891	B		PM
7440-02-0	Nickel	15.1			PM
7440-09-7	Potassium	887			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	75.7			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	81.2			PM
7440-62-2	Vanadium	13.8			PM
7440-66-6	Zinc	593			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-28
SDG:344-01
Lab Sample ID:908-344-028
Matrix:SOIL

Wt (g) of sample=	0.52	Solids ratio =	1.22		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9990			PM
7440-36-0	Antimony	328			PM
7440-38-2	Arsenic	10.3			PM
7440-39-3	Barium	36			PM
7440-41-7	Beryllium	0.248	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	14400			PM
7440-47-3	Chromium	11.1			PM
7440-48-4	Cobalt	5.71			PM
7440-50-8	Copper	242			PM
7439-89-6	Iron	20500			PM
7439-92-1	Lead	50900			PM
7439-95-4	Magnesium	6750			PM
7439-96-5	Manganese	560			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.16	B		PM
7440-02-0	Nickel	15.1			PM
7440-09-7	Potassium	1550			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	112			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	134			PM
7440-62-2	Vanadium	18.1			PM
7440-66-6	Zinc	86.2			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-29
SDG:344-01
Lab Sample ID:908-344-029
Matrix:SOIL

Wt (g) of sample=	0.54	Solids ratio =	1.85		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	8880			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	4.79			PM
7440-39-3	Barium	48.6			PM
7440-41-7	Beryllium	0.236	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	13300			PM
7440-47-3	Chromium	10.1			PM
7440-48-4	Cobalt	4.64			PM
7440-50-8	Copper	48.5			PM
7439-89-6	Iron	19200			PM
7439-92-1	Lead	68.6			PM
7439-95-4	Magnesium	6370			PM
7439-96-5	Manganese	458			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.22	B		PM
7440-02-0	Nickel	14.7			PM
7440-09-7	Potassium	1380			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	116			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	108			PM
7440-62-2	Vanadium	17.3			PM
7440-66-6	Zinc	68.9			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-30
SDG:344-01
Lab Sample ID:908-344-030
Matrix:SOIL

Wt (g) of sample=	0.50	Solids ratio =	1.37		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10200			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	5.76			PM
7440-39-3	Barium	38.3			PM
7440-41-7	Beryllium	0.299	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	9640			PM
7440-47-3	Chromium	13.1			PM
7440-48-4	Cobalt	5.95			PM
7440-50-8	Copper	155			PM
7439-89-6	Iron	22300			PM
7439-92-1	Lead	48.5			PM
7439-95-4	Magnesium	6690			PM
7439-96-5	Manganese	324			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.15	B		PM
7440-02-0	Nickel	19.4			PM
7440-09-7	Potassium	1810			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	129			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	129			PM
7440-62-2	Vanadium	18			PM
7440-66-6	Zinc	333			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-31
SDG:344-01
Lab Sample ID:908-344-031
Matrix:SOIL

Wt (g) of sample=	0.54	Solids ratio =	1.28		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9050			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	6.05			PM
7440-39-3	Barium	36.9			PM
7440-41-7	Beryllium	0.317	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	15300			PM
7440-47-3	Chromium	11.5			PM
7440-48-4	Cobalt	6.55			PM
7440-50-8	Copper	32.7			PM
7439-89-6	Iron	22700			PM
7439-92-1	Lead	121			PM
7439-95-4	Magnesium	7280			PM
7439-96-5	Manganese	403			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.28	B		PM
7440-02-0	Nickel	19.4			PM
7440-09-7	Potassium	1260			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	98.7			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	71.8			PM
7440-62-2	Vanadium	14.8			PM
7440-66-6	Zinc	68			PM

Laboratory Sample Summary Results - TCLP

New York State D.E.C. - Albany, NY
625 Broadway 9th Floor
Albany, NY 12233-7258

Work Order: RSB0576

Project: CASE NF908
Project Number: NYSDEC

Received: 02/18/09
Reported: 04/02/09 17:13

DATA QUALIFIERS AND DEFINITIONS

B	Analyte was detected in the associated Method Blank.
B1	Analyte was detected in the associated method blank. Analyte concentration in the sample is greater than 10x the concentration found in the method blank.
BT	Analyte detected in the TCLP Extractor Blank. Analyte at least five times less than the TCLP Regulatory limit.
D08	Dilution required due to high concentration of target analyte(s)

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

New York State D.E.C. - Albany, NY
625 Broadway 9th Floor
Albany, NY 12233-7258

Work Order: RSB0576

Project: CASE NF908
Project Number: NYSDEC

Received: 02/18/09
Reported: 04/02/09 17:13

Executive Summary - Detections

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-01 (NF908-11020-09 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**0.025**	B, BT	0.0060	0.0029	mg/L	1.00	02/23/09 18:21	TWS	9B20069	6010B
Sample ID: RSB0576-02 (NF908-11020-15 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**8.8**	B, B1	0.0060	0.0029	mg/L	1.00	02/23/09 18:26	TWS	9B20069	6010B
Sample ID: RSB0576-03 (NF908-11020-16 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**0.16**	B, BT	0.0060	0.0029	mg/L	1.00	02/23/09 18:31	TWS	9B20069	6010B
Sample ID: RSB0576-04 (NF908-11020-17 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**14**	B, B1	0.0060	0.0029	mg/L	1.00	02/23/09 18:37	TWS	9B20069	6010B
Sample ID: RSB0576-05 (NF908-11020-18 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**170**	B, D08, B1	0.030	0.014	mg/L	5.00	02/25/09 04:01	AH	9B20069	6010B
Sample ID: RSB0576-06 (NF908-11020-19 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**0.308**	B1, B	0.0060	0.0029	mg/L	1.00	02/23/09 16:10	TWS	9B23012	6010B
Sample ID: RSB0576-07 (NF908-11020-20 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**93**	B, D08, B1	0.030	0.014	mg/L	5.00	02/25/09 04:06	AH	9B20069	6010B
Sample ID: RSB0576-08 (NF908-11020-21 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**14**	B, B1	0.0060	0.0029	mg/L	1.00	02/23/09 18:52	TWS	9B20069	6010B
Sample ID: RSB0576-09 (NF908-11020-22 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**160**	B, B1, D08	0.060	0.029	mg/L	10.0	02/25/09 04:11	AH	9B20069	6010B
Sample ID: RSB0576-10 (NF908-11020-23 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**96**	B, B1, D08	0.060	0.029	mg/L	10.0	02/25/09 04:16	AH	9B20069	6010B
Sample ID: RSB0576-11 (NF908-11020-24 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**1.1**	B, B1	0.0060	0.0029	mg/L	1.00	02/23/09 19:20	TWS	9B20069	6010B
Sample ID: RSB0576-12 (NF908-11020-25 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**610**	B, B1, D08	0.12	0.058	mg/L	20.0	02/25/09 04:21	AH	9B20069	6010B
Sample ID: RSB0576-13 (NF908-11020-26 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**780**	B1, D08, B	0.12	0.058	mg/L	20.0	02/25/09 04:26	AH	9B20069	6010B
Sample ID: RSB0576-14 (NF908-11020-27 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**360**	B1, D08, B	0.060	0.029	mg/L	10.0	02/25/09 04:31	AH	9B20069	6010B

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

New York State D.E.C. - Albany, NY
625 Broadway 9th Floor
Albany, NY 12233-7258

Work Order: RSB0576

Project: CASE NF908
Project Number: NYSDEC

Received: 02/18/09
Reported: 04/02/09 17:13

Executive Summary - Detections

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analvzed	Analvst	Seq/ Batch	Method
Sample ID: RSB0576-15 (NF908-11020-28 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**700**	D08, B1, B	0.12	0.058	mg/L	20.0	02/25/09 04:36	AH	9B20069	6010B
Sample ID: RSB0576-16 (NF908-11020-31 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**0.22**	BT, B	0.0060	0.0029	mg/L	1.00	02/23/09 19:45	TWS	9B20069	6010B

Attachment 10

NYSDEC Sampling Staff Organizational Chart

ATTACHMENT # 10

NYSDEC Sampling Staff Organizational Chart

Staff Person	**Function**	**Certification**
Anthony Lopes, PE Environmental Engineer 2 NYSDEC DSHM	Plan Preparer Project Manager Sampler	40-Hour HAZWOPER*
Thomas Corbett Environmental Chemist 2 NYSDEC DSHM	Sampler QA/QC Reviewer	40-Hour HAZWOPER*
Kevin Glaser, Construction Inspector NYSDEC DSHM	Sampler Field Documentation	40-Hour HAZWOPER*

* 29 CFR 1910(e)(3) - Health and Safety at Hazardous Waste Sites

Attachment 11

Full Laboratory Results - Total Metals/TCLP on CD

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau A
625 Broadway, 11th Floor
Albany, New York 12233-7015
Phone: (518) 402-9625 • **Fax:** (518) 402-9020 / (518) 402-9627
Website: www.dec.ny.gov

Alexander B. Grannis
Commissioner

Division of Environmental Remediation Laboratory Analytical Report

The case narrative and analytical reports for the King Brothers site are attached.

Case Narrative

Site Name: King Brothers Site Date received: 12/09/08

For sample delivery group(s): 344-01

The following problems were noted during water sample analysis:

Continuing Calibration Verifications - when the CCV did not pass, usually Thalium and Cadmium had recoveries that were greater than the upper limit and Arsenic had recoveries that were less than the lower limit. This appeared to have no impact on the reported results.

In the method blank associated with these samples, 'B' levels (amount below NELAC PTRL but above MDL) for Arsenic, Chromium, and Manganese were present. Iron was present at low, but detectable level ~154mg/Kg.

Any reported results for these elements, may be higher than the actual concentrations.

Please Note:

On the accompanying chain-of-custody there was 32 samples identified. The lab received only 31 samples - NF908-11020-32 was not accounted for by the lab or the courier.

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-01
SDG:344-01
Lab Sample ID:908-344-001
Matrix:SOIL

Wt (g) of sample=	0.52	Solids ratio =	1.39		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10200			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	7.52			PM
7440-39-3	Barium	41.3			PM
7440-41-7	Beryllium	0.34	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	3730			PM
7440-47-3	Chromium	11.7			PM
7440-48-4	Cobalt	4.34			PM
7440-50-8	Copper	141			PM
7439-89-6	Iron	21300			PM
7439-92-1	Lead	20.1			PM
7439-95-4	Magnesium	3520			PM
7439-96-5	Manganese	491			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.46	B		PM
7440-02-0	Nickel	17			PM
7440-09-7	Potassium	1190			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	65.8			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	53.3			PM
7440-62-2	Vanadium	15.9			PM
7440-66-6	Zinc	86.8			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-02
SDG:344-01
Lab Sample ID:908-344-002
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.29		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	8570			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	5.58			PM
7440-39-3	Barium	34.5			PM
7440-41-7	Beryllium	0.297	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	37200			PM
7440-47-3	Chromium	10.9			PM
7440-48-4	Cobalt	4.06			PM
7440-50-8	Copper	69.4			PM
7439-89-6	Iron	19900			PM
7439-92-1	Lead	18			PM
7439-95-4	Magnesium	4930			PM
7439-96-5	Manganese	424			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.55	B		PM
7440-02-0	Nickel	17.5			PM
7440-09-7	Potassium	1250			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	89.6			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	60.6			PM
7440-62-2	Vanadium	13.3			PM
7440-66-6	Zinc	63.5			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-03
SDG:344-01
Lab Sample ID:908-344-003
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.34		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10700			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	6.56			PM
7440-39-3	Barium	43.7			PM
7440-41-7	Beryllium	0.289	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	7860			PM
7440-47-3	Chromium	15.2			PM
7440-48-4	Cobalt	5.33			PM
7440-50-8	Copper	54.9			PM
7439-89-6	Iron	24000			PM
7439-92-1	Lead	36.1			PM
7439-95-4	Magnesium	6120			PM
7439-96-5	Manganese	512			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	2.06	B		PM
7440-02-0	Nickel	21.4			PM
7440-09-7	Potassium	1470			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	150			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	86.3			PM
7440-62-2	Vanadium	17.4			PM
7440-66-6	Zinc	90.9			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-04
SDG:344-01
Lab Sample ID:908-344-004
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.44		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9030			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	6.34			PM
7440-39-3	Barium	44.5			PM
7440-41-7	Beryllium	0.301	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	6460			PM
7440-47-3	Chromium	10			PM
7440-48-4	Cobalt	4.12			PM
7440-50-8	Copper	40.5			PM
7439-89-6	Iron	19500			PM
7439-92-1	Lead	39.7			PM
7439-95-4	Magnesium	4610			PM
7439-96-5	Manganese	426			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.75	B		PM
7440-02-0	Nickel	15.2			PM
7440-09-7	Potassium	1350			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	68.8			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	59.7			PM
7440-62-2	Vanadium	14.7			PM
7440-66-6	Zinc	92.1			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-05
SDG:344-01
Lab Sample ID:908-344-005
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.37		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	12000			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	7.73			PM
7440-39-3	Barium	54.3			PM
7440-41-7	Beryllium	0.304	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	4390			PM
7440-47-3	Chromium	12.3			PM
7440-48-4	Cobalt	4.77			PM
7440-50-8	Copper	60.6			PM
7439-89-6	Iron	22700			PM
7439-92-1	Lead	25.7			PM
7439-95-4	Magnesium	3720			PM
7439-96-5	Manganese	663			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.76	B		PM
7440-02-0	Nickel	16.2			PM
7440-09-7	Potassium	1370			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	78.7			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	100			PM
7440-62-2	Vanadium	18.8			PM
7440-66-6	Zinc	92.1			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-06
SDG:344-01
Lab Sample ID:908-344-006
Matrix:SOIL

Wt (g) of sample=	0.50	Solids ratio =	1.4		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10100			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	7.01			PM
7440-39-3	Barium	42.6			PM
7440-41-7	Beryllium	0.26	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	3950			PM
7440-47-3	Chromium	10.7			PM
7440-48-4	Cobalt	3.16			PM
7440-50-8	Copper	29.1			PM
7439-89-6	Iron	20700			PM
7439-92-1	Lead	25.8			PM
7439-95-4	Magnesium	3200			PM
7439-96-5	Manganese	414			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.64	B		PM
7440-02-0	Nickel	14.1			PM
7440-09-7	Potassium	1070			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	72.8			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	89.2			PM
7440-62-2	Vanadium	16.8			PM
7440-66-6	Zinc	89.2			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-07
SDG:344-01
Lab Sample ID:908-344-007
Matrix:SOIL

Wt (g) of sample=	0.53	Solids ratio =	1.43		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9380			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	6.48			PM
7440-39-3	Barium	38.2			PM
7440-41-7	Beryllium	0.315	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	3520			PM
7440-47-3	Chromium	9.83			PM
7440-48-4	Cobalt	3.49			PM
7440-50-8	Copper	31.4			PM
7439-89-6	Iron	20200			PM
7439-92-1	Lead	37.3			PM
7439-95-4	Magnesium	3020			PM
7439-96-5	Manganese	472			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.63	B		PM
7440-02-0	Nickel	13.7			PM
7440-09-7	Potassium	982			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	53.7			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	56.2			PM
7440-62-2	Vanadium	14.8			PM
7440-66-6	Zinc	77.9			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-08
SDG:344-01
Lab Sample ID:908-344-008
Matrix:SOIL

Wt (g) of sample=	0.52	Solids ratio =	1.36		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9400			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	6.54			PM
7440-39-3	Barium	40.1			PM
7440-41-7	Beryllium	0.284	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	4020			PM
7440-47-3	Chromium	10.8			PM
7440-48-4	Cobalt	4.42			PM
7440-50-8	Copper	33.2			PM
7439-89-6	Iron	21400			PM
7439-92-1	Lead	46.8			PM
7439-95-4	Magnesium	3650			PM
7439-96-5	Manganese	479			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.72	B		PM
7440-02-0	Nickel	16.1			PM
7440-09-7	Potassium	1350			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	72.6			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	77.6			PM
7440-62-2	Vanadium	15.1			PM
7440-66-6	Zinc	83.6			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-09
SDG:344-01
Lab Sample ID:908-344-009
Matrix:SOIL

Wt (g) of sample=	0.53	Solids ratio =	1.37		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9470			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	8.08			PM
7440-39-3	Barium	40			PM
7440-41-7	Beryllium	0.293	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	3880			PM
7440-47-3	Chromium	10.8			PM
7440-48-4	Cobalt	3.53			PM
7440-50-8	Copper	34.9			PM
7439-89-6	Iron	21500			PM
7439-92-1	Lead	1930			PM
7439-95-4	Magnesium	3550			PM
7439-96-5	Manganese	362			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.74	B		PM
7440-02-0	Nickel	15.7			PM
7440-09-7	Potassium	1270			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	76			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	83			PM
7440-62-2	Vanadium	16.3			PM
7440-66-6	Zinc	80.8			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-10
SDG:344-01
Lab Sample ID:908-344-010
Matrix:SOIL

Wt (g) of sample=	0.53	Solids ratio =	1.35		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	11600			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	8.56			PM
7440-39-3	Barium	46.9			PM
7440-41-7	Beryllium	0.331	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	3520			PM
7440-47-3	Chromium	12.2			PM
7440-48-4	Cobalt	4.34			PM
7440-50-8	Copper	82.3			PM
7439-89-6	Iron	24000			PM
7439-92-1	Lead	49.4			PM
7439-95-4	Magnesium	3820			PM
7439-96-5	Manganese	522			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.7	B		PM
7440-02-0	Nickel	16.2			PM
7440-09-7	Potassium	1560			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	85.6			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	93.5			PM
7440-62-2	Vanadium	18.1			PM
7440-66-6	Zinc	152			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-11
SDG:344-01
Lab Sample ID:908-344-011
Matrix:SOIL

Wt (g) of sample=	0.52	Solids ratio =	1.31		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	8790			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	6.99			PM
7440-39-3	Barium	39.9			PM
7440-41-7	Beryllium	0.289	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	2940			PM
7440-47-3	Chromium	9.88			PM
7440-48-4	Cobalt	3.58			PM
7440-50-8	Copper	353			PM
7439-89-6	Iron	20100			PM
7439-92-1	Lead	90.9			PM
7439-95-4	Magnesium	3110			PM
7439-96-5	Manganese	516			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.54	B		PM
7440-02-0	Nickel	13.9			PM
7440-09-7	Potassium	939			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	59.9			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	69.1			PM
7440-62-2	Vanadium	13.7			PM
7440-66-6	Zinc	246			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-12
SDG:344-01
Lab Sample ID:908-344-012
Matrix:SOIL

Wt (g) of sample=	0.52	Solids ratio =	1.2		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10100			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	4.82			PM
7440-39-3	Barium	41.4			PM
7440-41-7	Beryllium	0.278	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	18300			PM
7440-47-3	Chromium	10.2			PM
7440-48-4	Cobalt	3.61			PM
7440-50-8	Copper	260			PM
7439-89-6	Iron	22000			PM
7439-92-1	Lead	33.9			PM
7439-95-4	Magnesium	4130			PM
7439-96-5	Manganese	811			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.58	B		PM
7440-02-0	Nickel	14.4			PM
7440-09-7	Potassium	1450			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	82.1			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	83.5			PM
7440-62-2	Vanadium	15.3			PM
7440-66-6	Zinc	346			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-13
SDG:344-01
Lab Sample ID:908-344-013
Matrix:SOIL

Wt (g) of sample=	0.50	Solids ratio =	1.33		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10700			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	8.81			PM
7440-39-3	Barium	43.5			PM
7440-41-7	Beryllium	0.286	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	3710			PM
7440-47-3	Chromium	11.1			PM
7440-48-4	Cobalt	4.11			PM
7440-50-8	Copper	54.4			PM
7439-89-6	Iron	23200			PM
7439-92-1	Lead	46.8			PM
7439-95-4	Magnesium	3870			PM
7439-96-5	Manganese	770			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	2.09	B		PM
7440-02-0	Nickel	18.6			PM
7440-09-7	Potassium	1380			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	70.9			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	84			PM
7440-62-2	Vanadium	17.3			PM
7440-66-6	Zinc	166			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-14
SDG:344-01
Lab Sample ID:908-344-014
Matrix:SOIL

Wt (g) of sample=	0.54	Solids ratio =	1.26		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10200			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	7.45			PM
7440-39-3	Barium	44			PM
7440-41-7	Beryllium	0.354	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	9970			PM
7440-47-3	Chromium	11.7			PM
7440-48-4	Cobalt	4.68			PM
7440-50-8	Copper	71.4			PM
7439-89-6	Iron	24100			PM
7439-92-1	Lead	24.6			PM
7439-95-4	Magnesium	7690			PM
7439-96-5	Manganese	587			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	2.22	B		PM
7440-02-0	Nickel	18.8			PM
7440-09-7	Potassium	1390			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	74.3			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	64.1			PM
7440-62-2	Vanadium	16			PM
7440-66-6	Zinc	225			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-15
SDG:344-01
Lab Sample ID:908-344-015
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.27		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	11000			PM
7440-36-0	Antimony	9.07			PM
7440-38-2	Arsenic	5.97			PM
7440-39-3	Barium	46.8			PM
7440-41-7	Beryllium	0.275	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	6040			PM
7440-47-3	Chromium	11			PM
7440-48-4	Cobalt	3.63			PM
7440-50-8	Copper	122			PM
7439-89-6	Iron	21700			PM
7439-92-1	Lead	969			PM
7439-95-4	Magnesium	4840			PM
7439-96-5	Manganese	794			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.12	B		PM
7440-02-0	Nickel	13.4			PM
7440-09-7	Potassium	1400			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	86.4			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	106			PM
7440-62-2	Vanadium	18.8			PM
7440-66-6	Zinc	71.9			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-16
SDG:344-01
Lab Sample ID:908-344-016
Matrix:SOIL

Wt (g) of sample=	0.53	Solids ratio =	1.21		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	8840			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	4.95			PM
7440-39-3	Barium	36.7			PM
7440-41-7	Beryllium	0.252	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	22500			PM
7440-47-3	Chromium	9.99			PM
7440-48-4	Cobalt	4			PM
7440-50-8	Copper	32.9			PM
7439-89-6	Iron	20700			PM
7439-92-1	Lead	182			PM
7439-95-4	Magnesium	7410			PM
7439-96-5	Manganese	514			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	0.985	B		PM
7440-02-0	Nickel	14.5			PM
7440-09-7	Potassium	1280			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	98.2			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	74.4			PM
7440-62-2	Vanadium	15.5			PM
7440-66-6	Zinc	48.4			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-17
SDG:344-01
Lab Sample ID:908-344-017
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.33		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	11200			PM
7440-36-0	Antimony	6.12	B		PM
7440-38-2	Arsenic	7.42			PM
7440-39-3	Barium	48.5			PM
7440-41-7	Beryllium	0.382	B		PM
7440-43-9	Cadmium	0.236	B		PM
7440-70-2	Calcium	4780			PM
7440-47-3	Chromium	14.2			PM
7440-48-4	Cobalt	7.79			PM
7440-50-8	Copper	82.8			PM
7439-89-6	Iron	23200			PM
7439-92-1	Lead	704			PM
7439-95-4	Magnesium	4510			PM
7439-96-5	Manganese	922			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.34	B		PM
7440-02-0	Nickel	22.2			PM
7440-09-7	Potassium	1420			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	94.8			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	79.1			PM
7440-62-2	Vanadium	18.9			PM
7440-66-6	Zinc	72.3			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-18
SDG:344-01
Lab Sample ID:908-344-018
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.23		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9890			PM
7440-36-0	Antimony	39.2			PM
7440-38-2	Arsenic	6.82			PM
7440-39-3	Barium	31.7			PM
7440-41-7	Beryllium	0.308	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	4800			PM
7440-47-3	Chromium	11.6			PM
7440-48-4	Cobalt	6.44			PM
7440-50-8	Copper	566			PM
7439-89-6	Iron	20200			PM
7439-92-1	Lead	4470			PM
7439-95-4	Magnesium	4040			PM
7439-96-5	Manganese	530			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.3	B		PM
7440-02-0	Nickel	18.7			PM
7440-09-7	Potassium	1320			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	90.5			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	80.9			PM
7440-62-2	Vanadium	16.1			PM
7440-66-6	Zinc	174			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-19
SDG:344-01
Lab Sample ID:908-344-019
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	6.7		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	3670			PM
7440-36-0	Antimony	13.8			PM
7440-38-2	Arsenic	12			PM
7440-39-3	Barium	61.6			PM
7440-41-7	Beryllium	0.14	U		PM
7440-43-9	Cadmium	0.355	B		PM
7440-70-2	Calcium	42900			PM
7440-47-3	Chromium	6.84			PM
7440-48-4	Cobalt	1.58	U		PM
7440-50-8	Copper	108			PM
7439-89-6	Iron	21700			PM
7439-92-1	Lead	351			PM
7439-95-4	Magnesium	2690			PM
7439-96-5	Manganese	669			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	2.65	B		PM
7440-02-0	Nickel	18.6			PM
7440-09-7	Potassium	770			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	272			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	57.3			PM
7440-62-2	Vanadium	7.72			PM
7440-66-6	Zinc	94.5			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-20
SDG:344-01
Lab Sample ID:908-344-020
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.26		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10000			PM
7440-36-0	Antimony	36			PM
7440-38-2	Arsenic	6.41			PM
7440-39-3	Barium	32.1			PM
7440-41-7	Beryllium	0.315	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	2570			PM
7440-47-3	Chromium	12			PM
7440-48-4	Cobalt	6.21			PM
7440-50-8	Copper	220			PM
7439-89-6	Iron	22500			PM
7439-92-1	Lead	4420			PM
7439-95-4	Magnesium	3550			PM
7439-96-5	Manganese	506			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.28	B		PM
7440-02-0	Nickel	19.8			PM
7440-09-7	Potassium	1250			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	79.2			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	87.5			PM
7440-62-2	Vanadium	17.6			PM
7440-66-6	Zinc	108			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-21
SDG:344-01
Lab Sample ID:908-344-021
Matrix:SOIL

Wt (g) of sample=	0.51	Solids ratio =	1.35		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9820			PM
7440-36-0	Antimony	16.1			PM
7440-38-2	Arsenic	5.93			PM
7440-39-3	Barium	37.7			PM
7440-41-7	Beryllium	0.309	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	11100			PM
7440-47-3	Chromium	11.3			PM
7440-48-4	Cobalt	5.83			PM
7440-50-8	Copper	145			PM
7439-89-6	Iron	21000			PM
7439-92-1	Lead	1530			PM
7439-95-4	Magnesium	7110			PM
7439-96-5	Manganese	422			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.18	B		PM
7440-02-0	Nickel	18.3			PM
7440-09-7	Potassium	1410			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	105			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	83.7			PM
7440-62-2	Vanadium	15.4			PM
7440-66-6	Zinc	83.8			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-22
SDG:344-01
Lab Sample ID:908-344-022
Matrix:SOIL

Wt (g) of sample=	0.52	Solids ratio =	1.17		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	8680			PM
7440-36-0	Antimony	48			PM
7440-38-2	Arsenic	5.21			PM
7440-39-3	Barium	27.1			PM
7440-41-7	Beryllium	0.243	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	25800			PM
7440-47-3	Chromium	10.1			PM
7440-48-4	Cobalt	4.77			PM
7440-50-8	Copper	453			PM
7439-89-6	Iron	18800			PM
7439-92-1	Lead	8980			PM
7439-95-4	Magnesium	7380			PM
7439-96-5	Manganese	395			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.18	B		PM
7440-02-0	Nickel	15.2			PM
7440-09-7	Potassium	1490			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	112			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	92.4			PM
7440-62-2	Vanadium	14.8			PM
7440-66-6	Zinc	117			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-23
SDG:344-01
Lab Sample ID:908-344-023
Matrix:SOIL

Wt (g) of sample=	0.54	Solids ratio =	1.17		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	6290			PM
7440-36-0	Antimony	47.1			PM
7440-38-2	Arsenic	4.47			PM
7440-39-3	Barium	17.1			PM
7440-41-7	Beryllium	0.182	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	30200			PM
7440-47-3	Chromium	7.96			PM
7440-48-4	Cobalt	4.68			PM
7440-50-8	Copper	95.3			PM
7439-89-6	Iron	17000			PM
7439-92-1	Lead	9990			PM
7439-95-4	Magnesium	6310			PM
7439-96-5	Manganese	296			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.08	B		PM
7440-02-0	Nickel	13.6			PM
7440-09-7	Potassium	887			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	99.1			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	80.5			PM
7440-62-2	Vanadium	12			PM
7440-66-6	Zinc	52			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-24
SDG:344-01
Lab Sample ID:908-344-024
Matrix:SOIL

Wt (g) of sample=	0.53	Solids ratio =	1.34		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	12400			PM
7440-36-0	Antimony	7.6	B		PM
7440-38-2	Arsenic	8.79			PM
7440-39-3	Barium	53.1			PM
7440-41-7	Beryllium	0.402	B		PM
7440-43-9	Cadmium	0.16	B		PM
7440-70-2	Calcium	8120			PM
7440-47-3	Chromium	13			PM
7440-48-4	Cobalt	6.68			PM
7440-50-8	Copper	84.4			PM
7439-89-6	Iron	23800			PM
7439-92-1	Lead	829			PM
7439-95-4	Magnesium	5210			PM
7439-96-5	Manganese	546			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.45	B		PM
7440-02-0	Nickel	19.2			PM
7440-09-7	Potassium	1200			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	94.9			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	80			PM
7440-62-2	Vanadium	19.3			PM
7440-66-6	Zinc	97.2			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-25
SDG:344-01
Lab Sample ID:908-344-025
Matrix:SOIL

Wt (g) of sample=	0.53	Solids ratio =	1.26		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9380			PM
7440-36-0	Antimony	62.3			PM
7440-38-2	Arsenic	5.38			PM
7440-39-3	Barium	33.4			PM
7440-41-7	Beryllium	0.266	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	10500			PM
7440-47-3	Chromium	10.1			PM
7440-48-4	Cobalt	4.71			PM
7440-50-8	Copper	141			PM
7439-89-6	Iron	19200			PM
7439-92-1	Lead	6000			PM
7439-95-4	Magnesium	5560			PM
7439-96-5	Manganese	445			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.42	B		PM
7440-02-0	Nickel	14.7			PM
7440-09-7	Potassium	1070			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	92			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	86.6			PM
7440-62-2	Vanadium	16.1			PM
7440-66-6	Zinc	80.5			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-26
SDG:344-01
Lab Sample ID:908-344-026
Matrix:SOIL

Wt (g) of sample=	0.54	Solids ratio =	1.18		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	7140			PM
7440-36-0	Antimony	42.7			PM
7440-38-2	Arsenic	4.51			PM
7440-39-3	Barium	20.4			PM
7440-41-7	Beryllium	0.224	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	13100			PM
7440-47-3	Chromium	8.5			PM
7440-48-4	Cobalt	4.92			PM
7440-50-8	Copper	90.2			PM
7439-89-6	Iron	18700			PM
7439-92-1	Lead	7430			PM
7439-95-4	Magnesium	5450			PM
7439-96-5	Manganese	386			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.89	B		PM
7440-02-0	Nickel	15.1			PM
7440-09-7	Potassium	878			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	78.9			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	74.8			PM
7440-62-2	Vanadium	13.4			PM
7440-66-6	Zinc	65.8			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-27
SDG:344-01
Lab Sample ID:908-344-027
Matrix:SOIL

