US Army Corps of Engineers
Buffalo District
BUILDING STRONG®

Field Investigation Report
Final

Balance of Plant Operable Unit Field Investigation
Niagara Falls Storage Site
Lewiston, New York
Contract No. W912QR-12-D-0023
Delivery Order No. DN01

Prepared by:
URS Group, Inc.

For:
U.S. Army Corps of Engineers
Buffalo District
Buffalo, New York

August 2013

PAGE LEFT INTENTIONALLY BLANK

TABLE OF CONTENTS

FIGURES
(Following Text)

TABLES
(Following Figures)

TABLES
(Cont'd)

TABLES
(Cont'd)

APPENDICES

LIST OF ACRONYMS

Ac	Actinium
AEC	Atomic Energy Commission
ALARA	As Low As Reasonably Achievable
APP	Accident Protection Plan
ASTM	American Society for Testing and Materials
BOP	Balance of Plant
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
cm	centimeter(s)
cm/sec	centimeters per second
cpm	counts per minute
CWM	Chemical Waste Management
COC	Contaminant of Concern
CO	Contracting Officer
CQC	Contractor Quality Control
Cs	Cesium
DOE	Department of Energy
DOT	Department of Transportation
DQCR	Daily Quality Control Report
DQO	Data Quality Objectives
DNAPL	Dense Non-Aqueous Phase Liquid
EM	Electromagnetic or Engineering Manual
EPA	Environmental Protection Agency
ERPIMS	Environmental Resources Program Information Management System
EU	Exposure Unit
EX	Excavation (radiation survey code)
FS	Feasibility Study
FSP	Field Sampling Plan
ft	feet/foot
FUSRAP	Formerly Utilized Sites Remedial Action Program
GIS	Geographical Information System
GM	Geiger–Mueller (detector)
GPS	Global Positioning System
HDPE	High Density Polyethylene
HSO	Health and Safety Officer
HTRW	Hazardous, Toxic and Radioactive Waste
HWP	hazardous or hot work permit
ID	inside diameter
IE	Investigative Excavation
in	inch(es)
IN	Incoming (radiation survey code)
IWCS	Interim Waste Containment Structure
IDW	Investigation-Derived Waste
Kd	distribution coefficient
LOOW	Lake Ontario Ordnance Works

LIST OF ACRONYMS (Cont'd)

LWBZ	Lower Water-Bearing Zone
LWTP	Lockport Wastewater Treatment Plant
m	meter(s)
MARLAP	Multi-Agency Radiological Laboratory Analytical Protocols Manual
MCL	Maximum Contaminant Level
MED	Manhattan Engineer District
MGP	Manufactured Gas Plant
MH	manhole
MD	Matrix Duplicate
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µR/h	microroentgen per hour
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mm	millimeter(s)
mrem	millirem
mmho/m	millisiemens per meter
mV	millivolt(s)
MW	monitoring well
NAD	North American Datum
NaI	Sodium Iodide
NAPL	Non-Aqueous Phase Liquid
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NFSS	Niagara Falls Storage Site
NRC	Nuclear Regulatory Commission
NTU	Nephelometric Turbidity Unit
NUREG	U. S. Nuclear Regulatory Commission
NYCRR	New York Codes, Rules, and Regulations
OT	Outgoing (radiation survey code)
OU	Operable Unit
Pa	Protactinium
pCi/g	picocuries per gram
pCi/L	picocuries per liter
PE	Pipeline Excavation
PM	Project Manager
PPE	Personal Protective Equipment
PQL	Practical Quantitation Limit
PUL	Precision Utility Locator
PVC	Polyvinyl chloride
QA	Quality Assurance
QC	Quality Control
QCP	Quality Control Plan
QAPP	Quality Assurance Project Plan
Ra	Radium

LIST OF ACRONYMS (Cont'd)

RCRA	Resource Conservation and Recovery Act
RFP	Request for Proposal
RI	Remedial Investigation
RIR	Remedial Investigation Report
ROD	Record of Decision
RPP	Radiation Protection Plan
RSL	Regional Screening Level
RT	Routine (radiation survey code)
RWP	radiation work permit
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SMS	Safety Management Standard
SOP	Standard Operating Procedure
SOW	Scope of Work
SRSO	Site Radiation Safety Officer
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
TED	Total Effective Dose
Th	Thorium
TN	Trench (radiation survey code)
TNT	trinitrotoluene
TSC	Temporary Storage Container
TWP	Temporary Well Point
U	Uranium
U-235	Uranium-235
U-238	Uranium-238
US	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USDOE	United States Department of Energy
UST	Underground Storage Tank
UWBZ	Upper Water-Bearing Zone
VOC	Volatile Organic Compound
WTS	Waste Technology Services, Inc.

1.0 INTRODUCTION

URS Group, Inc. (URS) has prepared this document under Contract 912QR-12-D-0023. As part of this contract, URS conducted a field investigation of the Balance of Plant (BOP) Operable Unit (OU) at the Niagara Falls Storage Site (NFSS) in November/December 2012. This report presents a description of the methods, procedures, and findings of the investigation.

URS performed the field investigation in accordance with the planning documents prepared by URS, dated November 2012:

- Sampling and Analysis Plan (SAP)
  - Volume 1 – Field Sampling Plan (FSP)
  - Volume 2 – Quality Assurance Project Plan (QAPP)
- Accident Prevention Plan (APP)
- Site Safety and Health Plan (SSHP)
- Radiation Protection Plan (RPP)
- Quality Control Plan (QCP)

1.1.1 Site Description

The NFSS is located at 1397 Pletcher Road in the Town of Lewiston (Figure 1). The NFSS represents a portion of the Lake Ontario Ordnance Works (LOOW), a former trinitrotoluene (TNT) production plant which shut down in 1943. Portions of the LOOW site were used by the United States Army Corps of Engineers (USACE) Manhattan Engineer District (MED) and U.S. Atomic Energy Commission (AEC) to store radioactive residues and other materials beginning in 1944. Much of the radioactive residues sent to the NFSS originated from uranium processing activities conducted for MED and AEC at the Linde Air Products facility in Tonawanda, New York, the Mallinckrodt Chemical Works refinery in St. Louis, Missouri, and the Middlesex Sampling Plant in Middlesex, New Jersey.

Radiological constituents of concern at NFSS include isotopic uranium (U), isotopic thorium (Th), and radium (Ra)-226/228. Other constituents that occur on-site in lesser amounts include daughter products of the uranium series (Uranium-238 [U-238]) and, to some extent, the actinium (Ac) series (Uranium-235 [U-235]). Some volatile organic compound (VOC) contaminants are also present at the site.

Between 1982 and 1986, the US Department of Energy (USDOE) consolidated radioactive materials from a portion of the LOOW into a 10-acre Interim Waste Containment Structure (IWCS) on the NFSS (see Figures 2 and 3). The IWCS is an engineered landfill designed to retard radon emissions, infiltration from precipitation, and migration of contamination to groundwater.

1.1.2 Site Geology

The geology of the site is presented below, from shallowest to deepest:

- Surficial Soils and Fill - The surficial soil at the site consists of a loose to medium dense, brown to yellowish silt with organic matter. Gravel and sands are generally encountered and are dispersed randomly throughout the unit. Thicknesses of surficial deposits vary from 0 to 1.5 meter (m) (0 to 5 feet [ft]), with an average range of 0.3 to 0.6 m (1 to 2 ft). The landscape in some areas of the site is routinely maintained and contains several centimeters (cm) (inches [in]) of loamy topsoil and grass.

- Brown Clay Unit - The Brown Clay Unit, also known as the "Upper Clay Till" or the "Brown Clay Till," is a brownish or reddish, poorly sorted, brown silty clay till deposit indicative of a ground moraine. The thickness of the unit varies from 1.8 to 7 m (6 to 23 ft). The consistency of the upper clay till ranges from medium soft to hard with plasticity increasing with depth. Thin sand and silt seams, pockets, and lenses are more common in the basal portion of the unit.

  The sand and silt lenses in the basal portion of this unit range from thin partings (i.e., small joints in clay) up to 1.5 m (1 to 5 ft) in thickness. The lateral extent and thickness of these lenses vary abruptly. These intermittent sand lenses likely represent glaciofluvial deposits and are generally vertically and horizontally discontinuous. When saturated, these lenses, pockets and/or seams are most likely not hydraulically interconnected and do not represent a continuous water-bearing zone or aquifer. The sand and gravel in the lenses are usually moist to saturated and vary from loose to dense. Occasional extensive deposits of sand and gravel 5.3 to 6.1 m (17.5 to 20 ft) in thickness occur within the Brown Clay Unit.

- Gray Clay Unit - The Gray Clay Unit, also known as the "Glacio-Lacustrine Clay Unit," is of lacustrine origin. Coarse-grained sand and gravel lenses of the Brown Clay Unit are found intermittently along the top of the Gray Clay Unit and are not representative of a contiguous lithologic unit. The Gray Clay Unit occasionally grades vertically to a silt and sand mixture and lenses of fine to medium-grained sand are dispersed throughout the unit. A "Middle Silt Till Unit" is found occasionally off site where the lower portion of the Gray Clay Unit is absent. The overall consistency of the unit ranges from soft to medium soft, with clay portions being slightly to highly plastic. The clay is generally wet and sand lenses are wet to saturated.

  The thickness of the Gray Clay Unit varies from less than 1.5 to 9.1 m (5 to 30 ft) and it is the thickest unconsolidated unit on site.

- Sand and Gravel Unit - The Sand and Gravel Unit, also referred to as "Alluvial Sand and Gravel," consists of clean sand to mixtures of sand, gravel, and silt. The unit is glaciofluvial in origin, normally wet to saturated, and exhibits loose to medium relative density. In general, the thickest portions of the unit are present where depressions occur in the underlying bedrock.

  The Sand and Gravel Unit is approximately 0.9 to 2.1 m (3 to 7 ft) in thickness and occurs 4.6 to 8.5 m (15 to 28 ft) below ground surface (bgs).

- Red Silt Unit - The Red Silt Unit, referred to as the "Basal Red Till," consists of angular fragments of red shale bedrock in a sandy silt matrix that suggests that this is a lodgement till. The Red Silt Unit is composed of clayey, gravelly silt with lesser amounts of sand. Gravel is dispersed throughout the unit and consists of both rounded and angular fragments of bedrock. This unit is generally dry to moist, over-consolidated, and ranges from medium to very dense. The Red Silt Unit varies in thickness from 0 to 2.1 m (0 to 7 ft). The top of the Red Silt Unit varies across the site from a minimum of 5.1 m (17 ft) bgs to a maximum of 13.7 m (45 ft) bgs. The base varies from 6.7 to 14.9 m (22 to 49 ft) bgs.

- Queenston Formation - The Queenston Formation is the uppermost bedrock unit beneath the site and consists of brownish red shale, siltstone, and mudstone. The top 1.8 to 3.7 m (6 to 12 ft) of the Queenston Formation are moderately weathered, fractured and more permeable than lower portions of the formation. The Queenston Formation is typically encountered 9.75 to 14.9 m (32 to 49 ft) bgs.

1.1.3 Site Hydrogeology

There are two water-bearing zones identified at the NFSS: the upper water-bearing zone (UWBZ) and the lower water-bearing zone (LWBZ).

The UWBZ is typified by clayey silt and silty clay with occasional sand and gravel lenses. Coarse-grained, possibly channel fill deposits, are sporadically present in the basal portion of the zone on the undulating upper surface of the Gray Clay Unit. However, based on boring logs and recent statistical analysis, these sand seams, pockets, and lenses are intermittent and vertically and horizontally discontinuous. USACE performed a geostatistical analysis to assess the continuity of sand lenses in the UWBZ at the NFSS to evaluate whether the sand lenses act as preferential migration pathways for contamination. Lithologic information from boring logs was spatially analyzed using semivariogram calculations and models. The results suggest the sand lenses in the UWBZ are not horizontally continuous over distances greater than 4.6 to 6.1 m (15 to 20 ft).

Saturated conditions occur in the UWBZ in both the continuous, low permeability clays and in the discontinuous lenses of sand and gravel. Throughout the UWBZ, the coarse-grained lenses, pockets and seams vary considerably in thickness and extent and range from dry to saturated. As a result, the occurrence of groundwater varies across the site.

The Gray Clay Unit (Unit 3) acts as an aquitard separating the UWBZ from the LWBZ. For purposes of classification, wells that terminate in the Gray Clay Unit are considered representative of the UWBZ.

The LWBZ extends from the bottom of the Gray Clay Unit to the bottom of the weathered zone of the Queenston Formation and consists of the stratified sands and gravels of the Sand and Gravel Unit, the dense silt and sands of the Red Silt Unit, and the weathered and fractured upper portions of the Queenston Formation. The thickness of the LWBZ varies from about 3.0 to about 11.7 m (10 ft to about 38.5 ft). The LWBZ has significantly higher permeability and more lateral continuity than the UWBZ.

The general direction of groundwater flow in the LWBZ is to the northwest. The highest gradients occur south of the NFSS and the Modern Landfill property.

1.1.4 Project Objectives

During development of a previous Remedial Investigation (RI), the NFSS was divided into exposure units (EU). Figures 2 and 3 present the overall site layout showing the locations of the EUs. An EU is defined as the geographic area in which a future receptor (for purposes of the baseline risk assessment) is assumed to work or live, and where a receptor may be exposed to site-related contaminants.

The objectives of the field investigation in support of the BOP Operable Unit (OU) Feasibility Study (FS) were to:

- Delineate groundwater contamination in EUs 1, 2, 4, and 10 (Figures 4, 5, and 6).
- Identify the source of increasing uranium concentrations in groundwater in well OW11B (Figure 6).
- Eliminate potential preferential pathways for off-site migration of groundwater contaminants via subsurface pipelines located near site boundaries.
- Evaluate potential groundwater contamination along the 25-cm (10-in) diameter water line near the southeast corner of the IWCS and eliminate the water line as a potential preferential pathway.

- Manage/sample/dispose of existing Investigation-Derived Waste (IDW) and IDW generated during the field investigation.

1.1.5 Scope of BOP OU Field Investigation

The BOP OU Field Investigation locations are shown in Figure 2. The original scope of the BOP OU field investigation was presented in the Field Sampling Plan prepared by URS dated November 2012. The proposed subsurface portion of the investigation included:

- Installing, developing, and sampling 17 monitoring wells (MW944 through MW960),
- Exposing, sampling, and plugging pipelines at three locations (referred to as Pipeline Excavations 1 through 3 [PE1 through PE3]),
- Plugging one manhole (MH41), and
- Excavating eight investigative trenches (referred to as Investigative Excavations 1 through 8 [IE1 through IE8]).

During the course of the investigation, USACE directed URS to perform additional work consisting of the following:

- Exposing, sampling, and plugging pipelines at three locations (referred to as PE4 through PE6), and
- Plugging one manhole (MH08).

Other activities performed in support of the subsurface investigation included:

- Geophysical survey,
- Radiation surveys,
- Investigation location coordinate and elevation surveys,
- Excavation/pipeline dewatering,
- Health and safety monitoring,
- Laboratory analyses for parameters including radionuclides, metals, pesticides, herbicides, polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs), and VOCs, and,
- IDW management including sampling and disposal.

The investigation activities are briefly described below. Details of the field investigation are provided in Section 2.0.

Delineation of Groundwater Contamination in EUs 1, 2, 4, and 10

The areas of dissolved total uranium groundwater contamination in the UWBZ in EUs 1, 2, 4, and 10 are fairly well delineated. However, additional monitoring wells were required in these areas to better define the limits of contamination. Fourteen wells (i.e., MW944 through MW946 and MW950 through MW960) were installed to provide additional delineation in these areas.

Part of the UWBZ groundwater in EU 4 is contaminated with VOCs in the form of dense non-aqueous phase liquid (DNAPL) that consists of tetrachloroethene, also referred to as perchloroethene (PCE), and its degradation products. Additional monitoring wells were required in both the UWBZ and LWBZ to complete the delineation of that contamination. Three wells (i.e., MW947, MW948, and MW949) were installed to provide additional information on groundwater quality in this area.

Investigative Excavations in the Well OW11B Area

Over the past several years, groundwater analytical data for well OW11B in EU10 has shown elevated concentrations of uranium. Based on USACE's review of soil and groundwater data collected near well OW11B, the source of the uranium has not been determined. However, several areas are possible sources due to the presence of structures in the vicinity related to the site's former usage. These include a decontamination pad and associated grit chamber, a former railroad bed, and several pipelines (see Figures 3 and 7). The grit chamber and decontamination pad were constructed as part of the radiation remediation/IWCS construction. The former railroad bed and most of the buried pipelines were associated with the former LOOW.

To investigate these potential sources, eight locations (IE1 through IE8) were excavated, visually inspected, and scanned for evidence of radioactive and organic contamination. Samples of soil and groundwater, where present, were collected for laboratory analyses.

Exposing and Plugging Underground Utilities

Several underground process water, fire protection, and potable water pipelines originate in the former water supply treatment area of the LOOW (located in the southern IWCS area) and leave the NFSS to former LOOW TNT process areas to the north and east. To eliminate the possibility that the utilities provide preferential pathways for off-site migration of site contaminants, 17 pipelines at six locations (PE1 through PE6) were exposed, sampled, and plugged. Pipeline diameters ranged from 10 cm (4 in) to 91 cm (36 in). In addition, to further eliminate the possibility for off-site migration of site contaminants, two manholes (MH08 and MH41) associated with the former LOOW sanitary sewer system were plugged.

2.0 FIELD INVESTIGATION ACTIVITIES

The BOP OU field investigation was conducted during the period of November 5, 2012, through December 19, 2012. This section presents a discussion of the specific field investigative activities performed. In accordance with pre-investigation work plans prepared by URS, and approved by USACE, the investigative activities were conducted as described herein.

All field work was performed under the supervision of a URS geologist who functioned as the Site Supervisor and Contractor Quality Control (CQC) Manager. A copy of the Site Supervisor's field notebook is provided in Appendix A. Appendix B includes copies of the Daily Quality Control Reports.

The URS Site Safety and Health Officer (SSHO) was present during all field activities. Appendix C contains copies of Tailgate Safety Meeting Minutes and Permits prepared by the SSHO.

2.1.1 Geophysical Survey

The first investigative field activity coordinated by URS at the site was a geophysical survey of the proposed areas of investigation. A Hager-Richter Geoscience, Inc. crew of two scientists performed the survey on November 7 and 8, 2012. The purpose of the survey was to confirm the locations of subsurface pipelines scheduled for cutting and plugging, and to identify the presence of utilities and other features that could potentially interfere with intrusive activities (e.g., drilling and excavation). Survey methods included electromagnetic (EM), magnetometer, and induced-tone line tracing.

Equipment

Hager-Richter used the following non-intrusive instruments during the survey:

- Geonics EM31
- Geonics EM61
- Geometrics G858-G magnetometer
- Radiodetection RD 4000 series precision utility locator (PUL)

The EM31, EM61, and magnetometer survey methods detect buried metal. However, none of these methods can provide information on the type of objects causing an anomaly. The EM31 and EM61 methods detect all types of metals including copper, brass, and aluminum, while the magnetometer method detects only ferrous metal. The PUL can detect "live" radio or electric signals or conductive materials (e.g., metal) through an "induced" signal.

EM31

The electromagnetic induction terrain conductivity survey was conducted using a Geonics Model EM31-MK2 terrain conductivity meter. This instrument provides measurement of both the quadrature-phase and in-phase components of terrain conductivity without ground electrodes or contact. The quadrature-phase data are useful for detecting the presence of anomalously conductive ground. The in-phase component data identify the presence of metal objects. A digital datalogger records data for both components.

The EM31 reads ground conductivity in millisiemens per meter (mmho/m) with a resolution of 2% of full scale and an accuracy of 1 mmho/m. The nominal depth of earth sampled by the EM31 in the vertical dipole mode is approximately 5.5 m (18 ft).

EM61

The EM61 survey was conducted using a Geonics EM61-MK2 time domain electromagnetic induction metal detector. The EM61-MK2 is capable of detecting buried metal objects such as utilities, underground storage tanks (USTs), and drums. A transmitter coil generates a pulsed primary magnetic field in the earth, thereby inducing eddy currents in nearby metal objects. The eddy current produces a secondary magnetic field that is sensed by two receiver coils; one coincident with the transmitter and the other positioned 40 cm (1.3 ft) above the main coil. The instrument responds to the secondary magnetic field produced by metal objects. A digital datalogger records the secondary responses in millivolts (mV).

Magnetometer

The magnetic survey was conducted using a Geometrics G858-G cesium (Cs) magnetometer equipped with two sensors. Total magnetic field and vertical magnetic gradient were measured. Data were acquired continuously in walking mode, effectively recording data at about 24-cm (10-in) intervals along each survey line. A base station location recorded the temporal variation of the earth's magnetic field.

PUL

The PUL survey was conducted using a Radiodetection RD4000 series PUL instrument. The RD4000 series consists of a separate transmitter and receiver. The system has "passive" and "active" modes to locate buried pipes by detecting electromagnetic signals carried by the pipes. In the "passive" mode, only the receiver unit detects signals carried by the pipe from nearby power lines, live signals transmitted along underground power cables, or very low frequency radio signals resulting from long wave radio transmissions that flow along buried conductors. In the "active" mode of operation, the transmitter is used to induce a signal on a target pipe, and the receiver is used to trace the signal along the length of the pipe.

Survey Procedures

Hager-Richter established 6-m by 6-m (20-ft by 20-ft) grids centered on each proposed boring and excavation location. The grids were expanded in the three originally proposed pipeline excavation areas to ensure inclusion of all pipelines. (Note that Hager-Richter did not perform geophysical surveys to determine the locations of the buried pipelines in the three additional PE4, PE5 and PE6 locations; the excavation contractor, Russo Development, Inc. (Russo), used a PUL unit to locate those pipelines.)

The survey grids were also expanded to encompass the entire well MW952 through MW955 area and the investigative trench IE1 through IE8 areas (collectively referred to as the “LEW1 area” by Hager-Richter).

URS staked the proposed monitoring well and investigative trench locations prior to Hager-Richter mobilizing to the site. Using a global positioning system (GPS) during the geophysical survey, Hager-Richter located the stakes, corners of Hager-Richter survey grids, and detected utilities.

The EM61 and magnetometer data were acquired at approximately 24-cm (0.8-ft) intervals along survey lines spaced 1.5 m (5 ft) apart.

The EM31 data were acquired at approximately 0.3-m (1-ft) intervals along survey lines spaced 1.5 m (5 ft) apart.

Utilities were detected by the PUL instrument both in passive mode and in active mode by directly connecting to aboveground utility connections.

Survey Results

Table 1 summarizes the survey findings. At the time of the survey, the locations of utilities detected by the PUL method were marked on the ground using paint and were georeferenced using GPS. Utilities detected by the PUL method included water lines and fire suppression (water) lines.

All water lines were successfully detected by the EM31, EM61 and/or magnetometer methods, with the exception of the 25-cm (10-in) diameter water line in PE1. The 25-cm (10-in) water line in PE1 could only be detected using the PUL method.

In the former grit chamber/OW11B area (Hager-Richter "LEW1" area), the geophysical survey clearly detected the locations of the former grit chamber structure, a water line running from the former decontamination pad to the grit chamber, and two water lines running in a southwest-northeast orientation in the area of well OW11B. The survey did not detect the concrete-encased sewer line that runs roughly north-south in this area.

The geophysical survey detected possible buried metal objects in the following areas:

- Southeast of well MW946,
- South and west of well MW947,
- East of well MW951,
- Southwest of well MW958,
- North of well MW959,
- Central, eastern and southern portions of the PE1 area,
- Central portion of PE2 area, and
- Northern, central and southern portions of the LEW1 area.

Following the geophysical survey, the proposed wells and investigative trenches were successfully installed without encountering any unknown buried objects or structures and the pipeline excavations confirmed the locations of the buried pipelines as detected through the geophysical surveys.

2.1.2 Radiation Surveys

There were two approaches to investigate potential radiation impacts at the site: radiation surveys performed during field activities, and laboratory analyses of multimedia samples (e.g., soil, sediment, and water) for radionuclides. This section discusses radiation surveys performed during field activities.

Scope

URS conducted field activities from November 5, 2012, to December 19, 2012, under the supervision of the Site Radiation Safety Officer (SRSO) in accordance with the RPP, dated November 2012. Radiation measurements to support characterization were collected during the installation of monitoring wells, the excavation of the investigation trenches, and of both historic investigation-derived waste and waste generated during these field activities.

Field radiation measurements recorded during investigation activities included:

- Personnel and equipment alpha, beta, and gamma scans;
- Alpha and beta smear counts;
- Ground surface gamma walkover surveys;
- Alpha, beta, and gamma soil core logging; and
- Down-hole borehole gamma logging.

Radiation scans were performed during all field investigation activities as part of the health and safety monitoring. Field personnel also participated in dosimetry monitoring.

Smear counts were recorded for materials and equipment to verify radiation conditions of those items as they were brought onto and removed from the site.

Prior to invasive activities, surface gamma radiation walkover surveys were conducted at each proposed borehole and excavation location. After installing monitoring wells and restoring the excavated areas, surface gamma walkover surveys were repeated to document the final radiological condition of each area.

A down-hole gamma radiation survey was performed in each borehole. The recovered soil core samples were scanned for gamma, alpha, and beta radiation to identify materials with elevated radiation readings.

Gamma radiation measurements were taken on the excavated soil during excavation. Once an excavation was complete, the sides and bottoms of the excavations were surveyed to identify any area of elevated material.

Personnel

All on-site URS and contractor personnel participated in site-specific radiation safety training and the project dosimeter program. The site-specific four-hour training met the requirements of USACE-authorized Assistant User requirements. URS Buffalo employees assigned to the site underwent an additional four hours of radiation safety training to meet the USACE requirements for Authorized Users.

During the field effort, site visitors included the geophysical team, a representative from TestAmerica, and the concrete truck driver. These visitors were allowed on the site under URS escort.

Instrumentation

Radiological constituents of concern at NFSS include isotopic uranium, isotopic thorium, and radium-226/228. Other constituents that occur on site in lesser amounts include daughter products of the uranium series (U-238) and, to some extent, the actinium series (U-235). Table 2 provides a list of the radiation detection equipment selected for use during this project based on the constituents of concern.

All instrumentation underwent annual calibration prior to its arrival on site; Appendix D1 contains copies of the calibration certificates. To ensure instrumentation was functioning as calibrated, performance tests of portable radiological instruments were conducted at the start of the day and the end of the day. Satisfactory performance test results were within ±20% of the expected response. Instruments that did not meet performance test criteria, or were defective, were removed from service (Note: one Model 12s meter was removed from service). The performance checks were documented in an electronic daily source check spreadsheet. Copies of the daily source check spreadsheets for each instrument detector pairing are included in Appendix D2-1.

Routine Radiation Protection Activities

Work activities were performed following the RPP and were documented on various survey forms and work logs. Together, these documents track all work performed. The Radiation Protection Daily Log provides a general summary of radiation protection activities, equipment, and identifies assignments of instruments to each onsite work activity by serial number. Appendix D2-2 contains daily logs.

All work was conducted under the URS Radiation Work Permit (RWP)/Hazardous Work Permit (HWP) program, as outlined in the RPP, and URS Safety Management Standard 52 (SMS-52). The RWP/HWP permit identified radiological conditions, established worker protection and monitoring requirements, and contained specific approvals for radiological work activities. Radiological or hazardous work permits (RWP/HWP) were assigned a sequential number, and issued for each job task. Workers signed in and out of the job site RWP/HWP indicating that they understood the work requirements, and conducted personal frisks as applicable. Copies of the RWP/HWP issue log and completed permits are provided in Appendix D3.

Radiation surveys were assigned a unique survey number and documented in the Project Radiation Survey Log and on appropriate survey forms. The unique survey number includes a code to indicate the type of survey: Incoming (IN), Outgoing (OT), Routine (RT), Excavation (EX), and Trench (TN). A total of 118 surveys were conducted during the project as listed in the Survey Log provided in Appendix D4-1.

Prior to being brought onsite, reusable equipment and items were surveyed for radiological contamination to verify IN conditions. Materials that arrived onsite in new and unopened condition were assumed to be free of radioactive contamination and not surveyed. Smear samples to identify removable contamination were collected and recorded on the survey forms as appropriate. RT surveys were conducted to identify radiation exposure rates in areas where work occurred, to support general work activities, and to screen for contamination when moving equipment around the site. Surveys to support the pipeline excavation and investigative trench work were documented as EX and TN surveys, respectively.

To document compliance with the site release criteria identified in the RPP, and to document compliance with United States Department of Transportation (DOT) requirements, all sample coolers were surveyed and smear sampled before leaving the site (OT).

At the end of a specific job and before it left the site, equipment that had the potential to come into contact with contaminated material was decontaminated and surveyed for release (OT). Copies of all radiation surveys are provided in Appendix D4-2.

Gamma Walkover

Gamma radiation walkover surveys were conducted at each proposed monitoring well location, pipeline excavation, and investigation excavation area. These initial (primary) surveys provided information on the gamma radiation levels in the proposed work areas for the RWPs and also documented the pre-work radiation levels. All gamma walkover surveys were conducted by walking transects over an approximate 7.6-m (25-ft) radius around each proposed location. The gamma walkover survey was repeated in each disturbed work location after restoration to document the post-work radiation levels.

The primary surface gamma radiation survey method was conducted with a high-efficiency gamma ray scintillation detector (2 x 2 NaI, Ludlum Model 44-10). The detector was coupled to a count rate meter/scaler (Ludlum Model 2221) with serial port (Ludlum 4261-148) that transferred gamma radiation count rates to the GPS unit every two seconds. The survey grade (±1 meter) GPS (Geo6000) and external

antenna (Zephyr) recorded the position and associated information at 1-second intervals. The GPS units were configured to collect data using North American Datum (NAD) 1983 New York State Plane Coordinates. The GPS external antenna was positioned at a fixed distance directly above the detector to accurately determine the detector locations throughout the survey. The GPS antenna was mounted on top of the survey pole, with the detector mounted at a distance of 28 cm (11 in) from the bottom of the pole. This allowed the surveyor to maintain a detector height of 30.5 cm (12 in) when the pole was lifted off the ground.

The secondary survey method used the same radiation detector configuration and instrumentation but did not use the GPS system. The general radiation survey measurements were periodically recorded by hand.

The GPS data files were downloaded to a computer using GPS Pathfinder and differentially corrected to improve the precision. Data files were exported to Microsoft Excel, measurements were converted to microroentgen per hour (µR/h) using Ludlum's standard conversion factor, summary statistics, and Surfer classed postings plots were generated. Appendix D-5 provides gamma walkover survey documentation.

Monitoring Well Logging

Seventeen monitoring wells were installed across the site, with each well location assigned a well ID number. Well depths ranged between approximately 3 m and 12.2 m (10 ft and 40 ft). At each well location, the well soil core was laid out on a plastic-lined work surface for field screening. These soil cores were scanned at approximately 15-cm (6-in) depth intervals with both a Ludlum Model 44-9 Geiger-Mueller pancake probe and a Ludlum Model 43-93 alpha/beta probe and recorded on Core Sample Log data sheets.

Photograph 1 – GM pancake scan of soil core. Note brown clay unit on left and gray clay unit on right

Down-hole gamma surveys were performed following completion of soil sampling. To ensure that the borehole remained open and to protect the radiation detector from exposure to water, once the borehole reached the appropriate depth a temporary 10-cm (4-in) diameter polyvinyl chloride (PVC) pipe (with a bottom cap) was inserted into the borehole through the casing and the drill casing was removed. The down-hole gamma survey began by inserting a Ludlum Model 44-10 NaI detector in the PVC and lowering it to the bottom of the borehole. A timed measurement (30 seconds) was collected at each 15-cm (6-in) interval as the detector was retrieved. After reviewing the data, a 1-minute timed count was also collected from the interval with the highest measurement. The resulting radiation data were recorded on a Borehole Gamma Log. URS' Geologist reviewed both sets of radiological data (core and down-hole scans) to identify the sample collection intervals. Appendix D6 contains the field data sheets.

Investigation Excavations

Investigative Excavations (IEs) were specifically designed to gather radiation data at depth to identify a possibly radiological source term. At each proposed excavation location, the material was removed from the investigation trench and placed nearby on plastic-lined ground. The excavated soil and stockpile were routinely scanned using an NaI detector to identify any elevated material. Excavations were approximately 0.6-m wide by 3-m long (2-ft by 10-ft) with a nominal depth of 3 m (10 ft). However, some excavations varied in area and/or depth. After completion of the excavation, the excavation walls and floor were gamma-scanned using the NaI detector in a systematic manner. Generally, a 30-second measurement was collected to represent each approximate 1.2- to 1.5-square meter (4- to 5-square foot) area. The long walls were surveyed in approximate 0.3-m by 1.5-m (1-ft by 5-ft) areas. The short walls and floor were surveyed in approximate 0.6-m by 0.6-m (2-ft by 2-ft) areas. The presence of standing water in some trenches prevented the collection of data at certain locations. After the gamma data and soil samples were collected, excavated soil was returned to the trenches. Appendix D7 contains investigation trench data forms.

Following excavation but prior to moving to a different excavation location, the equipment was dry decontaminated and then surveyed for contamination control.

Pipeline Excavations

The Pipeline Excavations (PEs) were specifically designed to access, sample, cut and plug underground pipelines at the site. The focus of radiation surveys for these excavations was for general radiation protection and contamination control. At each proposed excavation location, the soil was removed from the excavation and placed nearby on plastic-lined ground. The excavated soil and stockpile were routinely scanned using an NaI detector to identify any elevated material. At these locations, the stockpiles were routinely rescanned to ensure radiation levels did not change as the excavated soils dried.

Excavation continued until the pipeline was sufficiently exposed. Generally, before personnel entered the excavation to begin cutting and capping the pipe, a limited gamma scan on the excavation walls was conducted to identify any elevated areas (Note: none were found). After the pipelines were cut and sealed, the excavated soil was returned to the excavation. Following excavation but prior to moving to a different excavation location, the equipment was dry decontaminated and then surveyed for contamination control. Appendix D8 contains the field data forms.

Investigation-Derived Waste (IDW) Surveys

Materials used during performance of the field work had the potential to come into contact with potentially contaminated soil. The soil and drilling cuttings from the monitoring well installations were

placed in 55-gallon drums. Water pumped out of the pipes, excavations, and generated during decontamination was placed into storage tanks. The source of all generated waste was identified on each waste container. Plastic sheeting and other solid materials were placed, as applicable, in large garbage bags. The exterior of the storage containers were surveyed for contamination and documented as part of the routine radiation surveys.

Historical IDW generated during prior investigation was stored on site. This waste consisted of five drums of contaminated soil, liquid IDW in a water tank, and other miscellaneous materials (i.e., Shelby tubes and a cooler). The drums were stored in the onsite storage building, the liquid IDW was in one of the water tanks adjacent to the storage building, and the remaining materials were in a Conex box. The waste containers were opened and samples collected to characterize the waste for disposal. Sampling was performed in a well-ventilated area to minimize airborne contamination risk. After sampling, the exteriors of the containers were surveyed for contamination to support eventual transport for disposal.

Radiation Survey Results

Work performed at the site was in accordance with the RPP. No incidents of personal contamination occurred, and all personnel exposures were below the dosimeter detection limits.

Routine Radiation Protection Activities

All equipment and general survey results were within the site ambient radiation levels and met the requirements for release. Appendix D-3 contains copies of the surveys.

Gamma Walkover Results

Table 3 summarizes gamma walkover survey results. During the pre-work walkover survey gamma radiation levels across the site ranged from 4.4 microroentgen per hour (µR/h) to 27.6 µR/h, with the highest value found near MW958 located in EU11, approximately 60 m (200 ft) south of the IWCS. The post-work gamma radiation levels ranged from 4.4 µR/h to 20.3 µR/h.

Monitoring Well Logging Results

Table 4 provides a summary of the borehole timed count, high and low measurements for the GM, alpha, and beta for each well location. Generally, the measurements showed normal variations in the radiation count rates; significantly elevated radiation measurements were not identified during core or borehole scans. Appendix D6-1 provides Individual Monitoring Well Radiation Data Tables. These summary tables provide both the gamma down-hole data and core scan results relative to each depth.

Investigative Excavation Results

Table 5 provides a summary of the scan ranges for the excavated soils and the excavation. Generally, the measurements showed normal variations in the radiation count rates; significantly elevated radiation measurements were not identified in the excavation scans. Appendix D7-1 provides Individual Investigation Excavation Summary Figures.

Pipeline and Manhole Results

During excavation activities, excavated material and excavations were routinely scanned with an NaI detector. The spoil count rates were consistent with ambient radiation levels. The excavations showed

higher count rates resulting from the change in geometry. Additional measurements were not collected at the manholes, as no excavation was performed. These higher rates were within expected values, and do not indicate the presence of significant contamination. Table 6 summarizes the pipeline excavation gamma survey results.

IDW Results

Radiation levels and smear samples from IDW from the monitoring well installation and excavations were within the ambient radiation levels seen on site.

Gamma radiation levels from the five drums of historical IDW (WEC1 to 5) ranged from 7.4 µR/h to 24.8 µR/h (Appendix D). These levels were above the ambient radiation level in the Quonset storage building of 4.8 µR/h.

2.1.3 Drilling and Monitoring Well Installation

Boart Longyear performed drilling and well installation activities during the period of November 10 through 20, 2012. A URS Geologist supervised drilling and well installation activities and a URS Health Physicist measured radiation readings.

Borehole Drilling

Sixteen shallow (UWBZ) wells (i.e., MW944 through MW948 and MW950 through MW960) and one deep (LWBZ) well (i.e., MW949) were installed during the investigation. Table 7 presents a summary of monitoring well locations and the water-bearing zone each well is intended to monitor.

Drilling was performed using a Sonic track-mounted Spyder drill rig. A double-cased drill string comprised of a 10-cm (4-in) diameter inner casing and a 15-cm (6-in) diameter outer casing advanced the boreholes. Casing lengths used were 1.5 m (5 ft) or 3 m (10 ft) allowing for continuous soil sampling. Water was not used during the drilling process.

Photograph 2 – Drill rig set up at MW948 location.

Following soil sampling into the Gray Clay aquitard, the upper portion (5.2 m [17 ft]) of deep well MW949 was enlarged using 30-cm (12-in) diameter casing to allow for the subsequent installation of 20-cm (8-in) diameter permanent steel casing.

Figures 4, 5, and 6 identify the locations of wells, MW944 through MW960. The wells were sited at the approximate locations identified in the pre-investigation documents. The final well locations were adjusted based on field conditions and/or at the request of USACE.

Thirteen of the 17 monitoring wells locations were manually pre-cleared to a depth of 1.1 m to 1.5 m (3.5 to 5.0 ft) to avoid drilling through subsurface utilities.

Decontamination

Boart Longyear set up a decontamination pad and drilling equipment was decontaminated with high-pressure steam prior to and between each monitoring well location. To minimize decontamination time between borings, Boart Longyear provided multiple pieces of decontaminated drive casing.

Decontamination fluids were placed in polyethylene tanks. Soils and sediment generated during equipment decontamination were placed in 55-gallon drums. Miscellaneous solids, such as plastic and personnel protective equipment (PPE) were placed in 40-gallon trash bags.

URS performed radiological scans of the drill rig and drilling equipment when the equipment first arrived on site, between each drilling location, and at the end of the field investigation (release survey), prior to the equipment leaving the site.

Drilling Observations

Each borehole was continuously sampled. Appendix E provides copies of these boring logs. Upon completing a sampling interval, the outer drill casing was held in place within the borehole while the inner core barrel was removed. A 10-cm (4-in) diameter continuous core was then extruded from the core barrel and placed directly into a plastic sleeve. The sample was then laid out on a plastic-lined work surface for field screening, visual description, and sample selection.

Table 8 summarizes drilling observations made at each borehole. In general, deposits encountered during drilling consisted of the following, from shallowest to deepest:

> Topsoil: Brown to black loamy topsoil was found at most drilling locations. At well locations around the IWCS and near site roads, the topsoil was covered by grass. At the remaining well locations, topsoil was either absent or present under leafy debris.
>
> Fill: Composed of varying proportions of sand and gravel in a reddish brown to brown silty clay to clayey silt matrix. Fill was most noticeable in the IWCS area where past ground disturbance activities were most extensive. At other areas, the fill was less apparent as it consisted primarily of reworked underlying till deposits.
>
> Brown Clay Unit: Composed primarily of brown to reddish brown clayey silt to silty clay with trace to some sand and gravel and orange to gray mottles. This deposit was typically moist and slightly plastic; plasticity often increased with depth as did moisture

content. Some sand and silt partings, lenses and seams were also observed.

Gray Clay Unit: Composed of brownish to pinkish gray clay to silty clay with trace to some sand and gravel. The deposit contains trace to some brown varves. It was typically moist to wet, plastic to very plastic with some silty sand partings, seams and lenses.

Sand and Gravel Unit: Penetrated only in the MW949 boring, this unit was found to consist of brown to gray silty fine to coarse sand with trace to some fine to coarse gravel. This unit was wet and contained some silty clay to clay seams and lenses.

Appendix A contains field notes recorded by the site geologist.

Down-Hole Gamma Scan

Upon reaching the final depth, the drilling equipment was removed from the borehole and a temporary 10-cm (4-in) diameter PVC pipe fitted with a bottom cap was inserted into the borehole. URS then performed a down-hole gamma scan inside the PVC pipe using an NaI (Ludlum Model 44-10) detector. The detector was lowered to the bottom of the hole and slowly retracted with measurements recorded at 15-cm (6-in) intervals. After the entire hole was logged, a one (1) minute static count was recorded at the location that exhibited the highest reading. The temporary PVC pipe was removed from the hole following the completion of the down-hole gamma logging.

Soil Core Screening

The plastic sleeve containing the soil core was sliced open lengthwise and the soil core was scanned at 15-cm (6-in) intervals with the Ludlum Model 44-9 pancake detector (for alpha, beta and gamma radiation), Ludlum Model 43-93 detector (for alpha and beta radiation), and MiniRae photoionization detector (PID) for volatile organic vapors.

Sample Selection

In accordance with the work plans, with the exception of the three well borings in EU4 (i.e., MW947, MW948, and MW949), soil sample selection was driven based on radiological readings. Four soil samples from each borehole were collected in accordance with the following protocol:

a. one sample from the top 15 cm (6 in) of soil;

b. one sample from a 0.3-m (1-ft) interval in the approximate middle of the well screen;

c. one sample from the interval that exhibited the highest radiological scan measurement on the soil core, and,

d. one sample from the interval that exhibits the highest radiological scan measurements based on the down-hole gamma reading. If the highest down-hole gamma reading and the highest core scan measurement were recorded for the same interval, the sample was collected from the soil core at the depth of the second highest down-hole gamma reading.

Soil sample selection from the three EU4 wells was to be driven by PID readings. These wells are

intended primarily to monitor DNAPL contamination. However, no elevated PID readings were observed, so soil sample selection from these boreholes also followed the above-mentioned protocol. (It is noted that no substantially elevated radiation readings were observed in any of the boreholes either.) Table 9 presents a summary of soil samples selected for laboratory analyses and the sample selection rationale in accordance with the above protocol.

Samples were placed in laboratory-provided containers. Each soil sample interval was homogenized in a decontaminated stainless steel bowl and then transferred to the appropriate sample containers. For each soil sample scheduled for VOC analysis, the VOC aliquot was placed in 2-ounce glass jars with Teflon-lined lids without homogenization.

Field duplicates and matrix spike/matrix spike duplicate (MS/MSD) samples were collected at frequencies of 10% and 5%, respectively.

TestAmerica provided sample containers, coolers, and courier service. The TestAmerica Amherst, New York, facility does not perform radiological analyses. However, to facilitate sample tracking and shipment, a TestAmerica courier picked up the samples from the site and transported them to the TestAmerica facility in Amherst, New York. Subsequently, TestAmerica shipped the samples to their facility in Earth City, Missouri. A USACE representative oversaw sample handling, preservation, and chain-of-custody procedures.

Well Installation

Based on the lithology encountered at each monitoring well location, URS determined well depths and screen intervals in consultation with the USACE. This was consistent with the portion of the formation monitored by nearby existing wells.

For the 16 shallow wells, the bottoms of the well screens were placed at or just into the top of the Gray Clay Unit. The lengths of the well screens were placed to include, to the extent possible, the more permeable silt and sand lenses within in the Brown Clay Unit.

Monitoring wells were constructed using 5-cm (2-in) diameter, 0.02-cm (0.010-in) slotted schedule 40 PVC screens and equivalent risers. All joints were flush-threaded.

The wells were installed through the 15-cm (6-in) diameter outer drill casing as the casing was slowly removed. The annular space between the borehole wall and the screen was backfilled with #5 Global Sand to 0.3 to 0.6 m (1 to 2 ft) above the screen-riser coupling. A 0.3- to 0.9-m (1- to 3-ft) minimum bentonite pellet seal was placed above the sand pack. The remainder of the borehole to grade was filled with concrete. Each well was finished with a protective steel stickup casing set into the concrete.

Each monitoring well has a small weep hole located just above the ground surface seal to prevent the accumulation of water between the well riser and protective casing. After installation of the protective casing and surface seal, the annular space between the inner riser and protective casing was filled with sand to 5 cm (2 in) below the top of the well riser pipe. A reference mark was made on the highest point of each well riser for reference during the elevation survey and subsequent water level monitoring.

Three 2.1-m (7-ft) long steel bollards were placed around wells MW944, MW945, and MW957. The bollards were set approximately 1.2 m (4 ft) bgs and 0.9 m (3 ft) above grade. The bollards were covered

by yellow plastic sleeves equipped with reflectors.

Table 10 summarizes well construction information. Appendix F contains well construction logs.

Well Development

Well development began on November 29, 2012, nine days following completion of drilling and well installation activities. Each monitoring well was developed by pumping and surging. Because of very low recharge rates, development of most wells spanned several days.

Groundwater parameters of pH, specific conductance, temperature, turbidity, and dissolved oxygen were recorded. However, in most wells, stabilization of the parameters (i.e., three consecutive readings within 10 percent) was not achieved.

Wells MW944, MW945, and MW948 were dry at the time of well development. Wells MW946 and MW947 both had small amounts of water at the time of development but went dry during development and did not recover during the development process.

Because the drilling process can smear soils on the annular walls of a borehole and sometimes seal off permeable layers, with USACE approval, URS added distilled water (four gallons) to wells MW944 through MW948. Each well was then surged and then pumped until the majority of the added water was recovered.

Five of the wells (MW952, MW953, MW954, MW955, and MW958) had limited groundwater (i.e., 5 gallons or less) recovered. Groundwater parameters never stabilized even though these wells were purged to dryness multiple times.

The remaining wells (MW949, MW950, MW951, MW956, MW957, MW959, and MW960) had greater amounts of purged groundwater recovered (i.e., 8.5 to 40 gallons of water). Wells MW949 and MW951 were developed to relative clarity with turbidity readings below 50 nephelometric turbidity units (NTUs).

All development water was contained and transferred to the IDW storage area. Development water generated from the EU4 wells (MW947, MW948, and MW949) was stored separately from other wells due to the possible presence of VOCs in the EU4 wells.

Appendix G contains copies of well development logs.

Groundwater Sampling

Groundwater sampling was performed on December 6 through December 14, 2012. Wells MW944 through MW948 were dry at the time of sampling.

The groundwater samples were collected using the low-flow sampling method and analyzed in the field for water quality parameters of pH, temperature, dissolved oxygen, oxidation-reduction potential (redox), specific conductivity, and turbidity. Appendix H contains copies of well purge logs.

Field duplicates and matrix spike/matrix spike duplicate (MS/MSD) samples were collected at frequencies of 10% and 5%, respectively.

TestAmerica provided sample containers, coolers, and courier service. The lab courier picked up the samples from the site and transported them to the TestAmerica facility in Amherst, New York. Subsequently, samples were shipped to the TestAmerica facility in Earth City, Missouri. A USACE representative oversaw sample handling, preservation, and chain-of-custody procedures.

Soil and Groundwater Analyses

The groundwater and soil samples were submitted to TestAmerica for analyses of radionuclides, metals, VOCs, etc., in accordance with the analytical schedule presented in Table 11. Upon receipt, URS forwarded the analytical results to the USACE for review and qualification/validation.

2.1.4 Excavation Activities

Two types of excavations were advanced at the site:

- Pipeline Excavations (PE) to locate, access, sample, cut and plug buried pipelines; and
- Investigative Excavations (IE) to investigate areas of possible radiation contamination.

During a pre-investigation site visit, URS and USACE personnel identified the proposed excavation locations using field observations and scaling from site maps and plans. Geophysical surveys, described in Section 2.1, were performed to further refine the proposed locations. Prior to beginning intrusive excavation activities, a pre-work gamma radiation walkover survey was conducted at each location as described in Section 2.1.2.

Seventeen pipelines were exposed, sampled, and plugged at six PE locations (i.e., PE1 through PE6, Figure 2). Investigative excavations were performed at eight locations (i.e., IE1 through IE8, see Figure 7).

Excavation activities were performed during the period of November 13, 2012, through December 19, 2012. A URS Geologist supervised all excavation activities and a URS Health Physicist measured radiation readings.

Excavation services were provided by Russo using a John Deere 200LC tracked excavator with a two-person crew (i.e., operator and laborer). A steel trench box (6-m long by 1.3-m wide by 2.4-m high (20-ft by 4.2-ft by 8-ft) was used, as needed, to ensure safe excavation access and egress. A 6-m long by 0.6-m wide (20-ft by 2-ft) aluminum scaffolding stage with a guardrail was placed across the open excavations, as needed, to allow personnel to safely scan/inspect the excavation from grade. Russo provided a competent person to inspect and confirm safety aspects of the excavation.

Excavated soils were stockpiled on plastic sheeting next to each excavation, laid out in the order of removal. The excavated soils were routinely scanned for radiation and VOCs using NaI and PID detectors, respectively. At the completion of excavation activities, the soils were placed back into the excavations in the order in which they were removed. The soils were placed in 0.3- to 0.6-m (1- to 2-ft) lifts and compacted with the excavator bucket. The corners of each excavation were then staked for subsequent surveying. A final gamma radiation walkover survey was conducted to document the final radiological condition of each area.

Field activities and observations were recorded in bound field logbooks (copies are provided in Appendix I). Appendix J contains Pipeline Excavation logs prepared by URS; Appendix K contains Investigative Excavation logs. Information in the logs include location and survey information, field observations, soil

descriptions, radiological and PID survey data, sample collection information, pipe decommissioning information, plan and cross-sectional sketches of the excavation, and excavation photographs.

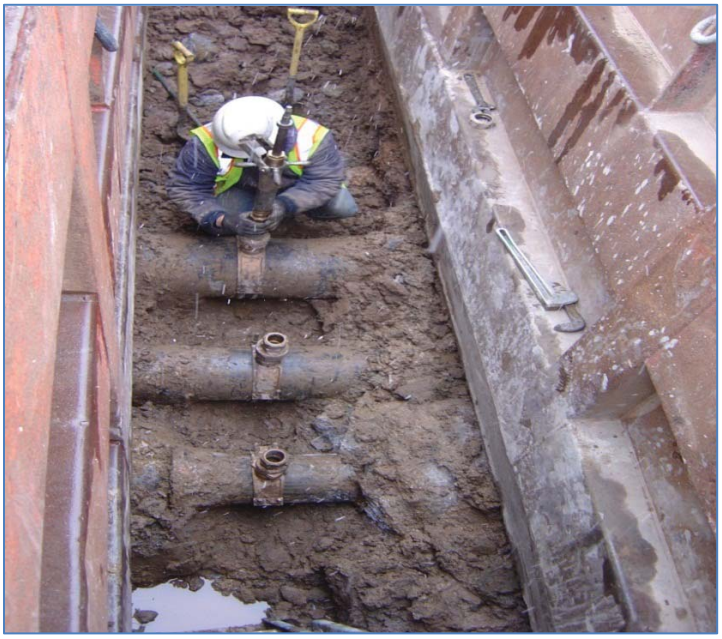
Pipeline Excavation, Cutting and Plugging Procedures

Pipeline excavations were conducted between November 13, 2012, and December 14, 2012. Figure 2 shows the locations of the excavations, identified as PE1 through PE6. Figures 7 through 12 show the dimensions of the pipeline excavations and relative locations of the pipelines encountered in each excavation. Each excavation was oriented perpendicular to the run of the utility pipelines to make the pipes accessible for observation, sampling, and plugging.

Prior to personnel entering an excavation, the excavation walls were braced with the trench box and/or benched to maintain stable sidewalls. Once the excavation sidewalls were stabilized and radiation and air monitoring scans had been performed, Russo personnel entered the excavation to characterize the pipeline bedding and identify the diameter and composition of each pipeline. In general, there was no bedding material around the pipelines. The pipes appeared to have been backfilled with previously excavated native clayey soils. In a few instances (see logs for PE3, PE4, PE5), pieces of wooden cribbing and/or minor volumes of sandy-gravelly soils were present beneath the pipes (probably used to stabilize the pipes during backfilling).

Accessing Pipeline Interiors

URS assumed that the pipelines would be filled with liquid. To control the flow of liquids from the pipes, initial penetrations into the pipes were made using a wet tap system. The wet tap system consisted of a saddle that was clamped around the pipe. One side of the saddle contained a threaded hole into which a valve assembly was installed. A hole saw inserted through the saddle/valve assembly was used to cut a hole in the pipe. Once the pipe was penetrated, the valve assembly was used to regulate liquid flow from the pipe.



Photograph 3 - Installing wet valves on pipelines

Each pipe contained water. Most of the pipes were under gravity pressure and required dewatering to reduce the gravity pressure head so the pipes could be further opened for sediment sampling (if present) and plugging. Dewatering was performed through the saddle/valve assembly using a double-diaphragm pump. All water generated during dewatering activities was containerized in a polyethylene tank and transported to the IDW storage area for subsequent waste characterization and disposal.

Pipeline Soil, Sediment and Water Sampling

Prior to opening a pipe, Russo collected soil samples for chemical analyses from beneath the pipeline. One soil sample was collected from beneath each pipe. The soil samples were collected using a decontaminated shovel and stainless steel bowl. The soil aliquot for VOC analysis was placed in 2-ounce glass jars with Teflon-lined lids without homogenization. The remaining soil was homogenized in the bowl with a decontaminated stainless steel spoon or disposable plastic scoop. The homogenized sample was transferred into clean sample containers provided by the analytical laboratory.

After collection of the soil samples, the soils were removed from around the circumference of the pipes. The pipes were then opened to collect liquid and sediment samples. A peristaltic pump with clean, dedicated silicone and polyethylene tubing was used to collect water samples. The water samples were pumped directly into clean sample containers provided by the analytical laboratory.

One water sample was collected from each pipe for chemical analyses. The water samples were analyzed in accordance with the analytical schedule presented in Table 12.

Once the pressure head had subsided and the water sample had been collected, the brass saddle assembly was removed and a chop saw with a diamond blade was used to cut a square opening into the top of the pipe. A sediment sample (if present) was then collected for chemical analyses. Clean, dedicated elbow-length protective gloves were used to grab sediment samples by hand from the bottoms and sides of the pipe interiors and place them into a decontaminated stainless steel bowl. Any free water present was decanted. The sediment aliquot for VOC analysis was placed in 2-ounce glass jars with Teflon-lined lids without homogenization. The remaining sediment was homogenized (if possible) with a decontaminated stainless steel spoon or disposable plastic scoop. The homogenized sample was then transferred into clean sample containers provided by the analytical laboratory.

Soil and sediment samples were analyzed in accordance with the analytical schedule presented in Table 13.

The sample numbering system was consistent with that used at the NFSS during previous investigations and included the following nomenclature: “SB” for subsurface soil, “SED” for sediment, and “PIPE” for pipeline liquid and sediment samples.

In order to comply with USACE sampling protocols, the number of field duplicates and MS/MSD samples was planned to be 10%, and 5%, respectively, of the total number of soil, liquid, and sediment samples collected. For example, one field duplicate was collected for every ten soil samples, and one MS/MSD was collected for every 20 liquid samples. However, in most cases only limited (or no) sediment volume was present inside the pipes and no sediment field QA/QC samples could be collected. The analytical laboratory utilized batch QA/QC for the pipeline sediment samples.

Standard turnaround time (not to exceed 21 days) was requested for all pipeline samples. URS’

subcontract laboratory provided the appropriate number of sample containers and coolers for all samples. URS prepared the coolers for pickup by a TestAmerica - Buffalo courier under the supervision of the SRSO. The laboratory then shipped the samples to their TestAmerica – Earth City facility.

Pipeline Plugging and Backfilling

Following sample collection, the interior of each pipe was plugged with Speed Crete Red Line rapid-setting cement-based concrete and masonry repair mortar cement. Once this was completed and it was determined that the pipe was effectively plugged, the exterior of the pipe was encased in a concrete-bentonite mixture to prevent liquid migration along the outside of the pipe. A concrete truck equipped with a conveyor delivered and placed the concrete mixture.

Photograph 4 - Concrete being pumped into 24-inch pipe in PE4

Efforts to reduce the gravity head in the 0.9-m (36-in) inside diameter (ID) pipe at PE3 and the 0.6-m (24-in) ID pipe at PE5 were unsuccessful. With USACE approval, a square "window" was scored into the top of each pipe with the chop saw. The excavator bucket was then used to break the window and the awaiting concrete conveyor truck immediately filled the interior and the area surrounding the pipe with the concrete/bentonite mixture.

No difficulties were encountered when using this procedure at PE3. However, when the excavator broke the "window" in the 0.6-m (24-in) ID pipe at PE5, a crack developed in the top of the pipe. The crack extended approximately 46 cm (18 in) to the north and south of the "window" (see PE5 photo log in Appendix J). The pipe interior and surrounding area were initially filled with the concrete/bentonite mixture and the excavation was left open for inspection the following day. During the inspection, seepage was noted from a small portion of the exposed crack on the south side of the initial pour. The area beyond the crack was then excavated and the pipe was sealed with another 1.5 cubic yards of concrete-bentonite mixture.

Pipeline Excavation Observations

Table 14 provides a summary of the observations at each PE location. Soils encountered at the excavations generally consisted of a thin layer of surficial fill/reworked material underlain by brown to reddish brown silty clay (Brown Clay Unit). A pinkish to brownish gray silty clay (Gray Clay Unit) was encountered in the deepest excavations.

None of the excavations yielded groundwater. Although some yellowish brown silty-fine sandy partings and lenses were encountered in the Brown Clay Unit, these were generally only moist and did not produce groundwater. As noted previously, there was no bedding material around the pipelines; they appeared to have been backfilled with previously excavated native clayey soils. In a few instances (refer to PE3, PE4, and PE5 logs), wooden cribbing pieces and/or minor volumes of sandy-gravelly soils were observed beneath the pipes (likely used to stabilize the pipes during backfilling).

The pipelines encountered in the PEs appeared to be cast iron and were all in very good condition. The pipelines appeared to be of bell and hub construction with wall thicknesses ranging from approximately 2 to 3.8 cm (¾ to 1 ½ in). No cracks or breaches in the pipes were observed and no signs of leakage were noted.

All of the pipelines contained water and most were under gravity head pressure. Upon initial penetration, a few pipelines emitted gases with a decayed organics/hydrogen sulfide odor. Little free sediment was observed within the pipelines, although many pipes had a hard black scale buildup on the interior pipe walls (note: cast iron pipe is prone to develop black scale as iron oxidizes and precipitates out of water). The liquid and sediment within the pipelines did not exhibit elevated PID or radiation readings or any significant visual or olfactory signs of contamination.

Investigative Excavations

URS provided oversight of eight Investigative Excavations, identified as IE1 through IE8, between November 30, 2012, and December 6, 2012. The excavations were located in the grit chamber, decontamination pad and well OW11B areas (see Figure 7):

- Four excavations (IE1 through IE4) were located near each side of the former grit chamber,
- Two excavations were located near the southern end of the former decontamination pad (IE5 and IE6),
- One excavation was located near inactive underground utility lines (IE7), and,
- One excavation was located near the former railroad bed (IE8).

