FINAL

REMEDIAL INVESTIGATION WORK PLAN

Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

Formerly Used Defense Site (FUDS)

NO. C02NY007701

Contract No. W912DR-13-D-0013
Delivery Order No. DB01

Prepared for:

U.S. Army Corps of Engineers (USACE)
New England District
696 Virginia Road
Concord, MA 01742-2751

Prepared by:

TI2E Joint Venture
3761 Attucks Drive
Powell, OH 43065

February 2016

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

ACRONYMS AND ABBREVIATIONS

AHA .... Activity Hazard Analysis
APP .... Accident Prevention Plan
AST .... aboveground storage tank

BEHP .... bis 2-ethylhexyl phthalate
bgs .... below ground surface
BMP .... Best Management Practice
BTAG .... Biological Technical Assistance Group
BU .... Battery Unit

CAMP .... Community Air Monitoring Plan
CERCLA .... Comprehensive Environmental Response, Compensation, and Liability Act
CFR .... Code of Federal Regulations
COPC .... chemical of potential concern
COPEC .... contaminant of potential ecological concern
CSM .... conceptual site model
CTE .... central tendency exposure

DD .... Decision Document
DERP .... Defense Environmental Restoration Program
DO .... dissolved oxygen
DoD .... Department of Defense
DOT .... Department of Transportation
DQCR .... Data Quality Control Report
DQO .... data quality objective
DQSR .... Data Quality Summary Reports
DRO .... diesel range organics
DV .... data validation

EAI .... Environmental Audits Inc.
EDD .... electronic data deliverables
ELAP .... Environmental Laboratory Accreditation Program
EPC .... exposure point concentration
ESL .... ecological screening level
ERAGS .... Ecological Risk Assessment Guidance for Superfund

FS .... Feasibility Study
FUDS .... Formerly Used Defense Sites
FWIA .... Fish and Wildlife Impact Analysis
FWM .... Food Web Modeling

GIS .... Geographic Information System
gpm .... gallons per minute
GRO .... gasoline range organics
GSA .... General Services Administration

HHRA .... Human Health Risk Assessment
HRG .... Hager-Richter Geoscience, Inc.
HRI .... Health Research Incorporated
HQ .... Hazard Quotient

ID .... identification
IDW .... Investigation Derived Waste
IFC .... Integrated Fire Control

LOAEL .... Lowest Observed Adverse Effects Levels

M&E .... Metcalf and Eddy, Inc.
mg/kg .... milligrams per kilogram
µg/L .... micrograms per liter
MPI .... Malcolm Pirnie, Inc.
MSL .... Mean Sea Level
MW .... Monitoring Well

NCP .... National Oil and Hazardous Substances Pollution Contingency Plan
NFCS .... Niagara Frontier Consulting Services, Inc.
NOAA .... National Oceanic and Atmospheric Administration
NOAEL .... No Observed Adverse Effects Levels
NYSDEC .... New York State Department of Environmental Conservation
NYSDOH .... New York State Department of Health

ORNL .... Oak Ridge National Laboratory
ORP .... oxidation-reduction potential
PCB .... polychlorinated biphenyl
PID .... photo-ionization detector

PLC ....priority List contaminants
PMP ....Project Management Plan
POTW ....Publically Owned Treatment Works
PPE...................personal protective equipment
PVC..................polyvinyl chloride
QA....................quality assurance
QAPP ....Quality Assurance Project Plan
QC....................quality control

RAGS...............Risk Assessment Guidance for Superfund
RCRA...............Resource Conservation and Recovery Act
RI ....Remedial Investigation
RME.................Reasonable Maximum Exposure
RSBC ....rural soil background concentrations
RTC..................responses to comments

SARA...............Superfund Amendments and Reauthorization Act
SCO..................Soil Cleanup Objective
SESI ....Sterling Environmental Services, Inc.
SLERA.............Screening Level Ecological Risk Assessment
SPDES ....State Pollutant Discharge Elimination System
SSHO ....Site Safety and Health Officer
SSHP/APP ....Site Safety and Health Plan/Accident Prevention Plan
SVOC...............semivolatile organic compound

TBD ....to be determined
TEC..................Threshold Effects Concentrations
TI2E ....TI2E Joint Venture
TOC ....total organic carbon
TOR ....top of riser
TP.....................test pit
TPH..................total petroleum hydrocarbons
TRV ....Toxicity Reference Values
TSDF................treatment, storage, or disposal facility
T&D ....transportation and disposal

UCL ....upper confidence limits
UFP-QAPP ......Uniform Federal Policy for Quality Assurance Project Plan
USACE ....United States Army Corps of Engineers
USDA ....United State Department of Agriculture
USEPA ....United States Environmental Protection Agency
USGS ....United States Geological Survey
UST..................underground storage tank

VOC.................volatile organic compound

WRAI ....Water Resource Associates, Inc.

SIGNATURE PAGE

FINAL
REMEDIAL INVESTIGATION WORK PLAN

At The Former Niagara Falls-Buffalo Defense Nike Battery BU-34/35

East Aurora and Orchard Park, New York

The Formerly Used Defense Site (FUDS), No. C02NY007701

Contract No. W912DR-13-D-0013

Prepared by:
TI2E JV, LLC
3761 Attucks Drive,
Powell, OH 43035

Approved by:

Keith Fields

February 29, 2016
Date

Keith Fields, PE PMP
Project Manager
Tidewater, Inc.
Office (614) 792-2896; Cell (614) 778-2618

1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

TI2E Joint Venture (TI2E) developed this Remedial Investigation (RI) Work Plan for the Former Niagara Falls-Buffalo Defense Nike Battery Unit 34/35 (BU-34/35) under the Defense Environmental Restoration Program (DERP) for Formerly Used Defense Sites (FUDS). This work is being performed as part of Delivery Order No. DB01 under the United States Army Corps of Engineers (USACE) Contract No. W912DR-13-D-0013. The property is identified as FUDS Property number C02NY0077.

This RI work plan outlines the purpose, procedures and processes that will be implemented to conduct the RI investigation at the Former Nike BU 34-35 Site. The Work Plan will be conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by Superfund Amendments and Reauthorization Act (SARA) of 1986, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) requirements, and the Department of Defense (DoD) FUDS program (ER-200-3-1). RI/Feasibility Study (FS) activities will be conducted in coordination with state and federal regulatory agencies and consistent with New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) guidance, where practicable.

1.2 PROJECT OBJECTIVES

The overall objective for the Former Niagara Falls-Buffalo Defense Nike Battery BU-34/35 under the FUDS Program is to reach closure. To this end, TI2E has been tasked with various environmental investigation-related responsibilities, including an RI, leading up to the preparation of a Decision Document (DD). The objectives of the RI at the Former Nike BU-34/35 are as follows:

1) Determine the nature and extent of the contamination in soil and groundwater;
2) Update and refine the current conceptual site model (CSM), including actual and potential exposure pathways;
3) Collect data necessary to evaluate potential environmental risks of the silos; and
4) Collect data to support preparation of a baseline Human Health Risk Assessment (HHRA) and the Screening Level Ecological Risk Assessment (SLERA).

This RI Work Plan addresses the Launch Area at the Former Nike BU-34/35 site. There are no environmental hazards at the Control Area attributed to DoD operations; therefore, there is no DoD responsibility to conduct further remedial activities at this location. Considerable investigation and remediation work was performed at the Control Area between 1991 and 2002 by the current property owner, Health Research Inc. (HRI), in association with two potential real estate transactions involving the sale and development of the Control Area property. Specifically, two separate phases of investigation and remediation activities were conducted (Water Resource Associates, Inc. [WRAI], 1991; Niagara Frontier Consulting Services Inc. [NFCS], 1993; Sterling Environmental Services Inc. [SESI], 1994; Environmental Audits, Inc. [EAI], 2002).

The Control Area investigation and remediation reports indicate that impacts to soil and groundwater quality were delineated and that all soil impacted areas were remediated by the owner. These areas included the removal of over 175 tons of stained soil and cinder slag material from the flammable liquid storage shed and west generator building. In addition, the owner removed water, sediments/sludge, and pressure washed the former wastewater treatment system and associated structures. This included the removal of over 2,500 gallons of septic sludge and water. Lastly, low levels of volatile organic compounds (VOCs) that were detected in groundwater in 1999 were not detected during the more comprehensive 2001 investigation at the Control Area, and the metal concentrations detected in groundwater were attributed to background or natural conditions.

1.3 REPORT ORGANIZATION

This work plan is organized as follows:

- Chapter 1, Introduction – Describes the project objectives and content of the RI Work Plan, and provides background information including a site description and site history, and a summary of previous investigations
- Chapter 2, Physical Characteristics of the Study Area – Summarizes physical characteristics including location, topography, geology, hydrogeology, surface water features, wetlands, climate and precipitation, demographics, land use, and background metals
- Chapter 3, Work Plan Approach – Provides an overview of the CSM, the RI objectives, and the project approach.
- Chapter 4, Field Activities – Describes procedures for the implementation of investigation activities including site clearance and permitting, evaluation of existing site installations, drilling methods, soil logging procedures, sampling, well construction, test pit installation, silo pit installation, a final site survey, and investigation-derived waste (IDW) management.
- Chapter 5, Risk Assessment Methodology – Provides an overview of the methods that will be used to perform the HHRA and the SLERA.
- Chapter 6, Quality Assurance/Quality Control (QA/QC) - Details QC responsibilities, submittals, control, verification, acceptance and testing procedures, QC methods, and completion inspections.

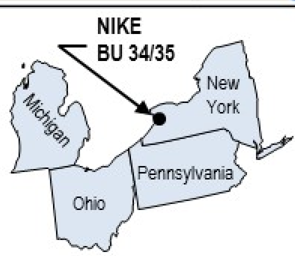
The following are appended to this document:

- Appendix A: Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP)
- Appendix B: Site Safety and Health Plan/Accident Prevention Plan (SSHP/APP)
- Appendix C: Community Air Monitoring Plan (CAMP)
- Appendix D: Site Visit Photographs Taken at the Launch and Control Areas, July 14, 2015
- Appendix E: QC Checklists and Forms

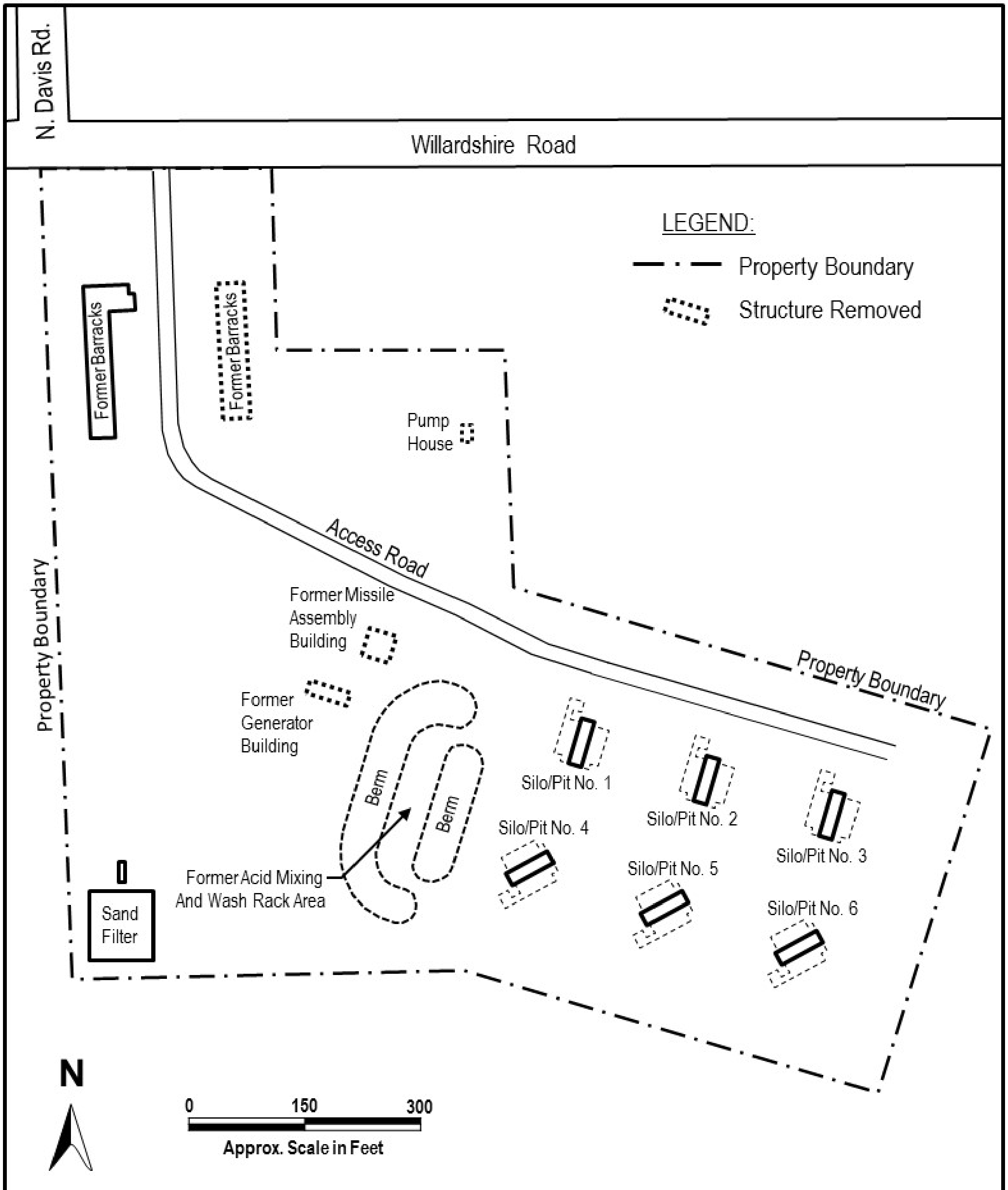
1.4 BACKGROUND

1.4.1 Site Description

The Former Niagara Falls-Buffalo Defense Nike Battery BU-34/35 is located in Erie County, New York and consisted of two operational areas located on separate parcels of land separated by approximately 2 miles. These include the former battery control area (Control Area) (also called Integrated Fire Control (IFC), and the former launch area (Launch Area) with underground missile magazines (also referred to as silos in previous reports). The Control Area is a 25.65-acre parcel of land located at 3270 Transit Road in Orchard Park, New York, and is currently vacant with no structures remaining at the site. The Control Area is not part of the investigation. The Launch Area is a 19.84-acre parcel of land located at 601 Willardshire Road near the intersection of North Davis Road in the Town of Aurora, New York, and is currently vacant with the exception of the former barracks and the six former underground magazines/silos. A general site location map is shown on Figure 1-1, and Launch Area location map is shown on Figures 1-2.



	November 2015	TI2E, A Joint Venture Between Tidewater and IEI
	Prepared by: K. DeSilva	Figure 1-1. Launch Area Location Map Nike BU 34/35 East Aurora, NY
	Approved by: K. Fields	



November 2015	TI2E, A Joint Venture Between Tidewater and IEI
Prepared by: K. DeSilva	**Figure 1-2. Launch Area Site Map Nike BU 34/35 East Aurora, NY**
Approved by: K. Fields	

1.4.2 Launch Area History

Starting in 1955, DoD began acquiring property for the construction of Former Nike Missile BU-34/35. After land acquisition and construction, the Former Nike BU-34/35 complex was used by the U.S. Army between January 1957 through 1964 for the assembly, launching, and control of guided Nike Ajax Missiles for defense against high-flying hostile aircraft. By 1958, almost 200 Nike Ajax batteries were deployed around strategic urban, military, and industrial complexes (including Buffalo). Shortly thereafter, the U.S. Army began to phase-out Nike Missile batteries due to the longer range and nuclear capabilities of the Hercules missiles. While certain Nike sites were converted to Hercules Missile Batteries, the Former Nike BU-34/35 site was deemed excess in July 1963 and then determined to be surplus by October 1963 (General Services Administration [GSA], 1963). The U.S. Army then disposed of both the Launch Area and the Control Area.

The Launch Area parcel was transferred from Marjorie Klopp to the U.S. Army via deed dated December 9, 1955. The U.S. Army constructed the surface to air missile Launch Area and ancillary buildings between December 1955 and January 1957 (Malcolm Pirnie, Inc. [MPI], 1996). The Launch Area formerly was occupied by barracks (subsequently converted to apartments) and a silo area consisting of six underground Nike missile magazines/silos. Figure 1-3 is a 1958 aerial photograph depicting the configuration of the Launch Area at the time it was used by the U.S. Army. The missile magazines were configured in two rows of three magazines each and were situated southeast of the former barracks. The underground structures were made of reinforced concrete and were accessed at the surface by steel doors.

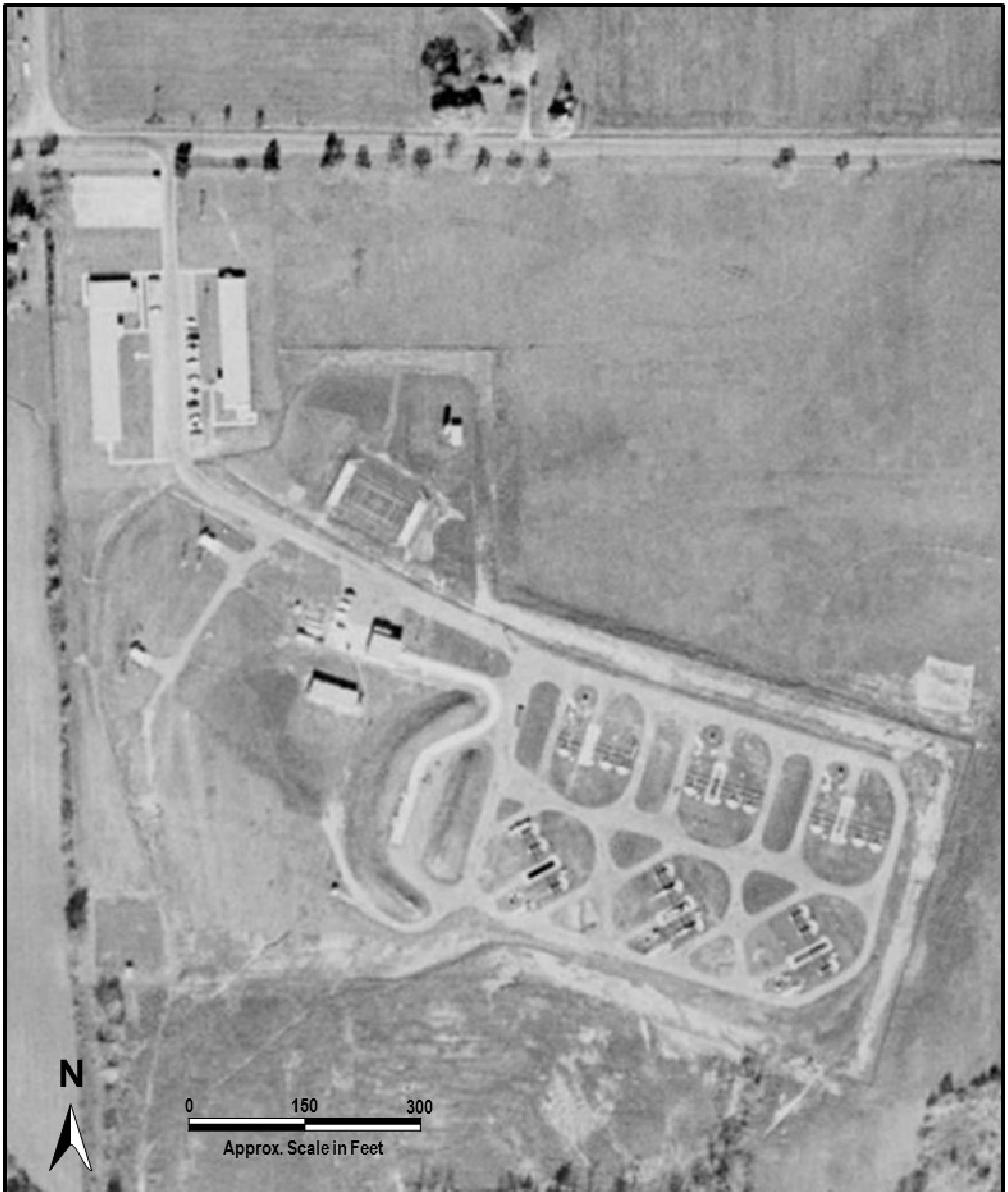
The Site was deactivated on April 8, 1965, and the Launch Area property reverted to the original property owner, Marjorie K. C. Klopp. Subsequently, the estate of Marjorie K. C. Klopp transferred title of the Launch Area Property to the H.G.M. Land Corporation. The Launch Area is currently owned by Waterhill Evergreen Holdings, LLC.

The GSA Report of Excess Real Property Schedule A listed several Launch Area buildings, structures, utilities, and facilities that conveyed when the property deed reverted back to the property owner. The listed Launch Area buildings and structures (Figure 1-2) that conveyed included the following:

- Launch Area Buildings included: missile assembly and test building, two acid storage sheds, two barracks buildings including one with administrative offices and the other with a mess hall, generator building, gas meter house, chlorinator house, sewage pump house, sentry station, and six underground missile magazines/silos.

- Launch Area Structures included: concrete pads, multi-court area (physical fitness), acid fueling station, electric distribution lines (above- and underground), seven transformers, gas pipelines, sewage treatment plant, septic tank, sanitary sewer line, storm sewers, potable water lines, fencing, and vehicle parking areas.

Based on the above and the USACE Assessment Guide (2003), the Nike missiles were assembled, serviced, maintained, and prepared for firing at the Launch Area. The dimensions of the underground magazine are approximately 60-feet by 60-feet. The personnel room is approximately 20-feet by 15-feet. The top of the magazine is approximately 3 feet below surface, and the floor is approximately 16 feet below surface. The elevator pit/sump extends an additional 6 feet below the floor of the underground magazine. The general layout of a typical missile magazine is depicted on Figure 1-4.