Wt (g) of sample=	0.53	Solids ratio =	1.27		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	7750			PM
7440-36-0	Antimony	20.1			PM
7440-38-2	Arsenic	4.62			PM
7440-39-3	Barium	29			PM
7440-41-7	Beryllium	0.235	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	3740			PM
7440-47-3	Chromium	9.08			PM
7440-48-4	Cobalt	4.63			PM
7440-50-8	Copper	5530			PM
7439-89-6	Iron	17400			PM
7439-92-1	Lead	4790			PM
7439-95-4	Magnesium	3080			PM
7439-96-5	Manganese	455			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	0.891	B		PM
7440-02-0	Nickel	15.1			PM
7440-09-7	Potassium	887			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	75.7			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	81.2			PM
7440-62-2	Vanadium	13.8			PM
7440-66-6	Zinc	593			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-28
SDG:344-01
Lab Sample ID:908-344-028
Matrix:SOIL

Wt (g) of sample=	0.52	Solids ratio =	1.22		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9990			PM
7440-36-0	Antimony	328			PM
7440-38-2	Arsenic	10.3			PM
7440-39-3	Barium	36			PM
7440-41-7	Beryllium	0.248	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	14400			PM
7440-47-3	Chromium	11.1			PM
7440-48-4	Cobalt	5.71			PM
7440-50-8	Copper	242			PM
7439-89-6	Iron	20500			PM
7439-92-1	Lead	50900			PM
7439-95-4	Magnesium	6750			PM
7439-96-5	Manganese	560			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.16	B		PM
7440-02-0	Nickel	15.1			PM
7440-09-7	Potassium	1550			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	112			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	134			PM
7440-62-2	Vanadium	18.1			PM
7440-66-6	Zinc	86.2			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-29
SDG:344-01
Lab Sample ID:908-344-029
Matrix:SOIL

Wt (g) of sample=	0.54	Solids ratio =	1.85		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	8880			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	4.79			PM
7440-39-3	Barium	48.6			PM
7440-41-7	Beryllium	0.236	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	13300			PM
7440-47-3	Chromium	10.1			PM
7440-48-4	Cobalt	4.64			PM
7440-50-8	Copper	48.5			PM
7439-89-6	Iron	19200			PM
7439-92-1	Lead	68.6			PM
7439-95-4	Magnesium	6370			PM
7439-96-5	Manganese	458			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.22	B		PM
7440-02-0	Nickel	14.7			PM
7440-09-7	Potassium	1380			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	116			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	108			PM
7440-62-2	Vanadium	17.3			PM
7440-66-6	Zinc	68.9			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-30
SDG:344-01
Lab Sample ID:908-344-030
Matrix:SOIL

Wt (g) of sample=	0.50	Solids ratio =	1.37		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	10200			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	5.76			PM
7440-39-3	Barium	38.3			PM
7440-41-7	Beryllium	0.299	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	9640			PM
7440-47-3	Chromium	13.1			PM
7440-48-4	Cobalt	5.95			PM
7440-50-8	Copper	155			PM
7439-89-6	Iron	22300			PM
7439-92-1	Lead	48.5			PM
7439-95-4	Magnesium	6690			PM
7439-96-5	Manganese	324			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.15	B		PM
7440-02-0	Nickel	19.4			PM
7440-09-7	Potassium	1810			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	129			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	129			PM
7440-62-2	Vanadium	18			PM
7440-66-6	Zinc	333			PM

DIVISION OF ENVIRONMENTAL REMEDIATION

LABORATORY ANALYTICAL REPORT

Site Name: King Brothers
Site Code: n/a
Date Received: 12/09/08

Field ID: NF908-11020-31
SDG:344-01
Lab Sample ID:908-344-031
Matrix:SOIL

Wt (g) of sample=	0.54	Solids ratio =	1.28		
CAS NO.	ANALYTE	CONC mg/Kg	C	Q	M
7429-90-5	Aluminum	9050			PM
7440-36-0	Antimony	3.64	U		PM
7440-38-2	Arsenic	6.05			PM
7440-39-3	Barium	36.9			PM
7440-41-7	Beryllium	0.317	B		PM
7440-43-9	Cadmium	0.13	U		PM
7440-70-2	Calcium	15300			PM
7440-47-3	Chromium	11.5			PM
7440-48-4	Cobalt	6.55			PM
7440-50-8	Copper	32.7			PM
7439-89-6	Iron	22700			PM
7439-92-1	Lead	121			PM
7439-95-4	Magnesium	7280			PM
7439-96-5	Manganese	403			PM
7439-97-6	Mercury	Not Analyzed			n/a
7439-98-7	Molybdenum	1.28	B		PM
7440-02-0	Nickel	19.4			PM
7440-09-7	Potassium	1260			PM
7482-49-2	Selenium	1.14	U		PM
7440-22-4	Silver	0.29	U		PM
7440-23-5	Sodium	98.7			PM
7440-28-0	Thallium	1.12	U		PM
7440-31-5	Tin	0	U		PM
7440-32-6	Titanium	71.8			PM
7440-62-2	Vanadium	14.8			PM
7440-66-6	Zinc	68			PM

Analytical Report

Work Order: RSB0576

Project Description
CASE NF908

For:

Anthony Lopes

New York State D.E.C. - Albany, NY
625 Broadway 9th Floor
Albany, NY 12233-7258

Brian Fischer

Project Manager

Brian.Fischer@testamericainc.com

Thursday, April 2, 2009

TestAmerica Buffalo
Current Certifications

As of 1/27/2009

STATE	Program	Cert # / Lab ID
Arkansas	CWA, RCRA, SOIL	88-0686
California*	NELAP CWA, RCRA	01169CA
Connecticut	SDWA, CWA, RCRA, SOIL	PH-0568
Florida*	NELAP CWA, RCRA	E87672
Georgia*	SDWA,NELAP CWA, RCRA	956
Illinois*	NELAP SDWA, CWA, RCRA	200003
Iowa	SW/CS	374
Kansas*	NELAP SDWA, CWA, RCRA	E-10187
Kentucky	SDWA	90029
Kentucky UST	UST	30
Louisiana*	NELAP CWA, RCRA	2031
Maine	SDWA, CWA	NY0044
Maryland	SDWA	294
Massachusetts	SDWA, CWA	M-NY044
Michigan	SDWA	9937
Minnesota	SDWA,CWA, RCRA	036-999-337
New Hampshire*	NELAP SDWA, CWA	233701
New Jersey*	NELAP,SDWA, CWA, RCRA,	NY455
New York*	NELAP, AIR, SDWA, CWA, RCRA,CLP	10026
Oklahoma	CWA, RCRA	9421
Pennsylvania*	NELAP CWA,RCRA	68-00281
Tennessee	SDWA	02970
Texas*	NELAP CWA, RCRA	T10470441208-TX
USDA	FOREIGN SOIL PERMIT	S-41579
USDOE	Department of Energy	DOECAP-STB
Virginia	SDWA	278
Washington*	NELAP CWA,RCRA	C1677
Wisconsin	CWA, RCRA	998310390
West Virginia	CWA,RCRA	252

*As required under the indicated accreditation, the test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report.

New York State D.E.C. - Albany, NY
625 Broadway 9th Floor
Albany, NY 12233-7258

Work Order: RSB0576

Project: CASE NF908
Project Number: NYSDEC

Received: 02/18/09
Reported: 04/02/09 17:13

Case Narrative

According to 40CFR Part 136.3, pH, Chlorine Residual, Dissolved Oxygen, Sulfite, and Temperature analyses are to be performed immediately after aqueous sample collection. When these parameters are not indicated as field (e.g. field-pH), they were not analyzed immediately, but as soon as possible after laboratory receipt.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed within the body of this report. Release of the data contained in this sample data package and in the electronic data deliverables has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Brian Fischer
Project Manager

Thursday, April 2, 2009

There are pertinent documents appended to this report, 2 pages, are included and are an integral part of this report.

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TestAmerica Laboratories, Inc. certifies that the analytical results contained herein apply only to the samples tested as received by our Laboratory.

DATA QUALIFIERS AND DEFINITIONS

B	Analyte was detected in the associated Method Blank.
B1	Analyte was detected in the associated method blank. Analyte concentration in the sample is greater than 10x the concentration found in the method blank.
BT	Analyte detected in the TCLP Extractor Blank. Analyte at least five times less than the TCLP Regulatory limit.
D08	Dilution required due to high concentration of target analyte(s)

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New York State D.E.C. - Albany, NY
625 Broadway 9th Floor
Albany, NY 12233-7258

Work Order: RSB0576

Project: CASE NF908
Project Number: NYSDEC

Received: 02/18/09
Reported: 04/02/09 17:13

Executive Summary - Detections

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-01 (NF908-11020-09 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**0.025**	B, BT	0.0060	0.0029	mg/L	1.00	02/23/09 18:21	TWS	9B20069	6010B
Sample ID: RSB0576-02 (NF908-11020-15 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**8.8**	B, B1	0.0060	0.0029	mg/L	1.00	02/23/09 18:26	TWS	9B20069	6010B
Sample ID: RSB0576-03 (NF908-11020-16 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**0.16**	B, BT	0.0060	0.0029	mg/L	1.00	02/23/09 18:31	TWS	9B20069	6010B
Sample ID: RSB0576-04 (NF908-11020-17 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**14**	B, B1	0.0060	0.0029	mg/L	1.00	02/23/09 18:37	TWS	9B20069	6010B
Sample ID: RSB0576-05 (NF908-11020-18 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**170**	B, D08, B1	0.030	0.014	mg/L	5.00	02/25/09 04:01	AH	9B20069	6010B
Sample ID: RSB0576-06 (NF908-11020-19 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**0.308**	B1, B	0.0060	0.0029	mg/L	1.00	02/23/09 16:10	TWS	9B23012	6010B
Sample ID: RSB0576-07 (NF908-11020-20 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**93**	B, D08, B1	0.030	0.014	mg/L	5.00	02/25/09 04:06	AH	9B20069	6010B
Sample ID: RSB0576-08 (NF908-11020-21 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**14**	B, B1	0.0060	0.0029	mg/L	1.00	02/23/09 18:52	TWS	9B20069	6010B
Sample ID: RSB0576-09 (NF908-11020-22 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**160**	B, B1, D08	0.060	0.029	mg/L	10.0	02/25/09 04:11	AH	9B20069	6010B
Sample ID: RSB0576-10 (NF908-11020-23 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**96**	B, B1, D08	0.060	0.029	mg/L	10.0	02/25/09 04:16	AH	9B20069	6010B
Sample ID: RSB0576-11 (NF908-11020-24 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**1.1**	B, B1	0.0060	0.0029	mg/L	1.00	02/23/09 19:20	TWS	9B20069	6010B
Sample ID: RSB0576-12 (NF908-11020-25 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**610**	B, B1, D08	0.12	0.058	mg/L	20.0	02/25/09 04:21	AH	9B20069	6010B
Sample ID: RSB0576-13 (NF908-11020-26 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**780**	B1, D08, B	0.12	0.058	mg/L	20.0	02/25/09 04:26	AH	9B20069	6010B
Sample ID: RSB0576-14 (NF908-11020-27 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**360**	B1, D08, B	0.060	0.029	mg/L	10.0	02/25/09 04:31	AH	9B20069	6010B

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Executive Summary - Detections

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analvzed	Analvst	Seq/ Batch	Method
Sample ID: RSB0576-15 (NF908-11020-28 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**700**	D08, B1, B	0.12	0.058	mg/L	20.0	02/25/09 04:36	AH	9B20069	6010B
Sample ID: RSB0576-16 (NF908-11020-31 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Metals										
Lead	**0.22**	BT, B	0.0060	0.0029	mg/L	1.00	02/23/09 19:45	TWS	9B20069	6010B

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Sample Summary

SAMPLE IDENTIFICATION	LAB NUMBER	Client Matrix	Date/Time Sampled	Date/Time Received
NF908-11020-09	RSB0576-01	Solid	11/06/08	02/18/09 14:10
NF908-11020-15	RSB0576-02	Solid	11/06/08	02/18/09 14:10
NF908-11020-16	RSB0576-03	Solid	11/06/08	02/18/09 14:10
NF908-11020-17	RSB0576-04	Solid	11/06/08	02/18/09 14:10
NF908-11020-18	RSB0576-05	Solid	11/06/08	02/18/09 14:10
NF908-11020-19	RSB0576-06	Solid	11/06/08	02/18/09 14:10
NF908-11020-20	RSB0576-07	Solid	11/06/08	02/18/09 14:10
NF908-11020-21	RSB0576-08	Solid	11/06/08	02/18/09 14:10
NF908-11020-22	RSB0576-09	Solid	11/06/08	02/18/09 14:10
NF908-11020-23	RSB0576-10	Solid	11/06/08	02/18/09 14:10
NF908-11020-24	RSB0576-11	Solid	11/06/08	02/18/09 14:10
NF908-11020-25	RSB0576-12	Solid	11/06/08	02/18/09 14:10
NF908-11020-26	RSB0576-13	Solid	11/06/08	02/18/09 14:10
NF908-11020-27	RSB0576-14	Solid	11/06/08	02/18/09 14:10
NF908-11020-28	RSB0576-15	Solid	11/06/08	02/18/09 14:10
NF908-11020-31	RSB0576-16	Solid	11/06/08	02/18/09 14:10

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-01 (NF908-11020-09 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	**0.025**	B, BT	0.0060	0.0029	mg/L	1.00	02/23/09 18:21	TWS	9B20069	6010B

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-02 (NF908-11020-15 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	**8.8**	B, B1	0.0060	0.0029	mg/L	1.00	02/23/09 18:26	TWS	9B20069	6010B

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-03 (NF908-11020-16 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	**0.16**	B, BT	0.0060	0.0029	mg/L	1.00	02/23/09 18:31	TWS	9B20069	6010B

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-04 (NF908-11020-17 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	14	B, B1	0.0060	0.0029	mg/L	1.00	02/23/09 18:37	TWS	9B20069	6010B

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-05 (NF908-11020-18 - Solid)						**Sampled: 11/06/08**			**Recvd: 02/18/09 14:10**	
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	**170**	B, D08, B1	0.030	0.014	mg/L	5.00	02/25/09 04:01	AH	9B20069	6010B

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-06 (NF908-11020-19 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/23/09 08:00	JRS	9B22003	1311
TCLP Metals										
Lead	**0.308**	B1, B	0.0060	0.0029	mg/L	1.00	02/23/09 16:10	TWS	9B23012	6010B

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Analytical Report

Sample ID: RSB0576-07 (NF908-11020-20 - Solid) **Sampled: 11/06/08** **Recvd: 02/18/09 14:10**

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	**93**	B, D08, B1	0.030	0.014	mg/L	5.00	02/25/09 04:06	AH	9B20069	6010B

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Work Order: RSB0576

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-08 (NF908-11020-21 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	14	B, B1	0.0060	0.0029	mg/L	1.00	02/23/09 18:52	TWS	9B20069	6010B

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-09 (NF908-11020-22 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	**160**	B, B1, D08	0.060	0.029	mg/L	10.0	02/25/09 04:11	AH	9B20069	6010B

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-10 (NF908-11020-23 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	**96**	B, B1, D08	0.060	0.029	mg/L	10.0	02/25/09 04:16	AH	9B20069	6010B

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-11 (NF908-11020-24 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	1.1	B, B1	0.0060	0.0029	mg/L	1.00	02/23/09 19:20	TWS	9B20069	6010B

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-12 (NF908-11020-25 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	**610**	B, B1, D08	0.12	0.058	mg/L	20.0	02/25/09 04:21	AH	9B20069	6010B

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-13 (NF908-11020-26 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	**780**	B1, D08, B	0.12	0.058	mg/L	20.0	02/25/09 04:26	AH	9B20069	6010B

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-14 (NF908-11020-27 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	**360**	B1, D08, B	0.060	0.029	mg/L	10.0	02/25/09 04:31	AH	9B20069	6010B

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-15 (NF908-11020-28 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	**700**	D08, B1, B	0.12	0.058	mg/L	20.0	02/25/09 04:36	AH	9B20069	6010B

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Analytical Report

Analyte	Sample Result	Data Qualifiers	Rpt Limit	MDL	Units	Dilution Factor	Date Analyzed	Analyst	Seq/ Batch	Method
Sample ID: RSB0576-16 (NF908-11020-31 - Solid)						**Sampled: 11/06/08**		**Recvd: 02/18/09 14:10**		
TCLP Extraction by EPA 1311										
Toxicity Characteristic Leaching Procedure	ND		NA	0.0	mg/L	1.00	02/20/09 13:00	CJC	9B19067	1311
TCLP Metals										
Lead	**0.22**	BT, B	0.0060	0.0029	mg/L	1.00	02/23/09 19:45	TWS	9B20069	6010B

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SAMPLE EXTRACTION DATA

Parameter	Batch	Lab Number	Wt/Vol Extracted	Units	Extract Volume	Units	Date	Analyst	Extraction Method
TCLP Extraction by EPA 1311									
1311	9B19067	RSB0576-01	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
1311	9B19067	RSB0576-02	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
1311	9B19067	RSB0576-03	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
1311	9B19067	RSB0576-04	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
1311	9B19067	RSB0576-05	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
1311	9B22003	RSB0576-06	1.00	g	1.00	mL	02/23/09 08:00	JRS	TCLP Metals 1311_ASP
1311	9B19067	RSB0576-07	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
1311	9B19067	RSB0576-08	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
1311	9B19067	RSB0576-09	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
1311	9B19067	RSB0576-10	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
1311	9B19067	RSB0576-11	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
1311	9B19067	RSB0576-12	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
1311	9B19067	RSB0576-13	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
1311	9B19067	RSB0576-14	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
1311	9B19067	RSB0576-15	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
1311	9B19067	RSB0576-16	100.00	g	1,750.00	mL	02/20/09 13:00	CJC	TCLP Org & Metals 1311
TCLP Metals									
6010B	9B20069	RSB0576-01	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A
6010B	9B20069	RSB0576-02	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A
6010B	9B20069	RSB0576-03	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A
6010B	9B20069	RSB0576-04	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A
6010B	9B20069	RSB0576-05	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A
6010B	9B23012	RSB0576-06	50.00	mL	50.00	mL	02/23/09 09:30	DAN	3010A
6010B	9B20069	RSB0576-07	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A
6010B	9B20069	RSB0576-08	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A
6010B	9B20069	RSB0576-09	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A
6010B	9B20069	RSB0576-10	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A
6010B	9B20069	RSB0576-11	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A
6010B	9B20069	RSB0576-12	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A
6010B	9B20069	RSB0576-13	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A
6010B	9B20069	RSB0576-14	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A
6010B	9B20069	RSB0576-15	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A
6010B	9B20069	RSB0576-16	50.00	mL	50.00	mL	02/23/09 07:00	MLD	3010A

New York State D.E.C. - Albany, NY
625 Broadway 9th Floor
Albany, NY 12233-7258

Work Order: RSB0576

Project: CASE NF908
Project Number: NYSDEC

Received: 02/18/09
Reported: 04/02/09 17:13

LABORATORY QC DATA

Analyte	Seq/ Batch	Source Result	Spike Level	MRL	MDL	Units	Result	% REC	% REC Limits	% RPD	RPD Limit	Qualifiers
TCLP Extraction by EPA 1311												
Blank Analyzed: 02/20/09 (9B19067-BLK1)												
Toxicity Characteristic Leaching Procedure	9B19067			N/A	0.0	mg/L	ND					

New York State D.E.C. - Albany, NY
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LABORATORY QC DATA

Analyte	Seq/ Batch	Source Result	Spike Level	MRL	MDL	Units	Result	% REC	% REC Limits	% RPD	RPD Limit	Qualifiers
TCLP Metals												
Blank Analyzed: 02/23/09 (9B20069-BLK1)												
Lead	9B20069			0.0060	0.0029	mg/L	0.048					B1
TCLP Metals												
Blank Analyzed: 02/23/09 (9B20069-BLK2)												
Lead	9B20069			0.0060	0.0029	mg/L	ND					
TCLP Metals												
LCS Analyzed: 02/23/09 (9B20069-BS1)												
Lead	9B20069		1.0	0.0060	0.0029	mg/L	1.08	108	85-115			B1,B

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LABORATORY QC DATA

Analyte	Seq/ Batch	Source Result	Spike Level	MRL	MDL	Units	Result	% REC	% REC Limits	% RPD	RPD Limit	Qualifiers
TCLP Extraction by EPA 1311												
Blank Analyzed: 02/23/09 (9B22003-BLK1)												
Toxicity Characteristic Leaching Procedure	9B22003			N/A	0.0	mg/L	ND					

LABORATORY QC DATA

Analyte	Seq/ Batch	Source Result	Spike Level	MRL	MDL	Units	Result	% REC	% REC Limits	% RPD	RPD Limit	Qualifiers
TCLP Metals												
Blank Analyzed: 02/23/09 (9B23012-BLK1)												
Lead	9B23012			0.0060	0.0029	mg/L	0.0062					B1
TCLP Metals												
Blank Analyzed: 02/23/09 (9B23012-BLK2)												
Lead	9B23012			0.0060	0.0029	mg/L	ND					
TCLP Metals												
LCS Analyzed: 02/23/09 (9B23012-BS1)												
Lead	9B23012		1.00	0.0060	0.0029	mg/L	1.08	108	85-115			B
TCLP Metals												
Matrix Spike Analyzed: 02/23/09 (9B23012-MS1)												
QC Source Sample: RSB0576-06												
Lead	9B23012	0.308	1.00	0.0060	0.0029	mg/L	1.33	102	70-130			B
Matrix Spike Dup Analyzed: 02/23/09 (9B23012-MSD1)												
QC Source Sample: RSB0576-06												
Lead	9B23012	0.308	1.00	0.0060	0.0029	mg/L	1.32	102	70-130	0	20	B
TCLP Metals												
Post Spike Analyzed: 02/23/09 (9B23012-PS1)												
QC Source Sample: RSB0576-06												
Lead	9B23012	0.308	1.00	N/A	NA	mg/L	1.10	80	75-125			B

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Albany, NY 12233-7258

Work Order: RSB0576

Project: CASE NF908
Project Number: NYSDEC

Received: 02/18/09
Reported: 04/02/09 17:13

LABORATORY QC DATA

Analyte	Seq/ Batch	Source Result	Spike Level	MRL	MDL	Units	Result	% REC	% REC Limits	% RPD	RPD Limit	Qualifiers
TCLP Metals												
Serial Dilution Analyzed: 02/23/09 (RB92614-SRD1)												
QC Source Sample: RSB0576-06												
Lead	RB92614	0.308		0.0300	0.0145	mg/L	0.307			0		

2010 Woods Hole Group Preliminary Site Investigation Report

OCTOBER 2010 PRELIMINARY SITE INVESTIGATION REPORT
FORMER CAMP O'RYAN
(FUDS PROPERTY NO. C0NY1132)

WETHERSFIELD, NEW YORK

Contract No. W912WJ-09-D-0001
Delivery Order No. 031

Prepared For:
United States Army Corps of Engineers
New England District
696 Virginia Road
Concord, MA 01742

Prepared By:
Woods Hole Group, Inc.
81 Technology Park Drive
East Falmouth, MA 02536

March 2011

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List of Acronyms

ADR	Automated Data Review
ASP	Analytical Services Protocols
CENAE	U.S. Army Corps of Engineers, New England District
CEMVR	U.S. Army Corps of Engineers, Rock Island District
COC	chain-of-custody
CRQL	Contract Required Quantitation Limit
DERP	Defense Environmental Restoration Program
DOD	Department of Defense
DO	dissolved oxygen
DQO(s)	data quality objectives
EB	Equipment blank
EPA	U.S. Environmental Protection Agency
FBI	Federal Bureau of Investigation
FUDS	Formerly Used Defense Sites
ft	feet
GPS	Global Positioning System
HTW	Hazardous, Toxic Waste
LCS	laboratory control sample
MC	Munitions Constituents
MCL	Maximum Contaminant Level
MDL	method detection limit
MEC	Munitions and Explosives of Concern
mL	milliliter
mg/L	milligrams per liter
MRS	Munitions Response Sites
MS/MSD	matrix spike/matrix spike duplicate
NAE	United States Army Corp of Engineers New England District
NAN	United States Army Corp of Engineers New York District
NEH	New Environmental Horizons, Inc.
NELAP	National Environmental Laboratory Accreditation Program
NTU	nephelometric turbidity unit
NY ARNG	New York Army National Guard
NY DEC	New York Department of Environmental Conservation
NYSDEC	New York State Department of Environmental Conservation
ORP	oxidation-reduction potential
PAHs	Polycyclic aromatic hydrocarbons
PAL	Project Action Limit
PCE	tetrachloroethene
PID	photoionization detector
PQL(s)	practical quantitation limits
QA	quality assurance
QC	Quality Control
QSM	Quality Systems Manual
RI	Remedial Investigation
RL	Reporting limit

ROTC	Reserve Officers Training Corp
RPD	relative percent deviation
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SEDD	Staged Electronic Data Deliverable
SOP(s)	Standard Operating Procedures
SOW	Statement of Work
SVOC	Semi-Volatile Organic Compounds
TCL	Target Compound List
TOGS	Technical and Operational Guideline Series
U.S.	United States
USACE	U.S. Army Corps of Engineers
USAF	United States Air Force
USGS	U.S. Geological Survey
UXO	Unexploded Ordnance
VOC(s)	volatile organic compounds
WHG	Woods Hole Group
XML	Extensible Markup Language
YSI	Yellow Springs Instrument Company

EXECUTIVE SUMMARY

Woods Hole Group, Inc. prepared this Preliminary Site Investigation report as part of the Preliminary Site Investigation including surface and shallow groundwater sampling at the Former Camp O'Ryan in Wethersfield, NY (FUDS Property No. C0NY1132), under contract with the United States Army Corps of Engineers (USACE), New England District (CENAE) Task Order 0031 of contract W912WJ-09-D-0001. The work was completed in accordance with the October 2010 Woods Hole Group Sampling and Analysis Plan (SAP) and the revised August 6, 2010 Statement of Work (SOW) prepared by CENAE. The work was performed with reference to the guidance document entitled USACE Requirements for the Preparation of Sampling and Analysis Plans, EM 200-1-3 [United States (U.S.) Army Corps of Engineers (USACE), 2001], the U.S. Environmental Protection Agency (EPA) Requirements for Quality Assurance Project Plans, EPA QA/R-5, EPA/240/B-01/003, March 2001, New York State Department of Environmental Conservation (NYSDEC) Regulations, Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), National Oil and Hazardous Substances Contingency Plan (NCP) requirements, and the Formerly Used Defense Sites (FUDS) Program Policy (ER 200-3-1). The analytical requirements included in the New York State Department of Environmental Conservation Analytical Services Protocols (NYSDEC 2005).

The report includes a summary of the field sampling activities conducted from October 18th to 21st, 2010, and the laboratory testing results. Sampling was conducted at three (3) surface water and fifteen (15) shallow groundwater sites. *In-situ* measurements of temperature, specific conductance, pH, Oxidation Reduction Potential (ORP), and turbidity, indicate that the water quality of the samples was acceptable by NYSDEC 703.3 water quality standards; however, the turbidity for numerous shallow groundwater samples did exceed the standard due to the sampling technique.

The samples were analyzed for chemical parameters by: EPA SW846 Method 8260B for the NYSDEC ASP Target Compound List (TCL) Volatile Organic Compounds (VOCs); EPA SW846 Method 8270C for the NYSDEC TCL Semivolatile Organic Compounds (SVOCs); EPA Method 332 for Perchlorate; EPA SW846 Method 6010B for Lead; and EPA Method 8330A for 14 Explosive compounds. The field samples were non-detect for all chemical analyses with only a single detection of lead in one field duplicate sample. These results indicate that the surface and shallow groundwater locations sampled during this investigation at the former Camp O'Ryan do not appear to show impacts from prior site activities.

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1.0 INTRODUCTION

1.1 SITE LOCATION AND DESCRIPTION

1.1.1 Site Location

Former Camp O'Ryan is in the rural Town of Wethersfield in Wyoming County, New York, about 40 miles east of Buffalo and 5 miles southeast of Warsaw, NY, (Figure 1). It is represented by District 26 Congressman Chris Lee and is in EPA Region 2. The 370-acre site is mostly forested. A 5-acre parcel including the former motor pool is used by a fireplace company. Residents in the area derive drinking water from private, unregistered wells. There are about a dozen dwellings along the north and west boundary of the site. Groundwater depth is 50 feet and yield is on the order of 10 gallons per minute (USACE SOW, revised 6 August 2010).

1.1.2 Background

Military use of the site began in 1949 when the New York Army National Guard (NY ARNG) enacted a lease for a "Target Range, Maneuver Area, Camp Site, and other Government purposes." (USACE SOW, revised 6 August 2010). Known users of the site included the Army and Air National Guard, Army Reserves, Naval Militia, Reserve Officers Training Program (ROTC) Cadets, Federal Bureau of Investigation (FBI), NY State Police, and local police agencies. Confirmed munitions used at the site included live and blank small arms, tear gas, slap flares, and practice bazooka rockets. Military training ended in 1994. The only Munitions and Explosives of Concern (MEC) reported on the site since site closure was a belt of unfired linked blank small arms found by personnel from the NYSDEC. Reported Munitions Constituents (MC) found at the site include an expended practice bazooka rocket found by a local citizen, similar rockets, expended small arms, and an expended slap flare found by the Rock Island District (CEMVR) during the site inspection in November 2009. The site has been subdivided into three Munitions Response Sites (MRS); MRS A, B, and C as seen in Figure 2. The primary findings in these areas include:

MRS A

MRS A is the four-acre parcel (Figure 2) that served as the former pistol and machine gun range. There is confirmed Hazardous, Toxic Waste (HTW) and MC present at the earthen target berm containing fired lead bullets. Although there is MEC potential in this area, it is not confirmed.

MRS B

MRS B is the ten-acre site that was the known-distance range (Figure 2). Confirmed HTW and MC presence includes lead (from lead bullets) in the earthen target berm. Confirmed MEC was also observed by NYSDEC in the form of an unfired belt of blank small arms ammunition. November 2008 testing by the NYSDEC indicated high Total Lead values and high Toxicity Characteristic Leaching Procedure (TCLP) values in the earthen target backstop.

MRS C

MRS C consists of 356 acres of all other land. This MRS has potential HTW and MEC. The motor pool may have been the site of vehicle maintenance, and similar maintenance may have been performed at the tank training course. A petroleum, oil, and lubricants (POL) point was located in the southern part of this MRS. MC was observed during the Site Inspection in the form of expended training rockets. There is MEC potential in this area, though not confirmed.

1.1.3 Water Quality

Naturally occurring surface water exists at the site in the form of intermittent streams and small manmade ponds on the southern part of the property. An unnamed intermittent stream flows from southeast to northwest across the site and separates the known-distance range from the pistol range, and there are at least two other similar streams in the southern portion of the site. It appears that the stream is being recharged by shallow groundwater downgradient of potential contamination source areas. Nearby water bodies include Java Lake 4 miles to the southwest and Wethersfield Springs Pond 4 miles to the east (Figure 1).

Java Lake is a 53.0 acre lake on the Lake Erie watershed and it is listed as an impaired waterway on the *Priority Waterways List* (PWL). Water bodies listed on the PWL by the NYDEC have documented water quality impairments, minor impacts and/or threats. Phosphorus levels in the lake typically exceed the state guidance values indicating that the lake is best characterized as eutrophic, or highly productive. Measurements of pH typically fall within the state water quality range of 6.5 to 8.5, but are consistently high and occasionally exceed 8.5 (NYSDEC, September 2010).