Field activities and observations were recorded in bound field logbooks (Appendix I contains copies of the logbooks). URS prepared detailed excavation logs that include locational and survey information, field observations, soil descriptions, radiological and PID survey data, sample collection information, pipe decommissioning information, plan and cross-sectional sketches of the excavation, and excavation photographs. Appendix K contains copies of the IE logs.

The planned dimensions of the excavations were approximately 3-m deep by 0.6-m wide by 2-m long (10-ft deep by 2-ft wide by 6-ft long). However, the final excavation dimensions were adjusted in the field, as needed, to further evaluate subsurface conditions such as concrete foundations and pipelines. Trench boxes were not used because there was no intent for site workers to enter the excavations.

Pipelines were encountered in IE2, IE4, and IE5 (associated with the former decontamination pad and grit chamber) and IE7 and IE8 (former water supply pipelines and a concrete encased sanitary sewer line). The pipelines encountered in the IEs were not opened for observation and sampling. There was no bedding material around the pipelines in IE7 and IE8; they appeared to have been backfilled with previously excavated native clayey soils. The pipelines encountered in IE2, IE4, and IE5 contained angular sandy bedding that produced water; samples were collected from the bedding material and the water that seeped from the bedding material to evaluate possible contamination.

Excavation Sampling

Four soil samples were collected from each IE in accordance with the planning documents:

- One sample from the top 15 cm (6 in) at the highest radiological detector reading during the surface survey prior to excavation,
- One sample from the bottom of the excavation, and
- Two samples from the sidewalls of the excavation. These two samples were collected from locations with higher radiological readings or as directed by USACE onsite personnel.

Surficial or shallow soil samples were collected directly into decontaminated stainless steel bowls using decontaminated stainless steel trowels or disposable scoops. The remainder of the deeper soil samples were collected from the excavation sidewalls and bottom using a decontaminated hand auger. When a sufficient soil volume had been collected, the soil sample was homogenized in a stainless steel bowl with a decontaminated stainless steel spoon or disposable plastic scoop and then transferred into clean sample containers provided by the analytical laboratory.

A peristaltic pump and new silicone and polyethylene tubing was used to collect groundwater samples. The groundwater samples were collected directly into clean laboratory-provided containers. One groundwater sample was collected from each IE, with the exception of IE1 which collapsed before a groundwater sample could be collected.

The soil and groundwater samples were analyzed in accordance with the analytical schedule presented in Table 15.

The sample numbering system was consistent with that used at the NFSS during previous investigations; however, “TB” was the identifier used for the excavation soil samples and “GW” was the identifier used for excavation groundwater samples.

In order to comply with USACE sampling protocols, the number of field duplicates and MS/MSD samples were 10% and 5%, respectively, of the total number of soil samples collected. The same requirements applied to water samples. For example, one field duplicate was collected for every ten soil samples, and one field duplicate was collected for every ten groundwater samples.

Standard turnaround time (not to exceed 21 days) was requested for all samples collected from the field investigative activities. URS’ subcontract laboratory provided the appropriate sample containers and coolers for the samples. URS prepared the coolers for pickup by a TestAmerica - Buffalo courier under the supervision of the SRSO. The laboratory then shipped the samples to the TestAmerica – Earth City facility.

Excavation Observations

Table 16 provides a summary of the observations at each IE location. Soils encountered at the IEs generally consisted of fill/reworked soils composed of a thin layer of surficial brown loamy clay underlain by red silty clay with trace to some angular to subangular fine to coarse sand and gravel (Red Fill). A buried brown topsoil layer and then a brown to reddish brown silty clay (Brown Clay Unit) underlie the fill. The deepest excavations encountered a brownish to pinkish gray silty clay (Gray Clay Unit).

The interface between the Red Fill and the underlying buried brown topsoil layer frequently yielded higher radiation survey measurements. Samples of this layer were collected from five of the eight IEs for laboratory analyses. The Red Fill layer was absent in IE8, the southernmost IE location.

Excavations IE1, IE2, IE3, and IE4 contained debris, consisting of magenta-colored ropes, fence posts, and radioactive warning signs with magenta text on a yellow background. At approximately 0.6 m (2 ft) bgs in IE4, a crushed and rusted black 55-gallon drum was found. The drum did not exhibit PID or radiation readings above background levels, nor any visual or olfactory signs of contamination.

The surface material at IE6 consisted of #3 crusher run gravel and topsoil; IE6 was located across the former access ramp at the south end of the decontamination pad.

The pipelines encountered in the IEs appeared to be cast iron. The three pipelines encountered in IE7 appeared to be cast iron of bell and hub construction similar to those in the PEs and were in very good condition. No cracks or breaches in the pipes were observed in any of the pipes and no signs of leakage were noted.

The pipelines encountered in IE2, IE4, and IE5 were surrounded by 10 cm to 46 cm (4 to 18 in) of wet, angular sand. These pipes had rusty, corroded exteriors. The pipes encountered in IE2 and IE5 appeared to connect the former decontamination pad to the grit chamber. The pipe encountered in IE4 appeared to connect the grit chamber to the adjacent grit chamber lift station.

The sandy bedding around the pipes in IE2, IE4, and IE5 did exhibit water seepage. URS collected soil samples from the bedding material and the water that seeped from the bedding to evaluate possible contamination along the bedding. Only a few liters of water had seeped into each excavation.

In IE6, a small volume of water, less than a couple liters, was seeping into the excavation primarily from the 0 to 0.6 m (0 to 2 ft) depth interval.

In IE7, water was seeping into the excavation from the area between the 38-cm (15-in) and 23-cm (9-in) diameter pipes at a depth of approximately 1.5 m (4.5 ft). Only a couple liters of water seeped into the excavation from this area. Some water was seeping into the excavation along the top of a concrete-encased sewer line at a depth of approximately 2.4 m but the volume of water was minimal, less than one liter.

In IE8, water was seeping into the excavation from along the top of the concrete-encased sewer. IE8 filled with water to approximately 1 m (3 ft) bgs overnight and was the only IE or PE that required dewatering due to groundwater infiltration. Approximately 375 gallons of water were pumped from the excavation into a polyethylene tank and transported to the IDW storage area for subsequent waste characterization and disposal.

Although IE8 was designed to investigate the potential interaction of a former railroad bed and an underlying sanitary sewer, no railroad ballast or other indications of a former railroad bed were observed in excavation IE8.

2.1.5 Manhole Sampling and Plugging

Manholes MH08 and MH41 were plugged to help eliminate the potential for migration of contaminants in the former LOOW sanitary sewer system. Manhole MH08 is located in the south central portion of EU11 and MH41 is located on the eastern side of EU8 (see Figure 2). Both manholes were constructed of red brick and mortar. Manhole sampling information is provided in Appendix K.

Manhole MH08

Manhole MH08 is located in EU11 approximately 75 m (250 ft) south of the IWCS. The manhole was in the up-gradient portion of the former LOOW sanitary sewer system. URS inspected manhole MH08 on 7 December 2012 and found it to be approximately 3 m (9.8 ft) deep and 1.2-m (4-ft) in diameter and contained water, which was measured at approximately 1.2 m (4.2 ft) bgs. Approximately 10- to 13-cm (4- to 5-in) of sediment was present in the bottom of the manhole. The sewer inlet/outlet pipes were not visible.

On December 10, 2012, URS collected a water and sediment sample from the manhole. The depth to water was measured at approximately 1.1 m (3.6 ft) bgs. A peristaltic pump with new tubing was used to collect the water sample first. The tubing intake was set at approximately 2 m (6 ft) bgs (i.e., approximately 1 m into the water). The water was pumped directly into laboratory-provided sample containers.

Photograph 5 - Manhole MH08 before and after plugging

The sediment sample was collected using a new polyethylene sample container affixed to a pole sampler. Upon retrieval, the sediment was placed in a clean stainless steel bowl and the free water present was decanted. The sediment aliquot for VOC analysis was placed in 2-ounce glass jars with Teflon-lined lids without homogenization. The remaining sediment was homogenized (if possible) with a decontaminated

disposable plastic scoop. The homogenized sample was then transferred into clean sample containers provided by the analytical laboratory.

Following the collection of water and sediment samples, manhole MH08 was plugged with a concrete-bentonite mixture. The concrete mixture was placed into the manhole using the excavator bucket. After approximately five bucket-loads of concrete were placed in the manhole, the water level rose to the top of the manhole. To accommodate the placement of the remaining concrete, approximately 375 gallons of water was pumped from the manhole into a polyethylene tank and transported to the IDW storage area for subsequent waste characterization and disposal. Following dewatering, concrete was added to the manhole to a level approximately 5 cm (2 in) bgs. Russo used a vibrator to help settle the concrete. In total, approximately 3.5 cubic yards of concrete were added to the manhole. The manhole lid was placed back on the manhole following plugging.

Manhole MH41

Manhole MH41 is located in the eastern-central portion of EU8 off Castle Garden Road. URS initially inspected the manhole on November 15, 2012. URS found that the manhole was approximately 2.1 m (7 ft) deep and 1 m (3 ft) wide. The manhole contained water to approximately 0.8 m (2.5 ft) bgs with a few centimeters of sediment at the bottom. A sewer pipe on the west side appeared to be approximately 20-cm (8-in) in diameter. Site utility drawings suggest that sewer pipes were located on the northeast and southeast sides of the manhole but those pipes were not visible.

Photograph 6 - Preparing to backfill manhole MH41

Following inspection, URS collected a water and sediment sample from the manhole. The water sample, collected first, was obtained using a peristaltic pump with new tubing. The tubing intake was set at approximately 1.2 m (4 ft) bgs (i.e., approximately 0.8 m into the water). The water was pumped directly into laboratory-provided sample containers.

The sediment sample was collected using a new polyethylene sample container affixed to a pole sampler. Upon retrieval, the sediment was placed in a clean stainless steel bowl and the free water was decanted. The sediment aliquot for VOC analysis was placed in 2-ounce glass jars with Teflon-lined lids without homogenization. The remaining sediment was homogenized (if possible) with a decontaminated disposable plastic scoop. The homogenized sample was then transferred into clean sample containers provided by the analytical laboratory.

Following the collection of water and sediment samples, manhole MH41 was plugged with a concrete-bentonite mixture. The concrete mixture was placed into the manhole directly from the concrete truck. Approximately 1.5 cubic yards of concrete was added, rising to a level approximately 1.1 m (3.3 ft) bgs. During placement of the concrete, the water level in the manhole had risen to grade. Russo used a vibrator to help settle the concrete.

On November 16, 2012, URS re-inspected the manhole. The water level in the manhole had dropped to approximately 0.7 m (2.3 ft) bgs. At USACE's request, the water was pumped from the manhole (approximately 75 gallons) into a polyethylene tank and transported to the IDW storage area for subsequent waste characterization and disposal. Following inspection of the concrete, the USACE concluded that the manhole was properly plugged. The manhole lid was placed back over the manhole following plugging.

Manhole Sample Analyses

The manhole water and sediment samples were analyzed in accordance with the same schedule as the PE water and sediment samples as shown in Tables 12 and 13, respectively. The sample numbering system was consistent with that used at the NFSS during previous investigations; "SED" was the identifier used for the manhole sediment samples and "MH" was the identifier used for manhole liquid samples.

Manhole sampling QA/QC samples were included with the pipeline excavation QA/QC sampling requirements due to the similarity in sample matrices and analyses. Standard turnaround time (not to exceed 21 days) was requested for all samples collected from the field investigative activities. URS' subcontract laboratory provided the appropriate sample containers and coolers for the samples. URS prepared the coolers for pickup by a TestAmerica - Buffalo courier under the supervision of the SRSO. The laboratory then shipped the samples to the TestAmerica – Earth City, Missouri, facility.

2.1.6 Investigation Derived Waste Management

Waste Streams

IDW includes waste solids and liquids generated during field investigation activities (e.g., drilling, excavation, decontamination, and sampling). URS coordinated the characterization, transportation, and disposal of all IDW. The following waste streams were generated during the investigation:

1. Decontamination liquids.
2. Well development and purge water.
3. Pipeline and excavation dewatering water.
4. Drill cuttings.
5. PPE, plastic, and other disposable materials.
6. 10-centimeter (4-inch) diameter PVC pipes.
7. Plywood sheeting.

In addition, URS coordinated the characterization, transportation, and disposal of the following wastes stored onsite from previous investigation activities:

1. Eighteen Shelby tube samples
2. Six 55-gallon drums of soil
3. One cooler containing samples of unknown materials
4. Approximately 1,500 gallons of purge/development water

Table 17 presents an inventory of IDW generated at the site including the sources, volumes, and accumulation start dates.

New, open-top 55-gallon drums were used to store soils generated during drilling and transferred to the IDW storage area. URS also placed pre-existing solid IDW in new 55-gallon drums and a B-25 box for subsequent offsite disposal.

Liquids from decontamination, well development, well purging and excavation dewatering were placed in polyethylene tanks and a 21,000-gallon frac tank. The waters were segregated per area/activity. For example, due to the possible presence of organics, water generated during the installation, development, and purging of wells MW947, MW948, and MW949 in EU4 were placed in a tank separate from other waters.

Materials such as PPE, plastic sheeting, disposable materials, and non-indigenous waste were placed in trash bags at the point of generation. The bags were then transferred to the IDW storage area and subsequently placed into new 55-gallon drums and a B-25 box for offsite disposal.

Waste Characterization

URS collected representative samples of each IDW waste stream (with the exception of bagged PPE, plastic, etc.) for waste characterization at the completion of the field investigation. Because the exact disposal site would not be known until the waste characterization results were received and reviewed, URS selected the waste characterization parameter list based on the assumption that the material would be considered radioactive. Therefore, the samples were analyzed for parameters required by radioactive waste disposal facilities: the solid IDW analytical parameter list was based on the requirements of Energy Solution's Clive, Utah facility and the liquid IDW analytical parameter list was based on the requirements of PermaFix Environmental Services' Knoxville, Tennessee, facility. Table 18 presents the complete list of analytical parameters.

Waste Transportation and Disposal

Solid IDW

The solid IDW analytical results indicated that radiation impacts were minor. URS retained Waste Technology Services, Inc. (WTS) of Lewiston, New York, to provide transportation and disposal services for the solid IDW. WTS is a certified waste shipping broker. Services provided by WTS include the preparation of waste profiles for both the drummed solid IDW and bagged materials, and coordination of transportation and disposal of the solid IDW. The solid IDW disposal facility is the Environmental Quality (EQ) Wayne Disposal facility in Belleville, Michigan. Appendix L contains copies of the waste

profiles (waste manifest and waste transportation permits will be provided following transportation and disposal of the IDW).

Liquid IDW

URS provided the liquid IDW analytical results to the City of Lockport Wastewater Treatment Plant (LWTP) for their evaluation. LWTP issued URS a letter stating that they would accept the liquid IDW. URS retained western New York Septic of Wilson, New York, to transport the liquid IDW from the site to the LWTP. Appendix L contains copies of the LWTP acceptance letter (the liquid IDW waste manifests will be provided following transportation and disposal of the IDW).

2.1.7 Land Surveying

Each monitoring well was surveyed for location and elevation (ground, riser, and protective casing). The staked corners of each excavation were surveyed for location and ground elevation.

The survey coordinates were geo-referenced to North American Datum (NAD) 1983 New York State Plane Coordinates and National Geodetic Vertical Datum (NGVD) 88 Datum. Ground surface, top of well riser, and top of protective casing elevations were measured to 3 millimeters (0.01 foot). Appendix M contains a copy of the survey data.

3.0 ANALYTICAL RESULTS

3.1.1 Analytical Procedures

The analytical procedures performed on the monitoring well (soil and groundwater), pipeline excavation and manhole (water, soil, and sediment), investigative excavation (soil and groundwater), and IDW (solid and aqueous) samples are presented in Tables 11, 12, 13, 15, and 18, respectively. The samples were analyzed by TestAmerica Laboratories, Inc. located in Earth City, Missouri, and Richland, Washington.

For some of the monitoring wells and excavations, a limited volume of groundwater was available for collection. Similarly, in some pipelines, limited sediment sample was available. When a limited volume of sample was available, the priority of analysis was, from highest to lowest priority: radiation parameters, metals (unfiltered, then filtered for aqueous samples), VOCs, QA/QC duplicates, QA/QC MD, QA/QC MS, QA/QC MSD. A copy of the laboratory analytical results is provided in Appendix N.

3.1.2 Data Validation/Qualification

In accordance with the QAPP, full deliverable data packages (Contract Laboratory Program (CLP)-like or equivalent) and Environmental Resources Program Information Management System (ERPIMS) electronic data deliverables were sent to USACE for validation. The USACE performed data validation (EPA Level IV or 100%) in accordance with the guidelines presented in the following documents:

- *USACE Kansas City and St. Louis District Radionuclide Data Quality Evaluation Guidance for Alpha and Gamma Spectroscopy,* 2002;
- U. S. Nuclear Regulatory Commission (NUREG), *Multi-Agency Radiological Laboratory Analytical Protocols Manual (MARLAP), NUREG-1576,* July 2004;
- USEPA, *National Functional Guidelines for Organic Data Review*, EPA 540-R-08-01, June 2008; and
- USEPA, *National Functional Guidelines for Inorganic Data Review*, EPA 540-R-10-011, January 2010.

The QC indicator parameters reviewed during the data validation included holding times, field and lab blanks, laboratory control sample/MS/MSD accuracy and precision, field duplicate precision, surrogate/tracer accuracy, and raw data. The results of these indicator parameters were compared to their respective QC limits, whereupon, sample results associated with outliers are qualified accordingly. The qualifiers applied to the data during the validation included "J" (estimated value), "U" (non-detect), and "R" (rejected).

3.1.3 Presentation of Analytical Data

The analytical results are presented in tables and figures for each area of investigation.

The soil and sediment analytical results are compared to the following criteria:

- For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013;
- For metals: the greater of either USEPA residential RSLs or NFSS RI Background Screening Levels, December 2007 (see Table 19);

- For Ac-227, Cs-137, and Uranium isotopes (picocuries per gram (pCi/g), equivalent to 25 millirem (mrem) per year): NUREG-1757 (NRC 2006); and
- For Ra-226/Ra-228 (sum total of 5 pCi/g) and Thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011.

Section 4h.(1) of USDOE Order 458.1 specifies that radiological activities must be conducted in a manner such that radiation exposure to members of the public from management and storage of radioactive waste complies with as low as reasonably achievable (ALARA) process requirements and does not result in a total effective dose (TED) greater than 25 mrem in a year from all exposure pathways and radiation sources associated with the waste, except for transportation and radon and its decay products. For purposes of this evaluation, compliance with the 25 mrem/year dose limit for radionuclides other than radium or thorium was evaluated through the use of the Nuclear Regulatory Commission's surface soil screening levels (NUREG 1757, NRC 2006).

The groundwater and pipeline water analytical results are compared to the following criteria:

- For organics, metals, and inorganics: 6 New York Codes, Rules, and Regulations (NYCRR) Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations, February 16, 2008, Class GA, and
- For Ra-226 (3 picocuries per liter (pCi/L)), Total Uranium and Ra-226/Ra-228 (sum total of 5 pCi/L), Alpha Emitters - Thorium isotopes (15 pCi/L), and Uranium isotopes (30 micrograms per liter (µg/L) x 0.9 pCi/µg = 27 pCi/L): USEPA National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

The tables present the results for only those parameters detected at least once per media per area (i.e., hits only). The tables and associated figures highlight those parameters which exceed criteria. Several of the metals that exceed criteria are commonly occurring metals (e.g., calcium and iron) which are not considered hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Although the presence of these metals at concentrations exceeding criteria would not necessarily be used to develop a remedial action, the exceedances are reported herein for completeness.

The figures presenting the analytical results are separated into two categories. One set of figures presents the results, as applicable, for VOCs, SVOCs, pesticides, PCBs, and metals. The other set of figures present the results for radionuclides. The figures present the results for only those parameters exceeding the criteria; if there are no results presented for a sample, then there were no exceedances in that sample. An exception to this is the total uranium results. None of the soil samples and only a few of the groundwater samples exceeded the total uranium criteria. However, the data show that even though the criteria were not exceeded, some samples contained elevated levels of uranium, indicating potential uranium impacts to groundwater.

Because uranium is an important contaminant of concern at the site, all of the total uranium results, including those that do not exceed the criteria, are presented in the figures. For this report, total uranium is considered to be detected at an elevated level when the concentration in a sample is at least twice the average concentration for all the samples of the same medium (e.g., soil) that were collected during this field investigation. For example, 130 soil samples were collected during the field investigation. The average total uranium concentration of those 130 samples is 6.8 mg/kg. In this report, the total uranium concentration in a soil sample is considered elevated when the concentration is at least twice the average

concentration (i.e., the total uranium concentration in a sample is considered at an elevated level when it is detected at a concentration of more than 13.6 mg/kg.).

3.1.4 Well Borehole Soil Analytical Results

Four soil samples were collected from each borehole for chemical analysis. At each borehole, two samples were selected from predetermined intervals: one from the top 15 cm (6 in) of soil and the other from the mid-point of the well screen. The remaining two samples were selected based on the highest down-hole gamma measurements and/or the highest soil core alpha, beta, or gamma measurement (note: no samples were selected based on beta measurements and only two samples were selected based on alpha measurements).

Each sample was analyzed for radiologic parameters and metals. Samples from EU4 were also analyzed for VOCs.

Salient Points of Well Borehole Soil Analytical Results

A substantial amount of analytical data is presented for the soil samples collected from the 17 well locations. Salient points of the analytical data are:

- No organics in the soils from the EU4 area well borings were detected at concentrations exceeding the criteria.
- Elevated levels of total uranium were detected in some of the soil samples from two well locations south of the IWCS (MW957 and MW960) and in OW11B area southeast of the IWCS (MW952, MW953, MW954, and MW955). The elevated uranium levels were present in the surface and near surface soils.
- Some radionuclides were detected at concentrations exceeding the criteria in the samples from MW953 and MW955.
- The radionuclide exceedances and elevated uranium levels were present in the surface and near surface soils.

EU1 Area Soil Analytical Results

The borings for wells MW944 and MW945 were advanced in the area just north of EU1 in the vicinity of well MW921 (see Figure 4). Well MW946 was installed approximately 230 m (755 ft) to the southeast in EU2. These three wells were installed to better define the limits of uranium impacts in groundwater in wells 505, 808A, MW921, MW922, and MW923 (see Figure 13).

Four soil samples were collected from each well boring plus one duplicate sample for a total of 13 samples. Each sample was analyzed for radionuclides and 25 metals, including boron and lithium. The analytical results are presented in Table 20. Review of the results indicates the following:

Metals

All metals except thallium were detected at least once in the 13 soil samples. Parameters, which exceeded the soil criteria were calcium (three samples), chromium (two samples), magnesium (four samples), potassium (one sample), and sodium (three samples).

Radionuclides

None of the radionuclides exceeded the soil criteria.

EU4 Area Soil Analytical Results

The borings for wells MW947, MW948 and MW949 were advanced in EU4 to better define the limits of PCE contamination in the UWBZ. MW947 was advanced on the up-gradient (southeastern) side of the PCE-impacted area and MW948 and MW949 were installed on the down-gradient (northern) side. Wells MW947 and MW948 were completed in the UWBZ and MW949 was completed in the LWBZ.

Four soil samples were collected from each well boring plus one duplicate sample for a total of 13 samples. Each sample was analyzed for VOCs, radionuclides, and 25 metals, including boron and lithium. The analytical results are presented in Table 21 and Figure 14. Review of the results indicates the following:

VOCs

Acetone was the only VOC detected in the soil samples from the new well borings. It was detected in eight of the 13 samples. The acetone concentrations ranged from 8.6 micrograms per kilogram (µg/kg) to 24 µg/kg. All detected acetone concentrations were estimated values (i.e., "J" qualifier). None of the samples exceeded the 50 µg/kg criterion for acetone.

Metals

All metals except thallium were detected at least once in the 13 soil samples. Parameters which exceeded the soil criteria were calcium (four samples), chromium (four samples), magnesium (four samples), potassium (three samples), and sodium (two samples).

Radionuclides

None of the radionuclides exceeded the soil criteria

EU10 Area Soil Analytical Results

The borings for wells MW950 and MW951 and wells MW956 through MW960 were advanced on the southern side of the IWCS in EU10 to better define uranium groundwater contamination in that area.

Four soil samples were collected from each well boring, plus three duplicate samples for a total of 31 samples. Each sample was analyzed for radionuclides and 25 metals, including boron and lithium. The analytical results are presented in Table 22 and Figures 15 and 16. Review of the results indicates the following:

Metals

All metals were detected at least once in the 31 soil samples. Parameters, which exceeded the soil criteria were calcium (seven samples), chromium (two samples), magnesium (two samples), potassium (two samples), and sodium (one sample).

Twenty nine of the 31 soil samples contained total uranium at concentrations ranging from 2.0 mg/kg to 5.0 mg/kg. The remaining two samples contained higher total uranium concentrations, but still below the soil criterion of 230 mg/kg:

MW957 (4.0 to 4.5 ft interval): 30.6 mg/kg
MW960 (2.0 to 3.0 ft interval): 29.1 mg/kg

The borings for these monitoring wells were located below or near historic material storage piles surrounding the Building 409 area, thus elevated metals results show consistency with that previous land use.

Radionuclides

Actinium-227 was detected in the soil from well MW959 at a concentration of 4.13 pCi/g, compared to the criterion of 0.5 pCi/g. No other radionuclides exceeded the soil criteria.

OW11B Area Soil Analytical Results

Wells MW952 through MW955 were installed in the area surrounding existing well OW11B to better define uranium groundwater contamination in that area.

Four soil samples were collected from each well boring plus two duplicate samples for a total of 18 samples. Each sample was analyzed for radionuclides and 25 metals, including boron and lithium. The analytical results are presented in Table 23 and Figures 17 and 18. Review of the results indicates the following:

Metals

All metals except boron, silver, and thallium were detected at least once in the 18 soil samples. Calcium was the only metal detected at concentrations above the criteria and only in two samples.

Although none of the samples exceeded the total uranium soil criterion, ten of the 18 samples contained elevated total uranium concentrations. In the ten samples, total uranium concentrations ranged from 12.2 mg/kg to 54.4 mg/kg. The total uranium concentrations in the remaining eight samples ranged from 1.6 mg/kg to 4.9 mg/kg.

Radionuclides

Three samples from the OW11B area wells borings contained radionuclides at concentrations above the soil criteria (see Figure 20).

- In the 4.0 to 4.5 ft sample from MW953:
  - Uranium-234 was detected at 19.2 pCi/g, compared to the criterion of 13 pCi/g.
  - Uranium-238 was detected at 18.9 pCi/g, compared to the criterion of 14 pCi/g.
  - Actinium-227 was detected at 4.07 pCi/g, compared to the criterion of 0.5 pCi/g.

- In the 0.0 to 0.5 ft sample from MW955:
  - Uranium-234 was detected at 14 pCi/g, compared to the criterion of 13 pCi/g.
  - Uranium-238 was detected at 14.3 pCi/g, compared to the criterion of 14 pCi/g.

- In the 0.5 to 1.0 ft sample from MW955:
  - Uranium-234 was detected at 16.8 pCi/g, compared to the criterion of 13 pCi/g.
  - Uranium-238 was detected at 16.7 pCi/g, compared to the criterion of 14 pCi/g.

3.1.5 Groundwater Analytical Results

Groundwater samples were collected from wells MW950 and MW951 in November 2012 and from all the newly installed wells in December 2012. The analytical results are summarized in Table 24.

Salient Points of Well Groundwater Analytical Results

Some salient points of the groundwater analyses are:

- Wells MW944, MW945, MW946, MW947, and MW948 were dry at the time of groundwater sampling in December 2012.
- The groundwater samples from wells MW950, MW951, MW952, MW953, MW954, MW957, MW958, MW959, and MW960 contained total uranium at levels above the groundwater criterion.
- The metals concentrations in most of the filtered samples resemble the metals concentrations in the related unfiltered samples.
- Of the three newly installed wells in EU4, only well MW949, installed to monitor groundwater quality in the LWBZ, contained groundwater at the time of sampling in December 2012. No exceedances of the groundwater criteria for organics were found in the groundwater sample from this well.
- Radionuclide criteria were exceeded in groundwater samples from wells MW951, MW952, MW953, MW957, and MW960.

MW950 and MW951 Expedited Analytical Results

Groundwater samples were collected from wells MW950 and MW951 on November 15, 2012, for isotopic and total uranium analyses. The wells were sampled and analyzed with an expedited turnaround time during well installation activities with the intent of possibly installing additional wells to further define contaminant conditions, should the results indicate that additional wells were warranted. Additional monitoring wells were not installed because other existing wells delineate the area of groundwater contamination.

The analytical results are presented in Table 24. The total uranium concentration in MW950 was 31 micrograms per liter (µg/L) for the filtered sample and 35 µg/L for the unfiltered sample. In MW951, the uranium concentration was 2,600 µg/L in the filtered sample and 2,400 µg/L in the unfiltered sample. These concentrations are above the USEPA drinking water Maximum Contaminant Level (MCL) of 30 µg/L.

December 2012 Groundwater Analytical Results

Groundwater samples were collected from 12 of the 17 newly installed wells during 6 through 14 December 2012; wells MW944 through MW948 did not contain sufficient water for sample collection. One duplicate sample was collected from well MW949 for a total of 13 groundwater samples. The analytical results are presented in Table 24 and Figures 19, 20, and 21.

VOCs

Only the sample and duplicate from well MW949 were analyzed for VOCs. Two VOCs were detected, but at concentrations below the groundwater criteria. 1,3-Dichlorobenzene was detected at estimated concentrations of 0.7 µg/L in MW949 and 0.67 µg/L in the duplicate sample. The groundwater criterion for 1,3-Dichlorobenzene is 3 µg/L. Toluene was only detected in the duplicate sample (1.3 µg/L). The groundwater criterion for toluene is 5 µg/L.

Metals

The groundwater samples were analyzed for 20 metals, including boron and lithium. All metals were detected at least once. Iron, magnesium, sodium, and thallium were detected at concentrations above the groundwater criteria in the filtered and unfiltered samples and manganese in the filtered sample from MW951 and MW955. Iron, magnesium, and sodium criteria were exceeded in most of the unfiltered samples while magnesium and sodium criteria were exceeded in most of the filtered samples. Thallium was detected at concentrations exceeding the criterion in unfiltered samples from MW950 and MW960 and in the filtered samples from MW949, MW950, MW959, and MW960.

Nine wells contained total uranium at concentrations above the criterion. Six of the wells are south of the IWCS (i.e., MW950, MW951, MW957, MW958, MW959, and MW960). The remaining three wells are in the OW11B area (i.e., MW952, MW953, and MW954).

Table 25 summarizes the maximum detected concentrations of the metals in the filtered and unfiltered samples.

Field and Miscellaneous Parameters

None of the field water quality or miscellaneous wet chemistry parameters (e.g., alkalinity, chloride, etc.) were measured at levels of significant note.

Radionuclides in Groundwater

Criteria for the uranium isotopes were exceeded in samples from wells MW951, MW952, MW953, MW957, and MW960.

3.1.6 Pipeline Excavation Analytical Results

The pipeline excavations were performed to expose, sample, and plug buried pipelines associated with the former LOOW water supply and distribution system. Samples collected from the pipeline excavations consisted of soil from beneath each pipe in an excavation, water samples from each pipeline, and, when present, sediment samples from the interior of each pipeline. The discussion of analytical results is presented below on a per location basis. The analytical results are summarized, per matrix, in tables and figures for each investigation location.

Salient Points of Pipeline Excavation Analytical Results

A substantial amount of analytical data is presented for the soil, sediment, and water samples collected from the pipeline excavation locations. Some salient points of the analyses are:

- No exceedances of radionuclides were found in the soil or sediment samples.

- Some of the soil and sediment samples contained elevated levels of SVOCs.
- Some of the pipeline sediment samples contained elevated levels of metals. However, some of those samples consisted primarily of pipe scale and the analytical results are likely indicative of the composition of the pipe(s) rather than anthropogenic contamination.
- In the PE3 excavation, the water from PIPE1 contained levels of boron, iron, magnesium, and sodium that were elevated relative to all of the other water samples collected during the investigation (i.e., pipeline, excavation, and groundwater).
- In the PE4 excavation, the water sample from PIPE4 slightly exceeded the radium-226 groundwater criterion.

PE1 Analytical Results

PE1 was excavated to expose, sample, and plug the 25-cm (10-in) former water line near the southwestern corner of the IWCS. One soil, one water, and one sediment sample were collected from the excavation.

PE1 Soil Analytical Results

The soil sample from PE1 was analyzed for VOCs, SVOCs, pesticides, PCBs, radionuclides, and metals. The analytical results are presented in Table 26 and Figures 15 and 16. Review of the analytical results indicates the following:

- No VOCs were detected at concentrations above the criteria.
- Three SVOCs were detected at concentrations above the criteria.
- No pesticides or PCBs were detected.
- No metals were detected at concentrations above the criteria.
- No radionuclides exceeded the soil criteria.

PE1 Sediment Analytical Results

One sediment sample was collected (PIPE1). The sample appeared to consist primarily of black scale. The sediment sample volume was limited and the sample was only analyzed for isotopic thorium and uranium. The analytical results are presented in Table 26. Review of the analytical results indicates that there were no exceedances of the soil criteria.

PE1 Water Analytical Results

The water sample from PE1 was analyzed for VOCs, SVOCs, pesticides, PCBs, radionuclides, and filtered and unfiltered metals. The analytical results are presented in Table 27 and Figure 19. Review of the analytical results indicates the following:

- One VOC, naphthalene, was detected at a concentration above the criteria.
- Two SVOCs, carbazole and naphthalene, were detected at concentrations slightly above the criteria.
- No pesticides were detected at concentrations above the groundwater criteria.
- No PCBs were detected.
- None of the wet chemistry parameters were measured at levels of significant note.
- The groundwater criterion for one metal, thallium, was exceeded in both the filtered and unfiltered samples.
- No radionuclides exceeded the groundwater criteria.

PE2 Analytical Results

PE2 was excavated to expose, sample, and plug three LOOW drinking, fire protection, and process water pipelines (PIPE1 (10-cm), PIPE2 (15-cm), and PIPE3 (20-cm)), on the west site of Campbell Street near the northern boundary of the site in EU2. One soil and one water sample were collected from each pipe. One sediment sample was collected from PIPE3; no sediment was present in the other two pipes.

PE2 Soil Analytical Results

The soil samples from PE2 were analyzed for VOCs, SVOCs, pesticides, PCBs, radionuclides, and metals. The analytical results are presented in Table 28 and Figure 14. Review of the analytical results indicates the following:

- No VOCs were detected at concentrations above the criteria.
- SVOCs were detected at concentrations above the criteria in two soil samples (i.e., PIPE1 and PIPE3).
- No pesticides or PCBs were detected.
- No metals were detected at concentrations above the criteria.
- No radionuclides exceeded the soil criteria.

PE2 Sediment Analytical Results

One sediment sample was collected (PIPE3). The sample appeared to consist primarily of black scale. The sediment sample volume was limited and the sample was only analyzed for isotopic thorium and uranium, actinium-227, cesium-137, and radium-226 and -228. The analytical results are presented in Table 28. Review of the analytical results indicates that there were no exceedances of the soil criteria.

PE2 Water Analytical Results

Water samples were collected from each of the three pipes and analyzed for VOCs, SVOCs, pesticides, PCBs, radionuclides, and filtered and unfiltered metals. The analytical results are presented in Table 29 and Figure 20. Review of the analytical results indicates the following:

- Two VOCs, naphthalene and total xylenes, were detected at concentrations above the groundwater criteria but only in the sample from PIPE3.
- No SVOCs were detected at concentrations above the criteria.
- No pesticides were detected at concentrations above the groundwater criteria.
- No PCBs were detected.
- None of the wet chemistry parameters were measured at levels of significant note.
- Groundwater criteria exceedances for metals were similar in the filtered and unfiltered samples.
  - In PIPE1, iron and manganese exceeded the criteria.
  - In PIPE2, iron, magnesium, sodium and thallium exceeded the criteria.
  - In PIPE3, only thallium exceeded the criterion.
- No radionuclides exceeded the groundwater criteria.

PE3 Analytical Results

PE3 was excavated to expose, sample and plug three LOOW drinking, fire protection, and process pipelines (PIPE1 (25-cm), PIPE2 (25-cm), PIPE3 (30-cm)), and one cooling water pipeline (PIPE4 (91-cm)), near the eastern boundary of the site in EU12. Soil and water samples were collected from each

pipe. A duplicate soil sample was also collected from PIPE2. Sediment samples were collected from PIPE1, PIPE2, and PIPE3.

PE3 Soil Analytical Results

The soil samples from PE3 were analyzed for VOCs, SVOCs, pesticides, PCBs, radionuclides, and metals. The analytical results are presented in Table 30 and Figure 22. Review of the analytical results indicates the following:

- No VOCs were detected at concentrations above the criteria.
- SVOCs were detected at concentrations above the criteria in the soil samples from beneath PIPE1 and PIPE2.
- No pesticides or PCBs were detected.
- Only arsenic and chromium and were detected at concentrations above the criteria.
- In the soil sample from beneath PIPE1, chromium was detected at 25.8 mg/kg, compared to the criterion of 25 mg/kg.
- In the duplicate soil sample from beneath PIPE3, arsenic was detected at 9 mg/kg, compared to the criterion of 8.73 mg/kg. Arsenic was detected at an estimated concentration of 5.6 mg/kg in the primary sample.
- No radionuclides exceeded the soil criteria.

PE3 Sediment Analytical Results

Three sediment samples were collected (PIPE1, PIPE2, and PIPE3). The sample from PIPE2 appeared to consist primarily of black scale. The samples from PIPE1 and PIPE3 appeared to be black clayey material. The PIPE3 sediment sample had a petroleum odor.

The PIPE1 and PIPE2 sediment sample volumes were limited, so the samples were only analyzed for isotopic thorium and uranium, actinium-227, cesium-137, and radium-226 and -228. The sediment sample from PIPE3 was analyzed for VOCs, SVOCs, pesticides, PCBs, metals, and radionuclides.

The analytical results are presented in Table 30 and Figure 22. Review of the analytical results indicates the following:

- There were no VOC exceedances of the soil criteria.
- The sediment sample from PIPE3 contained three SVOCs at concentrations above the soil criteria.
- The sediment sample from PIPE3 contained five metals at concentrations above the soil criteria: chromium, iron, magnesium, potassium, and sodium.
- There were no radionuclide exceedances of the soil criteria.

PE3 Water Analytical Results

Water samples were collected from all four pipes and analyzed for VOCs, SVOCs, pesticides, PCBs, radionuclides, and filtered and unfiltered metals. The analytical results are presented in Table 31 and Figure 23. Review of the analytical results indicates the following:

- VOCs were detected at concentrations above the groundwater criteria only in the sample from PIPE2. In that sample, three VOCs, benzene, naphthalene and total xylenes, were detected at concentrations above the criteria.

- SVOCs were detected at concentrations above the criteria only in the sample from PIPE2. In that sample, five SVOCs exceeded the groundwater criteria: 3 & 4-methylphenol, carbazole, naphthalene, phenanthrene, and phenol.
- Pesticides were detected at concentrations above the groundwater criteria only in the PIPE2 sample. In that sample, two pesticides, beta-BHC and heptachlor, were detected at concentrations just above the groundwater criteria.
- No PCBs were detected.
- None of the wet chemistry parameters were measured at levels of significant note. However, the water sample from PIPE1 contained the highest alkalinity, chloride and total dissolved solids concentrations when compared to other pipeline water samples collected during the investigation.
- Groundwater criteria for metals were exceeded only in the samples from PIPE1, PIPE3, and PIPE4.
  - In PIPE1, five metals, boron, iron, magnesium, sodium, and thallium, exceeded the criteria in both the filtered and unfiltered samples. The boron and sodium concentrations were the highest observed in any of the water samples collected during the investigation.
  - In PIPE3, iron, magnesium, sodium, and thallium exceeded the criteria in the filtered and unfiltered samples.
  - In PIPE4, sodium and thallium exceeded the criteria in both the filtered and unfiltered samples.
- No radionuclides exceeded the groundwater criteria.

PE4 Analytical Results

PE4 was excavated to expose, sample and plug three drinking, fire protection, and process water pipelines (PIPE1 (20-cm), PIPE2 (25-cm), and PIPE3 (30-cm)), and one cooling water pipeline (PIPE4 (91-cm)), near the southern boundary of the site in EU5. Soil and water samples were collected from each pipe. Only one sediment sample was collected (PIPE2).

PE4 Soil Analytical Results

The soil samples from PE4 were analyzed for VOCs, SVOCs, pesticides, PCBs, radionuclides, and metals. The analytical results are presented in Table 32 and Figures 24 and 25. Review of the analytical results indicates the following:

- No VOCs exceeded the criteria.
- At least one SVOC was detected at concentrations above the criteria in the soil samples from beneath all four pipes.
- No pesticides were detected at concentrations above the criteria.
- No PCBs were detected.
- No metals exceeded the criteria.
- No radionuclides exceeded the soil criteria.

PE4 Sediment Analytical Results

One sediment sample was collected from PIPE2. The sample appeared to be black pipe scale with some metal slivers.

Photograph 7 - Sediment (scale) sample from PIPE2 in PE4.

The sediment sample was analyzed for VOCs, SVOCs, pesticides, PCBs, radionuclides, and metals. The analytical results are presented in Table 32 and Figures 24 and 25. Review of the analytical results indicates the following:

- No VOCs were detected at concentrations above the criteria.
- Six SVOCs were detected at concentrations above the criteria: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and indeno (1,2,3-cd)pyrene.
- No pesticides were detected at concentrations above the criteria.
- No PCBs were detected.
- Three metals were detected at concentrations above the criteria: arsenic, chromium, and iron.
- No radionuclides were detected at concentrations above the criteria.

PE4 Water Analytical Results

Water samples were collected from all four pipes, plus a duplicate from PIPE4. The samples were analyzed for VOCs, SVOCs, pesticides, PCBs, radionuclides, and filtered and unfiltered metals. The analytical results are presented in Table 33 and Figure 25. Review of the analytical results indicates the following:

- No VOCs were detected at concentrations above the groundwater criteria.
- SVOCs were detected at concentrations above the criteria in the samples from PIPE1 and PIPE3.
  - In the PIPE1 sample, three SVOCs exceeded the groundwater criteria: carbazole, naphthalene, and phenanthrene.
  - In the PIPE3 sample, six SVOCs exceeded the groundwater criteria: benzo(a)anthracene, carbazole, chrysene, fluoranthene, naphthalene, and phenanthrene.
- One pesticide, aldrin, was detected at a concentration above the groundwater criterion and only in the PIPE4 (and duplicate) sample.
- No PCBs were detected.

- None of the wet chemistry parameters were measured at levels of significant note.
- Groundwater criteria for metals were exceeded in the filtered and/or unfiltered samples.
  - In PIPE1, iron and thallium exceeded the criteria.
  - In PIPE2, iron, magnesium, sodium and thallium exceeded the criteria.
  - In PIPE3, iron, magnesium, sodium, and thallium exceeded the criteria.
  - In PIPE4, iron, magnesium, sodium, and thallium exceeded the criteria.
- The radium-226 concentration in the filtered primary sample from PIPE4 was detected at 4.76 pCi/l, compared to the criterion of 3 pCi/l. Radium-226 did not exceed the criterion in the unfiltered sample.
- In the filtered duplicate sample from PIPE4, radium-226 was detected at a concentration of 5.47 pCi/l, compared to the criterion of 3 pCi/l. Radium-226, detected at a concentration of 5.31 pCi/L, also exceeded the criterion in the unfiltered sample.

PE5 Analytical Results

PE5 was excavated to expose, sample and plug three drinking, fire protection and process water pipelines (PIPE1 (20-cm), PIPE2 (25-cm), and PIPE3 (30-cm)), and one cooling water pipeline (PIPE4 (61-cm)) near the northern boundary of the site in EU5. Soil and water samples were collected from each pipe. Two sediment samples were collected (PIPE1 and PIPE2).

PE5 Soil Analytical Results

The soil samples from PE5 were analyzed for VOCs, SVOCs, pesticides, PCBs, radionuclides, and metals. The analytical results are presented in Table 34 and Figure 24. Review of the analytical results indicates the following:

- No VOCs were detected at concentrations above the criteria.
- SVOCs were detected at concentrations above the criteria in all four soil samples.
- One pesticide, heptachlor, was detected in one sample (PIPE3) at a concentration above the criterion.
- No PCBs were detected.
- Only one metal was detected at concentrations above the criteria and only in one sample.
  - In PIPE3, iron exceeded the criterion.
- No radionuclides exceeded the soil criteria.

PE5 Sediment Analytical Results

Two sediment samples were collected - one from PIPE1 and the other from PIPE2. Both samples appeared to be comprised of pipe scale with some metal slivers. The sediment sample volumes were limited and the samples were analyzed only for radionuclides. The analytical results are presented in Table 34 and Figure 24. Review of the analytical results indicates that there were no exceedances of the soil criteria.

PE5 Water Analytical Results

Water samples were collected from all four pipes and analyzed for VOCs, SVOCs, pesticides, PCBs, radionuclides, and filtered and unfiltered metals. The analytical results are presented in Table 35 and Figure 25. Review of the analytical results indicates the following:

- VOCs were detected at concentrations above the groundwater criteria in the samples from PIPE1 and PIPE3.
  - In PIPE1, benzene and naphthalene exceeded the groundwater criteria.
  - In PIPE3, naphthalene exceeded the groundwater criterion.
- SVOCs were detected at concentrations above the criteria in the samples from PIPE1 and PIPE3.
  - In PIPE1, five SVOCs exceeded the groundwater criteria: benzo(a)anthracene, carbazole, chrysene, naphthalene, and phenanthrene.
  - In PIPE3, six SVOCs exceeded the groundwater criteria: 2-methylphenol, carbazole, fluoranthene, fluorene, naphthalene, and phenanthrene.
- No pesticides were detected at concentrations above the groundwater criteria.
- No PCBs were detected.
- None of the wet chemistry parameters were measured at levels of significant note.
- Groundwater criteria for metals were exceeded in the filtered and/or unfiltered samples.
  - In PIPE1, iron, magnesium, and thallium exceeded the criteria.
  - In PIPE2, iron, magnesium, and manganese exceeded the criteria.
  - In PIPE3, magnesium and sodium exceeded the criteria.
  - In PIPE4, iron, magnesium, sodium, and thallium exceeded the criteria in the filtered and unfiltered samples and thallium exceeded the criterion only in the unfiltered sample.
- In the filtered duplicate sample from PIPE4, radium-226 was detected at a concentration of 4.45 pCi/l, compared to the criterion of 3 pCi/l. Radium-226 did not exceed the criterion in the unfiltered sample.

PE6 Analytical Results

PE6 was excavated to expose, sample and plug the 25-cm (10-in) water line near the southwestern corner of the site. One soil (and duplicate), one water, and one sediment sample were collected from the excavation.

PE6 Soil Analytical Results

The soil sample from PE6 was analyzed for VOCs, SVOCs, pesticides, PCBs, radionuclides, and metals. The analytical results are presented in Table 36 and Figures 15 and 16. Review of the analytical results indicates the following:

- No VOCs were detected at concentrations above the criteria.
- No SVOCs were detected at concentrations above the criteria.
- No pesticides were detected at concentrations above the criteria.
- No PCBs were detected.
- No metals were detected at concentrations above the criteria.
- No radionuclides exceeded the soil criteria.

PE6 Sediment Analytical Results

One sediment sample was collected from PE6. The sample appeared to be comprised of pipe scale with some metal slivers. The sediment sample was analyzed for VOCs, SVOCs, pesticides, PCBs, radionuclides, and metals. The analytical results are presented in Table 36 and Figures 15 and 16. Review of the analytical results indicates the following:

- No VOCs were detected at concentrations above the criteria.

- Seven SVOCs were detected at concentrations well above the criteria: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene.
- No pesticides were detected.
- No PCBs were detected.
- Arsenic, calcium, chromium, iron, and thallium were detected at concentrations above the criteria.
- No radionuclides were detected at concentrations above the criteria.

PE6 Water Analytical Results

The water sample from PE6 was analyzed for VOCs, SVOCs, pesticides, PCBs, radionuclides, and filtered and unfiltered metals. The analytical results are presented in Table 37 and Figure 19. Review of the analytical results indicates the following:

- No VOCs were detected at concentrations above the criteria.
- One SVOC, bis(2-ethylhexyl)phthalate, was detected at a concentration slightly above the criteria.
- No pesticides were detected.
- No PCBs were detected.
- None of the wet chemistry parameters were measured at levels of significant note.
- Two metals, iron and thallium, were detected at concentrations above the criteria.
- No radionuclides exceeded the groundwater criteria.

3.1.7 Investigative Excavation Analytical Results

The purpose of the investigative excavations was to evaluate possible uranium contamination at select areas east of the IWCS. In accordance with the planning documents, four soil samples were collected from each excavation: one sample was representative of surface soils and one sample was representative of soils in the bottom of the excavation. The remaining two soil samples were collected from areas of elevated radiation scan readings or from areas of interest (e.g., sand lenses). One groundwater sample (filtered), if present, was also collected. The discussion of analytical results is presented below on a per location basis. Analytical results are summarized, per matrix, in tables for each investigation location.

Salient Points of Investigative Trench Analytical Results

A substantial amount of analytical data is presented for the soil, sediment, and water samples collected from the investigative trench locations. Some salient points of the analyses are:

- No exceedances of radionuclides were found in the soil samples from the four excavations around the former grit chamber (i.e., IE1 through IE4).
- One of the soil samples from excavation IE6, adjacent to the former decontamination pad, contained elevated levels of uranium relative to the results for samples from excavations IE1 through IE5.
- Soil samples from excavations IE7 and IE8 (near well OW11B) contained elevated levels of uranium.
- The groundwater seeping into the following excavations contained elevated levels of uranium:
    - In IE4, from the sandy bedding beneath the 15-cm (6-in) diameter pipeline that runs from the grit chamber to the grit chamber lift station,

- In IE6, mainly from the interface between bottom of the fill and underlying brown silty clay at a depth of 0.6 cm (2 ft),
- In IE7, from the area between the 23-cm (9-in) and 38-cm (15-in) pipes at a depth of approximately 1.4 m (4.5 ft), and
- In IE8, from along the top of the concrete-encased sanitary sewer.

IE1 Analytical Results

Excavation IE1 was completed on the north side of the former grit chamber. Four soil samples were collected: one representative of the surface soils, one from the bottom of the excavation, one from a sand lens on the west wall, and one from the west wall at the interface between a red fill and underlying buried topsoil layer. Although some water was present, the excavation sidewall collapsed before a sample could be collected (note that a trench box was not used as there was not intent for personnel to enter the excavation).

IE1 Soil Analytical Results

The soil samples from IE1 were analyzed for radionuclides and metals. The analytical results are presented in Table 38 and Figures 17 and 18. Review of the analytical results indicates the following:

Metals

- No metals were detected at concentration exceeding the soil criteria.

Radionuclides in Soils

- No radionuclides exceeded the soil criteria

IE2 Analytical Results

Excavation IE2 was completed on the east side of the former grit chamber. Four soil samples (and one duplicate) were collected: one sample (and duplicate) representative of the surface soils, one from the bottom of the excavation, one from bedding beneath the 19-cm (7.5-in) diameter pipe running between the decontamination pad and the grit chamber, and one from the north wall at the interface between a red fill and underlying buried topsoil layer (this was also the highest radiation scan reading location in this excavation). A sample of groundwater seeping into the excavation along the pipe bedding material was also collected. Only a few liters had seeped into the excavation.

IE2 Soil Analytical Results

The soil samples from IE2 were analyzed for radionuclides and metals. The analytical results are presented in Table 38 and Figures 17 and 18. Review of the analytical results indicates the following:

Metals

- Calcium and magnesium were detected at concentrations exceeding the soil criteria in the sample from the north wall and the pipe bedding. There were no metal exceedances in the other two soil samples.

Radionuclides in Soils

- No radionuclides exceeded the soil criteria

IE2 Groundwater Analytical Results

The groundwater sample from IE2, collected from the bedding beneath the 19-cm (7.5-in) diameter pipe running between the decontamination pad and the grit chamber, was analyzed for miscellaneous wet chemistry parameters, radionuclides and metals. The analytical results are presented in Table 39 and Figure 21. Review of the analytical results indicates that iron, lead, magnesium, thallium and zinc exceeded the groundwater criteria. None of the wet chemistry parameters were measured at levels of significant note. None of the radionuclides exceeded the groundwater criteria.

IE3 Analytical Results

Excavation IE3 was completed on the south side of the former grit chamber. Four soil samples were collected: one representative of the surface soils, one from the bottom of the excavation, one from the northwest wall at the interface between a red fill and underlying buried topsoil layer (this was also an elevated radiation scan reading location), and one from the east wall at the interface between a red fill and underlying buried topsoil layer (this was also an elevated radiation scan reading location). A sample (and duplicate) of groundwater seeping into the excavation at the bottom on the west wall was also collected. Only a few liters of water seeped into the excavation.

IE3 Soil Analytical Results

The soil samples from IE3 were analyzed for radionuclides and metals. The analytical results are presented in Table 38 and Figures 17 and 18. Review of the analytical results indicates the following:

Metals

- Three metals (i.e., calcium, magnesium, and thallium) were detected in the surface soil sample a concentrations exceeding the soil criteria. There were no metals exceedances in the remaining three samples.

Radionuclides in Soils

- No radionuclides exceeded the soil criteria.

IE3 Groundwater Analytical Results

The sample of the groundwater seeping into the bottom of the IE3 excavation was analyzed for miscellaneous wet chemistry parameters, radionuclides and metals. The analytical results are presented in Table 39 and Figure 21. Review of the analytical results indicates that magnesium and sodium exceeded the groundwater criteria. None of the wet chemistry parameters were measured at levels of significant note. None of the radionuclides exceeded the groundwater criteria.

IE4 Analytical Results

Excavation IE4 was completed on the west side of the former grit chamber. Four soil samples were collected: one representative of the surface soils, one from the bottom of the excavation, one from the

south wall at the interface between a red fill and underlying buried topsoil layer (this was also an elevated radiation scan reading location), and one from bedding beneath the 15-cm (6-in) diameter pipeline that runs between the grit chamber and the grit chamber lift station. A sample of groundwater seeping into the excavation along the pipeline bedding was also collected. The volume of water that seeped into the excavation was only a few liters.

IE4 Soil Analytical Results

The soil samples from IE4 were analyzed for radionuclides and metals. The analytical results are presented in Table 38 and Figures 17 and 18. Review of the analytical results indicates the following:

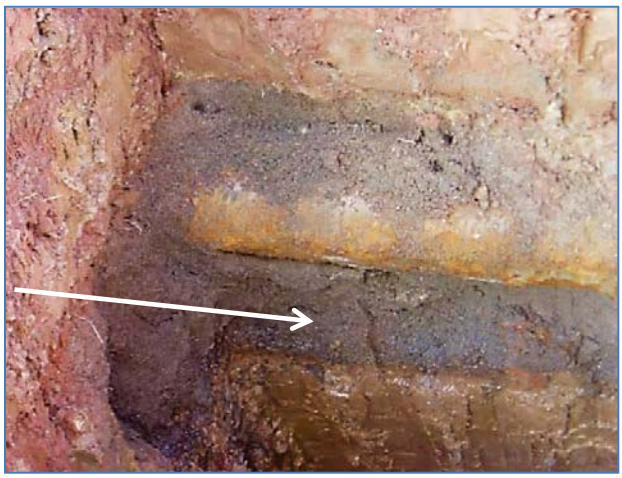
Metals

- Two metals (i.e., calcium and magnesium) were detected in the pipe bedding sample at concentrations exceeding the soil criteria. There were no other metals exceedances in the remaining three samples.

Radionuclides in Soils

- No radionuclides exceeded the soil criteria.

Gray sandy bedding beneath 15-cm pipe



Photograph 8 - Gray sandy bedding material around pipe in IE4.

IE4 Groundwater Analytical Results

The groundwater sample from IE4, collected from the sandy bedding beneath the 15-cm (6-in) diameter pipeline that runs from the grit chamber to the grit chamber lift station, was analyzed for miscellaneous wet chemistry parameters, radionuclides and metals. The analytical results are presented in Table 39 and Figure 21. Review of the analytical results indicates that iron, magnesium, manganese, and total uranium exceeded the groundwater criteria. The water sample from IE4 contained total uranium at a concentration of 44.2 µg/L. None of the radionuclides exceeded the groundwater criteria. None of the wet chemistry parameters were measured at levels of significant note.

IE5 Analytical Results

Excavation IE5 was completed off the northwest side of the decontamination pad. Four soil samples were collected: one representative of the surface soils, one from the bottom of the excavation, one from the northwest wall at the interface between a red fill and underlying buried topsoil layer (this was also an elevated radiation scan reading location), and one from the pipe bedding material beneath the 19-cm (7.5-in) diameter pipe that runs from the decontamination pad to the grit chamber. A sample of groundwater seeping into the excavation from the pipe bedding material was also collected. An estimated volume of less than 100 liters (25 gallons) of water had seeped into the excavation.

IE5 Soil Analytical Results

The soil samples from IE5 were analyzed for radionuclides and metals. The analytical results are presented in Table 40 and Figures 17 and 18. Review of the analytical results indicates the following:

Metals

- Two metals (i.e., calcium and magnesium) were detected in the pipeline bedding sample at concentrations exceeding the soil criteria. There were no metals exceedances in the remaining three samples.

Radionuclides in Soils

- No radionuclides exceeded the soil criteria.

IE5 Groundwater Analytical Results

The groundwater sample from IE5, collected from the bedding of the 19-cm (7.5-in) diameter pipe that runs from the decontamination pad to the grit chamber, was analyzed for miscellaneous wet chemistry parameters, radionuclides and metals. The analytical results are presented in Table 39 and Figure 21. Review of the analytical results indicates that there were no groundwater exceedances. None of the wet chemistry parameters were measured at levels of significant note.

IE6 Analytical Results

Excavation IE6 was completed off the southwest side of the decontamination pad. Four soil samples were collected: one representative of the surface soils, one from the bottom of the excavation, one from the northeast wall at a black silt lens, and one from the northeast wall at the location of an elevated radiation scan reading. A sample of groundwater seeping into the excavation, from the interface between the fill and brown silty clay at approximately 0.6 m (2 ft) below grade, was also collected. Only about 3 liters of water had seeped into the excavation.

Photograph 9 - Former decontamination pad (view east)

IE6 Soil Analytical Results

The soil samples from IE6 were analyzed for radionuclides and metals. The analytical results are presented in Table 40 and Figures 17 and 18. Review of the analytical results indicates the following:

Metals

- Two metals (i.e., calcium and magnesium) were detected in the surface soil sample at concentrations exceeding the soil criteria.
- Three metals (i.e., calcium, magnesium, and potassium) were detected in the bottom soil sample at concentrations exceeding the soil criteria.
- Total uranium did not exceed the soil criterion. However, the total uranium concentration in the sample from the black silt lens was elevated relative to the other samples. The total uranium concentration in the black silt lens sample was 25.4 mg/kg. The total uranium concentration in the other three samples ranged from 2.76 mg/kg to 3.23 mg/kg.

Radionuclides in Soils

- No radionuclides exceeded the soil criteria.

IE6 Groundwater Analytical Results

The groundwater sample from the interface between bottom of the fill and underlying brown silty clay at a depth of 0.6 m (2 ft) in IE6 was analyzed for miscellaneous wet chemistry parameters, radionuclides and metals. The analytical results are presented in Table 39 and Figure 21. Review of the analytical results indicates that iron, magnesium, sodium and total uranium exceeded the groundwater criteria. Total uranium was detected at 50.7 µg/L, compared to the criterion of 30 µg/L. None of the wet chemistry parameters were measured at levels of significant note.