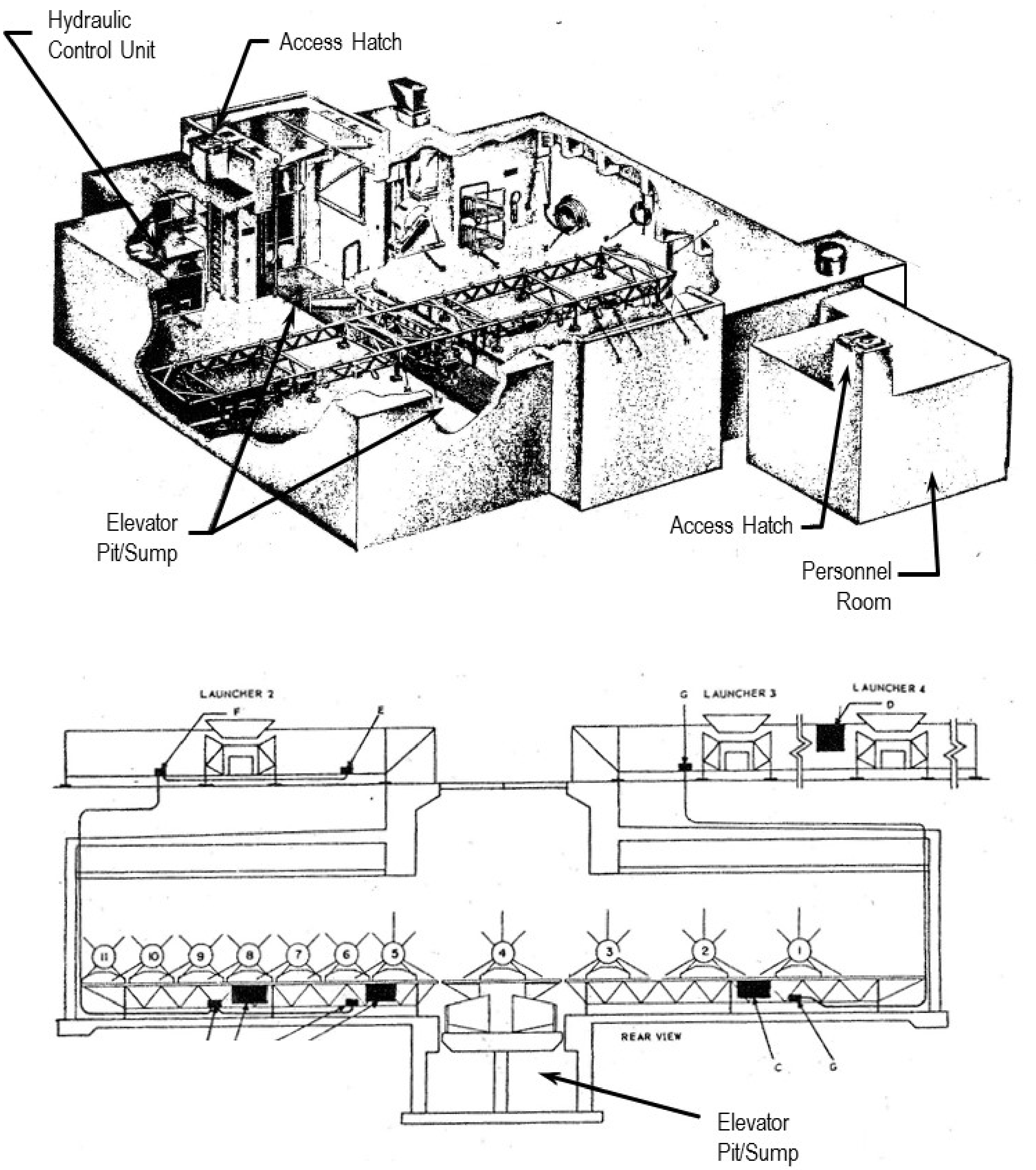
November 2015

Prepared by:
K. DeSilva

Approved by:
K. Fields

TI2E, A Joint Venture
Between Tidewater and IEI

Figure 1-3. 1958 Aerial Photograph, Launch Area, Nike BU 34/35 East Aurora, NY



	November 2015	TI2E, A Joint Venture Between Tidewater and IEI
	Prepared by: K. DeSilva	**Figure 1-4. General Silo/Pit Layout of a Typical Launch Area Site**
	Approved by: K. Fields	

Both natural gas and electric were commercially available to the Launch Area. This is evidenced by the list of conveyed structures, including the gas meter house and gas pipelines and the aboveground and underground electrical lines. The Launch Area also had its own electrical power as evidenced by the conveyance of the generator house. The uses of fuel and storage tanks associated with the generator house are unknown. In addition, GSA (1963) did not report that underground storage tanks (USTs)/aboveground storage tanks (ASTs) used for the storage of fuel (if any) conveyed to the former property owner. The Launch Area potable water facilities included a pump house, chlorinator, and potable water lines. Sanitary sewage treatment facilities included a sewage treatment plant, a sand filter, and a septic tank. The facility also had storm water facilities to direct storm water away from the underground missile magazines/silos. These structures included bermed areas surrounding swales connected with culverts (USACE, 1957).

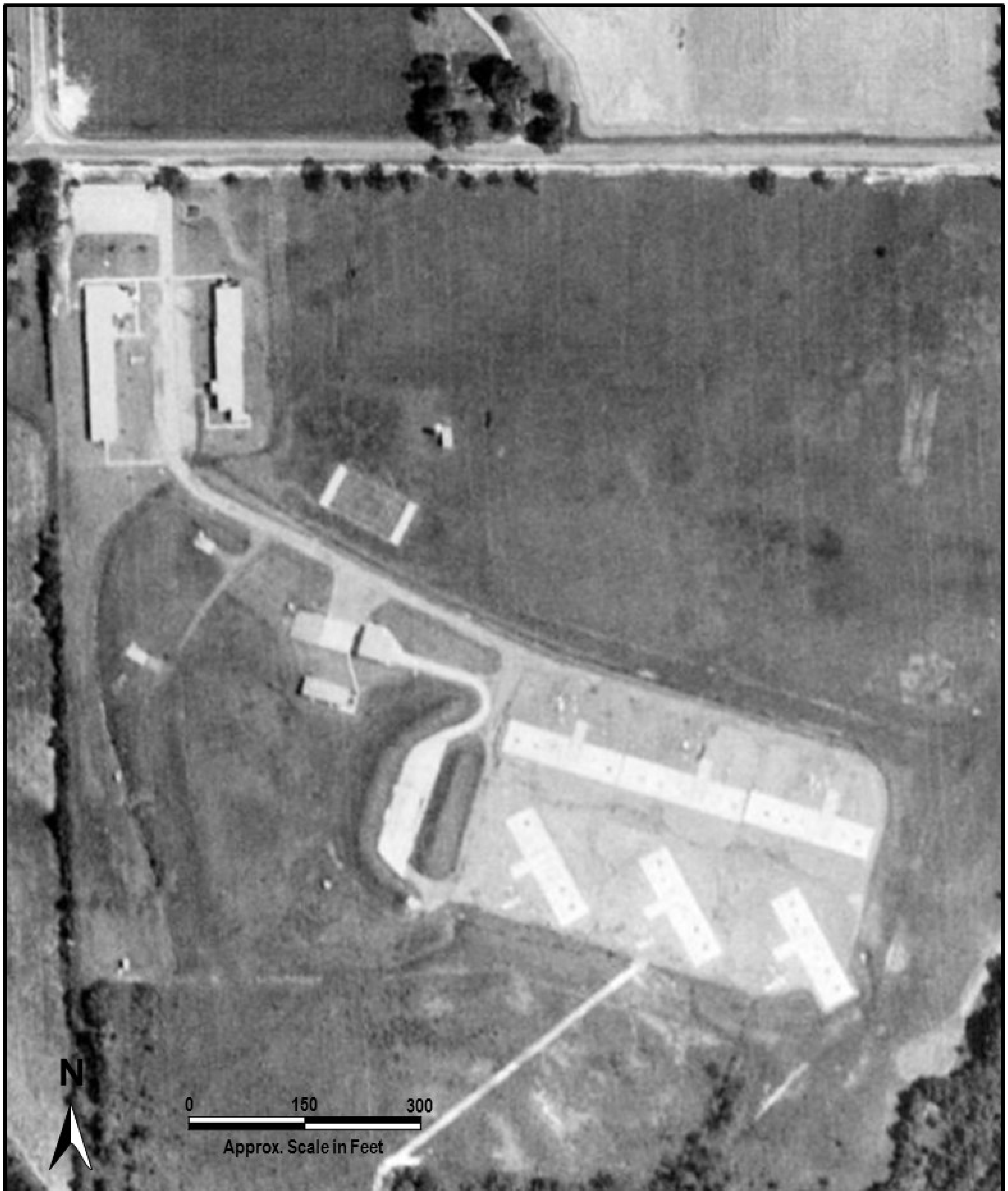
The Launch Area was only subject to DoD use and control between 1957 and 1964, and the only facility utilized post-DoD ownership and operation was the former enlisted men's barracks and bachelor officers' quarters building. These building structures were converted into apartments and then to a private residence, and then used for custodial purposes, including vehicle and machinery storage for H.G.M. (MPI, 1996). Figure 1-5 is an aerial photograph from 1966 depicting the configuration of the Launch Area shortly after it was deactivated and transferred to private ownership.

1.4.3 Previous Launch Area Investigations

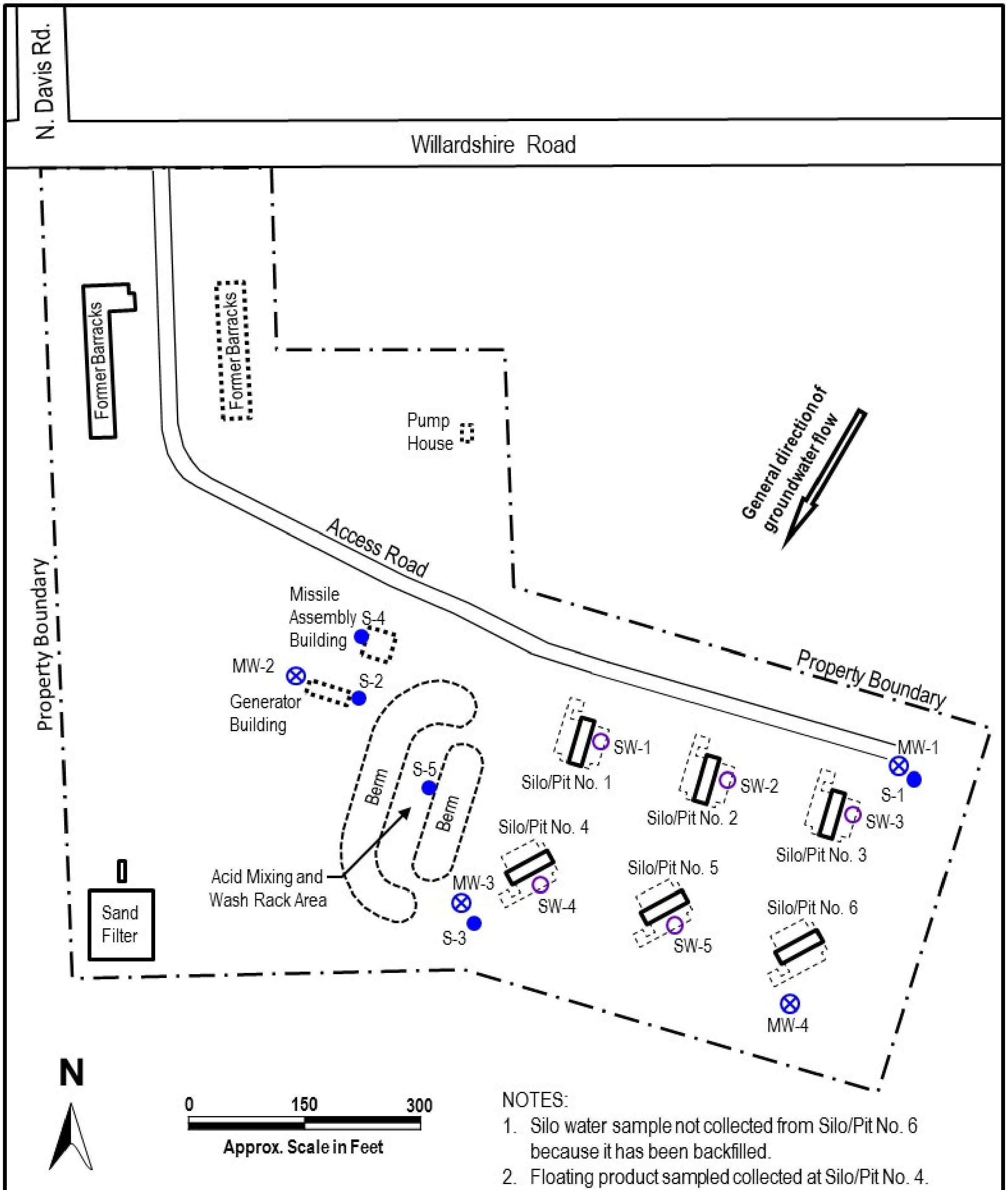
Two environmental investigations were conducted at the Launch Area during the period from 1988 to 1996. These two investigations were conducted on behalf of USACE and resulted in the 1988 Draft Engineering Report and Contamination Evaluation prepared by Metcalf & Eddy, Inc. (M&E, 1988), and the 1996 Draft Limited RI/FS Report, prepared by MPI, Inc. (1996). These reports are summarized below.

In 1988, a Preliminary Contamination Evaluation was completed by M&E to evaluate the presence (or absence) of on-site environmental contamination due to former DoD activities. The M&E investigation included: 1) site reconnaissance, 2) magnetic survey to locate silos, 3) work plan preparation, 4) soil boring and groundwater well (four) installation and respective sampling of soil and groundwater (five shallow soil samples from 0-2 feet below ground surface [bgs] and four groundwater samples); 5) collection of silo water from five of the six silos, and 6) a site survey. Locations of soil borings and groundwater wells are shown on Figure 1-6.

M&E reported concentrations of arsenic, barium, chromium, and lead in shallow soil samples. M&E attributed the detected soil metal concentrations to be consistent with levels found in background soil. Cadmium was detected in two soil samples slightly above detection limits, and acetone was detected in all soil samples ranging from 10 to 27 µg/kg. All soil sample detections were below current NYSDEC Unrestricted Use levels. Petroleum staining was observed at approximately three feet bgs during the installation of boring B4 for Monitoring Well (MW)-4. M&E also reported petroleum hydrocarbons (including floating product in Silo 4 and a sheen of product in Silos 2 and 3), lead, and chromium in silo water. No drums or buried tanks were identified on site.



	November 2015	TI2E, A Joint Venture Between Tidewater and IEI
	Prepared by: K. DeSilva	Figure 1-5. 1966 Aerial Photograph, Launch Area, Nike BU 34/35 East Aurora, NY
	Approved by: K. Fields	



NOTES:
1. Silo water sample not collected from Silo/Pit No. 6 because it has been backfilled.
2. Floating product sampled collected at Silo/Pit No. 4.

LEGEND
⊗ Monitoring Well
● Soil Sample Location (M&E, 1988
○ Silo Water Sample Location

November 2015

Prepared by: K. DeSilva

Approved by: K. Fields

TI2E, A Joint Venture Between Tidewater and IEI

Figure 1-6. Summary of Historical Investigation Activities Launch Area, Nike BU 34/35 East Aurora, NY

M&E retained Hager-Richter Geoscience, Inc. (HRG) to conduct a magnetic survey. HRG used an EG&G/Geometrics Model G856 Proton Precession Portable Magnetometer. M&E/HRG was able to identify the locations of five of the six silo (missile magazine) doors. M&E noted that HRG encountered “metallic interferences” from trash mounded over Silo 6. These interferences prevented the affirmative location of Silo 6. M&E stated that Silo 6 was reportedly filled with building debris from the demolition of site buildings.

M&E concluded that contamination related to DoD activities existed on the site and recommended site access control, testing of silo water for semivolatile organic compound (SVOCs) and polychlorinated biphenyl (PCBs), and an RI/FS.

In 1995, MPI conducted a Limited RI/FS (1996) to further characterize groundwater contamination and chemical impacts in the silo water, determine the extent of the contamination, perform a qualitative assessment of the risk to human health and the environment, and prepare a list of remedial action alternatives. The Limited RI/FS involved characterizing the physical, geological, hydrogeological, and environmental characteristics at the site; conducting a site visit; collecting background data, groundwater samples from the four existing monitoring wells, and five silo water samples; and conducting a community water well survey.

MPI reported concentrations of arsenic, barium, chromium, and lead in all four monitoring wells, with arsenic, chromium, and lead above state regulatory criteria. Total petroleum hydrocarbon (TPH) was not detected in any wells, but MPI reported that the wells were screened below the water table and not screened across the water table to allow floating free product (if present) to flow into the well. The only organic constituent detected above the NYSDEC criteria for Class GA groundwater was Aroclor-1254 in a duplicate sample for MW-4; however, it was not detected in the original sample for MW-4. Arsenic, barium, chromium, and lead were detected at MW-3 only and were below the NYSDEC criteria for Class GA groundwater. Groundwater samples collected for pH indicated that groundwater pH ranged from 6.64 to 7.17.

Water samples collected from Silo 3 contained concentrations of lead above New York groundwater guidelines. TPH was detected in three of five samples (Silos 2, 3, and 4), and these sample locations corresponded with the three silos that contained sheen/floating product. Of the organic compounds that were detected (excluding TPH, oil and grease), all concentrations were below the NYSDEC criteria for Class GA groundwater and NYSDEC State Pollutant Discharge Elimination System (SPDES) effluent standards for discharge to Class GA water. Only the bis 2-ethylhexyl phthalate (BEHP) detection in Silo 2 exceeded the NYSDEC criteria for Class B surface water. Metals detected included lead in four silos and dissolved hexavalent chromium in Silo 3, which exceeded the NYSDEC criteria for Class GA groundwater. The respective metal concentrations in Silo 3 also exceeded the NYSDEC criteria for Class B surface water; however, it should be noted that hexavalent chromium analyses took place outside of the required holding time. MPI collected a sample of the floating product layer for waste characterization from Silo 4. MPI reported that the sample was primarily diesel range organics (DRO). The sample was not corrosive or ignitable.

Tables 1-1 and 1-2 summarize the compounds detected in soil and groundwater at the Launch Area, respectively. Table 1-3 summarizes the compounds detected in silo water at the Launch Area. Figure 1-7 presents the locations and concentrations of analytes that exceed NYSDEC Class GA groundwater standards.

Table 1-1. Summary of Compounds Detected in Soil at the Launch Area				
Date	Sample Location/Description	Analyte	Result (mg/kg)	Comments
4/12/1988	S-1	Methylene Chloride	0.029	
4/12/1988	S-1	Acetone	0.022	
4/12/1988	S-1	Arsenic	0.0017	
4/12/1988	S-1	Barium	0.031	
4/12/1988	S-1	Cadmium	<0.0039	
4/12/1988	S-1	Chromium	0.0075	
4/12/1988	S-1	Lead	0.012	
4/12/1988	S-2	Methylene Chloride	0.028	
4/12/1988	S-2	Acetone	0.027	
4/12/1988	S-2	Arsenic	0.0033	
4/12/1988	S-2	Barium	0.028	
4/12/1988	S-2	Cadmium	0.00041	
4/12/1988	S-2	Chromium	0.0064	
4/12/1988	S-2	Lead	0.0097	
4/12/1988	S-3	Methylene Chloride	0.025	
4/12/1988	S-3	Acetone	0.02	
4/12/1988	S-3	Arsenic	0.0025	
4/12/1988	S-3	Barium	0.026	
4/12/1988	S-3	Cadmium	<0.0040	
4/12/1988	S-3	Chromium	0.0061	
4/12/1988	S-3	Lead	0.0095	
4/12/1988	S-4	Methylene Chloride	0.01	
4/12/1988	S-4	Acetone	0.027	
4/12/1988	S-4	Arsenic	0.0021	
4/12/1988	S-4	Barium	0.016	
4/12/1988	S-4	Cadmium	<0.0040	
4/12/1988	S-4	Chromium	0.0035	
4/12/1988	S-4	Lead	0.0049	
4/12/1988	S-5	Methylene Chloride	0.016	
4/12/1988	S-5	Acetone	0.01	
4/12/1988	S-5	Arsenic	0.003	
4/12/1988	S-5	Barium	0.023	
4/12/1988	S-5	Cadmium	0.00042	
4/12/1988	S-5	Chromium	0.007	
4/12/1988	S-5	Lead	0.0081	

Table 1-2. Summary of Compounds Detected in Groundwater at the Launch Area				
Date	Sample Location/Description	Analyte	Result (µg/L)	Comments
4/13/1988	MW-1	Arsenic	6.6	
4/13/1988	MW-1	Barium	82	
4/13/1988	MW-1	Chromium	19	
4/13/1988	MW-1	Lead	14	
4/13/1988	MW-1	VOCs	ND	
4/13/1988	MW-2	Arsenic	31	Exceeded NYSDEC Class GA
4/13/1988	MW-2	Barium	356	
4/13/1988	MW-2	Chromium	144	Exceeded NYSDEC Class GA
4/13/1988	MW-2	Lead	900	Exceeded NYSDEC Class GA
4/13/1988	MW-2	VOCs	ND	
4/13/1988	MW-3	Arsenic	28	Exceeded NYSDEC Class GA
4/13/1988	MW-3	Barium	187	
4/13/1988	MW-3	Chromium	83	Exceeded NYSDEC Class GA
4/13/1988	MW-3	Lead	66	Exceeded NYSDEC Class GA
4/13/1988	MW-3	VOCs	ND	