Wethersfield Springs Pond has not been assessed by the NYSDEC; however, it is a part of the headwaters of East Koy Creek, which is a tributary of the Genesee River. East Koy Creek is known as one of New York's best trout streams, but lack of riparian buffers along the stream and seasonal irrigation usage reduce stream flows, elevate temperatures and cause stresses to the fishery. Previous studies indicated slightly to moderately impacted water quality along the stream due to nutrient enrichment and thermal and flow fluctuations in the stream. The lower section of East Koy Creek is included on the NYS 2002 Section 303(d) List of Impaired Waters because the aquatic life support and fishery habitat is impacted by agricultural activities in the watershed. The Town of Wethersfield maintains an uncovered salt storage facility near the creek in Hermitage and there are concerns over the potential impacts of this facility to the watershed (NYSDEC, March 2003).

A biological (macroinvertebrate) survey of East Koy Creek at multiple sites between East Koy and Wethersfield Springs was conducted in 1993. Within this portion of the stream conditions were primarily slightly impacted. Clean-water mayflies, stoneflies and caddisflies were found, but species richness was lower than expected. Causes for these effects were not apparent. A concurrent fishery survey found appropriate populations in this reach. A biological (macroinvertebrate) assessment of East Koy Creek in East Koy was conducted in 1999. Filtering caddisflies dominated the sample. Impacts were attributed to nonpoint source nutrient loads and organic wastes. Previous biological sampling in 1993 found similar conditions and evidence of agricultural inputs at various sites (NYSDEC, March 2003).

1.2 PROJECT OBJECTIVES AND SCOPE

The purpose of the sampling was to characterize the water quality of both stream surface water and shallow groundwater at a time when the groundwater was recharging the stream under base flow conditions.

Field activities were completed during a single four-day survey and included:

1. Collecting one round of shallow groundwater samples using pore water sampling techniques.
2. Collecting one round of surface water samples.
3. Collecting field parameters including temperature, pH, specific conductance, dissolved oxygen, oxidation reduction potential (ORP), and turbidity at each sampling location.
4. Measuring the stream flow rate.

The results of the October 2010 sampling event are presented in this report. These data are used to assess the nature and extent of shallow groundwater contamination, potential impacts to surface water, and to determine whether unacceptable public health risks exist at these locations. Samples were analyzed in accordance with their respective NYSDEC ASP (2005) contract required quantitation limits (CRQLs). Sample results are compared to their respective regulatory criteria, which for Camp O'Ryan include the June 1998 NYSDEC Technical and Operational Guidance Series (TOGS), and the May 2009 EPA Maximum Contamination Levels (MCLs).

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2.0 SAMPLING METHODS

The Woods Hole Group Sampling and Analysis Plan (WHG SAP) and the Statement of Work (SOW) have established the requirement for data generation that meet the project objectives. Groundwater samples were collected in accordance with the Standard Operating Procedures (SOPs) presented in the SAP. The field investigators were escorted for all onsite sampling activities by the USACE-LRB Unexploded Ordinance (UXO) Specialist Nickolas Heleg-Greza, who provided anomaly avoidance especially for the intrusive investigation samples (shallow groundwater).

2.1 SURFACE WATER SAMPLING AND ANALYSIS

The SAP specified four surface water samples, SW-01, SW-02, SW-03, and SW-04; however, surface water sampling point SW-02 was dry during the sampling period. The surface water locations were sampled following the SOW (USACE, 2010), the SAP (Woods Hole Group, 2010), and the procedures outlined in the National Field Manual for the collection of Water Quality Data (USGS 2006). As outlined in the SAP, surface water sample collection was to occur under base flow conditions for the stream and not less than three days following a rainfall amount greater than 1/100th of an inch. In addition, it was noted that samples should not be collected from discontinuous, stagnant pools. Prior to sampling, field measurements of temperature, pH, conductivity, dissolved oxygen (DO), and ORP were taken using a YSI 556 MPS. In addition, a Hach 2100P turbidity meter was used to monitor turbidity.

Surface water samples were collected in bottles provided by Alpha Analytical, and were submitted for off-site laboratory analysis by: EPA SW846 Method 8260B for the NYSDEC ASP Target Compound List (TCL) VOCs; EPA SW846 Method 8270C for the NYSDEC TCL SVOCs; EPA Method 332 for Perchlorate; EPA SW846 Method 6010B for Lead; and EPA Method 8330A for 14 Explosive compounds. The 1-liter amber bottles for explosives and SVOCs were dip sampled. The samples for VOCs, perchlorate, and both total and dissolved lead were collected using a 140 ml syringe. The dissolved lead and perchlorate samples were filtered through a 0.45 µm syringe filter. Additionally, the perchlorate samples were filtered through a secondary 0.2 µm syringe filter. Samples collected during the groundwater sampling program were uniquely identified using the sample nomenclature outlined in the WHG SAP.

A rinsate blank for surface water, CO-EB01-1010, was to be collected for perchlorate, VOCs, and both total and dissolved lead due to use of the syringe and filters, while SVOCs and explosives did not require a rinsate blank due to use of the dip sampling method. The sample was collected by placing the VOC-free DI water provided by Alpha into a new syringe and then simply dispensing the correct amount into each container and using the correct filter, if applicable. Clean tubing, syringes, and filters were used at each sampling location, and used items were discarded between sampling locations.

2.2 SHALLOW GROUNDWATER SAMPLING AND ANALYSIS

Shallow groundwater samples were to be collected from eighteen (18) shallow groundwater locations during the October 2010 sampling. The shallow groundwater sites were sampled in accordance with the SOW (USACE, 2010), the WHG SAP, as well as using procedures outlined in the National Field Manual for the collection of Water Quality Data (USGS 2006) and Pore Water Sampling (EPA, 2007). The shallow groundwater samples were collected with a pushpoint pore water sampler in combination with a peristaltic pump. Prior to sampling, field measurements of temperature, pH, conductivity, dissolved oxygen (DO), and ORP were taken using a YSI 556 MPS. In addition, a Hach 2100P turbidity meter was used to monitor turbidity. Shallow groundwater samples were collected as composite samples for all analyses except for VOCs, which were individual, grab samples. The composite group associations are shown in Table 1.

Shallow groundwater samples were collected in bottles provided by Alpha Analytical and were submitted for off-site laboratory analysis by: EPA SW846 Method 8260B for the NYSDEC ASP Target Compound List (TCL) VOCs; EPA SW846 Method 8270C for the NYSDEC TCL SVOCs; EPA Method 332 for Perchlorate; EPA SW846 Method 6010B for Lead; and EPA Method 8330A for 14 Explosive compounds. The 1 Liter amber bottles for SVOCs and Explosives were filled first, followed by the 40ml VOCs vials and the total lead containers. Then, a 0.45 μm inline filter was placed on the end of the peristaltic pump tubing to filter the dissolved lead and perchlorate samples. Perchlorate samples were filtered into the back of a clean syringe and filtered a second time through a 0.2 μm syringe filter into a bacteria cup. Samples collected during the groundwater sampling program were uniquely identified using the sample nomenclature outlined in the SAP (WHG, 2010).

A rinsate blank sample, CO-EB02-1010, was collected from the pore water sampler used at the shallow groundwater sampling locations. The rinsate blank sample was collected from the pore water sampler following decontamination after use in the sampling process. This procedure included soap and DI water decontamination with a rinse of VOC-free distilled water provided by Alpha Analytical, followed by a final rinse with isopropanol. DI water was pumped from the container into the sample bottles using new tubing and a peristaltic pump. Additionally, the rinsate blanks for perchlorate and dissolved lead were collected using fresh syringes and filters.

2.3 QUALITY CONTROL

As described in the SOW (USACE, 2010) the quality control (QC) samples collected for the October 2010 sampling effort included: field duplicate samples; equipment blanks; matrix spike; matrix spike duplicate; and trip blanks for the VOC samples. Field duplicates were used to evaluate the field sampling procedures and laboratory accuracy and precision in analyzing the samples. The purpose of equipment blanks was to determine whether the sampling equipment could be a source of cross-contamination of samples. Matrix spike (MS) and matrix spike duplicate (MSD) samples were collected for the laboratory as QC samples to provide a measure of the accuracy of the laboratory method in the site matrix. Trip blanks were used to evaluate potential cross-contamination issues during sample transport, both in the field and to the laboratory. Details for the QC protocol were provided in the SAP (Woods Hole Group, 2010). The samples were stored in a cooler on ice until delivery to the laboratory. Analysis of samples was performed by Alpha Analytical Laboratory in Westborough, Massachusetts.

Practical quantitation limits (PQL), also called laboratory reporting limits, for analysis of VOCs, SVOCs, and Lead were at or below the corresponding NYSDEC ASP (2005) contract required quantitation limits (CRQLs). No NYSDEC CRQLs are available for Explosives or Perchlorate; therefore, the project required reporting limits for these parameters have been set as the laboratory reporting limits or PQLs, as supported by the calibration curves for these methods. The PQL is equivalent to the low level calibration standard. The method detection limit (MDL), which is lower than the PQL, represents the lowest quantitation level that can be achieved for each substance by the specified method. In general, the PQLs are three to five times higher than the MDLs. The sample quantitation limit or reporting limit is analogous to the PQL; however, it is adjusted for sample-specific variables such as analytical dilutions. Results for the methods were reported down to the PQL or sample-specific lab Reporting Limits (RLs). For aqueous samples by EPA Methods 8260 (VOCs) and 8270 (SVOCs), the laboratory will report detected results below the PQL, down to the MDL, as estimated (qualified "J") data.

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3.0 RESULTS

The sampling activities and results from the October 2010 sampling event at Camp O'Ryan are described in this section. From October 18th to 21st, 2010, surface and shallow groundwater samples were collected from a total of 18 monitoring points across the site. All field data, site descriptions, and notes were collected on field data sheets, which are provided in Attachment 2. The locations of the surface water and shallow groundwater samples in the SOW were considered approximate, and the actual locations were determined during the field work with the concurrence of the USACE project geologist, Ken Heim. As a result, new GPS coordinates for the actual surface water sampling locations were taken and are presented in Figure 3. Laboratory analytical results for both the pore and surface water locations sampled during the October 2010 sampling event are provided in Attachment 3. A compilation of photographs taken of the site, equipment, field crew, and sampling activities can be found in Attachment 5.

3.1 SURFACE WATER SAMPLING

Surface water samples were collected from a total of three (3) of the four (4) proposed monitoring points across the site including SW-01, SW-03 and SW-04 (Figure 3). Site SW-02 on the north branch of the stream was not sampled because the streambed was dry in this location except for a stagnant pool. Surface water sampling took place prior to shallow groundwater sampling in the afternoon of October 18th since rain was forecasted for October 19th. There was a trace amount of precipitation recorded overnight on October 18th and during the day on the 19th. The weather conditions during the sampling period are summarized on Table 2. Weather data were obtained from North Java, NY, located 3 miles from the Camp O'Ryan site because this was the closest source for local weather data.

Site SW-01 was roughly 50 feet upstream of the culvert that runs underneath Wethersfield Road. Sites SW-02 and SW-03 were on the north branch and main branch of the stream, respectively, just upstream of their confluence. The stream ran through a marshy flood plain at the location of SW-03. Site SW-04 was the furthest upstream and in the middle of a steep, narrow ravine. The surface water sampling started at the furthest downstream sampling location, SW-01, and continued moving upstream to SW-03 and SW-04. The sampling technician remained on the channel bank downstream of the sampling location (facing upstream) while sampling to avoid disturbing the bottom sediments.

3.2 SHALLOW GROUNDWATER SAMPLING

Shallow groundwater samples were collected from fifteen (15) of the eighteen (18) proposed shallow groundwater locations during the October 2010 sampling event. Shallow groundwater sampling began on October 19th at the north branch of the stream starting with the composite shallow groundwater locations MP-04, MP-05, and MP-06, and followed by MP-07, MP-08, and MP-09. This section of the stream was very shallow, narrow (about a foot across), and had a slow flow, which is in contrast to the dry surface water sampling location, SW-02, located further downstream. This portion of the stream was also heavily vegetated and forested, which hampered sampling efforts. In addition, the stream ended abruptly roughly 45 feet upstream of location MP-05 and there was no evidence of shallow groundwater upgradient of the end of the stream. As a result, shallow groundwater location MP-06 for composite group B was moved to a suitable sampling location downstream of MP-04. Similarly, both MP-08 and MP-09 were moved downstream due to a lack of suitable sampling locations in the proposed area. The pore water sampler could only be placed roughly a foot into the ground due to refusal.

With sampling completed on the northern branch of the stream, the sampling was continued October 20th on the main branch of the stream starting at the farthest upstream sampling location, MP-18 (composite group F). Sampling with a pore water sampler proved to be difficult in the upper portion of the main branch of the stream since it was set in a narrow, steep ravine with no clearly defined bank. The rockiness of the soil prevented the sampler from penetrating into the ground more than a foot. MP-17 was located on a silty deposit downstream from MP-18. MP-16 was not sampled due to a lack of suitable sampling locations. As a result, composite group F was composed of only two sampling locations, MP-18 and MP-17.

Composite group E proved to be easier to sample than group F, but sampling still remained difficult in the ravine. All three sample locations of composite group F including MP-13, MP-14, and MP-15, were sampled with the pore water sampler located close to the edge of the stream bank. The sampler could not penetrate the ground more than one foot due to rocks.

The ravine widened and gave way to a floodplain between composite groups E and D. Nonetheless, suitable sampling locations were limited resulting in only two locations sampled, MP-10 and MP-12. In this section, the stream had eroded a channel well below the grade of the surrounding floodplain, and, as a result, the pore water sampler could not penetrate deep enough to extract water on top of the floodplain due to refusal from a consolidated layer. A pool of surface water was found away from the bank near the location of MP-12; however, no seep water could be drawn with the pore water sampler from below the pool at this location. The water was simply pooled on top of a cohesive layer of the soil that had a consistency of mushy, dark clay. No suitable site for MP-11 could be found, so it was not sampled. MP-10 was taken by inserting the pore water sampler into an undercut bank along the stream bank.

Composite Group A was composed of only two locations, MP-01 and MP-02, due to a lack of suitable locations along this stretch of stream. As with composite group D, the stream has eroded a channel well below that of the surrounding floodplain, and the pore water sampler could not penetrate deep enough to extract water on top of the floodplain. MP-02 was taken on the stream bank adjacent to a washout with some surface water. Sampling was first attempted in the washout; however, no water could be drawn. The sampling was moved closer to the edge of the stream bank. Site MP-01 was characterized by a seep face set in a steep slope composed of a hard claylike material. Sampling was performed at the base of the seep face.

3.3 SURFACE WATER AND SHALLOW GROUNDWATER PHYSICAL RESULTS

A summary of the field data parameters collected prior to sampling at each of the surface and shallow groundwater locations for the October 2010 sampling are provided in Table 3. The measurements of field parameters were compared with their NYSDEC water quality standards for classes 'A' and 'GA' for surface and groundwater, respectively. The measurements of field parameters from the shallow groundwater measurements were compared to the groundwater (GA) standard as there is not separate class for shallow groundwater or pore water. Overall, the field parameters indicated that the water quality for the surface and shallow groundwater samples collected during this field effort was acceptable. At this time there were no standards set for temperature, ORP or specific conductance, turbidity for surface water (A) or dissolved oxygen for groundwater (GA).

Temperature and specific conductance were much higher for the samples collected on the north branch of the stream MP-04 through MP-09 than on the main branch of the stream. ORP was highest in the upper section of the stream and lowest on the north branch of the stream. The dissolved oxygen measurements for surface water samples ranged from 10.64 mg/L to 12.75 mg/L, which were well above the standard of 4 mg/L. The dissolved oxygen in the shallow groundwater samples ranged from 1.70 mg/L to 8.87 mg/L, which is lower than the surface water samples as expected of shallow groundwater samples.

The pH measurements were within the TOGS standard range of 6.5 to 8.5 for all measurements except for SW-01, which had a pH reading of 6.26. The pH of the samples decreased with their respective downstream location. The pH was also lower on the north branch of the stream than it was on the main branch of the stream. The lower pH measurements downstream of the stream confluence may be an indicator of different groundwater sources feeding the upper section of the stream versus the lower section and north branch of the stream.

The NYSDEC turbidity standard was 5 NTU for groundwater, but there was no standard at this time for the surface water. The shallow groundwater measurements of turbidity actually exceeded the standard of 5 NTU for all locations except for MP-02, MP-06, and MP-13; however, this may be due to the limitations of the pore water sampling technique. Sediment may become mobilized when the pore water sampler is inserted into the ground, which causes the sediment to mix with the groundwater. The pore water sampler could only be inserted into the ground about a foot or so, and this top layer or soil tends be more active biologically and geologically causing this layer to be less consolidated and more easily mobilized as well. The turbidity of the surface water samples from the stream were much lower overall than the shallow groundwater samples, which supports the notion that the turbidity of the shallow groundwater samples is related to the sampling technique. In addition, the water class "GA" may be more appropriately applied towards established drinking water and monitoring wells, which are carefully constructed and can be sampled by less invasive techniques such as low flow sampling.

The stream dimensions and velocity were measured so that the flow rate could be calculated for each surface water sampling location. The average stream flow rate was estimated to be 60% of the product of the stream cross-sectional area and the stream surface velocity, measured by timing a buoyant surface drifter/float over a measured distance, as outlined in the SAP. The flow rate was calculated to be 0.55 ft^3/s at SW-01, 0.25 ft^3/s at SW-03, and0.03 ft^3/s at SW-04. As expected, the flow rate increased at each successive downstream sampling location, which is an indication of a gaining stream. The stream dimensions, velocity and flow rate are shown in Table 4.

3.4 SURFACE WATER AND SHALLOW GROUNDWATER CHEMICAL RESULTS

The results were compared to applicable regulatory standards including the NYSDEC TOGS and EPA MCLs, which are summarized in Tables 5-1 and 5-2 for shallow groundwater and surface water, respectively. The standards for TOGS took precedent over the EPA MCLs, except where the MCLs were lower. In general, most of the analytes had standards listed under the NYSDEC TOGS, however, only a few of the analytes tested had standards listed under the EPA MCLs. The values for the NYS TOGS were selected from Table 1 "Ambient Water Quality Standards and Guidance Values, June 1998". A standard is a value that has been promulgated and placed into regulation, while a guidance value is a suggested criterion that has not been placed into regulation yet. A guidance value may only be used where a standard for a substance or group of substances has not been established. Selection of the appropriate standard or guidance value for a compound requires referring to the specific 'water class' and protection 'type' for the sample water source. Protection 'type' in the NYS TOGS was divided into four main categories for human health (H), fish health (A), wildlife health (W), and aesthetics (E). The protection 'type' selected for Camp O'Ryan was human health (H), and more specifically Health for a Water Source or 'H(WS)'. The specific 'water classes' chosen for the shallow groundwater and surface water samples were 'GA' for groundwater and 'A' for freshwater drinking water supply. The sample specific designations for 'water class' and 'type' were selected using guidance from the NYSDEC Region 9 office.

A number of compounds had no standard or guidance value listed under either the NYS TOGS or the EPA MCLs, therefore, these compounds do not have a standard at this time and are listed as 'NS' for in the summary tables. Other compounds were considered to be unregulated for groundwater by New York State, meaning they have no set standard or guidance value and are listed in Table 3 "Partial List of Substances Not Regulated by the Principal Organic Contaminant (POC) Groundwater Standard" of the NYS TOGS. These unregulated compounds are listed as 'NR' in the summary tables.

The results of the surface and shallow groundwater samples for the 2010 October sampling event were "Non-Detect" or "ND" for analyses including VOCs, SVOCs, explosives, perchlorate and both total and dissolved lead for almost all analyses (except as described below). This indicates that the concentrations were not detected at concentration below the RL. There was a single detection of total lead at 0.018 mg/L in the field duplicate sample for the shallow groundwater composite group MPE. The associated field sample was ND. This field duplicate comparison was acceptable by EPA Region 2 data validation standards and further details can be found in the Section 4 Data Quality. This detection of total lead in the duplicate sample of MPE was below the NYSDEC TOGS standard of 0.025 mg/L for groundwater (GA), but it did exceed the

EPA MCL of 0.015 mg/L. This result could be due to the entrainment of suspended particles containing lead during sampling as the turbidity was above the 5 NTU standard at two of the three sampling locations included in this composite sample. A summary of the results can be found in Tables 5-1 and 5-2 and complete laboratory analytical results can be found in Attachment 3.

The results for the SVOC analyte 2,4-dimethylphenol were rejected due to LCS/LCSD recoveries less than 10%. This data is not considered usable for project decisions. The lab commented in their report that this analyte is a problematic analyte to measure in the lab. Considering that SVOCs were not detected in any of the samples, it is not expected that 2,4-dimethylphenol would be present on site. Further details can be found in the Section 4 Data Quality.

All other SVOCs met the reporting limits specified in the approved SAP (NYSDEC ASP CRQLs, 2005). Note that these reporting limits for a number of analytes exceed their respective regulatory limits, as shown in the tables. Standard EPA methods were used for analysis of these samples.

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4.0 DATA QUALITY

4.1 SAMPLE CUSTODY, PRESERVATION, HOLDING TIME, AND LABORATORY DATA REVIEW

Samples were collected October 18th through 20th, 2011 and received at Alpha Analytical on October 21, 2010. The laboratory narrative confirms that all samples collected for the October 2010 sampling event were received under proper chain-of-custody (COC) procedures and with acceptable preservation as defined in Table 10 Sample Containers, Preservatives, and Holding Times of the SAP (October 2010). A copy of the login narrative is provided in Attachment 3. All samples were analyzed within the required method holding times. All samples were prepared and analyzed using the methods defined in Table 8 Analysis Methods and Project Data Quality Objectives of the SAP (October 2010), summarized as follows:

- EPA SW846 Method 8260B for the NYSDEC ASP Target Compound List (TCL) VOCs
- EPA SW846 Method 8270C for the NYSDEC TCL SVOCs
- EPA Method 332 for Perchlorate
- EPA SW846 Method 6010B for Lead
- EPA Method 8330A for 14 Explosive compounds

The lab processed and delivered the sample results in one sample delivery group (SDG) labeled L1016650. The laboratory performed a data review consistent with the procedures detailed in Section 5.3 of the SAP (October 2010) and the laboratory Quality Assurance Manual. Data reporting procedures were consistent with Section 5.4 and Table 8 of the SAP, with a minor deviation that not all results were reported in units of µg/L. VOCs, SVOCs, Explosives, and Perchlorate were reported in units of µg/L while Total and Dissolved Lead were reported in mg/L. These were acceptable reporting protocols for aqueous results for these parameters.

Additionally, there were several inconsistencies between the compound names used by the laboratory and those listed in Table 8 of the SAP. The laboratory reported "3-Methylphenol/4-Methylphenol" rather than "4-Methylphenol" since these two isomers co-elute. Three compounds were reported using common names not listed in Table 8 (IUPAC names used here) as follows: "N-nitrosodiphenylamine" was reported as "NitrosoDiPhenylAmine(NDPA)/DPA"; "4-Chloro-3-methylphenol" was reported as "p-Chloro-m-Cresol"; and "4,6-Dinitro-2-methylphenol" was reported as "4,6-Dinitro-o-cresol". The laboratory reported "m/p-Xylene" and "o-Xylene" instead of "Total Xylene"; therefore, 52 VOCs are reported rather than 51 compounds as listed in Table 8 and the ADR library files were updated accordingly. All these deviations were considered acceptable and do not adversely affect data quality.

As required in Section 5.4 of the SAP, the laboratory provided a narrative non-conformance summary, Stage 2a SEDD (xml) files, and laboratory data report for SDG L1016650 (in pdf format) including results, units, reporting limits, and summary QC.

4.2 DATA VALIDATION PROCESS

The Woods Hole Group team performed the QC data review and validation on samples analyzed by the contract laboratory in accordance with the August 2010 SOW and the October 2010 Sampling and Analysis Plan (SAP). The SEDD analytical data were evaluated utilizing v8.3 ADR software and the Camp O'Ryan project ADR Library created by CENAE and Alpha Analytical, based on the 2010 SAP. During the ADR evaluation, the ADR files were reviewed in the ADR Review Module. The software was used to generate non-conformance reports (error logs) and qualification reports, which can be found in Attachment 4.

Consistent with Section 5.8 of the 2010 SAP, NEH performed a targeted data validation review for each analysis method in SDG L1016650. This review consisted of: verification of sample identification preservation, and holding times; surrogate, LCS/LCSD, and MS/MSD recoveries; LCS/LCSD, MS/MSD/MD, and Field Duplicate precision; method and field blank contamination issues; and sensitivity of reported results compared to the SAP requirements. This review did not include an evaluation of instrument tunes, initial and continuing calibration results, internal standard recoveries, raw data, or include calculation verifications. The data validation checklists generated by NEH to document this targeted data validation are presented as the January 7, 2011 Data Validation Review reports for sample batch L1016650 (Attachment 4). NEH then reviewed the SEDD/ADR reports to verify that all issues affecting data quality identified in the targeted data validation were properly documented in the ADR/SEDD reports and reconciled issues found in these reports.

4.3 DATA VALIDATION RESULTS

Data Usability

All data, except for the 2,4-dimethylphenol results, are considered usable for project decisions with the understanding of the potential uncertainty in qualified (J and UJ) results. All results for the SVOC 2,4-dimethylphenol were rejected (qualified R) during data validation due to severe exceedance of the method QC measure of accuracy. Rejected results are considered unusable for project decisions. Overall, other QC results for all parameters indicated generally acceptable accuracy, precision, representativeness, and sensitivity of the results, with the following observations. Details for all issues described in this section were included in the data validation reports (Attachment 4).

Accuracy & Precision

For SVOCs, several compounds recovered below acceptance criteria in the MS and/or MSD or demonstrated imprecision in the LCS/LCSD or MS/MSD results. All results for 2,4-dimethylphenol were rejected (qualified R) and are not usable for project decisions based on LCS/LCSD recoveries < 10%. Other results were qualified as estimated (UJ). Data validation actions to qualify SVOC results were consistent with the ADR/SEDD Sample Qualification Report. Three compounds out of the 66 SVOCs listed in Table 8 of the SAP were not reported in the LCS/LCSD or MS/MSD. As the laboratory narrative did not indicate any nonconformance in calibration for these compounds, the data are considered usable as reported. All qualified data are usable (with the exception of 2,4-dimethlyphenol) with low or indeterminate bias.

For VOCs, bromomethane recovered below acceptance criteria in the LCS/LCSD and MS/MSD results. All bromomethane results were estimated (UJ) and are usable with a potential low bias. Several other results were negated (U), as described below, or estimated (J) consistent with the ADR/SEDD Sample Qualification Report.

Potential for field sample contamination was evaluated using trip blank and equipment rinsate blank results. One trip blank for VOCs (CO-TB01-1010) and two equipment rinsate blanks (CO-EB01-1010 for surface water samples and CO-EB02-1010 for shallow groundwater samples), were submitted with the field samples. All parameters were ND in these blanks except as follows. Low levels of chloroform and acetone were detected in the equipment blanks and chloroform was also detected in the trip blank. Low level contamination of these VOCs are common in environmental analyses. The ADR reported estimated values (J) of chloroform below the RL in both equipment blanks; however, the software did not apply the required blank action. During data validation, blank actions were taken to negate (U) the chloroform results in both equipment blanks due to the presence of chloroform as a contaminant in the associated trip blank.

Additionally, the ADR software did not apply the correct qualification for two shallow groundwater samples based on the detected level of acetone in the associated equipment blank. The ADR reported two acetone results in samples CO-MP18-1010 and CO-MP18-1010-B qualified “UJ”; whereas the correct qualification is “U” due to blank actions.

For Explosives, professional judgment was used to estimate (qualify UJ) all results for methyl-2,4,6-trinitrophenylnitramine (Tetryl), rather than just the two results estimated as indicated in the ADR/SEDD Sample Qualification Report. This professional judgment was based on the MS/MSD evidence of matrix effects on accuracy and precision coupled with the QC exceedances in the continuing calibration results for Tetryl (as reported in the laboratory narrative). Tetryl results are usable as estimated values with indeterminate bias.

No data validation actions were required for Perchlorate, Total Lead, or Dissolved Lead as all QC measures of accuracy and precision met acceptance criteria.

Field Precision & Representativeness

Field duplicate (FD) precision and representativeness was evaluated based on results from the analysis of field samples as compared to results from the corresponding field duplicate samples. FD precision was expressed quantitatively in terms of relative percent difference (RPD). Three FD pairs were collected for VOCs and two FD pairs were collected each for SVOCs, Explosives, Perchlorate, and Lead. This FD frequency meets the SAP requirement of collection of 1 FD per 10 field samples.

Field duplicate results for VOCs, SVOCs, Explosives, Perchlorate, and Dissolved Lead were all ND. These ND results were consistent with each other and were considered acceptable field duplicate precision and representativeness, though RPD could not be calculated. Total Lead was detected in one FD sample, CO-MPE-101B, at 0.018 mg/L while the result for its associated field sample, CO-MPE-1010, was ND at 0.010 U mg/L. The laboratory confirmed these results on re-analysis. Though these FD results did not meet the project requirement of RPD less than 30% (as defined in Table 8 of the SAP), they actually satisfied the EPA Region 2 metals data validation criteria (SOP HW-2, September 2006) for acceptable field duplicate precision. For values near the RL (at <5x RL), the EPA defined acceptable FD precision as the difference between the two results must be less than or equal to the contract required quantitation limit (CRQL), which for lead CRQL was 0.010 mg/L (equal to the RL of our data). The difference between the ND result and detected lead result was 0.008 mg/L, which was less than 0.010 mg/L and, therefore, meets EPA acceptance criteria.

These FD results were an indication of acceptable precision from sample collection through analysis and acceptable representativeness of the sample to the site locations for all types of aqueous samples collected.

Sensitivity

Sensitivity, in terms of achieving the CRQLs listed in Table 8 of the SAP, was met for all parameters with the following observations. For Explosives, all results were ND; however, the sample-specific reporting limits (RLs) were slightly greater than the Project RL of 0.25 µg/L (specified in the SAP); this was due to differences in extraction volumes (preparation factors). The achieved RLs were considered acceptable since they were all were below their associated TOGS, except for 2,6-dinitrotoluene for surface water; however, 2,6-dinitrotoluene would not have achieved the TOGS standard of 0.07 µg/L even at the original RL of 0.25 µg/L. For SVOCs, the following analytes exceeded their CRQLs given in Table 8, as expected, due to method limitations, but met the defined Project RLs: 1,2,4,5-tetrachlorobenzene, 2,4-dichlorophenol, 2,4-dimethylphenol, 2,4-dinitrophenol, 2-nitrophenol, 3,3'-dichlorobenzidine, 4,6-dinitro-2-methylphenol, acetophenone, hexachlorobutadiene, and hexachlorocyclopentadiene. For VOCs, 1,4-Dioxane exceeded its CRQL, due to method limitations. In addition, the RLs for a number of compounds exceeded their TOGS and/or MCLs due to method limitations. T compounds are shown in the date summary tables.

4.4 DATA VALIDATION ACTIONS RECONCILED WITH THE ADR

Upon completion of the ADR package and independent validation of the data by New Environmental Horizons (NEH), the following manual edits were made in the ADR software (explanations for these actions as discussed in Section 3.3.3 above):

- All Tetryl results for Explosives were estimated (UJ) and have indeterminate bias
- Chloroform in samples CO-EB01-1010 and CO-EB02-1010 were negated (U) at the RL (0.75 U µg/L)
- Acetone in samples CO-MP18-1010 and CO-MP18-1010-B were negated (U) at the RL (5 U µg/L)

The reviewed files were exported from the ADR software as reviewed EDDs and submitted for final approval by the CENAE.