IE7 Analytical Results

Excavation IE7 was completed in the area east-northeast of well OW11B to identify possible uranium contamination in that area.

Four soil samples were collected: one representative of the surface soils, one (and one duplicate) from the bottom of the excavation, one from the clay backfill beneath the 0.9-m (36-in) diameter pipe, and one from the western corner above the concrete-encased sewer line. A sample of groundwater seeping into the excavation was also collected. The water was seeping into the excavation from the area between the 38-cm (15-in) and 23-cm (9-in) diameter pipes at a depth of approximately 1.5 m (there was no sandy bedding material beneath this pipe). Only a couple liters of water seeped into the excavation from this area. Some water was also seeping into the excavation along the top of a concrete-encased sewer line at a depth of approximately 2.4 m, but the volume of water was insufficient for sample collection.

IE7 Soil Analytical Results

The soil samples from IE7 were analyzed for radionuclides and metals. The analytical results are presented in Table 41 and Figures 17 and 18. Review of the analytical results indicates the following:

Metals

- The soil sample from beneath the 0.9-m (36-in) diameter pipe and the bottom sample each had one metal detected at a concentration exceeding the soil criteria.
  - In the sample from beneath the 0.9-m (36-in) diameter pipe, thallium exceeded the criterion.
  - In the bottom soil (and duplicate) sample, calcium exceeded the criterion.
- Total uranium did not exceed the soil criterion. However, the total uranium concentrations in the samples from the clay backfill beneath the 0.9-m (36-in) diameter pipe and the bottom of the excavation were elevated relative to the other samples. The total uranium concentration in the soil sample from the clay backfill beneath the 0.9-m (36-in) diameter pipe was 45.6 mg/kg. The total uranium concentration in the bottom sample (and duplicate) was 32.2 mg/kg (41.8 mg/kg). The total uranium concentrations in the remaining two samples were 6.15 mg/kg and 8.67 mg/kg.

Radionuclides in Soils

- No radionuclides exceeded the soil criteria.

IE7 Groundwater Analytical Results

The groundwater sample from the area between the 23-cm (9-in) and 38-cm (15-in) diameter pipes at a depth of approximately 1.4 m (4.5 ft) in IE7 was analyzed for miscellaneous wet chemistry parameters, radionuclides and metals. The analytical results are presented in Table 39 and Figure 21. Review of the analytical results indicates that iron, magnesium, sodium and total uranium exceeded the groundwater criteria. In comparison with the other IE groundwater samples, the groundwater sample from IE7 contained the highest total uranium concentration (7,080 µg/L). The groundwater criterion for total uranium is 30 µg/L. The criteria for the uranium isotopes were also exceeded. None of the wet chemistry parameters were measured at levels of significant note.

IE8 Analytical Results

Excavation IE8 was completed in the area southeast of well OW11B to identify possible uranium contamination in that area.

Four soil samples were collected: one (and duplicate) representative of the surface soils, one from the bottom of the excavation, one from the west wall (an area of elevated radiation scan reading), and one from beneath the concrete-encased sewer line.

A sample of groundwater seeping into the excavation from along the top of the concrete-encased sanitary sewer was also collected. More than 375 gallons of water had seeped into the excavation while the excavation was open overnight.

IE8 Soil Analytical Results

The soil samples from IE8 were analyzed for radionuclides and metals. The analytical results are presented in Table 41 and Figures 17 and 18. Review of the analytical results indicates the following:

Metals

- No metals were detected at concentrations exceeding the soil criteria. However, an elevated level of total uranium (45.9 mg/kg) was detected in the soil sample from the northwest corner of the excavation.

Radionuclides in Soils

- One sample contained radionuclides at concentrations exceeding the soil criteria. In the northwest corner sample, uranium-234 was detected at 15.8 pCi/g, compared to the criterion of 13 pCi/g, and uranium-238 was detected at 15.7 pCi/g, compared to the criterion of 14 pCi/g.

IE8 Groundwater Analytical Results

The groundwater sample from along the top of the concrete-encased sanitary sewer in IE8 was analyzed for miscellaneous wet chemistry parameters, radionuclides and metals. The analytical results are presented in Table 39 and Figure 21. Review of the analytical results indicates that iron, magnesium and total uranium were detected at concentrations exceeding the groundwater criteria. Total uranium was detected at 1,870 µg/L, compared to the groundwater criterion of 30 µg/L. The criteria for the uranium isotopes were also exceeded. None of the wet chemistry parameters were measured at levels of significant note.

3.1.8 Manhole Analytical Results

Water and sediment samples were collected from manholes MH08 and MH41. The samples were analyzed for VOCs, SVOCs, pesticides, PCBs, metals, and radionuclides. The manholes were backfilled with concrete following sampling to help eliminate the potential for migration of contaminants in the former LOOW sanitary sewer system.

MH08 Sediment Analytical Results

The MH08 sediment and duplicate sample analytical results are presented in Table 42 and Figures 15 and 16. Review of the analytical results indicates the following:

- No VOCs were detected at concentrations above the criteria.
- No SVOCs were detected at concentrations above the criteria.
- No pesticides were detected at concentrations above the criteria.
- No PCBs were detected.
- Chromium was the only metal detected at a concentration above the criteria.
- Although it didn't exceed the soil criteria, the total uranium concentrations in the samples were elevated. The total uranium concentrations in the sample and duplicate were 43.1 mg/kg and 42.7 mg/kg, respectively.
- Uranium-234 and -238 were detected at concentrations exceeding the soil criteria.
  - Uranium-234 was detected at a concentration of 16.1 pCi/g, compared to the criterion of 13 pCi/g. Uranium-234 was detected at 17.4 pCi/g in the duplicate sample.
  - Uranium-238 was detected at a concentration of 15.4 pCi/g, compared to the criterion of 14 pCi/g. Uranium-238 was detected at 17.5 pCi/g in the duplicate sample.

MH08 Water Analytical Results

The analytical results for the water sample from MH08 are presented in Table 43 and Figure 21. Review of the analytical results indicates the following:

- No VOCs were detected.
- No SVOCs were detected at concentrations above the criteria.
- No pesticides were detected.
- No PCBs were detected.
- None of the wet chemistry parameters were measured at levels of significant note.
- Iron, magnesium, manganese, sodium and total uranium were detected in the unfiltered sample at concentrations exceeding the groundwater criteria and magnesium, manganese, sodium and total uranium were detected in the filtered sample at concentrations exceeding the groundwater criteria.
- Uranium-234 was detected at 43.3 pCi/L and uranium-238 was detected at 37.9 pCi/L compared to the total uranium criterion of 27 pCi/L.

MH41 Sediment Analytical Results

The MH41 sediment sample analytical results are presented in Table 42 and Figure 22. Review of the analytical results indicates the following:

- No VOCs were detected at concentrations above the criteria.
- Four SVOCs were detected at concentrations above the criteria.
- No pesticides were detected at concentrations above the criteria.
- No PCBs were detected at concentrations above the criteria.
- Arsenic, chromium, and potassium were detected at concentrations above the criteria.
- Although it didn't exceed the soil criteria, the total uranium concentration in the sample was elevated. The total uranium concentration in the sample was 21.6 mg/kg.

- No radionuclides were detected at concentrations exceeding the criteria.

MH41 Water Analytical Results

The analytical results for the water sample from MH41 are presented in Table 43 and Figure 23. Review of the analytical results indicates the following:

- No VOCs were detected at concentrations above the criteria.
- No SVOCs were detected.
- No pesticides were detected.
- No PCBs were detected.
- None of the wet chemistry parameters were measured at levels of significant note.
- No metals were detected at concentrations above the criteria.
- No radionuclides were detected at concentrations above the criteria.

3.1.9 IDW Analytical Results

Liquid IDW Analytical Results

Representative samples of each of the nine containers holding liquid IDW were sampled and analyzed for the parameters listed in Table 18. The analytical results are presented in Table 44. The results were provided to the LWTP, which provided URS a letter stating their acceptance of the material. A copy of the LWTP letter is provided in Appendix L.

Solid IDW Analytical Results

Representative samples of each of the eight solid IDW waste streams were sampled and analyzed for the parameters listed in Table 18. The analytical results are presented in Table 45. The results were provided to WTS. Using this data, WTS completed waste profiles and forwarded them to the Environmental Quality Wayne Disposal facility in Belleville, Michigan. Copies of the waste profiles are provided in Appendix L.

4.0 EVALUATION OF FINDINGS

4.1.1 Radiation Surveys

The pre-work and post-work walkover survey gamma radiation levels did not vary significantly, which is as expected as radiation measurements of the subsurface soils at the monitoring wells, pipeline excavation and investigative excavation locations showed normal variations in the radiation count rates; elevated radiation measurements were not identified. Similarly, radiation levels and smear samples from IDW from the monitoring well installation and excavations were within the ambient radiation levels seen on site. However, it is noted that gamma radiation levels from the five drums of historical IDW were slightly above the ambient radiation level in the Quonset storage building where the drums were stored.

All equipment and general survey results were within the site ambient radiation levels and met the requirements for equipment/materials release.

4.1.2 EU1 Area

Wells MW944, MW945, and MW946 were installed in the EU1 area to further delineate uranium impacts observed in existing wells. The analytical results for soil samples collected from the newly installed well borings indicate that uranium has not impacted the soils in those well areas. The wells were dry at the time of groundwater sampling, so an evaluation of impacts to groundwater could not be made. However, the absence of water in the wells demonstrates that groundwater movement through the native deposits in the UWBZ in this area is discontinuous and is controlled by the presence of sand and silt lenses and partings, as seen in the boring logs in Appendix E.

4.1.3 EU4 Area

Wells MW947, MW948, and MW949 were installed in the EU4 area to further delineate uranium and PCE impacts observed in existing wells. The analytical results for soil samples collected from the newly installed well borings indicate that neither uranium nor PCE have impacted the soils in those well areas. An evaluation of impacts to groundwater could not be made because the shallow wells were dry at the time of groundwater sampling. Similar to the wells installed in EU1, the absence of water in the wells demonstrates that groundwater movement in the UWBZ in the EU4 area is discontinuous. The groundwater analytical results for deep well MW949 indicate that the LWBZ in the well area has not been impacted by uranium or PCE.

4.1.4 Manhole MH41

The water and sediment in manhole MH41 was sampled prior to plugging the manhole. The sediment analytical results indicated the presence of some organic and metals impacts, but the absence of radionuclide impacts. The water sample from the manhole did not exceed the criteria for organics, metals, or radionuclides.

4.1.5 Pipelines

Seventeen water lines associated with the former LOOW TNT production plant were exposed, sampled, and plugged as part of the PE excavations. With the exception of PIPE3 in the PE3 excavation and PIPE2 in the PE4 excavation, the soil and sediment analytical results show that there were no organic, inorganic, or radionuclide impacts in the former TNT pipelines or underlying soils. The majority of the pipelines contained sediment that appeared to consist only of pipe scale. PIPE3 in the PE3 excavation and PIPE2

in the PE4 excavation contained clayey sediments, indicating that the lines have been penetrated and foreign materials have entered the lines. These clayey sediments contained slightly elevated levels of SVOCs. The source(s) of the SVOCs is unknown, but SVOCs are common contaminants in manmade fill and can be associated with materials such as petroleum products and partial combustion of organic materials.

The PE pipelines did not have bedding materials. Also, little groundwater was encountered in the excavations indicating that at those locations, the pipelines do not appear to be preferential pathways for groundwater migration.

Radium-226 was detected at concentrations just above the groundwater criteria in water samples from PIPE4 in PE4 and PIPE4 in PE5. None of the other pipeline water samples contained radionuclide exceedances.

4.1.6 EU10/OW11B/MH08 Area

Monitoring Well Data

The lack of groundwater in wells in the EU1 and EU4 areas demonstrate the limited movement of groundwater in the native deposits. Unlike the EU1 and EU4 areas, the EU10/OW11B/MH08 area has had significant surface and subsurface disturbances during construction of LOOW TNT-era structures as well as during radiation remediation/IWCS construction activities. Those subsurface disturbances have resulted in increased permeability of the soils and, consequently, increased groundwater movement in that area. The impact of historical subsurface disturbance is illustrated by the fact that all of the newly installed wells in this area produced groundwater.

Historical groundwater monitoring data from existing wells in the EU10/OW11B area show elevated uranium levels. The groundwater analytical data for the newly installed wells in this area confirm this observation. Also, two of the seven new wells installed south of the IWCS (i.e., MW957 and MW960) had elevated uranium levels in the soil and all four new wells in the OW11B area contained elevated uranium levels in the soil.

Table 46 presents total uranium analytical results for monitoring well soil and groundwater samples for all of the wells installed during this investigation. This table was generated using Table 9, and as such, includes soil sample depth intervals and the associated down-hole gamma readings and the GM pancake, alpha, and beta readings from the core samples.

The table shows that the elevated uranium levels in the soil samples did not always correlate with the highest gamma, GM pancake, alpha, or beta readings. The table also shows that the highest total uranium concentrations in the groundwater samples did not directly correlate with the well with the highest total uranium concentration in the soil samples. The soils data shows that uranium impacts appear to be found predominantly in the surface and near surface soils; the deepest elevated total uranium levels were found in the soil sample from the 1.8- to 2-m (6- to 6.5-ft) interval in MW953.

Investigative Excavation Data

Table 47 presents a summary of investigative excavation soil sample collection locations, maximum field gamma scan readings, and total uranium soil and groundwater analytical results. The soil samples from the four investigative excavations around the grit chamber (i.e., IE1 through IE4) did not contain elevated levels of total uranium (as previously defined in Section 3.1.3). Elevated total uranium levels were

detected in the black silt lens in IE6 located near the former USDOE decontamination pad; in the clay backfill beneath the 0.9-m (36-in) diameter pipe and in the soil beneath the sanitary sewer in IE7; and in the surface soil, west wall soil, and northwest corner soil in IE8.

The groundwater analytical data shows that total uranium-impacted groundwater is present in areas where USDOE remedial activities were known to occur. Specifically, the sandy bedding beneath the 15-cm (6-in) diameter pipeline that runs from the grit chamber to the grit chamber lift station as observed in excavation IE4 and from the interface between bottom of the fill and underlying brown silty clay in excavation IE6. Historical aerial photographs show land scarring in the OW11B area during the time of USDOE remediation activities. The uranium impacts detected in the groundwater collected from the area between the 23-cm (9-in) and 38-cm (15-in) diameter pipes in excavation IE7 and from along the top of the concrete-encased sanitary sewer as observed in excavation IE8 might be associated with those former remediation activities.

5.0 SUMMARY AND CONCLUSIONS

The BOP OU field investigation included installing 17 groundwater monitoring wells; excavating, sampling and plugging 17 pipelines; excavating eight investigative excavations; and sampling and plugging two manholes.

The absence of groundwater in four of the newly installed wells confirms that groundwater flow in the UWBZ is discontinuous in some areas. Excavations adjacent to the grit chamber, decontamination pad and near OW11B indicate groundwater flow in these areas occurs predominantly along the concrete-encased sanitary sewer system with the source of water likely being South 31 Ditch. With the exception of the OW11B area, groundwater was absent in the excavations of the LOOW-era pipelines.

The soils sampled in the EU1 wells did not have uranium impacts. Due to the absence of groundwater in the new wells, a conclusion regarding uranium impacts in the groundwater in these areas cannot be made. Further monitoring of the new wells is warranted.

The soils in the EU4 wells did not have uranium or PCE impacts. Similar to EU1, due to the absence of groundwater in the new wells, a conclusion regarding uranium/PCE impacts in the groundwater in the UWBZ in these areas cannot be made. Further monitoring of the new wells is warranted. Analysis of the groundwater from well MW949 shows that the LWBZ has not been impacted by uranium or PCE at that well location.

Field radiation scanning of soils had limited effectiveness in identifying intervals with elevated uranium impacts (as confirmed by laboratory analyses). In the field, the soil intervals with elevated uranium impacts were better selected based on the presence of higher permeability soils, soil interfaces, and/or the presence of groundwater seepage.

The investigation confirmed the presence of uranium impacts in groundwater in the area south of the IWCS and in the area near the grit chamber, decontamination pad, and well OW11B. The impacts are likely associated with past practices at the site. In particular, the location of former material storage piles to the east and south of Building 409 (south of the IWCS) shown on historical aerial photographs (presented in Appendix O) closely mirror uranium detections in groundwater in that area. Similarly, historical aerial photographs also show ground scarring along the railroad line in the vicinity of well OW11B, the decontamination pad, and the grit chamber.

Furthermore, decontamination activities during construction of the IWCS near the decontamination pad, grit chamber, and OW11B may have also contributed to the uranium impacts detected in soil and groundwater in that area. The soils data showed that the surface and near surface soils had uranium impacts, while the deeper soils did not. The low permeability of the soils appears to have limited migration of uranium impacts in the soil column. Impacts were generally not found along the original TNT facility water lines (e.g., 25-cm (10-in) diameter pipeline in PE1). The older TNT facility pipelines were installed without bedding material and it appears that the natural silty clay backfill inhibits groundwater migration along these older pipelines.

An analysis was previously performed by USACE to evaluate the occurrence of uranium contamination in the soils and groundwater. The distribution coefficient, Kd, describes the sorption relationship between concentrations in groundwater and soil at equilibrium. The Kd is a function of the concentration and geochemical properties of the chemical constituent, as well as the physical characteristics of the soil and

groundwater. In previous investigations (e.g., USACE, 2007), site-specific values of Kd were determined for the NFSS based on historical site measurements and a literature review. The Kd values calculated from this field investigation are consistent with previous studies. Therefore, the total uranium concentrations in groundwater are reasonable given the concentrations detected in soil during this field investigation.

6.0 RECOMMENDATIONS

Further delineation of uranium impacts in the groundwater in the EU1 and EU4 areas and PCE impacts in the EU4 area is warranted. URS recommends the installation of temporary monitoring wells to confirm the presence of groundwater. After a few days waiting period, those wells which produce groundwater should be converted into permanent monitoring wells and those which do not produce groundwater should be abandoned. Groundwater samples should then be collected and analyzed for radionuclides and total uranium. The analyses of samples from EU4 should also include VOCs.

For any future investigations, unless site historical information indicates the possibility of other contaminants in a particular area, the analytical parameter list should focus on radionuclides and total uranium. The analysis of an extensive list of parameters (e.g., VOCs, SVOCs, pesticides, PCBs, and metals) is often unwarranted.

The historical placement of material storage piles appear to be the source of radionuclide and total uranium contamination in the area south of the IWCS. Previous remedial activities in and around the grit chamber, decontamination pad, and OW11B and historical material storage piles discerned from photographic analyses are likely sources of groundwater impacts in this area. Furthermore, the groundwater concentrations are consistent with the soil detections in the area south of the IWCS and near OW11B. However, the USACE may perform additional field investigations in the vicinity of OW11B to obtain additional information on the hydraulic conductivity of this area.

7.0 REFERENCES

American Society of Testing Materials (ASTM) *Standard Test for Trace Uranium in Water by Pulsed-Laser Phosphorimetry*, D 5174-91(or most recent version).

NUREG, *Multi-Agency Radiological Laboratory Analytical Protocols Manual (MARLAP), NUREG-1576,* July 2004.

NYSDEC, Part 703: *Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations*. February 16, 2008, Class GA.

USACE, *Kansas City and St. Louis District Radionuclide Data Quality Evaluation Guidance for Alpha and Gamma Spectroscopy,* 2002.

USACE, *Remedial Investigation Report for the Niagara Falls Storage Site*, December 2007.

USDOE, *Environmental Measurements Laboratory*, HASL-300, 28th Edition, February 1997.

USDOE Order 458.1, *Radiation Protection of the Public and Environment*, June 2011.

USEPA, *National Primary Drinking Water Regulations*, EPA 816-F-09-004, May 2009.

USEPA, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, August 1980.

USEPA, Regional Screening Levels (RSL), Residential, May 2013.

USEPA, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*, Final Update III, June 1997 (most current version).

USEPA, *The Determination of Inorganic Anions in Water by Ion Chromatography*, November 1991.

USEPA, *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, Revised March 1983 (or most recent version).

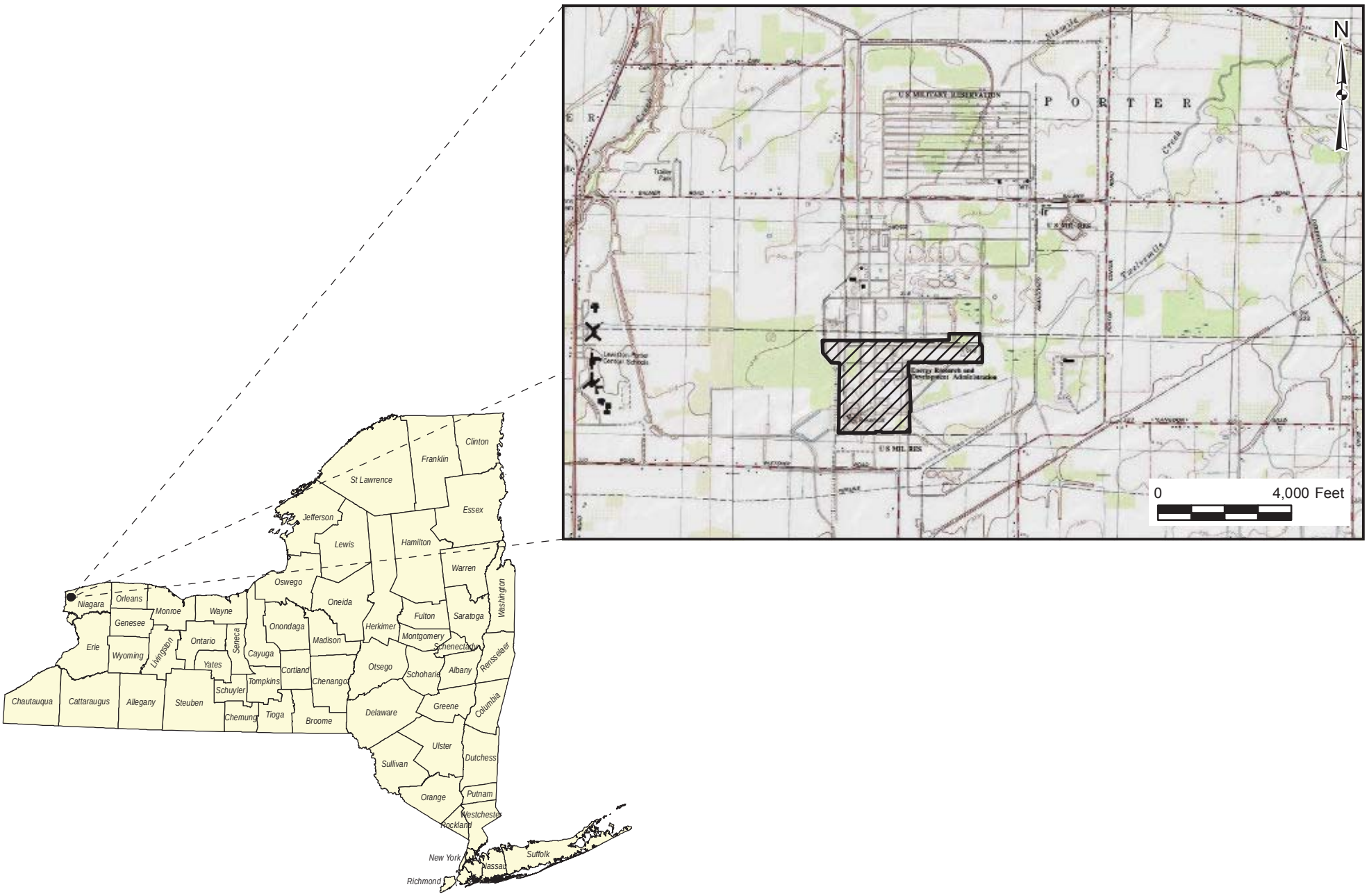
USEPA, *N-Hexane Extractable Material (HEM) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM) by Extraction and Gravimetry (Oil and Grease and Total Petroleum Hydrocarbons)*, May 1999.

USEPA, *National Functional Guidelines for Organic Data Review*, EPA 540-R-08-01, June 2008.

USEPA, *National Functional Guidelines for Inorganic Data Review*, EPA 540-R-10-011, January 2010.

USNRC, *Consolidated Decommissioning Guidance (NUREG-1757)*, September 2006.

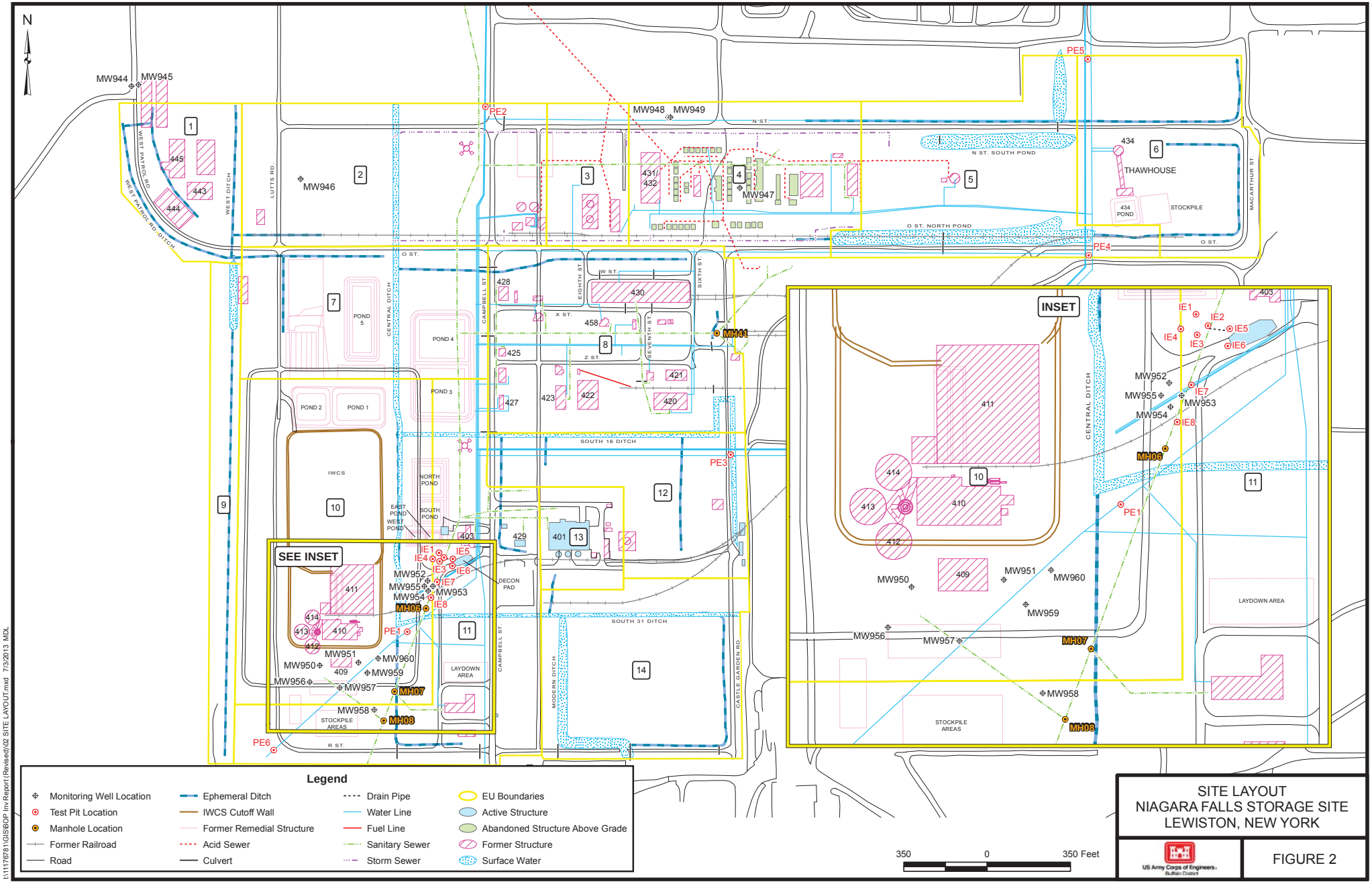
I:\11176781\GIS\BOP Inv Report (Revised)\01 SITE LOCATION.mxd 7/3/2013 MDL



US Army Corps of Engineers
Buffalo District

SITE LOCATION
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK

FIGURE 1

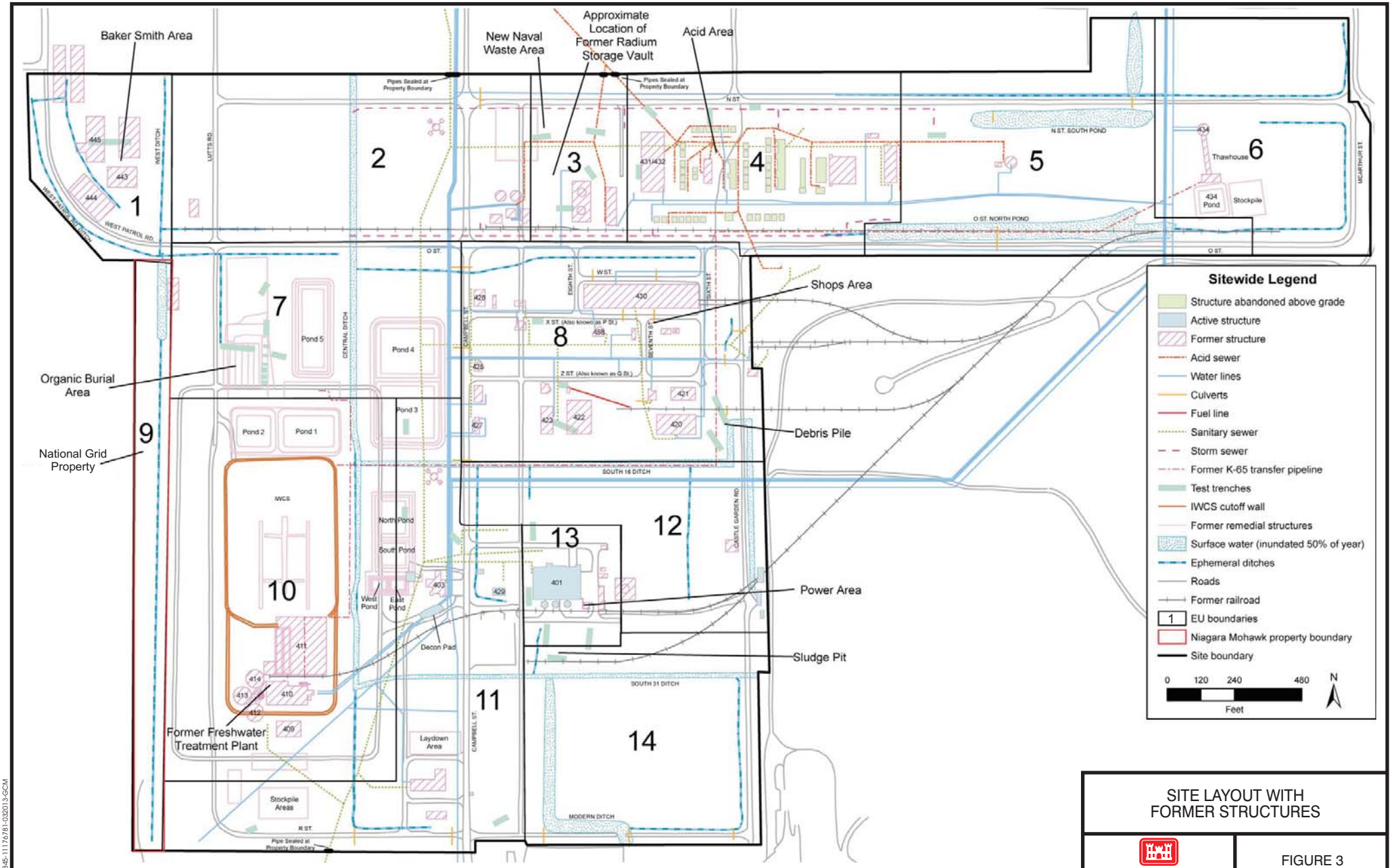


SITE LAYOUT
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK

US Army Corps of Engineers
Buffalo District

FIGURE 2

I:\111767811\GIS\BOP Inv Report (Revised)\02 SITE LAYOUT.mxd 7/3/2013 MDL



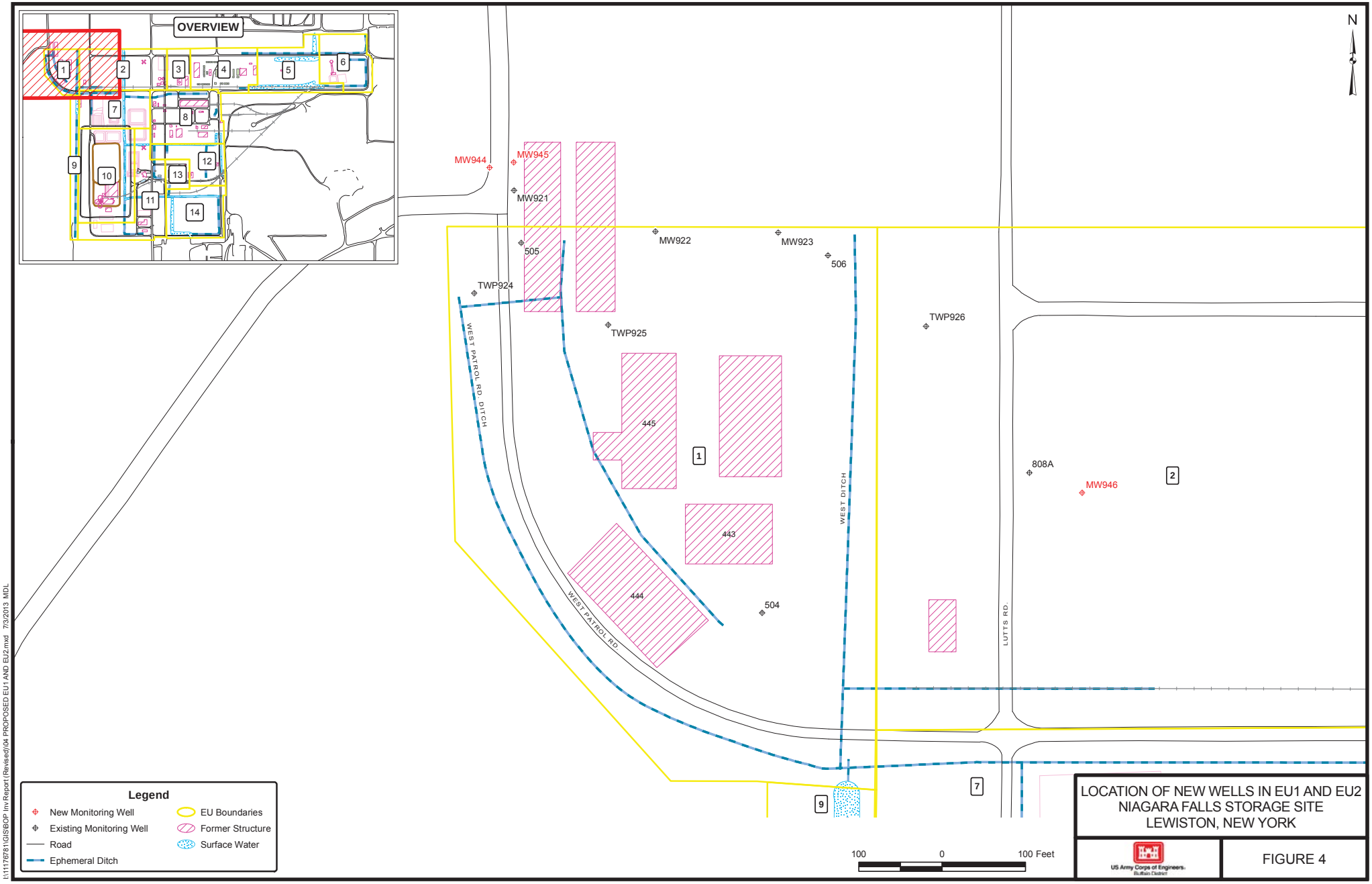
Source: Remedial Investigation Report for the Niagara Falls Storage Site, SAIC, December 2007

SITE LAYOUT WITH FORMER STRUCTURES

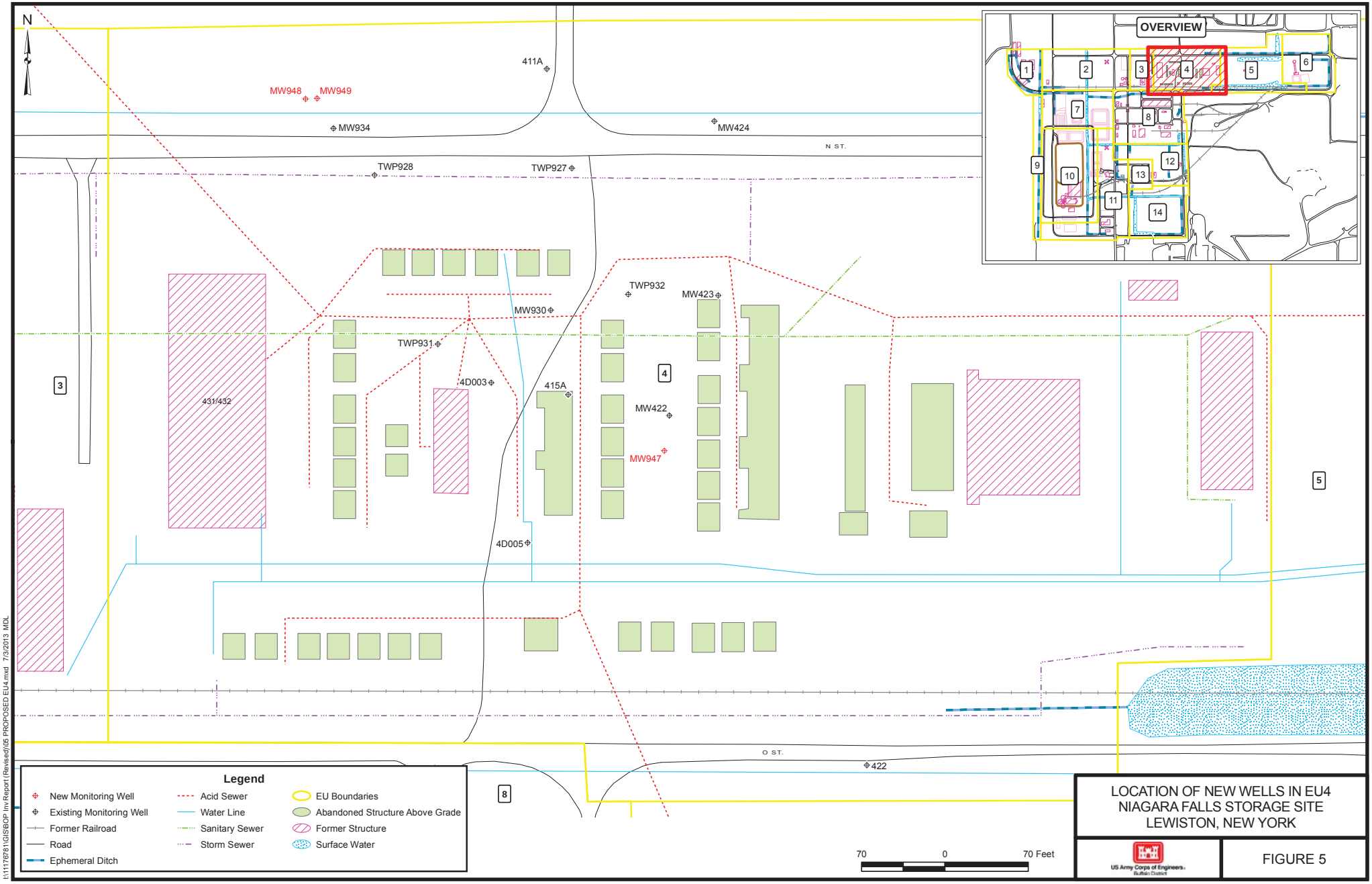
US Army Corps of Engineers
Buffalo District

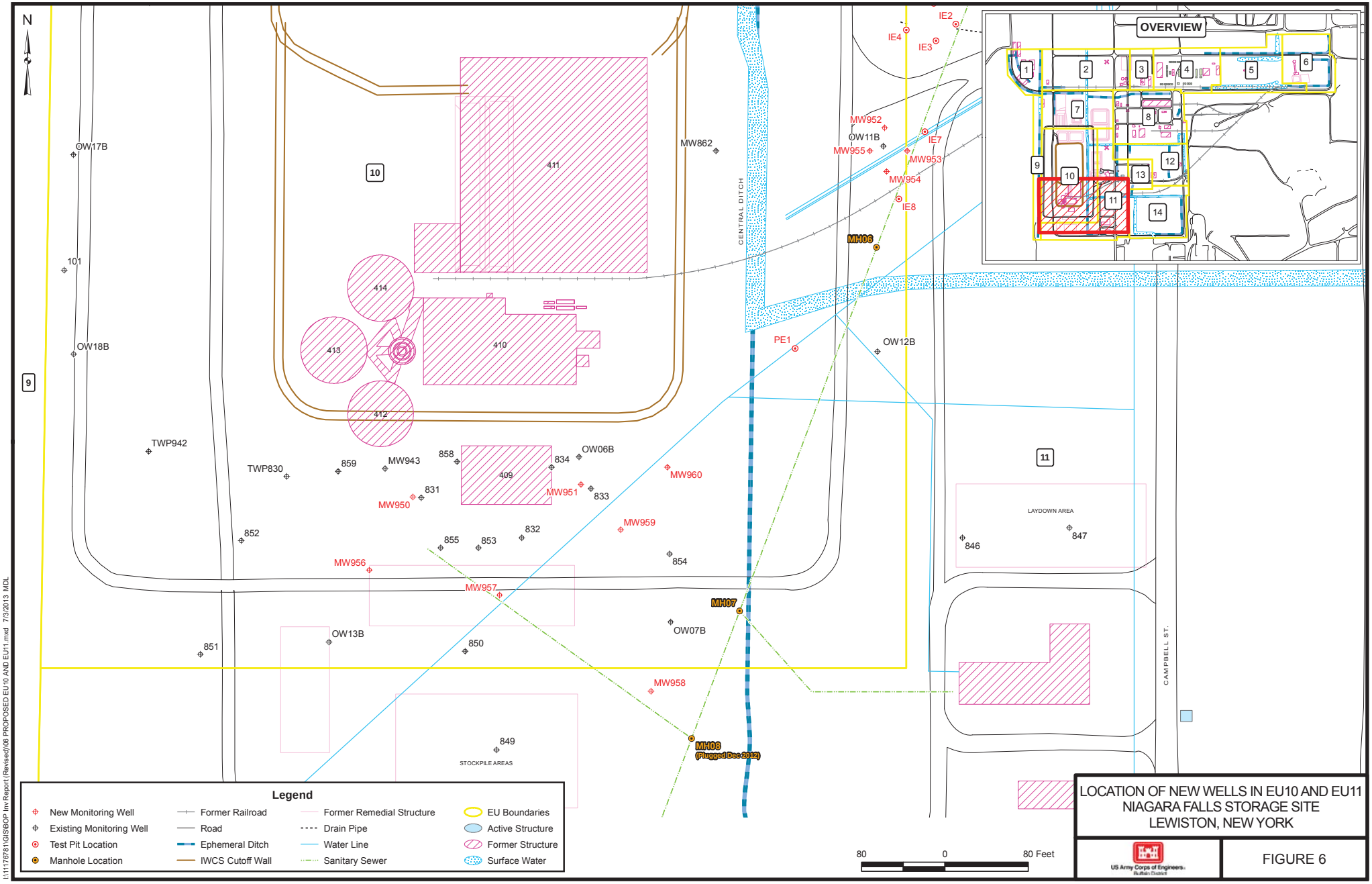
FIGURE 3

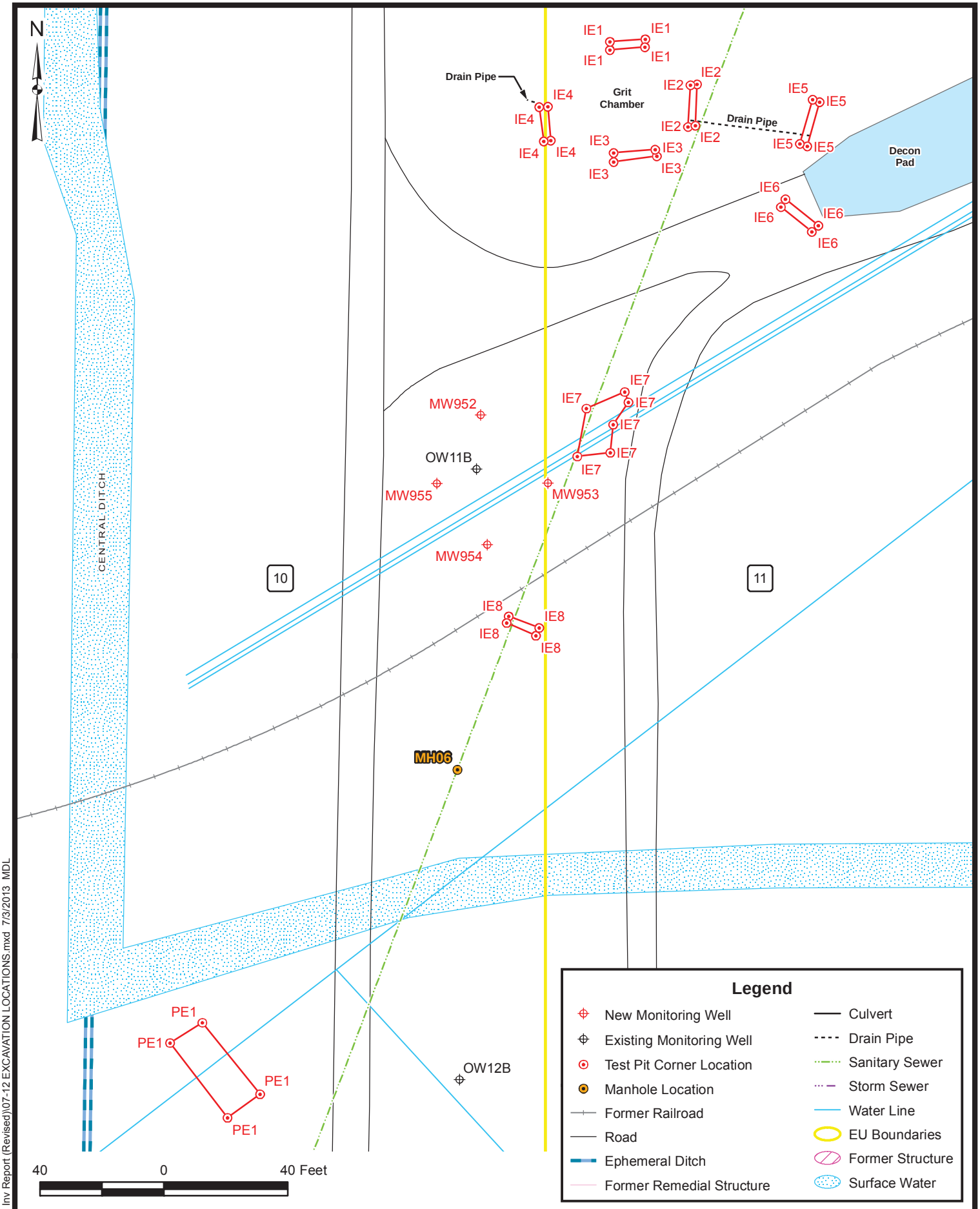
AG20845-111767B1-032013-GCM



I:\111767811\GIS\BOP Inv Report (Revised)\04 PROPOSED EU1 AND EU2.mxd 7/3/2013 MDL


N
411A
MW948
MW949
MW934
MW424
N ST.
TWP928
TWP927
TWP932
MW423
MW930
TWP931
4D003
415A
MW422
MW947
431/432
4D005
O ST.
422
3
4
5
8
OVERVIEW
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Legend
New Monitoring Well
Existing Monitoring Well
Former Railroad
Road
Ephemeral Ditch
Acid Sewer
Water Line
Sanitary Sewer
Storm Sewer
EU Boundaries
Abandoned Structure Above Grade
Former Structure
Surface Water
70
0
70 Feet
LOCATION OF NEW WELLS IN EU4
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK
US Army Corps of Engineers
Buffalo District
FIGURE 5
I:\111767811\GIS\BOP Inv Report (Revised)\05 PROPOSED EU4.mxd 7/3/2013 MDL


N
OVERVIEW
1
2
3
4
5
6
7
8
9
10
11
12
13
14
OW17B
101
OW18B
9
10
411
414
413
410
412
MW862
CENTRAL DITCH
IE2
IE4
IE3
MW952
OW11B
MW955
IE7
MW953
MW954
IE8
MH06
PE1
OW12B
11
TWP942
TWP830
859
MW943
858
834
OW06B
409
MW960
MW951
833
831
MW950
MW959
852
855
853
832
854
MW956
MW957
MH07
OW13B
OW07B
851
850
MW958
849
STOCKPILE AREAS
LAYDOWN AREA
847
846
CAMPBELL ST.
MH08
(Plugged Dec 2012)
Legend
New Monitoring Well
Existing Monitoring Well
Test Pit Location
Manhole Location
Former Railroad
Road
Ephemeral Ditch
IWCS Cutoff Wall
Former Remedial Structure
Drain Pipe
Water Line
Sanitary Sewer
EU Boundaries
Active Structure
Former Structure
Surface Water
80
0
80 Feet
LOCATION OF NEW WELLS IN EU10 AND EU11
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK
US Army Corps of Engineers
Buffalo District
FIGURE 6
I:\111767811\GIS\BOP Inv Report (Revised)\06 PROPOSED EU 10 AND EU11.mxd 7/3/2013 MDL

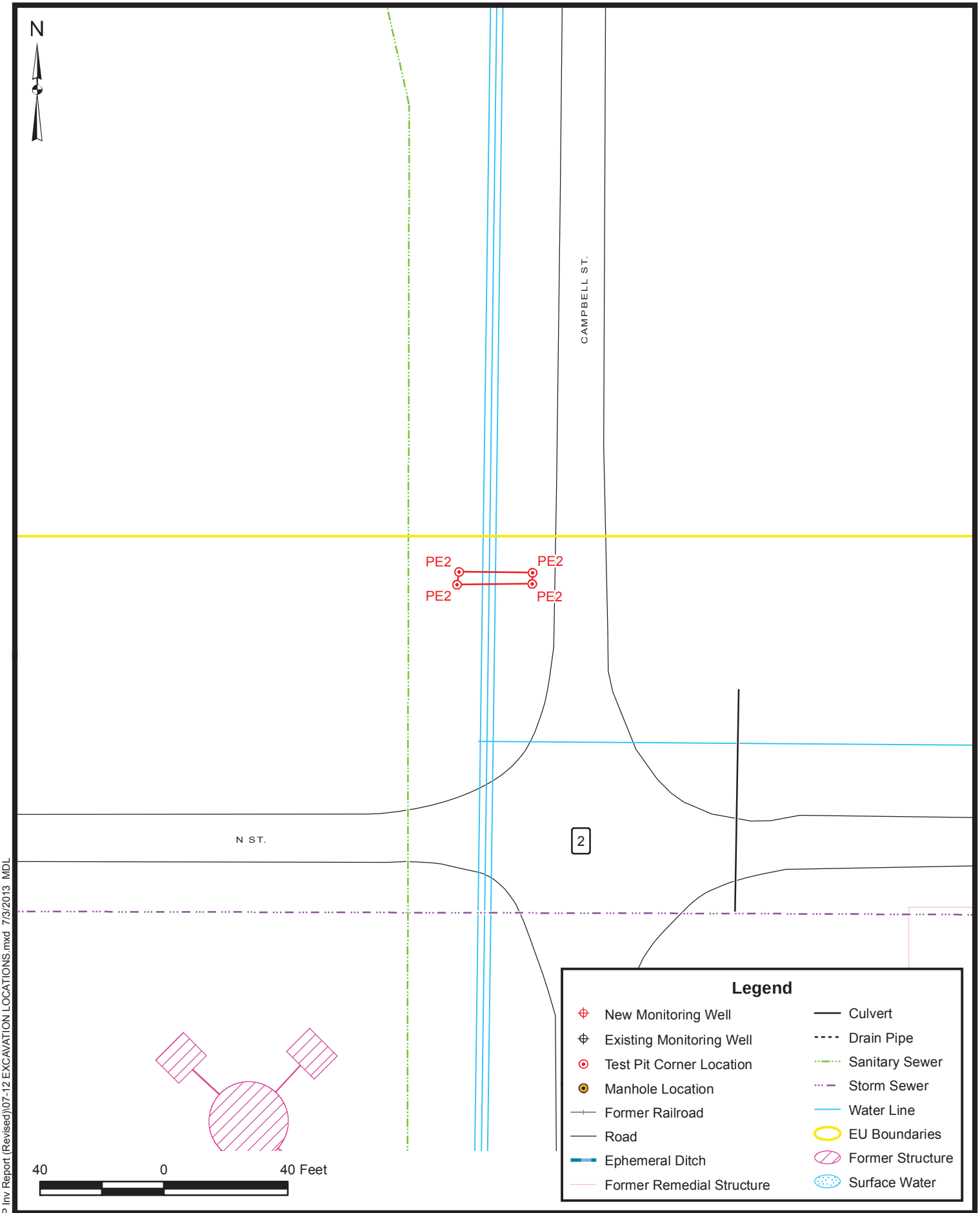


US Army Corps of Engineers
Buffalo District

IE AND PE1 EXCAVATION LOCATIONS
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK

FIGURE 7

I:\111776781\GIS\BOP Inv Report (Revised)\07-12 EXCAVATION LOCATIONS.mxd 7/3/2013 MDL

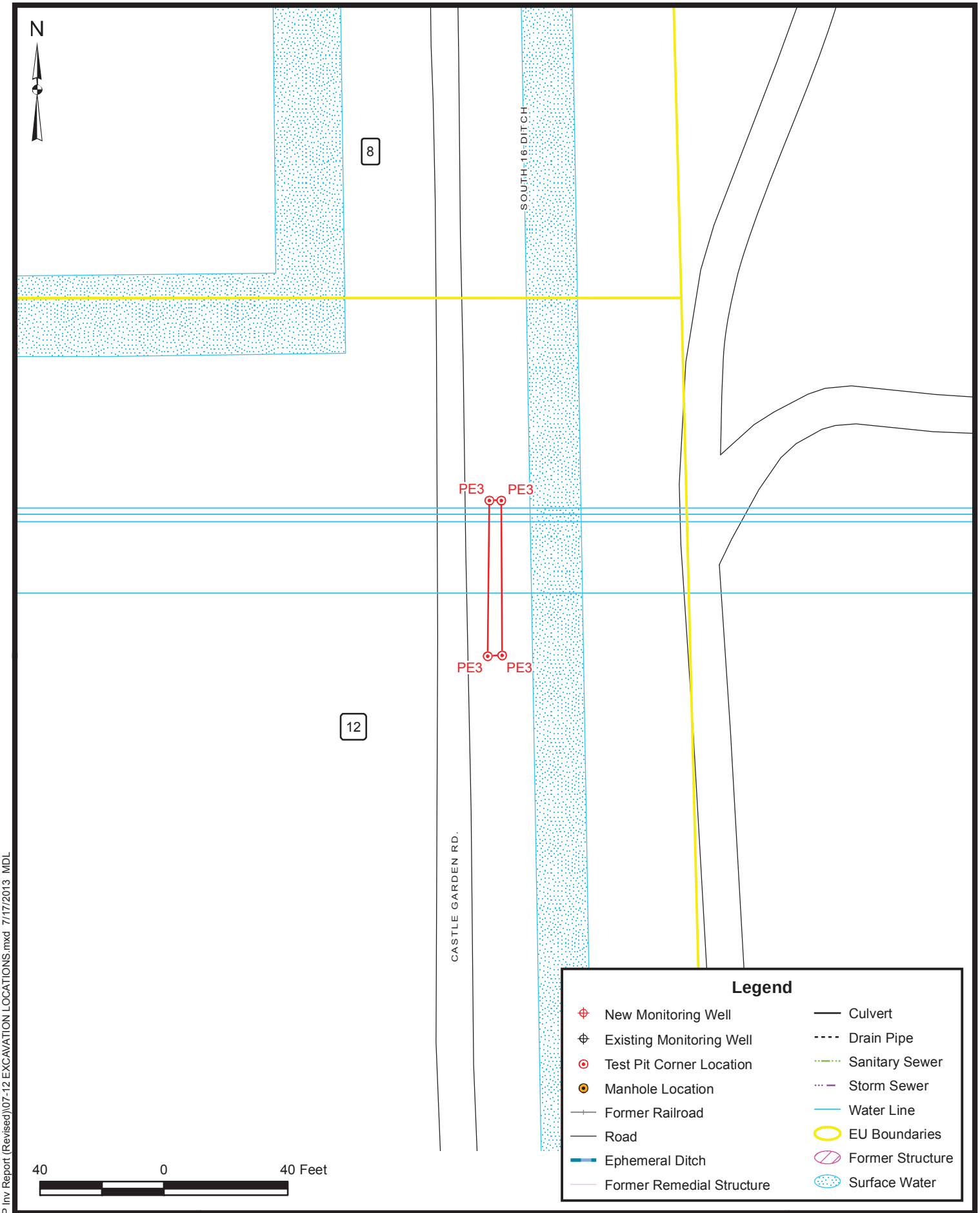


I:\11176781\GIS\BOP Inv Report (Revised)\07-12 EXCAVATION LOCATIONS.mxd 7/3/2013 MDL