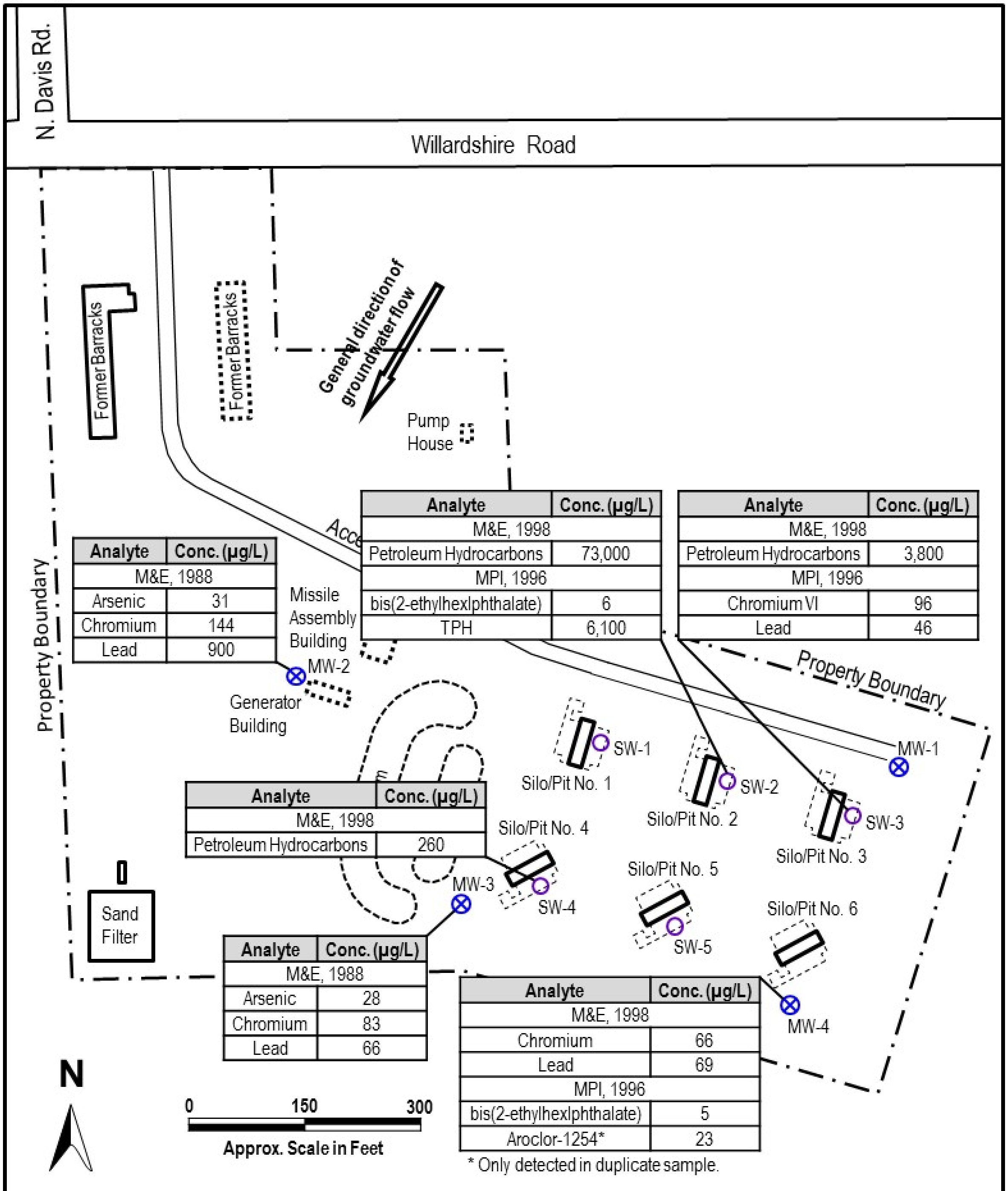
Table 1-2. Summary of Compounds Detected in Groundwater at the Launch Area				
Date	Sample Location/Description	Analyte	Result (µg/L)	Comments
4/13/1988	MW-4	Arsenic	23	
4/13/1988	MW-4	Barium	232	
4/13/1988	MW-4	Chromium	66	Exceeded NYSDEC Class GA
4/13/1988	MW-4	Lead	69	Exceeded NYSDEC Class GA
12/18/1995	MW-1	Butylbenzyphthalate	1	
12/18/1995	MW-1	bis(2-ethylhexlphthalate)	2	
12/18/1995	MW-1	Diethylphthalate	0.8	
12/19/1995	MW-2	Trichlorofluoromethane	1	
12/19/1995	MW-3	Arsenic	7	
12/19/1995	MW-3	Barium	52	
12/19/1995	MW-3	Barium	50	
12/19/1995	MW-3	Chromium	14	
12/19/1995	MW-3	Lead	12	
12/18/1995	MW-4	Tetrachloroethene	1	
12/18/1995	MW-4	Butylbenzyphthalate	0.8	
12/18/1995	MW-4	bis(2-ethylhexlphthalate)	3	
12/18/1995	MW-4	Diethylphthalate	0.5	
12/18/1995	MW-4 Dup	Butylbenzyphthalate	2	
12/18/1995	MW-4 Dup	bis(2-ethylhexlphthalate)	5	Equaled NYSDEC Class GA
12/18/1995	MW-4 Dup	Diethylphthalate	0.8	
12/18/1995	MW-4 Dup	Di-n-butylphthalate	5	
12/18/1995	MW-4 Dup	Aroclor-1254	23	Exceeded NYSDEC Class GA; only present in duplicate sample

Table 1-3. Summary of Compounds Detected in Silo Water at the Launch Area				
Date	Sample Location/Description	Analyte	Result (µg/L)	Comments
3/30/1988	SW-1	Acetone	<10.0	
3/30/1988	SW-1	Petroleum Hydrocarbons	<1000	
3/30/1988	SW-1	Arsenic	3.8	
3/30/1988	SW-1	Barium	13	
3/30/1988	SW-1	Chromium	18	
3/30/1988	SW-1	Lead	39	
3/30/1988	SW-2	Acetone	10	
3/30/1988	SW-2	Petroleum Hydrocarbons	73,000	Exceeded NYSDEC Class GA
3/30/1988	SW-2	Arsenic	<1.5	
3/30/1988	SW-2	Barium	37	
3/30/1988	SW-2	Chromium	<5.0	
3/30/1988	SW-2	Lead	16	
3/30/1988	SW-3	Acetone	<10.0	
3/30/1988	SW-3	Petroleum Hydrocarbons	3,800	Exceeded NYSDEC Class GA
3/30/1988	SW-3	Arsenic	<1.5	
3/30/1988	SW-3	Barium	22	
3/30/1988	SW-3	Chromium	<5.0	
3/30/1988	SW-3	Lead	27	
3/30/1988	SW-4	Acetone	<10.0	
3/30/1988	SW-4	Petroleum Hydrocarbons	260	Exceeded NYSDEC Class GA
3/30/1988	SW-4	Arsenic	<1.5	
3/30/1988	SW-4	Barium	55	
3/30/1988	SW-4	Chromium	<5.0	
3/30/1988	SW-4	Lead	42	
3/30/1988	SW-5	Acetone	<10.0	
3/30/1988	SW-5	Petroleum Hydrocarbons	<1000	

Date	Sample Location/Description	Analyte	Result (µg/L)	Comments
3/30/1988	SW-5	Arsenic	<1.5	
3/30/1988	SW-5	Barium	22	
3/30/1988	SW-5	Chromium	<5.0	
3/30/1988	SW-5	Lead	<2.5	
12/20/1995	Silo 1	Lead	0.005	
12/20/1995	Silo 1	Oil and Grease	3.8	
12/19/1995	Silo 2	Butylbenzyphthalate	0.4	
12/19/1995	Silo 2	bis(2-ethylhexlphthalate)	6	Exceeded NYSDEC Class GA
12/19/1995	Silo 2	Lead	8	
12/19/1995	Silo 2	Total Petroleum Hydrocarbons	6100	Exceeded NYSDEC Class GA
12/19/1995	Silo 2	Oil and Grease	4200	
12/19/1995	Silo 2 Dup	Butylbenzyphthalate	0.5	
12/19/1995	Silo 2 Dup	bis(2-ethylhexlphthalate)	10	Exceeded NYSDEC Class GA
12/19/1995	Silo 2 Dup	Lead	7	
12/19/1995	Silo 2 Dup	Total Petroleum Hydrocarbons	1200	Exceeded NYSDEC Class GA
12/19/1995	Silo 2 Dup	Oil and Grease	4700	
12/19/1995	Silo 3	bis(2-ethylhexlphthalate)	0.3	
12/19/1995	Silo 3	Lead	5	
12/19/1995	Silo 3	Lead	15	
12/19/1995	Silo 3 Dup	Chromium VI	96	Exceeded NYSDEC Class GA
12/19/1995	Silo 3 Dup	Chromium VI	90	Exceeded NYSDEC Class GA
12/19/1995	Silo 3 Dup	Lead	46	Exceeded NYSDEC Class GA
12/19/1995	Silo 3 Dup	Lead	22	
12/20/1995	Silo 4	1,1-Dichloroethane	2	
12/20/1995	Silo 4	Oil and Grease	2900	
12/20/1995	Silo 5	Lead	14	
12/20/1995	Silo 5	Oil and Grease	2300	

Table 1-3. Summary of Compounds Detected in Silo Water at the Launch Area

MPI evaluated four remedial action alternatives (this included no action). Based on this review, MPI recommended Alternative 4 consisting of institutional controls, extraction of water and product from silos, grouting of silo drainage system and walls, and backfilling silos. Prior to implementing any remedial action MPI recommended that the source and extent of Aroclor-1254 in groundwater monitoring well MW-4 be determined (Note: Aroclor-1254 was detected in a duplicate sample for MW-4; however, it was not detected in the original sample for MW-4), and the nature of the materials deposited in Silo 6 be determined.



Analyte	Conc. (µg/L)
M&E, 1988	
Arsenic	31
Chromium	144
Lead	900

Analyte	Conc. (µg/L)
M&E, 1998	
Petroleum Hydrocarbons	73,000
MPI, 1996	
bis(2-ethylhexlphthalate)	6
TPH	6,100

Analyte	Conc. (µg/L)
M&E, 1998	
Petroleum Hydrocarbons	3,800
MPI, 1996	
Chromium VI	96
Lead	46

Analyte	Conc. (µg/L)
M&E, 1998	
Petroleum Hydrocarbons	260

Analyte	Conc. (µg/L)
M&E, 1988	
Arsenic	28
Chromium	83
Lead	66

Analyte	Conc. (µg/L)
M&E, 1998	
Chromium	66
Lead	69
MPI, 1996	
bis(2-ethylhexlphthalate)	5
Aroclor-1254*	23

* Only detected in duplicate sample.

LEGEND

⊗ Monitoring Well

○ Silo Water Sample Location

November 2015

Prepared by:
K. DeSilva

Approved by:
K. Fields

TI2E, A Joint Venture Between Tidewater and IEI

Figure 1-7. Summary of Water Samples Exceeding NYSDEC Class GA Standards Launch Area, Nike BU 34/35 East Aurora, NY

2.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

The following sections provide information regarding the Former Niagara Falls-Buffalo Defense Nike BU-34/35 location; topography and site features; geology, soils, hydrogeology, surface water features, and wetlands; and climate, demographics, land-use, and background metals in soil. This section focuses on the Launch Area since it is the subject of RI field activities. The information presented is based on the references cited including previous site environmental reports and information gained during an initial site visit conducted at the Launch Area on July 14, 2015. During the site visit, current site conditions and surrounding land use were observed. Photographs taken during the site visit are included in Appendix D. The information in this section provides a baseline of information to support the development of the RI Work Plan, the execution of the RI work, and the context to interpret future RI results and findings.

2.1 LOCATION

The Former Nike BU-34/35 consists of a Launch Area and Control Area located respectively in East Aurora and Orchard Park, Erie County, New York. The Launch Area formerly occupied 19.84 acres (fee parcels) and 26 acres (easement parcels) located at 601 Willardshire Road in East Aurora, New York (U.S. Army, 1958).

2.2 TOPOGRAPHY AND SURFACE FEATURES

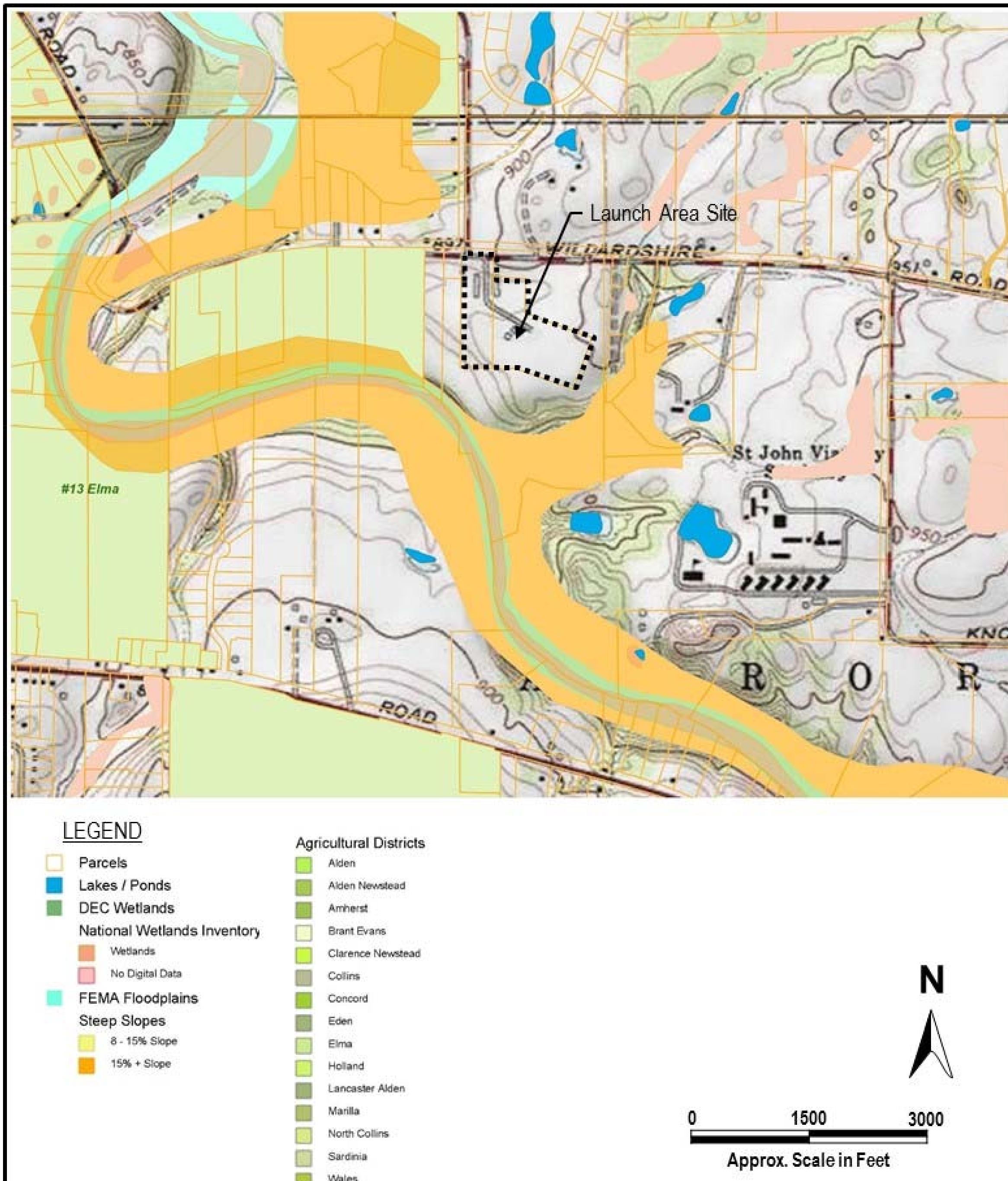
The Former Nike BU-34/35 Launch Area is situated on a fluvial (river) dissected glaciated upland surface that is characterized as having little relief except within the vicinity of major drainage ways (river valleys having steep valley walls).

The Launch Area is fairly level with a majority of the property situated at elevations ranging from 870 feet above mean sea level (MSL) at the southern portion of the property to 890 feet above MSL at the northern portion of the property adjacent to Willardshire Road (United State Geological Survey [USGS], 2013). The slope of the Launch Area is to the south toward Cazenovia Creek and an unnamed intermittent stream (stream and creek bottom are at approximately 790 feet above MSL). South of the Launch Area, the Cazenovia Creek is confined to a narrow valley with steep slopes (greater than 15 percent). Figure 2-1 shows the location, topography, wetlands, and other natural site features of the Launch Area.

2.3 GEOLOGY

The Former Nike BU-34/35 is located within the Central Lowland Physiographic Province (Tesmer, 1981). The Central Lowland Physiographic Province is bounded on the north by Lake Ontario, on the west by Lake Erie, and to the south and east by the Appalachian Plateau Physiographic Province[1]. The Surficial Geologic Map of Western New York (Niagara Sheet) (Caldwell, 1988) indicates the Central Lowland Physiographic Province is underlain by glacial deposits comprised of northeast - southwest bands of till (ice-deposited sediment ranging in thickness from 3 to 150 feet thick) and till moraine (ice and water deposited sediment ranging in thickness from 30 to 90 feet) with scattered kame deposits, sheets of lacustrine deposits, and string-like fluvial sand and gravel deposits, all originating from the advancing and then retreating continental glaciers. The shallow bedrock in the vicinity of the Town of Aurora is the West Falls Group, a thin to massively bedded black to gray shale and light-gray siltstone and sandstone that dips to the south at approximately 40 feet per mile (Buehler and Tesmer, 1963).

[1] See http://pubs.usgs.gov/ha/ha730/ch_m/gif/M002.GIF



Source: Erie County Department of Environment And Planning, Office of GIS	August 2015	TI2E, A Joint Venture Between Tidewater and IEI
	Prepared by: K. DeSilva	Figure 2-1. Launch Area Topography, Wetlands and other Natural Site Features, Nike BU 34/35 East Aurora, NY
	Approved by: K. Fields	

The Launch Area is underlain by a veneer of glacial deposits consisting of glacial till and fluvial and lacustrine deposits overlying bedrock comprised of the Upper Devonian West Falls Group. Four borings, converted to four 2-inch diameter shallow monitoring wells with depths of less than 20 feet bgs, were installed by M&E in 1988. Based on these borings and monitoring wells, the Launch Area (in the vicinity of the missile magazines/silos) is underlain by fill (consisting of former unconsolidated glacial deposits with scattered debris) comprised of brown silt and fine sand having a variable thickness of less than a foot to approximately 8 feet thick overlying a silt with varying amounts of clay and sand ranging in approximate thickness from 5 to 17 feet. M&E noted that the sand content increases with depth. Grain size analyses conducted by M&E (1988) indicate the predominant lithology of the unconsolidated sediment is silt followed by clay and sand (fine to medium) with a trace of gravel. Groundwater was encountered at elevations ranging from 888.61 feet above MSL to 896.57 feet above MSL with flow to the south-southwest (MPI, 1996). The groundwater was actually measured from top of riser (TOR) and ranged from 3.88 feet from TOR to 10.20 feet from TOR. The monitoring wells are constructed with "stick-up well covers", therefore the riser lengths could be more than 2 feet above the ground surface. None of the M&E borings encountered bedrock. M&E estimated the thickness of overburden (unconsolidated sediments) to be 30 to 50 feet thick based on observed bedrock outcrop along Cazenovia Creek. The contact between the bedrock and overlying unconsolidated sediments beneath the Launch Area is an erosional contact. The shale bedrock underlying the Launch Area is also regularly jointed and fractured.

2.4 HYDROGEOLOGY

The Cazenovia Creek Watershed is fed by groundwater and surface water runoff. The direction of shallow groundwater flow in the unconsolidated glacial deposits in the vicinity of Cazenovia Creek is in the direction of the creek and generally follows the topographic gradient and the buried surface configuration of the contact between the glacial sediments and the underlying shale bedrock.

Groundwater within the shallow unconfined aquifer flows south-southwest toward Cazenovia Creek in the direction of the topographic gradient (M&E, 1988 and MPI, 1996). M&E (1988) and MPI (1996) calculated the gradient to be 0.016 feet per feet and 0.015 feet per feet, respectively, to the southwest. The hydraulic conductivity calculated by M&E (using "recovery testing" and the Hvorslev Method) ranged from 0.4 to 1.6 feet per day – these are typical hydraulic conductivity values (low) for silt and sandy silt deposits (MPI, 1996). The thickness of the unconsolidated glacial deposits beneath the Launch Area was estimated to range from 30 to 50 feet thick (MPI, 1996). The shale bedrock outcrops along the steep slopes of Cazenovia Creek and creek bottom. While the unconfined shallow surficial aquifer beneath the site is not suitable for potable water supply, it is hydraulically connected to the underlying shale bedrock aquifer that may be used for water supply (see community well survey below).

Based on a community well survey, MPI (1996) identified that the area in the vicinity of the Launch Area is supplied with potable water by the Municipal Water Authority (Erie County). MPI (1996) mapped the municipal water lines and the "intermittent use of municipal water lines" along certain roads in the vicinity of the Launch Area. More specifically, MPI (1996) mapped the municipal water lines along Quaker Road (south of Cazenovia Creek), Willardshire Road and Milestrip Road (west of Cazenovia Creek), North Davis Road (north of Cazenovia Creek), and Buffalo Road (north and east of Cazenovia Creek). MPI also identified intermittent use of municipal water along Willardshire Road and Knox Road (north of Cazenovia Creek). Most residents using groundwater (and confirmed by MPI) were located west of the Launch Site and within 1,000 feet of Cazenovia Creek. MPI confirmed that 20 residents use groundwater wells for potable water supply within a mile radius of the Launch Area. These 20 residents include ten residents located on Willardshire Road, seven residents located on Stoneybrook Road and three residents located on Knox Road. Based on limited well construction information obtained during the well survey, the well diameters ranged from six inches to 12 inches (based on ten reporting residents) and have depths ranging from 42 to 119 feet (based on four reporting residents). The distribution and use of groundwater likely reflects the location of municipal water supply lines as well as the accessibility of shallow plentiful water adjacent to Cazenovia Creek.

2.5 SURFACE WATER FEATURES

The major surface water feature in the vicinity of the Launch Area is the Cazenovia Creek watershed. Several small, shallow, unnamed intermittent streams adjacent to the Launch Area drain the glaciated upland to Cazenovia Creek. There are also isolated small shallow ponds in the vicinity (not on site) of the Launch Area. The shallow intermittent streams and scattered small ponds are characteristic of surface water features associated with poorly-drained upland surface underlain by glacial till, moraine, and other glacial deposits. Many of these small ponds are also manmade or provide stormwater management.

Cazenovia Creek drains an area of approximately 144 square miles (all within Erie County). The Cazenovia Creek segment in the vicinity of the Former Nike BU-34/35 Launch Area is classified by the NYSDEC as a Class B stream/waterbody suitable for supporting public bathing, general recreational use, and aquatic life, but not as a water supply.

2.6 WETLANDS

The following section presents wetland information for the Former Nike BU-34/35 Launch Area. There are no national or state (NYSDEC) designated wetlands present on the Launch Area property. There are a number of small man-made ponds present to the north and east of the Launch Area at the Craig Burn Country Club and at the Christ the King Seminary, formerly the St. John Vianney Seminary. There are also regulated wetlands located to the east of the Launch Area near Knox Road and within the Knox Farm State Park, which is located approximately 4,000 feet to the east of the Launch Area (Town of Aurora, 2010). These natural wetlands are designated palustrine forested wetland and are seasonal (MPI, 1996). In addition, riverine wetlands are present along Cazenovia Creek and have been identified approximately 0.8 miles downstream of the Former Nike BU-34/35 Launch Area. Figure 2-1 shows the location of the surface water bodies, slopes, agricultural districts and floodplains in the vicinity of the Former Nike BU-34/35 Launch Area.

2.7 LAND USE

The Launch Area is comprised of two parcels. The first 7.53-acre parcel (a rectangular-shaped parcel) with frontage along Willardshire Road with address of 601 Willardshire Road, East Aurora, New York, is identified as Section-Block-Lot 160.00-3-36.2. The parcel type is identified as rural-residential. The second 12.4-acre parcel (an irregular-shaped polygon) is identified as Section-Block-Lot as 160.00-3-36.1. This parcel formerly contained the six underground Nike missile storage magazines/silos, acid fueling station, missile assembly building, generator building, launchers, missile fuel service area, and four shallow two-inch diameter monitoring wells installed by M&E (1988). The current owner of both Launch Area parcels is identified as Waterhill Evergreen Holdings. The two parcels owned by Waterhill are surrounded on the east, south, and west by a 52.98-acre parcel identified as Section-Block-Lot 163.00-3-37 owned by Ambit Properties, LLC. This parcel type is identified as rural vacant and is situated between the two parcels that comprise the former Launch Area and Cazenovia Creek.