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5.0 DISCUSSION

This section discusses the findings of the October 2010 shallow groundwater and surface water sampling event at Camp O'Ryan. The results from the October 2010 sampling event demonstrate that:

- Rainfall was minimal during and prior to the sampling event indicating that sampling occurred under base flow conditions.
- Measurements of the stream flow indicated that flow increased downstream, which is indicative of a gaining stream.
- The *in-situ* measurements of field parameters including ORP, pH, temperature, specific conductance, dissolved oxygen, and turbidity indicated acceptable water quality by NYSDEC standards; however, turbidity was high for a number of the shallow groundwater samples as a result of the sampling technique.
- All chemical data, except for the 2,4-dimethylphenol results, are considered usable for project decisions with the understanding of the potential uncertainty in qualified (J and UJ) results.
- The surface water samples collected from the stream were nondetect (ND) for the compounds analyzed indicating that contamination of the stream appears to minimal.
- The shallow groundwater sample results for the shallow groundwater locations were nondetect (ND) for the compounds analyzed (except as described in the following bullet) suggesting that the there is no impact due to prior site activities.
- The only detectable result was for total lead at 0.018 mg/L in the duplicate field sample for the shallow groundwater composite group MPE. Total lead was ND in its associated parent field sample. This could be the result of the entrainment of a small amount of sediment containing lead as the turbidity was elevated at several locations of this composite sample. This level of detection was below the NYSDEC TOGS standard of 0.025 mg/L but above its EPA MCL of 0.015 mg/L. The result of the field duplicate comparison does meet EPA Region 2 data validation criteria.
- The reporting limits for a number of the analytes exceeded their respective regulatory limits. The samples were analyzed using standard EPA methods.

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6.0 DEVIATIONS FROM THE SAMPLING ANALYSIS PLAN AND CONCLUSIONS

- A surface water sample could not be collected at the location of SW-02 since the stream was dry.
- Shallow groundwater samples could not be collected at three locations including MP-03, MP-11, MP-16, due to the underlying geology of the adjacent bank and general stream characteristics. This reduced the size of their associated composite groups.
- The sample-specific RLs for Explosives were greater than the project RL of 0.25 µg/L (specified in the SAP) due to differences in extraction volumes. However, the results for Explosives were ND at a level below their respective TOGS and/or MCLs and considered acceptable.
- The laboratory reported "m/p-Xylene" and "o-Xylene" instead of "Total Xylene"; therefore, 52 VOCs are reported rather than 51 compounds as listed in Table 8 of the SAP. The ADR library files were updated accordingly and found in Attachment 6 (on CD) of this report.

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7.0 REFERENCES

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ATTACHMENT 1 TABLES AND FIGURES

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ATTACHMENT 2 FIELD LOGS (ON CD)

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ATTACHMENT 3 ALPHA ANALYTICAL LABORATORIES REPORTS AND ANALYTICAL DATA (ON CD)

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ATTACHMENT 4 VOC TIER –II TYPE DATA VALIDATION REVIEW (ON CD)

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ATTACHMENT 5 FIELD PHOTOS (ON CD)

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ATTACHMENT 6 UPDATED ADR LIBRARY (ON CD)

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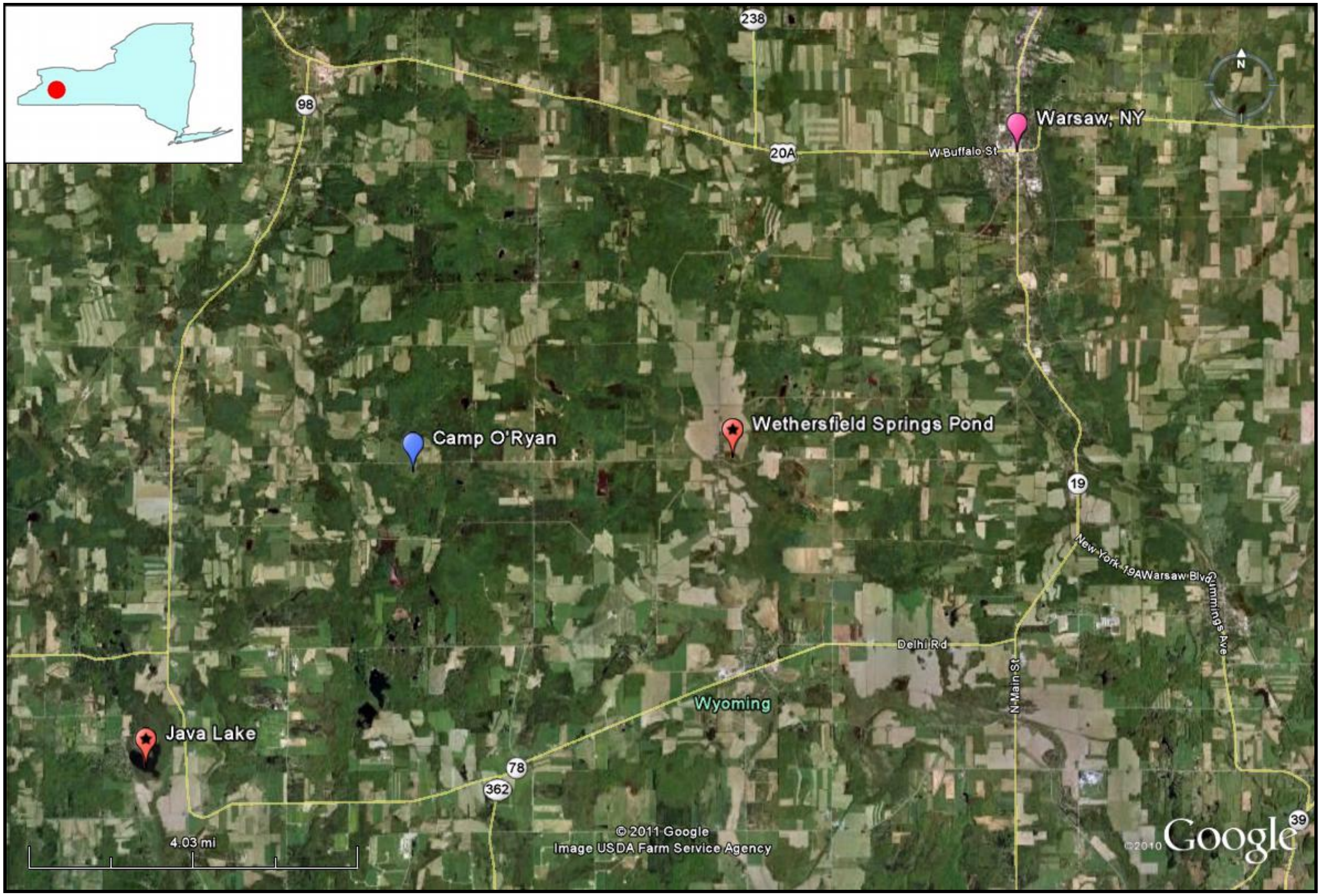


Figure 1. Regional map of Camp O'Ryan, Java Lake, Wethersfield Springs Pond and Warsaw, NY.

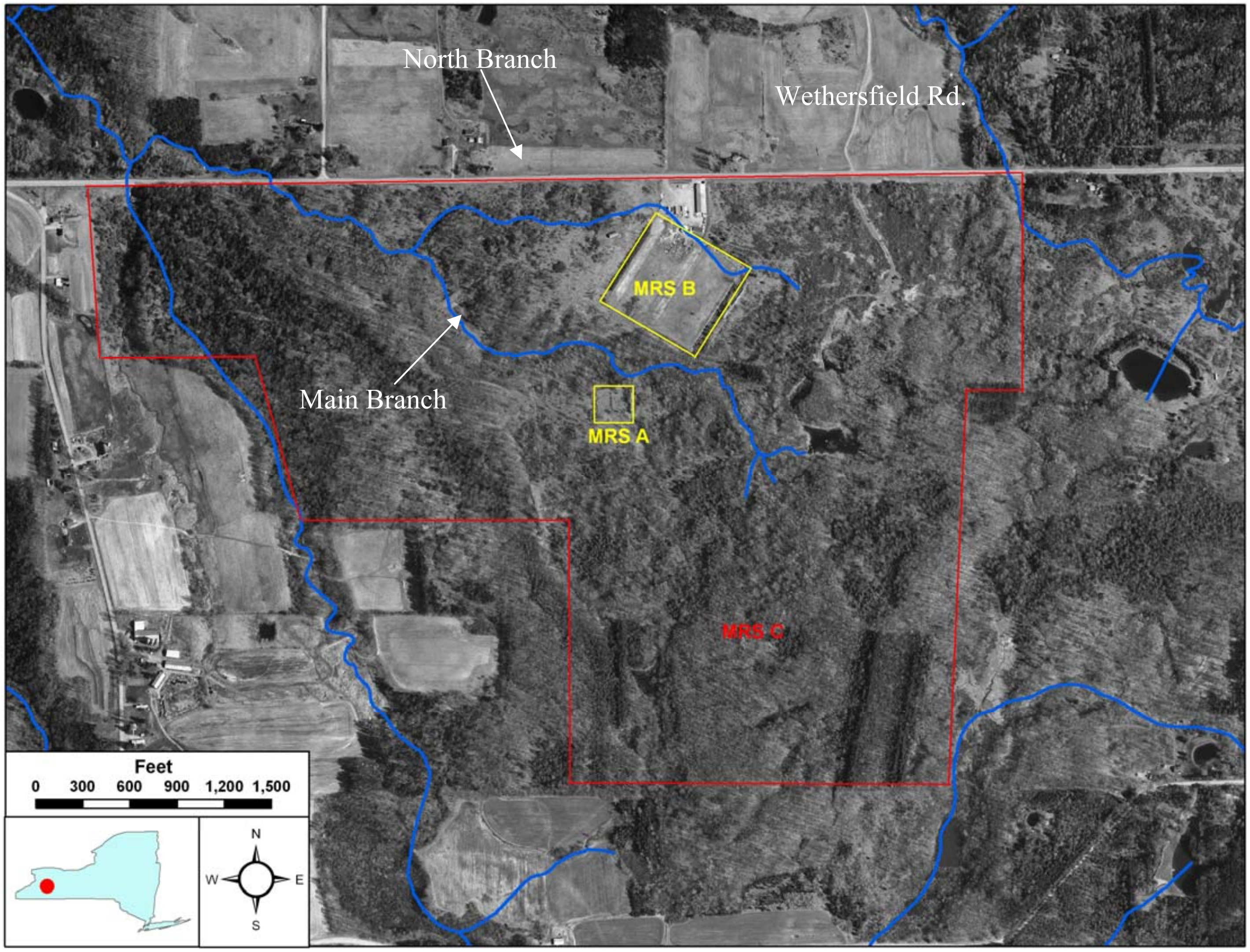


Figure 2. **Former Camp O'Ryan Munitions Response Sites (MRS) A, B and C.**

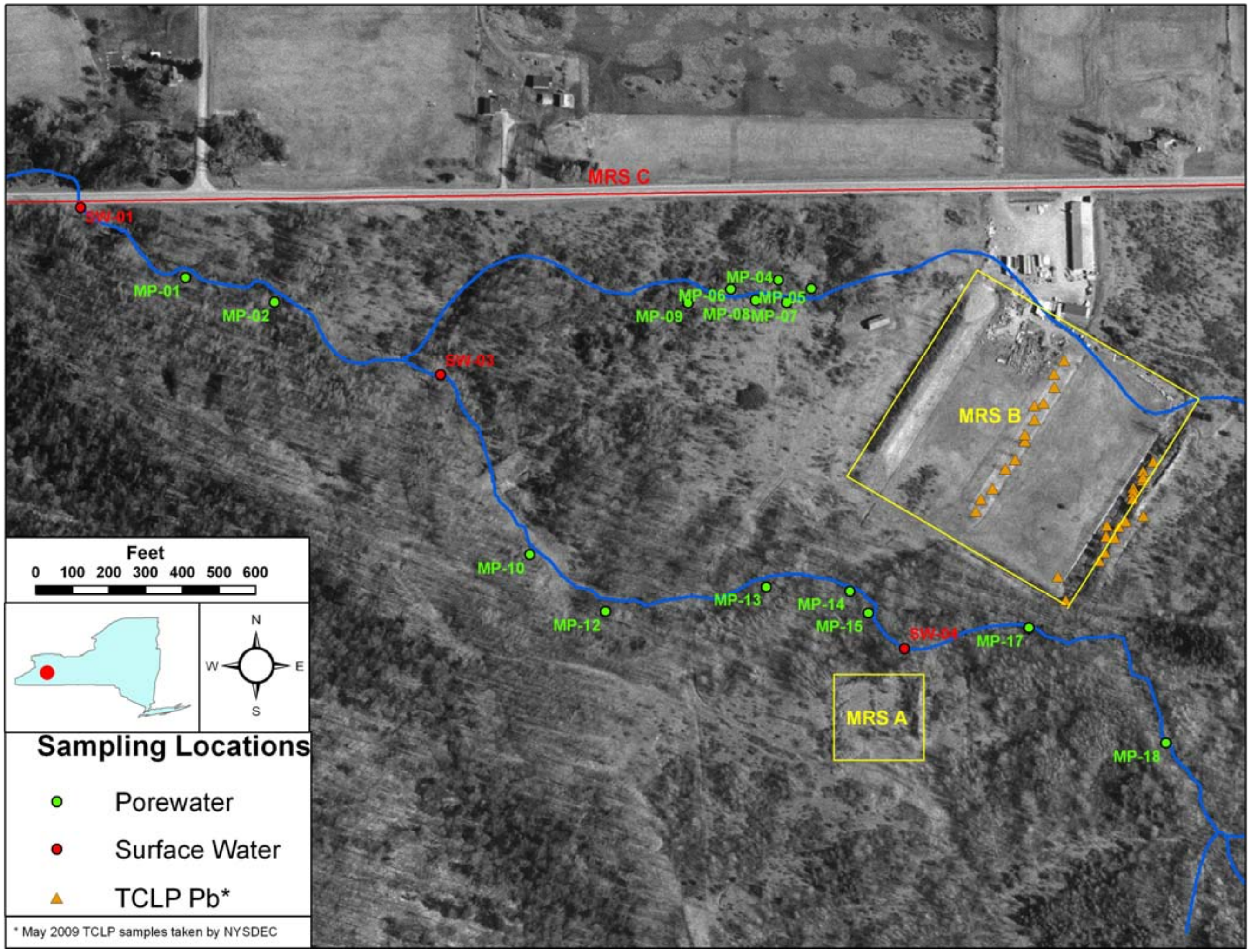


Figure 3. **Sampling locations for the October 2010 surface and pore water samples and the May 2009 TCLP samples taken by NYSDEC.**

Table 1. Summary of field sampling locations, samples, and rationale

ID	Composite Group	Field Measurement		Laboratory Analysis										Rationale
		Flow	*In Situ Data	Explosives (EPA 8330)		Perchlorate (EPA 6850 or 6860)		VOC (EPA 8260)		SVOC (EPA 8270)		Lead (Total/Diss.) (EPA 6010C)		
SW-1	NA	x	x	x	Grab	x	Grab	x	Grab	x	Grab	x	Grab	Confluence of stream reaches/ Camp O'Ryan Boundary
SW-2	NA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	Streambed dry
SW-3	NA	x	x	x	Grab	x	Grab	x	Grab	x	Grab	x	Grab	Down gradient southwest stream reach
SW-4	NA	x	x	x	Grab	x	Grab	x	Grab	x	Grab	x	Grab	Up gradient southwest stream reach
MP-1	A	N/A	x	N/A	N/A	N/A	N/A	x	Grab	x	Comp.	N/A	N/A	Down gradient tank training course
MP-2	A	N/A	x	N/A	N/A	N/A	N/A	x	Grab	x		N/A	N/A	
MP-3	A	NS	NS	NS	NS	NS	NS	NS	NS	NS		NS	NS	
MP-4	B	N/A	x	N/A	N/A	N/A	N/A	x	Grab	x	Comp.	N/A	N/A	Down gradient motor pool
MP-5	B	N/A	x	N/A	N/A	N/A	N/A	x	Grab	x		N/A	N/A	
MP-6	B	N/A	x	N/A	N/A	N/A	N/A	x	Grab	x		N/A	N/A	
MP-7	C	N/A	x	x	Comp.	x	Comp.	N/A	N/A	N/A	N/A	x	Comp.	Down gradient known distance firing line and target line
MP-8	C	N/A	x	x		x		N/A	N/A	N/A	N/A	x		
MP-9	C	N/A	x	x		x		N/A	N/A	N/A	N/A	x		
MP-10	D	N/A	x	x	Comp.	x	Comp.	x	Grab	x	Comp.	x	Comp.	Down gradient possible cylinder burial area
MP-11	D	N/A	NS	NS		NS		NS	NS	NS		NS		
MP-12	D	N/A	x	x		x		x	Grab	x		x		
MP-13	E	N/A	x	x	Comp.	x	Comp.	N/A	N/A	N/A	N/A	x	Comp.	Down gradient pistol range
MP-14	E	N/A	x	x		x		N/A	N/A	N/A	N/A	x		
MP-15	E	N/A	x	x		x		N/A	N/A	N/A	N/A	x		
MP-16	F	N/A	NS	NS	Comp.	NS	Comp.	NS	NS	NS	Comp.	NS	Comp.	Down gradient possible demo pit/rocket range
MP-17	F	N/A	x	x		x		x	Grab	x		x		
MP-18	F	N/A	x	x		x		x	Grab	x		x		
Total	6	4	22	8		8		16		8		8		

NS = not sampled; NA = Not Applicable

Table 2. Weather conditions at North Java during sampling event.

Date in October 2010	Temperature (°F)	Humidity	Sea Level Pressure (in. Hg)	Wind Speed (MPH)	Precipitation (in.)	Conditions
18	47	63	29.98	6	Trace	Overcast; some precipitation overnight
19	49	69	29.89	8	Trace	Mostly Cloudy; brief and light precipitation in the afternoon
20	50	58	29.74	14	0.07	Partly Sunny and windy

Table 3. Sample location field data

Sampling Location ID	Sample Date	Composite Group	Latitude	Longitude	Sample Depth (ft)	Temperature (°C)	Specific Conductance[1] (µS/cm)	pH	ORP[2] (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
Surface Samples											
Standard[3]						**NA**	**NA**	**6.5–8.5**	**NA**	**4**	**NA**
SW-01	10/18/2010	NA	42° 41.068’	78° 17.327’	0.25	7.31	315	6.26	138.3	12.75	1.04
SW-03	10/18/2010	NA	42° 40.992’	78° 17.108’	0.22	8.72	305	7.80	49.0	10.64	5.14
SW-04	10/18/2010	NA	42° 40.868’	78° 16.826’	0.12	8.32	209	7.86	58.3	10.83	6.31
Porewater Samples (shallow groundwater)											
Standard[3]						**NA**	**NA**	**6.5–8.5**	**NA**	**NA**	**5**
MP-01	10/20/2010	A	42° 41.036’	78° 17.263’	0.70	7.62	303	6.97	121.4	1.70	27.6
MP-02	10/20/2010	A	42° 41.025’	78° 17.209’	0.85	9.22	352	6.99	164.4	2.83	4.85
MP-04	10/19/2010	B	42° 41.034’	78° 16.902’	1.68	11.21	553	6.85	195.7	2.42	97.6
MP-05	10/19/2010	B	42° 41.030’	78° 16.882’	0.80	10.52	650	7.06	59.6	8.65	48.5
MP-06	10/19/2010	B	42° 41.030’	78° 16.931’	0.90	10.08	458	7.19	38.5	4.60	3.76
MP-07	10/19/2010	C	42° 41.024’	78° 16.897’	1.03	10.85	579	7.07	110.0	1.75	47.50
MP-08	10/19/2010	C	42° 41.025’	78° 16.916’	0.79	10.61	463	7.13	18.1	2.09	23.80
MP-09	10/19/2010	C	42° 41.024’	78° 16.957’	0.95	9.99	433	6.87	107.1	2.13	44.6
MP-10	10/20/2010	D	42° 40.911’	78° 17.054’	0.67	9.05	268	7.58	145.5	8.87	184.0
MP-12	10/20/2010	D	42° 40.885’	78° 17.008’	0.75	8.98	269	7.03	104.3	1.98	53.5
MP-13	10/20/2010	E	42° 40.896’	78° 16.910’	0.85	9.26	294	6.99	100.0	7.30	3.70
MP-14	10/20/2010	E	42° 40.894’	78° 16.859’	0.92	8.96	284	7.31	141.1	3.10	81.1
MP-15	10/20/2010	E	42° 40.884’	78° 16.848’	0.90	8.38	236	7.23	150.7	8.20	5.49
MP-17	10/20/2010	F	42° 40.877’	78° 16.750’	0.94	7.97	141	7.15	257.6	4.51	13.0
MP-18	10/20/2010	F	42° 40.825’	78° 16.667’	0.72	7.65	114	7.93	354.6	7.10	60.8

Notes:

[1] MicroSiemens per centimeter (µS/cm) at 25°C.

[2] Oxidation-reduction potential (ORP) values have a SHE-correction of 200 mV to correct to Eh.

[3] NYSDEC Standard.

NTU = nephelometric turbidity unit

mg/L = Milligrams per liter

°C = degrees Celsius

pH = hydrogen ion concentration

mV = MilliVolt

NA = Not Applicable

Table 4. Stream dimensions, velocity and calculated flow rate.

Location	Stream width (ft)	Average Stream Depth (ft)	Average Stream Velocity (ft/s)	Stream flow rate (ft^3/s)
SW-01	3.0	0.50	0.61	0.55
SW-03	3.9	0.45	0.24	0.25
SW-04	3.2	0.25	0.10	0.03

Table 5-1
Shallow Groundwater Sample Results

Camp O'Ryan,
Wethersfield, NY

				Location Name	MPC		MPD		MPE		MPE		MPF	
				Sample ID	CO-MPC-1010		CO-MPD-1010		CO-MPE-1010		CO-MPE-1010-B		CO-MPF-1010	
				Sample Date	10/19/2010		10/20/2010		10/20/2010		10/20/2010		10/20/2010	
				QC Code	FS		FS		FS		FD		FS	
Parameter Name	**CAS #**	**NYS TOGS (Class GA)**	**EPA MCL**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Explosives by Method 8330														
1,3,5-TRINITROBENZENE	99-35-4	5^a		µg/L	0.275	U	0.338	U	0.301	U	0.305	U	0.278	U
1,3-DINITROBENZENE	99-65-0	5^a		µg/L	0.275	U	0.338	U	0.301	U	0.305	U	0.278	U
2,4,6-TRINITROTOLUENE	118-96-7	5^a		µg/L	0.275	U	0.338	U	0.301	U	0.305	U	0.278	U
2,4-DINITROTOLUENE	121-14-2	5^a		µg/L	0.275	U	0.338	U	0.301	U	0.305	U	0.278	U
2,6-DINITROTOLUENE	606-20-2	5^a		µg/L	0.275	U	0.338	U	0.301	U	0.305	U	0.278	U
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	NS		µg/L	0.275	U	0.338	U	0.301	U	0.305	U	0.278	U
2-NITROTOLUENE	88-72-2	5^a		µg/L	0.275	U	0.338	U	0.301	U	0.305	U	0.278	U
3-NITROTOLUENE	99-08-1	5^a		µg/L	0.275	U	0.338	U	0.301	U	0.305	U	0.278	U
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	NS		µg/L	0.275	U	0.338	U	0.301	U	0.305	U	0.278	U
4-NITROTOLUENE	99-99-0	5^a		µg/L	0.275	U	0.338	U	0.301	U	0.305	U	0.278	U
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	121-82-4	NR		µg/L	0.275	U	0.338	U	0.301	U	0.305	U	0.278	U
METHYL-2,4,6-TRINITROPHENYLNITRAMINE	479-45-8	NS		µg/L	0.275	UJ	0.338	UJ	0.301	UJ	0.305	UJ	0.278	UJ
NITROBENZENE	98-95-3	0.4^a		µg/L	0.275	U	0.338	U	0.301	U	0.305	U	0.278	U
OCTAHYDRO-TETRANITRO-1,3,5,7-TETRAZOCINE	2691-41-0	NS		µg/L	0.275	U	0.338	U	0.301	U	0.305	U	0.278	U
Total & Dissolved Lead by Method 6010B														
Total Lead	7439-92-1	0.025^a	0.015	mg/L	0.010	U	0.010	U	0.010	U	0.018		0.010	U
Dissolved Lead	7439-92-1	0.025^a	0.015	mg/L	0.010	U	0.010	U	0.010	U	0.010	U	0.010	U
Perchlorate by Method 332														
Perchlorate	14797-73-0	NS	NS	µg/L	0.050	U	0.050	U	0.050	U	0.050	U	0.050	U

Notes

a - NYS TOGS 1.1.1 Table 1 Standard for groundwater class (GA) for source of drinking water type H(WS) (from: NYS Ambient Water Quality Standards and Guidance Values, June 1998)

b - NYS TOGS 1.1.1 Table 1 Guidance value for groundwater class (GA) for source of drinking water type H(WS) (from: NYS Ambient Water Quality Standards and Guidance Values, June 1998)

Shading indicates that the highlighted NYS TOGS and/or EPA MCL is exceeded

bold font indicates that the Reporting limit (RL) is greater than the associated regulatory standard (NYS TOGS and/or EPA MCL)

MCL = Maximum Contaminant Level. EPA National Primary Drinking Water Regulations, May 2009.

U = compound not detected; the associated value is the sample-specific reporting limit

UJ = compound not detected at an estimated reporting limit; the associated value is the sample-specific reporting limit; see the ADR and data validation report for details

J = result is an estimated value; see the ADR and data validation report for details

NS = No Standard. No applicable NYS TOGS regulatory standard or guidance value or EPA MCL available. Not listed in NYS Ambient Water Quality Standards & Guidance Values (TOGS 1998).

NR = Not Regulated. Listed in Table 3 of TOGS (NYS 1998) indicating that the compound is not regulated in groundwater.

Table 5-1
Shallow Groundwater Sample Results

Camp O'Ryan
Wethersfield, NY

				Location Name	MPA		MPA		MPB		MPD		MPF	
				Sample ID	CO-MPA-1010		CO-MPA-1010-B		CO-MPB-1010		CO-MPD-1010		CO-MPF-1010	
				Sample Date	10/20/2010		10/20/2010		10/19/2010		10/20/2010		10/20/2010	
				QC Code	FS		FD		FS		FS		FS	
Parameter Name	**CAS #**	**NYS TOGS (Class GA)**	**EPA MCL**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs by Method 8270C														
1,2,4,5-TETRACHLOROBENZENE	95-94-3	**5**[a]		µg/L	**20**	**U**	**20**	**U**	**20**	**U**	**20**	**UJ**	**20**	**U**
2,4,5-TRICHLOROPHENOL	95-95-4	NS		µg/L	5	U	5	U	5	U	5	UJ	5	U
2,4,6-TRICHLOROPHENOL	88-06-2	NS		µg/L	5	U	5	U	5	U	5	UJ	5	U
2,4-DICHLOROPHENOL	120-83-2	**5**[a]		µg/L	**10**	**U**	**10**	**U**	**10**	**U**	**10**	**UJ**	**10**	**U**
2,4-DIMETHYLPHENOL	105-67-9	50[b]		µg/L		R		R		R		R		R
2,4-DINITROPHENOL	51-28-5	**10**[b]		µg/L	**30**	**U**	**30**	**U**	**30**	**U**	**30**	**U**	**30**	**U**
2,4-DINITROTOLUENE	121-14-2	5[a]		µg/L	5	U	5	U	5	U	5	UJ	5	U
2,6-DINITROTOLUENE	606-20-2	5[a]		µg/L	5	U	5	U	5	U	5	UJ	5	U
2-CHLORONAPHTHALENE	91-58-7	NS		µg/L	5	U	5	U	5	U	5	UJ	5	U
2-CHLOROPHENOL	95-57-8	NS		µg/L	5	U	5	U	5	U	5	UJ	5	U
2-METHYLNAPHTHALENE	91-57-6	NR		µg/L	5	U	5	U	5	U	5	UJ	5	U
2-METHYLPHENOL	95-48-7	NS		µg/L	5	U	5	U	5	UJ	5	UJ	5	UJ
2-NITROANILINE	88-74-4	5[a]		µg/L	5	U	5	U	5	U	5	UJ	5	U
2-NITROPHENOL	88-75-5	NS		µg/L	10	U	10	U	10	U	10	UJ	10	U
3,3'-DICHLOROBENZIDINE	91-94-1	**5**[a]		µg/L	**50**	**U**	**50**	**U**	**50**	**UJ**	**50**	**U**	**50**	**U**
3-NITROANILINE	99-09-2	5[a]		µg/L	5	U	5	U	5	U	5	U	5	U
4,6-DINITRO-2-METHYLPHENOL	534-52-1	NS		µg/L	20	U	20	U	20	U	20	UJ	20	U
4-BROMOPHENYL-PHENYLETHER	101-55-3	NR		µg/L	5	U	5	U	5	U	5	UJ	5	U
4-CHLORO-3-METHYLPHENOL	59-50-7	NS		µg/L	5	U	5	U	5	U	5	UJ	5	U
4-CHLOROANILINE	106-47-8	5[a]		µg/L	5	U	5	U	5	UJ	5	UJ	5	UJ
4-CHLOROPHENYL-PHENYLETHER	7005-72-3	NR		µg/L	5	U	5	U	5	U	5	UJ	5	U
4-METHYLPHENOL	106-44-5	NS		µg/L	5	U	5	U	5	UJ	5	UJ	5	UJ
4-NITROANILINE	100-01-6	5[a]		µg/L	5	U	5	U	5	U	5	U	5	U
4-NITROPHENOL	100-02-7	NS		µg/L	10	U	10	U	10	U	10	UJ	10	U
ACENAPHTHENE	83-32-9	NS		µg/L	5	U	5	U	5	U	5	UJ	5	U
ACENAPHTHYLENE	208-96-8	NR		µg/L	5	U	5	U	5	U	5	UJ	5	U
ACETOPHENONE	98-86-2	NR		µg/L	20	U	20	U	20	U	20	UJ	20	U
ANTHRACENE	120-12-7	50[b]		µg/L	5	U	5	U	5	U	5	UJ	5	U
ATRAZINE	1912-24-9	7.5[a]	**3**	µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**
BENZALDEHYDE	100-52-7	NR		µg/L	5	U	5	U	5	U	5	U	5	U
BENZO(A)ANTHRACENE	56-55-3	**0.002**[b]		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**UJ**	**5**	**U**
BENZO(A)PYRENE	50-32-8	ND	**0.2**	µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**UJ**	**5**	**U**
BENZO(B)FLUORANTHENE	205-99-2	**0.002**[b]		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**
BENZO(G,H,I)PERYLENE	191-24-2	NR		µg/L	5	U	5	U	5	U	5	UJ	5	U
BENZO(K)FLUORANTHENE	207-08-9	**0.002**[b]		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**UJ**	**5**	**U**
BIPHENYL	92-52-4	5[a]		µg/L	5	U	5	U	5	U	5	UJ	5	U

Table 5-1
Shallow Groundwater Sample Results

Camp O'Ryan
Wethersfield, NY

Location Name					MPA		MPA		MPB		MPD		MPF	
Sample ID					CO-MPA-1010		CO-MPA-1010-B		CO-MPB-1010		CO-MPD-1010		CO-MPF-1010	
Sample Date					10/20/2010		10/20/2010		10/19/2010		10/20/2010		10/20/2010	
QC Code					FS		FD		FS		FS		FS	
Parameter Name	**CAS #**	**NYS TOGS (Class GA)**	**EPA MCL**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs by Method 8270C (Continued)														
BIS(2-CHLOROETHOXY)METHANE	111-91-1	5[a]		µg/L	5	U	5	U	5	U	5	UJ	5	U
BIS(2-CHLOROETHYL) ETHER	111-44-4	**1[a]**		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**UJ**	**5**	**U**
BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	5[a]		µg/L	5	U	5	U	5	U	5	UJ	5	UJ
BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	5[a]	6	µg/L	5	U	5	U	5	U	5	UJ	5	U
BUTYLBENZYL PHTHALATE	85-68-7	50[b]		µg/L	5	U	5	U	5	U	5	UJ	5	U
CAPROLACTAM	105-60-2	NR		µg/L	5	U	5	U	5	U	5	U	5	U
CARBAZOLE	86-74-8	NR		µg/L	5	U	5	U	5	U	5	UJ	5	U
CHRYSENE	218-01-9	**0.002[b]**		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**
DIBENZO(A,H)ANTHRACENE	53-70-3	NR		µg/L	5	U	5	U	5	U	5	UJ	5	U
DIBENZOFURAN	132-64-9	NR		µg/L	5	U	5	U	5	U	5	UJ	5	U
DIETHYL PHTHALATE	84-66-2	50[b]		µg/L	5	U	5	U	5	U	5	UJ	5	U
DIMETHYL PHTHALATE	131-11-3	50[b]		µg/L	5	U	5	U	5	U	5	UJ	5	U
DI-N-BUTYL PHTHALATE	84-74-2	50[a]		µg/L	5	U	5	U	5	U	5	UJ	5	U
DI-N-OCTYL PHTHALATE	117-84-0	50[b]		µg/L	5	U	5	U	5	U	5	UJ	5	U
FLUORANTHENE	206-44-0	50[b]		µg/L	5	U	5	U	5	U	5	UJ	5	U
FLUORENE	86-73-7	50[b]		µg/L	5	U	5	U	5	U	5	UJ	5	U
HEXACHLOROBENZENE	118-74-1	**0.04[a]**	**1**	µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**UJ**	**5**	**U**
HEXACHLOROBUTADIENE	87-68-3	**0.5[a]**		µg/L	**10**	**U**	**10**	**U**	**10**	**U**	**10**	**UJ**	**10**	**UJ**
HEXACHLOROCYCLOPENTADIENE	77-47-4	**5[a]**	50	µg/L	**30**	**U**	**30**	**U**	**30**	**U**	**30**	**U**	**30**	**U**
HEXACHLOROETHANE	67-72-1	5[a]		µg/L	5	U	5	U	5	U	5	UJ	5	UJ
INDENO(1,2,3-CD)PYRENE	193-39-5	**0.002[b]**		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**UJ**	**5**	**U**
ISOPHORONE	78-59-1	50[b]		µg/L	5	U	5	U	5	U	5	UJ	5	U
NAPHTHALENE	91-20-3	NS		µg/L	5	U	5	U	5	U	5	UJ	5	U
NITROBENZENE	98-95-3	**0.4[a]**		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**UJ**	**5**	**U**
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	NR		µg/L	5	U	5	U	5	U	5	UJ	5	U
N-NITROSODIPHENYLAMINE	86-30-6	50[b]		µg/L	5	U	5	U	5	U	5	UJ	5	U
PENTACHLOROPHENOL	87-86-5	NS	**1**	µg/L	**10**	**U**	**10**	**U**	**10**	**U**	**10**	**UJ**	**10**	**U**
PHENANTHRENE	85-01-8	50[b]		µg/L	5	U	5	U	5	U	5	UJ	5	U
PHENOL	108-95-2	NS		µg/L	5	U	5	U	5	U	5	UJ	5	UJ
PYRENE	129-00-0	50[b]		µg/L	5	U	5	U	5	U	5	UJ	5	U

Notes

a - NYS TOGS 1.1.1 Table 1 Standard for groundwater class (GA) for source of drinking water type H(WS) (from: NYS Ambient Water Quality Standards and Guidance Values, June 1998)

b - NYS TOGS 1.1.1 Table 1 Guidance value for groundwater class (GA) for source of drinking water type H(WS) (from: NYS Ambient Water Quality Standards and Guidance Values, June 1998)

Shading indicates that the highlighted NYS TOGS and/or EPA MCL is exceeded

bold font indicates that the Reporting limit (RL) is greater than the associated regulatory standard (NYS TOGS and/or EPA MCL)

ND = Non-Detect; as standard value from TOGS 1.1.1 Table 1

NS = No Standard. No applicable NYS TOGS regulatory standard or guidance value or EPA MCL available. Not listed in NYS Ambient Water Quality Standards & Guidance Values (TOGS 1998).