US Army Corps of Engineers
Buffalo District

PE2 EXCAVATION LOCATION
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK

FIGURE 8

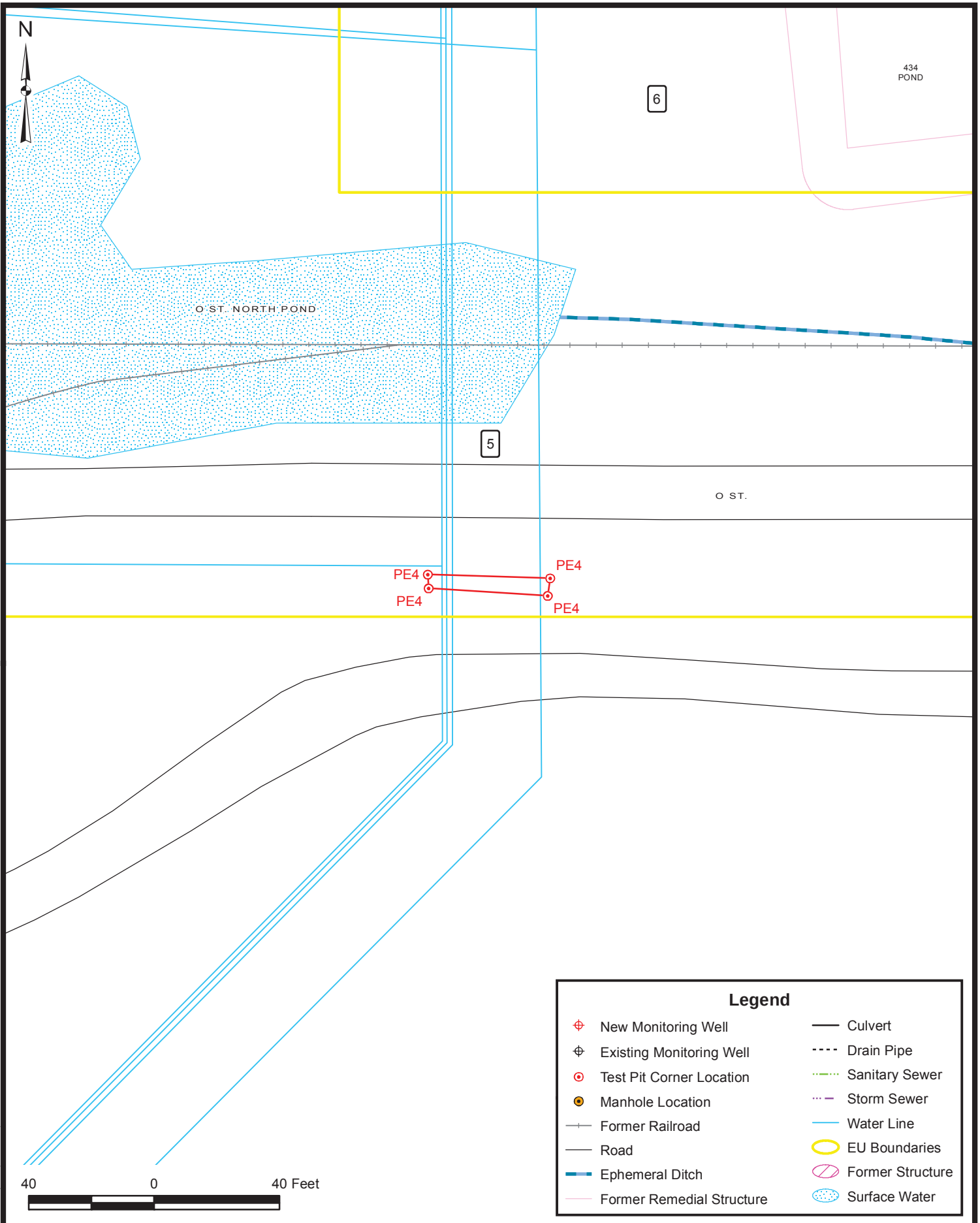


US Army Corps of Engineers
Buffalo District

PE3 EXCAVATION LOCATION
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK

FIGURE 9

I:\111776781\GIS\BOP Inv Report (Revised)\07-12 EXCAVATION LOCATIONS.mxd 7/17/2013 MDL

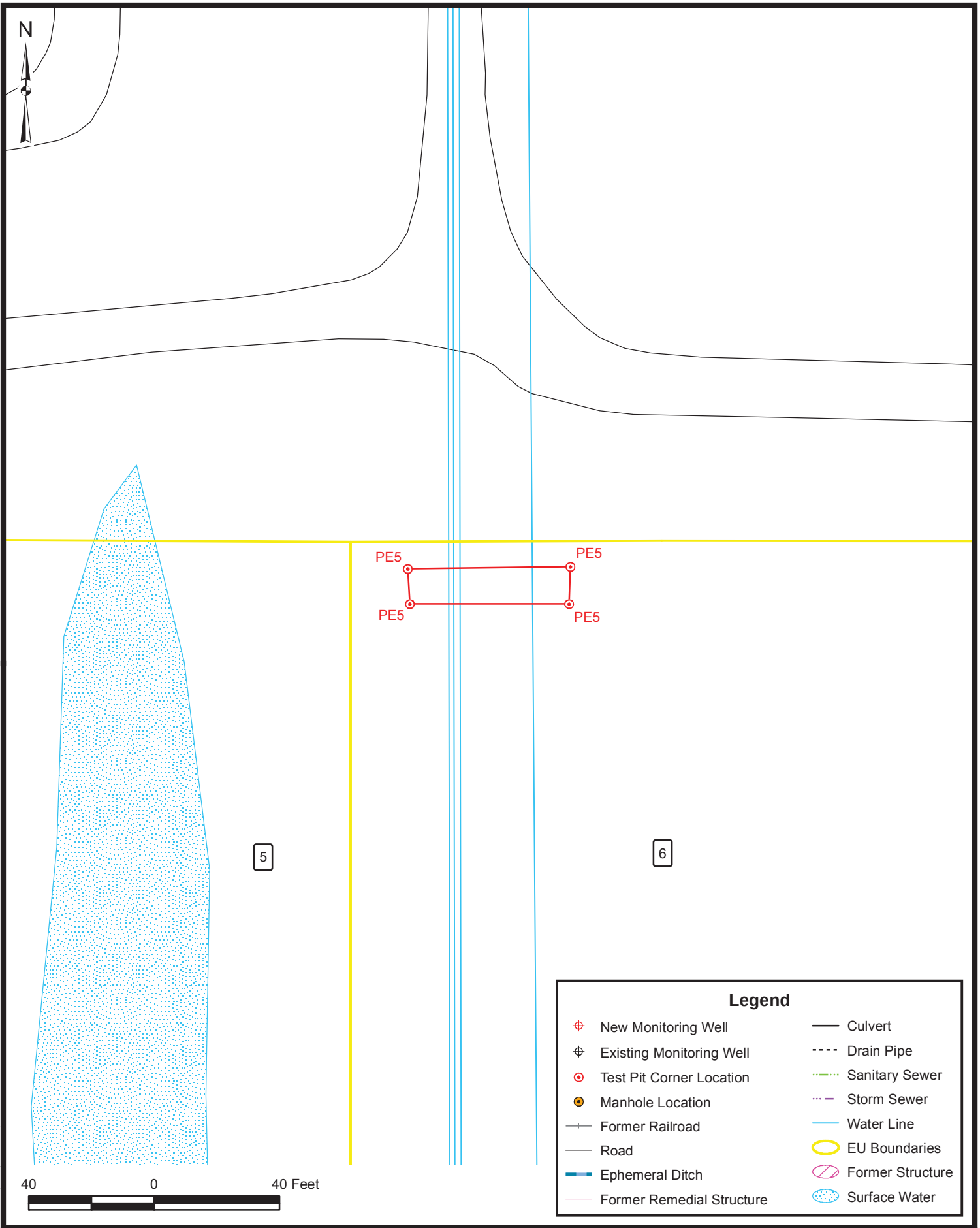


I:\111767811\GIS\BOP Inv Report (Revised)\07-12 EXCAVATION LOCATIONS.mxd 7/3/2013 MDL

US Army Corps of Engineers
Buffalo District

PE4 EXCAVATION LOCATION
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK

FIGURE 10

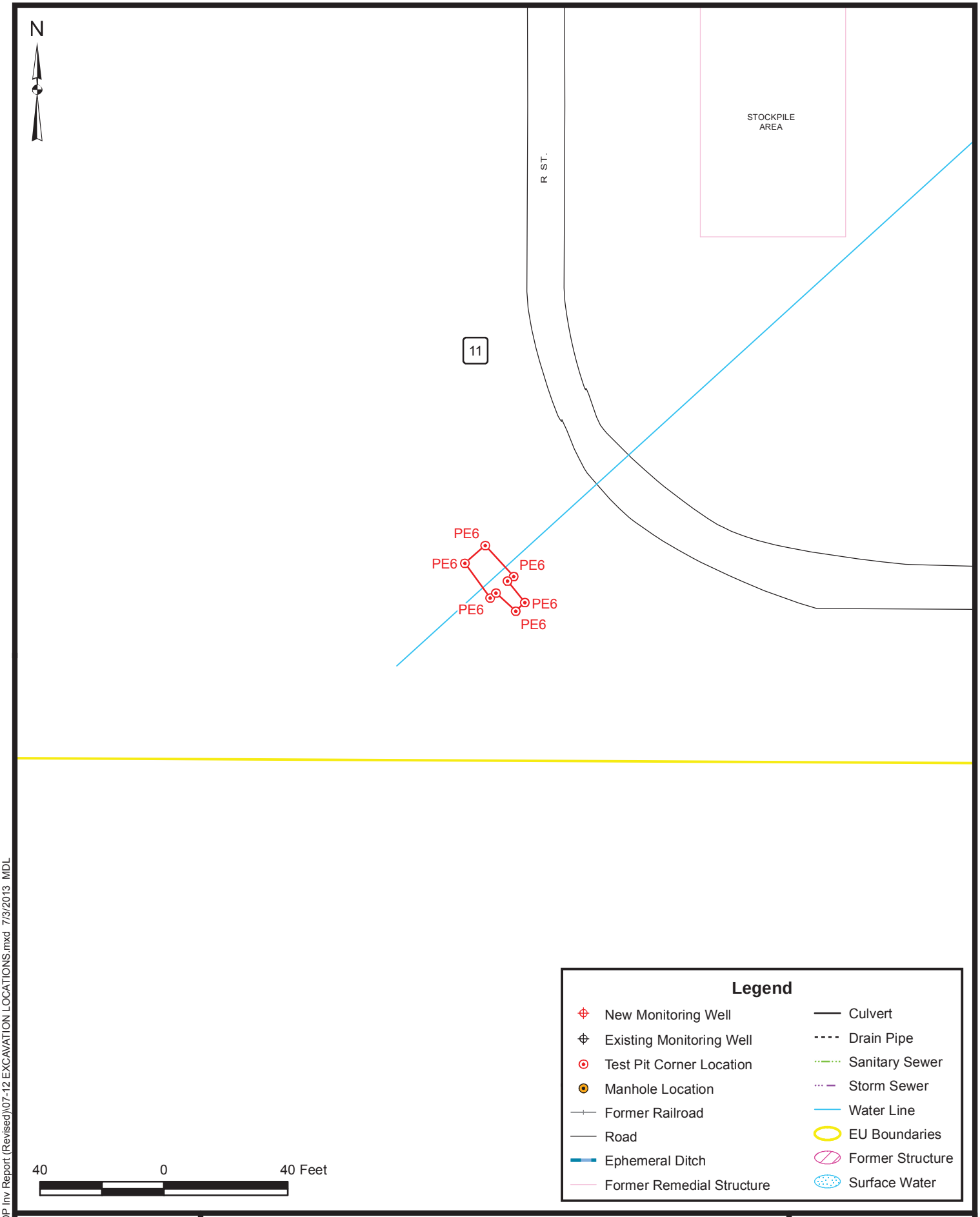


I:\111767811\GIS\BOP Inv Report (Revised)\07-12 EXCAVATION LOCATIONS.mxd 7/3/2013 MDL

US Army Corps of Engineers
Buffalo District

PE5 EXCAVATION LOCATION
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK

FIGURE 11

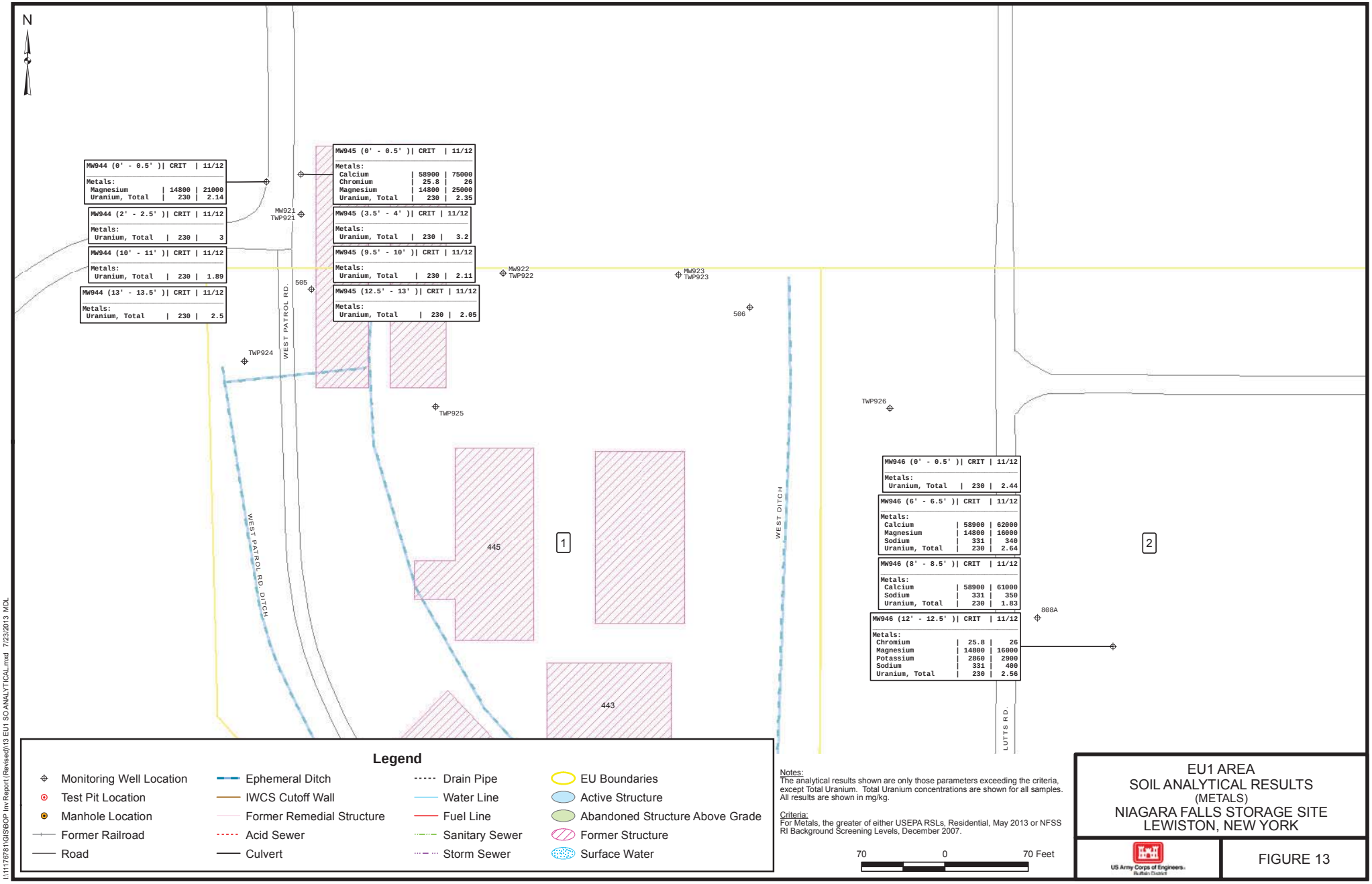


US Army Corps of Engineers
Buffalo District

PE6 EXCAVATION LOCATION
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK

FIGURE 12

I:\111767811\GIS\BOP Inv Report (Revised)\07-12 EXCAVATION LOCATIONS.mxd 7/3/2013 MDL



Notes:
The analytical results shown are only those parameters exceeding the criteria, except Total Uranium. Total Uranium concentrations are shown for all samples. All results are shown in mg/kg.

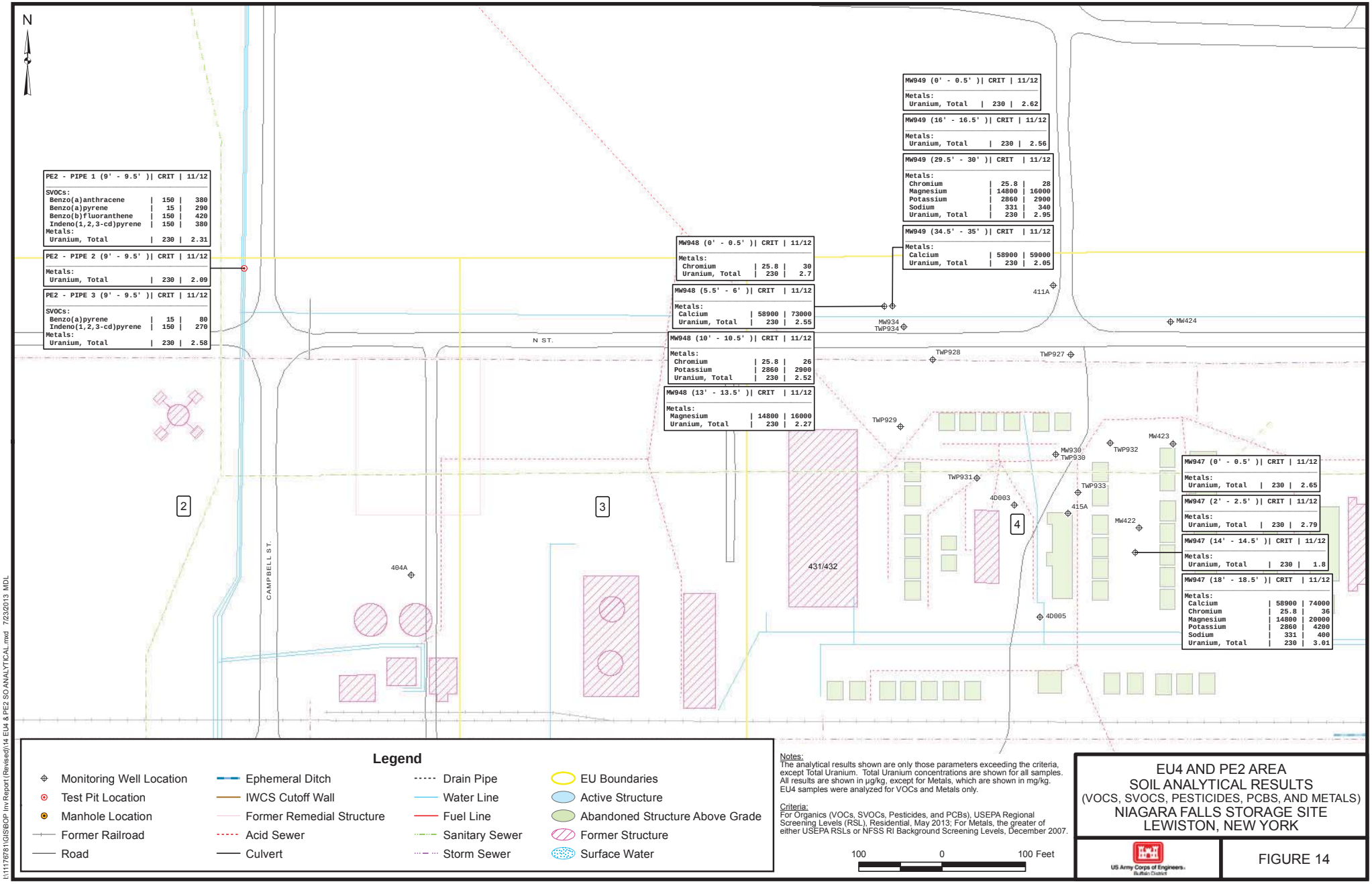
Criteria:
For Metals, the greater of either USEPA RSLs, Residential, May 2013 or NFSS RI Background Screening Levels, December 2007.

EU1 AREA
SOIL ANALYTICAL RESULTS
(METALS)
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK

US Army Corps of Engineers
Buffalo District

FIGURE 13

I:\111767811\GIS\BOP Inv Report (Revised)\13 EU1 SO ANALYTICAL.mxd 7/23/2013 MDL



Notes:
The analytical results shown are only those parameters exceeding the criteria, except Total Uranium. Total Uranium concentrations are shown for all samples. All results are shown in µg/kg, except for Metals, which are shown in mg/kg. EU4 samples were analyzed for VOCs and Metals only.

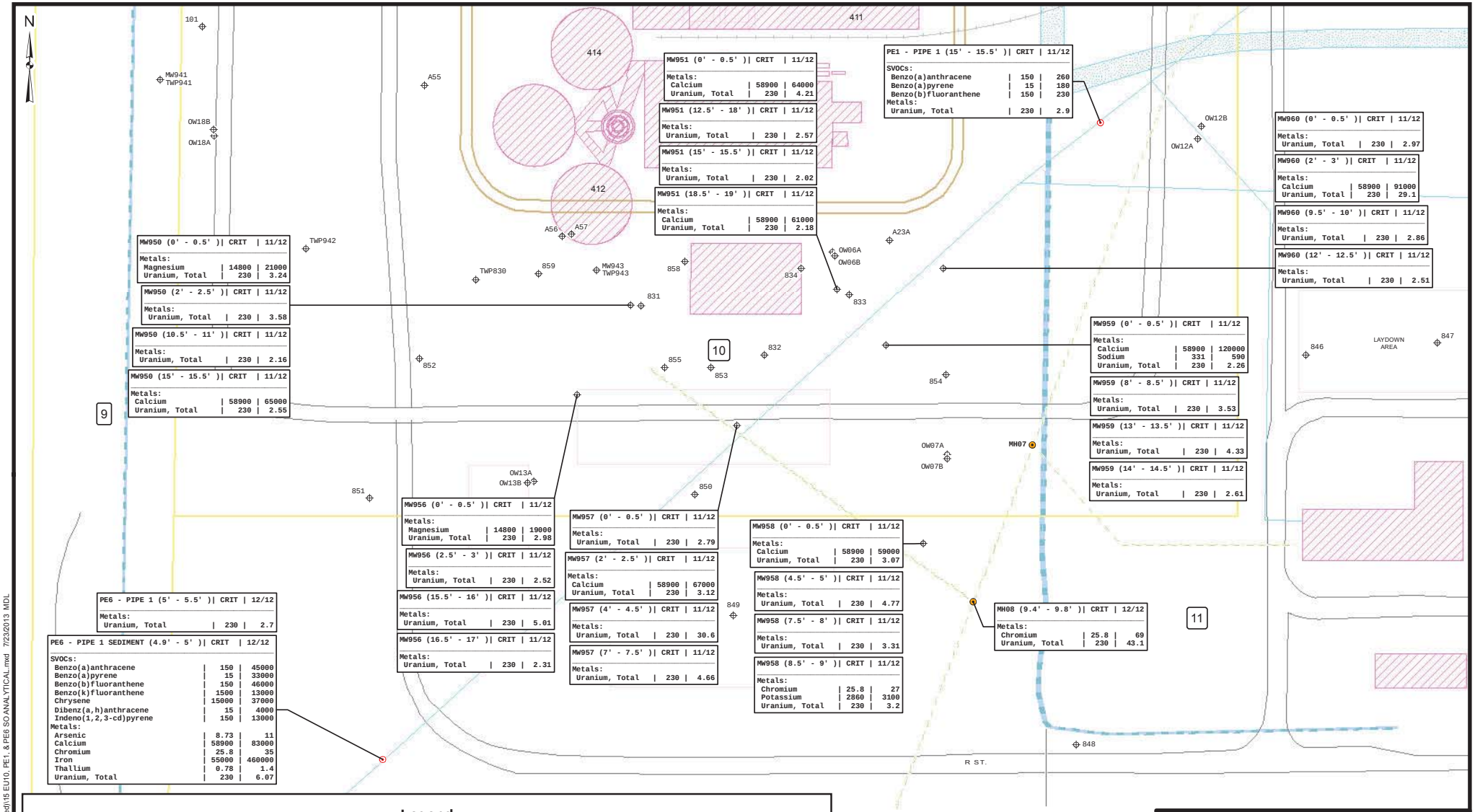
Criteria:
For Organics (VOCs, SVOCs, Pesticides, and PCBs), USEPA Regional Screening Levels (RSL), Residential, May 2013; For Metals, the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007.

EU4 AND PE2 AREA
SOIL ANALYTICAL RESULTS
(VOCS, SVOCS, PESTICIDES, PCBS, AND METALS)
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK

US Army Corps of Engineers, Buffalo District

FIGURE 14

I:\111767811\GIS\BOP Inv Report (Revised)\14 EU4 & PE2 SO ANALYTICAL.mxd 7/23/2013 MDL



Notes:
The analytical results shown are only those parameters exceeding the criteria, except Total Uranium. Total Uranium concentrations are shown for all samples. All results are shown in µg/kg, except for Metals, which are shown in mg/kg.

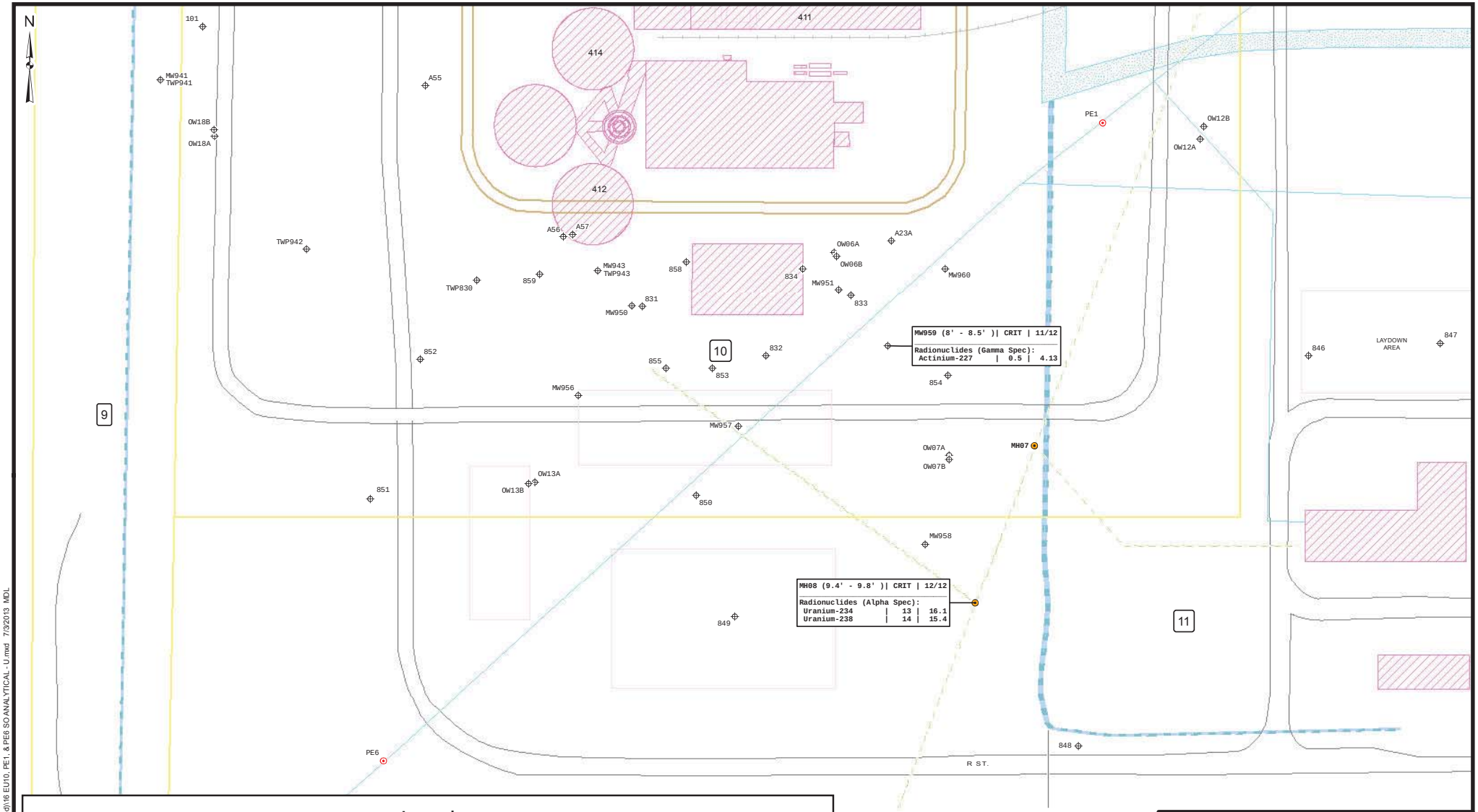
Criteria:
For Organics (VOCs, SVOCs, Pesticides, and PCBs), USEPA Regional Screening Levels (RSL), Residential, May 2013; For Metals, the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007.

EU10, PE1, AND PE6 AREA SOIL ANALYTICAL RESULTS (VOCS, SVOCS, PESTICIDES, PCBS, AND METALS) NIAGARA FALLS STORAGE SITE LEWISTON, NEW YORK

US Army Corps of Engineers, Buffalo District

FIGURE 15

I:\111767811\GIS\BOP Inv Report (Revised)\15 EU10, PE1, & PE6 SO ANALYTICAL.mxd 7/23/2013 MDL



Legend

- Monitoring Well Location
- Test Pit Location
- Manhole Location
- Former Railroad
- Road
- Ephemeral Ditch
- IWCS Cutoff Wall
- Former Remedial Structure
- Acid Sewer
- Culvert
- Drain Pipe
- Water Line
- Fuel Line
- Sanitary Sewer
- Storm Sewer
- EU Boundaries
- Active Structure
- Abandoned Structure Above Grade
- Former Structure
- Surface Water

Notes:
The analytical results shown are only those parameters exceeding the criteria.

All results are shown in pCi/g.

Criteria:
For Ac-227 and Uranium Isotopes (pCi/g, equivalent to 25 mrem/yr), NUREG 1757 (NRC 2006).

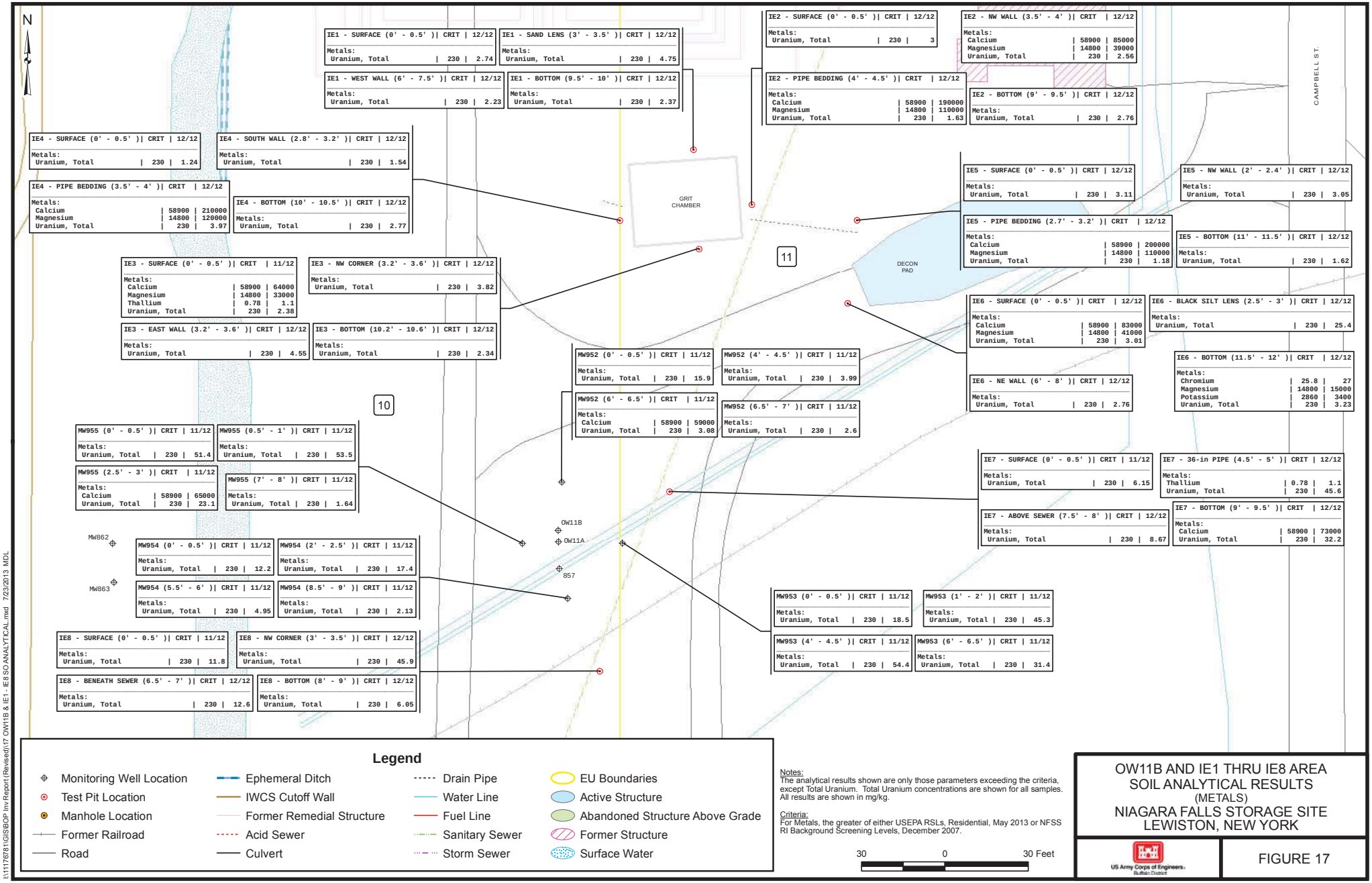
70 0 70 Feet

EU10, PE1, AND PE6 AREA SOIL ANALYTICAL RESULTS (RADIONUCLIDES) NIAGARA FALLS STORAGE SITE LEWISTON, NEW YORK

US Army Corps of Engineers, Buffalo District

FIGURE 16

I:\111767811\GIS\BOP Inv Report (Revised)\16 EU10, PE1, & PE6 SO ANALYTICAL - U.mxd 7/3/2013 MDL



Notes:
The analytical results shown are only those parameters exceeding the criteria, except Total Uranium. Total Uranium concentrations are shown for all samples. All results are shown in mg/kg.

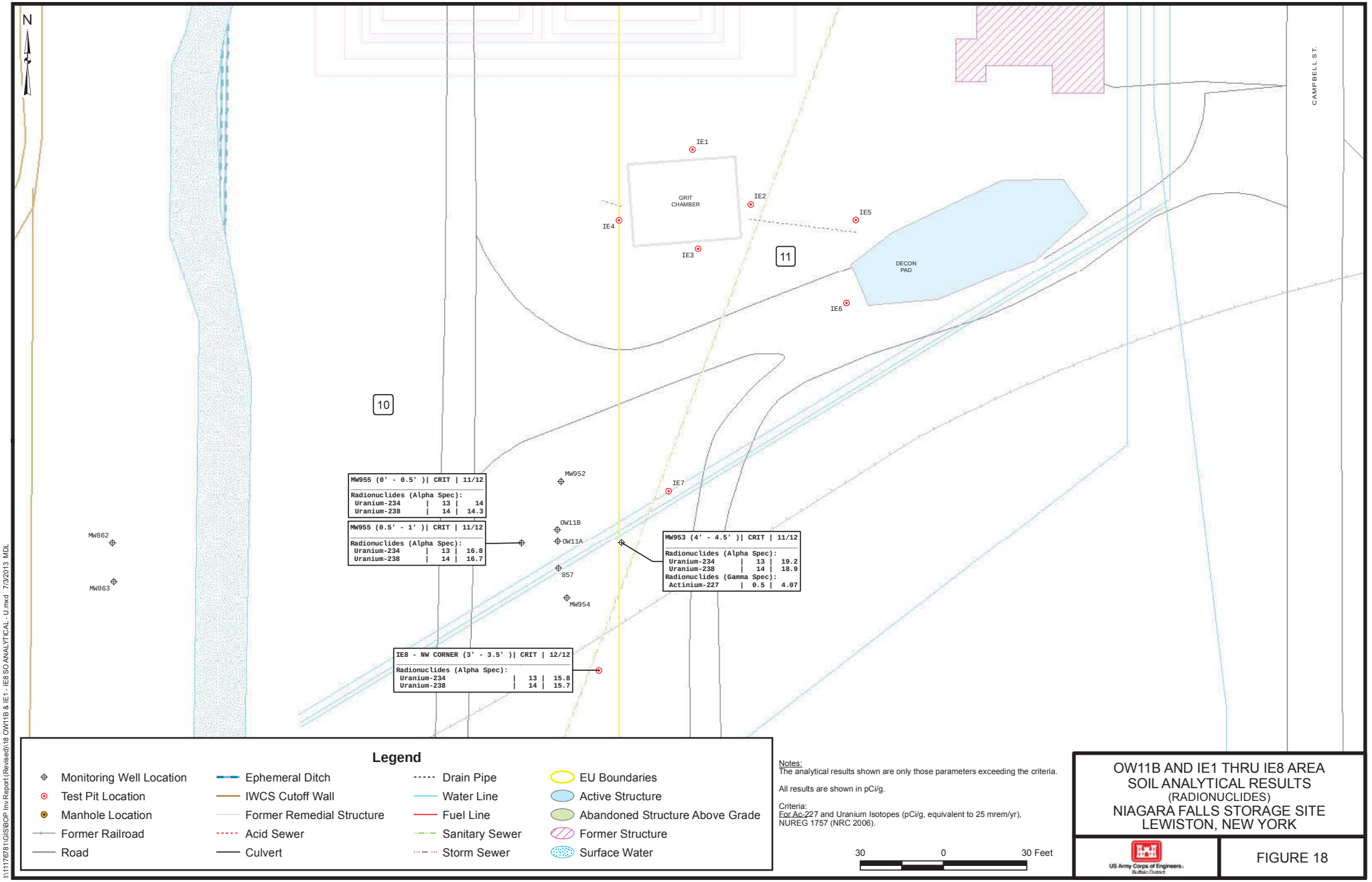
Criteria:
For Metals, the greater of either USEPA RSLs, Residential, May 2013 or NFSS RI Background Screening Levels, December 2007.

OW11B AND IE1 THRU IE8 AREA SOIL ANALYTICAL RESULTS (METALS) NIAGARA FALLS STORAGE SITE LEWISTON, NEW YORK

US Army Corps of Engineers, Buffalo District

FIGURE 17

I:\111767811\GIS\BOP Inv Report (Revised)\17 OW11B & IE1 - IE8 SO ANALYTICAL.mxd 7/23/2013 MDL



Notes:
The analytical results shown are only those parameters exceeding the criteria.

All results are shown in pCi/g.

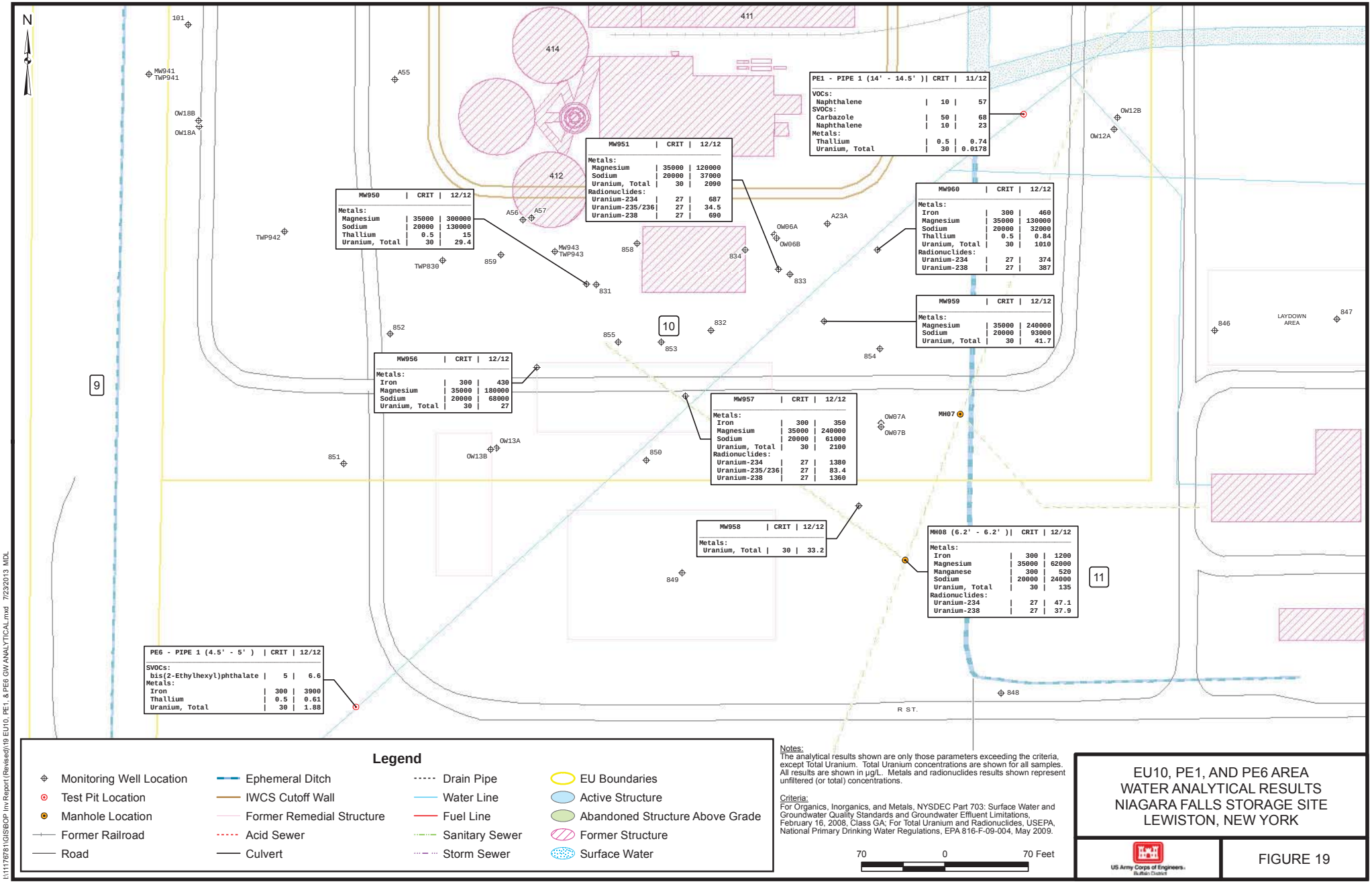
Criteria:
For Ac-227 and Uranium Isotopes (pCi/g, equivalent to 25 mrem/yr), NUREG 1757 (NRC 2006).

OW11B AND IE1 THRU IE8 AREA SOIL ANALYTICAL RESULTS (RADIONUCLIDES) NIAGARA FALLS STORAGE SITE LEWISTON, NEW YORK

US Army Corps of Engineers, Buffalo District

FIGURE 18

I:\111767811\GIS\BOP Inv Report (Revised)\18 OW11B & IE1 - IE8 SO ANALYTICAL - U.mxd 7/3/2013 MDL



Legend

- Monitoring Well Location
- Test Pit Location
- Manhole Location
- Former Railroad
- Road
- Ephemeral Ditch
- IWCS Cutoff Wall
- Former Remedial Structure
- Acid Sewer
- Culvert
- Drain Pipe
- Water Line
- Fuel Line
- Sanitary Sewer
- Storm Sewer
- EU Boundaries
- Active Structure
- Abandoned Structure Above Grade
- Former Structure
- Surface Water

Notes:
The analytical results shown are only those parameters exceeding the criteria, except Total Uranium. Total Uranium concentrations are shown for all samples. All results are shown in µg/L. Metals and radionuclides results shown represent unfiltered (or total) concentrations.

Criteria:
For Organics, Inorganics, and Metals, NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations, February 16, 2008, Class GA; For Total Uranium and Radionuclides, USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

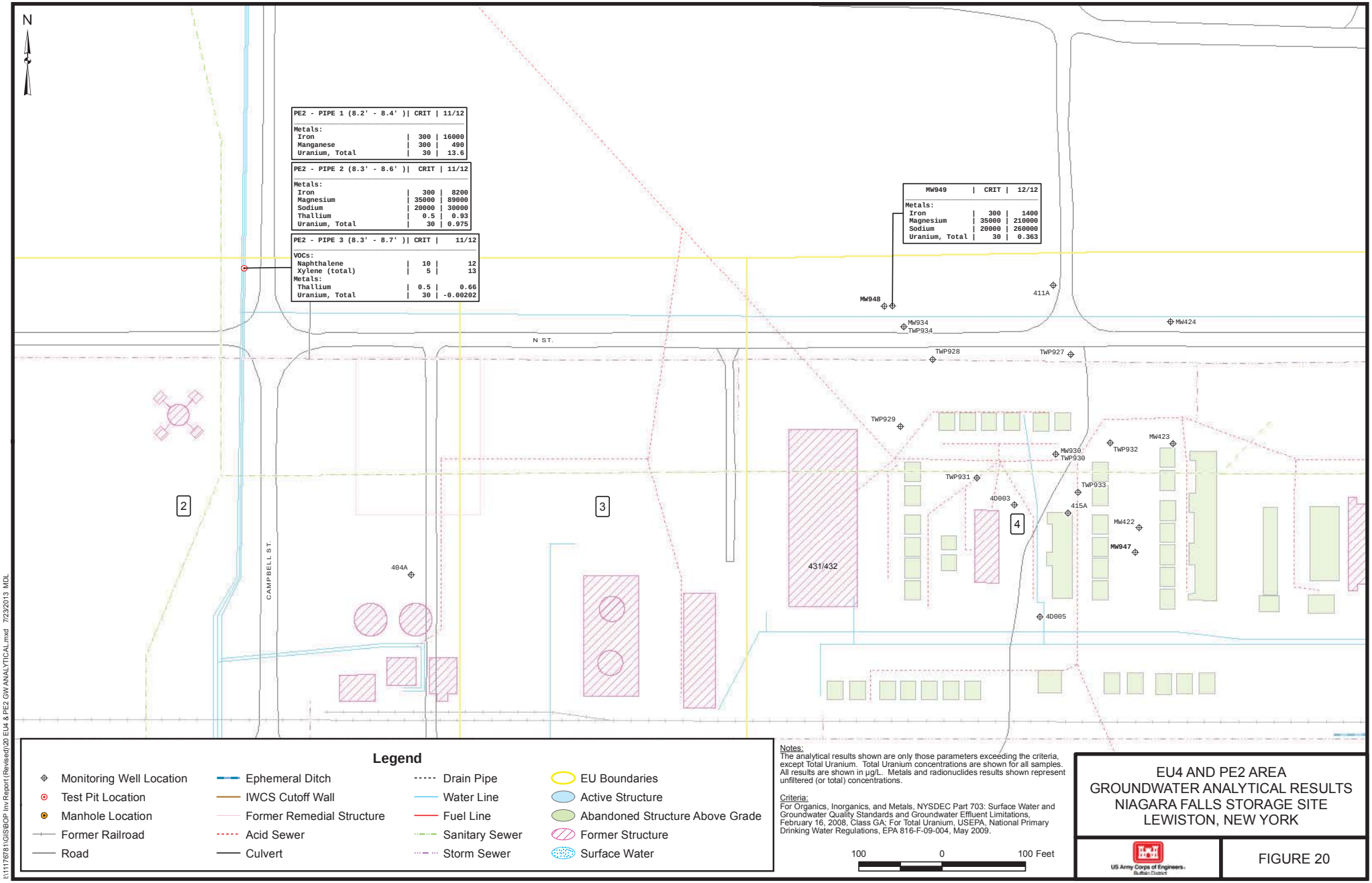
70 0 70 Feet

EU10, PE1, AND PE6 AREA WATER ANALYTICAL RESULTS NIAGARA FALLS STORAGE SITE LEWISTON, NEW YORK

US Army Corps of Engineers, Buffalo District

FIGURE 19

I:\111767811\GIS\BOP Inv Report (Revised)\19 EU10, PE1, & PE6 GW ANALYTICAL.mxd 7/23/2013 MDL



Legend

- Monitoring Well Location
- Test Pit Location
- Manhole Location
- Former Railroad
- Road
- Ephemeral Ditch
- IWCS Cutoff Wall
- Former Remedial Structure
- Acid Sewer
- Culvert
- Drain Pipe
- Water Line
- Fuel Line
- Sanitary Sewer
- Storm Sewer
- EU Boundaries
- Active Structure
- Abandoned Structure Above Grade
- Former Structure
- Surface Water

Notes:
The analytical results shown are only those parameters exceeding the criteria, except Total Uranium. Total Uranium concentrations are shown for all samples. All results are shown in µg/L. Metals and radionuclides results shown represent unfiltered (or total) concentrations.

Criteria:
For Organics, Inorganics, and Metals, NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations, February 16, 2008, Class GA; For Total Uranium, USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

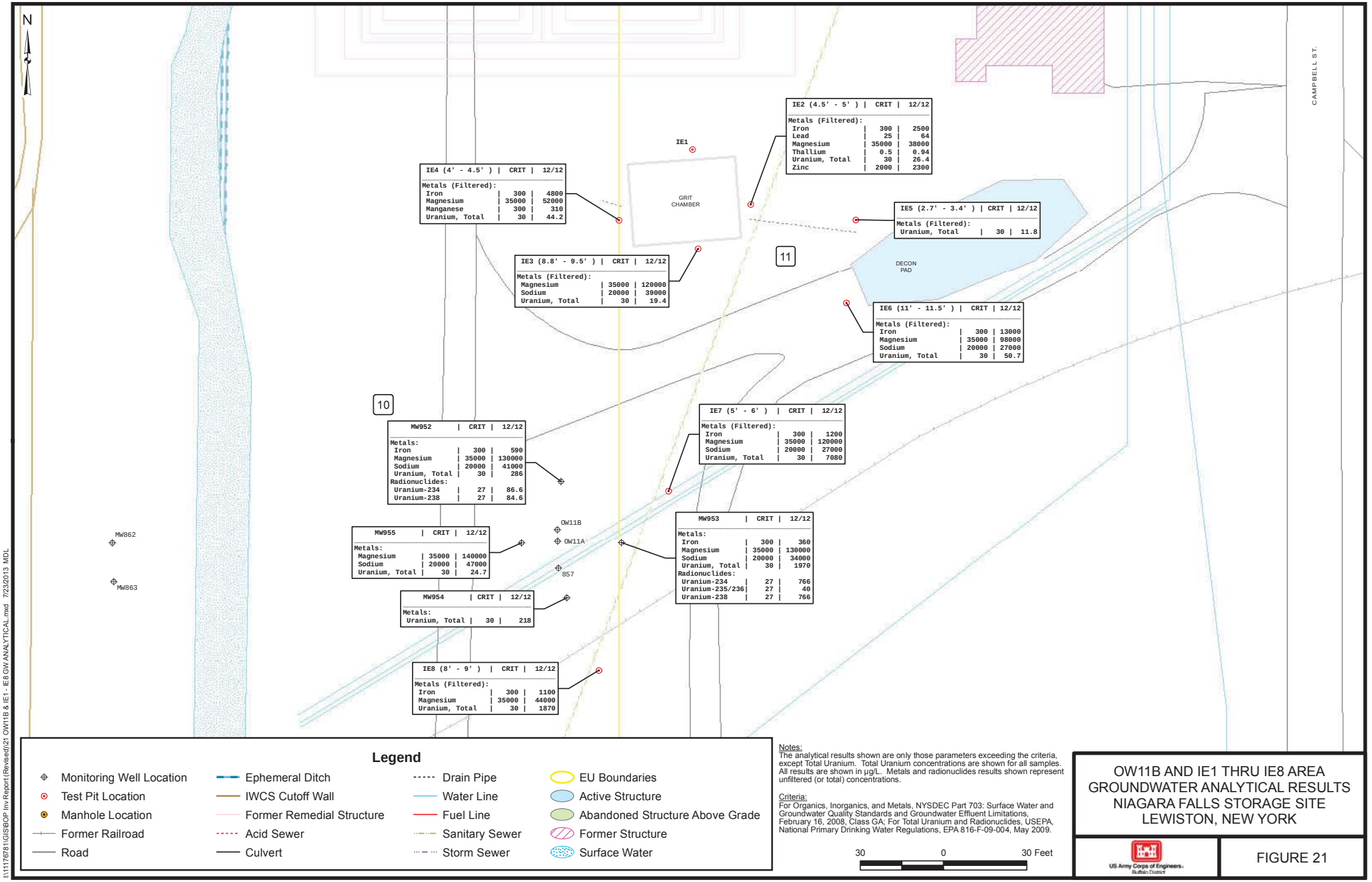
100 0 100 Feet

EU4 AND PE2 AREA GROUNDWATER ANALYTICAL RESULTS NIAGARA FALLS STORAGE SITE LEWISTON, NEW YORK

US Army Corps of Engineers, Buffalo District

FIGURE 20

I:\111767811\GIS\BOP Inv Report (Revised)\20 EU4 & PE2 GW ANALYTICAL.mxd 7/23/2013 MDL



Notes:
The analytical results shown are only those parameters exceeding the criteria, except Total Uranium. Total Uranium concentrations are shown for all samples. All results are shown in µg/L. Metals and radionuclides results shown represent unfiltered (or total) concentrations.

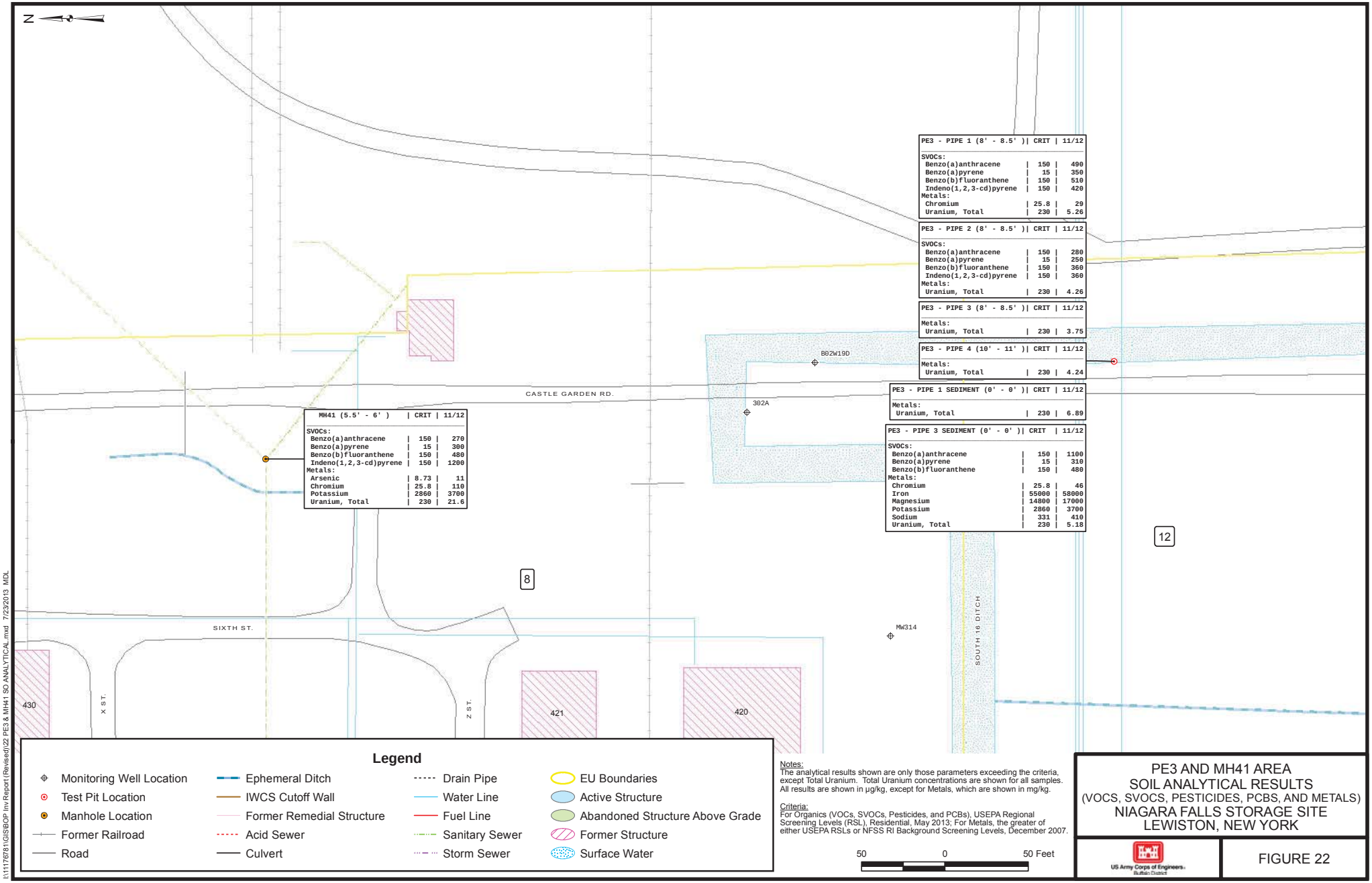
Criteria:
For Organics, Inorganics, and Metals, NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations, February 16, 2008, Class GA; For Total Uranium and Radionuclides, USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

OW11B AND IE1 THRU IE8 AREA GROUNDWATER ANALYTICAL RESULTS NIAGARA FALLS STORAGE SITE LEWISTON, NEW YORK

US Army Corps of Engineers, Buffalo District

FIGURE 21

I:\111767811\GIS\BOP Inv Report (Revised)\21 OW11B & IE1 - IE8 GW ANALYTICAL.mxd 7/23/2013 MDL



MH41 (5.5' - 6')	CRIT	11/12
SVOCs:		
Benzo(a)anthracene	150	270
Benzo(a)pyrene	15	300
Benzo(b)fluoranthene	150	480
Indeno(1,2,3-cd)pyrene	150	1200
Metals:		
Arsenic	8.73	11
Chromium	25.8	110
Potassium	2860	3700
Uranium, Total	230	21.6

PE3 - PIPE 1 (8' - 8.5')	CRIT	11/12
SVOCs:		
Benzo(a)anthracene	150	490
Benzo(a)pyrene	15	350
Benzo(b)fluoranthene	150	510
Indeno(1,2,3-cd)pyrene	150	420
Metals:		
Chromium	25.8	29
Uranium, Total	230	5.26

PE3 - PIPE 2 (8' - 8.5')	CRIT	11/12
SVOCs:		
Benzo(a)anthracene	150	280
Benzo(a)pyrene	15	250
Benzo(b)fluoranthene	150	360
Indeno(1,2,3-cd)pyrene	150	360
Metals:		
Uranium, Total	230	4.26

PE3 - PIPE 3 (8' - 8.5')	CRIT	11/12
Metals:		
Uranium, Total	230	3.75

PE3 - PIPE 4 (10' - 11')	CRIT	11/12
Metals:		
Uranium, Total	230	4.24

PE3 - PIPE 1 SEDIMENT (0' - 0')	CRIT	11/12
Metals:		
Uranium, Total	230	6.89

PE3 - PIPE 3 SEDIMENT (0' - 0')	CRIT	11/12
SVOCs:		
Benzo(a)anthracene	150	1100
Benzo(a)pyrene	15	310
Benzo(b)fluoranthene	150	480
Metals:		
Chromium	25.8	46
Iron	55000	58000
Magnesium	14800	17000
Potassium	2860	3700
Sodium	331	410
Uranium, Total	230	5.18

Legend

- Monitoring Well Location
- Test Pit Location
- Manhole Location
- Former Railroad
- Road
- Ephemeral Ditch
- IWCS Cutoff Wall
- Former Remedial Structure
- Acid Sewer
- Culvert
- Drain Pipe
- Water Line
- Fuel Line
- Sanitary Sewer
- Storm Sewer
- EU Boundaries
- Active Structure
- Abandoned Structure Above Grade
- Former Structure
- Surface Water

Notes:
The analytical results shown are only those parameters exceeding the criteria, except Total Uranium. Total Uranium concentrations are shown for all samples. All results are shown in µg/kg, except for Metals, which are shown in mg/kg.

Criteria:
For Organics (VOCs, SVOCs, Pesticides, and PCBs), USEPA Regional Screening Levels (RSL), Residential, May 2013; For Metals, the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007.