The Launch Area parcels are zoned Agricultural (CRA Infrastructure & Engineering, Inc., November 1996 and Revised, March 2010). The Launch Area is bounded on the east by residential estates; on the south by forested land, an intermittent stream, and Cazenovia Creek; on the west by residences, estate (large) properties, and the Elma Agricultural District; and on the north by Willardshire Road and further to the north by residential properties and estates. In addition to the above, the Christ the King Seminary, formerly the St. John Vianney Seminary, is located 3,000 feet southeast of the Launch Area, and the Craig Burn Country Club is located 1,600 feet to the north. The Former Nike BU-34/35 Launch Area parcels have been designated part of the Knox Park Priority Property Grouping by the Town of Aurora Open Space Committee (Town of Aurora, 2010). This property district consists of large parcel properties located on Willardshire Road within close proximity of Knox Farm State Park. The Knox Park Priority Property Grouping was designated by the Aurora Open Space Committee for purposes of preserving large parcels as open space in the vicinity of the State Park (Town of Aurora, 2010).

Currently the property is vacant (no residential inhabitants), posted, and monitored via all-terrain vehicle patrols by the owner to prevent poachers.

2.8 BACKGROUND METALS

This section presents information regarding background metal concentrations in soil and their consideration in evaluating releases or impacts. In 2004, NYSDEC proposed the development of Soil Cleanup Objectives (SCOs) for its Brownfield Cleanup Program for the purpose of defining contaminant-specific remedial action objectives for soil based on the site's current, intended, or reasonable anticipated future use (NYSDEC, NYSDOH, 2006). One of the many considerations NYSDEC used to develop its Brownfield Program SCOs was rural soil background concentrations (RSBCs). The Statewide Rural Survey (NYSDEC, 2005) and other data sources were used to identify rural soil background concentration for priority list contaminants (PLCs). This included 179 commonly assessed analytes (PLCs) in discrete surface soil samples collected from 125 randomly selected rural properties in New York State. The NYSDEC defined the background soil concentration using the 98th percentile concentration for the analyte. Table 2-2 compares Statewide RSBCs with NYSDEC SCOs. It was noted that there were only two samples collected in Erie County as part of Statewide Rural Survey; one sample was collected in the northeast portion of the county and the other was collected in the south-central portion of the county.

Table 2-1. Comparing Statewide Rural Surface Soil Background Levels with NYSDEC Soil Cleanup Objectives															
		Statewide Rural Surface Soil Background Levels [3]						Soil Cleanup Objectives (SCO) (mg/kg)							
									Restricted Use						
									Protection of Human Health						
Analyte	RSBC[2] (mg/kg)	Number of Samples	% Detected	Minimum	95th Percentile	98th Percentile[4]	Max	Unrestricted Use	Residential	Restricted-Residential	Commercial	Industrial	Protection of Ecological Resources	Protection of Groundwater
Aluminum	NE	146	100.0%	561	15,397	16,501	20,000	NE	NE	NE	NE	NE	NE	NE
Antimony	NE	146	4.1%	<0.6	<2.4	<2.7	5.0	NE	NE	NE	NE	NE	NE	NE
Arsenic	16	146	92.4%	<0.2	12.2	14.0	69	13	16	16	16	16	13	16
Barium	350	146	100.0%	4.0	163	288	743	350	350	400	400	10,000	433	820
Beryllium	NE	146	100.0%	0.1	1.0	1.14	2.5	7.2	14	72	590	2,700	10	47
Cadmium	2.5	146	77.4%	<0.05	2.3	2.62	4.2	2.5	2.5	4.3	9.3	60	4	7.5
Calcium	NE	146	100.0%	245	17,765	48,337	74,500	NE	NE	NE	NE	NE	NE	NE
Chromium (Total)	NE	146	100.0%	1.0	19.2	21.1	36	NE	NE	NE	NE	NE	NE	NE
Chromium, trivalent	30							30	36	180	1,500	6,800	41	NS
Chromium, hexavalent	NE							1	22	110	400	800	1	19
Cobalt	NE	146	97.9%	<0.2	13.3	16.6	24.1	NE	NE	NE	NE	NE	NE	NE
Copper	NE	146	100.0%	2.0	30.8	55.0	98	50	270	270	270	10,000	50	1,720
Iron	NE	146	100.0%	783	25,140	27,236	29,500	NE	NE	NE	NE	NE	NE	NE
Lead	NE	146	100.0%	3.0	74.3	86.1	133	63	400	400	1,000	3,900	63	450
Magnesium	NE	146	100.0%	177	6,774	12,318	46,000	NE	NE	NE	NE	NE	NE	NE
Manganese	2,000	146	100.0%	13	1,549	1,722	4,550	1,600	2,000	2,000	10,000	10,000	1,600	2,000
Mercury	0.3	146	98.7%	<0.01	0.20	0.272	0.34	0.18	0.81	0.81	2.8	5.7	0.18	0.73
Nickel	NE	146	100.0%	0.0	25.0	26.7	49	30	140	310	310	10,000	30	130
Potassium	NE	146	100.0%	116	1,827	2,080	2,440	NE	NE	NE	NE	NE	NE	NE
Selenium	4.0	146	94.6%	<0.4	3.8	5.45	6.5	3.9	36	180	1,500	6,800	3.9	4.0
Silver	NE	146	18.5%	<0.1	0.6	1.13	1.6	2	36	180	1,500	6,800	2	8.3
Sodium	NE	146	80.9%	<39	227	372	806	NE	NE	NE	NE	NE	NE	NE
Thallium	NE	146	0.0%	ND	ND	ND	ND	NE	NE	NE	NE	NE	NE	NE
Vanadium	NE	146	100.0%	2.0	29.4	35.7	38	NE	NE	NE	NE	NE	NE	NE
Zinc	NE	146	100.0%	10	134	166	454	109	2,200	10,000	10,000	10,000	109	2,480

[2] Rural Soil Background Concentration and NE = Not established.
[3] Source: Concentrations of Selected Analytes in *Rural New York State Surface Soils: A Summary Report on the Statewide Rural Surface Soil Survey*, August 2005.
[4] The percent detected, 95th and 98th percentiles are weighted averages calculated using the 118 source distant and 28 near source surface soil samples collected as part of the Statewide Rural Surface Soil Survey. The term “source distant” refers to surface soil samples from areas that were considered reasonable points of human contact, at least five meters from any potential pollution source. The term “near source” refers to surface soil samples from areas typically two meters distant from a road or driveway.

3.0 WORK PLAN APPROACH

3.1 RI OBJECTIVES

The objectives of the RI for the Launch Area of the Former Nike BU-34/35 are as follows:

1) Determine the nature and extent of the contamination in soil and groundwater (including an understanding of background concentrations of metals and SVOCs);
2) Update and refine the current CSM, including actual and potential exposure pathways;
3) Collect data necessary to evaluate potential environmental risk associated with silos; and
4) Collect data to support preparation of baseline HHRA and SLERA.

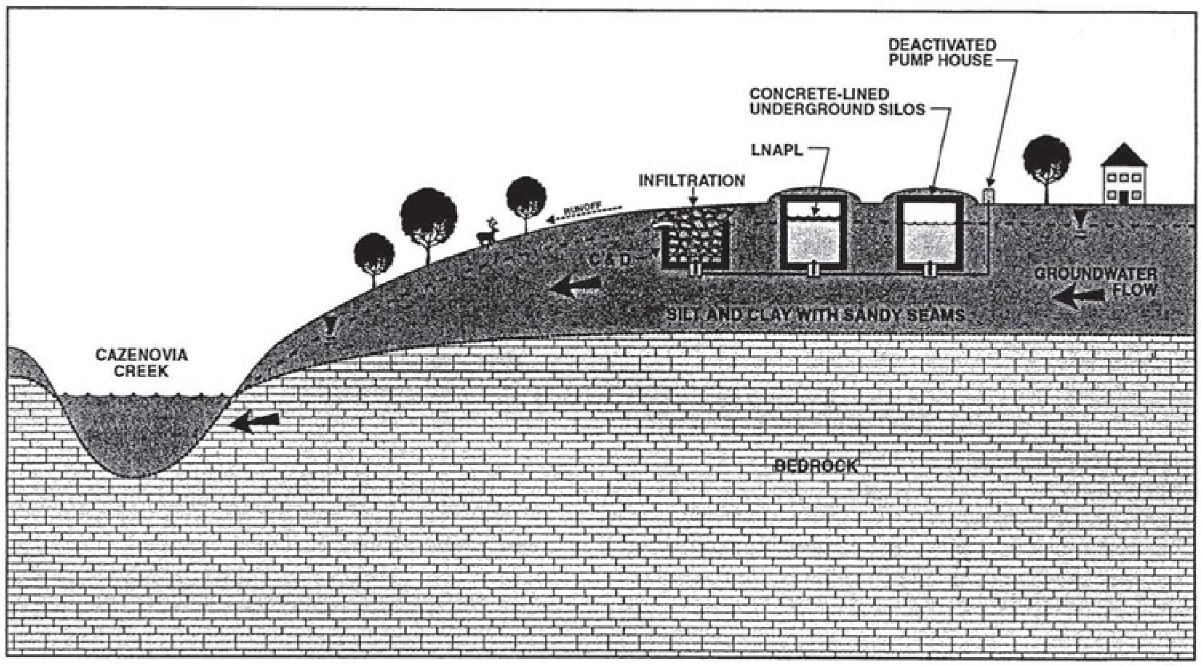
3.2 CONCEPTUAL SITE MODEL

A CSM is an essential engineering management tool, which helps the project team successfully manage a site through the investigation and remediation process. The CSM is dynamic and should be updated as more information is collected about a site. A comprehensive CSM should include background information, geologic and hydrogeologic data, contaminant source, distribution and fate and transport data, and risk assessment information (USACE, 2012). There are several formats which can be used to display elements of a CSM, and a comprehensive CSM should include a variety of data visualization methods, such as text, schematics, tables, photos, a receptor flow chart, cross sections, time-series plots, etc.

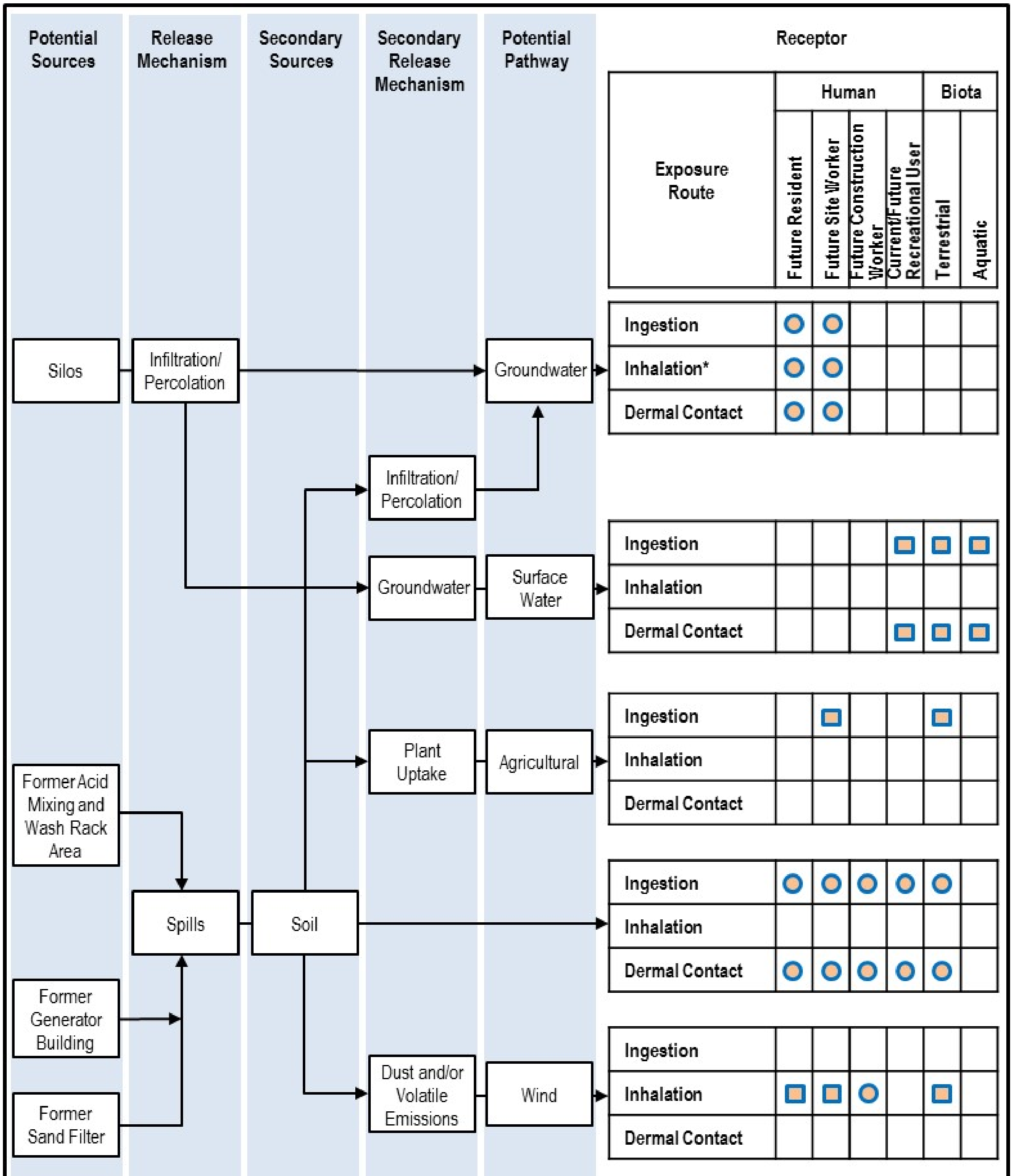
The information that formulates the basis of the CSM (e.g., background information, geologic and hydrogeologic data, contaminant data, etc.) for the Former Nike BU-34/35 is documented in Sections 1 and 2 of this report. Figure 3-1 provides the Launch Area CSM presented in the 1996 Limited RI Report (MPI, 1996). Figure 3-2 summarizes the current CSM and potential exposure pathways for Former Nike BU-34/35. Data collected as part of this RI will be used to update and refine the current CSM. Additional data visualization methods (e.g., receptor flow chart and schematic diagrams) will be utilized as part of the RI Report.

3.3 RI APPROACH

To achieve the RI objectives, a review of historical documents and existing data was performed to identify any data gaps that need to be filled through the RI (See Section 1.0). Data collected as part of the RI, combined with historical data, will used to prepare an RI Report and to conduct an FS. The FS Report will identify remedial action objectives and preliminary remediation goals, and it will evaluate potential alternatives to achieve the remedial action objectives. Following completion of the FS, a Proposed Plan will be prepared, and public involvement will be conducted to obtain community input. Community input on the Proposed Plan will be considered, and a DD will be prepared to document the selected remedy for Former Nike BU-34/35.



Source: MPI, 1996	August 2015	TI2E, A Joint Venture Between Tidewater and IEI
	Prepared by: K. DeSilva	Figure 3-1. CSM Presented in the Limited RI (MPI, 1996) Launch Area, Nike BU 34/35 East Aurora, NY
	Approved by: K. Fields	



Legend:

○ Potential Exposure Pathway, Evaluated Quantitatively

□ Potential Exposure Pathway, Evaluated Qualitatively

* Includes vapor intrusion pathway and residential showering (if VOCs are present)

September 2015

TI2E, A Joint Venture Between Tidewater and IEI

Prepared by: K. DeSilva

Approved by: K. Fields

Figure 3-2. Preliminary CSM
Launch Area, Nike BU 34/35
East Aurora, NY

Past investigation activities evaluated potential contamination at historical features at the Launch Area, such as the Generator Building, Missile Assembly Building, Acid Mixing and Wash Rack Area, and the former Silos/Pits. The results of the sampling indicated the presence of TPH and a sheen/floating product in Silos 2, 3, and 4. Metals were detected in soil but appeared representative of background levels. Arochlor-1254 was detected in a duplicate of one sample but not in the primary sample. Further investigation is needed in the Launch Area to provide a representative data set to evaluate human health and ecological risk and to support evaluation of the silos. Specific data quality objectives (DQOs) are documented in the UFP-QAPP (Appendix A) Worksheet 11.

The RI objectives for the Launch Area will be met through field investigation activities involving installation of soil borings/groundwater monitoring wells, evaluation of existing site structures, installation of three test pits, background sampling, and a silo evaluation. Furthermore, as a contingency, additional monitoring wells may be installed downgradient of the proposed wells if required to determine the extent of contamination. The RI sampling approach includes biased sampling to resolve data gaps associated with potential areas of interest (e.g., the Former Sand Filter) and random sampling locations throughout the site to support understanding and calculation of site-related risks. If biased sampling indicates the presence of contamination, additional sampling to delineate the extent of contamination (including impacted volume and weighted average concentration) may be required (likely as part of a separate mobilization).

Table 3-1 summarizes the RI Approach to address data gaps/data needs at the Former Nike BU-34/35 Launch Area. The proposed analytes and rationale for each of the soil borings and test pits is described in Table 3-2. The proposed analytes and rationale for groundwater and silo water sampling is described in Table 3-3. The proposed soil boring, monitoring well, and test pit locations, as well as existing site features, are shown on Figure 3-3. Further detail on investigation field activities can be found in Section 4.0.

Figure 3-3 also shows the investigation boundary, which makes up a single decision unit. The area near the Former Barracks was not included in the RI because there were no known potential sources identified in this area.

The chemical composition of groundwater in the Launch Area will be evaluated to understand groundwater quality and chemical fate and transport. In addition, water samples will be collected from Silos/Pits 1 through 5 to understand chemical composition of the water and options for wastewater management. The silo/pit evaluation will also provide information regarding the silos' physical contents, hydraulic connectivity between the silos, and current structural condition.

Table 3-1. RI Approach Summary for the Launch Area

Data Gap/Data Need	Rationale	RI Approach
Gather historical information on Launch Area site	Ensure we have a comprehensive understanding of the site history and use to support RI	• Perform National Archives record search • Perform search of USACE East Aurora records • Obtain historical aerial photographs
Locate and evaluate condition of existing monitoring wells	Determine usability of existing monitoring wells	• Remove debris/sediment from wells • Check wells for vapors and free product • Develop wells and monitor water quality parameters
Perform Utility Location	Identify subsurface utilities	• Mark utilities to avoid during drilling
Install new borings/monitoring wells (See Figure 3-3)	See Table 3-2 and Table 3-3	• Install eighteen soil borings to evaluate nature and extent of contamination, including unbiased samples sufficient for conducting the HHRA and SLERA • Install five new 2-inch wells screened across the water table • Collect continuous soil samples • Collect soil samples representative of the near surface (0-2 in bgs), surface (0-1 ft bgs), fill (2-8 feet bgs), and native soil

Table 3-1. RI Approach Summary for the Launch Area

Data Gap/Data Need	Rationale	RI Approach
		overlying /bedrock (8-15 feet bgs) • Analyze soil samples for VOCs, SVOCs, metals, PCBs (See Table 3-2) • Develop and sample new wells for VOCs, SVOCs, metals, and PCBs
Install new borings for background evaluation (See Figure 3-3)	See Table 3-2	• Collect continuous soil samples • Collect soil samples representative of the near surface (0-2 in bgs), surface (0-1 ft bgs), and native material (2-15 feet bgs) • Analyze soil samples for SVOCs and metals (See Table 3-2)
Evaluate groundwater chemical composition at existing and new monitoring wells	• Understand groundwater geochemistry and if/how it changes as groundwater flows through the site • Assess possible relationship between groundwater geochemistry and metals detected in groundwater	• Collect the following field parameters from site wells: oxidation reduction potential (ORP), dissolved oxygen (DO), pH, conductivity, turbidity, temperature, and salinity • Sample site wells for chloride, iron (II), manganese, nitrate, sulfate, total organic carbon (TOC) • Collect sufficient data for HHRA and SLERA
Install test pits (See Figure 3-3)	See Table 3-2	• Test pit depth: 5 feet • Conduct visual observations to evaluate soil staining, etc. • Photo-document all test pits • Collect 3 samples per test pit and any areas of concern based on visual observations • Analyze soil samples for VOCs, SVOCs, metals, PCBs
Evaluate pump house and assess if nearby well exists	If well still exists, collect samples	• If well exists, develop and sample well for VOCs, SVOCs, metals, and PCBs
Access and collect water samples from Silos/Pits 1 through 5	Understand the chemical composition of water in each of the silos/pits. See Table 3-3.	• Evaluate presence of free product • Sample silo water for VOCs, SVOCs, metals, and PCBs (and other compounds necessary to profile wastewater for discharge or off-site disposal). • Collect the following field parameters from silo water: ORP, DO, pH, conductivity, turbidity, temperature, and salinity • Sample silo water for chloride, iron (II), manganese, nitrate, sulfate, and TOC
Silo/pit investigation	Understand content of silos/pits (e.g., remaining equipment and infrastructure), structural integrity, and footprint	• Clear surface soil/vegetation from Silo/Pit 1, exposing surface of silo/pit; evaluate structural integrity • Evaluate hydraulic connectivity between Silos/Pits • Evaluate contents and structural integrity of Silo/Pit 1 to extent practicable • Photo-document investigation
Conduct Site Survey	Survey location of relevant site features, including silos/pits, utilities, infrastructure identified by geophysical survey, existing wells, new borings/wells	Utilize local surveyor to prepare a site map of relevant site features

Table 3-2. Soil Sampling and Analysis Summary for the RI at the Launch Area

Sample ID	Chemical Analysis				Rationale
	VOCs	SVOCs	Metals	PCBs	
BACK1-00		X	X		Background, Random Location
BACK1-01		X	X		
BACK1-15		X	X		
BACK2-01		X	X		Background, Random Location
BACK2-15		X	X		
BACK3-00		X	X		Background, Random Location
BACK3-01		X	X		
BACK3-15		X	X		
BACK4-01		X	X		Background, Random Location
BACK4-15		X	X		
BACK5-00		X	X		Background, Random Location