NR = Not Regulated. Listed in Table 3 of TOGS (NYS 1998) indicating that the compound is not regulated in groundwater.

MCL = Maximum Contaminant Level. EPA National Primary Drinking Water Regulations, May 2009.

U = compound not detected; the associated value is the sample-specific reporting limit

UJ = compound not detected at an estimated reporting limit; the associated value is the sample-specific reporting limit; see the ADR and data validation report for details

J = result is an estimated value; see the ADR and data validation report for details

R = result is rejected due to severe QC exceedance and is not usable for project decisions; see the ADR and data validation report for details.

Table 5-1
Shallow Groundwater Sample Results

Camp O'Ryan
Wethersfield, NY

				Location Name	MP-01		MP-02		MP-02		MP-04		MP-05		MP-06	
				Sample ID	CO-MP01-1010		CO-MP02-1010		CO-MP02-1010-B		CO-MP04-1010		CO-MP05-1010		CO-MP06-1010	
				Sample Date	10/20/2010		10/20/2010		10/20/2010		10/19/2010		10/19/2010		10/19/2010	
				QC Code	FS		FS		FD		FS		FS		FS	
Parameter Name	**CAS #**	**NYS TOGS (Class GA)**	**EPA MCL**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs by Method 8260																
1,1,1-TRICHLOROETHANE	71-55-6	5[a]	200	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2,2-TETRACHLOROETHANE	79-34-5	5[a]		µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-TRICHLOROETHANE	79-00-5	1[a]	5	µg/L	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
1,1-DICHLOROETHANE	75-34-3	5[a]		µg/L	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
1,1-DICHLOROETHENE	75-35-4	5[a]	7	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2,3-TRICHLOROBENZENE	87-61-6	5[a]		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
1,2,4-TRICHLOROBENZENE	120-82-1	5[a]	70	µg/L	2	U	2	U	2	U	2	U	2	U	2	U
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	**0.04[a]**	**0.2**	µg/L	**2**	**U**	**2**	**U**	**2**	**U**	**2**	**U**	**2**	**U**	**2**	**U**
1,2-DIBROMOETHANE	106-93-4	**0.0006[a]**		µg/L	**2**	**U**	**2**	**U**	**2**	**U**	**2**	**U**	**2**	**U**	**2**	**U**
1,2-DICHLOROBENZENE	95-50-1	3[a]		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
1,2-DICHLOROETHANE	107-06-2	0.6[a]	5	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROPROPANE	78-87-5	**1[a]**	5	µg/L	**1.8**	**U**	**1.8**	**U**	**1.8**	**U**	**1.8**	**U**	**1.8**	**U**	**1.8**	**U**
1,3-DICHLOROBENZENE	541-73-1	3[a]		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
1,4-DICHLOROBENZENE	106-46-7	3[a]		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
1,4-DIOXANE	123-91-1	NR		µg/L	250	U	250	U	250	U	250	U	250	U	250	U
2-BUTANONE	78-93-3	50[b]		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
2-HEXANONE	591-78-6	50[b]		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
4-METHYL-2-PENTANONE	108-10-1	NR		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
ACETONE	67-64-1	50[b]		µg/L	5	U	5	U	5	U	5	U	5	U	5	U
BENZENE	71-43-2	1[a]	5	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
BROMOCHLOROMETHANE	74-97-5	5[a]		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
BROMODICHLOROMETHANE	75-27-4	50[b]		µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
BROMOFORM	75-25-2	50[b]		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
BROMOMETHANE	74-83-9	5[a]		µg/L	1	UJ	1	UJ	1	UJ	1	UJ	1	UJ	1	UJ
CARBON DISULFIDE	75-15-0	NR		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
CARBON TETRACHLORIDE	56-23-5	5[a]	5	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROBENZENE	108-90-7	5[a]	100	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROETHANE	75-00-3	5[a,c]		µg/L	1	U	1	U	1	U	1	U	1	U	1	U
CHLOROFORM	67-66-3	7[a]		µg/L	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
CHLOROMETHANE	74-87-3	5[a]		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
CIS-1,2-DICHLOROETHENE	156-59-2	5[a]	70	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
CIS-1,3-DICHLOROPROPENE	10061-01-5	**0.4[a,c]**		µg/L	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
CYCLOHEXANE	110-82-7	NS		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
DIBROMOCHLOROMETHANE	124-48-1	50[b]		µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
DICHLORODIFLUOROMETHANE	75-71-8	5[a]		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
ETHYLBENZENE	100-41-4	5[a]	700	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

Table 5-1
Shallow Groundwater Sample Results

Camp O'Ryan
Wethersfield, NY

				Location Name	MP-01		MP-02		MP-02		MP-04		MP-05		MP-06	
				Sample ID	CO-MP01-1010		CO-MP02-1010		CO-MP02-1010-B		CO-MP04-1010		CO-MP05-1010		CO-MP06-1010	
				Sample Date	10/20/2010		10/20/2010		10/20/2010		10/19/2010		10/19/2010		10/19/2010	
				QC Code	FS		FS		FD		FS		FS		FS	
Parameter Name	**CAS #**	**NYS TOGS (Class GA)**	**EPA MCL**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs by Method 8260 (Continued)																
FREON 113	76-13-1	5^a		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
ISOPROPYLBENZENE	98-82-8	5^a		µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
m,p-Xylene[e]	108-38-3 /106-42-3	5^a	10000^d	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
METHYL ACETATE	79-20-9	NR		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
METHYL TERT-BUTYL ETHER	1634-04-4	NR		µg/L	1	U	1	U	1	U	1	U	1	U	1	U
METHYLCYCLOHEXANE	108-87-2	NS		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
METHYLENE CHLORIDE	75-09-2	5^a		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
O-XYLENE	95-47-6	5^a	10000^d	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
STYRENE	100-42-5	5^a	100	µg/L	1	U	1	U	1	U	1	U	1	U	1	U
TETRACHLOROETHENE	127-18-4	5^a	5	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
TOLUENE	108-88-3	5^a	1000	µg/L	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
TRANS-1,2-DICHLOROETHENE	156-60-5	5^a	100	µg/L	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
TRANS-1,3-DICHLOROPROPENE	10061-02-6	**$0.4^{a,c}$**		µg/L	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
TRICHLOROETHENE	79-01-6	5^a	5	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
TRICHLOROFLUOROMETHANE	75-69-4	5^a		µg/L	2	U	2	U	2	U	2	U	2	U	2	U
VINYL CHLORIDE	75-01-4	2^a	2	µg/L	1	U	1	U	1	U	1	U	1	U	1	U

Notes

a - NYS TOGS 1.1.1 Table 1 Standard for groundwater class (GA) for source of drinking water type H(WS) (from: NYS Ambient Water Quality Standards and Guidance Values, June 1998)

b - NYS TOGS 1.1.1 Table 1 Guidance value for groundwater class (GA) for source of drinking water type H(WS) (from: NYS Ambient Water Quality Standards and Guidance Values, June 1998)

c - standard value applies to sum of cis- and trans-1,3-dichloropropene

d - MCL applies to sum of total xylenes

e - based on 'p-' and 'm-' xylenes

Shading indicates that the highlighted NYS TOGS and/or EPA MCL is exceeded

bold font indicates that the Reporting limit (RL) is greater than the associated regulatory standard (NYS TOGS and/or EPA MCL)

NS = No Standard. No applicable NYS TOGS regulatory standard or guidance value or EPA MCL available. Not listed in NYS Ambient Water Quality Standards & Guidance Values (TOGS 1998).

NR = Not Regulated. Listed in Table 3 of TOGS (NYS 1998) indicating that the compound is not regulated in groundwater.

MCL = Maximum Contaminant Level. EPA National Primary Drinking Water Regulations, May 2009.

U = compound not detected; the associated value is the sample-specific reporting limit

J = result is an estimated value; see the ADR and data validation report for details

UJ = compound not detected at an estimated reporting limit; the associated value is the sample-specific reporting limit; see the ADR and data validation report for details

Table 5-1
Shallow Groundwater Sample Results

Camp O'Ryan
Wethersfield, NY

				Location Name	MP-10		MP-12		MP-17		MP-18		MP-18	
				Sample ID	CO-MP10-1010		CO-MP12-1010		CO-MP17-1010		CO-MP18-1010		CO-MP18-1010-B	
				Sample Date	10/20/2010		10/20/2010		10/20/2010		10/20/2010		10/20/2010	
				QC Code	FS		FS		FS		FS		FD	
Parameter Name	**CAS #**	**NYS TOGS (Class GA)**	**EPA MCL**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs by Method 8260														
1,1,1-TRICHLOROETHANE	71-55-6	5^{a}	200	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2,2-TETRACHLOROETHANE	79-34-5	5^{a}		µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2-TRICHLOROETHANE	79-00-5	1^{a}	5	µg/L	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
1,1-DICHLOROETHANE	75-34-3	5^{a}		µg/L	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
1,1-DICHLOROETHENE	75-35-4	5^{a}	7	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2,3-TRICHLOROBENZENE	87-61-6	5^{a}		µg/L	2	U	2	U	2	U	2	U	2	U
1,2,4-TRICHLOROBENZENE	120-82-1	5^{a}	70	µg/L	2	U	2	U	2	U	2	U	2	U
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	**0.04^{a}**	**0.2**	µg/L	**2**	**U**	**2**	**U**	**2**	**U**	**2**	**U**	**2**	**U**
1,2-DIBROMOETHANE	106-93-4	**0.0006^{a}**		µg/L	**2**	**U**	**2**	**U**	**2**	**U**	**2**	**U**	**2**	**U**
1,2-DICHLOROBENZENE	95-50-1	3^{a}		µg/L	2	U	2	U	2	U	2	U	2	U
1,2-DICHLOROETHANE	107-06-2	0.6^{a}	5	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROPROPANE	78-87-5	**1^{a}**	5	µg/L	**1.8**	**U**	**1.8**	**U**	**1.8**	**U**	**1.8**	**U**	**1.8**	**U**
1,3-DICHLOROBENZENE	541-73-1	3^{a}		µg/L	2	U	2	U	2	U	2	U	2	U
1,4-DICHLOROBENZENE	106-46-7	3^{a}		µg/L	2	U	2	U	2	U	2	U	2	U
1,4-DIOXANE	123-91-1	NR		µg/L	250	U	250	U	250	U	250	U	250	U
2-BUTANONE	78-93-3	50^{b}		µg/L	2	U	2	U	2	U	2	U	2	U
2-HEXANONE	591-78-6	50^{b}		µg/L	2	U	2	U	2	U	2	U	2	U
4-METHYL-2-PENTANONE	108-10-1	NR		µg/L	2	U	2	U	2	U	2	U	2	U
ACETONE	67-64-1	50^{b}		µg/L	5	U	5	U	5	U	5	U	5	U
BENZENE	71-43-2	1^{a}	5	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
BROMOCHLOROMETHANE	74-97-5	5^{a}		µg/L	2	U	2	U	2	U	2	U	2	U
BROMODICHLOROMETHANE	75-27-4	50^{b}		µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
BROMOFORM	75-25-2	50^{b}		µg/L	2	U	2	U	2	U	2	U	2	U
BROMOMETHANE	74-83-9	5^{a}		µg/L	1	UJ	1	U	1	U	1	U	1	U
CARBON DISULFIDE	75-15-0	NR		µg/L	2	U	2	U	2	U	2	U	2	U
CARBON TETRACHLORIDE	56-23-5	5^{a}	5	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROBENZENE	108-90-7	5^{a}	100	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROETHANE	75-00-3	$5^{a,c}$		µg/L	1	U	1	U	1	U	1	U	1	U
CHLOROFORM	67-66-3	7^{a}		µg/L	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
CHLOROMETHANE	74-87-3	5^{a}		µg/L	2	U	2	U	2	U	2	U	2	U
CIS-1,2-DICHLOROETHENE	156-59-2	5^{a}	70	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
CIS-1,3-DICHLOROPROPENE	10061-01-5	**$0.4^{a,c}$**		µg/L	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
CYCLOHEXANE	110-82-7	NS		µg/L	2	U	2	U	2	U	2	U	2	U
DIBROMOCHLOROMETHANE	124-48-1	50^{b}		µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
DICHLORODIFLUOROMETHANE	75-71-8	5^{a}		µg/L	2	U	2	U	2	U	2	U	2	U
ETHYLBENZENE	100-41-4	5^{a}	700	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

Table 5-1
Shallow Groundwater Sample Results

Camp O'Ryan
Wethersfield, NY

				Location Name	MP-10		MP-12		MP-17		MP-18		MP-18	
				Sample ID	CO-MP10-1010		CO-MP12-1010		CO-MP17-1010		CO-MP18-1010		CO-MP18-1010-B	
				Sample Date	10/20/2010		10/20/2010		10/20/2010		10/20/2010		10/20/2010	
				QC Code	FS		FS		FS		FS		FD	
Parameter Name	**CAS #**	**NYS TOGS (Class GA)**	**EPA MCL**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs by Method 8260 (Continued)														
FREON 113	76-13-1	5^{a}		µg/L	2	U	2	U	2	U	2	U	2	U
ISOPROPYLBENZENE	98-82-8	5^{a}		µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
m,p-Xylene[e]	108-38-3 /106-42-3	5^{a}	10000^{d}	µg/L	1	U	1	U	1	U	1	U	1	U
METHYL ACETATE	79-20-9	NR		µg/L	2	U	2	U	2	U	2	U	2	U
METHYL TERT-BUTYL ETHER	1634-04-4	NR		µg/L	1	U	1	U	1	U	1	U	1	U
METHYLCYCLOHEXANE	108-87-2	NS		µg/L	2	U	2	U	2	U	2	U	2	U
METHYLENE CHLORIDE	75-09-2	5^{a}		µg/L	2	U	2	U	2	U	2	U	2	U
O-XYLENE	95-47-6	5^{a}	10000^{d}	µg/L	1	U	1	U	1	U	1	U	1	U
STYRENE	100-42-5	5^{a}	100	µg/L	1	U	1	U	1	U	1	U	1	U
TETRACHLOROETHENE	127-18-4	5^{a}	5	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
TOLUENE	108-88-3	5^{a}	1000	µg/L	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
TRANS-1,2-DICHLOROETHENE	156-60-5	5^{a}	100	µg/L	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
TRANS-1,3-DICHLOROPROPENE	10061-02-6	$\mathbf{0.4}^{a,c}$		µg/L	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
TRICHLOROETHENE	79-01-6	5^{a}	5	µg/L	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
TRICHLOROFLUOROMETHANE	75-69-4	5^{a}		µg/L	2	U	2	U	2	U	2	U	2	U
VINYL CHLORIDE	75-01-4	2^{a}	2	µg/L	1	U	1	U	1	U	1	U	1	U

Notes

a - NYS TOGS 1.1.1 Table 1 Standard for groundwater class (GA) for source of drinking water type H(WS) (from:

b - NYS TOGS 1.1.1 Table 1 Guidance value for groundwater class (GA) for source of drinking water type H(WS)

c - standard value applies to sum of cis- and trans-1,3-dichloropropene

d - MCL applies to sum of total xylenes

e - based on 'p-' and 'm-' xylenes

Shading indicates that the highlighted NYS TOGS and/or EPA MCL is exceeded

bold font indicates that the Reporting limit (RL) is greater than the associated regulatory standard (NYS T

NS = No Standard. No applicable NYS TOGS regulatory standard or guidance value or EPA MCL available. Not

NR = Not Regulated. Listed in Table 3 of TOGS (NYS 1998) indicating that the compound is not regulated in grou

MCL = Maximum Contaminant Level. EPA National Primary Drinking Water Regulations, May 2009.

U = compound not detected; the associated value is the sample-specific reporting limit

J = result is an estimated value; see the ADR and data validation report for details

UJ = compound not detected at an estimated reporting limit; the associated value is the sample-specific reporting

Table 5-2
Surface Water
Sample Results

Camp O'Ryan,
Wethersfield, NY

				Location Name	SW01		SW03		SW03		SW04	
				Sample ID	CO-SW01-1010		CO-SW03-1010		CO-SW03-1010-B		CO-SW04-1010	
				Sample Date	10/18/2010		10/18/2010		10/18/2010		10/18/2010	
				QC Code	FS		FD		FD		FS	
Parameter Name	**CAS #**	**NYS TOGS (Class A)**	**EPA MCL**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Explosives by Method 8330												
1,3,5-TRINITROBENZENE	99-35-4	5[b]		µg/L	0.287	U	0.291	U	0.281	U	0.291	U
1,3-DINITROBENZENE	99-65-0	5[b]		µg/L	0.287	U	0.291	U	0.281	U	0.291	U
2,4,6-TRINITROTOLUENE	118-96-7	5[b]		µg/L	0.287	U	0.291	U	0.281	U	0.291	U
2,4-DINITROTOLUENE	121-14-2	5[b]		µg/L	0.287	U	0.291	U	0.281	U	0.291	U
2,6-DINITROTOLUENE	606-20-2	**0.07[b]**		µg/L	**0.287**	**U**	**0.291**	**U**	**0.281**	**U**	**0.291**	**U**
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	NS		µg/L	0.287	U	0.291	U	0.281	U	0.291	U
2-NITROTOLUENE	88-72-2	5[b]		µg/L	0.287	U	0.291	U	0.281	U	0.291	U
3-NITROTOLUENE	99-08-1	5[b]		µg/L	0.287	U	0.291	U	0.281	U	0.291	U
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	NS		µg/L	0.287	U	0.291	U	0.281	U	0.291	U
4-NITROTOLUENE	99-99-0	5[a]		µg/L	0.287	U	0.291	U	0.281	U	0.291	U
HEXAHYDRO-1,3,5-TRINITRO-1,3,5-TRIAZINE	121-82-4	NS		µg/L	0.287	U	0.291	U	0.281	U	0.291	U
METHYL-2,4,6-TRINITROPHENYLNITRAMINE	479-45-8	NS		µg/L	0.287	UJ	0.291	UJ	0.281	UJ	0.291	UJ
NITROBENZENE	98-95-3	0.4[a]		µg/L	0.287	U	0.291	U	0.281	U	0.291	U
OCTAHYDRO-TETRANITRO-1,3,5,7-TETRAZOCINE	2691-41-0	NS		µg/L	0.287	U	0.291	U	0.281	U	0.291	U
Total & Dissolved Lead by Method 6010B												
Total Lead	7439-92-1	0.050[a]	0.015	mg/L	0.010	U	0.010	U	0.010	U	0.010	U
Dissolved Lead	7439-92-1	0.050[a]	0.015	mg/L	0.010	U	0.010	U	0.010	U	0.010	U
Perchlorate by Method 332												
Perchlorate	14797-73-0	NS	NS	µg/L	0.050	U	0.050	U	0.050	U	0.050	U

Notes

a - NYS TOGS 1.1.1 Table 1 Standard for surface water class (A) for source of drinking water type H(WS) (from: NYS Ambient Water Quality Standards and Guidance Values, June 1998)

b - NYS TOGS 1.1.1 Table 1 Guidance value for water class (A) for source of drinking water type H(WS) (from: NYS Ambient Water Quality Standards and Guidance Values, June 1998)

Shading indicates that the highlighted NYS TOGS and/or EPA MCL is exceeded

bold font indicates that the Reporting limit (RL) is greater than the associated regulatory standard (NYS TOGS and/or EPA MCL)

MCL = Maximum Contaminant Level. EPA National Primary Drinking Water Regulations, May 2009.

U = compound not detected; the associated value is the sample-specific reporting limit

J = result is an estimated value; see the ADR and data validation report for details

UJ = compound not detected at an estimated reporting limit; the associated value is the sample-specific reporting limit; see the ADR and data validation report for details

NS = No Standard. No applicable NYS TOGS regulatory standard or guidance value or EPA MCL available. Not listed in NYS Ambient Water Quality Standards & Guidance Values (TOGS 1998).

Note that there are no EPA MCLs for any for any other compounds

Table 5-2
Surface Water
Sample Results

Camp O'Ryan
Wethersfield, NY

				Location Name	SW01		SW03		SW03		SW04	
				Sample ID	CO-SW01-1010		CO-SW03-1010		CO-SW03-1010-B		CO-SW04-1010	
				Sample Date	10/18/2010		10/18/2010		10/18/2010		10/18/2010	
				QC Code	FS		FS		FD		FS	
Parameter Name	**CAS #**	**NYS TOGS Class (A)**	**EPA MCL**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs by Method 8270C												
1,2,4,5-TETRACHLOROBENZENE	95-94-3	**5^b**		µg/L	**20**	**U**	**20**	**U**	**20**	**U**	**20**	**U**
2,4,5-TRICHLOROPHENOL	95-95-4	NS		µg/L	5	U	5	U	5	U	5	U
2,4,6-TRICHLOROPHENOL	88-06-2	NS		µg/L	5	U	5	U	5	U	5	U
2,4-DICHLOROPHENOL	120-83-2	**5^b**		µg/L	**10**	**U**	**10**	**U**	**10**	**U**	**10**	**U**
2,4-DIMETHYLPHENOL	105-67-9	50^b		µg/L		R		R		R		R
2,4-DINITROPHENOL	51-28-5	**10^b**		µg/L	**30**	**U**	**30**	**U**	**30**	**U**	**30**	**U**
2,4-DINITROTOLUENE	121-14-2	5^b		µg/L	5	U	5	U	5	U	5	U
2,6-DINITROTOLUENE	606-20-2	**0.07^b**		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**
2-CHLORONAPHTHALENE	91-58-7	NS		µg/L	5	U	5	U	5	U	5	U
2-CHLOROPHENOL	95-57-8	NS		µg/L	5	U	5	U	5	U	5	U
2-METHYLNAPHTHALENE	91-57-6	NS		µg/L	5	U	5	U	5	U	5	U
2-METHYLPHENOL	95-48-7	NS		µg/L	5	UJ	5	U	5	U	5	U
2-NITROANILINE	88-74-4	5^b		µg/L	5	U	5	U	5	U	5	U
2-NITROPHENOL	88-75-5	NS		µg/L	10	U	10	U	10	U	10	U
3,3'-DICHLOROBENZIDINE	91-94-1	**5^b**		µg/L	**50**	**UJ**	**50**	**U**	**50**	**U**	**50**	**U**
3-NITROANILINE	99-09-2	5^b		µg/L	5	U	5	U	5	U	5	U
4,6-DINITRO-2-METHYLPHENOL	534-52-1	NS		µg/L	20	U	20	U	20	U	20	U
4-BROMOPHENYL-PHENYLETHER	101-55-3	NS		µg/L	5	U	5	U	5	U	5	U
4-CHLORO-3-METHYLPHENOL	59-50-7	NS		µg/L	5	U	5	U	5	U	5	U
4-CHLOROANILINE	106-47-8	5^b		µg/L	5	UJ	5	U	5	U	5	U
4-CHLOROPHENYL-PHENYLETHER	7005-72-3	NS		µg/L	5	U	5	U	5	U	5	U
4-METHYLPHENOL	106-44-5	NS		µg/L	5	UJ	5	U	5	U	5	U
4-NITROANILINE	100-01-6	5^b		µg/L	5	U	5	U	5	U	5	U
4-NITROPHENOL	100-02-7	NS		µg/L	10	U	10	U	10	U	10	U
ACENAPHTHENE	83-32-9	NS		µg/L	5	U	5	U	5	U	5	U
ACENAPHTHYLENE	208-96-8	NS		µg/L	5	U	5	U	5	U	5	U
ACETOPHENONE	98-86-2	NS		µg/L	20	U	20	U	20	U	20	U
ANTHRACENE	120-12-7	50^b		µg/L	5	U	5	U	5	U	5	U
ATRAZINE	1912-24-9	**3^b**	**3**	µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**
BENZALDEHYDE	100-52-7	NS		µg/L	5	U	5	U	5	U	5	U
BENZO(A)ANTHRACENE	56-55-3	**0.002^b**		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**
BENZO(A)PYRENE	50-32-8	**0.002^b**	**0.2**	µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**
BENZO(B)FLUORANTHENE	205-99-2	**0.002^b**		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**
BENZO(G,H,I)PERYLENE	191-24-2	NS		µg/L	5	U	5	U	5	U	5	U
BENZO(K)FLUORANTHENE	207-08-9	**0.002^b**		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**
BIPHENYL	92-52-4	5^b		µg/L	5	U	5	U	5	U	5	U

Table 5-2
Surface Water
Sample Results

Camp O'Ryan
Wethersfield, NY

				Location Name	SW01		SW03		SW03		SW04	
				Sample ID	CO-SW01-1010		CO-SW03-1010		CO-SW03-1010-B		CO-SW04-1010	
				Sample Date	10/18/2010		10/18/2010		10/18/2010		10/18/2010	
				QC Code	FS		FS		FD		FS	
Parameter Name	**CAS #**	**NYS TOGS Class (A)**	**EPA MCL**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
SVOCs by Method 8270C (Continued)												
BIS(2-CHLOROETHOXY)METHANE	111-91-1	5^b		µg/L	5	U	5	U	5	U	5	U
BIS(2-CHLOROETHYL) ETHER	111-44-4	**0.03^b**		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**
BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	5^b		µg/L	5	U	5	U	5	U	5	U
BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	5^a	6	µg/L	5	U	5	U	5	U	5	U
BUTYLBENZYL PHTHALATE	85-68-7	50^b		µg/L	5	U	5	U	5	U	5	U
CAPROLACTAM	105-60-2	NS		µg/L	5	U	5	U	5	U	5	U
CARBAZOLE	86-74-8	NS		µg/L	5	U	5	U	5	U	5	U
CHRYSENE	218-01-9	**0.002^b**		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**
DIBENZO(A,H)ANTHRACENE	53-70-3	NS		µg/L	5	U	5	U	5	U	5	U
DIBENZOFURAN	132-64-9	NS		µg/L	5	U	5	U	5	U	5	U
DIETHYL PHTHALATE	84-66-2	50^b		µg/L	5	U	5	U	5	U	5	U
DIMETHYL PHTHALATE	131-11-3	50^b		µg/L	5	U	5	U	5	U	5	U
DI-N-BUTYL PHTHALATE	84-74-2	50^b		µg/L	5	U	5	U	5	U	5	U
DI-N-OCTYL PHTHALATE	117-84-0	50^b		µg/L	5	U	5	U	5	U	5	U
FLUORANTHENE	206-44-0	50^b		µg/L	5	U	5	U	5	U	5	U
FLUORENE	86-73-7	50^b		µg/L	5	U	5	U	5	U	5	U
HEXACHLOROBENZENE	118-74-1	**0.04^a**	**1**	µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**
HEXACHLOROBUTADIENE	87-68-3	**0.5^a**		µg/L	**10**	**U**	**10**	**U**	**10**	**U**	**10**	**U**
HEXACHLOROCYCLOPENTADIENE	77-47-4	**5^b**	50	µg/L	**30**	**U**	**30**	**U**	**30**	**U**	**30**	**U**
HEXACHLOROETHANE	67-72-1	5^a		µg/L	5	U	5	U	5	U	5	U
INDENO(1,2,3-CD)PYRENE	193-39-5	**0.002^b**		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**
ISOPHORONE	78-59-1	50^b		µg/L	5	U	5	U	5	U	5	U
NAPHTHALENE	91-20-3	NS		µg/L	5	U	5	U	5	U	5	U
NITROBENZENE	98-95-3	**0.4^a**		µg/L	**5**	**U**	**5**	**U**	**5**	**U**	**5**	**U**
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	NS		µg/L	5	U	5	U	5	U	5	U
N-NITROSODIPHENYLAMINE	86-30-6	50^b		µg/L	5	U	5	U	5	U	5	U
PENTACHLOROPHENOL	87-86-5	NS	**1**	µg/L	**10**	**U**	**10**	**U**	**10**	**U**	**10**	**U**
PHENANTHRENE	85-01-8	50^b		µg/L	5	U	5	U	5	U	5	U
PHENOL	108-95-2	NS		µg/L	5	U	5	U	5	U	5	U
PYRENE	129-00-0	50^b		µg/L	5	U	5	U	5	U	5	U

Notes

a - NYS TOGS 1.1.1 Table 1 Standard for water class (A) for source of drinking water type H(WS) (from: NYS Ambient Water Quality Standards and Guidance Values, June 1998)

b - NYS TOGS 1.1.1 Table 1 Guidance value for water class (A) for source of drinking water type H(WS) (from: NYS Ambient Water Quality Standards and Guidance Values, June 1998)

Shading indicates that the highlighted NYS TOGS and/or EPA MCL is exceeded

bold font indicates that the Reporting limit (RL) is greater than the associated regulatory standard (NYS TOGS and/or EPA MCL)

ND = Non-Detect; as standard value from TOGS 1.1.1 Table 1

NS = No Standard. No applicable NYS TOGS regulatory standard or guidance value or EPA MCL available. Not listed in NYS Ambient Water Quality Standards & Guidance Values (TOGS 1998).