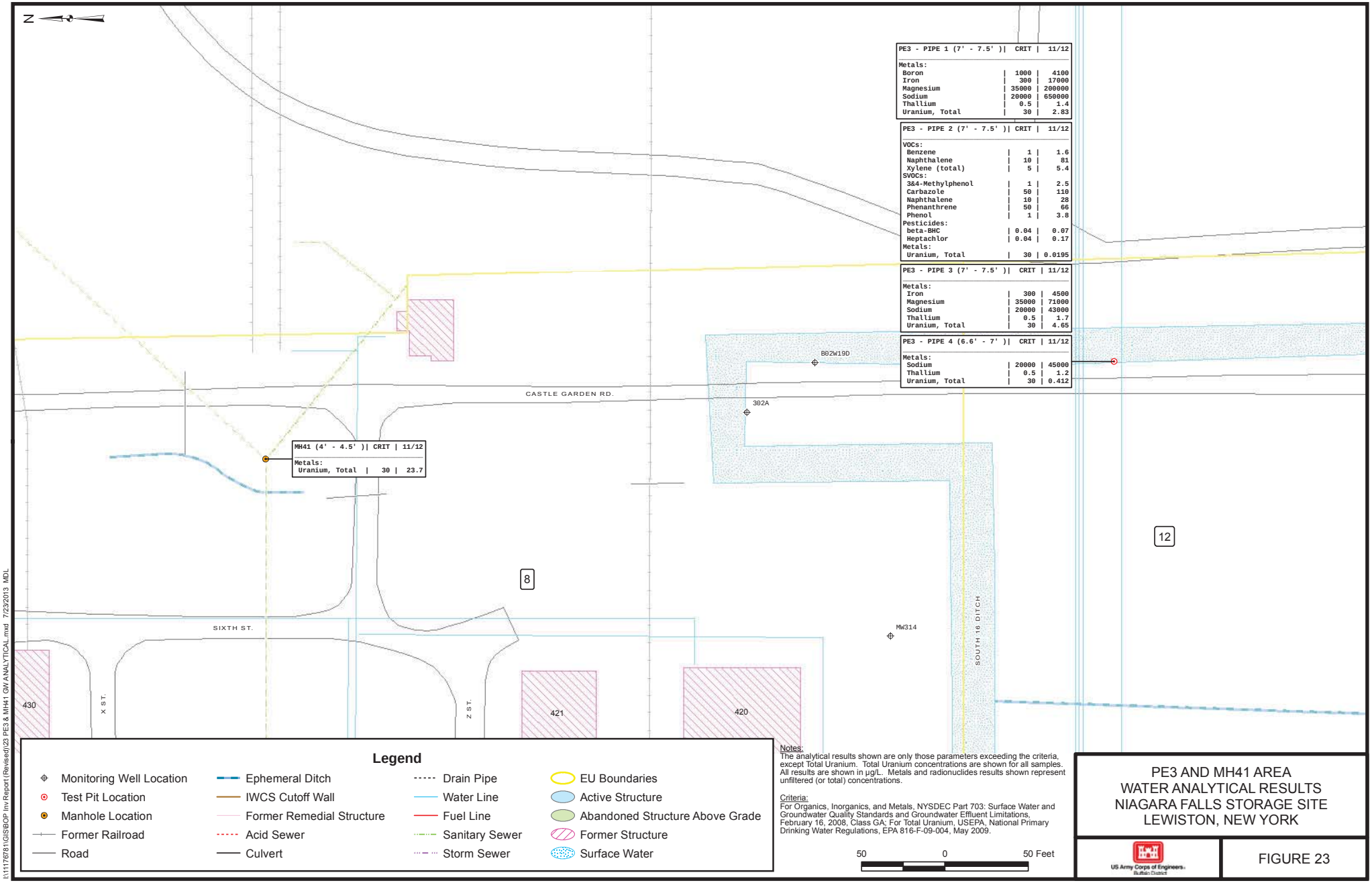
50 0 50 Feet

PE3 AND MH41 AREA
SOIL ANALYTICAL RESULTS
(VOCS, SVOCS, PESTICIDES, PCBS, AND METALS)
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK

US Army Corps of Engineers
Buffalo District

FIGURE 22

I:\111767811\GIS\BOP Inv Report (Revised)\22 PE3 & MH41 SO ANALYTICAL.mxd 7/23/2013 MDL



Notes:
The analytical results shown are only those parameters exceeding the criteria, except Total Uranium. Total Uranium concentrations are shown for all samples. All results are shown in µg/L. Metals and radionuclides results shown represent unfiltered (or total) concentrations.

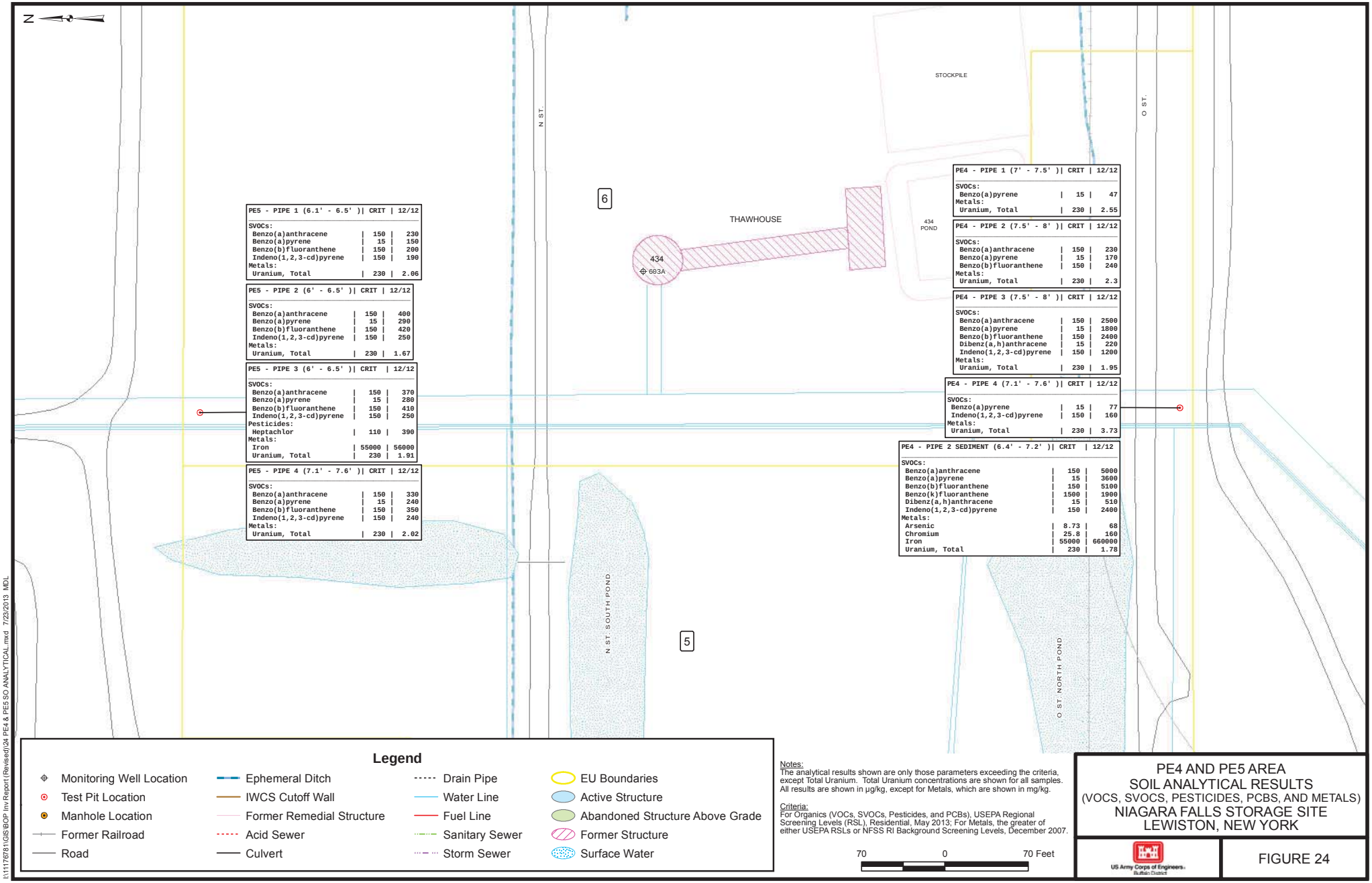
Criteria:
For Organics, Inorganics, and Metals, NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations, February 16, 2008, Class GA; For Total Uranium, USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

PE3 AND MH41 AREA WATER ANALYTICAL RESULTS NIAGARA FALLS STORAGE SITE LEWISTON, NEW YORK

US Army Corps of Engineers, Buffalo District

FIGURE 23

I:\111767811\GIS\BOP Inv Report (Revised)\23 PE3 & MH41 GW ANALYTICAL.mxd 7/23/2013 MDL



Notes:
The analytical results shown are only those parameters exceeding the criteria, except Total Uranium. Total Uranium concentrations are shown for all samples. All results are shown in µg/kg, except for Metals, which are shown in mg/kg.

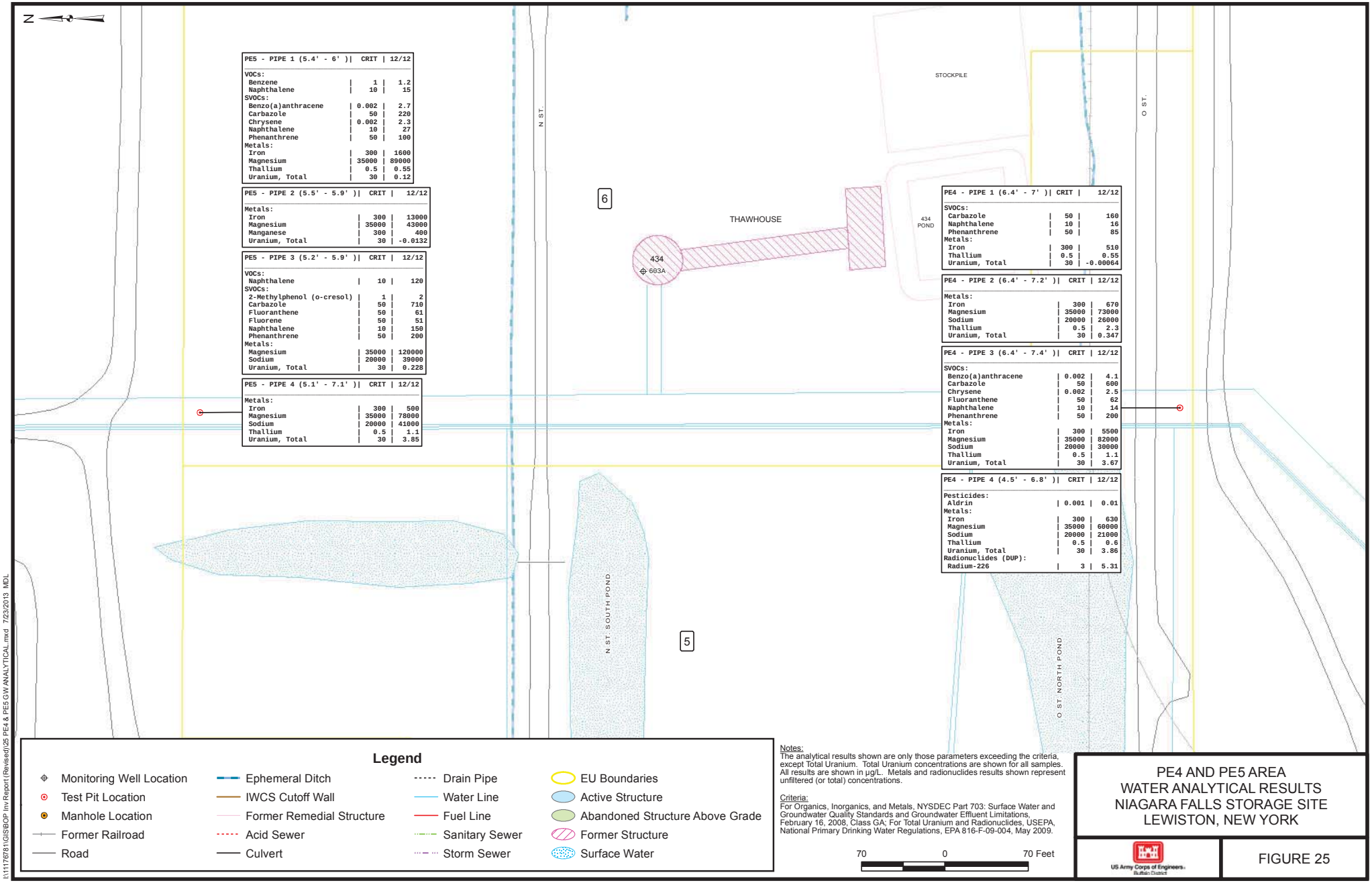
Criteria:
For Organics (VOCs, SVOCs, Pesticides, and PCBs), USEPA Regional Screening Levels (RSL), Residential, May 2013; For Metals, the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007.

PE4 AND PE5 AREA
SOIL ANALYTICAL RESULTS
(VOCS, SVOCS, PESTICIDES, PCBS, AND METALS)
NIAGARA FALLS STORAGE SITE
LEWISTON, NEW YORK

US Army Corps of Engineers
Buffalo District

FIGURE 24

I:\111767811\GIS\BOP Inv Report (Revised)\24 PE4 & PE5 SO ANALYTICAL.mxd 7/23/2013 MDL



Notes:
The analytical results shown are only those parameters exceeding the criteria, except Total Uranium. Total Uranium concentrations are shown for all samples. All results are shown in µg/L. Metals and radionuclides results shown represent unfiltered (or total) concentrations.

Criteria:
For Organics, Inorganics, and Metals, NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations, February 16, 2008, Class GA; For Total Uranium and Radionuclides, USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

PE4 AND PE5 AREA WATER ANALYTICAL RESULTS NIAGARA FALLS STORAGE SITE LEWISTON, NEW YORK

US Army Corps of Engineers
Buffalo District

FIGURE 25

I:\111767811\GIS\BOP Inv Report (Revised)\25 PE4 & PE5 GW ANALYTICAL.mxd 7/23/2013 MDL

TABLE 1

SUMMARY OF GEOPHYSICAL SURVEY RESULTS

Area of Interest	Geophysical Results
MW944 & MW945	No utilities or objects detected. MW944 is located close to fence and the presence or absence of subsurface metal objects in such areas cannot be determined on the basis of the EM61, EM31, or magnetometer data alone due to the interference caused by the surface metal objects (e.g., fence).
MW946 (A & B)*	No utilities detected. A small buried metallic object was detected approximately 2.4 meters (8 feet) southeast of MW946B. (Note: A and B represent alternate staked locations for MW946. The MW946B location was the final selected location of the well).
MW947	No utilities detected. An area of possible buried metal was detected approximately 0.6 meter (2 feet) south and a small buried metal object was detected approximately 1.5 meters (5 feet) west of MW947.
MW948 & MW949	A water line was detected approximately 0.9 meter (3 feet) south of MW948 and approximately 1.5 meters (5 feet) south of MW949.
MW951	An area of possible buried metal was detected approximately 0.91 meter (3 feet) east of MW951.
MW956	MW956 is located close to fence and the presence or absence of subsurface metal objects in such areas cannot be determined on the basis of the EM61, EM31, or magnetometer data alone due to the interference caused by the surface metal objects (e.g., fence).
MW957	A water line was detected approximately 2.4 meters (8 feet) southeast of MW957.
MW958	No utilities detected. An area of possible metal was detected approximately 1.2 meters (4 feet) southwest of MW958.
MW959	A water line was detected approximately 6.7 meters (22 feet) northwest of MW959. An area of possible buried metal was detected approximately 0.3 meter (1 foot) north of MW959.
MW960	Water lines were detected approximately 6 feet northwest and approximately 3.4 meters (11 feet) northeast of MW960.
PE1	Target northeast-southwest oriented water line was detected in the area of interest. Several areas of possible buried metal were detected in the area of interest.
PE2	A north-south oriented water line, previously plugged by USACE, was detected in the area of interest. An area of possible buried metal, coincident with the water line, was also detected in the area of interest. The area of the three water lines scheduled for cutting and plugging by URS was detected through the EM31 in-phase component of the survey.
PE3	The survey identified two east-west oriented water lines, approximately 8.2 meters (27 feet) apart. Subsequent excavation by URS confirmed that the northern line actually consisted of three east-west oriented lines in close proximity to each other. The south water line was confirmed to be a 0.91-meter (36-inch) diameter water line.
LEW1 Includes: MW952 - MW955 and IE1 - IE8	Three northeast-southwest oriented water lines were detected in LEW1. A former grit chamber was also detected in LEW1. MW953, MW954, MW955, IE4, IE5, and IE7 are located closer than 3 meters (10 feet) from detected water lines. The sewer system known to be present in this area was not detected by the geophysical survey because it was encased in concrete.

Notes:

* - USACE identified two possible locations for proposed well MW946. The MW946B location was selected.

TABLE 2

RADIATION DETECTION INSTRUMENTATION

Function	Radiation Detected	Instrument	Detector
Frisking	Alpha-beta-gamma	Ludlum Model 12	Ludlum Model 44-9 Geiger-Mueller (GM) pancake
Surface gamma survey; excavation survey	Gamma	Ludlum Model 2221	Ludlum Model 44-10 NaI scintillator (5-centimeter x 5 centimeter (2 inch x 2 inch))
Soil core logging	Alpha-beta-gamma	Ludlum Model 12	Ludlum Model 44-9 Geiger-Mueller (GM) pancake
Soil core logging	Alpha-beta	Ludlum Model 2360 scaler/ ratemeter	Ludlum Model 43-93 scintillator
Down-hole borehole logging	Gamma	Ludlum Model 2350-1 digital scalar/ratemeter	Ludlum Model 44-10 NaI scintillator (5-centimeter x 5 centimeter (2 inch x 2 inch))
General radiation surveys – equipment, surfaces	Alpha-beta-gamma	Ludlum Model 12 or Model 2221	Ludlum Model 44-9 Geiger-Mueller (GM) pancake
Radiation exposure rates	Gamma	Ludlum Model 2350-1 scaler/ ratemeter	Ludlum Model 44-2 NaI scintillator (2.5-centimeter x 2.5 centimeter (1 inch x 1 inch))
		Ludlum Model 12s	Integrated NaI detector
Smear counting	Alpha-beta	Ludlum Model 2929 dual channel scaler	Ludlum Model 43-10-1 scintillator

TABLE 3

GAMMA WALKOVER SURVEY SUMMARY

(44-10 Nal Detector)

Location	Pre Work Survey				Post Work Survey			
	# of GPS readings	Low (µR/h)	High (µR/h)	Average (µR/h)	# of GPS readings	Low (µR/h)	High (µR/h)	Average (µR/h)
MW960	372	8.4	13.6	9.8	425	8.4	12.5	10
MW959	342	8.1	10.9	9.6	449	8	12.2	9.8
MW958	287	8.7	27.6	11.4	429	7.9	13.1	10.5
MW957	319	5.4	19.1	8.8	318	5.5	11.6	8.1
MW956	393	4.7	9.8	7.4	398	5.1	11.2	8.2
MW946	1,082	6	12.3	7.9	311	6.1	10.6	8.1
MW947	357	7.5	13.2	9.2	312	7.9	12.2	10
MW950	299	7.3	18.2	9	229	6.8	11.4	9.1
MW951	362	8.4	11.1	9.6	283	7.4	11.8	9.7
MW948 & MW949	464	6.5	10.1	8.5	356	6.9	11.9	9.4
MW944 & MW945	528	5	13.3	7	465	5.1	9	6.5
MW952 thru MW955 & IE7 & 8	1,026	5.3	17.4	9.4	1,076	5.5	12.8	9.8
IE1-IE6	1,857	5.1	11.4	8.4	1,273	5.3	11.9	8.8
PE1	229	6.4	16.2	10.1	408	6.2	13.1	10.5
PE2	463	8.1	23.1	11	465	6.8	20.3	11.3
PE3	340	8.9	16.2	11.7	594	9.1	16.8	11.9
PE4	495	7.5	13.9	10.1	NA	7.8	13.3	11.3
PE5	NA	4.4	10	7.8	NA	4.4	10	8.8
PE6	420	7.9	12.4	9.9	NA	8.9	12.2	10.3
MH4	216	7.7	13.7	9.4	302	7.8	15.5	10.3
MH8	499	8	12.3	10	NA	5.6	12.5	8.9
Existing Decon Pad	293	5.6	8.2	6.5	NA	4.4	7.8	5.6
Conex Box	775	4.8	15.6	7.2	NM			
Woods	96	6.4	17.1	9.7	NM			

Notes:

NA: Not applicable - GPS not used to record survey points

NM: Not measured. Post work surveys were not performed on the Conex box or in the woods.

µR/h: Microroentgen per hour

TABLE 4

MONITORING WELL RADIATION SURVEY SUMMARY

Excavation Area	Gamma Down-hole	GM Pancake		Alpha		Beta	
	44-10 Nal Detector	44-9 Detector		43-93 Detector		43-93 Detector	
	Max (cpm)	Low (cpm)	High (cpm)	Low (cpm)	High (cpm)	Low (cpm)	High (cpm)
MW944	13,631	32	82	0	6	164	274
MW945	13,011	34	68	0	6	176	250
MW946	12,337	36	76	0	10	170	274
MW947	12,880	24	74	0	6	174	294
MW948	12,726	34	78	0	5	192	272
MW949	13,186	30	86	0	6	176	292
MW950	14,275	30	80	0	18	174	284
MW951	12,503	44	98	0	12	182	286
MW952	12,889	48	92	0	6	166	294
MW953	14,948	52	90	0	8	274	404
MW954	13,529	46	88	0	8	196	342
MW955	13,339	28	102	0	6	180	370
MW956	13,648	40	82	0	12	182	294
MW957	13,310	38	102	0	6	206	366
MW958	14,170	42	82	0	8	218	322
MW959	13,257	46	88	0	6	194	324
MW960	14,359	42	88	0	16	184	324

Notes:

CPM: Counts per minute

TABLE 5

INVESTIGATION TRENCH GAMMA SURVEY SUMMARY

(44-10 Nal Detector)

Excavation Area	Excavated Soils		Excavation	
	Low (cpm)	High (cpm)	Low (cpm)	High (cpm)
IE1	8,000	12,000	9,976	16,504
IE2	7,000	11,000	10,550	17,684
IE3	5,000	12,000	9,584	17,430
IE4	9,000	13,000	9,818	17,316
IE5	7,000	11,000	10,900	19,262
IE6	7,000	12,000	7,098	17,140
IE7	9,000	15,000	11,652	17,986
IE8	9,000	14,000	13,736	18,036

Notes:

CPM: Counts per minute

TABLE 6

PIPELINE EXCAVATION GAMMA SURVEY SUMMARY

(44-10 Nal Detector)

Excavation Area	Excavated Soils			Excavation			
	Low (cpm)	High (cpm)	Average (cpm)	Low (cpm)	High (cpm)	Average (cpm)	Max 1 minute count
PE1	9,000	15,000	11,000	9,000	17,000	16,000	17,235
PE2	9,000	14,000	11,000	13,000	16,000	15,000	16,130
PE3	9,000	14,000	11,000	9,000	16,000	14,000	15,888
PE4	8,000	12,000	10,000	11,000	14,000	12,000	14,545
PE5	7,000	12,000	9,000	9,000	13,000	10,000	13,278
PE6	9,000	13,000	10,000	13,000	16,000	14,000	

Notes:

CPM: Counts per minute

TABLE 7

MONITORING WELL LOCATION INFORMATION

Well Identification	Location	Depth*	Water-Bearing Zone	Figure
MW944	EU1, northwest of existing well MW921	5.18 m (17 ft)	UWBZ	4
MW945	EU1, northwest of existing well MW921	6.10 m (20 ft)	UWBZ	4
MW946	EU2, southeast of existing well 808A	4.57 m (15 ft)	UWBZ	4
MW947	EU4, southeast of existing well 415A	6.10 m (20 ft)	UWBZ	5
MW948	EU4, northwest of existing well MW934	4.57 m (15 ft)	UWBZ	5
MW949	EU4, near MW948	12.9 m (40 ft)	LWBZ	5
MW950 and MW951	EU10, at former temporary well points 831 and 833, respectively	6.10 m (20 ft)	UWBZ	6
MW952, MW953, and MW954	EU10, north, south, east, and west of existing well OW11B	3.04 m (10 ft)	UWBZ	6
MW955	EU10, north, south, east, and west of existing well OW11B	4.57 m (15 ft)	UWBZ	6
MW956	EU10, south of IWCS (Near wells 832, 850, 853, 854, 855, OW07B, and OW13B)	6.10 m (20 ft)	UWBZ	6
MW957	EU10, south of IWCS (Near wells 832, 850, 853, 854, 855, OW07B, and OW13B)	4.57 m (15 ft)	UWBZ	6
MW958	EU10, south of IWCS (Near wells 832, 850, 853, 854, 855, OW07B, and OW13B)	3.04 m (10 ft)	UWBZ	6
MW959, and MW960	EU10, south of IWCS (Near wells 832, 850, 853, 854, 855, OW07B, and OW13B)	4.57 m (15 ft)	UWBZ	6

* The actual well completion depths were determined using a visual determination of the base of the UWBZ and the top of the underlying Gray Clay Unit. The originally proposed monitoring well "target" depths were based on the depths of the UWBZ as encountered in the existing wells identified in the "Location" column.

TABLE 8

DRILLING OBSERVATIONS

Well	Total Depth (ft, bgs)	Depth to Groundwater* (ft, bgs)	Maximum PID Reading (ppm)	Maximum Radiation Measurements						Observations
				GM Pancake** (44-9 Detector)		Alpha** (43-93 Detector)		Beta** (43-93 Detector)		
				Low (cpm)	High (cpm)	Low (cpm)	High (cpm)	Low (cpm)	High (cpm)	
MW944	17	Dry	0	32	82	0	6	164	274	Fill underlain by brown to gray-brown clayey silt with some silt and sand lenses to 16 ft. Underlain by gray silty clay. No evidence of apparent contamination
MW945	20	Dry	0	34	68	0	6	176	250	Topsoil underlain by 15 feet of brown to gray-brown silty clay with some sand and silt lenses. Underlain by gray silty clay at 15.5 ft. No evidence of apparent contamination.
MW946	15	12.09	0	36	76	0	10	170	274	Topsoil underlain by 12 feet of brown silty clay, trace to some sand and gravel. Underlain by gray clay. No evidence of apparent contamination.
MW947	20	17.92	0	24	74	0	6	174	294	Topsoil underlain by 17.7 ft of brown silty clay with some silt and sand lenses. Underlain by gray silty clay. No evidence of apparent contamination.
MW948	15	Dry	0	34	78	0	5	192	272	Topsoil underlain by 14.5 ft of brown to gray-brown silty clay with trace to some sand and gravel. Underlain by gray silty clay. No evidence of apparent contamination.
MW949	40	10.15	0	30	86	0	6	176	292	Topsoil underlain by 15 ft of brown to gray-brown silty clay with some sand lenses. Gray silty clay to clay to 32.5 ft. Underlain by brown silty sand to 40 ft. Sand seam at 34.5 to 37'. No evidence of apparent contamination.
MW950	20	3.43	0	30	80	0	18	174	284	Topsoil underlain by 13.5 ft of brown clayey silt to silty clay with trace to some sand and gravel. Underlain by gray-brown silty clay. No evidence of apparent contamination.
MW951	20	4.32	0	44	98	0	12	182	286	Topsoil underlain by 16.5 ft of brown to gray-brown clayey silt to silty clay with trace to some sand and gravel. Some silt and sand lenses. Underlain by gray-brown clayey silt to clay. No evidence of apparent contamination.
MW952	10	1.50	0	48	92	0	6	166	294	Topsoil underlain by brown to gray clayey silt to silty clay with trace to some sand and gravel. Some silt partings. No evidence of apparent contamination.
MW953	10	5.11	0	52	90	0	8	274	404	Topsoil underlain by brown silty clay with trace to some sand and gravel. Silt and sand seam at 6.5 to 9'. Underlain by gray-brown silty clay. No evidence of apparent contamination.

TABLE 8

DRILLING OBSERVATIONS

Well	Total Depth (ft, bgs)	Depth to Groundwater* (ft, bgs)	Maximum PID Reading (ppm)	Maximum Radiation Measurements						Observations
				GM Pancake** (44-9 Detector)		Alpha** (43-93 Detector)		Beta** (43-93 Detector)		
				Low (cpm)	High (cpm)	Low (cpm)	High (cpm)	Low (cpm)	High (cpm)	
MW954	10	7.48	0	46	88	0	8	196	342	Topsoil underlain by 9.2 ft of brown silty clay with some sand and gravel. Underlain by gray-brown silty clay. No evidence of apparent contamination.
MW955	15	2.73	0	28	102	0	6	180	370	Topsoil underlain by 5 ft of brown silty clay with some sand and gravel. Underlain by silty sand with some gravel to 14 ft. Underlain by gray silty clay. No evidence of apparent contamination.
MW956	20	6.43	0	40	82	0	12	182	294	Topsoil underlain by 14 ft of brown to gray-brown silty clay to clayey silt with some sand and gravel. Silty sand from 14 to 16 ft. Underlain by gray silty clay. No evidence of apparent contamination.
MW957	15	6.87	0	38	102	0	6	206	366	Topsoil underlain by 14 ft of brown to gray-brown silty clay to clayey silt with some sand and gravel. Silty sand at 5.8 to 8 ft and 9.8 to 10.8 ft. Underlain by gray clay. No evidence of apparent contamination.
MW958	10	8.98	0	42	82	0	8	218	322	Topsoil underlain by 8.5 ft of brown silty clay with some sand and gravel. Silty sand at 3 to 3.8 ft and 5 to 5.5 ft. Underlain by gray silty clay. No evidence of apparent contamination.
MW959	15	5.59	0	46	88	0	6	194	324	Topsoil underlain by 13 ft of brown to gray-brown silty clay to clayey silt with some sand and gravel. Silty sand from 13 to 14 ft. Underlain by brown-gray silty clay. No evidence of apparent contamination.
MW960	15	4.23	0	42	88	0	16	184	324	Topsoil underlain by 4 ft of brown clayey silt with some sand and gravel. Sand from 4.5 to 7 ft. Silty clay from 7 to 9.5 ft and sand from 9.5 to 10.8 ft. Underlain by gray-brown to gray silty clay. No evidence of apparent contamination.

Notes:
* Measured at time of well development
** Summary of core scan results

TABLE 9

MONITORING WELL SOIL SAMPLE SELECTION INFORMATION

Well	Total Depth (ft)	Sample Intervals (ft)	Gamma Down-hole (44-10 Detector) (cpm)	GM Pancake (44-9 Detector) (cpm)	Alpha (43-93 Detector) (cpm)	Beta (43-93 Detector) (cpm)	Rationale
MW944	17	0.0-0.5	7596	48	4	172	Surface soil sample
		2.0-2.5	13646	28	0	216	High gamma
		10.0-11.0	11606	58	0	188	Midpoint of screen
		13.0-13.5	12176	82	0	184	High GM
MW945	20	0.0-0.5	7518	40	0	207	Surface soil sample
		3.5-4.0	12940	48	4	206	High gamma
		9.5-10.0	11800	64	0	206	Midpoint of screen
		12.5-13.0	9736	62	0	176	2nd high GM
MW946	15	0.0-0.5	7072	44	4	170	Surface soil sample
		6.0-6.5	12354	76	2	254	High gamma
		8.0-8.5	11234	56	2	230	Midpoint of screen
		12.0-12.5	12664	36	6	274	High alpha
MW947	20	0.0-0.5	8092	62	2	206	Surface soil sample
		2.0-2.5	12060	74	4	244	High GM
		14.0-14.5	8898	24	0	200	Midpoint of screen
		18.0-18.5	13140	42	2	248	High gamma
MW948	15	0.0-0.5	8384	34	0	192	Surface soil sample
		5.5-6.0	12666	44	0	244	High gamma
		10.0-10.5	12542	58	0	224	Midpoint of screen
		13.0-13.5	12356	78	0	204	High GM
MW949	40	0.0-0.5	9188	46	0	188	Surface soil sample
		16.0-16.5	11556	86	4	258	High GM
		29.5-30.0	12626	62	0	244	High gamma
		34.5-35.0	10320	54	2	238	Midpoint of screen
MW950	20	0.0-0.5	6778	60	0	198	Surface soil sample
		2.0-2.5	14266	58	8	252	High gamma
		10.5-11.0	12508	80	4	248	High GM
		15.0-15.5	12682	66	2	256	Midpoint of screen
MW951	20	0.0-0.5	9554	58	2	220	Surface soil sample
		15.0-15.5	12030	70	0	228	Midpoint of screen
		17.5-18.0	12636	54	0	240	High gamma
		18.5-19.0	12378	98	2	234	Hi GM
MW952	10	0.0-0.5	9950	62	0	294	Surface soil sample
		4.0-4.5	12324	72	4	254	Second highest GM
		6.0-6.5	13112	60	4	202	High gamma
		6.5-7.0	12964	72	6	260	Midpoint of screen
MW953	10	0.0-0.5	10842	90	0	286	Surface soil sample
		1.0-2.0	15516	68	4	342	High gamma
		4.0-4.5	14046	90	8	354	High GM
		6.0-6.5	13292	74	2	312	Midpoint of screen
MW954	10	0.0-0.5	10182	62	2	196	Surface soil sample
		2.0-2.5	13354	64	4	342	High gamma
		5.5-6.0	13018	88	2	262	High GM
		8.5-9.0	11340	56	0	200	Midpoint of screen

TABLE 9

MONITORING WELL SOIL SAMPLE SELECTION INFORMATION

Well	Total Depth (ft)	Sample Intervals (ft)	Gamma Down-hole (44-10 Detector) (cpm)	GM Pancake (44-9 Detector) (cpm)	Alpha (43-93 Detector) (cpm)	Beta (43-93 Detector) (cpm)	Rationale
MW955	15	0.0-0.5	9874	54	0	370	Surface soil sample
		0.5-1.0	11820	102	4	360	High GM
		2.5-3.0	13408	82	2	304	High gamma
		7.0-8.0	9306	62	4	216	Midpoint of screen
MW956	20	0.0-0.5	10978	46	0	190	Surface soil sample
		2.0-3.0	13770	42	2	222	High gamma
		15.5-16.0	10336	58	12	222	High alpha
		16.5-17	11228	60	2	228	Midpoint of screen
MW957	15	0.0-0.5	9554	48	0	246	Surface soil sample
		2.0-2.5	13756	64	2	240	High gamma
		4.0-4.5	13594	102	4	366	High GM
		7.0-7.5	9494	62	4	242	Midpoint of screen
MW958	10	0.0-0.5	10020	62	0	280	Surface soil sample
		4.5-5.0	11652	82	6	286	High GM
		7.5-8.0	14208	60	4	266	Midpoint of screen
		8.5-9.0	14184	52	8	322	2nd highest gamma
MW959	15	0.0-0.5	9824	50	0	246	Surface soil sample
		8.0-8.5	13774	76	2	298	High gamma
		13.0-13.5	11554	46	2	240	Midpoint of screen
		14.0-14.5	11536	88	2	198	High GM
MW960	15	0.0-0.5	5210	70	2	214	Surface soil sample
		2.0-3.0	14442	80	4	324	High gamma
		9.5-10.0	11084	62	16	200	Midpoint of screen
		12.0-12.5	12402	76	6	264	Second highest GM

Notes:

CPM: Counts per minute

GM: Geiger-Mueller

TABLE 10

WELL CONSTRUCTION INFORMATION

WELL ID	COORDINATES		ELEVATION			RISER HEIGHT	TOTAL DEPTH	WELL CONSTRUCTION DETAILS									
								SCREEN		SANDPACK		BENTONITE		CONCRETE		SEPARATION CASING	
	NORTHING	EASTING	GROUND	CASING	RISER			TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM
						(ft)	(ft, bgs)	(ft, bgs)	(ft, bgs)	(ft, bgs)	(ft, bgs)	(ft, bgs)	(ft, bgs)	(ft, bgs)	(ft, bgs)	(ft, bgs)	(ft, bgs)
MW944	1173313.59	1040008.902	316.043	318.93	318.64	2.6	17	7.5	12.5	5.5	17	4	5.5	0	4	-	-
MW945	1173319.797	1040037.742	317.552	320.61	320.24	2.7	20	6	16	4	20	3	4	0	3	-	-
MW946	1172923.608	1040719.731	316.716	319.94	319.65	2.9	15	7.5	12.5	5.5	15	3	5.5	0	3	-	-
MW947	1172887.178	1042564.362	319.392	322.76	322.53	3.1	20	8.5	18.5	6.5	20	4	6.5	0	4	-	-
MW948	1173182.578	1042263.192	318.039	321.29	321.04	3	15	5	15	4	15	3	4	0	3	-	-
MW949	1173182.892	1042272.833	318.072	321.21	320.96	2.9	40	30	40	28	40	6	28	0	6	2	17
MW950	1170882.707	1040800.395	319.122	322.28	322.03	2.9	20	10	20	7.8	20	3	7.8	0	3	-	-
MW951	1170894.878	1040961.694	317.802	321.22	320.84	3	20	10	20	7.8	20	3	7.8	0	3	-	-
MW952	1171236.823	1041253.078	317.129	320.4	320.16	3	10	4	9	3.5	10	3	3.5	0	3	-	-
MW953	1171214.809	1041274.898	316.936	320.24	319.94	3	10	4.5	9.5	4	10	3	4	0	3	-	-
MW954	1171194.942	1041255.184	316.777	320.09	319.85	3.1	10	5	10	4	10	3	4	0	3	-	-
MW955	1171214.696	1041238.949	317.055	320.39	320.09	3	15	5	15	4	15	3	4	0	3	-	-
MW956	1170812.661	1040758.599	320.136	323.38	323.13	3	20	10	20	8	20	3	8	0	3	-	-
MW957	1170788.68	1040883.536	321.463	324.85	324.48	3	15	5	15	4	15	3	4	0	3	-	-
MW958	1170696.512	1041028.952	316.707	320.13	319.77	3.1	10	5	10	4	10	3	4	0	3	-	-
MW959	1170851.24	1040999.84	317.447	320.99	320.56	3.1	15	5	15	4	15	3	4	0	3	-	-
MW960	1170911.415	1041044.646	318.01	321.34	321.02	3	15	5	15	4	15	3	4	0	3	-	-

Notes: Coordinates are based on State Plane Coordinate System New York West NAD 83, NAVD 88

TABLE 11

MONITORING WELL SOIL AND GROUNDWATER ANALYTICAL SCHEDULE

PARAMETER	METHOD	GROUNDWATER	SOIL
Mass Uranium(1)	ASTM D5174-02, Trace Uranium by Pulsed-Laser Phosphorimetry	Yes(2)	Yes
Isotopic Uranium-234, 235, and 238(1)	DOE EML HASL-300m, Alpha-Spectroscopy	Yes(2)	Yes
Radium-226	EPA 903.1, Radon Emanation/EPA 901.1 (soil)	Yes(2)	Yes
Radium-228	EPA 904.0, Gas Proportional Counting/EPA 901.1 (soil)	Yes(2)	Yes
Isotopic Thorium	DOE EML HASL-300m, Alpha-Spectroscopy	Yes(2)	Yes
Actinium-227, Cesium-137	EPA 901.1, Gamma Spectroscopy	No	Yes
Anions	EPA 300.0, Ion Chromatography	Yes(3)	No
Total Dissolved Solids	EPA 160.1	Yes(3)	No
Alkalinity (bicarbonate and carbonate)	EPA 310.1	Yes(3)	No
Metals, including Boron & Lithium	EPA SW846 6020/7470A/7471A	Yes(2)	Yes
Volatile Organic Compounds(4)	EPA SW846 8260B	Yes(3)	Yes

(1) Expedited turnaround time for these parameters was requested for groundwater samples from wells MW950 and MW951.

(2) Filtered and unfiltered.

(3) Unfiltered.

(4) Wells MW947, MW948, and MW949 only.

(5) When limited volume of sample was available, the priority of analysis was, from highest to lowest priority: radiation parameters, metals, VOCs, QA/QC duplicates, QA/QC MD, QA/QC MS, QA/QC MSD.

TABLE 12

PIPELINE EXCAVATION WATER ANALYTICAL SCHEDULE

PARAMETER	METHOD
Mass Uranium (Total-U) (filtered and unfiltered) [1]	ASTM D5174-02, Trace Uranium by Pulsed-Laser Phosphorimetry
Isotopic Uranium-234, 235/236 and 238 (filtered and unfiltered) [1]	DOE EML HASL-300m, Alpha-Spectroscopy
Radium- 226 (filtered and unfiltered)[1]	EPA 903.1, Radon Emanation
Radium- 228 (filtered and unfiltered)[1]	EPA 904.0, Gas Proportional Counting
Isotopic Thorium-228, 230 and 232 (filtered and unfiltered) [1]	DOE EML HASL-300m, Alpha-Spectroscopy
Anions (unfiltered only)	EPA 300.0, Ion Chromatography
Total Dissolved Solids (unfiltered only)	EPA 160.1
Alkalinity (unfiltered) (bicarbonate and carbonate)	EPA 310.1
Metals, including Boron and Lithium (filtered and unfiltered) [1]	EPA SW846 6020/7470A
Volatile organic compounds	EPA SW846 8260B
Semi-volatile organic compounds	EPA SW846 8270D
PCBs and Pesticides	EPA SW846 8082/8081A

(1) Liquid samples were filtered with disposable 0.45 micron in-line field filters.

TABLE 13

PIPELINE EXCAVATION SOIL AND SEDIMENT ANALYTICAL SCHEDULE

PARAMETER	METHOD[1]
Mass Uranium (Total-U)	ASTM D5174-02, Trace Uranium by Pulsed-Laser Phosphorimetry
Isotopic Uranium-234, 235/236 and 238	DOE EML HASL-300m, Alpha-Spectroscopy
Radium- 226	EPA 903.1, Radon Emanation / EPA 901.1
Radium- 228	EPA 904.0, Gas Proportional Counting / EPA 901.1
Isotopic Thorium -228, 230 and 232	DOE EML HASL-300m, Alpha-Spectroscopy
Actinium-227, Cesium-137	EPA 901.1, Gamma Spectroscopy
Metals, including Boron and Lithium	EPA SW846 6020/7471A
Volatile organic compounds	EPA SW846 8260B
Semi-volatile organic compounds	EPA SW846 8270D
PCBs and Pesticides	EPA SW 846 8082/8081A

(1) When limited volume of sample was available, the priority of analysis was, from highest to lowest priority: radiation parameters, metals, VOCs, SVOCs, pesticides/PCBs, QA/QC duplicates, QA/QC MD, QA/QC MS, QA/QC MSD.

TABLE 14

Pipeline Excavation Observations

Excavation ID	Dimensions (L x W x D)	Description	Pipelines Found	Samples					Observations
				Soil Below Pipe	Pipe Sediment	Pipe Water	Max. PID (ppm)	Max. RAD (cpm)[1]	
PE1	31' x 12' x 16'	Excavation near southeast corner of IWCS in EU10. Subsurface soils consisted of a thin layer of surficial fill underlain by reddish brown silty clay (CL) and pinkish to brownish gray silty clay (CH). No groundwater encountered. 10" inside diameter (ID) cast iron pipe encountered in approximate center of excavation at 14' below ground surface (bgs). No bedding around pipe.	10" ID	Yes	Yes	Yes	0	17,235	Pipeline under gravity pressure; removed 1,625 gallons of water to enable sampling/sealing. Sediment within pipe consisted of hard black scale.
PE2	21.5' x 4.5' x 9.5'	Excavation near northeastern corner of EU2, between "N" Street and chain link fence, just west of Campbell Street. Subsurface soils consisted of a thin layer of surficial fill underlain by brown to reddish brown silty clay (CL). No groundwater encountered. 4", 6", and 8" pipes located within ~4' of each other in excavation. No bedding around pipes.	4" OD	Yes	Yes	Yes	0	16,130	Pipeline under gravity pressure. Removed 525 gallons of water to enable sealing. No sediment present.
			6" OD	Yes	No	Yes	0		Pipeline under gravity pressure. Removed 300 gallons of water to enable sealing. No sediment present.
			8" OD	Yes	No	Yes	0		Pipeline under gravity pressure. Removed 1,550 gallons of water to enable sampling/sealing. There was a thin layer of dark gray to black, oily smelling soil immediately around PIPE3 (sampled). Sediment within pipe consisted of hard black scale.
PE3	50' x 4.2' x 11'	Excavation near northeastern corner of EU12, between Castle Garden Road and chain-link fence. Subsurface soils consisted of a layer of surficial fill underlain by brown to reddish brown silty clay (CL). 10", 10", and 12" ID pipes located within ~4.5' of each other at north end of excavation; 36" pipe located ~23' away at south end of excavation. A small amount of groundwater seeped into the north end of the excavation, appearing to originate from around the pipes and/or the backfill soils.	10" ID	Yes	Yes	Yes	0	15,888	Some gas pressure within pipe, but liquid contents did not flow out of pipe. Sediment within pipe consisted of gray silt-clay.
			10" ID	Yes	Yes	Yes	0		Pipeline liquid contents were not under pressure. Sediment within pipe consisted of hard black scale.
			12" ID	Yes	Yes	Yes	0		Pipeline under gravity pressure. Removed 450 gallons of water to enable sampling. Sediment within pipe consisted of black silt-clay.
			36" ID	Yes	No	Yes	0		Pipeline under gravity pressure. Following removal of 1,800 gallons of water, pipe remained under pressure. Unable to access pipe interior for sediment sampling.
PE4	34' x 4.5' x 8'	Excavation near southeastern corner of EU5, between "O" Street and chain link fence. Subsurface soils consisted of layer of surficial fill underlain by grayish brown to yellowish brown to brown to reddish brown silty clay (CL). No groundwater encountered. 8", 10", and 12" ID pipes located within 3.5' of each other at west end of excavation; 36" pipe located ~20' away near east end of excavation.	8" ID	Yes	No	Yes	0	14,535	Pipeline under gravity pressure. Removed 425 gallons of water to enable sampling. No sediment present.
			10" ID	Yes	Yes	Yes	0		Pipeline under gravity pressure. Removed 525 gallons of water to enable sampling. Sediment within pipe consisted of hard black scale.
			12" ID	Yes	No	Yes	0		Pipeline under gravity pressure. Removed 725 gallons of water to enable sampling. No sediment present.
			36" ID	Yes	No	Yes	0		Pipeline liquid contents were not under pressure. Unable to collect sediment sample.
PE5	48' x 12.5' x 8.5'	Excavation near northwestern corner of EU6, just south of chain link fence. Subsurface soils consisted of thin layer of surficial fill/reworked material underlain by grayish brown to yellowish brown to brown to reddish brown silty clay (CL). No groundwater encountered. 8", 10", and 12" ID pipes located within ~4' of each other at west end of excavation; 24" pipe located 27' away at east end of excavation.	8" ID	Yes	Yes	Yes	0	13,278	Pipeline under gravity pressure. Removed 500 gallons of water to enable sampling. Sediment within pipe consisted of hard black scale.
			10" ID	Yes	Yes	Yes	0		Pipeline liquid contents were not under pressure. Sediment within pipe consisted of hard black scale.
			12" ID	Yes	No	Yes	0		Pipeline under gravity pressure. Removed 400 gallons of water to enable sampling. No sediment present.
			24" ID	Yes	No	Yes	0		Pipeline under gravity pressure; did not dewater pipe. Unable to access for sediment sampling.
PE6	22' x 8' x 6'	Excavation near southwestern corner of EU11, just north of chain link fence. Subsurface soils consisted of thin layer of surficial fill/reworked material underlain by grayish brown to yellowish brown to brown to reddish brown silty clay (CL). 10" ID cast iron pipe encountered near center of excavation at 4' bgs. A small amount of groundwater seeped into the excavation, appearing to originate from beneath the bottom of the pipe. No bedding around pipe.	10" ID	Yes	Yes	Yes	0	16,000	Pipeline liquid contents were not under pressure. Sediment consisted of hard black scale.

Notes:

1 - Radiation readings recorded using an NaI detector. Readings are the maximum of a one-minute count.

TABLE 15

INVESTIGATIVE EXCAVATION SOIL AND GROUNDWATER ANALYTICAL SCHEDULE

PARAMETER	GROUNDWATER	SOIL	METHOD
Mass Uranium (Total-U)	7 filtered	32 samples	ASTM D5174-02, Trace Uranium by Pulsed-Laser Phosphorimetry
Isotopic Uranium-234, 235/236 and 238	7 filtered	32 samples	DOE EML HASL-300m, Alpha-Spectroscopy
Radium- 226	7 filtered	32 samples	EPA 903.1, Radon Emanation/EPA 901.1 - soil only
Radium- 228	7 filtered	32 samples	EPA 904.0, Gas Proportional Counting/EPA 901.1 - soil only
Isotopic Thorium – 228, 230 and 232	7 filtered	32 samples	DOE EML HASL-300m, Alpha-Spectroscopy
Actinium-227, Cesium-137	NA	32 samples	EPA 901.1, Gamma Spectroscopy – soil only
Anions (unfiltered only)	7 unfiltered	NA	EPA 300.0, Ion Chromatography
Total Dissolved Solids (unfiltered only)	7 unfiltered	NA	EPA 160.1
Alkalinity (unfiltered) (bicarbonate and carbonate)	8 unfiltered	NA	EPA 310.1
Metals, including Boron and Lithium	8 filtered	16 to 32 samples	EPA SW846 6020/7470A/7471A

(1) Groundwater samples were filtered using disposable 0.45 micron in-line field filters.

(2) NA – not applicable

TABLE 16

Investigative Excavation Observations

Excavation ID	Dimensions (L x W x D)	Observations	Pipelines Found	Samples						
				Top 0.15 meter (6 inches) Soil Sample[1]	Sidewall Soil Sample[2]	Sidewall Soil Sample	Bottom of Excavation Soil Sample	Groundwater Sample	Max. PID (ppm)	Max. RAD (cpm)[3]
IE1	11' x 2.2' x 10'	Excavation along north side of grit chamber, west-central portion of EU11. Subsurface soils consisted of FILL composed of a thin layer of surficial loamy clay underlain by red silty clay with trace to some angular to subangular fine to coarse (F-C) sand and gravel, underlain by a buried brown topsoil layer and then brown and reddish brown silty clay (CL). Some groundwater seepage occurred from 3 sandy lenses in the west excavation wall from 6.0'-7.5' bgs.	None	Yes	Yes, west wall 3.0'-3.5' bgs at interface between red fill and underlying former topsoil layer	Yes, west wall 6.0'-7.5' bgs from 3 wet sandy lenses	Yes, west end bottom at 9.5'-10' bgs	No, trench collapsed before sample could be collected	0	16,504
IE2	13' x 2.3' x 10'	Excavation along east side of grit chamber, west-central portion of EU11. Subsurface soils consisted of FILL composed of a thin layer of surficial loamy clay underlain by red silty clay with trace to some angular to subangular F-C sand and gravel, underlain by a buried brown topsoil layer and then brown and reddish brown silty clay (CL). An east-west oriented 7.5" OD cast iron pipe was uncovered in the southern portion of the excavation at about 3.5' bgs. Gray angular sandy bedding around that pipe produced water.	7.5" OD Cast Iron	Yes	Yes, north wall 3.5'-4.0' bgs at interface between red fill and underlying former topsoil layer	Yes, from bedding material beneath north side of pipe	Yes, north end bottom at 9.0'-9.5' bgs	Yes, from pipe bedding seepage	0	17,684
IE3	12.5' x 2.3' x 10.2'	Excavation along south side of grit chamber, west-central portion of EU11. Subsurface soils consisted of FILL composed of a thin layer of surficial loamy clay underlain by red silty clay with trace to some angular to subangular F-C sand and gravel, underlain by a buried brown topsoil layer and then brown and reddish brown silty clay (CL). Some small groundwater seeps were observed at bottom of excavation.	None	Yes	Yes, east wall 3.2'-3.6' bgs at interface between red fill and underlying former topsoil layer	Yes, northwest corner 3.2'-3.6' bgs at interface between red fill and underlying former topsoil layer (2nd highest rad. reading)	Yes, east end bottom at 10.2'-10.6' bgs	Yes, at bottom of west side at 8.8'-9.5' bgs	0	17,430
IE4	10.5' x 2.2' x 10.5'	Excavation along west side of grit chamber, west-central portion of EU11. Subsurface soils consisted of FILL composed of a thin layer of surficial loamy clay underlain by red silty clay with trace to some angular to subangular F-C sand and gravel, underlain by a buried brown topsoil layer and then brown and reddish brown silty clay (CL). A crushed metal drum was found at 2' bgs (no rad. or PID readings over background). An E-W oriented 6" OD cast iron pipe was uncovered at the northern end of the excavation at about 2.7' bgs. Gray angular sandy bedding around pipe that produced water.	6" OD Cast Iron	Yes	Yes, south wall 2.8'-3.2' bgs at interface between red fill and underlying former topsoil layer	Yes, from bedding material beneath south side of pipe	Yes, north end bottom at 10.0'-10.5' bgs	Yes, from pipe bedding seepage	0	17,316
IE5	15' x 2.2' x 11'	Excavation along northwest corner of former decon pad, west-central portion of EU11. Subsurface soils consisted of FILL composed of a thin layer of surficial loamy clay underlain by red silty clay with trace to some angular to subangular F-C sand and gravel, underlain by a buried brown topsoil layer and then brown and reddish brown silty clay (CL). A northwest-southeast oriented cast iron pipe was uncovered at the southern end of the excavation at about 2' bgs. Gray angular sandy bedding around pipe that produced water.	7.5" OD Cast Iron	Yes	Yes, northwest corner at 2.0'-2.4' bgs at interface between red fill and underlying former topsoil layer	Yes, from bedding material beneath south side of pipe	Yes, center bottom at 11.0'-11.5' bgs	Yes, from pipe bedding seepage	0	19,262
IE6	12' x 2.7' x 11.5'	Excavation near southwest corner of former decon pad, west-central portion of EU11. Subsurface soils consisted of FILL composed of #3 crusher run and loamy clay underlain by red silty clay with trace to some angular to subangular F-C sand and gravel, underlain by a buried brown topsoil layer and then brown and reddish brown silty clay (CL) and brownish to pinkish gray silty clay (CH).	None	Yes	Yes, northeast corner at 2.5'-3.0' bgs from black silt lens	Yes, northeast corner at 6.0'-8.0' bgs reddish brown silty clay (2nd highest rad. reading)	Yes, bottom at 11.5'-12.0' bgs brownish to pinkish gray silty clay (high rad. reading)	Yes, bottom of excavation (mainly from seepage at 0.0-2.0' bgs)	0	17,140

TABLE 16

Investigative Excavation Observations

Excavation ID	Dimensions (L x W x D)	Observations	Pipelines Found	Samples						
				Top 0.15 meter (6 inches) Soil Sample[1]	Sidewall Soil Sample[2]	Sidewall Soil Sample	Bottom of Excavation Soil Sample	Groundwater Sample	Max. PID (ppm)	Max. RAD (cpm)[3]
IE7	16' x 14' x 11'	East-northeast of well OW11B, near water and sanitary sewer lines, west-central portion of EU11. Subsurface soils consisted of FILL composed of a thin layer of surficial loamy clay underlain by red silty clay with trace to some angular to subangular F-C sand and gravel, underlain by brown silty clay (CL) and brownish to pinkish gray silty clay (CH). 9", 15", and 36" OD cast iron pipes were located between about 3'-4.5' bgs and a concrete encased sewer line was encountered at a depth of 8' bgs running beneath the three pipelines. A small amount of groundwater seeped into the excavation between the 9" and 15" OD pipes and along the top of the sewer concrete encasement.	9" OD, 15" OD and 36" OD Cast Iron and a Concrete- Encased Sewer Line	Yes	Yes, at 4.5'-5.0' bgs beneath bell in 36" OD pipe	Yes, from westernmost corner just above concrete encased sewer line at 7.5'-8.0' bgs	Yes, beneath sanitary sewer concrete encasement at 9.0'-9.5' bgs	Yes, from seepage into a sump dug between 9" OD and 15" OD pipes	0	17,986
IE8	10' x 3' x 9'	Southeast of well OW11B near sanitary sewer line, west-central portion of EU11. Subsurface soils consisted of FILL composed of a thin layer of surficial loamy clay underlain by brown to reddish brown silty clay (CL). A concrete encased sewer line was encountered at 7' bgs. Groundwater seeped into IE8 along the top of the sewer concrete encasement. The water level in nearby manhole MH06 appeared to drop as water was seeping into the excavation indicating likely hydraulic connection.	concrete encased sewer line	Yes	Yes, from west wall of IE-8 near northwest corner	Yes, above concrete encased sewer line at NW end of IE8 from 7.5'-8.0' bgs	Yes, beneath sanitary sewer concrete encasement at 8.0'-9.0' bgs	Yes, seepage from top of concrete encased sewer line	0	18,036

Notes:
1 - Surface soil samples were collected from the locations of the highest gamma radiation reading recorded in during pre-work walkover survey.
2 - Sidewall soil samples were collected from the locations of the highest radiation reading recorded in the excavation unless otherwise noted.
3 - Values are the maximum reading recorded in the excavation using an NaI detector.
CPM - Counts per minute

TABLE 17

INVESTIGATION-DERIVED WASTE INVENTORY

IDW Container(s)	Matrix	Volume/Source/Description	Accumulation Start Date
URS Generated IDW			
550 gallon white polyethylene tank (Tank 1)	Liquid	~300 gallons of water from PE1 PIPE1	11/29/2012
1500 gallon green polyethylene tank (Tank 2)	Liquid	~1300 gallons of water from PE1 PIPE1	11/28/2012
1500 gallon green polyethylene tank (Tank 3)	Liquid	~1525 gallons of water from IE3 & Russo decon pad	12/3/2012
1000 gallon white polyethylene tank (Tank 8)	Liquid	~1025 gallons of water from IE8, IE7- IE8 decon, & MH08	11/30/2012
21,000 gallon metal FRAC Tank (E-Tank)	Liquid	~7700 gallons of water from PE2/ PE3/MH41/PE4/PE5/Russo decon pad	11/27/2012
425 gallon white polyethylene tank (425 Tank)	Liquid	~110 gallons of development/purge water from MW950-MW955	11/29 - 12/5/2012
1500 gallon green polyethylene tank (Tank 6)	Liquid	~700 gallons of water from PE3 & drilling decon pad water	11/10/2012
1 x 55-gallon drum labeled "MW949 Water"	Liquid	~50 gallons of development/purge water from MW949	11/29/2012
5 x 55-gallon drums labeled: "MW949" (3 drums), "MW948 & MW949" (1 drum), and "MW946 & MW947" (1 drum)	Solid	each drum is ~3/4 to 7/8 full of soil	11/13 - 11/17/2012
3 x 55-gallon drums labeled: "MW954 & 955", "MW955", and "MW952,MW953, MW954" (1 drum each)	Solid	each drum is ~3/4 to 7/8 full of soil	11/19 & 11/20/2012
2 x 55-gallon drums labeled: "944" and "45-44"	Solid	each drum is ~3/4 to 7/8 full of soil	11/18 & 11/20/2012
4 x 55-gallon drums labeled: "MW957 & MW958", "959956", "960950", and "MW951 + MW950" (1 drum each)	Solid	each drum is ~3/4 to 7/8 full of soil	11/10 - 11/13/2012
1 x 55-gallon drum	Solid	~3/4 to 7/8 full of drilling decon pad plastic sheeting	~11/10 - 11/19/2012
4-inch diameter Schedule 40 polyvinyl chloride (PVC) pipe (placed in B-25 box)	Solid	70 linear feet (3 x 10-foot pieces and 8 x 5-foot pieces) of 4-inch diameter Sch 40 PVC pipe (used for downhole gamma surveys in monitoring well boreholes)	~11/10 - 11/19/2012
4 sheets (4'x8'x3/4") of plywood (placed in B-25 box)	Solid	4 sheets of plywood used under excavator tracks	12/17/2012
~30 x 42-gallon plastic contractor trash bags (placed in B-25 box)	Solid	bags filled primarily with plastic sheeting, but a few bags also contain empty concrete or bentonite chip bags, cardboard boxes, rope/twine, used personal protective equipment (PPE) (nitrile gloves and tyvek suits), CAUTION tape, and polyethylene tubing	11/27/2012

TABLE 17

INVESTIGATION-DERIVED WASTE INVENTORY

IDW Container(s)	Matrix	Volume/Source/Description	Accumulation Start Date
Existing IDW			
1500 gallon green polyethylene tank (Tank 7)	Liquid	~1225 gallons of old IDW water (source unknown)	unknown
55-gallon drum labeled "WEC-1"	Solid	~40 gallons of soil	"Project 10-15-10" on drum
55-gallon drum labeled "WEC-2"	Solid	~40 gallons of soil	"Project 10-15-10" on drum
55-gallon drum labeled "WEC-3"	Solid	~40 gallons of soil	"Project 10-15-10" on drum
55-gallon drum labeled "WEC-4"	Solid	~40 gallons of soil; black plastic sheeting and blue nitrile gloves also in drum	"Project 10-15-10" on drum
55-gallon drum labeled "WEC-5"	Solid	~50 gallons of soil; blue poly tarp also in drum	"Project 10-15-10" on drum
55-gallon drum labeled "WC-178"	Solid	5-gallon plastic pail of concrete cores; 8 plastic containers (32oz - 1 gal size) of soil samples in plastic bags	inner containers labeled 12-25-85, 2-25-85, and 1-30-85
Blue & White ~50 quart Igloo Plastic Cooler with many plastic sample containers inside (transferred to B-25 box)	Solid	~15 x 16oz plastic containers (steel pieces, powders, and dried resins inside containers) and ~9 x 100ml plastic vials (powders inside vials)	jars dated 1996
20 Shelby tubes and 2 plastic/foil wrapped soil samples (transferred to B-25 box)	Solid	20 Shelby tubes (~15 cu ft)	unknown

TABLE 18

SOLID AND LIQUID INVESTIGATIVE-DERIVED WASTE ANALYTICAL SCHEDULE

PARAMETER	SOLID	LIQUID	METHOD
Mass Uranium (Total-U)	8 samples	NA	ASTM D5174-02, Trace Uranium by Pulsed-Laser Phosphorimetry
Isotopic Uranium-234, 235/236 and 238	8 samples	9 samples	DOE EML HASL-300m, Alpha-Spectroscopy
Radium- 226	8 samples	9 samples	EPA 901.1, Gamma Spectroscopy
Radium- 228	8 samples	9 samples	EPA 901.1, Gamma Spectroscopy
Isotopic Thorium -228, 230 and 232	8 samples	9 samples	DOE EML HASL-300m, Alpha-Spectroscopy
Actinium-227, Cesium-137	8 samples	9 samples	EPA 901.1, Gamma Spectroscopy
Other Gamma Radionuclides[1]	NA	9 samples	EPA 901.1, Gamma Spectroscopy
Metals, including Boron and Lithium	NA	9 samples	EPA SW846 6020/7470A
Volatile Organic Compounds (VOCs)	8 samples	9 samples	EPA SW846 8260C
Semi-Volatile Organic Compounds (SVOCs)	8 samples	9 samples	EPA SW846 8270D
Pesticides	8 samples	9 samples	EPA SW846 8082A/8081B
Herbicides	8 samples	9 samples	EPA SW846 8151A
TCLP VOCs	NA	9 samples	EPA SW846 1311/8260C
TCLP SVOCs	NA	9 samples	EPA SW846 1311/8270D
TCLP Pesticides	NA	9 samples	EPA SW846 1311/8081B
TCLP Herbicides	NA	9 samples	EPA SW846 1311/8151A
TCLP Metals	8 samples	9 samples	EPA SW846 1311/6010B/7470A
Paint Filter Test	8 samples	9 samples	EPA SW846 9056
pH	NA	9 samples	EPA SW846 9040B
Oil & Grease	NA	9 samples	EPA 1664A
Total Organic Carbon	NA	9 samples	EPA 415.1
Total Phosphorus	NA	9 samples	EPA SW846 6020
Total Suspended Solids	NA	9 samples	EPA 160.2

(1) Other gamma radionuclides include: Actinium-228, Bismuth-212, Bismuth-214, Lead-210, Lead-212, Lead-214, Potassium-40, Protactinium-231, Thallium-208, Thorium-232, Thorium-234, Uranium-235, and Uranium-238.