Table 3-2. Soil Sampling and Analysis Summary for the RI at the Launch Area

Sample ID	Chemical Analysis				Rationale
	VOCs	SVOCs	Metals	PCBs	
BACK5-01		X	X		
BACK5-15		X	X		
BACK6-01		X	X		Background, Random Location
BACK6-15		X	X		
BACK7-00		X	X		Background, Random Location
BACK7-01		X	X		
BACK7-15		X	X		
BACK8-01		X	X		Background, Random Location
BACK8-15		X	X		
BACK9-00		X	X		Background, Random Location
BACK9-01		X	X		
BACK9-15		X	X		
BACK10-01		X	X		Background, Random Location
BACK10-15		X	X		
SB1-01		X	X	X	Biased location. The nearest well, MW-2 is screened below the water table. Well needed to evaluate potential free product. See Table 3-3 (MW-5).
SB1-08	X	X	X	X	
SB1-15	X	X	X	X	
SB2-01		X	X	X	Biased location. The nearest well, MW-3 is screened below the water table. Well needed to evaluate potential free product. See Table 3-3 (MW-6).
SB2-08	X	X	X	X	
SB2-15	X	X	X	X	
SB3-01		X	X	X	Biased location. The nearest well, MW-4 is screened below the water table. Well needed to evaluate potential free product and PCB detection (MPI, 1996). See Table 3-3 (MW-7).
SB3-08	X	X	X	X	
SB3-15	X	X	X	X	
SB4-01		X	X	X	Random Location
SB4-08	X	X	X	X	
SB4-15	X	X	X	X	
SB5-00		X	X	X	Random Location
SB5-01[(a)]		X	X	X	
SB5-08	X	X	X	X	
SB5-15	X	X	X	X	
SB6-01		X	X	X	Random Location
SB6-08	X	X	X	X	
SB6-15	X	X	X	X	
SB7-01		X	X	X	Biased location near former Sand Filter. Location was not evaluated during previous investigations. To be converted in monitoring well. See Table 3-3 (MW-8).
SB7-08	X	X	X	X	
SB7-15	X	X	X	X	
SB8-01		X	X	X	Random Location
SB8-08	X	X	X	X	
SB8-15	X	X	X	X	
SB9-01		X	X	X	Random Location
SB9-08	X	X	X	X	
SB9-15	X	X	X	X	
SB10-01		X	X	X	Random Location. To be converted into background monitoring well. See Table 3-3 (MW-9).
SB10-08	X	X	X	X	
SB10-15	X	X	X	X	
SB11-00		X	X	X	
SB11-01		X	X	X	Random Location
SB11-08	X	X	X	X	
SB11-15	X	X	X	X	
SB12-01		X	X	X	Random Location
SB12-08	X	X	X	X	
SB12-15	X	X	X	X	
SB13-00		X	X	X	Random Location
SB13-01		X	X	X	
SB13-08	X	X	X	X	

Table 3-2. Soil Sampling and Analysis Summary for the RI at the Launch Area					
Sample ID	Chemical Analysis				Rationale
	VOCs	SVOCs	Metals	PCBs	
SB13-15	X	X	X	X	
SB14-00		X	X	X	Random Location
SB14-01[(a)]		X	X	X	
SB14-08	X	X	X	X	
SB14-15	X	X	X	X	
SB15-01		X	X	X	Random Location
SB15-08	X	X	X	X	
SB15-15	X	X	X	X	
SB16-01		X	X	X	Random Location
SB16-08	X	X	X	X	
SB16-15	X	X	X	X	
SB17-01		X	X	X	Random Location
SB17-08	X	X	X	X	
SB17-15	X	X	X	X	
SB18-00		X	X	X	Random Location
SB18-01[(a)]		X	X	X	
SB18-08	X	X	X	X	
SB18-15	X	X	X	X	
TP-1-00		X	X	X	Biased location. Evaluate shallow subsurface soils near former Generator Building/Missile Assembly Building.
TP-1-03	X	X	X	X	
TP-1-05	X	X	X	X	
TP-2-00		X	X	X	Biased location. Evaluate shallow subsurface soils near former Acid Mixing and Wash Rack.
TP-2-03	X	X	X	X	
TP-2-05	X	X	X	X	
TP-3-00		X	X	X	Biased location. Evaluate contents (fill material and debris) placed in Silo/Pit No. 6.
TP-3-03	X	X	X	X	
TP-3-05	X	X	X	X	

(a) Sample also will be analyzed for grain-size distribution and TOC

Notes:

- Sample IDs: 00 = near surface sample - 0 to 2 inches bgs; 01 = surface sample – 0 to 1 feet bgs; 08 = 2-8 feet bgs representative of fill; 15 = 8-15 feet bgs (2-15 feet bgs in background area since there is no fill in the background area) representative of native material above bedrock; sample depths will be selected randomly within each interval
- BACK = background; SB = soil boring/random location; B = soil boring/biased location; TP = test pit

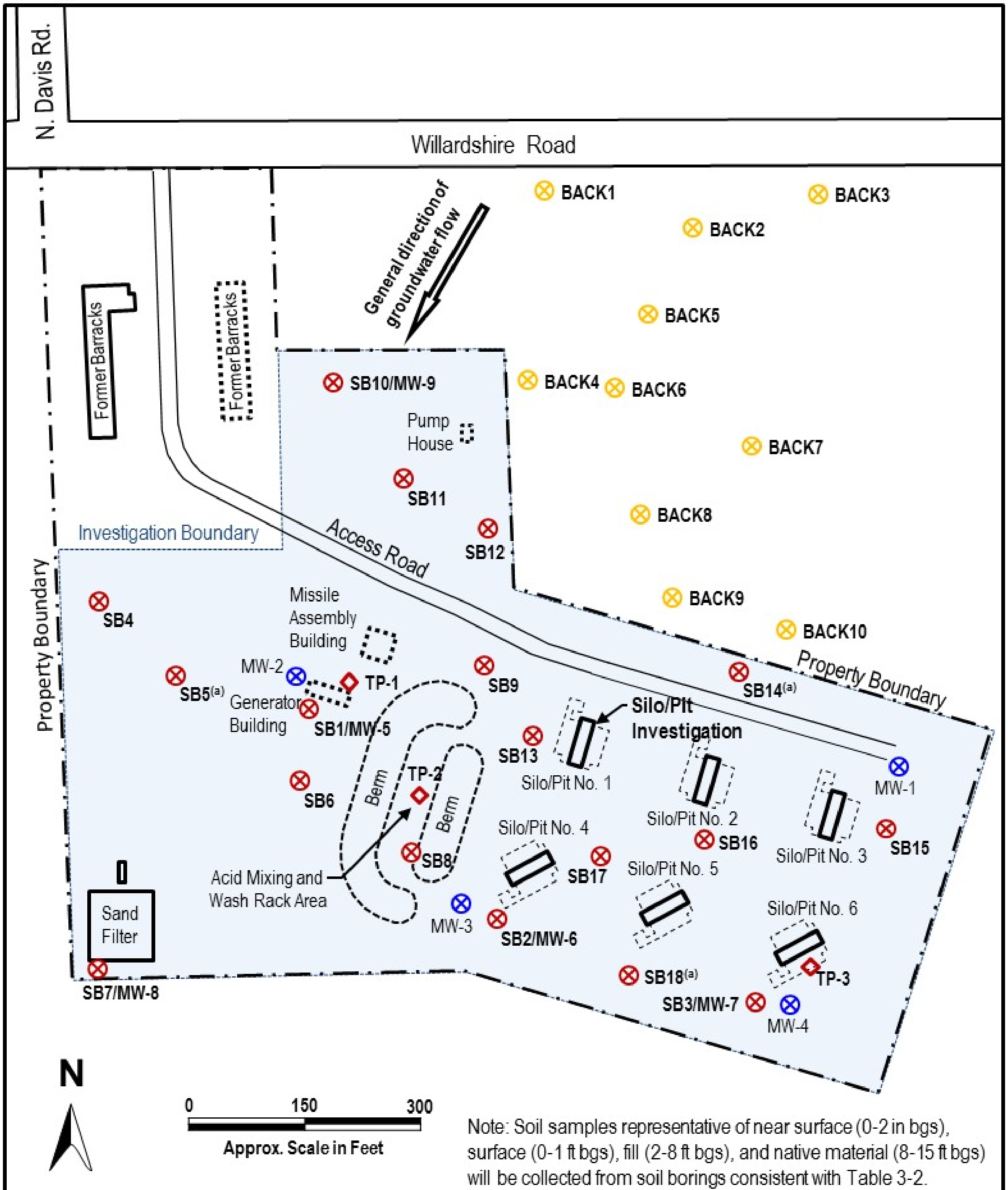
Table 3-3. Water Sampling and Analysis Summary for the RI at the Launch Area							
Sample ID	Chemical Analysis						Rationale
	VOCs	SVOCs	Metals	PCBs	Anions	TOC	
MW-1	X	X	X	X	X	X	Existing Monitoring Well; Background Monitoring Well
MW-2	X	X	X	X	X	X	Existing Monitoring Well
MW-3	X	X	X	X	X	X	Existing Monitoring Well
MW-4	X	X	X	X	X	X	Existing Monitoring Well
MW-5	X	X	X	X	X	X	Biased. See Table 3-2 (SB1)
MW-6	X	X	X	X	X	X	Biased. See Table 3-2 (SB2)
MW-7	X	X	X	X	X	X	Biased. See Table 3-2 (SB3)
MW-8	X	X	X	X	X	X	Biased. See Table 3-2 (SB7)
MW-9	X	X	X	X	X	X	Background Monitoring Well; Random Upgradient Location. See Table 3-2 (SB10)
Silo1-SW	X	X	X	X	X	X	Near surface sample
Silo1-Deep	X	X	X	X	X	X	Sample collected from bottom of Silo
Silo1-Comp[(a)]	X	X	X	X	X	X	Composite sample to evaluate IDW and remediation waste disposal options
Silo2-SW	X	X	X	X	X	X	Near surface sample
Silo2-Deep	X	X	X	X	X	X	Sample collected from bottom of Silo
Silo3-SW	X	X	X	X	X	X	Near surface sample

Table 3-3. Water Sampling and Analysis Summary for the RI at the Launch Area

Sample ID	Chemical Analysis						Rationale
	VOCs	SVOCs	Metals	PCBs	Anions	TOC	
Silo3-Deep	X	X	X	X	X	X	Sample collected from bottom of Silo
Silo4-SW	X	X	X	X	X	X	Near surface sample
Silo4-Deep	X	X	X	X	X	X	Sample collected from bottom of Silo
Silo5-SW	X	X	X	X	X	X	Near surface sample
Silo5-Deep	X	X	X	X	X	X	Sample collected from bottom of Silo

(a) Composite sample from Silo1 (Silo1-Comp) to include additional analysis to evaluate IDW and remediation waste disposal options. Additional analysis includes: Total Petroleum Hydrocarbons (TPH) Gasoline Range (GRO) and Diesel Range (DRO); Organochloride Pesticides; Organophosphorous Compounds; Herbicides; Sulfides; Nitrogen; Oil, Grease, and Total Petroleum; Hexavalent Chromium; Total Cyanide; Ignitability; and Total Coliform

Notes: MW = monitoring well



Note: Soil samples representative of near surface (0-2 in bgs), surface (0-1 ft bgs), fill (2-8 ft bgs), and native material (8-15 ft bgs) will be collected from soil borings consistent with Table 3-2.

LEGEND
- Existing Monitoring Well
- Proposed Boring/Monitoring Well
- Proposed Background Boring
- Proposed Test Pit

(a) Locate boring within drainage ditch based on field observations

February 2016

Prepared by:
K. DeSilva

Approved by:
K. Fields

TI2E, A Joint Venture Between Tidewater and IEI

Figure 3-3. Proposed Locations for Borings/Monitoring Wells and Test Pits Launch Area, Nike BU 34/35 East Aurora, NY

4.0 FIELD ACTIVITIES

Field activities described in this Work Plan encompass only the Launch Area for the Former Niagara Falls Buffalo Defense Nike BU-34/35. These field activities include mobilization and utility clearance; evaluation of existing structures; soil boring and monitoring well installation; test pit excavations; silo pit evaluation; soil and groundwater sampling; surveying the site; and associated health and safety monitoring, QA/QC activities, and disposal of IDW. The respective field activities are described in this section, and other sections and appendices provide further detail where appropriate.

TI2E will establish site controls to ensure that any site investigation activities do not further impact (temporarily or permanently) or contaminate the project site or surrounding area. TI2E will be responsible for decontaminating all equipment and/or tools, implementing soil erosion control measures, removing any temporary facilities, and restoring all areas impacted by site activities. The anticipated RI field program is summarized in the sections below. All field activities will be executed in accordance with the UFP-QAPP and the SSHP/APP included as Appendices A and B of this document. Furthermore, community air monitoring will take place according to the procedures described in the CAMP (Appendix C).

4.1 MOBILIZATION AND UTILITY CLEARANCE

TI2E will coordinate all required utility clearances with a qualified contractor and/or other responsible entities before commencement of any ground-intrusive activities at the site. The locations of the proposed borings/monitoring wells and test pit excavations will be staked before mobilizing equipment to the site, and subsurface utilities in their vicinity will be clearly marked to avoid them during field activities.

Furthermore, if the silo doors are not visibly identifiable through field observation, they will be located during site clearance activities. The doors were covered with approximately 0.5 to 1.5 feet of soil at the time of the 1995 investigation and were identifiable through topographic expression (MPI, 1996); however, the doors are not known to have been accessed since that investigation.

4.2 EVALUATION OF EXISTING FEATURES AND STRUCTURES

Upon mobilization to the site, existing structures will be located and evaluated to determine their condition and whether they can be used for investigation purposes, if applicable. These structures include monitoring wells, the sand filter, the pump house assembly, and the silo pits. Due to the extensive nature of the silo/pit evaluation, it will be addressed in further detail in Section 4.4.

4.2.1 Monitoring Wells

Upon mobilization to the site, existing monitoring wells will be located and evaluated to determine if they can be used for monitoring. Debris and sediment will be removed from the wells, and they will be checked for vapors and free product. If possible, the wells will be developed and monitored for water quality parameters according to the procedures described in Section 4.3.2.

4.2.2 Sand Filter

The condition, construction, size, and use of the former Sand Filter will be investigated, since it was not included in previous site investigations.

4.2.3 Pump House Assembly

The pump house assembly will be evaluated as to its condition and construction. If the well still exists, samples will be collected according to the methods described in Section 4.3.2.

4.2.4 Silo/Pits

Once located, either visually or according to the procedures described in Section 4.4, silo/pit doors will be exposed using a backhoe. They are likely to be covered with a layer of soil and vegetation, since they are not known to have been accessed since 1995. At the time, the ¼-inch diamond plate steel doors were accessed using a jackhammer to bore through the reinforced concrete that covered them. Holes were bored in the concrete above each door, and then a reciprocating saw was used to cut an opening in the steel plate that was large enough to facilitate sampling. This step was not necessary at Silo 1 during previous investigations, because it was accessible through a 4-feet square hinged access door (MPI, 1996).

During the previous limited RI conducted by MPI (1996), the doorway to Silo 6 could not be identified/located after conducting 15 test-pit excavations. M&E (1988) concluded that Silo 6 had been filled with building debris from demolished buildings. Evaluation of the contents of the existing silo/pits is detailed in Section 4.4.

4.3 SAMPLING AND ANALYSIS PLAN

Sampling will be conducted in accordance with the UFP-QAPP presented in Appendix A and the procedures described in this section. Sampling includes collecting soil samples from soil borings and test pits, collecting groundwater samples from new and existing monitoring wells, and collecting samples of silo/pit water. Free product will also be collected and analyzed if observed at the site. All laboratory samples will be sent to ALS Laboratory Group, a DoD Environmental Laboratory Accreditation Program (ELAP)-certified laboratory.

4.3.1 Soil Sampling

TI2E will subcontract a local drilling company to perform drilling activities at the Launch Area in order to collect soil samples and subsequently install groundwater monitoring wells collocated in the borings. The drilling company will have the appropriate certificates, experience, and training to perform this work. It is anticipated that hollow-stem augers with split-spoon sampling will be utilized for drilling, sampling of soils, and installation of groundwater monitoring wells.

A licensed professional geologist will oversee drilling activities and perform lithologic logging on soil samples collected continuously from the soil borings. The geologist will visually inspect, classify, and log the cuttings retrieved from the drilling process according to the USCS. Soil boring logs will be prepared for this site using a USACE-approved drilling log form.

During drilling and sampling activities, a photo-ionization detector (PID) will be used to screen soil samples/cuttings for residual VOCs. Readings will be recorded in the boring log. Organic vapors above the open boreholes will be monitored during the drilling process. The PID will be calibrated daily or more frequently should conditions warrant recalibration.

Soil samples for laboratory analysis will be collected from three depths representative of the near surface (0-2 in bgs), surface (0-1 ft bgs), fill (2-8 feet bgs), and native soil overlying/bedrock (8-15 feet bgs). Additional samples will be collected at depth if contamination is suspected to be present based on PID readings, odor, or visual staining. All soil samples will be analyzed according to methods listed in Table 4-1. VOC analysis will be performed on subsurface samples only. Samples for laboratory analysis will be collected from the core and will be sealed with Teflon® tape and covered with end caps.

Table 4-1. Soil Sampling Plan and Laboratory Analysis for the Launch Area

Location	Analyte/Method	Description
SB1 through SB18	VOCs/8260C* SVOCs/8270D PCBs/8082 Metals (/ 200.7/6010B/200.8/6020A	Collect soil samples representative of the near surface (0-2 in bgs), surface (0-1 ft bgs), fill (2-8 feet bgs), and native soil overlying /bedrock (8-15 feet bgs) at random depths within each interval; additional samples collected at depth if contamination is suspected to be present based on PID readings, odor, or visual staining. * VOC analysis will be performed on subsurface samples only.
TP-1 through TP-3	VOCs/8260C SVOCs/8270D PCBs/8082 Metals/ 200.7/6010B/200.8/6020A	Three samples collected per test pit (approximately 1, 3, and 5 feet bgs); additional samples collected at depth if contamination is suspected to be present based on PID readings, odor, or visual staining.
BACK1 through BACK10	SVOCs/8270D Metals / 200.7/6010B/200.8/6020A	Collect soil samples representative of the near surface (0-2 in bgs), surface (0-1 ft bgs), and native material (2-15 feet bgs) at random depths within each interval
Contingency: Additional downgradient borings /monitoring wells	VOCs/8260C SVOCs/8270D PCBs/8082 Metals/ 200.7/6010B/200.8/6020A	Additional downgradient wells installed if project screening levels exceeded in any of the existing wells
QA/QC: Field Duplicate Samples	VOCs/8260C SVOCs/8270D PCBs/8082 Metals/ 200.7/6010B/200.8/6020A	10% of all samples/matrices collected
QA/QC: Matrix Spike/Matrix Spike Duplicate Samples	VOCs/8260C SVOCs/8270D PCBs/8082 Metals/ 200.7/6010B/200.8/6020A	5% of all samples/matrices collected
QA/QC: Trip Blanks	8260C	1 per sample cooler with VOCs

All drilling, lithologic logging, and sampling activities will be conducted in accordance with the USACE *"Geology Supplement to the Scope of Services"* (May 2011) and the UFP-QAPP. All drilling, excavation, and sampling equipment will be decontaminated between soil boring/well locations using a steam cleaner or pressure washer with non-phosphate detergent. Expendable materials will be used to the maximum extent possible to reduce decontamination requirements and to minimize the potential for cross contamination between boring locations.

Test Pit Sampling

Test pits will be excavated near the Generator Building/Missile Assembly Building, near the Acid Mixing and Wash Rack, and at Silo/Pit 6. The test pits will be approximately 10 feet wide by 10 feet long and will be installed with a backhoe to a depth of approximately 5 feet. Dimensions may vary depending on site specific conditions (i.e., greater dimensions if visual observations indicate that additional exploration is warranted, smaller dimensions if groundwater or other obstructions preclude a deeper excavation).

Before initiating excavation activities, the bucket of the backhoe will be decontaminated. Excavated soil will be placed on plastic sheeting adjacent to the excavation and will be examined for visual staining or other unusual features. A lithologic description will be recorded for discrete depths. All test pits will be photo-documented.

Field soil samples will be collected from the excavated soil that are representative of the shallow soils (0-1 feet bgs range), mid-excavation (approximately 3 feet bgs), and base of the pit (approximately 5 feet bgs). The soil will be placed in a jar, sealed and then after 15 minutes, the head space will be screened for organic vapors using a PID. Additional field samples for VOC analysis will be collected from locations where odor or visual staining is observed.

Three discrete soil samples will be collected from each test pit for laboratory analysis that are representative of the shallow soils (1 feet bgs range), mid-excavation (approximately 3 feet bgs), and base of the pit (approximately 5 feet bgs). Samples will be collected from the bucket of the backhoe and placed in laboratory supplied, pre-cleaned sample jars, labeled with a unique sample identification, chilled, and shipped under chain-of-custody to an ELAP-certified laboratory. Samples will be analyzed for VOCs, SVOCs, PCBs, and metals according to the procedures listed in Table 4-1.

Upon completion of sampling activities, soil will be returned to the respective test pit excavations, and the site will be restored and graded back to original surface elevation. The bucket of the backhoe will be decontaminated prior to beginning excavation at the subsequent test pit.

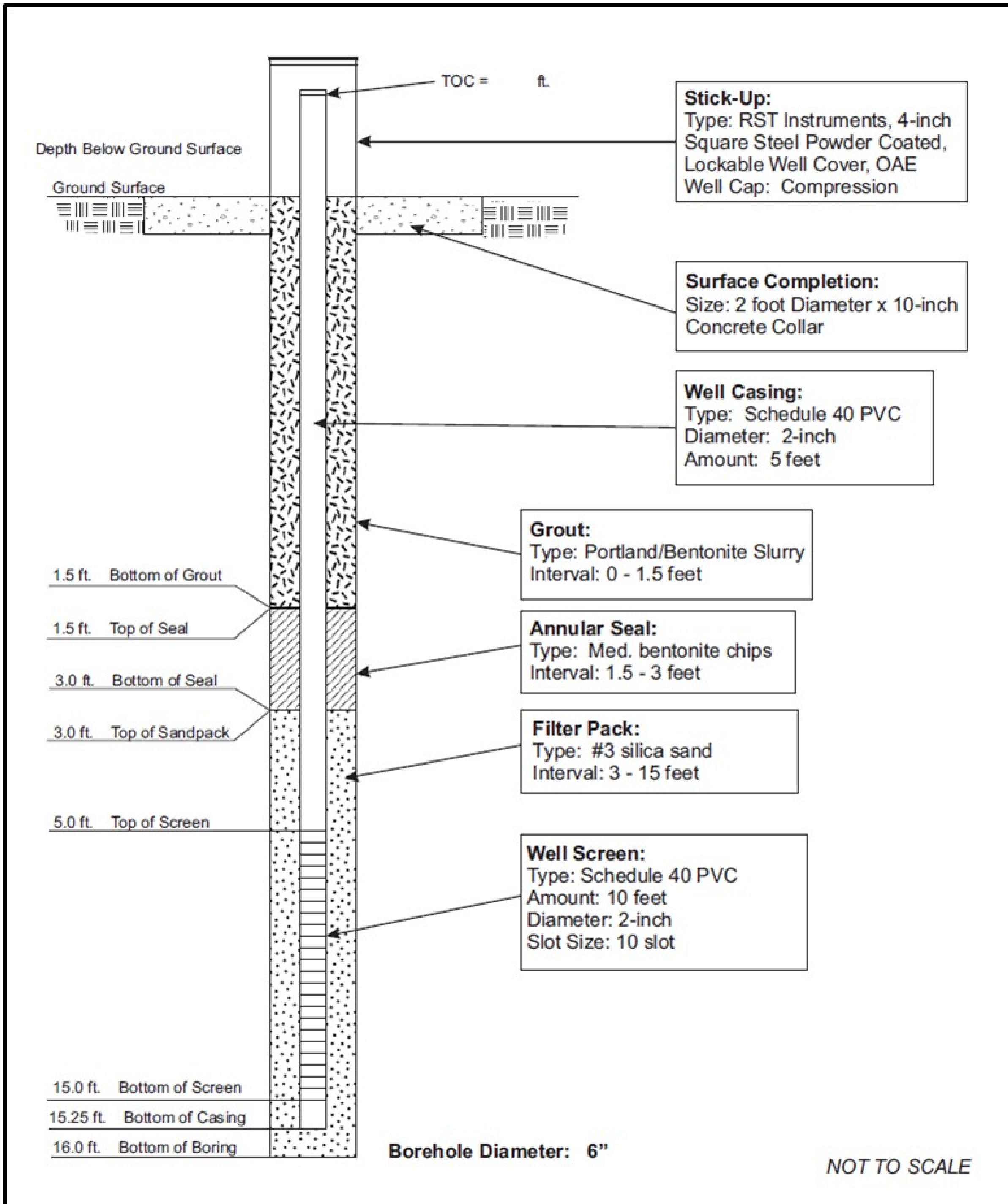
4.3.2 Groundwater and Silo Water Sampling

Groundwater samples will be collected from both the new and existing monitoring wells in the Launch Area. This section details well construction, well development, and sampling procedures that will be conducted to ensure the collection of representative groundwater samples.