MCL = Maximum Contaminant Level. EPA National Primary Drinking Water Regulations, May 2009.

U = compound not detected; the associated value is the sample-specific reporting limit

UJ = compound not detected at an estimated reporting limit; the associated value is the sample-specific reporting limit; see the ADR and data validation report for details

J = result is an estimated value; see the ADR and data validation report for details

R = result is rejected due to severe QC exceedance and is not usable for project decisions; see the ADR and data validation report for details.

Table 5-2
Surface Water
Sample Results

Camp O'Ryan
Wethersfield, NY

				Location Name	SW-01		SW-03		SW-03		SW-04	
				Sample ID	CO-SW01-1010		CO-SW03-1010		CO-SW03-1010-B		CO-SW04-1010-B	
				Sample Date	10/18/2010		10/18/2010		10/18/2010		10/18/2010	
				QC Code	FS		FS		FD		FS	
Parameter Name	**CAS #**	**NYS TOGS (Class A)**	**EPA MCL**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs by Method 8260												
1,1,1-TRICHLOROETHANE	71-55-6	5^a	200	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
1,1,2,2-TETRACHLOROETHANE	79-34-5	**0.2^b**		µg/L	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
1,1,2-TRICHLOROETHANE	79-00-5	1^a	5	µg/L	0.75	U	0.75	U	0.75	U	0.75	U
1,1-DICHLOROETHANE	75-34-3	5^a		µg/L	0.75	U	0.75	U	0.75	U	0.75	U
1,1-DICHLOROETHENE	75-35-4	0.7^b	7	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2,3-TRICHLOROBENZENE	87-61-6	5^b		µg/L	2	U	2	U	2	U	2	U
1,2,4-TRICHLOROBENZENE	120-82-1	5^b	70	µg/L	2	U	2	U	2	U	2	U
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	**0.04^a**	**0.2**	µg/L	**2**	**U**	**2**	**U**	**2**	**U**	**2**	**U**
1,2-DIBROMOETHANE	106-93-4	**0.0006^a**		µg/L	**2**	**U**	**2**	**U**	**2**	**U**	**2**	**U**
1,2-DICHLOROBENZENE	95-50-1	3^a		µg/L	2	U	2	U	2	U	2	U
1,2-DICHLOROETHANE	107-06-2	0.6^a	5	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
1,2-DICHLOROPROPANE	78-87-5	**1^a**	5	µg/L	**1.8**	**U**	**1.8**	**U**	**1.8**	**U**	**1.8**	**U**
1,3-DICHLOROBENZENE	541-73-1	3^a		µg/L	2	U	2	U	2	U	2	U
1,4-DICHLOROBENZENE	106-46-7	3^a		µg/L	2	U	2	U	2	U	2	U
1,4-DIOXANE	123-91-1	NS		µg/L	250	U	250	U	250	U	250	U
2-BUTANONE	78-93-3	50^b		µg/L	2	U	2	U	2	U	2	U
2-HEXANONE	591-78-6	50^b		µg/L	2	U	2	U	2	U	2	U
4-METHYL-2-PENTANONE	108-10-1	NS		µg/L	2	U	2	U	2	U	2	U
ACETONE	67-64-1	50^b		µg/L	5	U	5	U	5	U	5	U
BENZENE	71-43-2	1^a	5	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
BROMOCHLOROMETHANE	74-97-5	5^a		µg/L	2	U	2	U	2	U	2	U
BROMODICHLOROMETHANE	75-27-4	50^b		µg/L	0.5	U	0.5	U	0.5	U	0.5	U
BROMOFORM	75-25-2	50^b		µg/L	2	U	2	U	2	U	2	U
BROMOMETHANE	74-83-9	5^a		µg/L	1	UJ	1	UJ	1	UJ	1	UJ
CARBON DISULFIDE	75-15-0	NS		µg/L	2	U	2	U	2	U	2	U
CARBON TETRACHLORIDE	56-23-5	**0.4^b**	5	µg/L	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
CHLOROBENZENE	108-90-7	5^a	100	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
CHLOROETHANE	75-00-3	5^b		µg/L	1	U	1	U	1	U	1	U
CHLOROFORM	67-66-3	7^a		µg/L	0.75	U	0.75	U	0.75	U	0.75	U
CHLOROMETHANE	74-87-3	5^a		µg/L	2	U	2	U	2	U	2	U
CIS-1,2-DICHLOROETHENE	156-59-2	5^a	70	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
CIS-1,3-DICHLOROPROPENE	10061-01-5	**$0.4^{a,C}$**		µg/L	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
CYCLOHEXANE	110-82-7	NS		µg/L	2	U	2	U	2	U	2	U
DIBROMOCHLOROMETHANE	124-48-1	50^b		µg/L	0.5	U	0.5	U	0.5	U	0.5	U
DICHLORODIFLUOROMETHANE	75-71-8	5^a		µg/L	2	U	2	U	2	U	2	U
ETHYLBENZENE	100-41-4	5^a	700	µg/L	0.5	U	0.5	U	0.5	U	0.5	U

Table 5-2
Surface Water
Sample Results

Camp O'Ryan
Wethersfield, NY

				Location Name	SW-01		SW-03		SW-03		SW-04	
				Sample ID	CO-SW01-1010		CO-SW03-1010		CO-SW03-1010-B		CO-SW04-1010-B	
				Sample Date	10/18/2010		10/18/2010		10/18/2010		10/18/2010	
				QC Code	FS		FS		FD		FS	
Parameter Name	**CAS #**	**NYS TOGS (Class A)**	**EPA MCL**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
VOCs by Method 8260 (Continued)												
FREON 113	76-13-1	5[a]		µg/L	2	U	2	U	2	U	2	U
ISOPROPYLBENZENE	98-82-8	5[b]		µg/L	0.5	U	0.5	U	0.5	U	0.5	U
m,p-Xylene[e]	108-38-3 /106-42-3	5[a]	10000[d]	µg/L	1	U	1	U	1	U	1	U
METHYL ACETATE	79-20-9	NS		µg/L	2	U	2	U	2	U	2	U
METHYL TERT-BUTYL ETHER	1634-04-4	NS		µg/L	1	U	1	U	1	U	1	U
METHYLCYCLOHEXANE	108-87-2	NS		µg/L	2	U	2	U	2	U	2	U
METHYLENE CHLORIDE	75-09-2	5[a]		µg/L	2	U	2	U	2	U	2	U
O-XYLENE	95-47-6	5[a]	10000[d]	µg/L	1	U	1	U	1	U	1	U
STYRENE	100-42-5	5[b]	100	µg/L	1	U	1	U	1	U	1	U
TETRACHLOROETHENE	127-18-4	0.7[b]	5	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
TOLUENE	108-88-3	5[a]	1000	µg/L	0.75	U	0.75	U	0.75	U	0.75	U
TRANS-1,2-DICHLOROETHENE	156-60-5	5[a]	100	µg/L	0.75	U	0.75	U	0.75	U	0.75	U
TRANS-1,3-DICHLOROPROPENE	10061-02-6	**0.4**[a,C]		µg/L	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**	**0.5**	**U**
TRICHLOROETHENE	79-01-6	5[a]	5	µg/L	0.5	U	0.5	U	0.5	U	0.5	U
TRICHLOROFLUOROMETHANE	75-69-4	5[a]		µg/L	2	U	2	U	2	U	2	U
VINYL CHLORIDE	75-01-4	**0.3**[b]	2	µg/L	**1**	**U**	**1**	**U**	**1**	**U**	**1**	**U**

Notes

a - NYS TOGS 1.1.1 Table 1 Standard for water class (A) for source of drinking water type H(WS) (from: NYS Ambient Water Quality Standards and Guidance Values, June 1998)

b - NYS TOGS 1.1.1 Table 1 Guidance value for water class (A) for source of drinking water type H(WS) (from: NYS Ambient Water Quality Standards and Guidance Values, June 1998)

c - standard value applies to sum of cis- and trans-1,3-dichloropropene

d - MCL applies to sum of total xylenes

e - based on 'p-' and 'm-' xylenes

Shading indicates that the highlighted NYS TOGS and/or EPA MCL is exceeded

bold font indicates that the Reporting limit (RL) is greater than the associated regulatory standard (NYS TOGS and/or EPA MCL)

NS = No Standard. No applicable NYS TOGS regulatory standard or guidance value or EPA MCL available. Not listed in NYS Ambient Water Quality Standards & Guidance Values (TOGS 1998).

MCL = Maximum Contaminant Level. EPA National Primary Drinking Water Regulations, May 2009.

U = compound not detected; the associated value is the sample-specific reporting limit

J = result is an estimated value; see the ADR and data validation report for details

UJ = compound not detected at an estimated reporting limit; the associated value is the sample-specific reporting limit; see the ADR and data validation report for details

Health and Safety Plan Pre-Entry Briefing Attendance Form
Former Camp O'Ryan
Wethersfield, NY

Conducted by:	Nick Heley Greza	**Date Performed:**	10/18/10
Topics Discussed:	1. Review of the content of the HASP (Required)		
	2. Review of potential unexploded ordnance hazards		
	3. Slips, Trips, Falls		
	4.		

Printed Name	Signature	Representing
Mitchell Buck	Mitchell Buck	WHG
David Bailey		WHG
NICK HELEG GREZA		USACE

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/18/10
LOCATION ID: SW-01
ACTIVITY TIME: START 1100 END 1200
BOTTLE TIME: 1131

SURFACE WATER DATA

WATER DEPTH AT LOCATION: surface FT
DEPTH OF SAMPLE: 0 FT

WATER QUALITY PARAMETERS:

TEMPERATURE	7.31	°C
SPEC. COND.	0.315	mS/cm
PH	6.26	Units
ORP	138.3	mV
DO	12.75	mg/L
TURBIDITY	1.04	NTUs
SALINITY	NA	%

EQUIPMENT USED:
☐ BEAKER
☐ PUSHPOINT SAMPLER
☐ PERISTALTIC PUMP
☒ FILTER/ NUMBER 0.2/0.45
☒ OTHER syringe

TYPE OF SURFACE WATER:
☒ STREAM/ RIVER
☐ LAKE/ POND
☐ SEEP
☐ ______

DECON FLUIDS USED:
☐ DI WATER
☐ POTABLE WATER
☐ LIQUINOX
☐ ISOPROPYL ALCOHOL
☒ All disposed

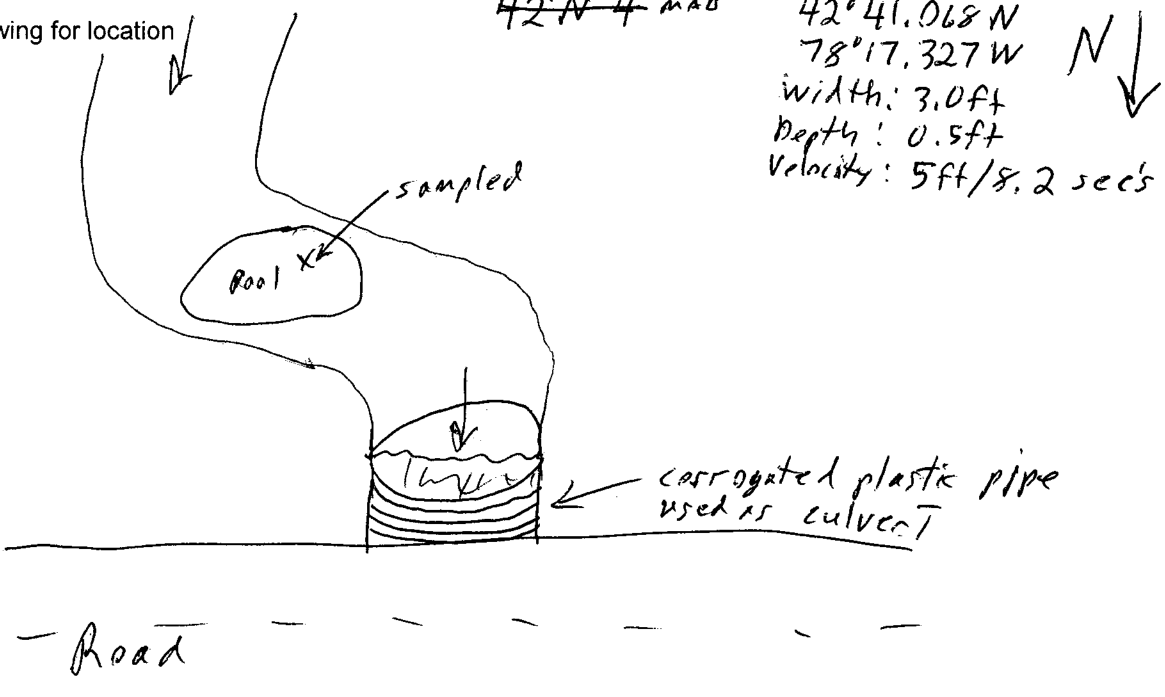
ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☒	Explosives	8330	none	2 x 1-L Amber Bottles	☒	MS/MSD
☒	SVOCs	8270C	none	2 x 1-L Amber Bottles	☒	
☒	VOCs	8260B	HCL	3 x 40-ml Vials	☒	
☒	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☒	
☒	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☒	

Drawing for location

~~42°N 4~~ MAB

42°41.068 N
78°17.327 W
width: 3.0ft
Depth: 0.5ft
Velocity: 5ft/8.2 sec's



Notes:
sampled upstream of culverT. Dip sampled Exp. & SVOC's. Used syringe on resT.

SIGNATURE:

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/18/10
LOCATION ID: SW-03
ACTIVITY TIME: START 1325 END 1345
BOTTLE TIME: 1330

SURFACE WATER DATA

WATER DEPTH AT LOCATION: Surface FT
DEPTH OF SAMPLE: 0 FT

WATER QUALITY PARAMETERS:		EQUIPMENT USED:	TYPE OF SURFACE WATER:	DECON FLUIDS USED:
TEMPERATURE	8.72 °C	☐ BEAKER	☒ STREAM/ RIVER	☐ DI WATER
SPEC. COND.	0.305 mS/cm	☐ PUSHPOINT SAMPLER	☐ LAKE/ POND	☐ POTABLE WATER
PH	7.80 Units	☐ PERISTALTIC PUMP	☐ SEEP	☐ LIQUINOX
ORP	49 mV	☒ FILTER/ NUMBER 0.2/0.45		☐ ISOPROPYL ALCOHOL
DO	10.64 mg/L	☒ OTHER syringe	☐	☒ All disposed
TURBIDITY	5.14 NTUs			
SALINITY	NA %			

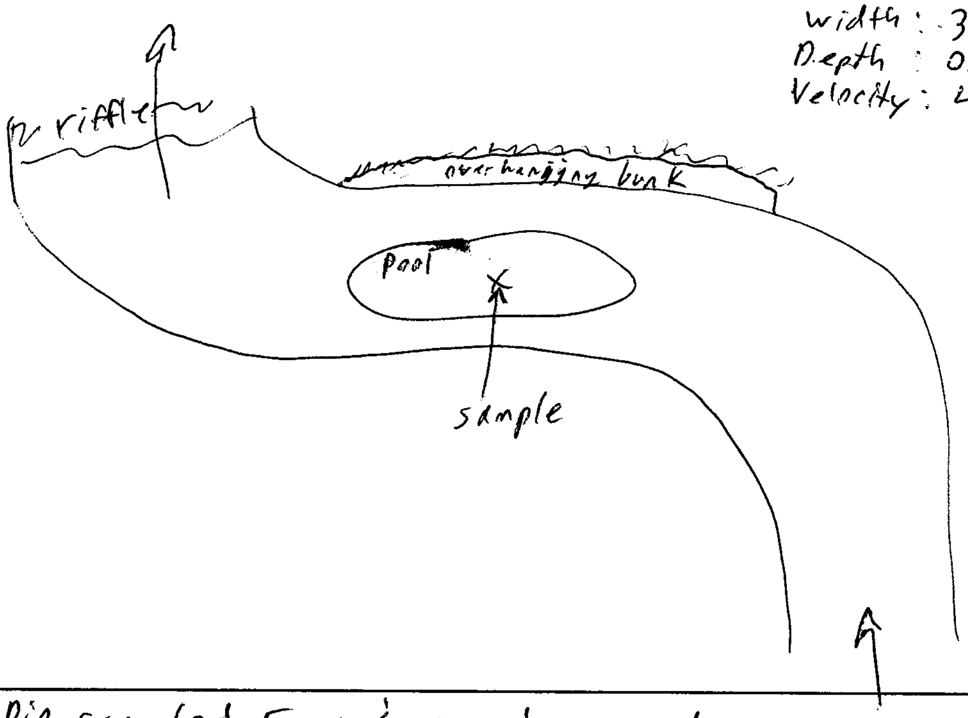
ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☒	Explosives	8330	none	2 x 1-L Amber Bottles	☒	Dup
☒	SVOCs	8270C	none	2 x 1-L Amber Bottles	☒	↓
☒	VOCs	8260B	HCL	3 x 40-ml Vials	☒	
☒	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☒	
☒	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☒	

Drawing for location

42° 40.192 N
78° 17.108 W
width : 3.9 ft
Depth : 0.45 ft
Velocity : 4.23 sec/1 ft

N ↑



Notes: Dip sampled Exp. & SVOC's, used syringe on rest.

SIGNATURE: Mitchell Beck

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/18/10
LOCATION ID: SW-04
ACTIVITY TIME: START 1520 END 1545
BOTTLE TIME: 1525

SURFACE WATER DATA

WATER DEPTH AT LOCATION: surface FT
DEPTH OF SAMPLE: 0 FT

WATER QUALITY PARAMETERS:

TEMPERATURE	8.32	°C
SPEC. COND.	0.209	mS/cm
PH	7.86	Units
ORP	58.3	mV
DO	10.83	mg/L
TURBIDITY	6.31	NTUs
SALINITY	NA	%

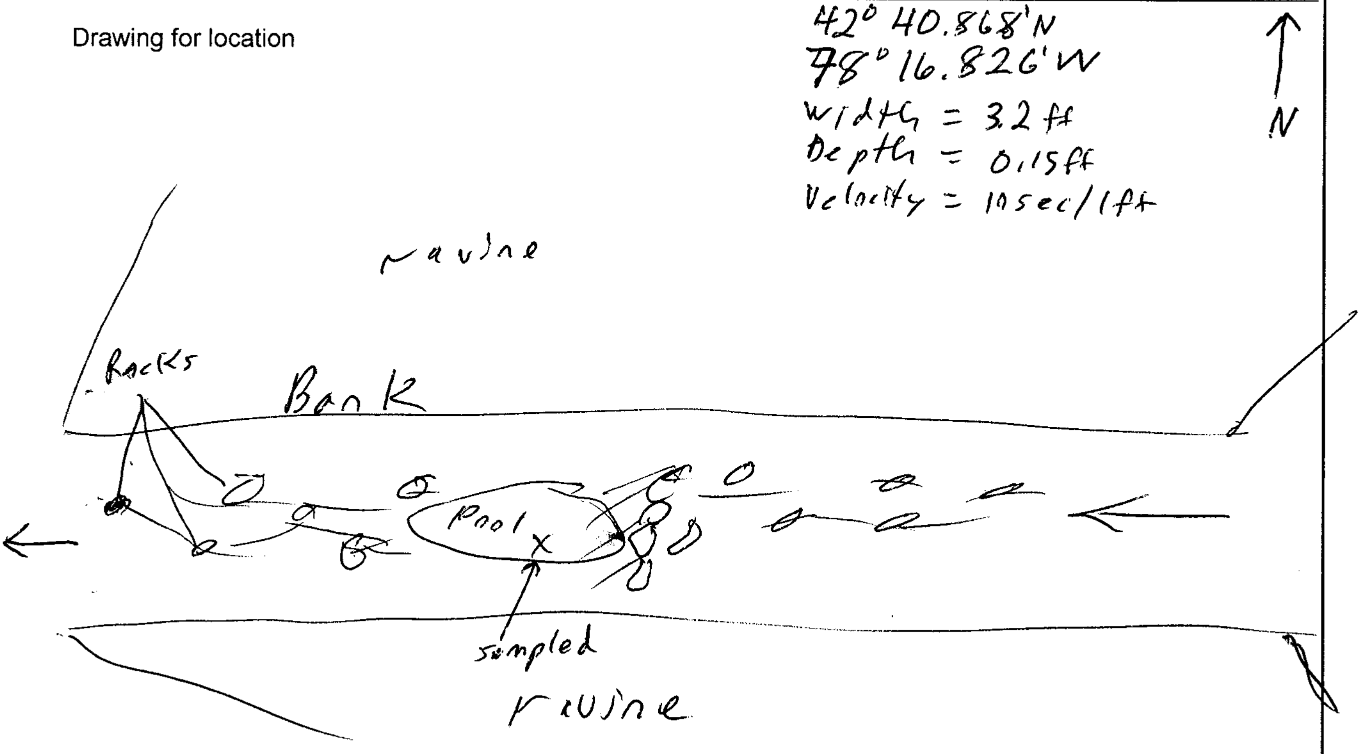
EQUIPMENT USED:	TYPE OF SURFACE WATER:	DECON FLUIDS USED:
☐ BEAKER	☒ STREAM/ RIVER	☐ DI WATER
☐ PUSHPOINT SAMPLER	☐ LAKE/ POND	☐ POTABLE WATER
☐ PERISTALTIC PUMP	☐ SEEP	☐ LIQUINOX
☒ FILTER/ NUMBER 0.2/0.45		☐ ISOPROPYL ALCOHOL
☒ OTHER syringe	☐ ____	☐ All Disposed

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☒	Explosives	8330	none	2 x 1-L Amber Bottles	☒	
☒	SVOCs	8270C	none	2 x 1-L Amber Bottles	☒	
☒	VOCs	8260B	HCL	3 x 40-ml Vials	☒	
☒	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☒	
☒	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☒	

Drawing for location

42° 40.868'N
78° 16.826'W
width = 3.2 ft
Depth = 0.15ft
Velocity = 10sec/1ft



Notes:
creek is small/narrow/shallow portion between banks covered with rocks & leaves. Moved downstream from coordinates to find suitable location. Dip sampled Exp. & SVOC's, and used syringe on rest.

SIGNATURE: M Mitchell

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/20/10
LOCATION ID: MP-01
ACTIVITY TIME: START 1750 END 1810
BOTTLE TIME: 1805

SURFACE WATER DATA

WATER DEPTH AT LOCATION: 0.7 FT
DEPTH OF SAMPLE: 0.7 FT

WATER QUALITY PARAMETERS:		After
TEMPERATURE	7.62 °C	7.49
SPEC. COND.	0.303 mS/cm	0.306
PH	6.97 Units	7.39
ORP	121.4 mV	96.7
DO	1.70 mg/L	1.25
TURBIDITY	27.6 NTUs	29.9
SALINITY	NA %	

EQUIPMENT USED:
☐ BEAKER
☒ PUSHPOINT SAMPLER
☒ PERISTALTIC PUMP
☐ FILTER/ NUMBER ____
☐ OTHER

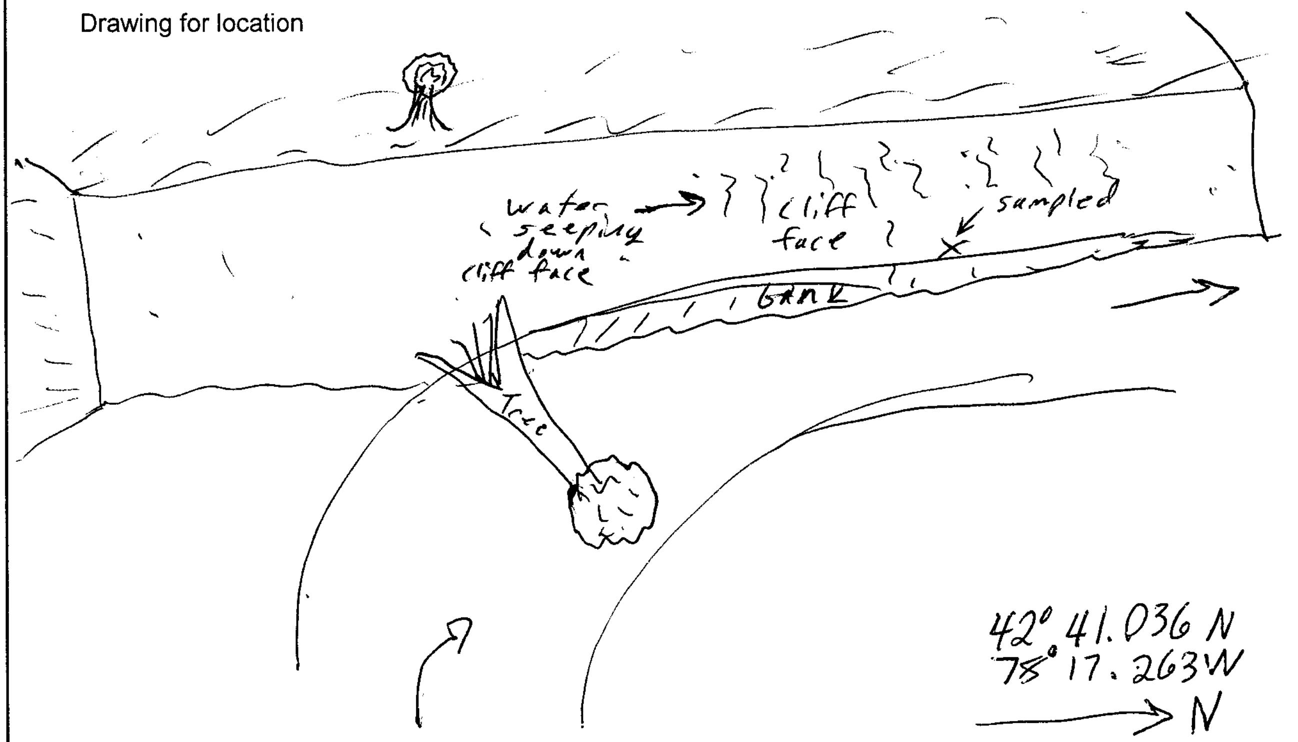
TYPE OF SURFACE WATER:
☐ STREAM/ RIVER
☐ LAKE/ POND
☒ SEEP
☐ ____

DECON FLUIDS USED:
☒ DI WATER
☒ POTABLE WATER
☒ LIQUINOX
☒ ISOPROPYL ALCOHOL
☒ ____

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☐	Explosives	8330	none	2 x 1-L Amber Bottles	☐	
☒	SVOCs	8270C	none	2 x 1-L Amber Bottles	☒	Dup
☒	VOCs	8260B	HCL	3 x 40-ml Vials	☒	
☐	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☐	
☐	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☐	

Drawing for location



Notes: Composite Group A. Sampled base of Cliff face which had obvious seep. Cliff composed hard compact clay. Sampled about 2 foot from bank

SIGNATURE:

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/20/10
LOCATION ID: MP-02
ACTIVITY TIME: START 1720 END 1745
BOTTLE TIME: 1730

SURFACE WATER DATA

WATER DEPTH AT LOCATION: 0.85 FT
DEPTH OF SAMPLE: 0.85 FT

WATER QUALITY PARAMETERS:		After
TEMPERATURE	9.22 °C	9.03
SPEC. COND.	0.352 mS/cm	0.343
PH	6.99 Units	6.73
ORP	164.4 mV	145.4
DO	2.83 mg/L	2.26
TURBIDITY	4.85 NTUs	13.3
SALINITY	NA %	

EQUIPMENT USED:
- ☐ BEAKER
- ☒ PUSHPOINT SAMPLER
- ☒ PERISTALTIC PUMP
- ☐ FILTER/ NUMBER ____
- ☐ OTHER

TYPE OF SURFACE WATER:
- ☐ STREAM/ RIVER
- ☐ LAKE/ POND
- ☒ SEEP
- ☐ ____

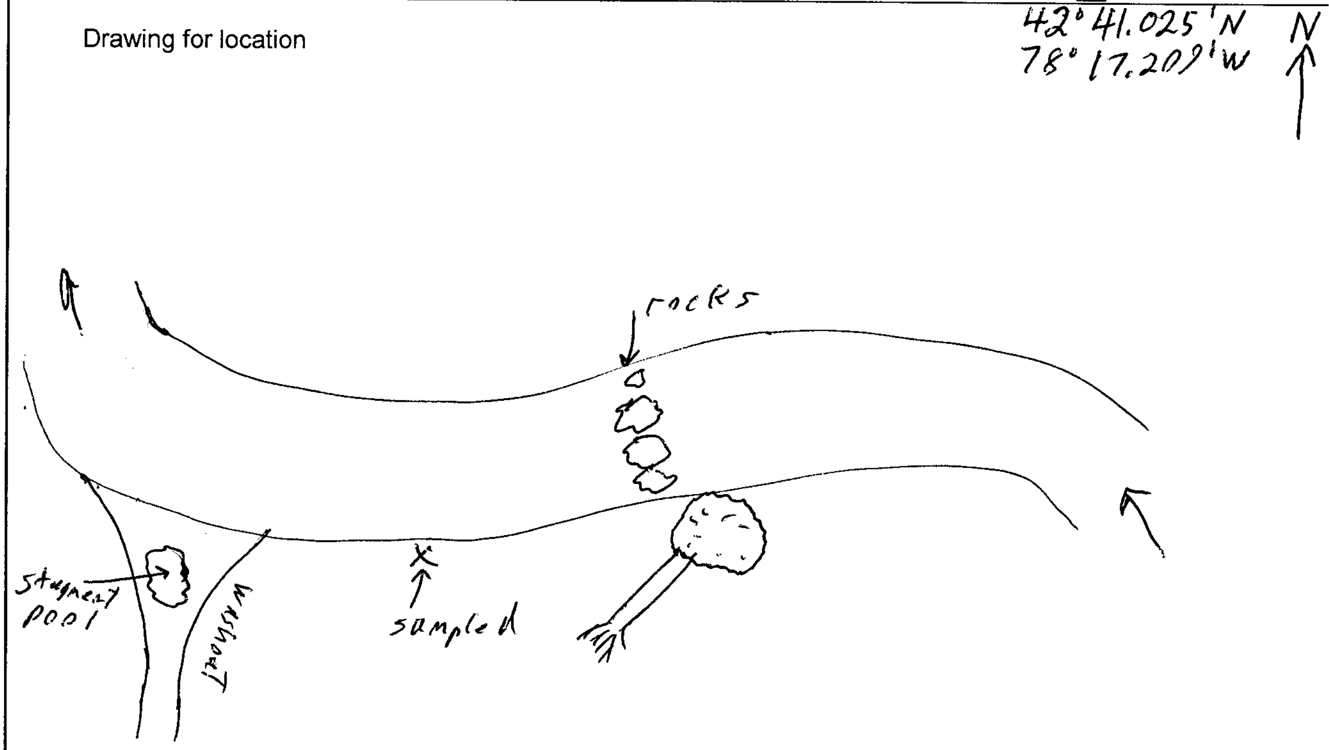
DECON FLUIDS USED:
- ☒ DI WATER
- ☒ POTABLE WATER
- ☒ LIQUINOX
- ☒ ISOPROPYL ALCOHOL
- ☐ ____

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☐	Explosives	8330	none	2 x 1-L Amber Bottles	☐	
☒	SVOCs	8270C	none	2 x 1-L Amber Bottles	☒	Dup
☒	VOCs	8260B	HCL	3 x 40-ml Vials	☒	Dup
☐	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☐	
☐	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☐	

Drawing for location

42° 41.025'N
78° 17.209'W



Notes: Composite Group A. Sampled about a foot from stream.