NA - Not analyzed

TABLE 19
SOIL AND SEDIMENT CRITERIA

Metal	Criteria (mg/kg)	Reference
Aluminum	77,000	EPA RSL
Arsenic	8.73	RI BSL
Barium	15,000	EPA RSL
Beryllium	160	EPA RSL
Boron	16,000	EPA RSL
Cadmium	70	EPA RSL
Calcium	58,900	RI BSL
Chromium	25.8	RI BSL
Cobalt	36.7	RI BSL
Copper	3,100	EPA RSL
Iron	55,000	EPA RSL
Lead	400	EPA RSL
Lithium	160	EPA RSL
Magnesium	14,800	RI BSL
Manganese	6,650	RI BSL
Mercury	10	EPA RSL
Molybdenum	390	EPA RSL
Nickel	1,500	EPA RSL
Potassium	2,860	EPA RSL
Selenium	390	EPA RSL
Silver	390	EPA RSL
Sodium	331	RI BSL
Thallium	0.78	EPA RSL
Total Uranium	230	EPA RSL
Vanadium	390	EPA RSL
Zinc	23,000	EPA RSL

Notes:
EPA RSL: USEPA Regional Screening Level (May 2013)
RI BSL: NFSS RI background screening level (Dec 2007)
Value shown is the higher of the EPA RSL and the RI background level.

TABLE 20
MONITORING WELL SOIL ANALYTICAL RESULTS
EU1 AREA

Location ID			MW944	MW944	MW944	MW944	MW945	MW945	MW945	MW945	MW945	MW946	MW946	MW946	MW946
Field Sample ID			MW944SS0.0-0.5-0051	MW944SB2.0-2.5-0052	MW944SB10.0-11.0-0053	MW944SB13.0-13.5-0054	MW945SS0.0-0.5-0047	MW945SB3.5-4.0-0048	MW945SB9.5-10.0-0050	MW945SB12.5-13.0-0049	MW945SB12.5-13.0D-9009	MW946SS0.0-0.5-0029	MW946SB6.0-6.5-0030	MW946SB8.0-8.5-0031	MW946SB12.0-12.5-0032
Matrix			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (ft)			0.0-0.5	2.0-2.5	10.0-11.0	13.0-13.5	0.0-0.5	3.5-4.0	9.5-10.0	12.5-13.0	12.5-13.0	0.0-0.5	6.0-6.5	8.0-8.5	12.0-12.5
Date Sampled			11/18/12	11/18/12	11/18/12	11/18/12	11/18/12	11/18/12	11/18/12	11/18/12	11/18/12	11/13/12	11/14/12	11/14/12	11/14/12
Parameter	Units	Criteria*									Field Duplicate				
Metals															
Aluminum	MG/KG	77000	10,000 J	10,000 J	6,500 J	12,000 J	12,000 J	15,000 J	11,000 J	6,100 J	6,500 J	8,100 J	17,000	14,000 J	16,000 J
Arsenic	MG/KG	8.73	4.8 J	5.6	4 J	3.9 J	5.3 J	6.5	4.4 J	3.8 J	4.2 J	2.4	4.2 J	5.3 J	4.2 J
Barium	MG/KG	15000	110	160	100	88	110	210	160	95	93	76	170	450 J	230 J
Beryllium	MG/KG	160	0.54	0.49	0.28 J	0.59	0.62	0.8	0.51	0.31 J	0.31 J	0.38	0.81	0.72 J	0.93 J
Boron	MG/KG	16000	52 U	48 U	50 U	20 J	54 U	51 U	49 U	49 U	47 U	14 U	58 U	64 U	60 U
Cadmium	MG/KG	70	0.75	0.27 J	0.3 U	0.29 U	0.4	0.21 J	0.29 U	0.1 J	0.083 J	0.1	0.35 U	0.1 J	0.097 J
Calcium	MG/KG	58900	51,000	38,000	42,000 J	43,000	75,000	3,200	50,000	41,000	44,000	2,300	62,000	61,000 J	55,000 J
Chromium	MG/KG	25.8	20	17	11	18	26	23	22	10	11	11	25	22	26
Cobalt	MG/KG	36.7	9.4	11	7.2	11	11	14	10	6.6	6.8	3.8	14	13 J	16 J
Copper	MG/KG	3100	29	35	32	26	31	23	33	33	35	10	31	32	37
Iron	MG/KG	55000	24,000	28,000	16,000	25,000	25,000	36,000	23,000	16,000	17,000	12,000	35,000	30,000	35,000
Lead	MG/KG	400	57	13	3.9	5.5	22	6.8	5.4	3.5	3.7	12	7.2	7.6 J	8.7 J
Lithium	MG/KG	160	18	18	13	25	22	25	21	13	15	14	34	27 J	35 J
Magnesium	MG/KG	14800	21,000	6,300	7,000 J	12,000	25,000	5,000	9,800	8,700	9,400	1,700	16,000	14,000 J	16,000 J
Manganese	MG/KG	6650	820	1,400	850 J	830	860	1,900	870	860	970	130	980	980 J	900 J
Mercury	MG/KG	10	0.069	0.031 J	0.039 U	0.026 J	0.028 J	0.019 J	0.018 J	0.039 U	0.039 U	0.068	0.047 U	0.051 U	0.049
Molybdenum	MG/KG	390	0.92 J	0.79 J	2.5 U	0.63 J	2.7 U	1.1 J	1.2 J	2.5 U	2.4 U	0.48 J	2.9 U	3.2 U	3 U
Nickel	MG/KG	1500	20	17	15	24	23	27	22	14	14	8.8	32	30 J	34 J
Potassium	MG/KG	2860	1,200 J	940 J	950 J	2,000	1,700 J	1,400 J	1,500 J	970 J	1,000 J	640 J	2,200	2,300 J	2,900 J
Selenium	MG/KG	390	2.5 J	2.1 J	2.2 J	2.8	3	3.1	3.4	2.5 J	2 J	1.6	2.7 J	2.9 J	2.4 J
Silver	MG/KG	390	1 U	0.95 U	1 U	0.13 J	1.1 U	1 U	0.52 J	0.99 U	0.95 U	0.087 J	1.2 U	1.3 U	1.2 U
Sodium	MG/KG	331	110 J	87 J	96 J	150	130	110 J	200	130	140	40	340	350	400
Uranium, Total	MG/KG	230	2.14	3	1.89	2.5	2.35	3.2	2.11	2.05	1.97	2.44	2.64	1.83	2.56
Vanadium	MG/KG	390	23	26	14	24	24	35	23	14	15	16	34	30 J	34 J
Zinc	MG/KG	23000	170	69	38	52	140	67	47	34	35	42	70	68 J	73 J
Radionuclides (Alpha Spec)															
Thorium-228	PCI/G	5	0.703	0.61	0.609	0.906	0.782	0.884	0.886	0.637	0.621	0.685	0.731	0.67	0.867
Thorium-230	PCI/G	5	0.672	0.655	0.521	0.784	0.799	0.695	0.862	0.633	0.668	1.12	R	0.643	0.761
Thorium-232	PCI/G	5	0.722	0.693	0.6	0.903	0.789	0.664	1	0.724	0.627	0.613	0.735	0.67	0.909
Uranium-234	PCI/G	13	0.81	0.682	0.472	0.641	0.639	0.855	0.675	0.547	0.639	0.654	0.708	0.507	0.821
Uranium-235/236	PCI/G	8	0.028 U	0.0592	0.0156	0.025	0.0498	0.0438	0.0396	0.0265	0.0114 U	0.016 U	0.0491	0.023 U	0.0424
Uranium-238	PCI/G	14	0.772	0.698	0.436	0.693	0.611	0.714	0.733	0.442	0.565	0.692	0.774	0.542	0.712
Radionuclides (Gamma Spec)															
Actinium-227	PCI/G	0.5	0.00312 U	-0.78 U	0.222	-0.377 U	0.258 U	0.211 U	-0.0234 U	-0.168 U	-0.734 U	0.126 U	-0.579 U	1.55 U	0.0171 U
Cesium-137	PCI/G	11	0.0948	-0.000534 U	0.00466 U	-0.0081 U	0.01 U	0.0144 U	-0.00866 U	0.00358 U	0.00893 U	0.198	-0.0112 U	-0.024 U	-0.00964 U
Radium-226	PCI/G	5	0.703	0.679	0.717	0.956	0.851	0.73	0.688	0.435 J	0.998	0.684	1.18	0.718 J	0.911
Radium-228	PCI/G	5	0.647	0.965	0.836	1.15	0.719	1.09	0.898	0.489	0.641	0.426 U	1.25	1.04	0.795

Notes:

*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;

For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and

For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 21
MONITORING WELL SOIL ANALYTICAL RESULTS
EU4 AREA

Location ID			MW947	MW947	MW947	MW947	MW948	MW948	MW948	MW948	MW948	MW949	MW949	MW949	MW949
Field Sample ID			MW947SS0.0-0.5-0033	MW947SB2.0-2.5-0034	MW947SB14.0-14.5-0035	MW947SB18.0-18.5-0036	MW948SS0.0-0.5-0040	MW948SB5.5-6.0-0041	MW948SB10.0-10.5-0042	MW948SB13.0-13.5-0043	MW948SB13.0-13.5D-9008	MW949SS0.0-0.5-0037	MW949SB16.0-16.5-0044	MW949SB29.5-30.0-0045	MW949SB34.5-35.0-0046
Matrix			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (ft)			0.0-0.5	2.0-2.5	14.0-14.5	18.0-18.5	0.0-0.5	5.5-6.0	10.0-10.5	13.0-13.5	13.0-13.5	0.0-0.5	16.0-16.5	29.5-30.0	34.5-35.0
Date Sampled			11/14/12	11/14/12	11/14/12	11/14/12	11/16/12	11/16/12	11/16/12	11/16/12	11/16/12	11/15/12	11/17/12	11/17/12	11/17/12
Parameter	**Units**	**Criteria***									**Field Duplicate**				
Volatile Organic Compounds															
Acetone	UG/KG	6.10E+07	16 J	26 U	17 J	24 J	18 J	9.1 J	14 J	11 J	8.6 J	30 U	25 U	27 U	22 U
Metals															
Aluminum	MG/KG	77000	14,000 J	16,000 J	5,200 J	23,000 J	14,000 J	15,000 J	17,000 J	16,000 J	16,000 J	3,900 J	13,000 J	19,000 J	7,000 J
Arsenic	MG/KG	8.73	6.6 J	4.5 J	2.8 J	6.7 J	3.2 J	5.3 J	4 J	5.2 J	4.6 J	7.6 U	5.1	5.1	3.6 J
Barium	MG/KG	15000	200 J	180 J	95 J	220 J	130 J	89 J	130 J	140 J	170 J	50 J	140	120	120
Beryllium	MG/KG	160	0.76 J	0.95 J	0.27 J	1.1 J	0.83 J	0.88 J	0.91 J	0.82 J	0.83 J	0.26 J	0.7	0.92	0.32 J
Boron	MG/KG	16000	66 U	65 U	65 U	68 U	44 J	58 U	20 J	61 U	61 U	76 U	47 U	50 U	51 U
Cadmium	MG/KG	70	0.3 J	0.39 U	0.39 U	0.41 U	0.38 J	0.098 J	0.11 J	0.37 U	0.11 J	0.47 J	0.1 J	0.3 U	0.31 U
Calcium	MG/KG	58900	6,400 J	4,400 J	48,000 J	74,000 J	7,000 J	73,000 J	57,000 J	58,000 J	61,000 J	3,800 J	49,000	47,000	59,000
Chromium	MG/KG	25.8	22	21	9.4 J	36	30	24	26	25	24	24 J	21	28	10
Cobalt	MG/KG	36.7	13 J	10 J	5.9 J	21 J	11 J	13 J	15 J	17 J	16 J	3.4 J	13	16	7.3
Copper	MG/KG	3100	45	25	23	38	38	37	42	34	34	54	32	32	23
Iron	MG/KG	55000	32,000	28,000	14,000	46,000	23,000	35,000	36,000	36,000	34,000	7,900 J	28,000	36,000	16,000
Lead	MG/KG	400	73 J	9.8 J	3.1 J	12 J	38 J	8.3 J	8.9 J	8.1 J	8.6 J	20 J	6.1	9.4	4
Lithium	MG/KG	160	24 J	22 J	12 J	45 J	24 J	31 J	34 J	35 J	34 J	7.1 J	28	38	16
Magnesium	MG/KG	14800	5,200 J	3,900 J	9,800 J	20,000 J	5,200 J	14,000 J	14,000 J	16,000 J	15,000 J	2,000 J	13,000	16,000	9,200
Manganese	MG/KG	6650	1,100 J	410 J	930 J	1,000 J	230 J	870 J	820 J	990 J	1,000 J	150 J	960	790	1,100
Mercury	MG/KG	10	0.048 J	0.023 J	0.052 U	0.055 U	0.058 U	0.015 J	0.047 U	0.048 U	0.049 U	0.06 J	0.02 J	0.019 J	0.037 U
Molybdenum	MG/KG	390	0.86 J	0.83 J	3.3 U	3.4 U	3.6 U	2.9 U	3 U	3.1 U	3 U	3.8 U	0.74 J	2.5 U	2.6 U
Nickel	MG/KG	1500	30 J	21 J	12 J	46 J	30 J	30 J	35 J	35 J	34 J	11 J	28	37	15
Potassium	MG/KG	2860	1,800 J	1,100 J	890 J	4,200 J	1,700 J	2,300 J	2,900 J	2,800 J	2,700 J	720 J	1,900 J	2,900 J	1,200 J
Selenium	MG/KG	390	4.1 J	4.9 J	1.6 J	4.1 J	2.9 J	3.7 J	3.4 J	3.3 J	2.2 J	1.9 J	2.3 J	3.4	2.9
Silver	MG/KG	390	1.3 U	1.3 U	1.3 U	1.4 U	0.18 J	1.2 U	1.2 U	1.2 U	1.2 U	1.5 U	0.12 J	1 U	1 U
Sodium	MG/KG	331	57 J	62 J	120 J	400	70 J	280	300	300	300	56 J	270	340	160
Uranium, Total	MG/KG	230	2.65	2.79	1.8	3.01	2.7	2.55	2.52	2.27	2.32	2.62	2.56	2.95	2.05
Vanadium	MG/KG	390	31 J	35 J	13 J	46 J	28 J	34 J	35 J	33 J	32 J	10 J	26	36	14
Zinc	MG/KG	23000	73 J	50 J	31 J	94 J	120 J	68 J	77 J	73 J	72 J	79 J	63	73	34
Radionuclides (Alpha Spec)															
Thorium-228	PCI/G	5	0.909	0.812	0.62	1.18	0.821	1.05	0.957	0.982	1	0.665	0.886	1.02	0.701
Thorium-230	PCI/G	5	R	0.794	R	1.03	1.64	0.925	0.837	0.764	0.892	1.91	0.912	0.921	0.54
Thorium-232	PCI/G	5	0.708	0.94	0.575	1	0.688	1.16	1.04	0.88	0.722	0.781	0.97	0.941	0.601
Uranium-234	PCI/G	13	0.77	0.73	0.492	0.859	0.867	0.584	0.663	0.589	0.57	0.698	0.738	0.692	0.477
Uranium-235/236	PCI/G	8	0.0376	0.0397 U	0.02	0.0487	0.0194 U	0.0307	0.0206 U	0.0274	0.0394	0.0381	0.00903 U	0.0356	0.0163 U
Uranium-238	PCI/G	14	0.714	0.723	0.486	0.833	0.783	0.569	0.609	0.639	0.653	0.742	0.729	0.766	0.534
Radionuclides (Gamma Spec)															
Actinium-227	PCI/G	0.5	0.161 U	-0.459 U	0.033 U	0.446 U	0.0958 U	0.123 U	0.207 U	0.0527 U	0.0724 U	0.0441 U	-0.361 U	-0.0314 U	-0.0108 U
Cesium-137	PCI/G	11	0.362	0.00211 U	0.0591 U	-0.0145 U	0.465	9.42E-05 U	0.174 U	0.00467 U	-0.00298 U	0.253	0.0297 U	-0.0578 U	-0.0039 U
Radium-226	PCI/G	5	1.83	0.903	0.601 J	1.08	1.64	0.84	0.696	0.764	1.09	1.76	0.803	0.675	0.648
Radium-228	PCI/G	5	0.869	1.18	0.649	1.35	0.702	1.1	1.11	0.471	1.17	0.962	0.952	1.53	0.829

Notes:

*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;

For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and

For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 22
MONITORING WELL SOIL ANALYTICAL RESULTS
EU10 AREA
(Page 1 of 2)

Location ID			MW950	MW950	MW950	MW950	MW950	MW951	MW951	MW951	MW951	MW956	MW956	MW956	MW956	MW956
Field Sample ID			MW950SS0.0-0.5-0005	MW950SB2.0-2.5-0007	MW950SB10.5-11.0-0006	MW950SB10.5-11.0D-9001	MW950SB15.0-15.5-0008	MW951SS0.0-0.5-0001	MW951SB17.5-18.0-0003	MW951SB15.0-15.5-0002	MW951SB18.5-19.0-0004	MW956SS0.0-0.5-0017	MW956SB2.5-3.0-0018	MW956SB15.5-16.0-0019	MW956SB15.5-16.0D-9004	MW956SB16.5-17.0-0020
Matrix			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (ft)			0.0-0.5	2.0-2.5	10.5-11.0	10.5-11.0	15.0-15.5	0.0-0.5	12.5-18.0	15.0-15.5	18.5-19.0	0.0-0.5	2.5-3.0	15.5-16.0	15.5-16.0	16.5-17.0
Date Sampled			11/11/12	11/11/12	11/11/12	11/11/12	11/11/12	11/10/12	11/10/12	11/10/12	11/10/12	11/12/12	11/12/12	11/12/12	11/12/12	11/12/12
Parameter	Units	Criteria*				Field Duplicate									Field Duplicate	
Metals																
Aluminum	MG/KG	77000	10,000 J	14,000 J	12,000 J	11,000 J	13,000 J	12,000 J	14,000 J	13,000 J	8,600 J	12,000 J	13,000 J	9,900 J	8,900 J	15,000 J
Arsenic	MG/KG	8.73	3.6	5.6 J	5.4 J	3.4 J	6.5	3.5	3.8	3.9	4.3	3.8	4.4	5.3 J	3.2 J	4.6
Barium	MG/KG	15000	95	150	88 J	120 J	94	120	100	71	90	97	130	100	120	100
Beryllium	MG/KG	160	0.64	0.99	0.75	0.62	0.78	0.72	0.84	0.66	0.51	0.71	0.77	0.58	0.5	0.81
Boron	MG/KG	16000	4.9 J	4.3 J	6.9 J	4.9 J	8.4 J	6.3 J	9 J	6.8 J	4.3 J	65 U	10 J	9.6 J	7.5 J	11 J
Cadmium	MG/KG	70	0.48	0.074	0.063 J	0.078 J	0.07 J	0.093	0.058 J	0.062 J	0.073 J	0.27	0.095	0.069 J	0.066 J	0.06 J
Calcium	MG/KG	58900	55,000	50,000	53,000	51,000	65,000	64,000	55,000	58,000	61,000	55,000	44,000	48,000 J	51,000	45,000
Chromium	MG/KG	25.8	16	21	18	17	21	18	20	19	13	17	19	16	14	23
Cobalt	MG/KG	36.7	9.2	17	17 J	11 J	18	9.7	12	11	9.3	9.2	11	9.9 J	8.2 J	13
Copper	MG/KG	3100	20	48	39 J	22 J	34	21	22	20	22	21	25	28	69	26
Iron	MG/KG	55000	22,000	34,000	34,000 J	26,000 J	38,000	33,000	40,000	36,000	23,000	30,000	29,000	25,000	23,000	32,000
Lead	MG/KG	400	22	7.3	6.6 J	5.2 J	6.8	7.7	7.4	5.8	4.5	18	7.8	5.4 J	4.4 J	7.4
Lithium	MG/KG	160	22	30	27	26	32	26	34	27	22	23	26	23	21	32
Magnesium	MG/KG	14800	21,000	10,000	11,000	10,000	12,000	9,400	12,000	12,000	9,900	19,000	9,600	11,000	12,000	13,000
Manganese	MG/KG	6650	670	1,200	1,100 J	740 J	1,000	640	670	770	800	680	710	820 J	1,100 J	760
Mercury	MG/KG	10	0.017 J	0.014 J	0.047 U	0.048 U	0.05 U	0.014 J	0.052 U	0.05 U	0.052 U	0.016 J	0.046 U	0.048 U	0.046 U	0.05 U
Molybdenum	MG/KG	390	0.47 J	0.42 J	3 U	0.24 J	0.32 J	0.4 J	0.26 J	0.22 J	0.24 J	0.53 J	0.51 J	0.45 J	0.43 J	0.37 J
Nickel	MG/KG	1500	19	36	31	27	38	21	26	23	19	20	23	20	17	28
Potassium	MG/KG	2860	1,600	2,200	2,000	1,800	2,400	1,900	2,400	2,200	1,500	1,700 J	1,700 J	1,700 J	1,500 J	2,700 J
Selenium	MG/KG	390	1.7	3.4	4 J	3.1 J	4.3	1.9	2	2.1	2.5	1.8	2.2	2.2	2.2	2.6
Silver	MG/KG	390	0.042 J	0.04 J	0.045 J	0.051 J	0.045 J	0.06 J	0.051 J	0.049 J	0.04 J	0.057 J	0.05 J	0.066 J	0.12 J	0.045 J
Sodium	MG/KG	331	110	150	190	180	280	120	190	180	150	110	140	150 J	120 J	210
Thallium	MG/KG	0.78	0.61 U	0.53 U	0.53 U	0.53 U	0.56 U	0.54 U	0.59 U	0.56 U	0.58 U	0.2 J	0.52 U	0.53 U	0.52 U	0.57 U
Uranium, Total	MG/KG	230	3.24	3.58	2.16	2.46	2.55	4.21	2.57	2.02	2.18	2.98	2.52	5.01 J	2.25	2.31
Vanadium	MG/KG	390	22	30	25	22	27	24	27	25	18	25	27	21	19	30
Zinc	MG/KG	23000	170	62	65	62	80	46	51	47	38	120	50	45	37	58
Radionuclides (Alpha Spec)																
Thorium-228	PCI/G	5	0.831	0.877	0.972	0.933	1.01	0.785	1.06	0.667	0.858	0.7	0.949	1.02	0.838	0.871
Thorium-230	PCI/G	5	1.02	0.971	0.907	0.639	0.895	0.96	0.935	0.63	0.943	0.875	0.908	0.968	0.857	0.729
Thorium-232	PCI/G	5	0.743	0.847	0.953	0.769	0.936	0.895	1.14	0.796	0.85	0.752	1.06	0.848	0.814	0.739
Uranium-234	PCI/G	13	0.834	0.969	0.608	0.663	0.955	1.29	0.743	0.602	0.783	1.43	1.57	0.653	0.69	0.671
Uranium-235/236	PCI/G	8	0.0547	0.045	0.0187 U	0.035	0.0253 U	0.0796	0.0744	0.013 U	0.0479	0.0649	0.087	0.0438	0.0287 U	0.016 U
Uranium-238	PCI/G	14	0.871	1.11	0.51	0.672	1.02	1.35	0.73	0.743	0.817	1.68	1.8	0.591	0.635	0.632
Radionuclides (Gamma Spec)																
Actinium-227	PCI/G	0.5	0.0511 U	-0.0683 U	0.273 U	0.107 U	-0.468 U	0.112 U	0.0117 U	-0.892 U	-0.349 U	-0.348 U	-0.317 U	0.0756 U	-0.78 U	0.0525 U
Cesium-137	PCI/G	11	-0.00956 U	-0.021 U	-0.0202 U	-0.00214 U	-0.000362 U	-0.00851 U	0.0232 U	-0.0423 U	-0.0043 U	0.0174 U	0.00688 U	0.00376 U	-0.0144 U	-0.016 U
Radium-226	PCI/G	5	0.487	1.01	0.813	0.826	1.05	0.956	0.491	1.04	0.888	0.921	0.844	0.766	0.859	0.754 J
Radium-228	PCI/G	5	0.243	1.23	1.16	0.935	1.3	0.652	1.44	0.82	1.3	0.829	1.37	0.979	0.941	1.39

Notes:

*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;

For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and

For Ac-227, Cs-137. Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 22
MONITORING WELL SOIL ANALYTICAL RESULTS
EU10 AREA
(Page 2 of 2)

Location ID			MW957	MW957	MW957	MW957	MW958	MW958	MW958	MW958	MW958	MW959	MW959	MW959	MW959	MW960	MW960	MW960	MW960
Field Sample ID			MW957SS0.0-0.5-0021	MW957SB2.0-2.5-0022	MW957SB4.0-4.5-0023	MW957SB7.0-7.5-0024	MW958SS0.0-0.5-0025	MW958SB4.5-5.0-0026	MW958SB7.5-8.0-0027	MW958SB7.5-8.0D-0027	MW958SB8.5-9.0-0028	MW959SS0.0-0.5-0013	MW959SB8.0-8.5-0014	MW959SB13.0-13.5-0015	MW959SB14.0-14.5-0016	MW960SS0.0-0.5-0009	MW960SB2.0-3.0-0010	MW960SB9.5-10.0-0011	MW960SB12.0-12.5-0012
Matrix			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (ft)			0.0-0.5	2.0-2.5	4.0-4.5	7.0-7.5	0.0-0.5	4.5-5.0	7.5-8.0	7.5-8.0	8.5-9.0	0.0-0.5	8.0-8.5	13.0-13.5	14.0-14.5	0.0-0.5	2.0-3.0	9.5-10.0	12.0-12.5
Date Sampled			11/13/12	11/13/12	11/13/12	11/13/12	11/13/12	11/13/12	11/13/12	11/13/12	11/13/12	11/12/12	11/12/12	11/12/12	11/12/12	11/11/12	11/11/12	11/11/12	11/11/12
Parameter	Units	Criteria*								Field Duplicate									
Metals																			
Aluminum	MG/KG	77000	12,000 J	13,000 J	15,000 J	4,500 J	14,000 J	8,200 J	16,000 J	17,000 J	17,000 J	32,000 J	14,000 J	9,100 J	15,000 J	14,000 J	13,000 J	5,100 J	13,000 J
Arsenic	MG/KG	8.73	3.8	5	8.6	2.9	5.9	4.4	6.1	4.2	4.5	3.3	2.4	4.2	3.9	5.5 J	1.7 J	3.2	3.6
Barium	MG/KG	15000	120	180	180	42	240	120	110 J	150 J	130	310	120	81 J	100	160	140	75	110
Beryllium	MG/KG	160	0.7	0.83	1.2	0.27	0.96	0.48	1.1	1	1.1	3.1	0.89	0.5	0.91	0.91	0.77	0.27	0.77
Boron	MG/KG	16000	6.8 J	7 J	12 U	12 U	6.2 J	4.4 J	10 J	11 J	11 J	60 U	65 U	6.2 J	65 U	3.9 J	5.7 J	60 U	62 U
Cadmium	MG/KG	70	0.094	0.1	0.093	0.051 J	0.093	0.066 J	0.077 J	0.074 J	0.07 J	0.11	0.064 J	0.092	0.071 J	0.097	0.12	0.07 J	0.068 J
Calcium	MG/KG	58900	47,000	67,000	4,500	35,000	59,000	46,000	49,000	53,000	47,000	120,000	51,000	50,000 J	44,000	34,000	91,000 J	44,000	54,000
Chromium	MG/KG	25.8	18	19	21	7.3	21	13	24	27	27	12	21	14	22	20	19	8.4	20
Cobalt	MG/KG	36.7	9.9	8.9	11	4.8	14	8.2	14	16	13	6.7	12	9.3	13	14 J	11 J	5.6 J	12
Copper	MG/KG	3100	32	22	27	18	29	27	26	26	27	18	21	18	27	36	21 J	19	24
Iron	MG/KG	55000	29,000	30,000	42,000	13,000	34,000	22,000	40,000	37,000	38,000	21,000	38,000	23,000 J	33,000	34,000	26,000 J	15,000	36,000
Lead	MG/KG	400	7.1	6.3	9.3	3.2	7.3	5	9.6	8.4	11	5.9	7.6	4.8	7.6	8.6	6.8	3	6.6
Lithium	MG/KG	160	24	27	24	9.3	27	18	34	34	36	43	33	23	34	27	26	11	30
Magnesium	MG/KG	14800	9,800	9,800	5,400	6,800	9,600	8,600	12,000	13,000	13,000	12,000	11,000	10,000 J	12,000	8,100	8,700 J	8,200	11,000
Manganese	MG/KG	6650	700	620	220	630	1,100	790	700	820	580	1,600	630	770	680	750	690 J	610	690
Mercury	MG/KG	10	0.017 J	0.015 J	0.019 J	0.047 U	0.014 J	0.047 U	0.052 U	0.015 J	0.055 U	0.019 J	0.052 U	0.05 U	0.052 U	0.021 J	0.047 U	0.048 U	0.05 U
Molybdenum	MG/KG	390	0.43 J	0.58 J	1.8	0.28 J	0.59	0.39 J	0.55 J	0.48 J	0.52 J	0.33 J	0.29 J	0.31 J	0.36 J	2.9 U	2.9 U	0.25 J	0.34 J
Nickel	MG/KG	1500	22	22	24	9.3	27	16	31	32	33	15	27	19	28	32	28 J	11	25
Potassium	MG/KG	2860	1,800 J	1,600 J	920 J	650 J	1,600 J	1,300 J	2,800 J	3,200 J	3,100 J	1,700	2,600	1,600 J	2,800 J	1,500	1,300 J	850	2,400
Selenium	MG/KG	390	1.9	2.5	3.1	1.6	2.4	1.8	2.3 J	2.9 J	2.8	4.4	2.8	2.4	2.1	3.3	2.2 J	1.7	2
Silver	MG/KG	390	0.05 J	0.065 J	0.035 J	0.23 U	0.037 J	0.23 U	0.041 J	0.045 J	0.042 J	0.056 J	0.047 J	0.063 J	0.091 J	0.046 J	0.065 J	0.062 J	0.052 J
Sodium	MG/KG	331	110	98	97	97	99	98	160	180	190	590	160	160	200	88	120	110	170
Thallium	MG/KG	0.78	0.54 U	0.53 U	0.55 U	0.53 U	0.53 U	0.52 U	0.58 U	0.59 U	0.62 U	0.54 U	0.59 U	0.55 U	0.28 J	0.52 U	0.53 U	0.53 U	0.57 U
Uranium, Total	MG/KG	230	2.79	3.12	30.6	4.66	3.07	4.77	3.31	3.18	3.2	2.26	3.53	4.33	2.61	2.97	29.1	2.86	2.51
Vanadium	MG/KG	390	25	28	46	12	31	19	34	35	36	17	29	20	29	28	22	12	27
Zinc	MG/KG	23000	50	49	46	24	50	35	64	65	68	36	55	40	54	72	61 J	27	52
Radionuclides (Alpha Spec)																			
Thorium-228	PCI/G	5	0.855	0.841	0.89	0.464	0.908	0.812	0.985	1.13	0.925	0.875	1.14	0.943	0.89	0.987	0.851	0.738	0.91
Thorium-230	PCI/G	5	0.762	1.2	1	0.629	0.898	0.722	0.903	0.941	1.05	0.975	0.838	0.697	0.997	0.95	0.756	0.607	0.941
Thorium-232	PCI/G	5	0.851	0.865	0.902	0.435	0.72	0.742	1	1.07	1.05	0.871	1.07	0.809	1.01	0.884	0.782	0.702	0.964
Uranium-234	PCI/G	13	0.853	1.01	12	1.95	1.07	1.7	0.938	0.83	0.983	0.779	0.614	0.787	0.974	0.792	8.94	1.18	0.809
Uranium-235/236	PCI/G	8	0.0423	0.0868	0.585	0.121	0.0555	0.104	0.0475	0.0655	0.0515	0.0472	0.0589	0.0569	0.0675	0.0379	0.504	0.068	0.0555
Uranium-238	PCI/G	14	0.798	0.79	12.5	2.22	0.972	1.77	1.02	0.916	1.08	0.807	0.76	0.826	0.988	0.78	9.3	1.18	0.788
Radionuclides (Gamma Spec)																			
Actinium-227	PCI/G	0.5	-0.309 U	0.344 U	-0.484 U	-0.343 U	0.0903 U	0.0172 U	-0.444 U	0.245 U	0.275 U	0.112 U	4.13	0.0465 U	-0.64 U	0.107 U	-0.036 U	-0.522 U	-0.255 U
Cesium-137	PCI/G	11	-0.051 U	-0.000805 U	-0.000842 U	0.145 U	0.0203 U	-0.003 U	0.0031 U	-0.0207 U	0.00258 U	0.00127 U	-0.0512 U	0.00237 U	0.152 U	0.0461 U	0.0196 U	0.0269 U	-0.0152 U
Radium-226	PCI/G	5	0.905	1.24	1.07	0.72	1.14	0.845	0.894	1.1	1.24	0.882	1.13	0.897	0.945	0.912	1	0.928	0.914
Radium-228	PCI/G	5	1.04	1.01	0.929	0.7	1.19	0.869	0.839	1.36	1.46	0.843	0.902	1.33	1.29	1.05	0.813	1.22	0.534

Notes:

*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;

For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and

For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 23
MONITORING WELL SOIL ANALYTICAL RESULTS
OW11B AREA

Location ID			MW952	MW952	MW952	MW952	MW952	MW953	MW953	MW953	MW953	MW954	MW954	MW954	MW954	MW954	MW955	MW955	MW955	MW955
Field Sample ID			MW952SS0.0-0.5-0055	MW952SB4.0-4.5-0056	MW952SB6.0-6.5-0057	MW952SB6.5-7.0-0058	MW952SB6.5-7.0D-9012	MW953SS0.0-0.5-0059	MW953SB1.0-2.0-0060	MW953SB4.0-4.5-0061	MW953SB6.0-6.5-0062	MW954SS0.0-0.5-0063	MW954SB2.0-2.5-0064	MW954SB5.5-6.0-0065	MW954SB8.5-9.0-0066	MW954SB8.5-9.0D-9013	MW955SS0.0-0.5-0067	MW955SB0.5-1.0-0068	MW955SB2.5-3.0-0069	MW955SB7.0-8.0-0079
Matrix			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (ft)			0.0-0.5	4.0-4.5	6.0-6.5	6.5-7.0	6.5-7.0	0.0-0.5	1.0-2.0	4.0-4.5	6.0-6.5	0.0-0.5	2.0-2.5	5.5-6.0	8.5-9.0	8.5-9.0	0.0-0.5	0.5-1.0	2.5-3.0	7.0-8.0
Date Sampled			11/19/12	11/19/12	11/19/12	11/19/12	11/19/12	11/19/12	11/19/12	11/19/12	11/20/12	11/20/12	11/20/12	11/20/12	11/20/12	11/20/12	11/20/12	11/20/12	11/20/12	11/20/12
Parameter	Units	Criteria*					Field Duplicate									Field Duplicate				
Metals																				
Aluminum	MG/KG	77000	18,000 J	16,000 J	16,000 J	14,000 J	13,000 J	15,000 J	17,000 J	16,000 J	12,000 J	17,000 J	14,000 J	16,000 J	11,000 J	9,800 J	16,000 J	17,000 J	12,000 J	4,600 J
Arsenic	MG/KG	8.73	3.4 J	4.4 J	6.9	4.6 J	5.4 J	3.7 J	4.4 J	4.1 J	4.4 J	3.8 J	4.9 J	5 J	5.1 J	6.8 J	6.8	3.2 J	3.5 J	4.4 J
Barium	MG/KG	15000	230	140	140	120	120	160	140	100	110	170	120	110	160 J	91 J	240	130	210	75
Beryllium	MG/KG	160	1.1	0.81	0.79	0.7	0.81	0.81	0.8	0.76	0.63	0.85	0.71	0.75	0.43 J	0.68 J	0.93	0.8	0.62	0.2 J
Boron	MG/KG	16000	63 U	64 U	65 U	56 U	62 U	69 U	59 U	60 U	57 U	69 U	58 U	57 U	58 U	58 U	67 U	59 U	59 U	56 U
Cadmium	MG/KG	70	0.19 J	0.11 J	0.39 U	0.34 U	0.37 U	0.16 J	0.12 J	0.36 U	0.34 U	0.14 J	0.35 U	0.34 U	0.35 U	0.35 U	0.17 J	0.35 U	0.35 U	0.34 U
Calcium	MG/KG	58900	9,700	57,000	59,000	51,000	52,000	14,000	31,000	34,000	52,000	24,000	54,000	51,000	50,000	50,000	11,000	24,000	65,000	43,000 J
Chromium	MG/KG	25.8	23	24	23	21	20	20	24	22	18	22	21	24	15	15	21	22	18	6.6 J
Cobalt	MG/KG	36.7	10	11	17	12 J	16 J	10	13	12	9.8	12	12	14	9.6 J	16 J	17	11	9.3	5
Copper	MG/KG	3100	34	25	32	25	27	29	32	32	28	29	28	27	31 J	35 J	37	24	24	21
Iron	MG/KG	55000	24,000	30,000	32,000	29,000	27,000	25,000	30,000	27,000	23,000	26,000	31,000	32,000	23,000	23,000	34,000	26,000	25,000	12,000 J
Lead	MG/KG	400	9	6.7	7.2	6.1 J	8.6 J	11	8.9	7.2	5.4	9.1	6	6.6	4.6 J	7.1 J	9.1	6.2	5.6	3.2
Lithium	MG/KG	160	31	30	29	28	34	24	28	30	24	28	28	33	18 J	27 J	24	27	24	9.9
Magnesium	MG/KG	14800	6,000	12,000	13,000	12,000	11,000	6,800	10,000	10,000	10,000	7,800	13,000	13,000	12,000	10,000	7,000	9,400	11,000	7,400 J
Manganese	MG/KG	6650	280	660	970	770	870	420	710	530	700	760	830	780	990	930	1,500	690	820	800 J
Mercury	MG/KG	10	0.015 J	0.047 U	0.047 U	0.047 U	0.047 U	0.026 J	0.046 U	0.015 J	0.045 U	0.02 J	0.047 U	0.049 U	0.045 U	0.044 U	0.014 J	0.012 J	0.046 U	0.045 U
Molybdenum	MG/KG	390	1.3 J	3.2 U	3.2 U	2.8 U	3.1 U	0.92 J	2.9 U	3 U	2.8 U	3.4 U	2.9 U	2.9 U	2.9 U	2.9 U	1.4 J	3 U	3 U	2.8 U
Nickel	MG/KG	1500	27	30	32	29 J	36 J	25	31	27	23	28	30	33	22 J	30 J	35	29	23	10
Potassium	MG/KG	2860	950 J	2,100 J	2,300 J	2,100 J	2,100 J	1,400 J	1,500 J	1,400 J	1,600 J	1,500 J	1,900 J	2,100 J	1,500	1,600	1,200 J	1,100 J	1,500 J	720 J
Selenium	MG/KG	390	3.5	2.7 J	1.6 J	1.2 J	3.1 U	2.8 J	4.4	2.7 J	1 J	2.8 J	1.7 J	2.5 J	1.4 J	1.8 J	1.7 J	1.8 J	1.5 J	2.8 U
Sodium	MG/KG	331	87 J	160	160	150	130 J	54 J	97 J	94 J	110 J	53 J	180	140	130 J	120 J	57 J	93 J	180	81 J
Uranium, Total	MG/KG	230	15.9	3.99	3.08	2.6	2.64	18.5	45.3	54.4	31.4	12.2	17.4	4.95	2.13	2.24	51.4	53.5	23.1	1.64
Vanadium	MG/KG	390	35	30	31	27	27	28	32	29	24	30	29	29	21	22	35	27	25	10
Zinc	MG/KG	23000	52	66	66	65	58	62	67	59	52	62	61	93	51	49	58	53	53	26 J
Radionuclides (Alpha Spec)																				
Thorium-228	PCI/G	5	0.732	1.03	0.85	0.955	0.95	0.906	0.935	0.668	1.03	0.922	1.06	1.08	0.756	0.825	0.986	0.928	0.918	0.474
Thorium-230	PCI/G	5	0.916	0.877	0.699	0.941	0.887	1.19	1.15	0.678	0.796	0.886	0.803	0.948	0.611	0.713	1.04	0.77	0.785	0.469
Thorium-232	PCI/G	5	0.836	0.981	0.939	0.969	0.923	0.861	0.797	0.721	0.915	0.948	1.03	0.868	0.647	0.77	1.01	0.929	0.998	0.486
Uranium-234	PCI/G	13	6.5	1.7	0.91	0.857	0.912	7.22	13	19.2	10.1	5.64	7.98	1.55	0.659	0.731	14	16.8	7.07	0.335
Uranium-235/236	PCI/G	8	0.286	0.0661	0.0874	0.0394	0.0703	0.367	0.463	0.897	0.494	0.288	0.346	0.0781	0.00937 U	0.0445	0.799	0.697	0.365	0.0302 U
Uranium-238	PCI/G	14	6.4	1.48	0.942	0.909	0.837	7.24	12.9	18.9	9.86	5.46	7.58	1.61	0.593	0.64	14.3	16.7	6.84	0.374
Radionuclides (Gamma Spec)																				
Actinium-227	PCI/G	0.5	-0.557 U	0.0433 U	-0.464 U	0.106 U	0.165 U	0.161 U	-0.0117 U	4.07	0.146 U	-0.572 U	0.301 U	0.075 U	-0.585 U	0.0689 U	-0.822 U	0.278 U	0.173 U	-0.265 U
Cesium-137	PCI/G	11	-0.0432 U	0.0125 U	-0.0406 U	-0.00843 U	0.00639 U	0.0191 U	-0.00018 U	0.00796 U	-0.0138 U	-0.00478 U	0.01 U	-0.0439 U	0.0358 U	-0.065 U	-0.00681 U	0.000694 U	-0.0197 U	-0.00396 U
Radium-226	PCI/G	5	1.05	0.927	0.925	0.924	0.976	1.36	0.973	0.887	0.923	1	0.629	0.975	0.776	0.577	0.85	1.05	1.01	0.682
Radium-228	PCI/G	5	1.4	1.25	0.78	0.559	1.41	0.945	1.25	0.849	1.05	1.36	0.863	1.22	0.794	1.08	1.31	1.1	0.847	0.6

Notes:

*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;

For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and

For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 24

MONITORING WELL GROUNDWATER ANALYTICAL RESULTS

(Page 1 of 2)

Location ID			MW949	MW949	MW950	MW950	MW951	MW951	MW952 (1)	MW953 (1)	MW954	MW955	MW956	MW957	MW958	MW959	MW960
Field Sample ID			MW949GW0001-0071	MW949GW0001D-9016	MW950GW0001-0039	MW950GW0001-0075	MW951GW0001-0038	MW951GW0002-0072	MW952GW0001-0079	MW953GW0001-0080	MW954GW0001-0082	MW955GW0001-0081	MW956GW0001-0076	MW957GW0001-0077	MW958GW0001-0078	MW959GW0001-0074	MW960GW0001-0073
Matrix			GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER
Date Sampled			12/06/12	12/06/12	11/15/12	12/10/12	11/15/12	12/07/12	12/12/12	12/12/12	12/14/12	12/13/12	12/11/12	12/11/12	12/14/12	12/10/12	12/07/12
Area			EU4	EU4	EU10 South of IWCS	EU10 South of IWCS	EU10 South of IWCS	EU10 South of IWCS	OW11B	OW11B	OW11B	OW11B	EU10 South of IWCS	EU10 South of IWCS	South of IWCS	EU10 South of IWCS	EU10 South of IWCS
Parameter	**Units**	**Criteria***		**Field Duplicate**													
Volatile Organic Compounds																	
1,3-Dichlorobenzene	UG/L	3	0.7 J	0.67 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	UG/L	5	5 U	1.3 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals																	
Aluminum	UG/L	-	74	65	NA	300 U	NA	30 U	420	210	NA	81	110 J	200	NA	300 U	420
Arsenic	UG/L	25	15	13	NA	100 U	NA	1.3 J	50 U	50 U	NA	20 U	8.1 J	50 U	NA	100 U	10 U
Barium	UG/L	1000	12	11	NA	11 J	NA	44	39	32	NA	34	24	32	NA	42	35
Boron	UG/L	1000	590	600	NA	380 J	NA	120	70 J	110 J	NA	98 J	270	87 J	NA	460 J	120
Calcium	UG/L	-	190,000	190,000	NA	160,000	NA	150,000 J	160,000	170,000	NA	120,000	100,000	230,000	NA	130,000 J	160,000
Cobalt	UG/L	-	2 U	2 U	NA	20 U	NA	0.53 J	10 U	10 U	NA	0.73 J	1.1 J	10 U	NA	20 U	0.74 J
Copper	UG/L	200	0.51 J	3 U	NA	30 U	NA	2.2 J	15 U	15 U	NA	6 U	15 U	15 U	NA	30 U	1.5 J
Iron	UG/L	300	1,400	200	NA	500 U	NA	190	590	360	NA	160	430	350	NA	500 U	460
Lead	UG/L	25	3 U	3 U	NA	30 U	NA	3 U	15 U	15 U	NA	6 U	15 U	1.3 J	NA	30 U	0.21 J
Lithium	UG/L	-	51	48	NA	130	NA	34	58	34	NA	69	88	60	NA	100	56
Magnesium	UG/L	35000	210,000	190,000	NA	300,000	NA	120,000 J	130,000	130,000	NA	140,000	180,000	240,000	NA	240,000 J	130,000
Manganese	UG/L	300	77	68	NA	31	NA	290	55	200	NA	300	120	220	NA	89	130
Molybdenum	UG/L	-	20	20	NA	50 U	NA	1.6 J	25 U	25 U	NA	7.5 J	9 J	25 U	NA	50 U	3.4 J
Nickel	UG/L	100	0.46 J	0.41 J	NA	50 U	NA	1 J	2.3 J	25 U	NA	2.5 J	2.9 J	3.6 J	NA	50 U	2.3 J
Potassium	UG/L	-	5,600	4,900	NA	2,400	NA	2,000	3,000	1,900	NA	3,800	4,200	1,800	NA	5,400	2,100
Silver	UG/L	50	0.47 J	0.099 J	NA	4.1 J	NA	2 U	R	10 U	NA	4 U	10 U	0.66 J	NA	20 U	0.76 J
Sodium	UG/L	20000	260,000	240,000	NA	130,000	NA	37,000	41,000	34,000	NA	47,000	68,000	61,000	NA	93,000 J	32,000
Thallium	UG/L	0.5	2 U	2 U	NA	15 J	NA	2 U	10 U	10 U	NA	4 U	10 U	10 U	NA	20 U	0.84 J
Uranium, Total	UG/L	30	0.363 J	0.842	35	29.4	2,400	2,090	286	1,970	218	24.7	27	2,100	33.2	41.7	1,010
Zinc	UG/L	2000	16	12 U	NA	120 U	NA	12 U	60 U	60 U	NA	24 U	60 U	60 U	NA	120 U	12 U
Metals (Filtered)																	
Aluminum	UG/L	-	24 J	300 U	NA	300 U	NA	30 U	60 U	150 U	NA	60 U	150 U	150 U	NA	300 U	53
Arsenic	UG/L	25	15	15	NA	100 U	NA	1.3 J	20 U	50 U	NA	20 U	24 J	50 U	NA	100 U	10 U
Barium	UG/L	1000	10	11	NA	12 J	NA	46	30	21	NA	20	12	32	NA	32	32
Boron	UG/L	1000	950	780	NA	500 J	NA	150 J	43 J	120 J	NA	110	330	100 J	NA	760	130 J
Calcium	UG/L	-	180,000	190,000	NA	180,000	NA	150,000 J	170,000	140,000	NA	120,000	80,000	220,000	NA	120,000	160,000
Cobalt	UG/L	-	2 U	2 U	NA	20 U	NA	0.55 J	4 U	10 U	NA	1.1 J	10 U	1.4 J	NA	20 U	0.69 J
Copper	UG/L	200	3 U	3 U	NA	30 U	NA	2.1 J	2.3 J	15 U	NA	6 U	15 U	15 U	NA	30 U	1.6 J
Iron	UG/L	300	270	170	NA	500 U	NA	170	100 U	170 J	NA	100 U	840	250 U	NA	220 J	91
Lithium	UG/L	-	46	51	NA	150	NA	36 J	38	37	NA	71	82	67	NA	99	57
Magnesium	UG/L	35000	200,000	200,000	NA	360,000	NA	120,000	110,000	110,000	NA	140,000	160,000	250,000	NA	230,000	130,000
Manganese	UG/L	300	80	80	NA	27	NA	310	21	290	NA	320	40	200	NA	92	130
Molybdenum	UG/L	-	20	21	NA	50 U	NA	50 U	4.2 J	25 U	NA	15	6.7 J	25 U	NA	50 U	2.8 J
Nickel	UG/L	100	5 U	5 U	NA	50 U	NA	1.1 J	1.5 J	25 U	NA	2.5 J	25 U	3.8 J	NA	50 U	2.4 J
Potassium	UG/L	-	5,200	5,500	NA	2,600	NA	2,200	2,100	1,700	NA	4,300	3,400	2,300	NA	4,800	2,000
Silver	UG/L	50	0.64 J	0.14 J	NA	1.2 J	NA	2 U	4 U	10 U	NA	R	10 U	0.58 J	NA	4.1 J	0.46 J
Sodium	UG/L	20000	250,000 J	250,000 J	NA	150,000	NA	35,000 J	40,000	31,000	NA	47,000	66,000	65,000	NA	90,000	28,000 J
Thallium	UG/L	0.5	1 J	2 U	NA	6.2 J	NA	2 U	4 U	10 U	NA	4 U	10 U	10 U	NA	16 J	0.71 J
Uranium, Total	UG/L	30	1.05	0.698	31	28.9	2,600	1,740	353	1,760	NA	20.1	6.6	2,680	NA	17.2	1,040

Notes:

(1) Groundater samples collected over a two day period.

Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and

For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L); USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 24

MONITORING WELL GROUNDWATER ANALYTICAL RESULTS

(Page 2 of 2)

Location ID			MW949	MW949	MW950	MW950	MW951	MW951	MW952 (1)	MW953 (1)	MW954	MW955	MW956	MW957	MW958	MW959	MW960
Field Sample ID			MW949GW0001-0071	MW949GW0001D-9016	MW950GW0001-0039	MW950GW0001-0075	MW951GW0001-0038	MW951GW0002-0072	MW952GW0001-0079	MW953GW0001-0080	MW954GW0001-0082	MW955GW0001-0081	MW956GW0001-0076	MW957GW0001-0077	MW958GW0001-0078	MW959GW0001-0074	MW960GW0001-0073
Matrix			GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER
Date Sampled			12/06/12	12/06/12	11/15/12	12/10/12	11/15/12	12/07/12	12/12/12	12/12/12	12/14/12	12/13/12	12/11/12	12/11/12	12/14/12	12/10/12	12/07/12
Area			EU4	EU4	EU10 South of IWCS	EU10 South of IWCS	EU10 South of IWCS	EU10 South of IWCS	OW11B	OW11B	OW11B	OW11B	EU10 South of IWCS	EU10 South of IWCS	South of IWCS	EU10 South of IWCS	EU10 South of IWCS
Parameter	**Units**	**Criteria***		**Field Duplicate**													
Miscellaneous Parameters																	
Alkalinity, Bicarbonate (as CaCO3)	MG/L	-	75 J	57 J	NA	5 U	NA	5 U	5 U	5 U	NA	5 U	5 U	5 U	NA	5 U	5 U
Alkalinity, carbonate (as CaCO3)	MG/L	-	4 J	8 J	NA	5 U	NA	5 U	5 U	5 U	NA	5 U	5 U	5 U	NA	5 U	5 U
Alkalinity, hydroxide (as CaCO3)	MG/L	-	5 U	5 U	NA	510	NA	460	290	380	NA	400	510	590	NA	490	520
Alkalinity, Total (as CaCO3)	MG/L	-	79	65	NA	510	NA	460	290	380	NA	400	510	590	NA	490	520
Chloride	MG/L	250	79	79	NA	54	NA	48	39	23	NA	20	28	26	NA	32	55
Fluoride	MG/L	1.5	0.1 U	0.1 U	NA	1 J	NA	0.51 J	0.28	0.26	NA	0.28	0.35	0.81	NA	0.37	0.39
Nitrate-Nitrogen (as N)	MG/L	10	0.02 U	0.02 U	NA	0.02 U	NA	0.22	0.037 J	0.062 J	NA	0.059 J	0.023 J	0.009 J	NA	0.016 J	0.02 U
Phosphate (as o-PO4)	MG/L	-	0.05 U	0.05 U	NA	0.05 U	NA	0.05 U	0.05 U	0.05 U	NA	0.05 U	0.05 U	0.05 U	NA	0.16 J	0.05 U
Sulfate (as SO4)	MG/L	250	1,600	1,500	NA	1,200	NA	370	620	600	NA	540	1,000	1,000	NA	720	390
Total Dissolved Solids	MG/L	-	5,400	5,300	NA	5,100 J	NA	1,200	1,400	1,400	NA	1,300	2,900	4,400	NA	3,000 J	1,300
Turbidity	NTU	-	NA	NA	350 J	NA	57 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Field Parameters																	
pH	SU	-	8.82	NA	8.37	7.02	8.15	6.81	7.14	7.12	7.27	7.27	7.07	6.90	7.28	7.04	6.89
Temperature	°C	-	10.13	NA	10.8	10.90	10.4	12.45	10.19	9.47	11.48	11.21	10.64	10.14	10.98	10.22	11.5
Conductivity	mS/cm	-	2.34	NA	NA	2.351	NA	1.369	1.27	1.26	1.556	1.373	1.457	2.068	1.09	1.561	1.382
Dissolved Oxygen	MG/L	-	0.33	NA	NA	3.55	NA	0.52	9.79	6.23	7.91	8.56	4.06	6.90	3.65	6.05	7.26
Turbidity	NTU	-	3.5	NA	NA	1.5	NA	0.6	0.4	1.1	78.7	4.8	0.6	19.1	3.2	0.4	5.0
Oxidation-Reduction Potential	Mv	-	119.4	NA	NA	188.1	NA	26.1	194.9	192.1	183.6	171.9	160.6	192.3	185.8	167.6	135.4
Radionuclides (Alpha Spec)																	
Thorium-228	PCI/L	15	0.0722	0.0573	0.303 U	0.528 U	0.0328 U	0.0379 U	0.00804 U	0.0272 U	0.0826 U	0.0638 U	0.0276 U	0.0177 U	0.2 U	0.287 U	0.0436
Thorium-230	PCI/L	15	R	0.0825 J	0.59 J	0.765 U	0.332 J	R	0.0137 U	0.0354 U	R	R	0.0487	0.0404 U	0.886 J	0.741 U	0.0692 J
Thorium-232	PCI/L	15	0.00492 U	0.0061 U	0.221 U	0.468 U	0.0872 U	0.00347 U	0.0267 U	-0.00124 U	0.2 U	0.00866 U	-0.00252 U	-0.00747 U	0.0454 U	-0.0818 U	0.028
Uranium-234	PCI/L	27	0.55	0.2 U	13.1	11.5	742	687	86.6 J	766 J	NA	12.8	14.9	1,380 J	NA	23.7	374
Uranium-235/236	PCI/L	27	0.0167 U	-0.0318 U	0.559	0.589	39.8	34.5	3.72 J	40 J	NA	0.429	0.68	83.4 J	NA	0.902	17.9
Uranium-238	PCI/L	27	0.192 U	0.296 U	11.2	10.2	758	690	84.6 J	766 J	NA	10.5	14.3	1,360 J	NA	22.3	387
Radionuclides (Filtered - Alpha Spec)																	
Thorium-228	PCI/L	15	0.0179 U	0.0383 U	0.299 U	0.2 U	0.129 U	0.00698 U	0.0255 U	0.00812 U	NA	0.0122 U	0.0699 U	0.231 U	NA	0.2 U	0.0244 U
Thorium-230	PCI/L	15	0.0535 U	0.0386 U	0.0579 U	0.02 U	0.543 J	R	0.017 U	0.0189 U	NA	0.0305 U	0.0893	0.483 J	NA	0.165 U	0.0362 U
Thorium-232	PCI/L	15	0.0177 U	-0.00401 U	0.0761 U	-0.0199 U	-0.0747 U	-0.00239 U	0.0254	0.0215 U	NA	0.2 U	0.00652 U	0.2 U	NA	-0.0137 U	-0.00204 U
Uranium-234	PCI/L	27	0.0538 U	0.813	12	14.5	756	547	109	709 J	NA	9.8	3.95	905	NA	13.9	313
Uranium-235/236	PCI/L	27	0.0893 U	0.0723 U	0.455	0.54	37.6	24.6	4.8	36.3 J	NA	0.403	0.128	44.8	NA	0.725	13.1
Uranium-238	PCI/L	27	-0.0358 U	0.2 U	9.43	10.7	736	556	105	709 J	NA	7.53	3.37	919	NA	12.9	314
Radionuclides (Radon Emanation)																	
Radium-226	PCI/L	3	0.202	0.212	NA	0.102 U	NA	0.198	0.329	0.28	0.0906 U	0.251	NA	0.209	0.273	0.351	0.184
Radionuclides (Filtered - Radon Emanation)																	
Radium-226	PCI/L	3	0.107 U	0.251	NA	-0.00563 U	NA	0.0911	0.0899 U	-0.181 U	NA	0.16 U	0.249	0.202	NA	0.271	0.3
Radionuclides (Gas Flow Proportional)																	
Radium-228	PCI/L	5	0.369 J	0.366 U	0.563 U	0.448	0.483 U	0.141 U	0.00717 U	0.118 U	1.85	0.371	0.16 U	0.451	1.7 U	1.27	0.568
Radionuclides (Filtered - Gas Flow Proportional)																	
Radium-228	PCI/L	5	0.206 U	0.394 J	0.463 U	0.308 U	0.215 U	0.374 U	0.139 U	0.194 U	NA	0.0571 U	0.138 U	0.343 U	NA	0.546	0.486 J

Notes:

(1) Groundater samples collected over a two day period.

Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and

For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 25

METALS DETECTED IN GROUNDWATER SAMPLES

PARAMETER	2012 BOP OU FIELD INVESTIGATION MAXIMUM DETECTED CONCENTRATION (µg/L)			
	UNFILTERED	LOCATION	FILTERED	LOCATION
Aluminum	420	MW952 & MW960	53	MW960
Arsenic	15	MW949	24 J	MW956
Barium	44	MW951	46	MW951
Beryllium	ND	NA	ND	NA
Boron	600	MW949	950	MW949
Cadmium	ND	NA	ND	NA
Calcium	230,000	MW957	220,000	MW957
Chromium	ND	NA	ND	NA
Cobalt	1.1 J	MW956	1.4 J	MW957
Copper	2.2 J	MW951	2.3 J	MW952
Iron	1,400	MW949	840	MW956
Lead	1.3 J	MW957	ND	NA
Lithium	130	MW950	150	MW950
Magnesium	300,000	MW950	360,000	MW950
Manganese	300	MW955	320	MW955
Mercury	ND	NA	ND	NA
Molybdenum	20	MW949	21	MW949
Nickel	3.6 J	MW957	3.8 J	MW957
Potassium	5,600	MW949	5,500	MW949
Selenium	ND	NA	ND	NA
Silver	4.1 J	MW950	4.1 J	MW959
Sodium	260,000	MW949	250,000 J	MW949
Thallium	15 J	MW950	16 J	MW959
Uranium, Total	2,400	MW951	2,680	MW957
Vanadium	ND	NA	ND	NA
Zinc	16	MW949	ND	NA

Notes:

J - Estimated value

NA - Not applicable

ND - Not detected

TABLE 26
PIPELINE EXCAVATION PE1
SOIL AND SEDIMENT ANALYTICAL RESULTS

Location ID			PE1	PE1
Field Sample ID			PE1SB115.0-15.5-0121	PE1PIPE1SED-0123
Matrix			SOIL	SEDIMENT
Sample Depth Interval (ft)			15.0-15.5	14.0-15.0
Date Sampled			11/28/12	11/29/12
Parameter	**Units**	**Criteria***	**PIPE1**	**PIPE1**
			10"	**10"**
Volatile Organic Compounds				
Acetone	UG/KG	6.10E+07	15 J	NA
Carbon disulfide	UG/KG	8.20E+05	1.3 J	NA
Naphthalene	UG/KG	3600	5.4 J	NA
Semivolatile Organic Compounds				
Anthracene	UG/KG	1.70E+07	130 J	NA
Benzo(a)anthracene	UG/KG	150	260 J	NA
Benzo(a)pyrene	UG/KG	15	180 J	NA
Benzo(b)fluoranthene	UG/KG	150	230 J	NA
Benzo(g,h,i)perylene	UG/KG	-	73 J	NA
Benzo(k)fluoranthene	UG/KG	1500	120 J	NA
Carbazole	UG/KG	-	210 J	NA
Chrysene	UG/KG	15000	240 J	NA
Fluoranthene	UG/KG	2.30E+06	710	NA
Fluorene	UG/KG	2.30E+06	61 J	NA
Phenanthrene	UG/KG	-	660	NA
Pyrene	UG/KG	1.70E+06	490	NA
Metals				
Aluminum	MG/KG	77000	13,000 J	NA
Arsenic	MG/KG	8.73	3.7 J	NA
Barium	MG/KG	15000	100	NA
Beryllium	MG/KG	160	0.84	NA
Boron	MG/KG	16000	25 J	NA
Cadmium	MG/KG	70	0.16 J	NA
Calcium	MG/KG	58900	44,000 J	NA
Chromium	MG/KG	25.8	20	NA
Cobalt	MG/KG	36.7	13	NA
Copper	MG/KG	3100	26	NA
Iron	MG/KG	55000	27,000 J	NA
Lead	MG/KG	400	7.2	NA
Lithium	MG/KG	160	30	NA
Magnesium	MG/KG	14800	12,000 J	NA
Manganese	MG/KG	6650	900 J	NA
Molybdenum	MG/KG	390	0.96 J	NA
Nickel	MG/KG	1500	28	NA
Potassium	MG/KG	2860	2,000 J	NA
Selenium	MG/KG	390	1.5 J	NA
Sodium	MG/KG	331	190	NA
Uranium, Total	MG/KG	230	2.9	NA
Vanadium	MG/KG	390	26	NA
Zinc	MG/KG	23000	56	NA
Radionuclides (Alpha Spec)				
Thorium-228	PCI/G	5	1.02	-0.00047 U
Thorium-230	PCI/G	5	0.918	R
Thorium-232	PCI/G	5	0.966	0.00561 U
Uranium-234	PCI/G	13	0.733	0.923
Uranium-235/236	PCI/G	8	0.0332	0.0482
Uranium-238	PCI/G	14	0.719	0.771
Radionuclides (Gamma Spec)				
Actinium-227	PCI/G	0.5	0.011 U	NA
Cesium-137	PCI/G	11	-0.000451 U	NA
Radium-226	PCI/G	5	1.2	NA

Notes:

*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;

For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and

For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 27
PE1 PIPELINE EXCAVATION WATER ANALYTICAL RESULTS
(Page 1 of 2)

Location ID			PE1
Field Sample ID			PE1PIPE114.0-14.5-0122
Matrix			WATER
Sample Depth Interval (ft)			14.0-14.5
Date Sampled			11/28/12
Parameter	**Units**	**Criteria***	
Volatile Organic Compounds			
Benzene	UG/L	1	0.54 J
Ethylbenzene	UG/L	5	1.2 J
Hexane	UG/L	-	3.5 J
Naphthalene	UG/L	10	57
Semivolatile Organic Compounds			
2-Methylnaphthalene	UG/L	-	2.6 J
Acenaphthene	UG/L	20	5.2 J
Anthracene	UG/L	50	7.7 J
Carbazole	UG/L	50	68
Dibenzofuran	UG/L	50	6.1 J
Fluoranthene	UG/L	50	17
Fluorene	UG/L	50	11
Naphthalene	UG/L	10	23
Phenanthrene	UG/L	50	50
Pyrene	UG/L	50	10
Pesticide Organic Compounds			
Methoxychlor	UG/L	35	0.025 J
Metals			
Aluminum	UG/L	-	19 J
Barium	UG/L	1000	24
Boron	UG/L	1000	90
Calcium	UG/L	-	18,000
Copper	UG/L	200	4.5
Iron	UG/L	300	140
Lead	UG/L	25	5.4
Lithium	UG/L	-	6.2
Magnesium	UG/L	35000	14,000
Manganese	UG/L	300	25
Molybdenum	UG/L	-	2.1 J
Potassium	UG/L	-	1,500
Silver	UG/L	50	0.87 J
Sodium	UG/L	20000	8,400
Thallium	UG/L	0.5	0.74 J
Uranium, Total	UG/L	30	0.0178 U
Metals (Filtered)			
Barium	UG/L	1000	25
Boron	UG/L	1000	89
Calcium	UG/L	-	19,000
Iron	UG/L	300	29 J
Lithium	UG/L	-	6.6
Magnesium	UG/L	35000	14,000
Manganese	UG/L	300	24
Molybdenum	UG/L	-	2.2 J
Potassium	UG/L	-	1,500
Silver	UG/L	50	0.97 J
Sodium	UG/L	20000	8,400
Thallium	UG/L	0.5	0.55 J
Uranium, Total	UG/L	30	0.0131 U

Notes:
Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and
For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 27
PE1 PIPELINE EXCAVATION WATER ANALYTICAL RESULTS
(Page 2 of 2)

Location ID			PE1
Field Sample ID			PE1PIPE114.0-14.5-0122
Matrix			WATER
Sample Depth Interval (ft)			14.0-14.5
Date Sampled			11/28/12
Parameter	**Units**	**Criteria***	
Miscellaneous Parameters			
Alkalinity, hydroxide (as CaCO3)	MG/L	-	30
Alkalinity, Total (as CaCO3)	MG/L	-	30
Chloride	MG/L	250	57
Fluoride	MG/L	1.5	1.2
Nitrate-Nitrogen (as N)	MG/L	10	0.45
Nitrite-Nitrogen	MG/L	1	0.13
Sulfate (as SO4)	MG/L	250	0.081 J
Total Dissolved Solids	MG/L	-	200
Radionuclides (Alpha Spec)			
Thorium-228	PCI/L	15	-0.00736 U
Thorium-230	PCI/L	15	0.0804
Thorium-232	PCI/L	15	-0.00977 U
Uranium-234	PCI/L	27	0.0243
Uranium-235/236	PCI/L	27	0.0101 U
Uranium-238	PCI/L	27	0.0121 U
Radionuclides (Filtered - Alpha Spec)			
Thorium-228	PCI/L	15	0.0106 U
Thorium-230	PCI/L	15	0.0364 U
Thorium-232	PCI/L	15	0.0263 U
Uranium-234	PCI/L	27	0.0445 J
Uranium-235/236	PCI/L	27	0.00874 U
Uranium-238	PCI/L	27	0.0257 U
Radionuclides (Radon Emanation)			
Radium-226	PCI/L	3	0.0533 U
Radionuclides (Filtered - Radon Emanation)			
Radium-226	PCI/L	3	0.0569 U
Radionuclides (Gas Flow Proportional)			
Radium-228	PCI/L	5	0.225 U
Radionuclides (Filtered - Gas Flow Proportional)			
Radium-228	PCI/L	5	0.0418 U

Notes:
Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and
For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 28
PIPELINE EXCAVATION PE2
SOIL AND SEDIMENT ANALYTICAL RESULTS

Location ID			PE2	PE2	PE2	PE2
Field Sample ID			PE2SB19.0-9.5-0114	PE2SB29.0-9.5-0115	PE2SB39.0-9.5-0116	PE2PIPE3SED-0120
Matrix			SOIL	SOIL	SOIL	SEDIMENT
Sample Depth Interval (ft)			9.0-9.5	9.0-9.5	9.0-9.5	-
Date Sampled			11/20/12	11/20/12	11/20/12	11/20/12
Parameter	Units	Criteria*	PIPE1	PIPE2	PIPE3	PIPE3
			4"	6"	8"	8"
Volatile Organic Compounds						
Acetone	UG/KG	6.10E+07	24 U	13 J	9 J	NA
Semivolatile Organic Compounds						
Anthracene	UG/KG	1.70E+07	110 J	410 U	46 J	NA
Benzo(a)anthracene	UG/KG	150	380 J	410 U	120 J	NA
Benzo(a)pyrene	UG/KG	15	290 J	410 U	80 J	NA
Benzo(b)fluoranthene	UG/KG	150	420	410 U	110 J	NA
Benzo(g,h,i)perylene	UG/KG	-	170 J	410 U	420 U	NA
Benzo(k)fluoranthene	UG/KG	1500	140 J	410 U	420 U	NA
Carbazole	UG/KG	-	110 J	410 U	420 U	NA
Chrysene	UG/KG	15000	340 J	410 U	100 J	NA
Fluoranthene	UG/KG	2.30E+06	820	410 U	330 J	NA
Indeno(1,2,3-cd)pyrene	UG/KG	150	380 J	410 U	270 J	NA
Phenanthrene	UG/KG	-	420	410 U	150 J	NA
Pyrene	UG/KG	1.70E+06	600	410 U	220 J	NA
Metals						
Aluminum	MG/KG	77000	11,000 J	11,000 J	13,000 J	NA
Arsenic	MG/KG	8.73	4.4 J	5.2 J	7.7	NA
Barium	MG/KG	15000	120 J	160	130	NA
Beryllium	MG/KG	160	0.57 J	0.65	0.96	NA
Cadmium	MG/KG	70	0.17 J	0.15 J	0.62	NA
Calcium	MG/KG	58900	35,000 J	43,000	16,000	NA
Chromium	MG/KG	25.8	16	16	15	NA
Cobalt	MG/KG	36.7	10	10	20	NA
Copper	MG/KG	3100	29	28	36	NA
Iron	MG/KG	55000	22,000 J	30,000	30,000	NA
Lead	MG/KG	400	6.3	7.3	11	NA
Lithium	MG/KG	160	22	26	23	NA
Magnesium	MG/KG	14800	9,400	8,700	5,500	NA
Manganese	MG/KG	6650	910 J	820	2,900	NA
Mercury	MG/KG	10	0.045 U	0.05 U	0.02 J	NA
Molybdenum	MG/KG	390	3 U	1.3 J	1 J	NA
Nickel	MG/KG	1500	20	25	31	NA
Potassium	MG/KG	2860	1,400 J	1,200 J	780 J	NA
Selenium	MG/KG	390	1.3 J	1.7 J	3.2 U	NA
Sodium	MG/KG	331	160	150	130 J	NA
Uranium, Total	MG/KG	230	2.31	2.09	2.58	NA
Vanadium	MG/KG	390	23	23	27	NA
Zinc	MG/KG	23000	49	49	52	NA
Radionuclides (Alpha Spec)						
Thorium-228	PCI/G	5	0.851	0.885	0.827	0.00466 U
Thorium-230	PCI/G	5	0.741	0.858	0.701	0.0693
Thorium-232	PCI/G	5	0.86	0.84	0.759	0.0255 U
Uranium-234	PCI/G	13	0.681	0.627	0.667	0.579
Uranium-235/236	PCI/G	8	0.0463 J	0.0318	0.0322	0.0756
Uranium-238	PCI/G	14	0.606	0.694	0.658	0.644
Radionuclides (Gamma Spec)						
Actinium-227	PCI/G	0.5	0.0391 U	0.0611 U	-0.0211 U	-0.0829 U
Cesium-137	PCI/G	11	0.00146 U	-0.015 U	0.0252 U	0.0355 U
Radium-226	PCI/G	5	0.947	0.819	0.953	0.105 U
Radium-228	PCI/G	5	0.995	1.08	0.989	0.186 U

Notes:

*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;

For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and

For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 29
PE2 PIPELINE EXCAVATION WATER ANALYTICAL RESULTS
(Page 1 of 2)

Location ID			PE2	PE2	PE2
Field Sample ID			PE2PIPE18.2-8.4-0117	PE2PIPE28.3-8.6-0119	PE2PIPE38.3-8.7-0118
Matrix			WATER	WATER	WATER
Sample Depth Interval (ft)			8.2-8.4	8.3-8.6	8.3-8.7
Date Sampled			11/20/12	11/20/12	11/20/12
Parameter	Units	Criteria*	PIPE 1	PIPE 2	PIPE 3
Volatile Organic Compounds					
Benzene	UG/L	1	5 U	0.26 J	0.6 J
Ethylbenzene	UG/L	5	5 U	0.42 J	1.4 J
Hexane	UG/L	-	10 U	10 U	0.91 J
Naphthalene	UG/L	10	5 U	5 U	12
Xylene (total)	UG/L	5	10 U	10 U	13
Semivolatile Organic Compounds					
Acenaphthene	UG/L	20	9.5 U	5.4 J	2.4 J
Acetophenone	UG/L	-	2.3 J	9.5 U	9.5 U
Anthracene	UG/L	50	9.5 U	4.9 J	2.9 J
Benzyl alcohol	UG/L	50	1.4 J	9.5 U	9.5 U
Carbazole	UG/L	50	9.5 U	25	25
Dibenzofuran	UG/L	50	9.5 U	6.9 J	2.3 J
Dimethylphthalate	UG/L	50	1.1 J	9.5 U	9.5 U
Fluoranthene	UG/L	50	1.3 J	7.4 J	3.3 J
Fluorene	UG/L	50	9.5 U	12	5.1 J
Naphthalene	UG/L	10	9.5 U	9.5 U	6.5 J
Phenanthrene	UG/L	50	9.5 U	1.1 J	10
Pyrene	UG/L	50	9.5 U	4.7 J	1.7 J
Pesticide Organic Compounds					
4,4'-DDE	UG/L	0.2	0.048 U	0.016 J	0.047 U
Methoxychlor	UG/L	35	0.018 J	0.099 U	0.095 U
Metals					
Aluminum	UG/L	-	30 U	30 U	42
Barium	UG/L	1000	140	59	19
Boron	UG/L	1000	98	52 J	21 J
Calcium	UG/L	-	160,000	57,000	15,000
Copper	UG/L	200	1.5 J	3 U	6.8
Iron	UG/L	300	16,000	8,200	300
Lead	UG/L	25	9.9	3 U	9.3
Lithium	UG/L	-	5.5	3.5 J	8
Magnesium	UG/L	35000	32,000	89,000	8,200
Manganese	UG/L	300	490	65	22
Mercury	UG/L	0.7	0.085 J	0.081 J	0.084 J
Molybdenum	UG/L	-	5 U	5 U	1.8 J
Nickel	UG/L	100	0.87 J	5 U	0.43 J
Potassium	UG/L	-	2,400	1,900	3,000
Silver	UG/L	50	0.2 J	R	2 U
Sodium	UG/L	20000	9,100	30,000	9,600
Thallium	UG/L	0.5	2 U	0.93 J	0.66 J
Uranium, Total	UG/L	30	13.6	0.975	-0.00202 U
Zinc	UG/L	2000	45	8.3 J	12
Metals (Filtered)					
Barium	UG/L	1000	140	57	18
Boron	UG/L	1000	130	51 J	42 J
Cadmium	UG/L	5	0.5 U	0.5 U	0.16 J
Calcium	UG/L	-	150,000	55,000	15,000
Copper	UG/L	200	0.51 J	3 U	3 U
Iron	UG/L	300	15,000	7,800	22 J
Lead	UG/L	25	0.35 J	0.22 J	0.38 J
Lithium	UG/L	-	4.3 J	1.8 J	7.1
Magnesium	UG/L	35000	34,000	90,000 J	8,100
Manganese	UG/L	300	470	64	17
Mercury	UG/L	0.7	0.083 J	0.082 J	0.082 J
Molybdenum	UG/L	-	5 U	5 U	2.2 J
Nickel	UG/L	100	0.68 J	5 U	5 U
Potassium	UG/L	-	2,400	1,900	2,900
Silver	UG/L	50	0.32 J	0.55 J	0.51 J
Sodium	UG/L	20000	9,600	30,000	9,500
Thallium	UG/L	0.5	1.2 J	0.95 J	1.6 J
Uranium, Total	UG/L	30	14.9	0.949	-0.0048 U
Zinc	UG/L	2000	12 U	11 J	12 U

Notes:

Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and

For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 29
PE2 PIPELINE EXCAVATION WATER ANALYTICAL RESULTS
(Page 2 of 2)

Location ID			PE2	PE2	PE2
Field Sample ID			PE2PIPE18.2-8.4-0117	PE2PIPE28.3-8.6-0119	PE2PIPE38.3-8.7-0118
Matrix			WATER	WATER	WATER
Sample Depth Interval (ft)			8.2-8.4	8.3-8.6	8.3-8.7
Date Sampled			11/20/12	11/20/12	11/20/12
Parameter	Units	Criteria*	PIPE 1	PIPE 2	PIPE 3
Miscellaneous Parameters					
Alkalinity, carbonate (as CaCO3)	MG/L	-	NA	5 U	2 J
Alkalinity, hydroxide (as CaCO3)	MG/L	-	NA	540	20
Alkalinity, Total (as CaCO3)	MG/L	-	NA	540	22
Chloride	MG/L	250	NA	19	48 J
Fluoride	MG/L	1.5	NA	0.35	1.9
Nitrate-Nitrogen (as N)	MG/L	10	NA	0.02 U	0.029 J
Nitrite-Nitrogen	MG/L	1	NA	0.43 J	1.4 J
Sulfate (as SO4)	MG/L	250	NA	19	0.5 U
Total Dissolved Solids	MG/L	-	NA	540	130
Radionuclides (Alpha Spec)					
Thorium-228	PCI/L	15	0.00628 U	0.0311 U	0.022 U
Thorium-230	PCI/L	15	0.0473 U	0.0523	0.0154 U
Thorium-232	PCI/L	15	0.0229 U	-0.00412 U	-0.0148 U
Uranium-234	PCI/L	27	5.4	0.314	0.0099 U
Uranium-235/236	PCI/L	27	0.206	0.00869 U	0.00493 U
Uranium-238	PCI/L	27	4.65	0.372	0.0257 U
Radionuclides (Filtered - Alpha Spec)					
Thorium-228	PCI/L	15	0.0395 U	-0.00413 U	0.0137 U
Thorium-230	PCI/L	15	0.0398 U	0.0664 J	R
Thorium-232	PCI/L	15	0.0183 U	0.0206 U	-0.00227 U
Uranium-234	PCI/L	27	5.46	0.365	-0.00403 U
Uranium-235/236	PCI/L	27	0.315	0.0117 U	0.0276 U
Uranium-238	PCI/L	27	5.16	0.199	0.00804 U
Radionuclides (Radon Emanation)					
Radium-226	PCI/L	3	0.0738 U	0.0286 U	0.0289 U
Radionuclides (Filtered - Radon Emanation)					
Radium-226	PCI/L	3	-0.0399 U	0.051 U	0.102 U
Radionuclides (Gas Flow Proportional)					
Radium-228	PCI/L	5	0.462 U	0.23 U	0.243 U
Radionuclides (Filtered - Gas Flow Proportional)					
Radium-228	PCI/L	5	0.332 U	0.108 U	0.211 U

Notes:
Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and
For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.
Concentration exceeds criteria.
U - Not detected above the reported quantitation limit.
J - The reported concentration is an estimated value.
NA - Not Analyzed.
R - Data rejected.
Only detected results reported.

TABLE 30
PIPELINE EXCAVATION PE3
SOIL AND SEDIMENT ANALYTICAL RESULTS

Location ID			PE3	PE3	PE3	PE3	PE3	PE3	PE3	PE3
Field Sample ID			PE3SB18.0-8.5-0101	PE3SB28.0-8.5-0102	PE3SB38.0-8.5-0104	PE3SB38.0-8.5D-9101	PE3SB410-11-0110	PE3PIPE1SED-0107	PE3PIPE2SED-0108	PE3PIPE3SED-0109
Matrix			SOIL	SOIL	SOIL	SOIL	SOIL	SEDIMENT	SEDIMENT	SEDIMENT
Sample Depth Interval (ft)			8.0-8.5	8.0-8.5	8.0-8.5	8.0-8.5	10.0-11.0	-	-	-
Date Sampled			11/13/12	11/13/12	11/13/12	11/13/12	11/15/12	11/14/12	11/14/12	11/14/12
Parameter	**Units**	**Criteria***	**PIPE1**	**PIPE2**	**PIPE3**	**PIPE3 (DUPLICATE)**	**PIPE4**	**PIPE1**	**PIPE2**	**PIPE3**
			10"	10"	12"	12"	36"	10"	10"	12"
Volatile Organic Compounds										
1,2-Dichlorobenzene	UG/KG	1.90E+06	6.4 U	6.2 U	6.1 U	6.4 U	6.5 U	NA	NA	42
1,3-Dichlorobenzene	UG/KG	-	6.4 U	6.2 U	6.1 U	6.4 U	6.5 U	NA	NA	7.3 J
1,4-Dichlorobenzene	UG/KG	2400	6.4 U	6.2 U	6.1 U	6.4 U	6.5 U	NA	NA	21
4-Isopropyltoluene (p-Cymene)	UG/KG	-	6.4 U	6.2 U	6.1 U	6.4 U	0.5 J	NA	NA	15 U
Acetone	UG/KG	6.10E+07	27	36	36	41	37	NA	NA	40 J
Carbon disulfide	UG/KG	8.20E+05	6.4 U	6.2 U	0.97 J	1.3 J	6.5 U	NA	NA	3.5 J
Chlorobenzene	UG/KG	2.90E+05	6.4 U	6.2 U	6.1 U	6.4 U	6.5 U	NA	NA	4.2 J
Ethylbenzene	UG/KG	5400	6.4 U	6.2 U	6.1 U	0.8 J	0.97 J	NA	NA	15 U
Methyl ethyl ketone (2-Butanone)	UG/KG	2.80E+07	26 U	25 U	5.5 J	8.6 J	26 U	NA	NA	58 U
Naphthalene	UG/KG	3600	6.4 U	6.2 U	6.1 U	6.4 U	6.5 U	NA	NA	2.6 J
Semivolatile Organic Compounds										
1,2-Dichlorobenzene	UG/KG	1.90E+06	420 U	410 U	400 U	410 U	430 U	NA	NA	560 J
4-Chloroaniline	UG/KG	2400	420 U	410 U	400 U	410 U	430 U	NA	NA	310 J
Acenaphthene	UG/KG	3.40E+06	420 U	410 U	400 U	410 U	430 U	NA	NA	380 J
Anthracene	UG/KG	1.70E+07	180 J	410 U	400 U	410 U	430 U	NA	NA	1,100 J
Benzo(a)anthracene	UG/KG	150	490	280 J	400 U	410 U	430 U	NA	NA	1,100 J
Benzo(a)pyrene	UG/KG	15	350 J	250 J	400 U	410 U	430 U	NA	NA	310 J
Benzo(b)fluoranthene	UG/KG	150	510	360 J	400 U	410 U	430 U	NA	NA	480 J
Benzo(g,h,i)perylene	UG/KG	-	180 J	150 J	400 U	410 U	430 U	NA	NA	2800 U
Benzo(k)fluoranthene	UG/KG	1500	190 J	120 J	400 U	410 U	430 U	NA	NA	2800 U
Carbazole	UG/KG	-	140 J	410 U	400 U	410 U	430 U	NA	NA	510 J
Chrysene	UG/KG	15000	410 J	270 J	400 U	410 U	430 U	NA	NA	960 J
Dimethylphthalate	UG/KG	-	62 J	54 J	400 U	410 U	430 U	NA	NA	2800 U
Fluoranthene	UG/KG	2.30E+06	1,100	330 J	400 U	410 U	430 U	NA	NA	9,300
Fluorene	UG/KG	2.30E+06	44 J	410 U	400 U	410 U	430 U	NA	NA	2800 U
Indeno(1,2,3-cd)pyrene	UG/KG	150	420	360 J	400 U	410 U	430 U	NA	NA	2800 U
Phenanthrene	UG/KG	-	770	70 J	400 U	410 U	430 U	NA	NA	700 J
Pyrene	UG/KG	1.70E+06	850	330 J	400 U	410 U	430 U	NA	NA	6,100
Metals										
Aluminum	MG/KG	77000	19,000 J	17,000 J	16,000 J	16,000 D	13,000 J	NA	NA	23,000 J
Arsenic	MG/KG	8.73	3.8 J	3.6 J	5.6 J	9 D	4.4 J	NA	NA	6.5 J
Barium	MG/KG	15000	180 J	140 J	120 J	140 D	130 J	NA	NA	240 J
Beryllium	MG/KG	160	1 J	0.95 J	0.87 J	0.94 D	0.84 J	NA	NA	1.4 J
Boron	MG/KG	16000	65 U	62 U	60 U	63 U	22 J	NA	NA	150 U
Cadmium	MG/KG	70	0.18 J	0.17 J	0.15 J	0.33 J	0.14 J	NA	NA	0.67 J
Calcium	MG/KG	58900	37,000 J	57,000 J	55,000 J	35,000 D	48,000 J	NA	NA	56,000 J
Chromium	MG/KG	25.8	29	25	24	24 D	20 J	NA	NA	46
Cobalt	MG/KG	36.7	20	15	14	16 D	15 J	NA	NA	20
Copper	MG/KG	3100	50 J	40 J	41 J	57 D	36 J	NA	NA	96 J
Iron	MG/KG	55000	39,000	36,000	33,000	32,000 D	28,000 J	NA	NA	58,000
Lead	MG/KG	400	13 J	9.3 J	9.4 J	13 D	7.4 J	NA	NA	51 J
Lithium	MG/KG	160	39 J	34 J	32 J	33 D	29 J	NA	NA	48 J
Magnesium	MG/KG	14800	14,000 J	14,000 J	13,000 J	11,000 D	12,000 J	NA	NA	17,000 J
Manganese	MG/KG	6650	740 J	1,200 J	1,200 J	630 D	770 J	NA	NA	1,000 J
Mercury	MG/KG	10	0.052 U	0.05 U	0.018 J	0.05 U	0.052 U	NA	NA	0.11 J
Molybdenum	MG/KG	390	3.2 U	3.1 U	3 U	0.86 J	3.2 U	NA	NA	2.1 J
Nickel	MG/KG	1500	41 J	34 J	32 J	33 D	29 J	NA	NA	54 J
Potassium	MG/KG	2860	2,600 J	2,700 J	2,500 J	2,100 D	2,500 J	NA	NA	3,700 J
Selenium	MG/KG	390	4.8 J	3.3 J	3.9 J	4 D	2.4 J	NA	NA	3.1 J
Silver	MG/KG	390	1.3 U	1.2 U	1.2 U	1.3 U	1.3 U	NA	NA	0.59 J
Sodium	MG/KG	331	260	270	250	240 D	190 J	NA	NA	410
Uranium, Total	MG/KG	230	5.26	4.26	3.75	3.08	4.24	6.89	NA	5.18
Vanadium	MG/KG	390	39 J	33 J	32 J	33 D	28 J	NA	NA	49 J
Zinc	MG/KG	23000	90 J	76 J	72 J	79 D	66 J	NA	NA	190 J
Radionuclides (Alpha Spec)										
Thorium-228	PCI/G	5	0.813	0.938	0.74	0.93	0.792	1.0	0.0105 U	1.05
Thorium-230	PCI/G	5	R	0.885	0.683	0.811	0.829	0.814	0.0671 U	1.19
Thorium-232	PCI/G	5	0.691	0.98	0.783	1.07	0.857	0.721	0.0105 U	1.27
Uranium-234	PCI/G	13	1.25	1.32	1.04	0.842	1.11	2.68	0.721	1.83
Uranium-235/236	PCI/G	8	0.0758	0.073	0.0483	0.0601	0.0457	0.116	0.04	0.063
Uranium-238	PCI/G	14	1.16	1.12	0.95	0.826	0.943	2.33	0.646	1.55
Radionuclides (Gamma Spec)										
Actinium-227	PCI/G	0.5	1.24 U	0.243 U	-0.507 U	-0.263 U	-0.258 U	-1.02 U	0.089 U	0.0948 U
Cesium-137	PCI/G	11	-0.00598 U	0.102 U	0.014 U	-0.0226 U	-0.00251 U	0.0128 U	-0.00207 U	0.0546 U
Radium-226	PCI/G	5	0.807	0.914	0.986	0.713	1.05	1.19	0.211 J	1.92
Radium-228	PCI/G	5	1.02	0.773	0.854	0.966	1.27	1.47	0.124 U	1.1

Notes:

*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;

For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and

For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 31
PE3 PIPELINE EXCAVATION WATER ANALYTICAL RESULTS
(Page 1 of 2)

Location ID			PE3	PE3	PE3	PE3	PE3
Field Sample ID			PE3PIPE17.0-7.5-0103	PE3PIPE27.0-7.5-0105	PE3PIPE37.0-7.5-0106	PE3PIPE37.0-7.5D-9102	PE3PIPE46.6-7.0-0111
Matrix			WATER	WATER	WATER	WATER	WATER
Sample Depth Interval (ft)			7.0-7.5	7.0-7.5	7.0-7.5	7.0-7.5	6.6-7.0
Date Sampled			11/13/12	11/13/12	11/14/12	11/14/12	11/15/12
Parameter	Units	Criteria*	PIPE 1	PIPE 2	PIPE3	Field Duplicate	PIPE 4
Volatile Organic Compounds						PIPE 3	
1,2,4-Trimethylbenzene	UG/L	5	5 U	1.3 J	5 U	5 U	5 U
1,2-Dichlorobenzene	UG/L	3	2.2 J	5 U	1.6 J	1.6 J	5 U
1,3,5-Trimethylbenzene (Mesitylene)	UG/L	5	5 U	0.54 J	5 U	5 U	5 U
1,3-Dichlorobenzene	UG/L	3	0.25 J	5 U	5 U	5 U	5 U
1,4-Dichlorobenzene	UG/L	3	0.95 J	5 U	0.59 J	0.72 J	5 U
Acetone	UG/L	50	20 U	9 J	20 U	20 U	20 U
Benzene	UG/L	1	0.29 J	1.6 J	5 U	5 U	5 U
Chlorobenzene	UG/L	5	1.3 J	5 U	5 U	5 U	5 U
Chloroethane	UG/L	5	0.65 J	10 U	10 U	10 U	10 U
Ethylbenzene	UG/L	5	5 U	2.5 J	5 U	5 U	5 U
Hexane	UG/L	-	10 U	12	10 U	10 U	10 U
Methylcyclohexane	UG/L	-	10 U	0.45 J	10 U	10 U	10 U
Naphthalene	UG/L	10	5 U	81	5 U	5 U	5 U
Toluene	UG/L	5	5 U	1.7 J	5 U	5 U	5 U
Xylene (total)	UG/L	5	10 U	5.4 J	10 U	10 U	10 U
Semivolatile Organic Compounds							
2-Methylnaphthalene	UG/L	-	21 U	3 J	10 U	9.7 U	9.5 U
3&4-Methylphenol	UG/L	1	21 U	2.5 J	10 U	9.7 U	9.5 U
Acenaphthene	UG/L	20	2.5 J	5.4 J	1.7 J	1.8 J	9.5 U
Anthracene	UG/L	50	21 U	12	2.5 J	2.8 J	9.5 U
Benzyl alcohol	UG/L	50	3.7 J	9.8 U	1.6 J	2.2 J	9.5 U
Carbazole	UG/L	50	21 U	110	2.4 J	2.8 J	9.5 U
Dibenzofuran	UG/L	50	21 U	7.6 J	1.1 J	1.2 J	9.5 U
Dimethylphthalate	UG/L	50	3.3 J	9.8 U	1.4 J	2 J	9.5 U
Fluoranthene	UG/L	50	3.8 J	22	8.9 J	9.5 J	9.5 U
Fluorene	UG/L	50	21 U	12	10 U	9.7 U	9.5 U
Naphthalene	UG/L	10	21 U	28	10 U	9.7 U	9.5 U
N-Nitrosodiphenylamine	UG/L	50	21 U	1.4 J	10 U	9.7 U	9.5 U
Phenanthrene	UG/L	50	21 U	66	4.9 J	5.9 J	9.5 U
Phenol	UG/L	1	32 U	3.8 J	15 U	15 U	14 U
Pyrene	UG/L	50	21 U	14	5.8 J	6.2 J	9.5 U
Pesticide Organic Compounds							
beta-BHC	UG/L	0.04	0.047 U	0.07	0.047 U	0.048 U	0.048 U
Heptachlor	UG/L	0.04	0.095 U	0.17 J	0.095 U	0.095 U	0.095 U
Metals							
Aluminum	UG/L	-	64	30 U	30 U	30 U	30 U
Arsenic	UG/L	25	3.6 J	10 U	10 U	10 U	10 U
Barium	UG/L	1000	130	130	49	45	2.6
Boron	UG/L	1000	4,100	44 J	230	210	230
Calcium	UG/L	-	68,000	89,000	64,000	66,000	5,600
Chromium	UG/L	50	6.2 J	10 U	10 U	10 U	10 U
Cobalt	UG/L	-	2.8	20 U	2 U	2 U	2 U
Copper	UG/L	200	0.95 J	30 U	0.66 J	3 U	1.3 J
Iron	UG/L	300	17,000	160	4,500	5,300	25 J
Lead	UG/L	25	0.22 J	3 U	1.3 J	0.51 J	3 U
Lithium	UG/L	-	58	19	15	13	9
Magnesium	UG/L	35000	200,000 J	11,000 J	71,000	68,000	29,000 J
Manganese	UG/L	300	130 J	140 J	77	84	1.9 J
Molybdenum	UG/L	-	1.2 J	5 U	5 U	5 U	5 U
Nickel	UG/L	100	20 J	5 U	0.92 J	0.77 J	5 U
Potassium	UG/L	-	36,000	2,600	4,100	3,900	2,600
Silver	UG/L	50	R	2 U	R	0.05 J	R
Sodium	UG/L	20000	650,000	11,000	43,000	40,000	45,000
Thallium	UG/L	0.5	1.4 J	2 U	1.7 J	0.63 J	1.2 J
Uranium, Total	UG/L	30	2.83	0.0195 U	4.65	5.13	0.412
Zinc	UG/L	2000	12 U	12 U	12 U	12 U	8.4 J
Metals (Filtered)							
Arsenic	UG/L	25	3.4 J	10 U	10 U	100 U	10 U
Barium	UG/L	1000	130	130	44 J	60 D	2.6
Boron	UG/L	1000	3,900	540 U	220 J	350 J	290 J
Calcium	UG/L	-	65,000	90,000	66,000 J	89,000 D	5,600
Chromium	UG/L	50	6.5 J	10 U	10 U	100 U	10 U
Cobalt	UG/L	-	3.2 J	20 U	2 U	2 U	2 U
Iron	UG/L	300	13,000	84	5,400	7,700 D	50 U
Lithium	UG/L	-	55	25 J	13 J	21 J	15 J
Magnesium	UG/L	35000	200,000 J	11,000 J	65,000 J	90,000 D	29,000 J
Manganese	UG/L	300	100 J	140 J	86 J	120 D	0.51 J
Molybdenum	UG/L	-	1.2 J	5 U	5 U	50 U	5 U
Nickel	UG/L	100	19 J	5 U	0.72 J	50 U	5 U
Potassium	UG/L	-	35,000	2,600	3,700 J	4,900 D	2,600
Silver	UG/L	50	R	2 U	0.56 J	1.8 J	0.79 J
Sodium	UG/L	20000	650,000	11,000	39,000 J	52,000 D	46,000
Thallium	UG/L	0.5	1.4 J	2 U	3.3	20 U	0.73 J
Uranium, Total	UG/L	30	2.27	0.118	4.84	5.18	0.381
Zinc	UG/L	2000	12 U	12 U	12 U	120 U	8.6 J

Notes:

Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and

For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 31
PE3 PIPELINE EXCAVATION WATER ANALYTICAL RESULTS
(Page 2 of 2)

Location ID			PE3	PE3	PE3	PE3	PE3
Field Sample ID			PE3PIPE17.0-7.5-0103	PE3PIPE27.0-7.5-0105	PE3PIPE37.0-7.5-0106	PE3PIPE37.0-7.5D-9102	PE3PIPE46.6-7.0-0111
Matrix			WATER	WATER	WATER	WATER	WATER
Sample Depth Interval (ft)			7.0-7.5	7.0-7.5	7.0-7.5	7.0-7.5	6.6-7.0
Date Sampled			11/13/12	11/13/12	11/14/12	11/14/12	11/15/12
Parameter	**Units**	**Criteria***	**PIPE 1**	**PIPE 2**	**PIPE3**	**Field Duplicate PIPE 3**	**PIPE 4**
Miscellaneous Parameters							
Alkalinity, hydroxide (as CaCO3)	MG/L	-	670	22	290	NA	81
Alkalinity, Total (as CaCO3)	MG/L	-	670	22	290	NA	81
Chloride	MG/L	250	810	200	59	NA	78
Fluoride	MG/L	1.5	1	2.1	0.3	NA	0.25
Nitrate-Nitrogen (as N)	MG/L	10	0.061 J	0.024 J	0.02 J	NA	0.0051 J
Nitrite-Nitrogen	MG/L	1	30 J	7.7 J	2.1 J	NA	2.9 J
Phosphate (as o-PO4)	MG/L	-	0.5 U	0.5 U	0.5 U	NA	0.19 J
Sulfate (as SO4)	MG/L	250	120	0.058 J	210	NA	58
Total Dissolved Solids	MG/L	-	2,400	800	700	NA	320
Radionuclides (Alpha Spec)							
Thorium-228	PCI/L	15	-0.0184 U	0.00834 U	0.00404 U	0.0181 U	0.0177 U
Thorium-230	PCI/L	15	0.0842 J	0.0211 U	-0.00202 U	0.0433 J	0.0229 U
Thorium-232	PCI/L	15	0.2 U	0.0166 U	0.0205 U	-0.0045 U	0.0064 U
Uranium-234	PCI/L	27	1.6	0.014 U	1.71	2.57	0.165 J
Uranium-235/236	PCI/L	27	-0.0259 U	0.0397 U	0.118 U	0.0428 U	0.0264 U
Uranium-238	PCI/L	27	1.33	-0.0179 U	1.67	1.93	0.0634
Radionuclides (Filtered - Alpha Spec)							
Thorium-228	PCI/L	15	-0.00804 U	0.0407	0.0096 U	0.0151 U	0.0028 U
Thorium-230	PCI/L	15	0.0382 U	0.0557 J	0.0655 J	0.0968	0.0277 U
Thorium-232	PCI/L	15	0.00402 U	0.00853 U	0.0205 U	0.015 U	0.00369 U
Uranium-234	PCI/L	27	1.28	0.00874 U	2.14	2.13	0.217
Uranium-235/236	PCI/L	27	0.0369 U	-0.0148 U	0.133	0.0977	0.064 U
Uranium-238	PCI/L	27	1.05	0.00872 U	1.54	1.44	0.278
Radionuclides (Radon Emanation)							
Radium-226	PCI/L	3	0.255 U	0.205 U	0.16 U	0.0133 U	0.165 U
Radionuclides (Filtered - Radon Emanation)							
Radium-226	PCI/L	3	0.0843 U	0.239 U	0.213 U	0.00888 U	0.0728 U
Radionuclides (Gas Flow Proportional)							
Radium-228	PCI/L	5	-0.0502 U	0.351 U	0.157 U	0.361 U	0.312 U
Radionuclides (Filtered - Gas Flow Proportional)							
Radium-228	PCI/L	5	0.101 U	-0.166 U	0.146 U	0.205 U	0.105 U

Notes:

Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and

For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 32
PIPELINE EXCAVATION PE4
SOIL AND SEDIMENT ANALYTICAL RESULTS

Location ID			PE4	PE4	PE4	PE4	PE4
Field Sample ID			PE4SB17.0-7.5-0168	PE4SB27.5-8.0-0169	PE4SB37.5-8.0-0170	PE4SB47.1-7.6-0176	PE4PIPE2SED-0174
Matrix			SOIL	SOIL	SOIL	SOIL	SEDIMENT
Sample Depth Interval (ft)			7.0-7.5	7.5-8.0	7.5-8.0	7.1-7.6	6.4-7.2
Date Sampled			12/11/12	12/11/12	12/11/12	12/12/12	12/11/12
Parameter	Units	Criteria*	PIPE1	PIPE2	PIPE3	PIPE4	PIPE2
			8"	10"	12"	36"	10"
Volatile Organic Compounds							
1,2,3-Trichlorobenzene	UG/KG	49000	R	5.9 U	5.9 U	6.4 U	6.6 U
1,2,4-Trichlorobenzene	UG/KG	22000	0.68 J	5.9 U	5.9 U	6.4 U	6.6 U
1,2,4-Trimethylbenzene	UG/KG	62000	6.2 U	5.9 U	5.9 U	6.4 U	0.8 J
1,2-Dichlorobenzene	UG/KG	1.90E+06	0.38 J	5.9 U	5.9 U	6.4 U	6.6 U
Acetone	UG/KG	6.10E+07	25 U	24 U	24 U	26 U	99
Benzene	UG/KG	1100	6.2 U	5.9 U	5.9 U	6.4 U	1.1 J
Carbon disulfide	UG/KG	8.20E+05	6.2 U	5.9 U	5.9 U	6.4 U	0.95 J
Ethylbenzene	UG/KG	5400	6.2 U	1.2 J	1.3 J	1.2 J	1.3 J
Hexane	UG/KG	5.70E+05	12 U	12 U	12 U	13 U	5.4 J
Methyl ethyl ketone (2-Butanone)	UG/KG	2.80E+07	25 U	24 U	24 U	26 U	23 J
Methylene chloride	UG/KG	56000	4 J	3.7 J	4 J	4.4 J	4.3 J
Naphthalene	UG/KG	3600	1.5 J	0.76 J	0.73 J	6.4 U	1.9 J
sec-Butylbenzene	UG/KG	-	3.9 J	5.9 U	5.9 U	6.4 U	6.6 U
Tetrachloroethene	UG/KG	22000	0.5 J	0.58 J	2.9 J	6.4 U	6.6 U
Toluene	UG/KG	5.00E+06	6.2 U	0.9 J	5.9 U	6.4 U	2.9 J
Xylene (total)	UG/KG	6.30E+05	12 U	6.4 J	7.7 J	6.3 J	3.6 J
Semivolatile Organic Compounds							
Anthracene	UG/KG	1.70E+07	400 U	390 U	580	410 U	610 J
Benzo(a)anthracene	UG/KG	150	67 J	230 J	2,500	110 J	5,000
Benzo(a)pyrene	UG/KG	15	47 J	170 J	1,800	77 J	3,600
Benzo(b)fluoranthene	UG/KG	150	400 U	240 J	2,400	100 J	5,100
Benzo(g,h,i)perylene	UG/KG	-	400 U	82 J	1,100	43 J	2,100
Benzo(k)fluoranthene	UG/KG	1500	400 U	110 J	970	48 J	1,900
Carbazole	UG/KG	-	400 U	390 U	610	410 U	640 J
Chrysene	UG/KG	15000	51 J	200 J	2,100	96 J	4,200
Dibenz(a,h)anthracene	UG/KG	15	400 U	390 U	220 J	410 U	510 J
Dibenzofuran	UG/KG	-	400 U	390 U	42 J	410 U	94 J
Fluoranthene	UG/KG	2.30E+06	110 J	300 J	4,300	240 J	6,600
Fluorene	UG/KG	2.30E+06	400 U	390 U	96 J	410 U	160 J
Indeno(1,2,3-cd)pyrene	UG/KG	150	400 U	85 J	1,200	160 J	2,400
Naphthalene	UG/KG	3600	400 U	390 U	48 J	410 U	840 U
Phenanthrene	UG/KG	-	43 J	61 J	2,200	150 J	2,300
Pyrene	UG/KG	1.70E+06	90 J	260 J	3,600	190 J	5,800
Pesticide Organic Compounds							
4,4'-DDE	UG/KG	1400	0.6 J	2 U	2 U	2.2 U	1.5 J
4,4'-DDT	UG/KG	1700	0.91 J	2 U	2 U	2.2 U	2 J
Heptachlor	UG/KG	110	2.1 U	2 U	2 U	1.2 J	4.4 U
Metals							
Aluminum	MG/KG	77000	17,000	11,000	6,600	11,000 J	1,600
Antimony	MG/KG	31					8.4 J
Arsenic	MG/KG	8.73	6.1 J	5.3 J	3.1 J	5.4 J	68
Barium	MG/KG	15000	200	110	67	69 J	6.4 J
Beryllium	MG/KG	160	0.8	0.57 J	0.3 J	0.63 J	0.68 U
Cadmium	MG/KG	70	0.12 J	0.38 U	0.34 U	0.39 U	0.32 J
Calcium	MG/KG	58900	19,000	29,000	35,000	44,000 J	5,800
Chromium	MG/KG	25.8	25	16	9.6 J	16	160
Cobalt	MG/KG	36.7	14	11	7	13	29
Copper	MG/KG	3100	39	38	27	32 J	1,500
Iron	MG/KG	55000	33,000	26,000	16,000	26,000 J	660,000
Lead	MG/KG	400	7	6.3	4.1	6.3	47
Lithium	MG/KG	160	27	20	13	23	6.8 U
Magnesium	MG/KG	14800	7,500	7,900	7,300	9,800 J	290 J
Manganese	MG/KG	6650	790	790	670	920 J	1,500
Mercury	MG/KG	10	0.047 U	0.048 U	0.045 U	0.014 J	0.053 U
Molybdenum	MG/KG	390	3.2 U	3.2 U	2.9 U	3.3 U	27
Nickel	MG/KG	1500	33	24	14	26	180
Potassium	MG/KG	2860	1,400 J	1,200 J	710 J	1,600 J	68 U
Selenium	MG/KG	390	2.9 J	2.3 J	1.7 J	3.2 J	3.4 U
Sodium	MG/KG	331	120 J	120 J	130 J	160	170 U
Uranium, Total	MG/KG	230	2.55	2.3	1.95	3.73	1.78
Vanadium	MG/KG	390	32	25	16	23	93
Zinc	MG/KG	23000	58	48	33	59	76
Radionuclides (Alpha Spec)							
Thorium-228	PCI/G	5	0.776	0.987	0.705	0.756	-0.0371 U
Thorium-230	PCI/G	5	0.741	0.85	0.577	0.769	0.0481 U
Thorium-232	PCI/G	5	0.891	0.924	0.678	0.811	0.0126 U
Uranium-234	PCI/G	13	0.899	0.701	0.657	0.66	0.729
Uranium-235/236	PCI/G	8	0.0174 U	0.0436	0.0341	0.0289	0.0388
Uranium-238	PCI/G	14	0.779	0.635	0.623	0.556	0.606
Radionuclides (Gamma Spec)							
Actinium-227	PCI/G	0.5	0.241	-0.589 U	0.0514 U	0.0261 U	-0.0153 U
Cesium-137	PCI/G	11	0.000184 U	-0.0274 U	0.0348 U	-0.0149 U	-0.00172 U
Radium-226	PCI/G	5	0.95	0.852	0.912	0.884	-0.0185 U
Radium-228	PCI/G	5	0.863	0.516 U	0.429 U	1.2	0.0868 U

Notes:
*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;
For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and
For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).
Concentration exceeds criteria.
U - Not detected above the reported quantitation limit.
J - The reported concentration is an estimated value.
NA - Not Analyzed.
R - Data rejected.
Only detected results reported.