New monitoring wells installed in the Launch Area will be identified as MW-5 through MW-9, and numbered sequentially after that if additional wells are necessary. Proposed monitoring well locations are shown on Figure 3-3. Locations may vary slightly depending on field conditions; however, any alternative locations will be selected to satisfy the criteria presented in Table 3-1.

Monitoring wells will be constructed of 2-inch diameter schedule 40 polyvinyl chloride (PVC) pipe and screened across the water table. Based on prior reports, groundwater occurs at 3.8 to 8 feet bgs; however, due to the silty nature of the soil, it is anticipated that groundwater may not immediately flow into the well. For this reason, the augers will be left in the borehole until the water table stabilizes so the well can be screened properly. Final construction details will depend on site conditions at the time of installation; however, it is anticipated that the total depth of the well will be approximately 15 feet bgs with a 10-foot screened interval from 5 to 15 feet bgs. Well screens will be situated as to straddle the water table with 2-3 feet of well screen, to extent practicable, above the water table to intercept any possible LNAPL, if present. The sand pack will extend from the bottom of the borehole to approximately 3 feet bgs with a bentonite layer from 3 to 1.5 feet bgs and a grout layer from approximately 1.5 bgs to ground surface. Figure 4-1 shows the proposed monitoring well construction diagram at the Launch Area.

If possible, soil borings will be advanced to 18 feet bgs (unless refusal is met due to bedrock). Groundwater monitoring wells will be installed as deep as possible within the boring.



Notes:

- Depth of well may vary based on field conditions, and if possible, borings will be advanced to 18 feet bgs (unless refusal is met due to bedrock). Groundwater monitoring wells will be installed as deep as possible within the boring.

February 2016

Prepared by:
K. DeSilva

Approved by:
K. Fields

TI2E, A Joint Venture Between Tidewater and IEI

Figure 4-1. Monitoring Well Construction Diagram, Nike BU 34/35 East Aurora, NY

The wells will be finished at the surface with stickup well covers. A concrete collar will be poured at the surface flush with the existing grade, and a galvanized steel casing stickup will be set into it and have a locking cover.

New monitoring wells will be developed according to the procedures described in the *"Geology Supplement to the Scope of Services"* (USACE, 2011), and well development forms will be prepared by the onsite geologist.

Monitoring wells will be measured for water level and the presence of free product (if any) using a Solinst 122 Interface Meter, or similar. Note that existing monitoring wells are screened below the water table level making them unsuitable for determining the presence of free product.

Low-flow groundwater sampling procedures will be used when sampling monitoring wells in order to minimize mixing of chemically distinct zones, minimize production of turbidity and oxidation, and minimize production of purge water. Low-flow purging and sampling will be conducted using an electric submersible bladder pump and dedicated polyethylene tubing for each monitoring well. During groundwater monitoring, the following parameters will be collected using a Horiba U-52 or similar meter that measures: ORP, DO, pH, conductivity, turbidity, temperature, and salinity.

In the Launch Area, groundwater samples will be collected following well development from each of the existing wells (MW-1 through MW-4), new monitoring wells (MW-5 through MW-9), as well as additional wells if necessary. Groundwater samples will be analyzed in the laboratory for VOCs, SVOCs, metals, PCBs, anions (chloride, nitrate, nitrite, and sulfate), and TOC according to the methods listed in Table 4-2.

In addition, silo water samples will be collected in Silos 1 through 5. Water samples will be collected from the surface and the bottom of each silo/pit. During the extraction of the silo water, composite water samples will be collected at four different intervals during pumping prior to water entering the collection tanks (Section 4.4 describes the silo/pit evaluation, including pumping of silo water). Silo water samples will be analyzed for the constituents identified in Table 4-2.

Table 4-2. Groundwater and Silo Water Sampling Plan and Laboratory Analysis for the Launch Area

Location	Analyte/Method	Description
MW-1 through MW-4	VOCs/8260C SVOCs/8270D PCBs/8082 Metals (filtered and unfiltered)/ 200.7/6010B/200.8/6020A Anions (Chloride, Nitrate, Nitrite, Sulfate)/300.0 Total Organic Carbon (Aqueous)/415.1/9060	Groundwater samples collected from existing wells that are screened below the water table
MW-5 through MW-9	VOCs/8260C SVOCs/8270D PCBs/8082 Metals (filtered and unfiltered)/ 200.7/6010B/200.8/6020A Anions (Chloride, Nitrate, Nitrite, Sulfate)/300.0 Total Organic Carbon (Aqueous)/415.1/9060	Groundwater samples collected from each of the newly installed wells screened across the water table
Additional downgradient monitoring wells	VOCs/8260C SVOCs/8270D PCBs/8082 Metals (filtered and unfiltered)/ 200.7/6010B/200.8/6020A	Additional downgradient wells installed if project screening levels exceeded in any of the existing wells
SP-1 through SP-5	VOCs/8260C SVOCs/8270D PCBs/8082 Metals (filtered and unfiltered)/ 200.7/6010B/200.8/6020A Anions (Chloride, Nitrate, Nitrite, Sulfate)/300.0	Water samples will be collected from the surface and the bottom of each silo pit

Table 4-2. Groundwater and Silo Water Sampling Plan and Laboratory Analysis for the Launch Area

Location	Analyte/Method	Description
	Total Organic Carbon (Aqueous)/415.1/9060	
Composite Silo Pit Sample	VOCs/8260C SVOCs/8270D PCBs/8082 Metals (filtered and unfiltered)/ 200.7/6010B/200.8/6020A TPH (DRO and GRO)/8015 Anions (Chloride, Nitrate, Nitrite, Sulfate)/300.0 Organochloride Pesticides/ SW 8081 A or B/EPA 608 Organophosphorous Compounds/ EPA 8141 A or B, and EPA 614 Herbicides/SW8151A, EPA 615 and EPA 515.1 Sulfides/EPA 376.1 and SM4500 S2 F Nitrogen as Nitrate and Nitrite/EPA Method 353.2 Oil, Grease and Total Petroleum Hydrocarbons/EPA 1664 A, and SW9070A Hexavalent Chromium/SW3060A and 7196A Total Cyanide/SW9010C, SW9013, EPA 335.1, EPA 335.2, CLP Inorganic SOW (ILM04.0); Determination of Weak and Dissociable Cyanide – SM4500-CN I Ignitability/SW1010A and ASTM93-80 Total Coliforms/9131	Composite water sample collected at 4 different intervals during pumping prior to water entering collection tanks. Includes additional analyses to evaluate IDW and remediation waste disposal options.
QA/QC: Field Duplicate Samples	VOCs/8260C SVOCs/8270D PCBs/8082 Metals (filtered and unfiltered)/ 200.7/6010B/200.8/6020A Anions (Chloride, Nitrate, Nitrite, Sulfate)/300.0 Total Organic Carbon (Aqueous)/415.1/9060	10% of all samples/matrices collected
QA/QC: Matrix Spike/Matrix Spike Duplicate Samples	VOCs/8260C SVOCs/8270D PCBs/8082 Metals (filtered and unfiltered)/ 200.7/6010B/200.8/6020A Anions (Chloride, Nitrate, Nitrite, Sulfate)/300.0 Total Organic Carbon (Aqueous)/415.1/9060	5% of all samples/matrices collected
QA/QC: Trip Blanks	8260C	1 per sample cooler with VOCs

4.3.3 QA/QC Sampling

QA/QC sampling will take place according to the specifications described in the UFP-QAPP. Field duplicate samples will represent 10% of all samples/matrices collected, and matrix spike/matrix spike duplicate samples will represent 5% of all samples/matrices collected. One trip blank (provided by the lab with analyte-free water) per sample cooler containing VOC samples will be analyzed for VOCs to assess any potential for cross contamination of VOCs during transport. Analytes and the respective methodologies for the QA/QC sampling protocol are included in Tables 4-1 and 4-2, respectively, for soil and water samples.

All RI data will be independently validated by a third-party subcontractor specializing in laboratory data validation. Samples collected during the field program, along with corresponding QC samples (duplicates, matrix spike/matrix spike duplicates, and trip blanks), will be analyzed via USEPA Methods. The analytical laboratory will provide at a minimum Staged Electronic Data Deliverables (EDDs) 2A. The laboratory data will be verified and validated according to the DoD QSM version 5.0, the USEPA National Functional Guidelines, and ALS's SOPs and QAM. Data Validation (DV) and Data Quality Summary Reports (DQSR) that document the results of the data verification and validation process and the usability of the data will be included in the RI report.

4.4 SILO/PIT EVALUATION

The silo/pit evaluation will be completed to gather specific information on the magazines' physical structures, contents, current water chemistry, and hydraulic connectivity. Determining specific details as they relate to the current condition of the silos/pits and their contents will guide development and assessment of closure alternatives and a final closure plan with estimated costs. Site silo activities will be photo documented to support presentation of information for the RI Report.

Currently, all silos/pits are covered with top soil/vegetation and are not accessible. Access into the silos/pits will require earthwork and footprint delineation which will include:

- Excavating 1-2 ft around the perimeter of Silo/Pit 1;
- Removing vegetation, top soil, and concrete from the surface of Silo/Pit 1 to gain access through the hatch;
- Documenting definable silo/pit features and measurements; and
- Removing top soil/concrete from the access hatches at Silos/Pits 2 through 5 and cutting 4-inch access ports at each.
- Covering access ports when field work is complete

A backhoe will be mobilized to the site to remove top soil, excavate the footprint of Silo/Pit 1, and remove concrete obstructions blocking access to the hatches. If practical, previously used monitoring ports installed by MPI will be identified and utilized. If TI2E uses the previously installed monitoring ports, TI2E will establish access by core drilling an access port measuring at least 4 inches in diameter. All soil removed from the silos/pits will be stockpiled on site and stored using Best Management Practices (BMPs) to reduce soil runoff and erosion. All equipment used on site will be decontaminated on site within the footprint of the silos/pits. Access ports/openings will be secured in a manner that limits unauthorized access but allows access for further evaluation if necessary.

During previous investigation activities (MPI, 1996), the silos/pits were found to be full of groundwater/rainwater. Each silo/pit will be measured for current water levels and free product thickness (if present) using a Solinst 122 Interface Meter, or similar meter. Depth to the bottom of the silo will also be recorded. Table 4-3 summarizes the sample types, parameters, locations and equipment to be utilized during the silo/pit evaluation sampling. Results from the evaluation will be used to characterize the current water chemistry and provide data to evaluate potential disposal/treatment options.

Table 4-3. Silo/Pit Evaluation for the Launch Area

Sample Type	Quantity per Silo/Pit	Sample Location	Sample Equipment	Parameters
Field Monitoring	1	Upper 2 feet of silo/pit[a]	Horiba U-52	pH, ORP, DO, conductivity, salinity, TDS, temperature, turbidity
Laboratory Analysis	1	Surface of silo/pit	Disposable HDPE bailer	Refer to Table 4-2
Laboratory Analysis	1	Bottom of silo/pit[b]	Discrete depth sampler	Refer to Table 4-2
Laboratory Analysis	1	Composite sample during pumping	Sample port	NY Class GA Water requirements

(a) If measureable amounts of free product are present, field parameters will not be collected.
(b) If bottom of silo/pit cannot be reached, sample will be collected from the deepest point.

The previous RI (MPI, 1996) assumed that all of the silos/pits shared a common sump drain system and that water from Silo/Pit 6 filled each of the silos. TI2E reviewed historical documents regarding silo construction (including sump pit) and evaluated silos/pits at other sites and determined that there is no evidence to suggest that the silos are hydraulically connected by a common sump system. Determination of the hydraulic connection between the silos is important, because it will impact selection of closure options. The following activities will be performed to confirm if there is a hydraulic connection between the silos/pits (if any):

- Mobilize 100,000 gallons of water storage and required pump;
- Install a data logging transducer into Silo/Pit 1 to monitor drawdown and recharge rates;
- Pump 100,000 gallons of water from Silo/Pit 1 (or alternative silo/pit if access and/or free product levels prohibit access or pumping);
- Monitor water levels (using a pressure transducer) in all silos/pits during pumping to determine drawdown;
- Sample purged water from storage tanks; and
- Return purged water back into Silo/Pit 1.

Extraction of the water will require the mobilization of five 21,000-gallon steel tanks, pump, and associated piping. The tanks will be staged in accessible on-site areas on stable, flat ground so that delivery and removal can be accommodated. Prior to pumping, a data logging transducer will be placed into Silo/Pit 1 to monitor drawdown during pumping and potential recharge rate after pumping of the silo is terminated. Pumping from Silo/Pit 1 will average approximately 750 to 1,500 gallons per minute (gpm) and last approximately 1 to 2 hours. During pumping, water levels will be collected from the silos/pits every 10 minutes to accurately determine if pumping activities at Silo/Pit 1 hydraulically impact the water levels in the other silos/pits.

A composite silo water sample will be collected during pumping prior to the water entering the tanks. This sample will be collected at 4 different intervals during pumping for the purposes of collecting a representative silo/pit water sample. The water sample and analytical results will be compared to New York Class GA Groundwater Effluent Limitations and the Erie County Sanitation District Guidelines for the Discharge of Petroleum Contaminated Water and Groundwater Remediation (2006). The guidelines specify that groundwater from remediation sites must meet District limits for discharge, have no other contaminants of concern, and be treated prior to discharge [Erie County District's Publically Owned Treatment Works (POTW)].

The silo/pits and storage tanks will be continuously monitored, visually, for free product. If measurable free product is identified within the storage tanks, it will be skimmed off with an absorbent boom and disposed of as IDW waste before the purge water is returned to Silo/Pit 1. Once empty, the temporary storage tanks will be decontaminated and removed from the site.

Following completion of the silo/pit evaluation, an accurate footprint of Silo/Pit 1 will be defined, and access points to all silo/pits (except Silo/Pit 6) will be clearly identified and made available for future activities. In addition, an understanding of the current water levels, product thickness (if any), and chemical composition of the silo/pit water will be established. Hydraulic testing of the pits will determine if the silos/pits are hydraulically connected and provide an understanding of groundwater infiltration rates into the silos/pits. This site-specific information will be used in conjunction with document findings and experiences from other Nike missile sites to support a feasibility study and analysis of alternatives to develop a feasible and cost-effective closure plan.

4.5 SITE SURVEY

Following completion of sampling activities, the location of site features will be surveyed for the purpose of preparing a site plan. The surveyed site features will include Silo/Pit 1 footprint and associated silo/pit features, access points for Silo/Pits 1 through 5, utilities and infrastructure identified by the geophysical survey, existing wells, new borings/wells, test pits, as well as any surface water/sediment sampling locations, if any. The elevation of wells and water levels will be accurately measured for determination of groundwater gradient and predicted flow direction. Surveying will be performed by a New York-licensed surveyor, with ±0.1 foot accuracy for horizontal accuracy and ±0.01-foot accuracy for elevations.

4.6 INVESTIGATION DERIVED WASTE

TI2E will manage all IDW generated during site field activities pursuant to applicable Federal, State, and local regulations and guidance including the USEPA Management of Investigation-Derived Wastes during Site Inspections (USEPA, 1992) and USACE guidance (2013). IDW includes all materials generated during the performance of the work that cannot be effectively reused, recycled, or decontaminated in the field. IDW consists of materials that could potentially pose a risk to human health and the environment (e.g., boring/well installation cuttings, sampling, and decontamination wastes) as well as materials that have minimal potential to pose a risk to human health and the environment (e.g., sanitary solid wastes).

Waste streams generated at the site will be sampled to support waste characterization and waste disposal facility waste acceptance requirements. Based upon this characterization, disposal options will be identified and ultimate disposition of all IDW will be determined. All disposal manifests and associated paperwork will be included in the appendices to the RI report.

Containers that meet Department of Transportation (DOT) requirements will be used for the different types of IDW generated during the project: solids (e.g., drill cuttings from boring/monitoring well installation - drums); liquid (monitoring well development water, purge water, decontamination water drums); and personal protection equipment (PPE), disposable sampling equipment, and trash (e.g., gloves, Tyvek®). When applicable, IDW will be containerized at the time of generation and temporarily staged at a designated secure location at the site. Hazardous waste is not anticipated to be generated during RI activities; however, any containers of IDW determined to contain hazardous waste will be removed from the temporary staging area for disposal at an off-site permitted facility with the proper manifests and disposal documents. Approval for waste disposal will be obtained prior to IDW pickup and disposal to an offsite permitted treatment, storage, or disposal facility (TSDF).

All solid IDW associated with the soil borings, monitoring well installations, and test pit excavations generated during the RI will be field-screened using a PID. The segregated solid IDW will be staged in a designated secure IDW storage location in containers (drums) until waste profiling on soil composite samples is performed by an off-site laboratory. Based on historical site characterization data, soil cuttings will likely be non-hazardous; however, characterization data will be used to prepare waste profiles for off-site disposal if necessary.

Generated liquid IDW will include monitoring well development water, purge water from sampling, water extracted during the silo/pit investigation, and decontamination water. Liquid IDW generated during project activities will be placed in appropriately labeled containers (drum/tank) and temporarily staged until waste profiling is performed by an off-site laboratory. Current disposal options being considered for liquid IDW include off-site disposal, discharge to POTW/sanitary sewer, and return of purged water to Silo/Pit 1.

Other non-hazardous waste anticipated to be generated at the site and its disposal method include:

- Concrete debris generated to access the silos will be disposed of as construction debris at an appropriate/regulated landfill [NYSDEC has a list of active permitted construction and demolition debris processing facilities (http://www.dec.ny.gov/chemical/23686.html)]; and

- PPE (e.g., Tyvek®, nitrile gloves, ear plugs), disposable sampling equipment (e.g., disposable bladders from bladder pumps, used sample tubing), and miscellaneous refuse will be double-bagged and disposed of in a designated waste dumpster or other receptacle located on site for eventual disposal as municipal solid waste.

Containers of IDW will be labeled indicating the generator, contact information, contents, and date of generation. Initial identification will include the following information:

- "Hazardous Waste – Pending Analysis";
- Project name (e.g., Former Nike BU-34/35 [Launch Area])
- USEPA Site Identification (ID) Number;
- Container name that includes Point of Generation (Well number(s)/boring number(s) and depth, if applicable);
- Contents (soil, development water, purge water, etc.);
- Date of generation; and
- Contact phone number and name

Hazardous waste determination will be made using available analytical data (including Toxicity Characteristic Leaching Procedure). If the waste is determined to be non-hazardous solid waste, the "Hazardous Waste – Pending Analysis" label will be removed. TI2E will label the container with a non-hazardous waste label within 5 working days of this determination. If the waste is determined to be hazardous, TI2E will label and mark the containers in accordance with 49 Code of Federal Regulations (CFR) Part 172 within 5 working days of the hazardous waste determination.

All containers of IDW will be cataloged in the field logbook or on an IDW tracking form. The unique ID number for each container will consist of the site, location (well/boring ID), and container number. Containers will be numbered consecutively and will include the media type (i.e., LIQ001 or SOIL002). Information for materials requiring off-site disposal based on laboratory analysis will include all pertinent information regarding the container, including:

- General label information,
- Whether the material is hazardous or non-hazardous,
- Storage location,
- Proposed disposition of the waste,
- Date manifested from the site,
- Manifest number, and
- Final disposition of the container.

Off-site disposal of IDW will be arranged in a manner appropriate to its classification (e.g., characteristic hazardous waste or non-hazardous, solid/liquid waste). TI2E will coordinate all waste handling activities with Capital Environmental, LLC (Waste Broker) to identify properly licensed and permitted transportation and disposal (T&D) firms for the project. In general, disposal includes the following activities:

- Procurement of transportation and disposal subcontractor(s),
- Completion of waste profile forms, as appropriate for each disposal facility,
- Completion of T&D manifests, and
- Pickup, transportation, and disposal of the wastes.

Approval to accept the IDW will be required from each facility selected to receive IDW and will be obtained prior to shipment of wastes from the site. Depending on the waste volume, alternate disposal and/or contamination reduction methods will be evaluated with USACE New York District and NYSDEC.

TI2E will provide the following to USACE New York District for all waste sent offsite for disposal:

- Facility name
- Location
- Point-of-contact
- USEPA Identification Number
- Verification the transporter is licensed

Preparation of a draft profile package will be performed by TI2E with assistance from field support subcontractors. The draft profile package will be sent to the USACE for review and approval. Upon approval of the profile package, TI2E will submit the package to the TSDF for approval. Once the profiles are approved by the TSDF, TI2E will prepare draft manifests and other TSDF-required shipping paperwork, which will then be provided to the USACE New York District Construction for review. Once the manifest package has been approved, TI2E will coordinate with the USACE and the TSDF for scheduling shipment of the wastes. A USACE representative will be present on site to sign manifests on the day of shipment, or make accommodations for signature prior to the day of shipment. TI2E will forward the final signed paperwork from the TSDF to the USACE within 30 days of the date of shipment.