SIGNATURE:

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/12/10
LOCATION ID: MP-04
ACTIVITY TIME: START 1025 END 1100
BOTTLE TIME: 1045

SURFACE WATER DATA

WATER DEPTH AT LOCATION: 1.68 FT
DEPTH OF SAMPLE: 1.68 FT

WATER QUALITY PARAMETERS:		After
TEMPERATURE	11.21 °C	11.54
SPEC. COND.	0.553 mS/cm	0.555
PH	6.85 Units	6.87
ORP	125.7 mV	123.3
DO	2.42 mg/L	1.94
TURBIDITY	97.6 NTUs	34.1
SALINITY	NA %	

EQUIPMENT USED:
- ☐ BEAKER
- ☒ PUSHPOINT SAMPLER
- ☒ PERISTALTIC PUMP
- ☐ FILTER/ NUMBER ____
- ☐ OTHER

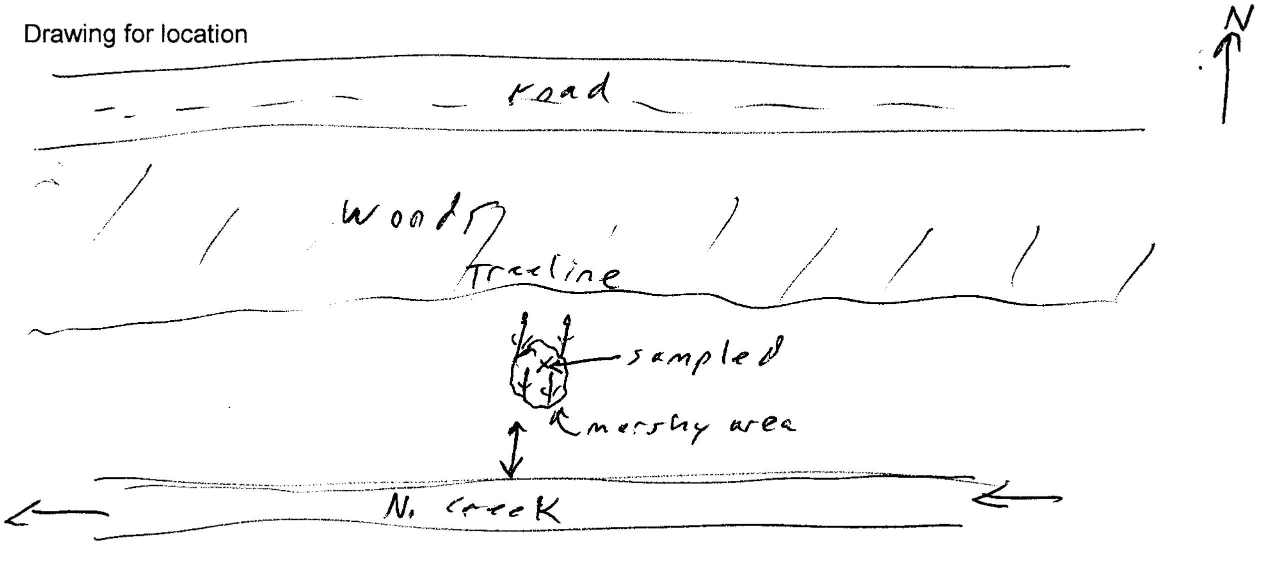
TYPE OF SURFACE WATER:
- ☐ STREAM/ RIVER
- ☐ LAKE/ POND
- ☒ SEEP
- ☐ ____________

DECON FLUIDS USED:
- ☒ DI WATER
- ☒ POTABLE WATER
- ☒ LIQUINOX
- ☒ ISOPROPYL ALCOHOL
- ☐ ____________

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☐	Explosives	8330	none	2 x 1-L Amber Bottles	☐	
☒	SVOCs	8270C	none	2 x 1-L Amber Bottles	☒	MS/MSD
☒	VOCs	8260B	HCL	3 x 40-ml Vials	☒	
☐	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☐	
☐	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☐	

Drawing for location



42°41.034'N
78°16.902'W

Notes: sampled marshy area ~25 ft from creek, Composite group B

SIGNATURE: Mitchell

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/19/10
LOCATION ID: MP-05
ACTIVITY TIME: START 1109 END 1220
BOTTLE TIME: 1148

SURFACE WATER DATA

WATER DEPTH AT LOCATION: 0.8 FT
DEPTH OF SAMPLE: 0.8 FT

WATER QUALITY PARAMETERS:		After
TEMPERATURE	10.52 °C	9.91
SPEC. COND.	0.650 mS/cm	0.631
PH	7.06 Units	7.18
ORP	-59.6 mV	13.1
DO	8.65 mg/L	8.63
TURBIDITY	48.5 NTUs	3.76
SALINITY	NA %	

EQUIPMENT USED:
- ☐ BEAKER
- ☒ PUSHPOINT SAMPLER
- ☒ PERISTALTIC PUMP
- ☐ FILTER/ NUMBER ____
- ☐ OTHER

TYPE OF SURFACE WATER:
- ☐ STREAM/ RIVER
- ☐ LAKE/ POND
- ☒ SEEP
- ☐ ____________

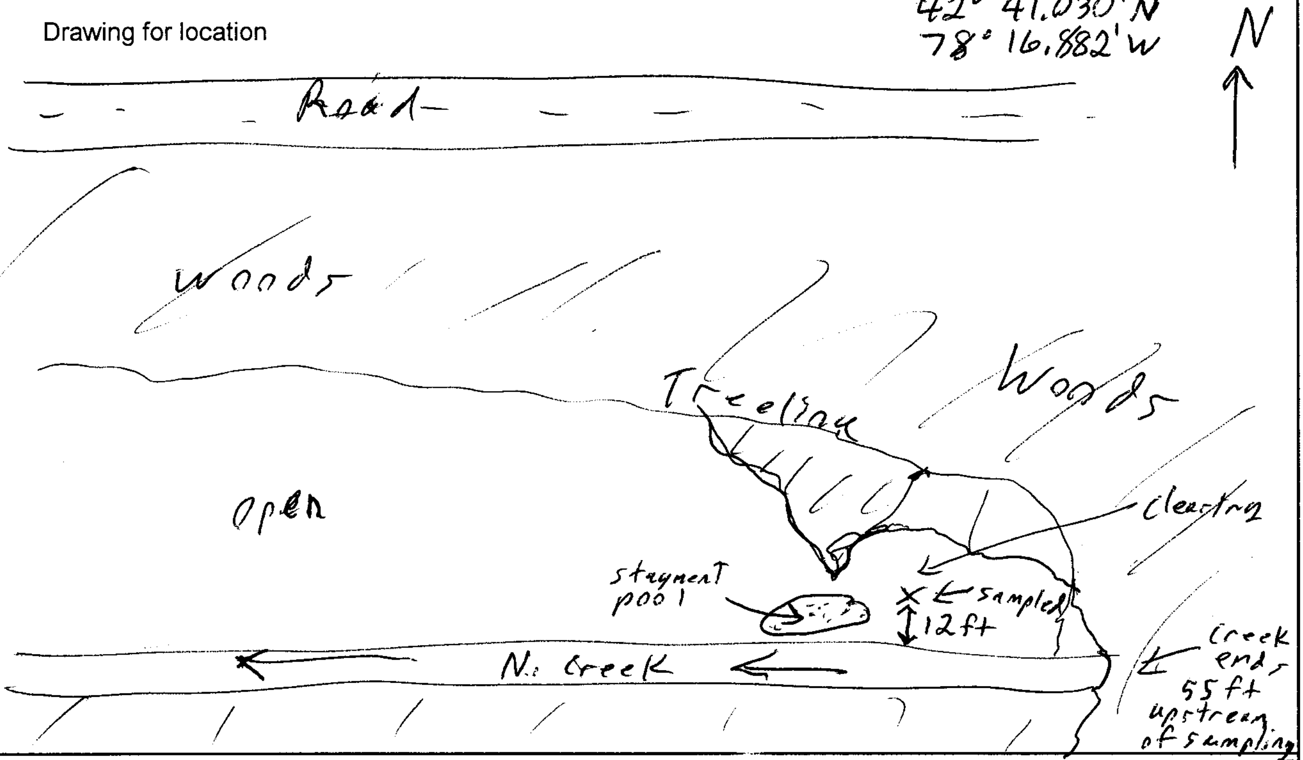
DECON FLUIDS USED:
- ☒ DI WATER
- ☒ POTABLE WATER
- ☒ LIQUINOX
- ☒ ISOPROPYL ALCOHOL
- ☐ ____________

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☐	Explosives	8330	none	2 x 1-L Amber Bottles	☐	
☒	SVOCs	8270C	none	2 x 1-L Amber Bottles	☒	MS/MSD
☒	VOCs	8260B	HCL	3 x 40-ml Vials	☒	
☐	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☐	
☐	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☐	

Drawing for location

42° 41.030'N
78° 16.882'W



Notes: Sampled 12ft north of creek. Soil has thick clay, hard to get sampler in. Heavily vegetated area. stagnant pool nearby
Composite group B

SIGNATURE:

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/18/10
LOCATION ID: MP-06
ACTIVITY TIME: START 1250 END 1310
BOTTLE TIME: 1305

SURFACE WATER DATA

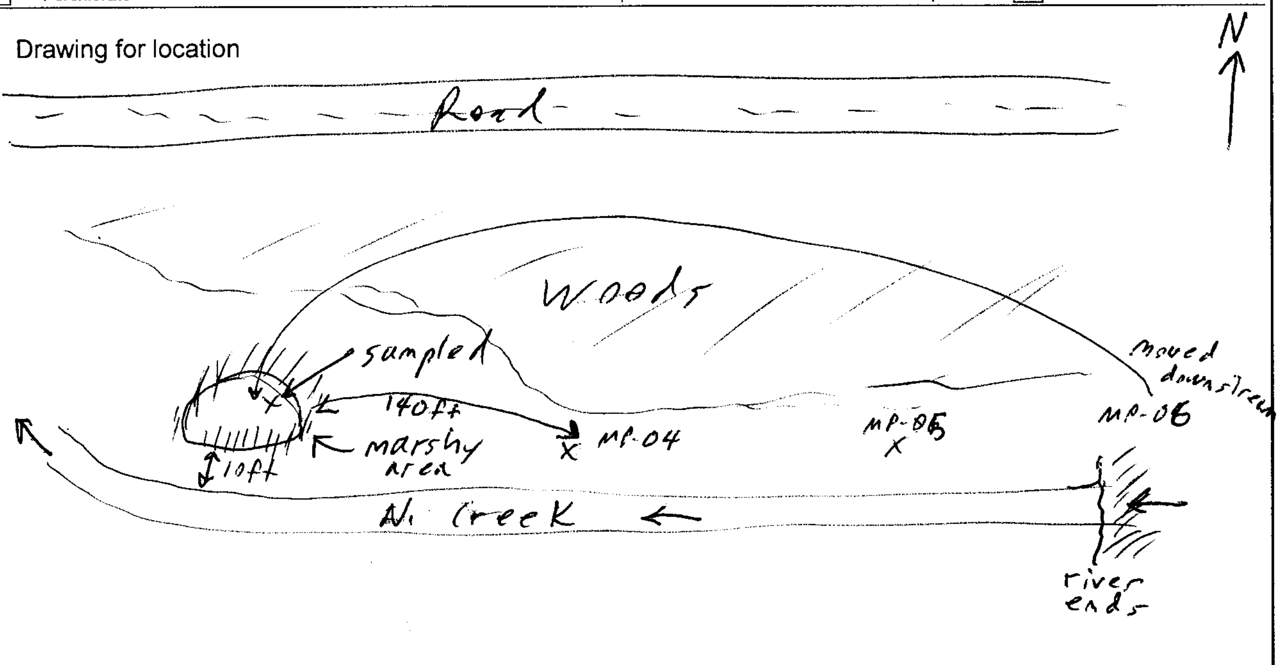
WATER DEPTH AT LOCATION: 0.9 FT
DEPTH OF SAMPLE: 0.9 FT

WATER QUALITY PARAMETERS:		After	EQUIPMENT USED:	TYPE OF SURFACE WATER:	DECON FLUIDS USED:
TEMPERATURE	10.08 °C	10.15	☐ BEAKER	☐ STREAM/ RIVER	☒ DI WATER
SPEC. COND.	0.458 mS/cm	0.451	☒ PUSHPOINT SAMPLER	☐ LAKE/ POND	☒ POTABLE WATER
PH	7.10 Units	7.12	☒ PERISTALTIC PUMP	☒ SEEP	☒ LIQUINOX
ORP	38.5 mV	122.3	☐ FILTER/ NUMBER ____		☒ ISOPROPYL ALCOHOL
DO	4.60 mg/L	7.00	☐ OTHER	☐ ____________	☐ ____________
TURBIDITY	3.76 NTUs	9.68			
SALINITY	NA %				

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☐	Explosives	8330	none	2 x 1-L Amber Bottles	☐	
☒	SVOCs	8270C	none	2 x 1-L Amber Bottles	☒	MS/MSD
☒	VOCs	8260B	HCL	3 x 40-ml Vials	☒	
☐	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☐	
☐	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☐	

Drawing for location



42°41.030'N
78°16.931'W

Notes: Composite Group B. Site moved downstream of coordinates due to river disappearing underground ~~140ft~~ MAB 55 ft North of MP-05, and No luck sampling there, Site moved 140ft downstream of MP-04; 10ft from creek

SIGNATURE:

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/19/10
LOCATION ID: MP-07
ACTIVITY TIME: START 1420 END 1500
BOTTLE TIME: 1435

SURFACE WATER DATA

WATER DEPTH AT LOCATION: 1.03 FT
DEPTH OF SAMPLE: 1.03 FT

WATER QUALITY PARAMETERS:

		After
TEMPERATURE	10.85 °C	10.62
SPEC. COND.	0.579 mS/cm	0.578
PH	7.07 Units	7.19
ORP	11.60 mV	-31.5
DO	1.75 mg/L	1.88
TURBIDITY	47.5 NTUs	115
SALINITY	NA %	

EQUIPMENT USED:
- ☐ BEAKER
- ☒ PUSHPOINT SAMPLER
- ☒ PERISTALTIC PUMP
- ☒ FILTER/ NUMBER 0.2/0.45
- ☒ OTHER syringe

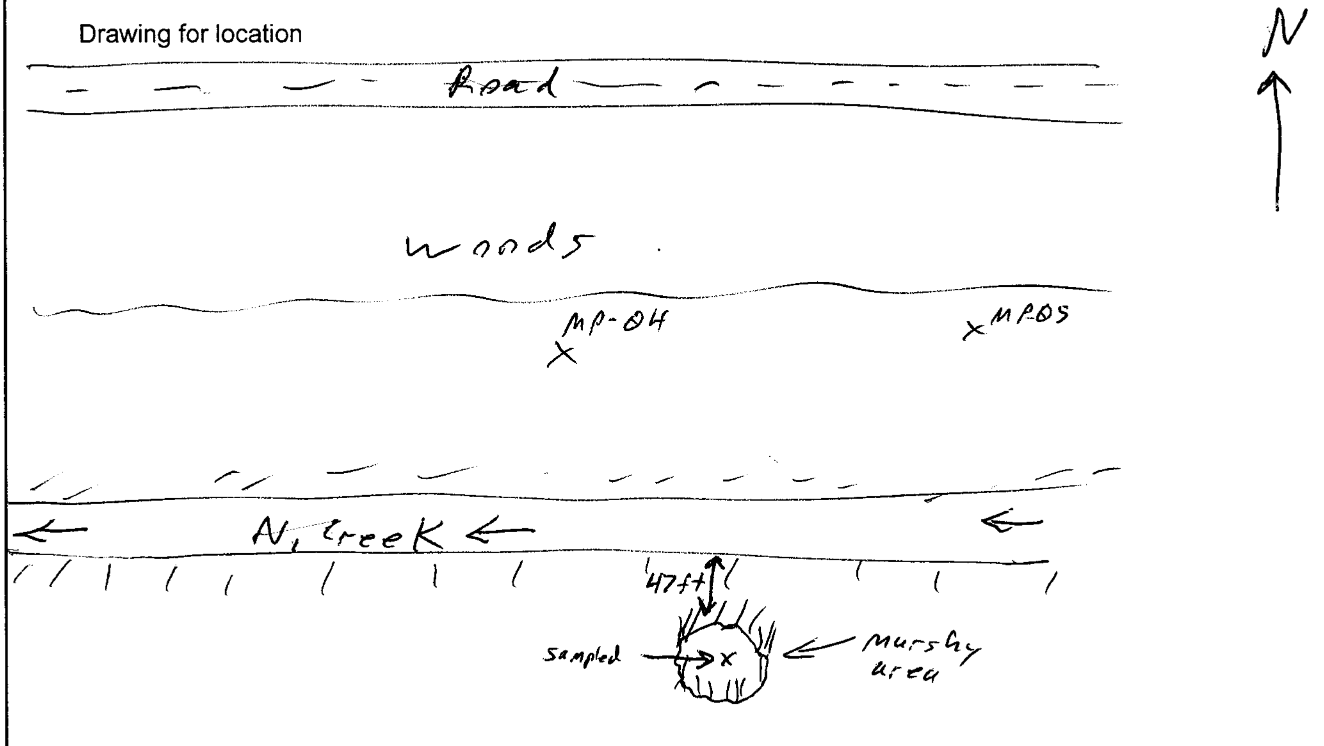
TYPE OF SURFACE WATER:
- ☐ STREAM/ RIVER
- ☐ LAKE/ POND
- ☒ SEEP
- ☐ ____

DECON FLUIDS USED:
- ☒ DI WATER
- ☒ POTABLE WATER
- ☒ LIQUINOX
- ☒ ISOPROPYL ALCOHOL
- ☐ ____

ANALYTICAL PARAMETERS

ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☒ Explosives	8330	none	2 x 1-L Amber Bottles	☒	
☐ SVOCs	8270C	none	2 x 1-L Amber Bottles	☐	
☐ VOCs	8260B	HCL	3 x 40-ml Vials	☐	
☒ Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☒	
☒ Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☒	

Drawing for location



Notes: Composite Group C. Sampled marshy area 47ft from creek. Sprinkled briefly prior to sampling

SIGNATURE:

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/13/10
LOCATION ID: MP-08
ACTIVITY TIME: START 1610 END 1630
BOTTLE TIME: 1620

SURFACE WATER DATA

WATER DEPTH AT LOCATION: 0.79 FT
DEPTH OF SAMPLE: 0.79 FT

WATER QUALITY PARAMETERS:		After
TEMPERATURE	10.68 °C	10.08
SPEC. COND.	0.463 mS/cm	0.461
PH	7.13 Units	7.00
ORP	18.1 mV	44.8
DO	2.09 mg/L	1.95
TURBIDITY	23.8 NTUs	9.99
SALINITY	NA %	

EQUIPMENT USED:
- ☐ BEAKER
- ☒ PUSHPOINT SAMPLER
- ☒ PERISTALTIC PUMP
- ☒ FILTER/ NUMBER 0.21045
- ☒ OTHER Syringe

TYPE OF SURFACE WATER:
- ☐ STREAM/ RIVER
- ☐ LAKE/ POND
- ☒ SEEP
- ☐ ______

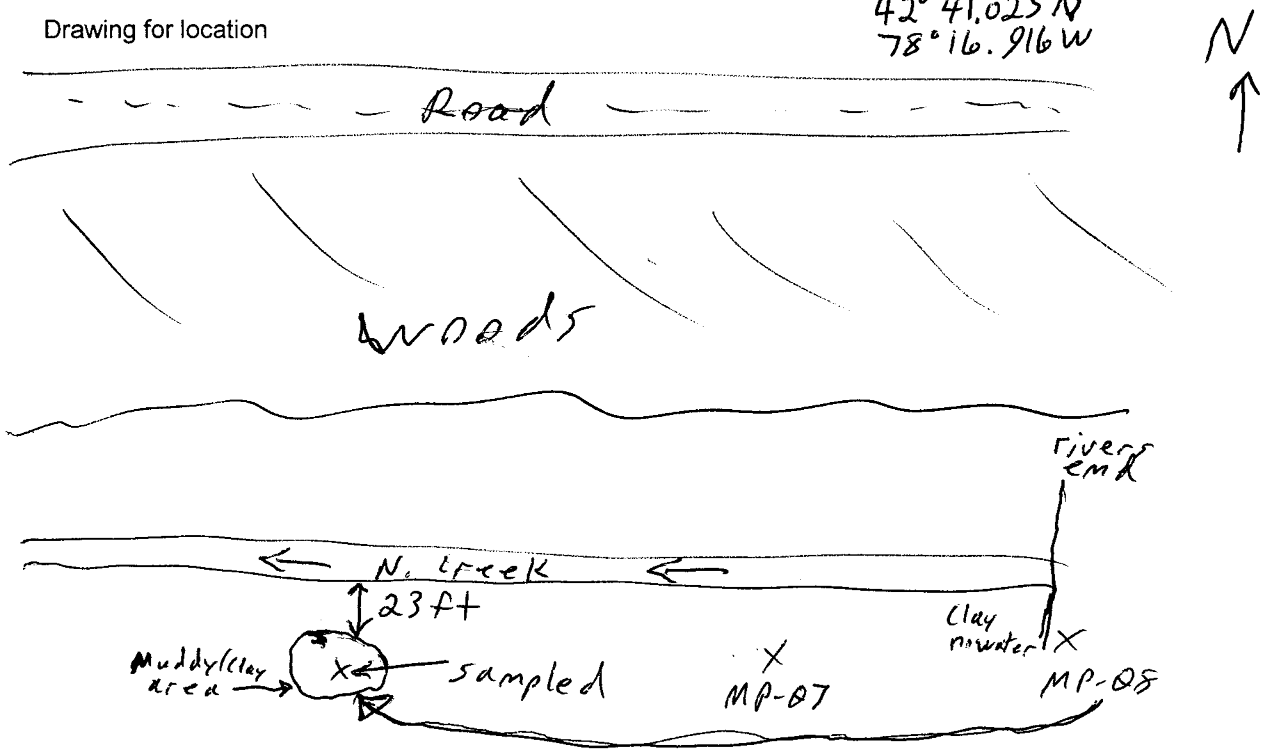
DECON FLUIDS USED:
- ☒ DI WATER
- ☒ POTABLE WATER
- ☒ LIQUINOX
- ☒ ISOPROPYL ALCOHOL
- ☐ ______

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☒	Explosives	8330	none	2 x 1-L Amber Bottles	☒	
☐	SVOCs	8270C	none	2 x 1-L Amber Bottles	☐	
☐	VOCs	8260B	HCL	3 x 40-ml Vials	☐	
☒	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☒	
☒	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☒	

Drawing for location

42° 41.025 N
78° 16.916 W



Notes: Composite Group C. Moved location downstream of MP-07 since couldn't find suitable location upstream at original coordinates.

SIGNATURE:

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/19/10
LOCATION ID: MP-09
ACTIVITY TIME: START 1630 END 1645
BOTTLE TIME: 1635

SURFACE WATER DATA

WATER DEPTH AT LOCATION: 0.95 FT
DEPTH OF SAMPLE: 0.95 FT

WATER QUALITY PARAMETERS:

TEMPERATURE	9.99 °C
SPEC. COND.	0.433 mS/cm
PH	6.87 Units
ORP	107.1 mV
DO	2.13 mg/L
TURBIDITY	44.6 NTUs
SALINITY	NA %

EQUIPMENT USED:
- ☐ BEAKER
- ☒ PUSHPOINT SAMPLER
- ☒ PERISTALTIC PUMP
- ☒ FILTER/ NUMBER 0.2/0.45
- ☒ OTHER Syringe

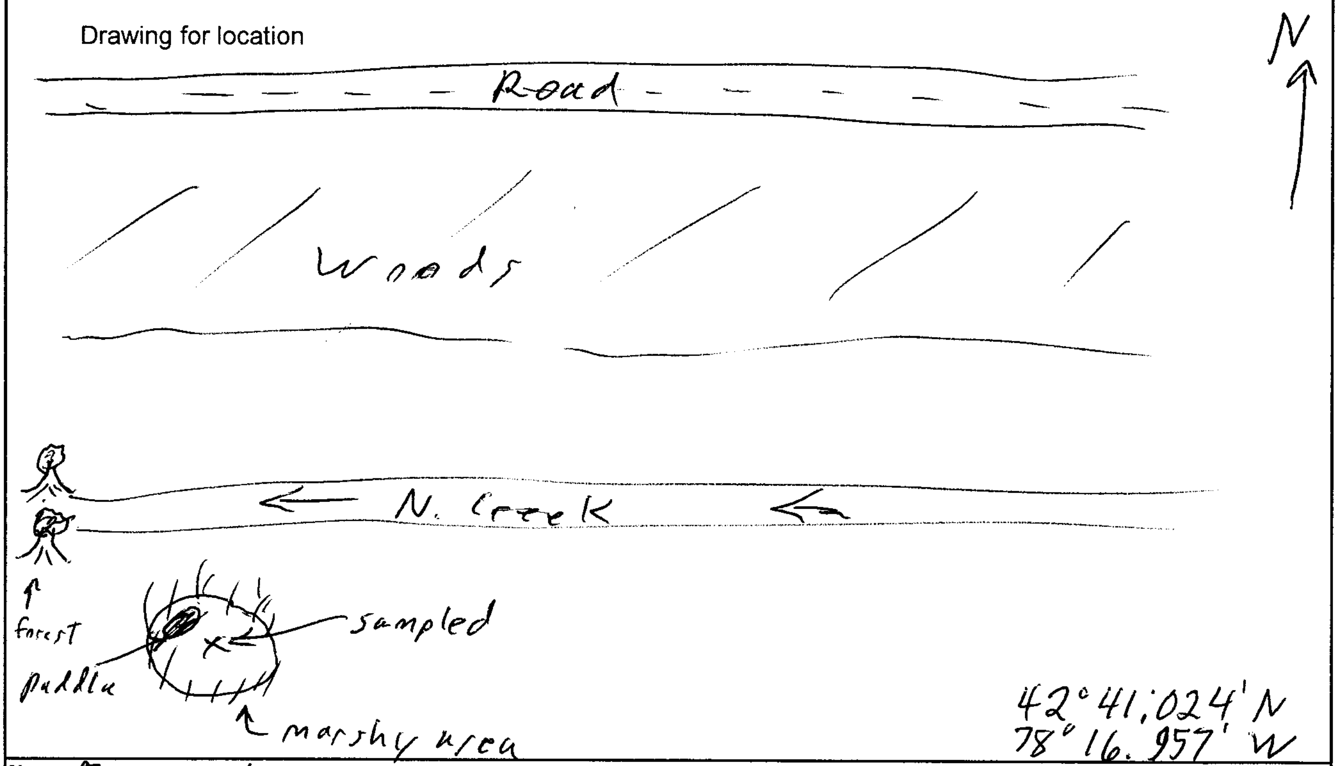
TYPE OF SURFACE WATER:
- ☐ STREAM/ RIVER
- ☐ LAKE/ POND
- ☒ SEEP
- ☐ ____________

DECON FLUIDS USED:
- ☒ DI WATER
- ☒ POTABLE WATER
- ☒ LIQUINOX
- ☒ ISOPROPYL ALCOHOL
- ☐ ____________

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☒	Explosives	8330	none	2 x 1-L Amber Bottles	☒	
☐	SVOCs	8270C	none	2 x 1-L Amber Bottles	☐	
☐	VOCs	8260B	HCL	3 x 40-ml Vials	☐	
☒	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☒	
☒	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☒	

Drawing for location



42° 41.024' N
78° 16.957' W

Notes: Composite Group C. Pump died, no final readings, Sampled 17 ft from Creek in Marshy area w/ shallow puddle nearby. Moved site downstream as no suitable locations upstream as with MP-08

SIGNATURE:

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/20/10
LOCATION ID: MP-10
ACTIVITY TIME: START 1545 END 1649
BOTTLE TIME: 1635

SURFACE WATER DATA

WATER DEPTH AT LOCATION: 0.67 FT
DEPTH OF SAMPLE: 0.67 FT

WATER QUALITY PARAMETERS:		
TEMPERATURE	9.05 °C	8.71
SPEC. COND.	0.268 mS/cm	0.267
PH	7.58 Units	7.59
ORP	145.5 mV	151.3
DO	8.87 mg/L	8.71
TURBIDITY	184 NTUs	201
SALINITY	NA %	

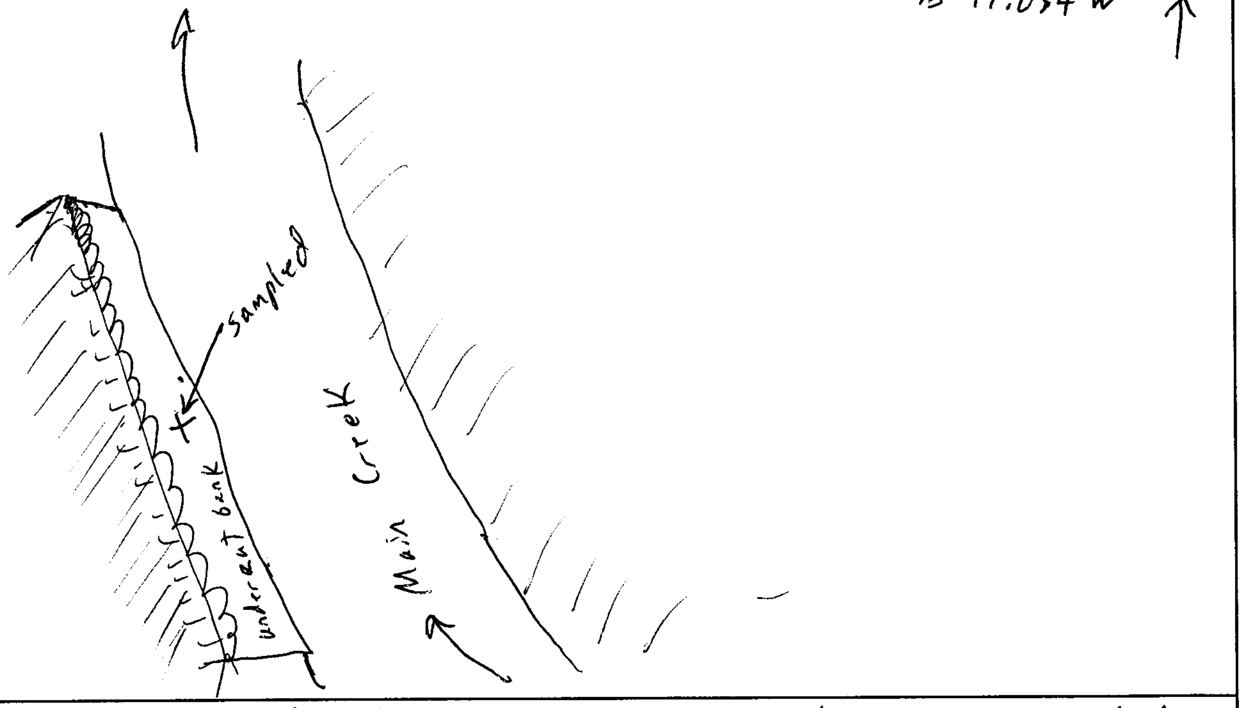
EQUIPMENT USED:	TYPE OF SURFACE WATER:	DECON FLUIDS USED:
☐ BEAKER	☐ STREAM/ RIVER	☒ DI WATER
☒ PUSHPOINT SAMPLER	☐ LAKE/ POND	☒ POTABLE WATER
☒ PERISTALTIC PUMP	☒ SEEP	☒ LIQUINOX
☒ FILTER/ NUMBER 0.2/0.45		☒ ISOPROPYL ALCOHOL
☒ OTHER syringe	☐ ________	☐ ________