USACE New York District will be listed as the generator of the IDW on the manifests. Copies of the manifests and all shipping forms will be maintained in both the TI2E and USACE Project Files. Manifest copies will contain the information in Section 5 of USEPA Form 8700-22 including generator name, mailing address, and phone number.

5.0 RISK ASSESSMENT METHODOLOGY

5.1 ECOLOGICAL RISK ASSESSMENT

A SLERA will be prepared for the Launch Area in accordance with the *Interim Final Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological: Risk Assessment* (ERAGS) (EPA, 1997), Fish and Wildlife Impact Analysis (FWIA) for Inactive Hazardous Waste Sites (NYSDEC, 1994), and USACE guidance (USACE, 2010). The SLERA for the Former Niagara Falls Buffalo Defense Nike BU-34/35 will encompass Steps 1 and 2 of the ERAGS guidance. The evaluation will include an ecological characterization, habitat characterization, and identification of threatened and endangered species and critical habitats as described below.

The ecological characterization will include a field investigation of the Launch Area to characterize ecological conditions (e.g., habitats and exposure pathway components such as contaminant source areas and contaminant migration potential) to support the RI and SLERA. Ecological characterization activities will also support the identification of federal- and state-listed threatened/endangered species and critical habitats.

A habitat characterization will be carried out in order to identify ecological conditions on and in areas nearby the Launch Area that are potentially affected by the migration of site contaminants. Site conditions of the adjacent area will also be documented. Observations on habitat conditions/quality/suitability, wildlife utilization, and contaminant exposure pathways will be made and include the following types of ecological information:

- Major vegetative types and relative percent cover, including size and location, on and in areas immediately adjacent to the Launch Area;
- Dominant vegetation species and general visual observations of abundance/diversity and visual stress;
- Topographic features, e.g., drainages, ponds, and low-lying areas that may be intermittently wet;
- Observations of wildlife use, including (to the extent practicable) species identification and type of usage (e.g., foraging or nesting behavior); and
- Indications of environmental stress that could be related to site contaminants.

Threatened and endangered species and critical habitats, if any, will be identified. Information on federal- and state-listed threatened, endangered or rare species will be requested from the U.S. Fish and Wildlife Service and NYSDEC. This information will be requested for the area on and within two miles of the study area.

The results of the SLERA will be used to determine if additional investigation (such as Step 3a of the ERAGs guidance) is warranted. The SLERA will be produced in draft and final format and will focus primarily on the potential for site-related contamination of surface soil to adversely affect exposed ecological receptors using conservative assumptions. The contaminant source area is assumed to be the Launch Area. The SLERA text will include the following:

- **Problem Formulation:** The problem formulation section will contain an overview of the environmental setting, ecological characterization, nature and extent of contamination, potential sources of contaminations, initial assessment and measurement endpoints, risk questions, a CSM that depicts contaminant sources, potential exposure pathways, and major receptor groups. This section will also describe the process for identification of Contaminants of Potential Ecological Concern (COPECs). The environmental setting will include site description, site history, habitat and biota observations, and information on threatened and endangered species/environments. Problem Formulation will also identify representative receptors selected for food web modeling (FWM) based on dietary exposures to bioaccumulative contaminants in surface soil. Given the relatively small size of the contaminant source area, such receptors should include those with small foraging ranges. Based on these criteria, preliminarily identified receptors for FWM include white-footed mouse (omnivorous small mammal), short-tailed shrew (carnivorous/vermivorous small mammal), and American robin (avian omnivore).

- **Exposure Assessment:** The exposure assessment will identify initial COPECs and derive exposure point concentrations (EPCs) to be used in risk estimation. EPCs at the initial SLERA stages (Steps 1 and 2) will be maximum detected concentrations of potentially hazardous chemicals. This section also identifies bioaccumulative COPECs that may warrant FWM and describes the potential for exposure for major receptor groups based on habitat suitability, natural history information, and site conditions. UCLs (95%) may serve as EPCs for surface soil if the number of soil samples allow for confident calculation of 95% UCLs.

- **Effects Assessment:** The effects assessment identifies ecological screening levels (ESLs) used to identify COPECs and to estimate risks using conservative assumptions. ESLs from the following references will be considered and likely applied in a hierarchical fashion to identify COPECs and derive conservative risk estimates:

  Soil
  - Remedial Program Soil Cleanup Objectives, Protection of Ecological Resources (NYSDEC, 2006)
  - Ecological Soil Screening Levels (Eco-SSLs; EPA, 2003a)
  - Oak Ridge National Laboratory (ORNL), Preliminary Remediation Goals for Ecological Endpoints (Efroymson et al., 1997a) or other ORNL documents providing soil benchmarks for terrestrial plants or soil invertebrates (Efroymson et al., 1997b and 1997c)
  - Region 5 Resource Conservation and Recovery Act (RCRA) Ecological Screening Levels (EPA, 2003a)
  - Dietary Toxicity Reference Values (TRVs) for Food Web Modeling
  - ORNL No Observed Adverse Effects Levels (NOAELs) and Lowest Observed Adverse Effects Levels (LOAELs; Sample et al. 1996)
  - Army Public Health Center Wildlife Toxicity Reference Values[5]

  If sediment and/or surface water are determined to be exposure media of concern, ESLs will be selected from the following ESL sources, in order of preference:

  Sediment
  - Screening and Assessment of Contaminated Sediment (NYSDEC, 2014)
  - EPA Region 2 Sediment Screening Levels (USEPA, 2011a)
  - EPA Region 3 Biological Technical Assistance Group (BTAG) Freshwater Sediment Screening Benchmarks[6]
  - Consensus-based Threshold Effects Concentrations (TECs; MacDonald et al., 2000)

[5] http://usaphcapps.amedd.army.mil/erawg/tox/
[6] See http://www.epa.gov/reg3hscd/risk/eco/btag/sbv/fwsed/screenbench.htm

Surface Water

- Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (NYSDEC, 1998)
- USEPA Region 2 Surface Water Screening Levels (USEPA, 2011b)
- National Recommended Water Quality Criteria[7]
- EPA Region 3 BTAG Freshwater Screening Levels[8]

Chemicals maybe eliminated as COPCs due to the chemical's frequency of detection (e.g., if very limited) or by comparison to background concentrations. Such information will be discussed in Risk Characterization to help interpret results.

- **Risk Characterization:** Risk characterization integrates exposure and effects information to estimate risks to ecological receptors. Characterization of risk to site ecological receptors will be determined primarily by comparing 95% UCLs of detected COPEC concentrations to selected ESLs to derive hazard quotients (HQs). HQs equal to or exceeding one will be considered indicative of unacceptable risk. For bioaccumulative chemicals that warrant FWM, HQs will be derived by comparing estimated average daily contaminant doses to NOAEL- and LOAEL-based doses. These quantitative risk estimates will be supplemented by qualitative information such as habitat quality and quantity and site observations related to receptor use of the site.

- **Uncertainty Analysis:** Use of assumptions in the risk estimation process results in uncertainties. Major types of uncertainties will be identified and the effect of such uncertainties on the results and conclusions of the ecological risk assessment will be discussed.

- **Refined SLERA:** If any soil exposures HQs equal or exceed 1, the risk analysis shall be refined by considering background soil concentrations and for, bioaccumualtive chemicals, refined food chain exposure modeling using less conservative exposure parameters.

5.2 HUMAN HEALTH RISK ASSESSMENT

The objectives of the baseline HHRA for the Launch Area at the Former Niagara Falls-Buffalo Defense Nike Battery BU-34/35 are to provide a quantitative assessment of the potential for adverse health effects to occur as a result of exposure to chemical contaminants in media of concern at the site. The HHRA will determine whether site contaminants at potential source areas pose a current or future risk to human health in the absence of any remedial action, and will be used to determine whether remediation is necessary at the site and to focus remediation on the media (e.g., soil and/or groundwater) and exposure pathways that pose the greatest risk. The HHRA will be conducted according to USEPA's human health risk assessment guidance for Superfund (USEPA, 1989, 2001, 2004, 2009), OSWER directives (USEPA, 1991, 2003b, 2014), USACE guidance (USACE, 1999), and applicable NYSDEC requirements. Additional guidance which addresses site-specific issues and chemical contaminants will also be used after consulting with USACE.

The HHRA section of the RI Report will establish the site characteristics of the contaminated media (e.g., soil, sediment, surface water, and groundwater), establish the extent of contamination, evaluate key contaminants identified for receptor exposure, and perform an estimate of the level of key contaminants reaching human receptors. The HRRA will also include an evaluation and assessment of the risk to

[7] See http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm
[8] See http://www.epa.gov/reg3hscd/risk/eco/btag/sbv/fw/screenbench.htm

humans posed by exposure to site contaminants and perform the following activities under this subtask, which will form the basis for the HHRA.

The HHRA will include a risk evaluation for the Launch Area of the Former Niagara Falls-Buffalo Defense Nike BU-34/35 and will cover the following:

- **Hazard Identification**: Available sample information will be reviewed on the hazardous substances present at the Launch Area to identify the chemicals of potential concern (COPCs). The COPCs to be used in the HHRA will be selected in accordance with EPA guidance as presented in Risk Assessment Guidance for Superfund (RAGS): Human Health Evaluation Manual, Part A (EPA, 1989). ProUCL Version 5.0.00 (USEPA, 2013) will be utilized to calculate 95% upper confidence limits (UCLs) on the arithmetic mean for selection of EPCs.

- **Data Evaluation**: Available data will be reviewed for risk assessment purposes.

- **Exposure Assessment:** Human receptors that may be exposed to site contaminants and potentially complete exposure pathways at the Launch Area and offsite areas under current and potential future land-use scenarios will be identified and characterized. A CSM will be developed to depict potential sources, contaminated media, potential release and transport mechanisms for contaminated source medium, and exposure pathways for identified receptors under current and future land-use scenarios.

  All exposure pathways under current and future land-use scenarios will be presented. Based on the available information, the Launch Area is inactive and is located in an agricultural zoned area. Current or future use of the areas for agricultural purposes will be determined during the RI. In addition, possible recreational use of nearby surface water (e.g., Cazenovia Creek) will be determined in the RI. Zoning of the areas may change in the future, and residential development of the areas is not currently restricted. Private residences are located adjacent to the Launch Area. Exposure point concentrations will be determined for each COPC identified in the HHRA for use in the calculation of daily intakes. The EPC is the lower value of the 95% UCL on the arithmetic mean or the maximum detected value.

  Daily intakes will be calculated for all exposures. The daily intakes will be used in conjunction with toxicity values to provide quantitative estimates of carcinogenic risk and non-cancer health effects. Exposure assumptions used in daily intake calculations will be based on information contained in USEPA guidance, site-specific information, and professional judgment. These assumptions are generally 90th and 95th percentile values for parameters which represent the reasonable maximum exposure (RME) which is the highest exposure that is reasonably expected to occur at a site. If potential risks and health hazards exceed EPA target levels, then central tendency exposure (CTE) will be evaluated using 50th percentile exposure parameters.

  The exposure assessment will identify the magnitude of potential human exposures, the frequency and duration of these exposures, and the routes by which receptors are exposed. Exposure assumptions will be based on information provided in the Standard Default Assumptions Guidance (USEPA, 1991), the Exposure Factors Handbook (USEPA, 2011c) and OSWER Directive 9200.1-120 (USEPA, 2014). These USEPA guidance documents and recommendations are used to select exposure assumptions for receptors when available. For example, standard default exposure assumptions for residents, commercial/industrial workers, and construction workers will be used if applicable. If USEPA recommended exposure variable values are not available for some scenarios (e.g. recreational scenarios), site specific information along with professional judgment about expected site conditions will be employed in estimating appropriate assumptions for these scenarios. Site-specific information will be used where appropriate to verify or refine exposure assumptions for all receptors. Table 5-1 is a summary of the exposure parameters for use in the Baseline HHRA, based on the current understanding of the CSM.

- **Toxicity Assessment**: The toxicity assessment will present the general toxicological properties of the selected COPCs using the hierarchy of toxicity values described in DoD Instruction 4715.18. Those chemicals which cannot be quantitatively evaluated due to a lack of toxicity factors will not be eliminated as COPCs on this basis. These chemicals will be qualitatively addressed for consideration in risk management decisions for Former Nike BU-34/35.

- **Risk Characterization**: In this section of the HHRA, toxicity and exposure assessments will be integrated into quantitative and qualitative expressions of cancer risk and non-cancer health hazards. The estimates of risk and health hazard will be presented numerically in spreadsheets contained in an appendix.

- **Identification of Uncertainty**: In any HHRA, estimates of potential cancer risks and non-cancer health hazard have numerous associated uncertainties. Primary uncertainties including those associated with environmental data, exposure parameter assumptions, toxicological data, and risk characterization will be discussed in the report.

- **Pathway Analysis – Interim Deliverable:** The team will coordinate with the USACE Project Manager and submit an interim deliverable as outlined in the RAGS Part D (USEPA, 2001), specifically, Table 1s (selection of exposure pathways) and Table 4s (values and equations used for intake calculations). After USACE approves these tables, the team will evaluate the data and calculate risks for the report.

Table 5-1. Summary of Proposed Exposure Parameters1 for Use in the Baseline Human Health Risk Assessment																			
Exposure Point/ Exposure Route		Receptor:		Current Site Worker, Caretaker, Adult		Current/Future Trespasser		Future Site Worker, Adult		Future Site Worker, Adult		Future Construction Worker		Future Resident, Adult		Future Resident, Child		Current/Future Recreational User	
		Scenario:		Limited outdoor caretaker activities such as brush cutting and trimming trees		Occasional onsite trespassing by adolescents (12 to 18 years in age)		Assumes that Commercial/Industrial Building is Constructed Onsite		Assumes reuse of Silos (e.g. Silos are used for storage)		Assumes that Site is Developed in the Future		Assumes Future Residential Land Use (Time weighted averages are assumed for adult/child exposures)				Assumes Recreational Use of the Site (6 to 18 year olds)	
Exposure Route	Parameter Code	Parameter Definition	Unit	Value	Source	Value	Source	Value	Source	Value	Source	Value	Source	Value	Source	Value	Source	Value	Source
Assumptions applicable for all exposure routes	ED	Exposure Duration	years	25	EPA 2011c/2014	6	EPA 1989	25	EPA 2011c/ 2014	25	EPA 2011c/ 2014	1	EPA 2002	20	EPA 1991/ 2014	6	EPA 1991/ 2014	12	EPA 1989
	BW	Body Weight	kg	80	EPA 2011c/2014	62	EPA 2011c[3]	80	EPA 2011c/ 2014	80	EPA 2011c/ 2014	80	EPA 2011c/ 2014	80	EPA 2011c/ 2014	15	EPA 2011c/ 2014	44	EPA 2011c[6]
	AT-C	Averaging Time (Cancer)	days	25,550	EPA 1989	25,550	EPA 1989	25,550	EPA 1989	25,550	EPA 1989	25,550	EPA 1989	25,550	EPA 1989	25,550	EPA 1989	25,550	EPA 1989
	AT-N	Averaging Time (Noncancer)	days	9,125	EPA 1989	2,190	EPA 1989	9,125	EPA 1989	9,125	EPA 1989	365	EPA 1989	7,300	EPA 1989	2,190	EPA 1989	4,380	EPA 1989
Exposure Point : Soil																			
Ingestion	CS	Chemical Concentration in Soil	mg/kg	TBD	Site-Specific	TBD	Site-Specific	TBD	Site-Specific	TBD	Site-Specific	TBD	Site-Specific	TBD	Site-Specific	TBD	Site-Specific	TBD	Site-Specific
	CF	Conversion Factor	kg/mg	1E-06	--	1E-06	--	1E-06	--	1E-06	--	1E-06	--	1E-06	--	1E-06	--	1E-06	--
	IR_S	Ingestion Rate of Soil	mg/day	100	EPA 1991/ 2014	100	EPA 2011c	50	EPA 1991/ 2014	100	EPA 1991/ 2014	330	EPA 2002	100	EPA 1991/ 2014	200	EPA 2011c/ 2014	100	EPA 2011c[7]
	EF	Exposure Frequency	days/year	72	Site-Specific [2]	100	EPA 2009	250	EPA 1991/ 2014	TDB (225)	Site-Specific	180	(5)	350	EPA 1991/ 2014	350	EPA 1991/ 2014	100	EPA 2009
Dermal Contact	CF	Conversion Factor	kg/mg	1E-06	--	1E-06	--	1E-06	--	1E-06	--	1E-06	--	1E-06	--			1E-06	--
	SA	Skin Surface Area Available for Contact	cm^2	3,470	EPA 2011c/ 2014	4,403	EPA 2011c[4]	3,470	EPA 2011c/2014	3,470	EPA 2011c/ 2014	3,470	EPA 2011c/2014	6,032	EPA 2011c/2014	2,373	EPA 2011c/ 2014	4,200	EPA 2011c[8]
	AF	Adherence Factor	mg/cm^2	0.12	EPA 2011c/ 2014	0.07	EPA 2004	0.12	EPA 2011c/2014	0.12	EPA 2011c/ 2014	0.3	EPA 2002	0.07	EPA 2004	0.2	EPA 2004	0.07	EPA 2011c[9]
	ABS	Absorption Factor	unitless	chemical specific		chemical specific		chemical specific		chemical specific		chemical specific		chemical specific		chemical specific		chemical specific	
	EF	Exposure Frequency	days/year	72	Site-Specific [2]	100	EPA 2009	250	EPA 1991/ 2014	TDB (225)	EPA 1991/ 2014	180	(5)	350	EPA 1991/ 2014	350	EPA 1991/ 2014	100	EPA 2009
Inhalation	CA	Chemical Concentration in Air	mg/m^3	calculated	calculated	Qualitatively Evaluated		Qualitatively Evaluated		Qualitatively Evaluated		calculated	calculated	Qualitatively Evaluated				Qualitatively Evaluated	
	ET	Exposure Time	hrs/day	8	EPA 2009							8	EPA 2009						
	EF	Exposure Frequency	days/year	72	Site-Specific [2]							180	(5)						
	PEF	Particulate Emission Factor	m^3/kg	calculated	EPA 2002							calculated	EPA 2002						
	AT-C	Averaging Time (Cancer)	hrs	613,200	EPA 1989							613,200	EPA 2002						
	AT-N	Averaging Time (Noncancer)	hrs	219,000	EPA 1989							8,760	EPA 1989						
Exposure Point : Groundwater (Note: Chemicals of potential concern for groundwater have not been determined and therefore exposure pathways may or may not be complete)																			
Ingestion	CW	Chemical Concentration in Water	µg/L	Incomplete Exposure Pathway		Incomplete Exposure Pathway		TBD	Site-Specific	TBD	Site-Specific	Incomplete Exposure Pathway		TBD	Site-Specific	TBD	Site-Specific	Incomplete Exposure Pathway	
	CF1	Conversion Factor 1	mg/µg					0.001	--	0.001	--			0.001	--	0.001	--		
	IR-W	Ingestion Rate of Water	L/day					2.5	EPA 2011c/2014	TBD	Incidental Ingestion			2.5	EPA 2011c/ 2014	0.78	EPA 2011c/ 2014		
Dermal Contact	CW	Chemical Concentration in Water	µg/L	Incomplete Exposure Pathway		Incomplete Exposure Pathway		Incomplete Exposure Pathway		TBD	Site-Specific	Incomplete Exposure Pathway		TBD	Site-Specific	TBD	Site-Specific	Incomplete Exposure Pathway	
	CF1	Conversion Factor 1	mg/µg							0.001	--			0.001	--				

Table 5-1. Summary of Proposed Exposure Parameters1 for Use in the Baseline Human Health Risk Assessment

Exposure Point/ Exposure Route		Receptor:		Current Site Worker, Caretaker, Adult		Current/Future Trespasser		Future Site Worker, Adult		Future Site Worker, Adult		Future Construction Worker		Future Resident, Adult		Future Resident, Child		Current/Future Recreational User	
		Scenario:		Limited outdoor caretaker activities such as brush cutting and trimming trees		Occasional onsite trespassing by adolescents (12 to 18 years in age)		Assumes that Commercial/Industrial Building is Constructed Onsite		Assumes reuse of Silos (e.g. Silos are used for storage)		Assumes that Site is Developed in the Future		Assumes Future Residential Land Use (Time weighted averages are assumed for adult/child exposures)				Assumes Recreational Use of the Site (6 to 18 year olds)	
Exposure Route	Parameter Code	Parameter Definition	Unit	Value	Source	Value	Source	Value	Source	Value	Source	Value	Source	Value	Source	Value	Source	Value	Source
	SA	Skin Surface Area Available for Contact	cm^2							3,470	EPA 2011c/2014			20,900	EPA 2011c/ 2014	6,378	EPA 2011c/ 2014		
	DA_{event}	Absorbed dose	mg/cm^2							chemical specific				chemical specific		chemical specific			
	CF2	Conversion Factor 2	L/cm^3							0.001	--			0.001	--	0.001	--		
	ET	Exposure Time	hr/event							TBD	Site-Specific			0.78	EPA 2011c/ 2014	0.54	EPA 2011c/ 2014		
Inhalation	CW	Chemical Concentration in Groundwater	µg/L											TBD	Site-Specific	TBD	Site-Specific		
	CA	Chemical Concentration in Air	$\mu g/m^3$	Incomplete Exposure Pathway		Incomplete Exposure Pathway		Incomplete Exposure Pathway		Incomplete Exposure Pathway (Dependent on chemicals of potential concern)		Incomplete Exposure Pathway		Estimated Using Shower Model if Necessary				Incomplete Exposure Pathway	
	CF	Conversion Factor	mg/µg											0.001	-	0.001	-		
	ET_a	Exposure Time	hr/event											0.78	EPA 2011c/ 2014	0.54	EPA 2011c/ 2014		
Exposure Point : Vapor Intrusion (Note: At this stage it is unknown if volatile organic chemicals are of concern at the site)																			
Exposure Point : Plant Uptake (Note: This potentially complete exposure pathway will be evaluated qualitatively)																			
Exposure Point : Surface water (Note: This potentially complete exposure pathway for recreational users will be evaluated qualitatively)																			

1 - Only Reasonable Maximum Exposure (RME) exposure assumptions are presented for discussion purposes. Time weighted exposure factors for residents will be calculated. Mutagenic factors will be applied if appropriate.
2 - Assumes 2 days per week for 9 months out of the year when soil is not covered by snow
3 - Based on weighted average for children 12 to <18 years in age
4 - Based on weighted average surface area for head, hands, forearms, and lower legs for children 12 to <18 years in age (Table 7-2) using forearm and lower leg ratios for nearest available age group (Table 7-8)
5 - Assumes 5 days per week for 9 months out of the year when soil is not covered by snow
6 - Based on the weighted average weight for children 6 to <21 years in age (Table 8-1)
7 - Based on the central tendency soil/dust ingestion rate for children 6 to <21 years in age (Table 5-1).
8 - Based on the weighted average surface area for head, hands, forearms, lower legs, and feet for children ages 6 to 18 years
9 - Based on the weighted adherence factors on soil activity under RME scenario and daycare for CTE scenario for head, hands, forearms, and lower legs for children ages 6 to <21 years
TBD = to be determined

6.0 QUALITY ASSURANCE/QUALITY CONTROL

All work performed under this DO will adhere to TI2E's QA/QC program and will be conducted in accordance with the most recent versions of USACE Standard Operating Procedures. Additionally, a site-specific UFP-QAPP (Appendix A) has been prepared to define a project-specific set of procedures and performance criteria to assure delivery of data that meet the client's expectations, acceptable scientific and engineering standards, and TI2E's project quality objectives. The TI2E QA Manager has responsibility for implementing and overseeing the quality system and ensuring project personnel adhere to corporate and contract-specific QA/QC requirements.

This section presents requirements for field QC documentation and was developed in accordance with applicable federal standards. The objective is to establish the project QC systems by defining the processes and organization that will ensure project activities conform to project objectives. TI2E is responsible for QC of work related to the performance of the TO. TI2E will implement an effective QC system, consisting of the procedures outlined herein, operations procedures, training, and a defined QC organization.

6.1 QUALITY CONTROL RESPONSIBILITIES

The project will use a three-phase control system for all aspects of the work; procedures for scheduling, reviewing, certifying, and managing submittals; control, verification, and acceptance testing procedures; reporting procedures; a list of the definable features of the work; and procedures for tracking deficiencies from identification through acceptable corrective action. The three phases of control include Preparatory, Initial, and Follow-Up phases, which are described in detail in Section 6.4.

It is TI2E's policy to allocate personnel with the appropriate training and authority to develop, refine, and implement our quality systems. A QC Manager and sufficient number of additional qualified personnel have been assigned to the project to ensure contract compliance. A qualified member of the QC organization will be at the site at all times during progress of the work and will have complete authority to take any action necessary to ensure compliance with the contract.

6.1.1 Personnel and Respective Authorities

See UFP-QAPP Tables #5, #6, and #7 for responsibilities and authorities of the project.

6.1.2 Subcontractor Management

TI2E will maximize project control by retaining program, TO, and site management (safety and QC) functions. Subcontracts will be formulated to reflect the detailed scope, performance objectives, and specifications of the project. Provisions of the basic contract, health and safety requirements, and QA/QC requirements will be 'flowed-down' as appropriate. Other provisions will include strict procedures for implementing subcontractor change orders, expediting dispute resolutions, and implementing corrective actions. Subcontractors may perform work utilizing their own QC procedures provided they are approved by TI2E and consistent with the quality management program outlined in this section.

The performance baseline will be developed jointly with key team subcontractors. Discrete tasks and milestones will be formally entered into the management control system. Performance against the fiscal and project schedule baseline will be monitored informally by the Project Manager on a weekly basis, and formally each month as part of the total project status review and routine progress reporting. The field performance of all subcontractors will be monitored at all times by the Site Supervisor and Site Safety and Health Officer (SSHO), who will record observations of progress in a formal daily log and discuss project status daily with the Project Manager. Deviations from the baseline will be closely monitored. Negative subcontractor performance trends will instigate an interim performance review and discussions with TI2E's contract management personnel. As required, a corrective action plan will be developed to bring schedule/cost performance back in line with the baseline.

6.2 REPORTING AND DELIVERABLES

TI2E will comply with the reporting and deliverable procedures specified in the Project Management Plan (PMP) for the Former Nike Battery BU-34/35. These include meetings, presentations, informal and formal correspondence, teleconferences, project status reports, technical memoranda, and final reports. TI2E's Project Manager will be responsible for reviewing and certifying that all submittals are in compliance with the contract TO requirements. Documents will be submitted according to the timeframes specified in the PMP in order to allow sufficient time for review and comment prior to initiation of work activities. UFP-QAPP Table #16 presents the project schedule/timeline table.

The Project Manager will ensure that all deliverables are submitted to the appropriate USACE, regulatory, and stakeholder recipients as identified in Section 4.2.4 of the PMP. Documents will be in the amount and format specified in Sections 4.2.3 and 4.2.4 of the PMP. TI2E will maintain a complete, up-to-date file of all submittals, and all appropriate CERCLA documentation will be submitted to the Project Repository. Documents will be produced with client draft, draft, and final versions unless otherwise approved or indicated. TI2E will respond to comments and promptly furnish a corrected submittal in the format and number of copies specified in the PMP. All documents will be identified as draft until completion of the required response to comments (RTC) and approval from the USACE Project Manager, at which time they will become final.

6.3 CONTROL, VERIFICATION, ACCEPTANCE AND TESTING PROCEDURES

This section includes the control, verification, and acceptance testing procedures for each specific analytical test to be performed.

TI2E will collect representative water and soil samples for laboratory analysis. Upon request, TI2E will furnish to the Government duplicate samples for possible testing by the Government if required. All sample analytical results will be provided on industry standard forms. Sample collection, analysis, and reporting are included in the UFP-QAPP tables.

TI2E or an approved subcontractor will perform the following activities and will record and provide the following data:

- Verify that testing procedures comply with performance objectives.
- Verify that facilities and testing equipment are available and comply with testing standards.
- Check test instrument calibration data against certified standards.
- Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- Record results of all tests taken, both passing and failing, on the report for the date taken. Actual test reports will be submitted later with a reference to the test and date taken.

6.4 QUALITY CONTROL METHODS

Contractor quality control is the means by which the Contractor ensures that the work, to include that of subcontractors and suppliers, complies with the requirements of the task order for each definable feature of the work as specified in Section 4.0.

TI2E will perform three phases of control for each definable feature of work. The three phases of control include Preparatory, Initial, and Follow-Up. Preparatory Phase control will be used to establish quality prior to mobilization and commencement of site activities and delivery of materials. Initial Phase control will verify that all necessary procedures have been instituted to ensure conformance with the project plans. Follow-Up Phase control will include daily checks and documentation of project requirements to ensure that quality work will be produced throughout the duration of the project. Data Quality Control Reports (DQCRs) will be prepared during field activities, including the advancement of soil borings, soil sample logs, construction of monitoring wells, monitoring well development, groundwater sampling, and surface water and sediment sample collection, if any.

Example forms that will be used to document each of the three phases of control are provided in Appendix E and include:

- Preparatory Phase Inspection Checklist
- Initial Phase Inspection Checklist
- DQCR

6.4.1 Preparatory Phase

This phase will be performed prior to beginning work on each definable feature of the work and after all the required work plans are approved. The preparatory phase inspection includes a review of all work requirements, a physical examination of all required materials and equipment, an examination of the work areas, and a demonstration of field activity preparation. Work cannot begin on a definable feature of work until the preparatory phase is complete. The Preparatory Inspection Checklist is included in Appendix E.

The following activities will also be performed during the Preparatory Phase:

- Review of regulations and contract requirements;
- Review of plans, maps, and drawing;
- Identification of project team;
- Identification and completion of training;
- Verification that all materials and/or equipment are on hand or have been scheduled for acquisition at the proper time and have been tested, submitted, and approved;
- Review of provisions made to provide required control inspections and testing;
- Physical check of instruments, logbooks, forms, reference documents, sample packaging and shipping supplies, materials, and equipment to confirm they are on-site and conform to project requirements;
- Examination of the work areas to assure that all preliminary and preparatory work has been completed and the work areas are ready for the start of activities;
- Review of the appropriate activity hazard analyses (AHA) to assure safety requirements are met;
- Discussion of procedures for controlling the quality of the work, including repetitive deficiencies;
- Documentation of workmanship standards for each feature of work; and

- Review of sampling procedures, materials, equipment calibration, decontamination, labeling, IDW procedures, and shipping requirements.

Included in this phase is a meeting conducted by the Project Manager and/or Site Superintendent and attended by TI2E staff and the subcontractor(s) for the definable feature of work (if applicable). The results of the preparatory phase action will be documented in the DQCR and in the Preparatory Phase Checklist.

6.4.2 Initial Phase

The Initial Phase is defined as the beginning of a definable feature of work. The initial checklist is included in Appendix E. The following will be accomplished during the Initial Phase:

- Check preliminary work including the review of the preparatory meeting minutes;
- Check new work to ensure that it is in full compliance with performance objectives;
- Verify the adequacy of controls to ensure full compliance and verify the required control inspection and testing;
- Establish the level of workmanship and verify that it meets minimum acceptable workmanship standards. Field notes will be inspected, equipment calibration observed and verified, labels and shipping will be inspected, and an inspection of QA/QC requirements and compliance will be completed;
- Check for omissions and resolve all differences of interpretation with USACE Project Manager;
- Check safety activities to include compliance with and upgrading of the APP/SSHP and AHAs, as necessary;
- Complete general check of dimensional requirements (e.g., proposed sample locations);
- Review the APP/SSHP including the AHAs with each worker and document the review on the daily report. Have each worker sign the appropriate form in the APP/SSHP stating that they have reviewed and understand the APP/SSHP; and
- Repeat the Initial Phase for each new crew member on-site, or any time acceptable specified quality standards are not being met. Document all new crew member orientations.

The Contracting Officer and USACE Project Manager will be notified in advance of the beginning of the Initial Phase. TI2E's Project Manager and/or Site Superintendent will lead the Initial Phase Meeting and the meeting will be attended by the Subcontractor Field Lead responsible for that definable feature of work.

6.4.3 Follow-Up Phase

Daily checks will be performed until completion of the particular feature of work to assure continued compliance with performance standards established at the initial phase in conjunction with project requirements. The daily check will accomplish the following tasks:

- Check that the work is in compliance with project requirements;
- Check that the quality of performance is maintained as required;
- Check that the testing is performed by the approved laboratory;
- Check that the rework items are being corrected; and
- Perform daily tailgate safety briefings and site safety inspections.

The checks will be recorded on the DQCR. Final follow-up checks will be conducted and all deficiencies corrected prior to the start of additional features of work that may be affected by the deficient work. The TI2E Team will not build upon nor conceal non-conforming work.

6.4.4 Documentation

TI2E will maintain current records of all control activities, inspections and sampling documentation. These will include factual evidence that the required control phases and tests have been performed including the number and results, nature of defects, causes for rejection, proposed remedial action, corrective actions taken, conforming and defective features, and a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. These records will include the work of subcontractors and suppliers. TI2E will ensure that the records are available for review by the Government, and all documentation will be submitted to the USACE Project Manager upon request. Otherwise, the documentation will be included in an appendix of the final report for the project. Project documentation will be maintained for a minimum of 10 years or for the length of time specified by the client or regulatory agencies. Items to be documented when appropriate include, but are not limited to, the following:

- Instrument calibration and maintenance records
- Field notebooks and daily activity logs
- Sample collection logs
- Field monitoring/screening results and associated data sheets
- Equipment inspection checklists
- Sample labels and chain-of-custody records
- Training records
- Pre-entry health and safety briefings and daily tailgate safety meetings
- Weight tickets
- Manifests
- Submittal Status Log
- Testing Plan and Log
- Rework Items List
- DQCR

The DQCR will include the following information:

- Date
- Weather conditions
- Contractor/subcontractor personnel on site
- General description of field activities performed (investigations, boring installations, well construction, aquifer tests, sampling, excavations, operational checks, etc.)
- Significant accomplishments/observations
- Quality control activities performed (including field calibrations and inspections)
- Problems or deficiencies encountered/corrective actions taken
- Future field activities
- Additional documentation (test results, checklists, health and safety, etc.)

These records will cover both conforming and deficient conditions. All calendar days during the site-specific fieldwork will be accounted for. At a minimum, one report will be prepared and submitted to account for each time period when no fieldwork is being performed. Reports will be signed and dated. The DQCR is included in Appendix E.

An approved copy of the applicable Work Plan and associated UFP-QAPP as well as copies of all completed daily reports will be maintained by TI2E at the job site. All quality control documents will be available for review by the Government QA representatives and/or Contracting Officer. At the completion of the project, quality control documents will be included as an appendix to the project's Final Report, both in hard copy and electronic formats.

6.4.5 Additional Quality Control

Additional quality control measures for the sampling and analysis to be conducted at the Former Nike BU-34/35 are discussed in the UFP-QAPP.

6.5 COMPLETION INSPECTIONS

This section describes the completion inspections and procedures for tracking investigation/construction deficiencies from identification through acceptable corrective action. It also defines the verification procedures to ensure that the identified deficiencies have been corrected.

6.5.1 Punch-Out Inspection

The Project Superintendent will conduct an inspection of work near completion for major definable work features specified in Section 4.0. The Project Superintendent will develop a punch list of items that do not conform to the approved work plan. The punch list of deficiencies will be included in the QC documentation and will include the estimated date by which the deficiencies will be corrected.

The Project Manager and/or Project Superintendent will make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, TI2E will notify the USACE Project Manager that the site is ready for the USACE Pre-Final Inspection.

6.5.2 Pre-Final Inspection

The USACE may choose to perform this inspection to verify that the work is complete. A USACE Pre-Final Punch List may be developed as a result of this inspection. The Project Manager and/or Project Superintendent will ensure that all items on this list have been corrected before notifying the USACE that a Final Inspection can be scheduled. Any items noted on the Pre-Final Inspection will be corrected in a timely manner. These inspections and any deficiency corrections required will be accomplished within the time slated for completion of the entire work or any particular increment thereof, if the project is divided into increments by separate completion dates.

6.5.3 Final Acceptance Inspection

The Project Manager and/or Project Superintendent and USACE personnel may be in attendance at this inspection. The Final Acceptance Inspection, if desired, will be formally scheduled by USACE based upon results and resolution of any issues from the Pre-Final Inspection.

6.5.4 Notification of Noncompliance

USACE will notify TI2E of any detected noncompliance with the foregoing requirements. TI2E will take immediate corrective action after receipt of such notice. When such a notice is delivered to TI2E at the work site, it will be deemed sufficient for the purpose of notification.

6.5.5 Quality Assurance Comments

During the course of the project, TI2E may receive various QA comments from USACE that will reflect site activity corrections or reflect outstanding or future items needing attention. TI2E will acknowledge receipt of these comments on the DQCR, and the DQCR will also reflect when these items are specifically completed or corrected to permit USACE verification.

7.0 REFERENCES

Buehler, Edward J.; and Irving H. Tesmer. 1963. Geology of Erie County, New York. Buffalo Soc. Nat. Sci. Bull., v. 21, no 3.

Caldwell, D. H. 1988. Niagara Sheet. *Surficial Geologic Map of New York.* New York State Museum Map and Chart Series 40, edited by D. H. Caldwell, and others, The University of the State of New York, Albany, New York. (See http://www.nysm.nysed.gov/gis/surficial_scans/surf_niagara.jpg).

CRA Infrastructure & Engineering, Inc. 1996. *Town of Aurora, Erie County, New York Zoning District Map*. Revised, March 2010. November. (See http://www.townofaurora.com/files/8914/0543/0421/AURORA_ZONING_MAP.pdf).

Department of Transportation. 2010. 49 CFR, Subchapters A, B, and C. July.

Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997a. Preliminary Remediation Goals for Ecological Endpoints, Prepared for the Department of Energy by Lockheed-Martin Energy Systems, Oak Ridge National Laboratory. ES/ER/TM/-162/R2. August.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997b. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Terrestrial Plants: 1997 Revision. Oak Ridge National Laboratory. Oak Ridge, Tennessee 37831.

Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997c. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

Environmental Audits, Inc. (EAI). 2002. Subsurface Investigation Report. Proposed Highlands of Orchard Park Subdivision. Old Transit Road. Orchard Park, NY. January.

Erie County Water Authority, 2014. *Annual Drinking Water Quality Report for 2014*. Town of Aurora, 300 Gleed Avenue, East Aurora, New York 14052 (Public Water Supply ID# 1400412; 1400413; 1400418).

General Services Administration. 1963. *Report of Excess Real Property - Niagara Falls – Buffalo Defense Area, Nike Batteries 34-35.* This included Schedule A – Standard Form 118A - Buildings, Structures Utilities and Miscellaneous Facilities; Schedule B – Standard Form 118B - Land. The document was not complete and did not include Schedule C – Perimeter Descriptions; Schedule D – General Site and Building Use Plan Map, Schedule E – Final Project Map; and Schedule F – Report of Title. June 28.

Environmental Laboratory, 1987. *Corps of Engineers Wetlands Delineation Manual,* Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Harland W.B. and others. 1982. A Geologic Time Scale. Cambridge University Press, Cambridge.

Integrated Waste Special Services. 1994. Letter from S. Brady Integrated Waste Special Services, Inc., to M. Murphy, HRI re; No USTs encountered at site. December 1.

MacDonald DD, Ingersoll CG, Berger T. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. *Arch Environ Contam Toxicol* 39:20-31.

Malcolm Pirnie, Inc. (MPI). 1996. *Draft Limited Remedial Investigation Report, Nike BU-34/35 East Aurora, New York.* February.

Metcalf & Eddy (M&E). 1988. *Engineering Report and Contamination Evaluation.*

Niagara Frontier Consulting Services, Inc. (NFCS). 1993. *Phase I Environmental Assessment, Former Nike Base, Orchard Park Laboratory, Roswell Park Institute, 3270 Transit Road, Orchard Park, New York.* Prepared for M. Murphy, Roswell Park. September.

NYSDEC. 1994. Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (FWIA). October.

NYSDEC. 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.

NYSDEC. 2005. *Concentrations of Selected Analytes in Rural New York State Surface Soils: A Summary Report on the Statewide Rural Surface Soil Survey.* August.

NYSDEC and NYSDOH. 2006. *New York State Brownfield Cleanup Program, Development of Soil Cleanup Objectives, Technical Support Document.* September.

NYSDEC. 2010. *DER-10/Technical Guidance for Site Investigation and Remediation.* May.

NYSDEC. 2014. Screening and Assessment of Contaminated Sediment.

Reck, Charles, W. and Edward T. Simmons. 1952. *Water Resources of the Buffalo-Niagara Falls Region.* Geological Survey Circular 173.

Rickard, L. V., and D. W. Fisher. 1970. *Geologic Map of New York; Niagara Sheet*, 1:250,000. New York State Museum and Science Service Map and Chart Series 15. The University of the State of New York, Albany, New York. (See http://www.nysm.nysed.gov/gis/bedrock_scans/Niagara_Bedrock_Sheet.jpg).

Sterling Environmental Services, Inc. (SESI). 1994. Tank Closure Activities South Milestrip & Old Transit Roads, Orchard Park, New York. September.

Symecko, R.E. 1967. Glacial geology of the Orchard Park, New York quadrangle, Unpub. M.A. thesis, State University of New York at Buffalo.

Tesmer, Irving H. (Editor). 1981. Colossal Cataract: The Geologic History of Niagara Falls. State University of New York, Press, Albany, New York.

Thornbury, William D. 1969. *Principles of Geomorphology*. Second Edition. John Wiley & Sons. New York.

Town of Aurora. 2010. The Aurora Open Space Plan, Protection Our Natural Heritage.

U.S. Army. 1958. *Real Estate, Niagara Falls – Buffalo Defense Area, Nike Batteries BU34-35, Installation or Project No. 5060*, Office of Chief Engineers. Washington, DC (C02NY007702_01.04_0003_p). June 17.

U.S. Army Corps of Engineers (USACE). 1957. *Special AAA Facilities, Improvements, FY 1957, Orchard Park Site, NF34&35 New Additions – Launch Area Grading, Drainage, Utilities*. The plan reflects revisions through February 2, 1958. November 27.

U.S. Army Corps of Engineers (USACE). 2003. *Final Report, Nike Missile Battery Environmental Conditions Assessment Guide.* Defense Environmental Restoration Program Formerly Used Defense Sites (DERP-FUDS). July.

U.S. Army Corps of Engineers (USACE). 1999. *Risk Assessment Handbook*. Volume I. EM 200-1-4. January.

U.S. Army Corps of Engineers (USACE). 2010. *Risk Assessment Handbook*. Volume II. EM 200-1-4. December.

U.S. Army Corps of Engineers (USACE). 2011. *Geology Supplement to the Scope of Services.* May.

U.S. Army Corps of Engineers (USACE). 2012. *Conceptual Site Models*. EM 200-1-12. December.

U.S. Army Corps of Engineers (USACE). 2013. *General Investigation Derived Waste/Remediation Waste Handling and Disposal, Scope of Services for Contracted Environmental Studies.* February.

U. S Department of Agriculture (USDA). 2014 National List of Hydric Soils (see http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/).

U.S. Environmental Protection Agency (USEPA). 1989. Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part A, EPA/540/1-89/002. December.

U.S. Environmental Protection Agency (USEPA). 1991. Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual, Supplemental Guidance “Standard Default Exposure Factors” Interim Final. OSWER 928.5. 6-03. March.

U.S. Environmental Protection Agency (USEPA). 1992. *Management of Investigation-derived Wastes during Site Inspections*. January.

U.S. Environmental Protection Agency (USEPA). 1997. *Interim Final Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessment.* EPA/540-R-97-006. June.

U.S. Environmental Protection Agency (USEPA). 2001. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments). December.

U.S. Environmental Protection Agency (USEPA). 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

U.S. Environmental Protection Agency (USEPA). 2003a. EPA Region 5 Resource Conservation and Recovery Act (RCRA) Ecological Screening Levels. August.

U.S. Environmental Protection Agency (USEPA). 2003b. Memorandum, Human Health Toxicity Values in Superfund Risk Assessments. Michael B. Cook, Director of Superfund Remediation and Technology Innovation, OSWER Directive 9285.7-53. December 5.

U.S. Environmental Protection Agency (USEPA). 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final, EPA/540/R/99/005. July.

U.S. Environmental Protection Agency (USEPA). 2009. Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment. EPA-540-R-070-002. OSWER 9285.7-82. January.

U.S. Environmental Protection Agency (USEPA). 2011a. EPA Region 2 Sediment Screening Levels.

U.S. Environmental Protection Agency (USEPA). 2011b. EPA Region 2 Surface Water Screening Levels.

U.S. Environmental Protection Agency (USEPA). 2011c. Exposure Factors Handbook. EPA/600/R-09/052F. Office of Research and Development. September.

U.S. Environmental Protection Agency (USEPA). 2013. ProUCL Version 5.0.00 Technical Guide. EPA/600/R-07/041. September.

U.S. Environmental Protection Agency (USEPA). 2014. Memorandum. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

U.S. Geological Survey (USGS). 2013. *Orchard Park 7.5-Minute Series Quadrangle, Scale 1:24,000*, Erie County, New York.

Waste Resource Associates, Inc. (WRAI). 1991. *Environmental Property Assessment, Phase I Report, Abandoned Nike Base, 3270 Transit Road, Orchard Park, New York.* Prepared for Health Research, Inc., Roswell Park Division. December 4

APPENDICES