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☒	Explosives	8330	none	2 x 1-L Amber Bottles	☒	MS/MSD
☒	SVOCs	8270C	none	2 x 1-L Amber Bottles	☒	
☒	VOCs	8260B	HCL	3 x 40-ml Vials	☒	
☒	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☒	
☒	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☒	

Drawing for location

42° 40.911'N
78° 17.054'W



Notes: Water was very turbid, so purged for 45 minutes with not much change. Tried other sites with no luck, so sampled here. Sampled in undercut bank about 2 ft from stream
Composite group D

SIGNATURE:

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/20/10
LOCATION ID: MP-12
ACTIVITY TIME: START 1440 END 1532
BOTTLE TIME: 1450

SURFACE WATER DATA

WATER DEPTH AT LOCATION: 0.75 FT
DEPTH OF SAMPLE: 0.75 FT

WATER QUALITY PARAMETERS:		After
TEMPERATURE	8.98 °C	8.97
SPEC. COND.	0.269 mS/cm	0.273
PH	7.03 Units	7.26
ORP	104.3 mV	88.4
DO	1.98 mg/L	2.26
TURBIDITY	53.5 NTUs	8.71
SALINITY	NA %	

EQUIPMENT USED:	TYPE OF SURFACE WATER:	DECON FLUIDS USED:
☐ BEAKER	☐ STREAM/ RIVER	☒ DI WATER
☒ PUSHPOINT SAMPLER	☐ LAKE/ POND	☒ POTABLE WATER
☒ PERISTALTIC PUMP	☒ SEEP	☒ LIQUINOX
☒ FILTER/ NUMBER 0.2/0.45		☒ ISOPROPYL ALCOHOL
☒ OTHER syringe	☐ ____	☐ ____

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☒	Explosives	8330	none	2 x 1-L Amber Bottles	☒	MS/MSD
☒	SVOCs	8270C	none	2 x 1-L Amber Bottles	☒	
☒	VOCs	8260B	HCL	3 x 40-ml Vials	☒	
☒	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☒	
☒	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☒	

Drawing for location

Notes: Composite Group D; Sampled at base of ravine, 3ft from bank in gravel soil

SIGNATURE:

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/20/10
LOCATION ID: MP-13
ACTIVITY TIME: START 1240 END 1305
BOTTLE TIME: 1300

SURFACE WATER DATA

WATER DEPTH AT LOCATION: 0.85 FT
DEPTH OF SAMPLE: 0.85 FT

WATER QUALITY PARAMETERS:		After
TEMPERATURE	9.26 °C	11.45
SPEC. COND.	0.294 mS/cm	0.307
PH	6.99 Units	6.81
ORP	100.0 mV	116.5
DO	7.30 mg/L	6.36
TURBIDITY	3.70 NTUs	
SALINITY	NA %	

EQUIPMENT USED:
- ☐ BEAKER
- ☒ PUSHPOINT SAMPLER
- ☒ PERISTALTIC PUMP
- ☒ FILTER/ NUMBER 0.2/0.45
- ☒ OTHER Syringe

TYPE OF SURFACE WATER:
- ☐ STREAM/ RIVER
- ☐ LAKE/ POND
- ☒ SEEP
- ☐ ________

DECON FLUIDS USED:
- ☒ DI WATER
- ☒ POTABLE WATER
- ☒ LIQUINOX
- ☒ ISOPROPYL ALCOHOL
- ☐ ________

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☒	Explosives	8330	none	2 x 1-L Amber Bottles	☒	Dup
☐	SVOCs	8270C	none	2 x 1-L Amber Bottles	☐	
☐	VOCs	8260B	HCL	3 x 40-ml Vials	☐	
☒	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-μm filter	1 x 125-ml bottle	☒	Dup
☒	Perchlorate	EPA 332	0.2-μm filter	1 x 125-ml bacteria cup	☒	Dup

Drawing for location

42° 40.896'N
78° 16.910'W

Notes: Composite Group E. Ravine giving way to floodplain just downstream of location. Sampled silty area 3ft from bank.

SIGNATURE:

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/20/10
LOCATION ID: MP-14
ACTIVITY TIME: START 1100 END 1135
BOTTLE TIME: 1125

SURFACE WATER DATA

WATER DEPTH AT LOCATION: 0.915 FT
DEPTH OF SAMPLE: 0.915 FT

WATER QUALITY PARAMETERS:		After
TEMPERATURE	8.96 °C	9.84
SPEC. COND.	0.284 mS/cm	0.258
PH	7.31 Units	7.16
ORP	141.1 mV	65.1
DO	3.10 mg/L	2.62
TURBIDITY	81.1 NTUs	139.0
SALINITY	NA %	

EQUIPMENT USED:
☐ BEAKER
☒ PUSHPOINT SAMPLER
☒ PERISTALTIC PUMP
☒ FILTER/ NUMBER 0.2/0.45
☒ OTHER Syringe

TYPE OF SURFACE WATER:
☐ STREAM/ RIVER
☐ LAKE/ POND
☒ SEEP
☐ ______

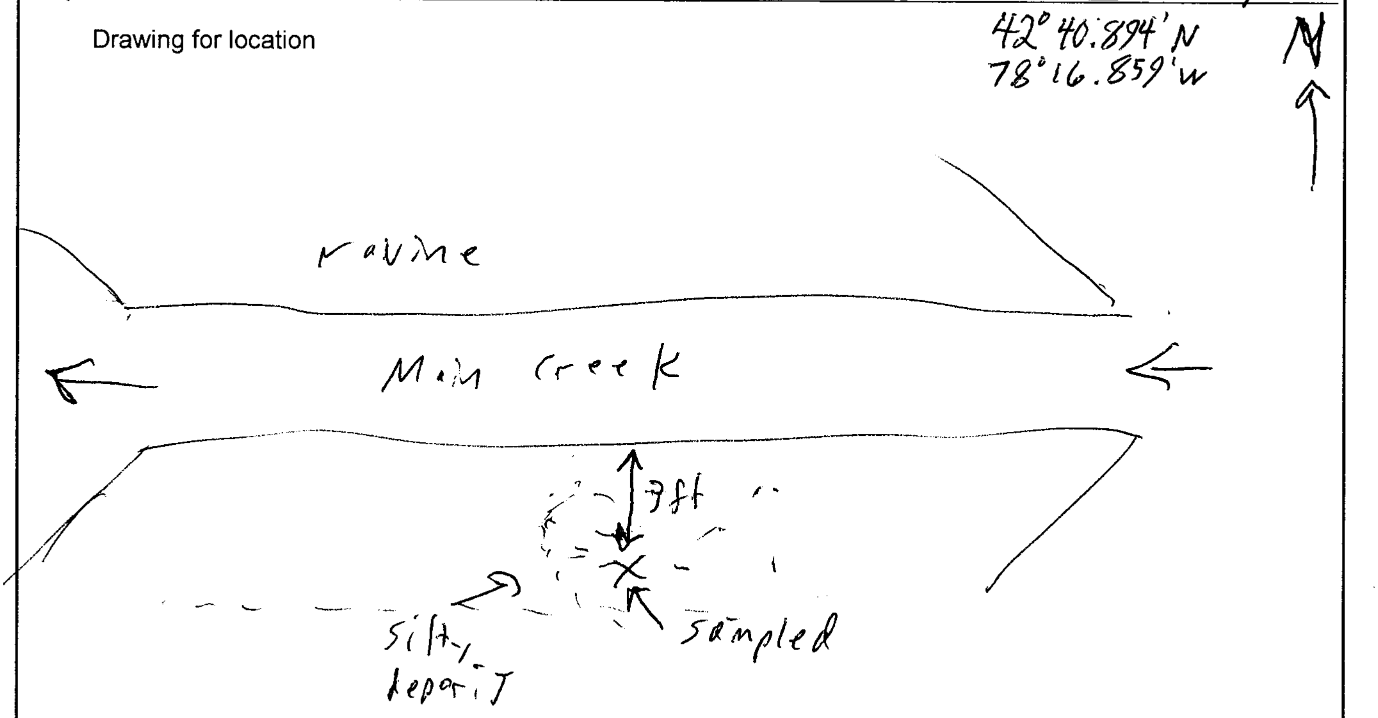
DECON FLUIDS USED:
☒ DI WATER
☒ POTABLE WATER
☒ LIQUINOX
☒ ISOPROPYL ALCOHOL
☐ ______

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☒	Explosives	8330	none	2 x 1-L Amber Bottles	☒	Dup
☐	SVOCs	8270C	none	2 x 1-L Amber Bottles	☐	
☐	VOCs	8260B	HCL	3 x 40-ml Vials	☐	
☒	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☒	Dup
☒	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☒	Dup

Drawing for location

42° 40.894' N
78° 16.859' W



Notes: Composite Group E. Sampled about 3 ft from bank in silty deposit. Ravine becoming shorter & better grade.

SIGNATURE: Mitchell

CONSULTANT: Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT: Camp O'Ryan
JOB NUMBER: TO-0031
DATE: 10/20/10
LOCATION ID: MP-15
ACTIVITY TIME: START 1133 END 1155
BOTTLE TIME: 1140

SURFACE WATER DATA

WATER DEPTH AT LOCATION: 0.90 FT
DEPTH OF SAMPLE: 0.90 FT

WATER QUALITY PARAMETERS:

		After
TEMPERATURE	8.38 °C	7.84
SPEC. COND.	0.236 mS/cm	0.243
PH	7.23 Units	7.50
ORP	150.7 mV	154.8
DO	8.20 mg/L	8.25
TURBIDITY	5.49 NTUs	28.2
SALINITY	NA %	

EQUIPMENT USED:
- ☐ BEAKER
- ☒ PUSHPOINT SAMPLER
- ☒ PERISTALTIC PUMP
- ☒ FILTER/ NUMBER 0.2/0.45
- ☒ OTHER syringe

TYPE OF SURFACE WATER:
- ☐ STREAM/ RIVER
- ☐ LAKE/ POND
- ☒ SEEP
- ☐ ______

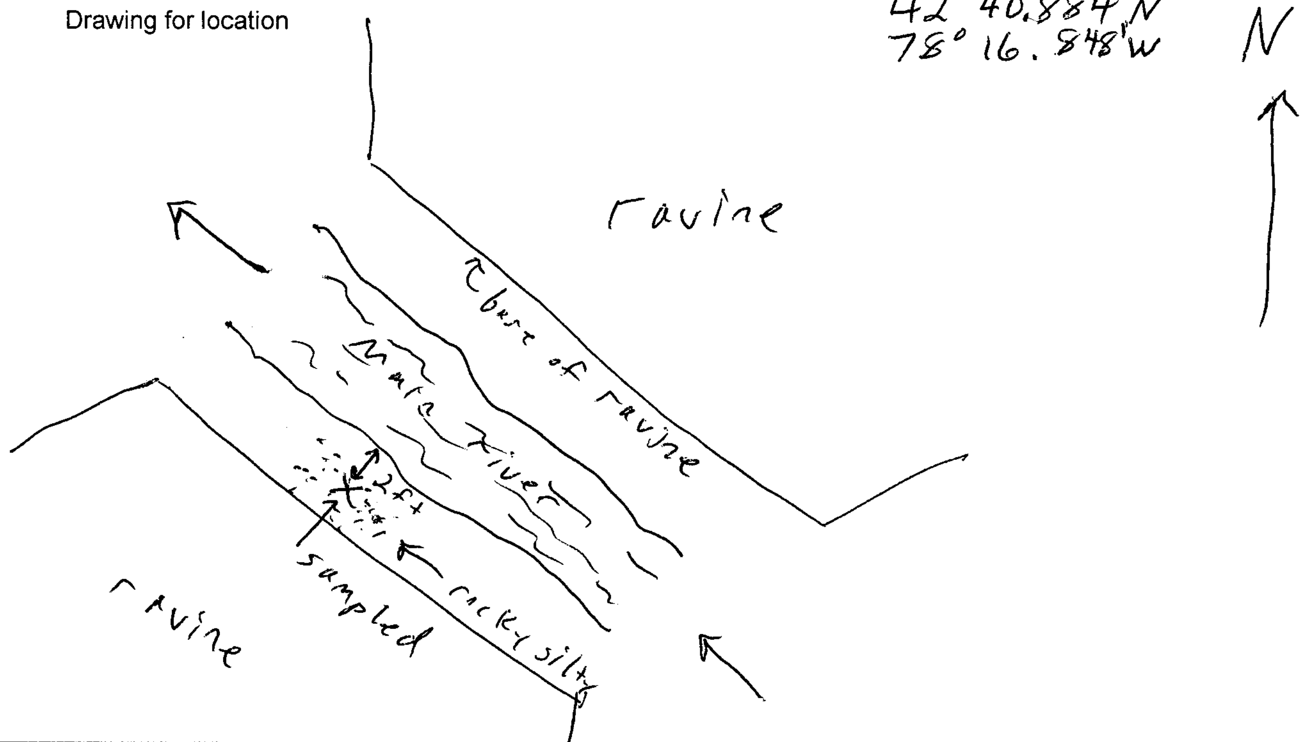
DECON FLUIDS USED:
- ☒ DI WATER
- ☒ POTABLE WATER
- ☒ LIQUINOX
- ☒ ISOPROPYL ALCOHOL
- ☐ ______

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☒	Explosives	8330	none	2 x 1-L Amber Bottles	☒	Dup
☐	SVOCs	8270C	none	2 x 1-L Amber Bottles	☐	
☐	VOCs	8260B	HCL	3 x 40-ml Vials	☐	
☒	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☒	Dup
☒	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☒	Dup

Drawing for location

42° 40.884' N
78° 16.848' W



Notes: Composite Group E. Sampled on streambed, 2 ft from the water edge in rocky, silty/clay area.

SIGNATURE:

CONSULTANT Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT Camp O'Ryan JOB NUMBER TO-0031 DATE 10/20/10

LOCATION ID MP-17 ACTIVITY TIME START 1020 END 1109 BOTTLE TIME 1030

SURFACE WATER DATA

WATER DEPTH AT LOCATION 0.94 FT

DEPTH OF SAMPLE 0.94 FT

WATER QUALITY PARAMETERS:		After
TEMPERATURE	7.97 °C	8.08
SPEC. COND.	0.141 mS/cm	0.141
PH	7.15 Units	7.22
ORP	257.6 mV	[illegible].149.6
DO	4.51 mg/L	2.98
TURBIDITY	13.0 NTUs	34.6
SALINITY	NA %	

EQUIPMENT USED:
- ☐ BEAKER
- ☒ PUSHPOINT SAMPLER
- ☒ PERISTALTIC PUMP
- ☒ FILTER/ NUMBER 0.2/0.45
- ☒ OTHER syringe

TYPE OF SURFACE WATER:
- ☐ STREAM/ RIVER
- ☐ LAKE/ POND
- ☒ SEEP
- ☐ ____________

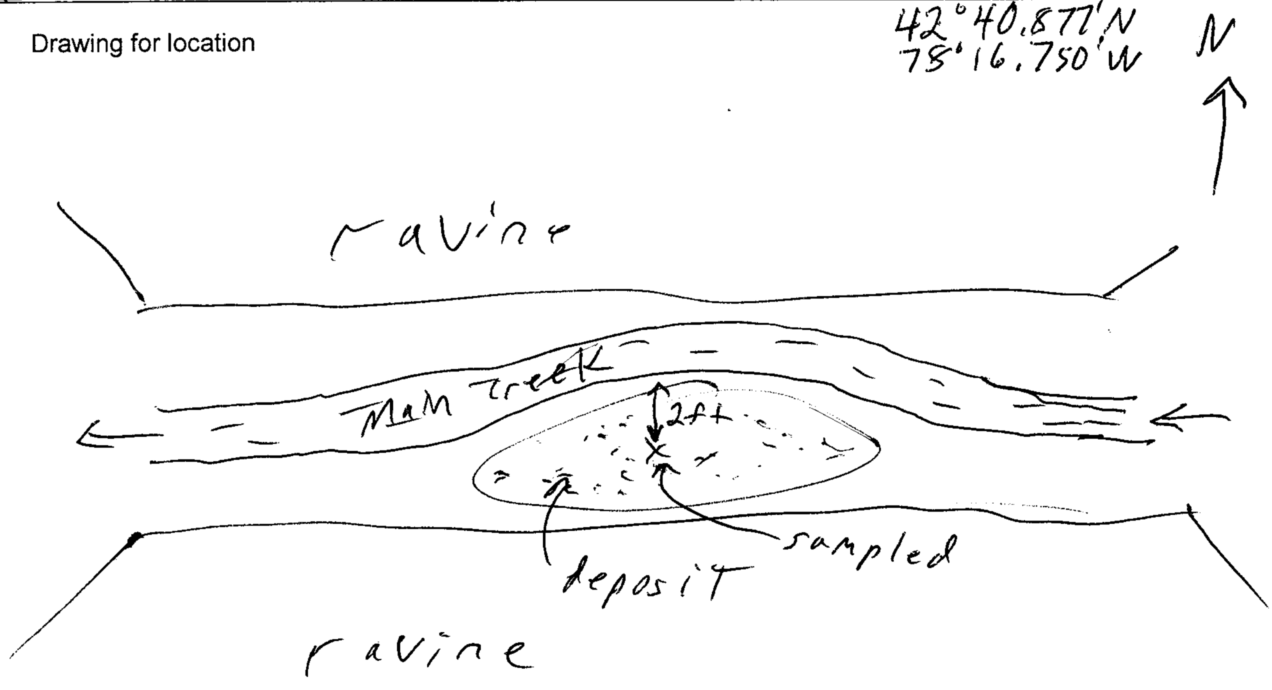
DECON FLUIDS USED:
- ☒ DI WATER
- ☒ POTABLE WATER
- ☒ LIQUINOX
- ☒ ISOPROPYL ALCOHOL
- ☐ ____________

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☒	Explosives	8330	none	2 x 1-L Amber Bottles	☒	
☒	SVOCs	8270C	none	2 x 1-L Amber Bottles	☒	
☒	VOCs	8260B	HCL	3 x 40-ml Vials	☒	
☒	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-μm filter	1 x 125-ml bottle	☒	MS/MSD
☒	Perchlorate	EPA 332	0.2-μm filter	1 x 125-ml bacteria cup	☒	MS/MSD

Drawing for location

42°40.877'N
78°16.750'W



Notes: Composite Group F. Sampled between MP-17 & MP-16 coordinates. No Suitable sites for MP-16, so Composite Group only 2 sites. Sampled 2ft From waters edge. Ravine base is almost at rivers edge, making sites difficult find & sample due to rocks.

SIGNATURE:

CONSULTANT Woods Hole Group

FIELD DATA RECORD - SURFACE & PORE WATER

PROJECT Camp O'Ryan

JOB NUMBER TO-0031

DATE 10/20/10

LOCATION ID MP-18

ACTIVITY TIME START 936 END 1000

BOTTLE TIME 940

SURFACE WATER DATA

WATER DEPTH AT LOCATION 0.72 FT

DEPTH OF SAMPLE 0.72 FT

WATER QUALITY PARAMETERS: After

TEMPERATURE	7.65 °C
SPEC. COND.	0.114 mS/cm
PH	7.93 Units
ORP	354.6 mV
DO	7.10 mg/L
TURBIDITY	60.8 NTUs
SALINITY	NA %

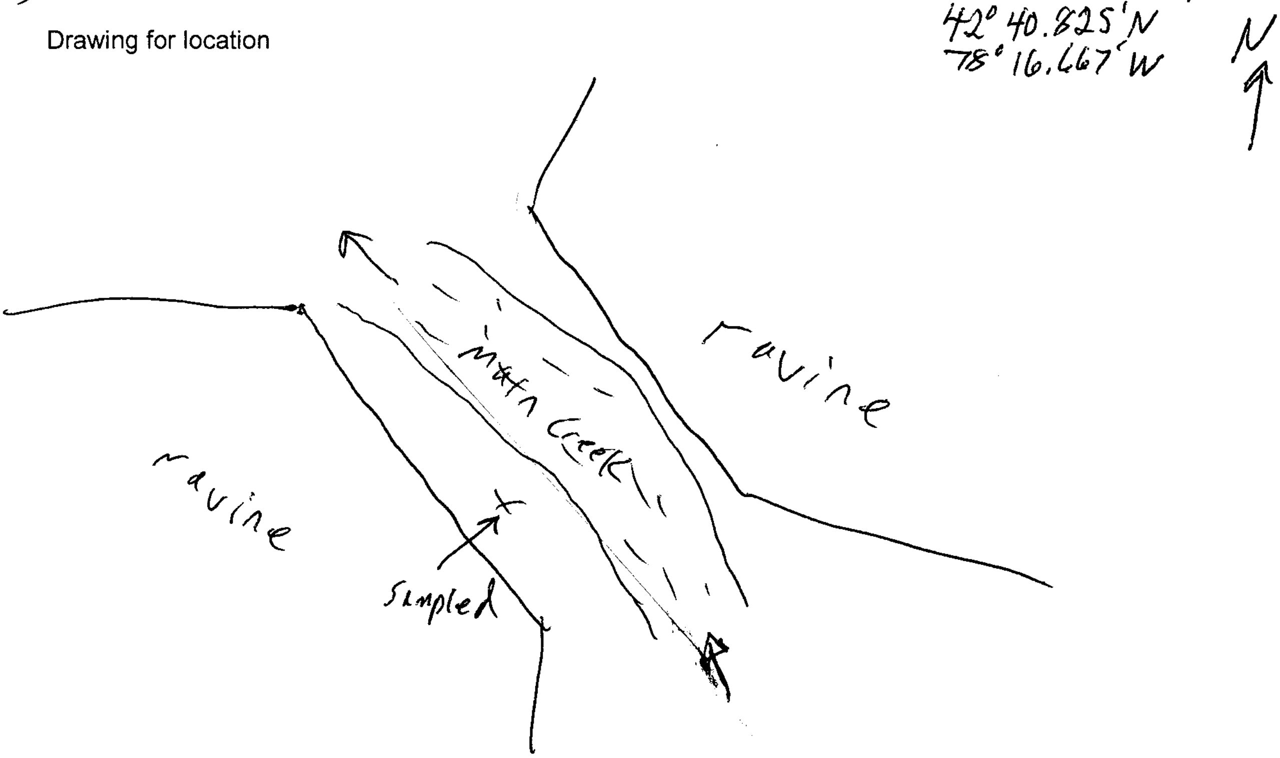
EQUIPMENT USED:	TYPE OF SURFACE WATER:	DECON FLUIDS USED:
☐ BEAKER	☐ STREAM/ RIVER	☒ DI WATER
☒ PUSHPOINT SAMPLER	☐ LAKE/ POND	☒ POTABLE WATER
☒ PERISTALTIC PUMP	☒ SEEP	☒ LIQUINOX
☒ FILTER/ NUMBER 0210:45		☒ ISOPROPYL ALCOHOL
☒ OTHER Syringe	☐	☐

ANALYTICAL PARAMETERS

	ANALYSIS	ANALYSIS METHOD	PRESERVATION METHOD	BOTTLE TYPE AND VOLUME REQUIRED	SAMPLE COLLECTED	QC PERFORMED
☒	Explosives	8330	none	2 x 1-L Amber Bottles	☒	
☒	SVOCs	8270C	none	2 x 1-L Amber Bottles	☒	
☒	VOCs	8260B	HCL	3 x 40-ml Vials	☒	Dup
☒	Lead (total & dissolved)	6010B	HNO_3 ; 0.5-µm filter	1 x 125-ml bottle	☒	~~Dup~~ MS/MSD
☒	Perchlorate	EPA 332	0.2-µm filter	1 x 125-ml bacteria cup	☒	~~Dup~~ MS/MSD

Drawing for location

42° 40.825'N
78° 16.667'W



Notes: Composite Group F. Walked up & down river 100yds but ~~not~~ many suitable locations ravine here is essentially the river bank. Ravine steep, rocky & tall. Tried several locations without much success. Lots of rocks in mud. Scouted MP-17 & MP-16, and decided to do only 2 locations instead of 3 based on site availability

SIGNATURE:

FIELD INSTRUMENTATION CALIBRATION RECORD

Woods Hole Group, INC.

PROJECT Camp O'Ryan
DATE 10/18/10
TIME 1020
CREW ID OR TASK ID DSB, MAB
JOB NUMBER TO-0031
SAMPLER SIGNATURE
CHECKED BY MAB

EQUIPMENT CALIBRATION

METER TYPE YSI
MODEL NO. 556 MPS
UNIT ID NO. 10G101491

TURBIDITY
METER TYPE HACH
MODEL NO. 2100P
UNIT ID NO. 1109

		AM CALIBRATION STANDARD VALUE	AM CALIBRATION METER VALUE	PM CALIBRATION CHECK STANDARD VALUE	PM CALIBRATION CHECK METER VALUE	ACCEPTANCE CRITERIA **
pH	units	4	4.06	4	3.98	±0.2 unit
pH	units	7	7.02	7	7.03	±0.2 unit
Redox	+/- mV	229	235	229	241	±20 mV
Conductivity	mS/cm	1.000	1.002	1.000	1.008	0.5% of reading + 0.001 mS/cm
DO	mg/L *	100	98.5% 96.9mg/L	100	98.9 8.57	2% of reading or 0.2 mg/L. , whichever is greater
Temperature	deg. C		12.29		23.04	
NTU (low)		0	0.11	0	0.14	2% of reading or 0.3 NTU. Whichever is greater.
NTU (high)		5 50	4.92 50	5 50	~~52.~~ 4.75 52.7	

Check One

☒ Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.

☐ Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above (see notes below).

MATERIALS RECORD

Calibration Fluids / Standard Source: Woods Hole Group, INC.

Disposable Filter Type: ______ ______

Lot Number

pH /Conductivity ______
ORP ______
Turbidity ______
Other ______

NOTES:

** = If the meter reading is not within acceptance criteria, clean or replace probe and re-calibrate, or use a different meter if available. If project requirements necessitate use of the instrument, clearly document on all data sheets and log book entries that the parameter was not calibrated to the acceptance criteria.

* = standard based on saturated headspace at given temperature

FIELD INSTRUMENTATION CALIBRATION RECORD

Woods Hole Group, INC.

PROJECT Camp O'Ryan

DATE 10/20/10

TIME 5:57

CREW ID OR TASK ID DSB, MAB

JOB NUMBER TO-0031

SAMPLER SIGNATURE

CHECKED BY MAB

EQUIPMENT CALIBRATION

METER TYPE YSI
MODEL NO. 556
UNIT ID NO.

		AM CALIBRATION STANDARD VALUE	AM CALIBRATION METER VALUE	PM CALIBRATION CHECK STANDARD VALUE	PM CALIBRATION CHECK METER VALUE	ACCEPTANCE CRITERIA **
pH	units	4	3.99	7	7.12	±0.2 unit
pH	units	7	7.01	4	3.91	±0.2 unit
Redox	+/- mV	229	226.7	229	236.9	±20 mV
Conductivity	mS/cm	1.000	1.008	1.000	1.021	0.5% of reading + 0.001 mS/cm
DO	mg/L *	100%	99.6% 8.56mg/L	100%	7.62	2% of reading or 0.2 mg/L., whichever is greater
Temperature	deg. C		21.71		24.60	

TURBIDITY
METER TYPE Hach 2100P
MODEL NO. 2100P
UNIT ID NO. 1109

	AM CALIBRATION STANDARD VALUE	AM CALIBRATION METER VALUE	PM CALIBRATION CHECK STANDARD VALUE	PM CALIBRATION CHECK METER VALUE	ACCEPTANCE CRITERIA **
NTU (low)	0	0.3	0	0.35	2% of reading or 0.3 NTU. Whichever is greater.
NTU (high)	5	4.97	5	5.35	
	50	50.3	50	51.9	

Check One

☒ Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.

☐ Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above (see notes below).

MATERIALS RECORD

Calibration Fluids / Standard Source: Woods Hole Group, INC.

Disposable Filter Type:

Lot Number

pH /Conductivity
ORP
Turbidity
Other

NOTES:

** = If the meter reading is not within acceptance criteria, clean or replace probe and re-calibrate, or use a different meter if available. If project requirements necessitate use of the instrument, clearly document on all data sheets and log book entries that the parameter was not calibrated to the acceptance criteria.

* = standard based on saturated headspace at given temperature

FIELD INSTRUMENTATION CALIBRATION RECORD

Woods Hole Group, INC.

PROJECT Camp O'Ryan
DATE 10/19/10
TIME 0645
CREW ID OR TASK ID DSB MAB
JOB NUMBER T0-0031
SAMPLER SIGNATURE
CHECKED BY MAB

EQUIPMENT CALIBRATION

METER TYPE YSI
MODEL NO. 556MPS
UNIT ID NO.

			AM CALIBRATION STANDARD VALUE	AM CALIBRATION METER VALUE	PM CALIBRATION CHECK STANDARD VALUE	PM CALIBRATION CHECK METER VALUE	ACCEPTANCE CRITERIA **
	pH	units	4	3.98	4.00	4.06	±0.2 unit
	pH	units	7	7.03	7.00	7.11	±0.2 unit
	Redox	+/- mV	229	228.6	229	235.1	±20 mV
	Conductivity	mS/cm	1.000	1.002	1.000	1.017	0.5% of reading + 0.001 mS/cm
	DO	mg/L *	100%	98.3% 8.36	100%	98.1% 7.69	2% of reading or 0.2 mg/L., whichever is greater
	Temperature	deg. C		32.71		22.92	
TURBIDITY METER TYPE Hach	NTU (low)		0	0.12	0	0.20	2% of reading
MODEL NO. 2100P UNIT ID NO. 1109	NTU (high)		5	4.81	5	4.94	or 0.3 NTU. Whichever is greater.
			50	50.2	50	50.6	

Check One

☒ Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.

☐ Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above (see notes below).

MATERIALS RECORD

Calibration Fluids / Standard Source: Woods Hole Group, INC.

Disposable Filter Type: ____________ ______

Lot Number

pH /Conductivity ____________
ORP ____________
Turbidity ____________
Other ____________

NOTES:

** = If the meter reading is not within acceptance criteria, clean or replace probe and re-calibrate, or use a different meter if available. If project requirements necessitate use of the instrument, clearly document on all data sheets and log book entries that the parameter was not calibrated to the acceptance criteria.

* = standard based on saturated headspace at given temperature