TABLE 33
PE4 PIPELINE EXCAVATION WATER ANALYTICAL RESULTS
(Page 1 of 2)

Location ID			PE4	PE4	PE4	PE4	PE4
Field Sample ID			PE4PIPE16.4-7.0-0173	PE4PIPE26.4-7.2-0172	PE4PIPE36.4-7.4-0171	PE4PIPE44.5-6.8-0175	PE4PIPE44.5-6.8D-9118
Matrix			WATER	WATER	WATER	WATER	WATER
Sample Depth Interval (ft)			6.4-7.0	6.4-7.2	6.4-7.4	4.5-6.8	4.5-6.8
Date Sampled			12/11/12	12/11/12	12/11/12	12/12/12	12/12/12
Parameter	**Units**	**Criteria***	**PIPE 1**	**PIPE 2**	**PIPE 3**	**PIPE 4**	**Field Duplicate**
Volatile Organic Compounds							**PIPE 4**
1,2-Dichloroethene (cis)	UG/L	5	5 U	5 U	5 U	0.44 J	0.46 J
1,2-Dichloroethene (total)	UG/L	-	10 U	10 U	10 U	0.44 J	0.46 J
Benzene	UG/L	1	0.89 J	5 U	5 U	5 U	5 U
Ethylbenzene	UG/L	5	1.3 J	5 U	0.4 J	5 U	5 U
Hexane	UG/L	-	0.9 J	10 U	10 U	10 U	10 U
Naphthalene	UG/L	10	8.3	2.1 J	7.8	5 U	5 U
Styrene	UG/L	5	0.68 J	5 U	5 U	5 U	5 U
Toluene	UG/L	5	1.3 J	5 U	1.5 J	5 U	5 U
Semivolatile Organic Compounds							
1,1-Biphenyl	UG/L	5	20 U	20 U	2.9 J	20 U	20 U
2-Methylnaphthalene	UG/L	-	3.5 J	20 U	20 U	20 U	20 U
Acenaphthene	UG/L	20	10 J	20 U	16 J	20 U	20 U
Acetophenone	UG/L	-	20 U	20 U	3.4 J	20 U	20 U
Anthracene	UG/L	50	15 J	3.2 J	30	20 U	20 U
Benzo(a)anthracene	UG/L	0.002	20 U	20 U	4.1 J	20 U	20 U
Carbazole	UG/L	50	160	9.2 J	600	20 U	20 U
Chrysene	UG/L	0.002	20 U	20 U	2.5 J	20 U	20 U
Dibenzofuran	UG/L	50	16 J	20 U	29	20 U	20 U
Fluoranthene	UG/L	50	15 J	15 J	62	20 U	20 U
Fluorene	UG/L	50	32	3.9 J	49	20 U	20 U
Naphthalene	UG/L	10	16 J	2 J	14 J	20 U	20 U
Phenanthrene	UG/L	50	85	11 J	200	20 U	20 U
Pyrene	UG/L	50	9.2 J	11 J	40	20 U	20 U
Pesticide Organic Compounds							
Aldrin	UG/L	0.001	0.048 U	0.048 U	0.092 U	0.01 J	0.011 J
Endosulfan sulfate	UG/L	-	0.053 U	0.053 U	0.025	0.052 U	0.053 U
Methoxychlor	UG/L	35	0.096 U	0.028 J	0.18 U	0.095 U	0.096 U
Metals							
Barium	UG/L	1000	11	17	5.4	96	97
Boron	UG/L	1000	87	95	400	88	94
Calcium	UG/L	-	8,900	24,000	54,000	40,000 J	40,000
Copper	UG/L	200	12	4.3	5.6 J	3 U	3 U
Iron	UG/L	300	510	670	5,500	630	570
Lead	UG/L	25	15	3.7	3.9 J	3 U	3 U
Lithium	UG/L	-	5.6	11	5.7 J	2.3 J	2 J
Magnesium	UG/L	35000	20,000 J	73,000	82,000	60,000 J	60,000
Manganese	UG/L	300	22	60	200	36	36
Molybdenum	UG/L	-	1.4 J	5 U	10 U	2.1 J	1.9 J
Nickel	UG/L	100	0.6 J	0.56 J	10 U	5 U	5 U
Potassium	UG/L	-	1,900	480	340	2,600	2,600
Silver	UG/L	50	0.7 J	0.61 J	R	0.69 J	0.5 J
Sodium	UG/L	20000	8,600	26,000	30,000	21,000 J	21,000
Thallium	UG/L	0.5	0.55 J	2.3	1.1 J	0.6 J	2.3
Uranium, Total	UG/L	30	-0.000641 U	0.347	3.67	3.86 J	2.39
Zinc	UG/L	2000	13	12 U	24 U	12 U	12 U
Metals (Filtered)							
Barium	UG/L	1000	11	16	5.4	90	90
Boron	UG/L	1000	92	94	430	81	90
Calcium	UG/L	-	8,800	22,000	57,000	39,000	39,000
Copper	UG/L	200	0.93 J	3 U	6 U	3 U	3 U
Iron	UG/L	300	87	420	5,400	24 J	30 J
Lead	UG/L	25	0.47 J	3 U	0.43 J	3 U	3 U
Lithium	UG/L	-	5.7	9.9	5.8 J	2.3 J	1.9 J
Magnesium	UG/L	35000	20,000	71,000	86,000	53,000 J	58,000
Manganese	UG/L	300	15	56	200	32	35
Molybdenum	UG/L	-	1.9 J	5 U	10 U	2.3 J	2.1 J
Potassium	UG/L	-	1,900	470	340	2,300	2,500
Silver	UG/L	50	0.83 J	0.53 J	R	0.84 J	0.45 J
Sodium	UG/L	20000	8,600	26,000	32,000	18,000	20,000
Thallium	UG/L	0.5	0.69 J	2.2	1.4 J	0.62 J	2.2
Uranium, Total	UG/L	30	0.0631 U	0.404	3.73	2.41	2.38

Notes:

Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and
For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 33
PE4 PIPELINE EXCAVATION WATER ANALYTICAL RESULTS
(Page 2 of 2)

Location ID			PE4	PE4	PE4	PE4	PE4
Field Sample ID			PE4PIPE16.4-7.0-0173	PE4PIPE26.4-7.2-0172	PE4PIPE36.4-7.4-0171	PE4PIPE44.5-6.8-0175	PE4PIPE44.5-6.8D-9118
Matrix			WATER	WATER	WATER	WATER	WATER
Sample Depth Interval (ft)			6.4-7.0	6.4-7.2	6.4-7.4	4.5-6.8	4.5-6.8
Date Sampled			12/11/12	12/11/12	12/11/12	12/12/12	12/12/12
Parameter	**Units**	**Criteria***	**PIPE 1**	**PIPE 2**	**PIPE 3**	**PIPE 4**	**Field Duplicate PIPE 4**
Miscellaneous Parameters							
Alkalinity, Bicarbonate (as CaCO3)	MG/L	-	93 J	200 J	5 U	5 U	5 U
Alkalinity, carbonate (as CaCO3)	MG/L	-	20	110	5 U	5 U	5 U
Alkalinity, hydroxide (as CaCO3)	MG/L	-	5 U	5 U	300	350	370
Alkalinity, Total (as CaCO3)	MG/L	-	110	310	300	350	370
Chloride	MG/L	250	15 J	27	36	24	24 D
Fluoride	MG/L	1.5	0.48	0.31	0.14	0.24	0.25
Nitrate-Nitrogen (as N)	MG/L	10	0.01 J	0.02 U	0.0041 J	0.02 U	0.018 J
Phosphate (as o-PO4)	MG/L	-	0.5 U	0.5 U	0.5 U	0.5 U	0.3 J
Sulfate (as SO4)	MG/L	250	0.071 J	44	240	4	4
Total Dissolved Solids	MG/L	-	130	410	660	390	380
Radionuclides (Alpha Spec)							
Thorium-228	PCI/L	15	0.0468 U	-0.00237 U	0.0893 U	0.0095 U	0.0157 U
Thorium-230	PCI/L	15	0.0718 U	0.0351 U	0.0832	0.0433 U	R
Thorium-232	PCI/L	15	-0.00621 U	0.2 U	0.2 U	-0.00242 U	0.00781 U
Uranium-234	PCI/L	27	0.00505 U	0.164	1.14	0.627	0.857
Uranium-235/236	PCI/L	27	-0.00628 U	0.04 U	0.0596	0.0171 U	-0.00303 U
Uranium-238	PCI/L	27	0.00756 U	0.128	1.15	0.775	0.661
Radionuclides (Filtered - Alpha Spec)							
Thorium-228	PCI/L	15	0.0106 U	0.0377 U	-0.0247 U	0.00953 U	-0.00224 U
Thorium-230	PCI/L	15	0.0396 U	0.0403	0.0331	0.0765 J	R
Thorium-232	PCI/L	15	0.00788 U	0.2 U	-0.00205 U	0.00711 U	0.0178 U
Uranium-234	PCI/L	27	0.2 U	0.14	1.14	0.757	0.68
Uranium-235/236	PCI/L	27	0.2 U	0.0235 U	0.0569 U	0.11	0.0718
Uranium-238	PCI/L	27	0.00798 U	0.0969	1.31	0.882	0.719
Radionuclides (Radon Emanation)							
Radium-226	PCI/L	3	0.383 J	0.136 U	NA	0.0508 U	5.31 J
Radionuclides (Filtered - Radon Emanation)							
Radium-226	PCI/L	3	0.347	NA	NA	4.76	5.47
Radionuclides (Gas Flow Proportional)							
Radium-228	PCI/L	5	0.334 U	0.00241 U	0.152 U	0.127 U	0.0631 U
Radionuclides (Filtered - Gas Flow Proportional)							
Radium-228	PCI/L	5	0.0333 U	0.25 U	0.12 U	0.145 U	0.305 U

Notes:

Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 34
PIPELINE EXCAVATION PE5
SOIL AND SEDIMENT ANALYTICAL RESULTS

Location ID			PE5	PE5	PE5	PE5	PE5	PE5
Field Sample ID			PE5SB47.1-7.6-0178	PE5SB26.0-6.5-0181	PE5SB36.0-6.5-0180	PE5SB16.1-6.5-0179	PE5PIPE1SED-0185	PE5PIPE2SED-0186
Matrix			SOIL	SOIL	SOIL	SOIL	SEDIMENT	SEDIMENT
Sample Depth Interval (ft)			7.1-7.6	6.0-6.5	6.0-6.5	6.1-6.5	5.4-6.0	5.2-5.9
Date Sampled			12/13/12	12/14/12	12/14/12	12/14/12	12/14/12	12/14/12
Parameter	**Units**	**Criteria***	**PIPE1**	**PIPE2**	**PIPE3**	**PIPE4**	**PIPE1**	**PIPE2**
			8"	**10"**	**12"**	**24"**	**10"**	**8"**
Volatile Organic Compounds								
Acetone	UG/KG	6.10E+07	27 U	24 U	25 U	30	NA	NA
Cyclohexane	UG/KG	7.00E+06	14 U	0.65 J	13 U	12 U	NA	NA
Ethylbenzene	UG/KG	5400	0.56 J	1.3 J	1.2 J	0.74 J	NA	NA
Hexane	UG/KG	5.70E+05	0.9 J	12 U	1.3 J	0.72 J	NA	NA
Methylene chloride	UG/KG	56000	3.3 J	3.9 J	4.3 J	3.4 J	NA	NA
Naphthalene	UG/KG	3600	0.79 J	5.9 U	6.3 U	5.8 U	NA	NA
Xylene (total)	UG/KG	6.30E+05	2.5 J	7.2 J	6.5 J	3.7 J	NA	NA
Semivolatile Organic Compounds								
Anthracene	UG/KG	1.70E+07	120 J	90 J	89 J	380 U	NA	NA
Benzo(a)anthracene	UG/KG	150	330 J	400	370 J	230 J	NA	NA
Benzo(a)pyrene	UG/KG	15	240 J	290 J	280 J	150 J	NA	NA
Benzo(b)fluoranthene	UG/KG	150	350 J	420	410 J	200 J	NA	NA
Benzo(g,h,i)perylene	UG/KG	-	130 J	150 J	160 J	83 J	NA	NA
Benzo(k)fluoranthene	UG/KG	1500	140 J	160 J	160 J	94 J	NA	NA
Carbazole	UG/KG	-	69 J	96 J	80 J	49 J	NA	NA
Chrysene	UG/KG	15000	300 J	350 J	340 J	200 J	NA	NA
Fluoranthene	UG/KG	2.30E+06	700	830	780	440	NA	NA
Indeno(1,2,3-cd)pyrene	UG/KG	150	240 J	250 J	250 J	190 J	NA	NA
Phenanthrene	UG/KG	-	530	390	410 J	150 J	NA	NA
Pyrene	UG/KG	1.70E+06	560	640	600	340 J	NA	NA
Pesticide Organic Compounds								
4,4'-DDE	UG/KG	1400	2.3 U	2 U	2.1 U	1.3 J	NA	NA
4,4'-DDT	UG/KG	1700	2.3 U	2 U	2.1 U	1.2 J	NA	NA
Endrin	UG/KG	18000	2.3 U	0.5 J	0.61 J	2 U	NA	NA
Heptachlor	UG/KG	110	0.56 J	1.5 J	390 J	2 U	NA	NA
Metals								
Aluminum	MG/KG	77000	13,000	7,800	13,000	9,500	NA	NA
Arsenic	MG/KG	8.73	5.7 J	4.7 J	5.1 J	4.7 J	NA	NA
Barium	MG/KG	15000	140 J	89 J	180 J	190 J	NA	NA
Beryllium	MG/KG	160	0.67	0.4 J	0.64 J	0.47 J	NA	NA
Boron	MG/KG	16000	22 J	61 U	66 U	58 U	NA	NA
Calcium	MG/KG	58900	31,000	36,000	45,000	49,000	NA	NA
Chromium	MG/KG	25.8	17	11 J	19	14	NA	NA
Cobalt	MG/KG	36.7	9.9	8.3	11	12	NA	NA
Copper	MG/KG	3100	30	32	34	32	NA	NA
Iron	MG/KG	55000	28,000	28,000	56,000	24,000	NA	NA
Lead	MG/KG	400	6.3	4.3	7	4.9	NA	NA
Lithium	MG/KG	160	24	17	22	18	NA	NA
Magnesium	MG/KG	14800	8,900	8,700	9,500	11,000	NA	NA
Manganese	MG/KG	6650	550	780	720	1,200	NA	NA
Mercury	MG/KG	10	0.021 J	0.047 U	0.02 J	0.044 U	NA	NA
Molybdenum	MG/KG	390	3.2 U	3 U	1.2 J	2.9 U	NA	NA
Nickel	MG/KG	1500	24	18	27	22	NA	NA
Potassium	MG/KG	2860	1,300 J	950 J	1,200 J	1,400 J	NA	NA
Selenium	MG/KG	390	2.7 J	1.9 J	2.3 J	1.5 J	NA	NA
Sodium	MG/KG	331	190	92 J	110 J	130 J	NA	NA
Uranium, Total	MG/KG	230	2.02	1.67	1.91	2.06	NA	NA
Vanadium	MG/KG	390	27	17	28	20	NA	NA
Zinc	MG/KG	23000	54	42	58	51	NA	NA
Radionuclides (Alpha Spec)								
Thorium-228	PCI/G	5	0.924	0.748	0.934	0.833	0.0207 U	0.0021 U
Thorium-230	PCI/G	5	0.838	0.856	0.775	0.77	0.054 U	-0.00193 U
Thorium-232	PCI/G	5	0.87	0.93	0.837	0.746	0.5 U	-0.0135 U
Uranium-234	PCI/G	13	0.838	0.621	0.79	0.695	0.902	0.717
Uranium-235/236	PCI/G	8	0.0348	0.0247	0.0331	0.0161 U	0.0587	0.013 U
Uranium-238	PCI/G	14	0.82	0.761	0.778	0.525	0.755	0.522
Radionuclides (Gamma Spec)								
Actinium-227	PCI/G	0.5	-0.477 U	0.017 U	-0.773 U	0.361 U	0.0125 U	0.0533 U
Cesium-137	PCI/G	11	0.015 U	-0.0209 U	0.00805 U	-0.0276 U	0.00852 U	0.00275 U
Radium-226	PCI/G	5	0.851	0.76	0.814	0.768	0.297	-0.0151 U
Radium-228	PCI/G	5	1.07	1.02	0.789	0.929	0.0871 U	0.025 U

Notes:

*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;
For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and
For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 35
PE5 PIPELINE EXCAVATION WATER ANALYTICAL RESULTS
(Page 1 of 2)

Location ID			PE5	PE5	PE5	PE5
Field Sample ID			PE5PIPE15.4-6.0-0182	PE5PIPE25.5-5.9-0183	PE5PIPE35.2-5.9-0184	PE5PIPE45.1-7.1-0177
Matrix			WATER	WATER	WATER	WATER
Sample Depth Interval (ft)			5.4-6.0	5.5-5.9	5.2-5.9	5.1-7.1
Date Sampled			12/14/12	12/14/12	12/14/12	12/13/12
Parameter	**Units**	**Criteria***	**PIPE 1**	**PIPE 2**	**PIPE 3**	**PIPE 4**
Volatile Organic Compounds						
Benzene	UG/L	1	1.2 J	0.36 J	0.43 J	0.85 J
Ethylbenzene	UG/L	5	2.3 J	0.37 J	0.57 J	0.55 J
Hexane	UG/L	-	5.3 J	10 U	0.82 J	10 U
Naphthalene	UG/L	10	15	4.2 J	120	5 U
Styrene	UG/L	5	0.56 J	5 U	5 U	5 U
Toluene	UG/L	5	1 J	5 U	5 U	5 U
Xylene (total)	UG/L	5	1.1 J	10 U	10 U	10 U
Semivolatile Organic Compounds						
1,1-Biphenyl	UG/L	5	20 U	20 U	4.2 J	20 U
2,4-Dimethylphenol	UG/L	50	3.2 J	20 U	3.4 J	20 U
2-Methylnaphthalene	UG/L	-	3.7 J	20 U	12 J	20 U
2-Methylphenol (o-cresol)	UG/L	1	20 U	20 U	2 J	20 U
Acenaphthene	UG/L	20	9.1 J	2.9 J	18 J	14 J
Acenaphthylene	UG/L	50	3.8 J	20 U	20 U	20 U
Anthracene	UG/L	50	14 J	5 J	29	4.9 J
Benzo(a)anthracene	UG/L	0.002	2.7 J	20 U	20 U	20 U
Carbazole	UG/L	50	220	39	710	20 U
Chrysene	UG/L	0.002	2.3 J	20 U	20 U	20 U
Dibenzofuran	UG/L	50	17 J	2.9 J	33	13 J
Fluoranthene	UG/L	50	18 J	21	61	20
Fluorene	UG/L	50	34	7.5 J	51	12 J
Naphthalene	UG/L	10	27	5.7 J	150	20 U
N-Nitrosodiphenylamine	UG/L	50	20 U	20 U	3.2 J	20 U
Phenanthrene	UG/L	50	100	20	200	20 U
Pyrene	UG/L	50	10 J	17 J	39	13 J
Pesticide Organic Compounds						
Endosulfan sulfate	UG/L	-	0.053 U	0.011	0.015	0.053 U
Methoxychlor	UG/L	35	0.096 U	0.029	0.096 U	0.096 U
Metals						
Aluminum	UG/L	-	30 U	15 J	60 U	30 U
Barium	UG/L	1000	31	33	5.3	34
Boron	UG/L	1000	35 J	31 J	97 J	81
Calcium	UG/L	-	21,000	22,000	9,200	26,000
Copper	UG/L	200	19	1.8 J	6 U	3 U
Iron	UG/L	300	1,600	13,000	140	500
Lead	UG/L	25	11	0.22 J	0.45 J	3 U
Lithium	UG/L	-	5.3	9.7	24	6.4
Magnesium	UG/L	35000	89,000	43,000	120,000	78,000
Manganese	UG/L	300	50	400	27	9.7
Molybdenum	UG/L	-	1 J	5 U	10 U	5 U
Nickel	UG/L	100	1.4 J	0.6 J	10 U	1.3 J
Potassium	UG/L	-	2,800	820	1,100	1,600
Silver	UG/L	50	R	R	R	R
Sodium	UG/L	20000	20,000	16,000	39,000	41,000
Thallium	UG/L	0.5	0.55 J	2 U	4 U	1.1 J
Uranium, Total	UG/L	30	0.12 U	-0.0132 U	0.228	3.85
Zinc	UG/L	2000	8.9 J	9.6 J	24 U	12 U
Metals (Filtered)						
Barium	UG/L	1000	30	30	5.2	35
Boron	UG/L	1000	40 J	37 J	99 J	82 J
Calcium	UG/L	-	21,000	22,000	9,400	26,000
Copper	UG/L	200	0.78 J	3 U	6 U	6 U
Iron	UG/L	300	970	13,000	58 J	470
Lead	UG/L	25	0.45 J	3 U	6 U	6 U
Lithium	UG/L	-	4.9 J	9.9	25	6.9 J
Magnesium	UG/L	35000	89,000	43,000	110,000	79,000
Manganese	UG/L	300	22	390	25	9.8
Molybdenum	UG/L	-	1 J	5 U	10 U	10 U
Nickel	UG/L	100	0.41 J	5 U	10 U	1.1 J
Potassium	UG/L	-	2,700	780	1,000	1,600
Silver	UG/L	50	R	R	R	R
Sodium	UG/L	20000	20,000	16,000	38,000	41,000
Thallium	UG/L	0.5	1.2 J	2 U	4 U	4 U
Uranium, Total	UG/L	30	0.107 U	-0.0142 U	0.224	2.42

Notes:

Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and

For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 35
PE5 PIPELINE EXCAVATION WATER ANALYTICAL RESULTS
(Page 2 of 2)

Location ID			PE5	PE5	PE5	PE5
Field Sample ID			PE5PIPE15.4-6.0-0182	PE5PIPE25.5-5.9-0183	PE5PIPE35.2-5.9-0184	PE5PIPE45.1-7.1-0177
Matrix			WATER	WATER	WATER	WATER
Sample Depth Interval (ft)			5.4-6.0	5.5-5.9	5.2-5.9	5.1-7.1
Date Sampled			12/14/12	12/14/12	12/14/12	12/13/12
Parameter	Units	Criteria*	PIPE 1	PIPE 2	PIPE 3	PIPE 4
Miscellaneous Parameters						
Alkalinity, Bicarbonate (as CaCO3)	MG/L	-	5 U	5 U	260	5 U
Alkalinity, carbonate (as CaCO3)	MG/L	-	5 U	5 U	120	5 U
Alkalinity, hydroxide (as CaCO3)	MG/L	-	460	200	5 U	460
Alkalinity, Total (as CaCO3)	MG/L	-	460	200	380	460
Chloride	MG/L	250	21	58	10	7.2
Fluoride	MG/L	1.5	0.24	0.91	0.48	0.2
Phosphate (as o-PO4)	MG/L	-	0.2 J	0.5 U	0.23 J	0.5 U
Sulfate (as SO4)	MG/L	250	0.29 J	0.12 J	180	23
Total Dissolved Solids	MG/L	-	440	290	640	480
Radionuclides (Alpha Spec)						
Thorium-228	PCI/L	15	0.018 U	0.00754 U	-0.00217 U	0.00454 U
Thorium-230	PCI/L	15	0.0446 U	0.0125 U	0.0326 U	R
Thorium-232	PCI/L	15	0.00449 U	-0.00751 U	0.0151 U	0.0203 U
Uranium-234	PCI/L	27	0.0236 U	0.013 U	0.134	1.55
Uranium-235/236	PCI/L	27	0.00881 U	0.2 U	0.2 U	0.0666
Uranium-238	PCI/L	27	0.0377	0.0173 U	0.0891	1.48
Radionuclides (Filtered - Alpha Spec)						
Thorium-228	PCI/L	15	-0.0155 U	0.00434 U	0.0185 U	0.0216 U
Thorium-230	PCI/L	15	0.0287 U	R	0.0357 U	R
Thorium-232	PCI/L	15	-0.00257 U	-0.00216 U	0.0079 U	0.2 U
Uranium-234	PCI/L	27	0.0602 U	0.2 U	0.0823	1.17
Uranium-235/236	PCI/L	27	0.2 U	0.2 U	0.2 U	0.0905
Uranium-238	PCI/L	27	0.015 U	0.00934 U	0.142	1.2
Radionuclides (Radon Emanation)						
Radium-226	PCI/L	3	0.0573 U	-0.112 U	-0.0869 U	0.126 U
Radionuclides (Filtered - Radon Emanation)						
Radium-226	PCI/L	3	0.178 U	0.238	0.0396 U	4.45
Radionuclides (Gas Flow Proportional)						
Radium-228	PCI/L	5	0.242 U	0.129 U	0.191 U	0.0173 U
Radionuclides (Filtered - Gas Flow Proportional)						
Radium-228	PCI/L	5	0.179 U	-0.0735 U	0.0416 U	0.752

Notes:

Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and

For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 36
PIPELINE EXCAVATION PE6
SOIL AND SEDIMENT ANALYTICAL RESULTS

Location ID			PE6	PE6	PE6
Field Sample ID			PE6SB15.0-5.5-0165	PE6SB15.0-5.5D	PE6PIPE1SED-0167
Matrix			SOIL	SOIL	SEDIMENT
Sample Depth Interval (ft)			5.0-5.5	5.0-5.5	4.9-5.0
Date Sampled			12/10/12	12/10/12	12/10/12
Parameter	Units	Criteria*	PIPE1	PIPE1 (DUPLICATE)	PIPE1
			10"	10"	10"
Volatile Organic Compounds					
1,2,4-Trimethylbenzene	UG/KG	62000	6.1 U	6.4 U	9.3
1,3,5-Trimethylbenzene (Mesitylene)	UG/KG	7.80E+05	6.1 U	6.4 U	2.5 J
Benzene	UG/KG	1100	6.1 U	6.4 U	1.5 J
Cyclohexane	UG/KG	7.00E+06	12 U	0.5 J	14 U
Ethylbenzene	UG/KG	5400	6.1 U	0.75 J	2.7 J
Hexane	UG/KG	5.70E+05	12 U	13 U	3.9 J
Isopropylbenzene (Cumene)	UG/KG	2.10E+05	24 U	26 U	0.69 J
Naphthalene	UG/KG	3600	6.1 U	6.4 U	18
n-Propylbenzene	UG/KG	3.40E+06	6.1 U	6.4 U	1.2 J
Tetrachloroethene	UG/KG	22000	6.1 U	0.47 J	6.8 U
Toluene	UG/KG	5.00E+06	6.1 U	6.4 U	6 J
Xylene (total)	UG/KG	6.30E+05	12 U	4 J	15
Semivolatile Organic Compounds					
1,1-Biphenyl	UG/KG	-	400 U	420 U	140 J
2-Methylnaphthalene	UG/KG	2.30E+05	400 U	420 U	280 J
Acenaphthene	UG/KG	3.40E+06	400 U	420 U	690 J
Acenaphthylene	UG/KG	-	400 U	420 U	1,000
Anthracene	UG/KG	1.70E+07	400 U	420 U	14,000
Benzo(a)anthracene	UG/KG	150	400 U	420 U	45,000
Benzo(a)pyrene	UG/KG	15	400 U	420 U	33,000
Benzo(b)fluoranthene	UG/KG	150	400 U	420 U	46,000
Benzo(g,h,i)perylene	UG/KG	-	400 U	420 U	11,000
Benzo(k)fluoranthene	UG/KG	1500	400 U	420 U	13,000
Benzyl alcohol	UG/KG	6.10E+06	400 U	50 J	870 U
Carbazole	UG/KG	-	400 U	420 U	12,000
Chrysene	UG/KG	15000	400 U	420 U	37,000
Dibenz(a,h)anthracene	UG/KG	15	400 U	420 U	4,000
Dibenzofuran	UG/KG	-	400 U	420 U	1,500
Dimethylphthalate	UG/KG	-	400 U	170 J	870 U
Fluoranthene	UG/KG	2.30E+06	400 U	420 U	100,000
Fluorene	UG/KG	2.30E+06	400 U	420 U	3,100
Indeno(1,2,3-cd)pyrene	UG/KG	150	400 U	420 U	13,000
Naphthalene	UG/KG	3600	400 U	420 U	670 J
Phenanthrene	UG/KG	-	400 U	420 U	58,000
Pyrene	UG/KG	1.70E+06	400 U	420 U	66,000
Metals					
Aluminum	MG/KG	77000	14,000	16,000 J	2,400
Antimony	MG/KG	31	3.2 U	3.3 U	2 J
Arsenic	MG/KG	8.73	5.5 J	5.1 J	11
Barium	MG/KG	15000	140	120	40
Beryllium	MG/KG	160	0.68	0.83	0.71 U
Boron	MG/KG	16000	63 U	66 U	26 J
Cadmium	MG/KG	70	0.38 U	0.4 U	0.6
Calcium	MG/KG	58900	50,000	53,000 J	83,000
Chromium	MG/KG	25.8	21	24	35
Cobalt	MG/KG	36.7	12 D	16 J	2.6
Copper	MG/KG	3100	35	36	98
Iron	MG/KG	55000	29,000	34,000 J	460,000
Lead	MG/KG	400	6.4	7.3	3.4
Lithium	MG/KG	160	29	32	7.1 U
Magnesium	MG/KG	14800	12,000	13,000 J	1,700
Manganese	MG/KG	6650	740	920 J	1,200
Mercury	MG/KG	10	0.013 J	0.05 U	0.052 U
Molybdenum	MG/KG	390	3.2 U	3.3 U	12
Nickel	MG/KG	1500	29	34	25
Potassium	MG/KG	2860	2,100 J	2,400 J	71 U
Selenium	MG/KG	390	3.2	2.7 J	3.5 U
Sodium	MG/KG	331	150 J	180	180 U
Thallium	MG/KG	0.78	2.8 U	3.0 U	1.4 J
Uranium, Total	MG/KG	230	2.7	2.76	6.07
Vanadium	MG/KG	390	29	32	28
Zinc	MG/KG	23000	60	58	28 J
Radionuclides (Alpha Spec)					
Thorium-228	PCI/G	5	1.06	0.918	-0.0219 U
Thorium-230	PCI/G	5	0.921	0.792	0.0227 U
Thorium-232	PCI/G	5	0.978	1.05	0.00902 U
Uranium-234	PCI/G	13	0.72	0.701	1.76
Uranium-235/236	PCI/G	8	0.0565	0.0166 U	0.0803
Uranium-238	PCI/G	14	0.746	0.621	1.46
Radionuclides (Gamma Spec)					
Actinium-227	PCI/G	0.5	0.137 U	0.0937 U	-0.102 U
Cesium-137	PCI/G	11	0.00483 U	-0.00463 U	-0.0045 U
Radium-226	PCI/G	5	0.79	0.81	-0.026 U
Radium-228	PCI/G	5	1.15	1.15	0.0624 U

Notes:

*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;

For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and

For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 37
PE6 PIPELINE EXCAVATION WATER ANALYTICAL RESULTS
(Page 1 of 2)

Location ID			PE6
Field Sample ID			PE6PIPE14.5-5.0-0166
Matrix			WATER
Sample Depth Interval (ft)			4.5-5.0
Date Sampled			12/10/12
Parameter	**Units**	**Criteria***	
Volatile Organic Compounds			
Naphthalene	UG/L	10	2.5 J
sec-Butylbenzene	UG/L	5	3.1 J
Semivolatile Organic Compounds			
Acenaphthene	UG/L	20	1.3 J
Anthracene	UG/L	50	3.9 J
bis(2-Ethylhexyl)phthalate	UG/L	5	6.6 J
Carbazole	UG/L	50	9.6
Dibenzofuran	UG/L	50	2.2 J
Fluoranthene	UG/L	50	12
Fluorene	UG/L	50	4.6 J
Naphthalene	UG/L	10	1.9 J
Phenanthrene	UG/L	50	28
Pyrene	UG/L	50	7.3 J
Metals			
Aluminum	UG/L	-	54
Barium	UG/L	1000	30
Boron	UG/L	1000	240
Calcium	UG/L	-	46,000
Cobalt	UG/L	-	0.22 J
Copper	UG/L	200	13
Iron	UG/L	300	3,900
Lead	UG/L	25	1.1 J
Lithium	UG/L	-	10
Magnesium	UG/L	35000	29,000
Manganese	UG/L	300	76
Molybdenum	UG/L	-	2.6 J
Nickel	UG/L	100	2 J
Potassium	UG/L	-	1,200
Silver	UG/L	50	0.76 J
Sodium	UG/L	20000	11,000
Thallium	UG/L	0.5	0.61 J
Uranium, Total	UG/L	30	1.88
Metals (Filtered)			
Barium	UG/L	1000	25
Boron	UG/L	1000	240
Calcium	UG/L	-	36,000
Iron	UG/L	300	670
Lead	UG/L	25	0.17 J
Lithium	UG/L	-	10
Magnesium	UG/L	35000	28,000 J
Manganese	UG/L	300	17
Molybdenum	UG/L	-	2.4 J
Nickel	UG/L	100	0.41 J
Potassium	UG/L	-	1,200
Silver	UG/L	50	0.74 J
Sodium	UG/L	20000	11,000
Thallium	UG/L	0.5	0.73 J
Uranium, Total	UG/L	30	1.88

Notes:

Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and

For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

D - Concentration reported from secondary dilution.

Only detected results reported.

TABLE 37
PE6 PIPELINE EXCAVATION WATER ANALYTICAL RESULTS
(Page 2 of 2)

Location ID			PE6
Field Sample ID			PE6PIPE14.5-5.0-0166
Matrix			WATER
Sample Depth Interval (ft)			4.5-5.0
Date Sampled			12/10/12
Parameter	**Units**	**Criteria***	
Miscellaneous Parameters			
Alkalinity, hydroxide (as CaCO3)	MG/L	-	480
Alkalinity, Total (as CaCO3)	MG/L	-	480
Chloride	MG/L	250	7.1
Fluoride	MG/L	1.5	0.43
Nitrate-Nitrogen (as N)	MG/L	10	0.017 J
Sulfate (as SO4)	MG/L	250	80 D
Total Dissolved Solids	MG/L	-	280 J
Radionuclides (Alpha Spec)			
Thorium-228	PCI/L	15	0.00896 U
Thorium-230	PCI/L	15	0.016 U
Thorium-232	PCI/L	15	0.0245 U
Uranium-234	PCI/L	27	0.587
Uranium-235/236	PCI/L	27	0.0535
Uranium-238	PCI/L	27	0.751
Radionuclides (Filtered - Alpha Spec)			
Thorium-228	PCI/L	15	-0.0612 U
Thorium-230	PCI/L	15	R
Thorium-232	PCI/L	15	0.2 U
Uranium-234	PCI/L	27	0.659
Uranium-235/236	PCI/L	27	0.0315
Uranium-238	PCI/L	27	0.61
Radionuclides (Radon Emanation)			
Radium-226	PCI/L	3	0.0183 U
Radionuclides (Filtered - Radon Emanation)			
Radium-226	PCI/L	3	-0.0101 U
Radionuclides (Gas Flow Proportional)			
Radium-228	PCI/L	5	0.867
Radionuclides (Filtered - Gas Flow Proportional)			
Radium-228	PCI/L	5	0.364 U

Notes:

Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and

For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

D - Concentration reported from secondary dilution.

Only detected results reported.

TABLE 38
INVESTIGATIVE EXCAVATION SOIL ANALYTICAL RESULTS
IE1 THROUGH IE4 - GRIT CHAMBER AREA
(Page 1 of 2)

Location ID			IE1	IE1	IE1	IE1	IE2	IE2	IE2	IE2	IE2
Field Sample ID			IE1TB10.0-0.5-0144	IE1TB33.0-3.5-0147	IE1TB26.0-7.5-0146	IE1TB49.5-10.0-0148	IE2TB10.0-0.5-0145	IE2TB10.0-0.5D-9115	IE2TB33.5-4.0-0152	IE2TB24.0-4.5-0149	IE2TB49.0-9.5-0151
Matrix			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (ft)			0.0-0.5	3.0-3.5	6.0-7.5	9.5-10.0	0.0-0.5	0.0-0.5	3.5-4.0	4.0-4.5	9.0-9.5
Date Sampled			12/05/12	12/05/12	12/05/12	12/05/12	12/05/12	12/05/12	12/05/12	12/05/12	12/05/12
Parameter	Units	Criteria*	Surface	Sand Lens	West Wall Interface	Bottom	Surface	Surface	NW Wall Interface	Pipe Bedding	Bottom
Metals								Field Duplicate			
Aluminum	MG/KG	77000	13,000 J	16,000	10,000	7,600	14,000	13,000	8,600	710	15,000
Antimony	MG/KG	31	2.9 U	3.1 U	3 U	2.8 U	3.1 U	3.6 U	2.7 U	2.9 U	3.2 U
Arsenic	MG/KG	8.73	5.1 J	4.2 J	4.3 J	3.9 J	4.4 J	4.3 J	5.2 J	5.7 U	7.8
Barium	MG/KG	15000	150	160	97	140	140	140	76	5.9 J	120
Beryllium	MG/KG	160	0.8	0.76	0.48 J	0.37 J	0.79	0.71 J	0.5 J	0.57 U	0.85
Boron	MG/KG	16000	19 J	63 U	60 U	57 U	32 J	25 J	55 U	57 U	64 U
Cadmium	MG/KG	70	0.22 J	0.17 J	0.36 U	0.34 U	0.15 J	0.25 J	0.35	1.9	0.39 U
Calcium	MG/KG	58900	22,000 J	8,800	56,000	34,000	27,000	28,000	85,000	190,000	19,000
Chromium	MG/KG	25.8	18	20	15	11	19	19	13	11 U	21
Cobalt	MG/KG	36.7	13	9.3	10	7.5	11	11	8.5	0.81 J	12
Copper	MG/KG	3100	23	20	27	20	28	29	29	2.4 J	30
Iron	MG/KG	55000	29,000 J	25,000	23,000	16,000	24,000	24,000	23,000	3,700	34,000
Lead	MG/KG	400	10	9.7	5.3	4.3	14	15	31	58	7.6
Lithium	MG/KG	160	23	31	20	17	26	25	17	3.3 J	27
Magnesium	MG/KG	14800	7,600 J	5,200	11,000	7,200	9,800	12,000	39,000	110,000	8,600
Manganese	MG/KG	6650	1,200 J	240	910	730	560	590	860	560	380
Mercury	MG/KG	10	0.019 J	0.025 J	0.045 U	0.044 U	0.016 J	0.025 J	0.013 J	0.047 U	0.047 U
Molybdenum	MG/KG	390	0.85 J	1.1 J	3 U	2.8 U	0.77 J	3.6 U	0.73 J	2.9 U	3.2 U
Nickel	MG/KG	1500	24	22	21	15	26	25	20	2.5 J	27
Potassium	MG/KG	2860	1,500 J	1,200	1,400	940	1,600	1,900	1,200	400	1,500
Selenium	MG/KG	390	1.5 J	3.1 U	3 U	2.8 U	3.1 U	3.6 U	2 J	1.3 J	3.2 U
Sodium	MG/KG	331	40 J	60 J	110 J	76 J	55 J	60 J	93 J	170	94 J
Thallium	MG/KG	0.78	2.6 U	2.8 U	2.7 U	2.6 U	2.8 U	3.2 U	2.5 U	2.6 U	2.9 U
Uranium, Total	MG/KG	230	2.74 J	4.75	2.23	2.37	3	3.13	2.56	1.63	2.76
Vanadium	MG/KG	390	29	30	22	16	28	27	25	5.7 U	32
Zinc	MG/KG	23000	61	54	47	34	70	84	110	550	55
Radionuclides (Alpha Spec)											
Thorium-228	PCI/G	5	0.947	0.923	0.588	0.709	0.741	0.951	0.771	0.0859	0.83
Thorium-230	PCI/G	5	1.13	1.61	0.454	0.69	1.54	1.55	0.803	0.397	0.783
Thorium-232	PCI/G	5	0.915	0.707	0.555	0.722	0.947	0.853	0.624	0.091	0.763
Uranium-234	PCI/G	13	0.678	1.37	0.469	0.603	1.14	0.986	0.742	0.384	0.669
Uranium-235/236	PCI/G	8	0.0451	0.0398	0.0318	0.0111 U	0.0317	0.053	0.093	0.00754 U	0.0443
Uranium-238	PCI/G	14	0.845	1.46	0.533	0.559	1.08	1.02	0.774	0.315	0.631
Radionuclides (Gamma Spec)											
Actinium-227	PCI/G	0.5	0.318 U	-1.31 U	0.0202 U	0.115 U	0.223 U	0.0699 U	0.0895 U	0.0341 U	0.0564 U
Cesium-137	PCI/G	11	0.0272 U	0.0141 U	-0.0038 U	0.153 U	0.00131 U	0.0233 U	-0.0074 U	-0.00497 U	0.0152 U
Radium-226	PCI/G	5	0.791	1.54	0.653	0.662	1.21	1.32	0.977	0.413 J	0.79
Radium-228	PCI/G	5	0.764	1.53	0.513	0.915	1.21	1.2	1.22	0.154	0.928

Notes:

*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;

For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and

For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 38

INVESTIGATIVE EXCAVATION SOIL ANALYTICAL RESULTS

IE1 THROUGH IE4 - GRIT CHAMBER AREA

(Page 2 of 2)

Location ID			IE3	IE3	IE3	IE3	IE4	IE4	IE4	IE4
Field Sample ID			IE3TB10.0-0.5-0126	IE3TB23.2-3.6-0129	IE3TB33.2-3.6-0130	IE3TB410.2-10.6-0128	IE4TB10.0-0.5-0131	IE4TB32.8-3.2-0134	IE4TB23.5-4.0-0132	IE4TB410.0-10.5-0135
Matrix			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (ft)			0.0-0.5	3.2-3.6	3.2-3.6	10.2-10.6	0.0-0.5	2.8-3.2	3.5-4.0	10.0-10.5
Date Sampled			11/30/12	12/03/12	12/03/12	12/03/12	12/03/12	12/03/12	12/03/12	12/03/12
Parameter	Units	Criteria*	Surface	NW Corner Interface	East Wall Interface	Bottom	Surface	South Wall Interface	Pipe Bedding	Bottom
Metals										
Aluminum	MG/KG	77000	9,900 J	16,000 J	15,000 J	12,000 J	15,000 J	13,000	660	10,000 J
Antimony	MG/KG	31	3 U	3.5 U	3.1 U	3.2 U	3.2 U	3.1 U	2.9 U	3 U
Arsenic	MG/KG	8.73	3.3 J	4.6 J	2.2 J	4.4 J	4.6 J	3.3 J	5.8 U	4.2 J
Barium	MG/KG	15000	94	240	200	160	130	150	5.9 J	130
Beryllium	MG/KG	160	0.53 J	0.81	0.82	0.57 J	0.83	0.68	0.58 U	0.5 J
Boron	MG/KG	16000	41 J	69 U	63 U	64 U	64 U	61 U	58 U	61 U
Cadmium	MG/KG	70	0.52	0.42 U	0.25 J	0.12 J	0.16 J	0.12 J	1	0.36 U
Calcium	MG/KG	58900	64,000	5,400	7,200	51,000	37,000	18,000	210,000	43,000
Chromium	MG/KG	25.8	15	22	18	18	22	18	55 U	16
Cobalt	MG/KG	36.7	8.2	12	6.5	10	12	11	0.73 J	10
Copper	MG/KG	3100	20	22	30	24	27	17	2 J	34
Iron	MG/KG	55000	18,000	31,000	16,000	24,000	30,000	22,000	3,700	23,000
Lead	MG/KG	400	36	7.5	8.2	5.1	9.8	9.5	66	4.9
Lithium	MG/KG	160	18	29	22	24	30	30	3 J	21
Magnesium	MG/KG	14800	33,000	6,200	4,200	11,000	10,000	7,400	120,000	10,000
Manganese	MG/KG	6650	580	320	140	790	760	460	620	760
Mercury	MG/KG	10	0.05 U	0.05 U	0.015 J	0.048 U	0.052 U	0.045 U	0.049 U	0.047 U
Molybdenum	MG/KG	390	0.79 J	3.5 U	3.1 U	3.2 U	3.2 U	0.83 J	2.9 U	3 U
Nickel	MG/KG	1500	19	28	19	24	28	27	2 J	22
Potassium	MG/KG	2860	1,600	1,200	1,000	1,900	1,800	1,400	390	1,700
Selenium	MG/KG	390	1 J	1.3 J	1.3 J	1.7 J	1.4 J	1.2 J	0.96 J	1.3 J
Sodium	MG/KG	331	69 J	170 U	57 J	110 J	58 J	81 J	190 J	120 J
Thallium	MG/KG	0.78	1.1 J	3.1 U	2.8 U	2.9 U	2.9 U	2.7 U	2.6 U	2.7 U
Uranium, Total	MG/KG	230	2.38	3.82	4.55	2.34	1.24	1.54	3.97	2.77
Vanadium	MG/KG	390	20	30	26	24	30	24	29 U	23
Zinc	MG/KG	23000	180	53	48	51	79	63	210	47
Radionuclides (Alpha Spec)										
Thorium-228	PCI/G	5	0.596	0.725	0.859	0.909	0.963	0.968	0.0853	0.735
Thorium-230	PCI/G	5	0.92	0.816	1.01	0.796	0.881	1.14	0.408	0.664
Thorium-232	PCI/G	5	0.691	0.873	0.811	0.84	0.858	0.874	0.0361 U	0.662
Uranium-234	PCI/G	13	0.604	1.06	1.38	0.751	0.85	1.09	0.392	0.635
Uranium-235/236	PCI/G	8	0.0317	0.0614	0.0585	0.0513	0.0292	0.026	0.0237	0.029
Uranium-238	PCI/G	14	0.634	1.04	1.21	0.715	0.969	1.14	0.449	0.619
Radionuclides (Gamma Spec)										
Actinium-227	PCI/G	0.5	-0.277 U	0.0222 U	0.0974 U	0.113 U	-1.15 U	0.241 U	0.00764 U	0.0633 U
Cesium-137	PCI/G	11	0.00952 U	0.0146 U	0.0188 U	0.0148 U	-0.00356 U	0.0232 U	-0.00483 U	0.00992 U
Radium-226	PCI/G	5	0.756	1.02	0.841	0.772	0.929	1.41	0.476	0.887
Radium-228	PCI/G	5	0.368	1.14	0.903	0.978	1.22	1.25	0.0712 U	0.876

Notes:

*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;

For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and

For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 39
INVESTIGATIVE EXCAVATION GROUNDWATER ANALYTICAL RESULTS

Location ID			IE2	IE3	IE3	IE4	IE5	IE6	IE7	IE8
Field Sample ID			IE2GW4.5-5.0-0150	IE3GW8.8-9.5-0127	IE3GW8.8-9.5D-9110	IE4GW4.0-4.5-0133	IE5GW2.7-3.4-0155	IE6GW11.0-11.5-0162	IE7GW5.0-6.0-0137	IE8GW8.0-9.0-0141
Matrix			WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
Sample Depth Interval (ft)			4.5-5.0	8.8-9.5	8.8-9.5	4.0-4.5	2.7-3.4	11.0-11.5	5.0-6.0	8.0-9.0
Date Sampled			12/05/12	12/03/12	12/03/12	12/03/12	12/06/12	12/06/12	12/04/12	12/04/12
Parameter	Units	Criteria*			Field Duplicate					
Metals (Filtered)										
Aluminum	UG/L	-	2,200	180	170	660	50	12,000	990	1,000
Arsenic	UG/L	25	1.3 J	10 U	10 U	2 J	10 U	3.4 J	10 U	1.6 J
Barium	UG/L	1000	79	25	25	80	59	130	38	54
Beryllium	UG/L	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.52	0.5 U	0.5 U
Boron	UG/L	1000	300 J	190 J	540 U	150 J	43 J	160 J	120 J	270 J
Cadmium	UG/L	5	1.4	0.5 U	0.5 U	0.43 J	0.2 J	0.13 J	0.5 U	0.5 U
Calcium	UG/L	-	140,000	150,000	150,000	160,000	78,000	140,000	120,000	100,000
Chromium	UG/L	50	10 U	10 U	10 U	10 U	10 U	13	10 U	7 J
Cobalt	UG/L	-	1.4 J	2 U	2 U	3.2	2 U	6.4	0.51 J	0.95 J
Copper	UG/L	200	6.9	2.4 J	2.5 J	1.8 J	4.4	26	3	4
Iron	UG/L	300	2,500	190	170	4,800	70	13,000	1,200	1,100
Lead	UG/L	25	64	0.21 J	3 U	22	3.7	7.4	0.35 J	0.93 J
Lithium	UG/L	-	6.6	46	45	3.4 J	2.5 J	71	24	21
Magnesium	UG/L	35000	38,000	120,000	110,000	52,000	13,000	98,000	120,000	44,000
Manganese	UG/L	300	75	4.1	3.9	310	6.1	300	25	120
Molybdenum	UG/L	-	2.2 J	5 U	5 U	2.3 J	3.2 J	1.5 J	5 U	4.8 J
Nickel	UG/L	100	6	10	10	2.7 J	2 J	56	1.6 J	2.9 J
Potassium	UG/L	-	4,800	1,000	1,000	5,000	3,000	5,000	1,200	3,600
Selenium	UG/L	10	5 U	1.7 J	5 U	5 U	5 U	5 U	5 U	5 U
Silver	UG/L	50	0.42 J	0.39 J	2 U	R	R	R	2 U	2 U
Sodium	UG/L	20000	8,400 J	39,000	39,000	17,000	5,800 J	27,000 J	27,000	14,000
Thallium	UG/L	0.5	0.94 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Uranium, Total	UG/L	30	26.4	19.4	21.8	44.2	11.8	50.7	7,080	1,870
Vanadium	UG/L	-	3.8 J	10 U	10 U	10 U	10 U	20	10 U	3 J
Zinc	UG/L	2000	2,300	12 U	12 U	190	1,700	59	12 U	13
Miscellaneous Parameters										
Alkalinity, hydroxide (as CaCO3)	MG/L	-	350	500 J	490 J	440 J	210	540	500	310
Alkalinity, Total (as CaCO3)	MG/L	-	350	500 J	490 J	440 J	210	540	500	310
Chloride	MG/L	250	3.2	9.9 J	13 J	3.1	4.1	7.2	11	12
Fluoride	MG/L	1.5	0.72	0.4	0.41	0.49	0.97	0.37	0.44	0.58
Nitrate-Nitrogen (as N)	MG/L	10	1.8 J	0.91	0.86	0.099	1.8 J	0.055 J	0.09 J	0.1 J
Nitrite-Nitrogen	MG/L	1	0.02 U	0.023 J	0.022 J	0.02 U	0.02 U	0.02 U	0.02 U	0.023 J
Sulfate (as SO4)	MG/L	250	140	450	450	290	50	220	340	140
Total Dissolved Solids	MG/L	-	580	1,200	1,200	840	360	870	1,000	560
Radionuclides (Filtered - Alpha Spec)										
Thorium-228	PCI/L	15	0.0979	0.0467 U	0.0119 U	0.0542 U	0.0296 U	0.486	0.0275 U	0.0273 U
Thorium-230	PCI/L	15	0.178 J	0.0182 U	0.0198 U	0.0888 J	R	0.229 J	0.0199 U	R
Thorium-232	PCI/L	15	0.0898	0.00202 U	-0.00197 U	0.0199 U	0.2 U	0.18	-0.00195 U	-0.00226 U
Uranium-234	PCI/L	27	9.11	8.52	8.65	16.7	5.32	21	1,880	553
Uranium-235/236	PCI/L	27	0.463	0.476	0.455	0.891	0.281	0.915	75.3	27.3
Uranium-238	PCI/L	27	8.85	6.4	7.15	15.5	3.02	17.7	1,860	532
Radionuclides (Filtered - Radon Emanation)										
Radium-226	PCI/L	3	0.374 J	0.5 U	0.115 U	1.24	0.224	0.323	NA	0.326
Radionuclides (Filtered - Gas Flow Proportional)										
Radium-228	PCI/L	5	-0.16 U	0.154 U	0.18 U	0.388 U	0.21 U	0.432 U	0.0565 U	0.331 U

Notes:

Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and

For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 40
INVESTIGATIVE EXCAVATION SOIL ANALYTICAL RESULTS
IE 5 AND IE6 - DECONTAMINATION PAD AREA

Location ID			IE5	IE5	IE5	IE5	IE6	IE6	IE6	IE6
Field Sample ID			IE5TB10.0-0.5-0153	IE5TB32.0-2.4-0157	IE5TB22.7-3.2-0154	IE5TB411.0-11.5-0158	IE6TB10.0-0.5-0156	IE6TB22.5-3.0-0159	IE6TB36.0-8.0-0161	IE6TB411.5-12.0-0160
Matrix			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (ft)			0.0-0.5	2.0-2.4	2.7-3.2	11.0-11.5	0.0-0.5	2.5-3.0	6.0-8.0	11.5-12.0
Date Sampled			12/06/12	12/06/12	12/06/12	12/06/12	12/06/12	12/06/12	12/06/12	12/06/12
Parameter	Units	Criteria*	Surface	NW Wall Interface	Pipe Bedding	Bottom	Surface	Black Silt Lens	Northeast Wall	Bottom
Metals										
Aluminum	MG/KG	77000	13,000 J	13,000	360	7,300	5,600	18,000	14,000	19,000
Antimony	MG/KG	31	3.6 U	3 U	2.8 U	3 U	3.3	3.3 U	3 U	3.6 U
Arsenic	MG/KG	8.73	4.1 J	3.8 J	5.7 U	3.9 J	5.4 J	2.3 J	3.6 J	3.6 J
Barium	MG/KG	15000	130	130	2.8 J	92	140	230	150	150
Beryllium	MG/KG	160	0.74	0.69	0.57 U	0.34 J	0.35 J	0.98	0.71	0.95
Boron	MG/KG	16000	71 U	20 J	27 J	60 U	64 U	65 U	60 U	71 U
Cadmium	MG/KG	70	0.27 J	0.15 J	12	0.13 J	15	0.3 J	0.36 U	0.43 U
Calcium	MG/KG	58900	26,000 J	38,000	200,000	53,000	83,000	7,100	48,000	56,000
Chromium	MG/KG	25.8	18	18	11 U	11	12	19	20	27
Cobalt	MG/KG	36.7	10	12	0.71 J	7.4	14	7.1	11	15
Copper	MG/KG	3100	28	26	3.4 J	30	17	37	27	28
Iron	MG/KG	55000	22,000 J	23,000 J	2,900 J	17,000 J	16,000 J	16,000 J	29,000 J	35,000 J
Lead	MG/KG	400	12	17	69	4.4	43	9.4	6.3	8.6
Lithium	MG/KG	160	22	25	5.7 U	14	10	27	26	38
Magnesium	MG/KG	14800	9,000 J	9,000 J	110,000 J	10,000 J	41,000 J	4,700 J	10,000 J	15,000 J
Manganese	MG/KG	6650	570 J	720	610	1,100	1,500	140	680	800
Mercury	MG/KG	10	0.034 J	0.022 J	0.042 U	0.045 U	0.032 J	0.028 J	0.047 U	0.055 U
Molybdenum	MG/KG	390	1.1 J	3 U	2.8 U	3 U	1.2 J	3.3 U	3 U	3.6 U
Nickel	MG/KG	1500	24	30	1.6 J	16	16	21	26	36
Potassium	MG/KG	2860	1,700 J	1,500	230	1,200	1,000	1,100	1,900	3,400
Selenium	MG/KG	390	2.2 J	2.1 J	1 J	2.9 J	1.3 J	2.7 J	2.3 J	2.3 J
Silver	MG/KG	390	1.4 U	1.2 U	0.17 J	1.2 U	1.3 U	1.3 U	1.2 U	1.4 U
Sodium	MG/KG	331	62 J	84 J	150	130 J	80 J	80 J	93 J	200
Uranium, Total	MG/KG	230	3.11	3.05	1.18	1.62	3.01	25.4	2.76	3.23
Vanadium	MG/KG	390	24	25	5.7 U	16	13	27	28	36
Zinc	MG/KG	23000	74	65	5,300	38	3,400	54	56	74
Radionuclides (Alpha Spec)										
Thorium-228	PCI/G	5	0.808	0.891	0.115	0.539	0.631	0.801	1.01	1.12
Thorium-230	PCI/G	5	1.6	1.49	0.42	0.495	1.14	1	0.977	1.03
Thorium-232	PCI/G	5	0.747	0.953	0.1	0.538	0.55	0.932	1.06	1.1
Uranium-234	PCI/G	13	0.861	0.813	0.385	0.422	0.905	7.43	0.846	0.98
Uranium-235/236	PCI/G	8	0.0634	0.0352	0.00764 U	0.0216	0.042	0.308	0.0422	0.0488
Uranium-238	PCI/G	14	0.912	0.777	0.356	0.462	0.866	7.09	0.812	1.01
Radionuclides (Gamma Spec)										
Actinium-227	PCI/G	0.5	-0.747 U	0.0216 U	0.0246 U	-0.419 U	0.0394 U	0.142 U	0.115 U	0.0281 U
Cesium-137	PCI/G	11	0.0408 U	0.00728 U	0.0441 U	0.00747 U	0.0186 U	0.000844 U	0.0203 U	-0.0154 U
Radium-226	PCI/G	5	1.47	1.68	0.395 J	0.726	0.804	1.19	1.04	1.1
Radium-228	PCI/G	5	0.831	1.03	0.17 U	0.544	0.381	1.2	1.11	1.1

Notes:

*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;

For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and

For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 41
INVESTIGATIVE EXCAVATION SOIL ANALYTICAL RESULTS
IE7 AND IE8 - OW11B AREA

Location ID			IE7	IE7	IE7	IE7	IE7	IE8	IE8	IE8	IE8	IE8
Field Sample ID			IE7TB10.0-0.5-0125	IE7TB24.5-5.0-0138	IE7TB37.5-8.0-0139	IE7TB49.0-9.5-0136	IE7TB49.0-9.5D-9112	IE8TB10.0-0.5-0124	IE8TB10.0-0.5D-9107	IE8TB23.0-3.5-0142	IE8TB36.5-7.0-0143	IE8TB48.0-9.0-0140
Matrix			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Depth Interval (ft)			0.0-0.5	4.5-5.0	7.5-8.0	9.0-9.5	9.0-9.5	0.0-0.5	0.0-0.5	3.0-3.5	6.5-7.0	8.0-9.0
Date Sampled			11/30/12	12/04/12	12/04/12	12/04/12	12/04/12	11/30/12	11/30/12	12/04/12	12/04/12	12/04/12
Parameter	Units	Criteria*	Surface	Beneath Pipe	West Wall	Bottom	Bottom	Surface	Surface	Northwest Corner	Beneath Concrete Sewer	Bottom
Metals							Field Duplicate		Field Duplicate			
Aluminum	MG/KG	77000	15,000 J	17,000 J	14,000 J	14,000 J	14,000 J	15,000 J	15,000 J	13,000 J	11,000 J	12,000 J
Antimony	MG/KG	31	3 U	1.7 J	2.8 U	3.2 U	3.3 U	3.2 U	2.9 U	3.1 U	3.1 U	3.3 U
Arsenic	MG/KG	8.73	2.3 J	4.6 J	4.4 J	5.9 J	5.7 J	4.1 J	3.2 J	4.1 J	5 J	5.7 J
Barium	MG/KG	15000	180	110	120	140 J	120	170	190	230	130	100
Beryllium	MG/KG	160	0.72	0.88	0.76	0.84	0.63 J	0.84	0.98	0.63	0.51 J	0.59 J
Boron	MG/KG	16000	60 U	55 J	25 J	30 J	65 U	65 U	57 U	62 U	63 U	67 U
Cadmium	MG/KG	70	0.36 U	0.36 U	0.34 U	0.19 J	0.39 U	0.25 J	0.14 J	0.37 U	0.38 U	0.4 U
Calcium	MG/KG	58900	8,600 J	31,000	49,000	73,000 J	59,000	25,000	12,000	50,000	56,000	49,000
Chromium	MG/KG	25.8	19	23	20	20	20	20	19	19	17	18
Cobalt	MG/KG	36.7	9.2	12	11	12	12	11	9	12	11	9.9
Copper	MG/KG	3100	24	34	33	32	25	30	29	30	36	30
Iron	MG/KG	55000	21,000 J	34,000	27,000	28,000 J	28,000	25,000	21,000	26,000	24,000	24,000
Lead	MG/KG	400	8.1	8	6.5	6.4 J	4.9 J	9	8.2	5.9	4.4	5.2
Lithium	MG/KG	160	28	33	27	25	27	27	30	26	23	24
Magnesium	MG/KG	14800	6,000 J	10,000	12,000	13,000 J	11,000	7,700 J	5,700 J	11,000	12,000	12,000
Manganese	MG/KG	6650	280 J	540	640	920 J	930	580 J	350 J	840	1,100	740
Mercury	MG/KG	10	0.014 J	0.049 U	0.046 U	0.048 U	0.05 U	0.046 U	0.013 J	0.046 U	0.046 U	0.05 U
Molybdenum	MG/KG	390	3 U	0.85 J	2.8 U	3.2 U	3.3 U	1.2 J	0.85 J	3.1 U	3.1 U	3.3 U
Nickel	MG/KG	1500	23	30	25	26	27	26	23	27	23	24
Potassium	MG/KG	2860	1,100 J	1,700	1,800	2,100 J	2,200	1,400	1,300	1,800	1,900	2,100
Selenium	MG/KG	390	1.4 J	1.1 J	2.5 J	2.5 J	1.4 J	1.5 J	1.9 J	1.6 J	2 J	2.5 J
Silver	MG/KG	390	1.2 U	1.2 U	1.1 U	1.3 U	1.3 U	1.3 U	1.1 U	1.2 U	1.3 U	1.3 U
Sodium	MG/KG	331	150 U	100 J	110 J	130 J	110 J	47 J	140 U	85 J	110 J	110 J
Thallium	MG/KG	0.78	2.7 U	1.1 J	2.5 U	2.8 U	2.9 U	2.9 U	2.6 U	2.8 U	2.8 U	3 U
Uranium, Total	MG/KG	230	6.15	45.6	8.67	32.2	41.8	11.8	11.3	45.9	12.6	6.05
Vanadium	MG/KG	390	26	34	30	29	27	28	27	27	24	25
Zinc	MG/KG	23000	52	61	54	55	56	56	50	54	53	52
Radionuclides (Alpha Spec)												
Thorium-228	PCI/G	5	1.05	0.964	0.975	0.794	0.937	0.956	0.836	0.895	0.925	0.939
Thorium-230	PCI/G	5	1.2	0.959	0.771	0.782	0.842	1.27	1.15	0.758	0.766	1.03
Thorium-232	PCI/G	5	0.97	0.962	0.883	0.79	0.824	1.05	0.903	0.877	0.881	0.81
Uranium-234	PCI/G	13	2.27	11.6	2.18	11.7	9.99	3.97	4	15.8	4.15	2.2
Uranium-235/236	PCI/G	8	0.0786	0.513	0.0693	0.522	0.497	0.148	0.16	0.737	0.205	0.111
Uranium-238	PCI/G	14	2.3	11.2	2.16	10.9	10.2	4.08	4.03	15.7	4.32	2.17
Radionuclides (Gamma Spec)												
Actinium-227	PCI/G	0.5	0.137 U	0.0226 U	-0.0151 U	0.0536 U	0.208 U	0.0213 U	0.364	-0.561 U	0.0992 U	-0.608 U
Cesium-137	PCI/G	11	0.0389 U	-0.00323 U	0.00218 U	-0.00781 U	-0.0236 U	0.143 U	-0.00409 U	-0.0277 U	0.00646 U	-0.00787 U
Radium-226	PCI/G	5	0.981	1.06	0.845	0.904	0.775	1.26	1.25	0.875	0.883	0.844
Radium-228	PCI/G	5	1.07	1.14	0.682	1.14	1.13	1.19	0.952	0.916	1.34	1.11

Notes:
*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;
For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and
For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).
Concentration exceeds criteria.
U - Not detected above the reported quantitation limit.
J - The reported concentration is an estimated value.
NA - Not Analyzed.
R - Data rejected.
Only detected results reported.

TABLE 42
MANHOLE MH08 AND MH41 SEDIMENT ANALYTICAL RESULTS
(Page 1 of 2)

Location ID			MH08	MH08	MH41
Field Sample ID			MH08SED9.4-9.8-0164	MH08SED9.4-9.8D-9116	MH41SED5.5-6.0-0113
Matrix			SEDIMENT	SEDIMENT	SEDIMENT
Sample Depth Interval (ft)			9.4-9.8	9.4-9.8	5.5-6.0
Date Sampled			12/07/12	12/07/12	11/15/12
Parameter	**Units**	**Criteria***		**Field Duplicate**	
Volatile Organic Compounds					
1,2,3-Trichlorobenzene	UG/KG	49000	1.6 J	11 U	26 U
1,2,4-Trichlorobenzene	UG/KG	22000	1.1 J	11 U	26 U
Acetone	UG/KG	6.10E+07	43	47	260
Methyl ethyl ketone (2-Butanone)	UG/KG	2.80E+07	42 U	4.2 J	100 U
Naphthalene	UG/KG	3600	1.8 J	11 U	26 U
Semivolatile Organic Compounds					
Benzo(a)anthracene	UG/KG	150	1,400 U	1,500 U	270 J
Benzo(a)pyrene	UG/KG	15	1,400 U	1,500 U	300 J
Benzo(b)fluoranthene	UG/KG	150	1,400 U	1,500 U	480 J
Benzo(g,h,i)perylene	UG/KG	-	1,400 U	1,500 U	320 J
Benzo(k)fluoranthene	UG/KG	1500	1,400 U	1,500 U	190 J
Benzyl alcohol	UG/KG	6.10E+06	250 J	290 J	1,700 U
bis(2-Ethylhexyl)phthalate	UG/KG	35000	420 J	1,500 U	1,700 U
Chrysene	UG/KG	15000	1,400 U	1,500 U	310 J
Dimethylphthalate	UG/KG	-	480 J	410 J	300 J
Fluoranthene	UG/KG	2.30E+06	1,400 U	1,500 U	430 J
Indeno(1,2,3-cd)pyrene	UG/KG	150	1,400 U	1,500 U	1,200 J
Phenanthrene	UG/KG	-	1,400 U	1,500 U	200 J
Pyrene	UG/KG	1.70E+06	1,400 U	1,500 U	340 J
Pesticide Organic Compounds					
4,4'-DDE	UG/KG	1400	1.7 J	1.9 J	7.2 J
Endrin	UG/KG	18000	1.8 J	1.1 J	8.6 U
Polychlorinated Biphenyls					
Aroclor 1260	UG/KG	220	140 U	140 U	93 J
Metals					
Aluminum	MG/KG	77000	20,000	18,000	21,000 J
Arsenic	MG/KG	8.73	5.2 J	7.6 J	11 J
Barium	MG/KG	15000	190	170	270 J
Beryllium	MG/KG	160	1 J	1 J	1.1 J
Cadmium	MG/KG	70	0.33 J	0.48 J	1.6 J
Calcium	MG/KG	58900	40,000	41,000	16,000

Notes:

*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;

For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and

For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

Only detected results reported.

TABLE 42
MANHOLE MH08 AND MH41 SEDIMENT ANALYTICAL RESULTS
(Page 2 of 2)

Location ID			MH08	MH08	MH41
Field Sample ID			MH08SED9.4-9.8-0164	MH08SED9.4-9.8D-9116	MH41SED5.5-6.0-0113
Matrix			SEDIMENT	SEDIMENT	SEDIMENT
Sample Depth Interval (ft)			9.4-9.8	9.4-9.8	5.5-6.0
Date Sampled			12/07/12	12/07/12	11/15/12
Parameter	Units	Criteria*		Field Duplicate	
Metals					
Chromium	MG/KG	25.8	69	120	110 J
Cobalt	MG/KG	36.7	14	14	17 J
Copper	MG/KG	3100	52 J	99	290 J
Iron	MG/KG	55000	42,000 J	47,000 J	41,000
Lead	MG/KG	400	22	37	100 J
Lithium	MG/KG	160	36	37	37 J
Magnesium	MG/KG	14800	11,000 J	11,000 J	10,000 J
Manganese	MG/KG	6650	610	640	1,000
Mercury	MG/KG	10	0.047 J	0.082 J	0.59
Molybdenum	MG/KG	390	2.1 J	4.1 J	3.8 J
Nickel	MG/KG	1500	44	58	58 J
Potassium	MG/KG	2860	2,500	2,400	3,700 J
Selenium	MG/KG	390	3.6 J	5.1 J	11 J
Silver	MG/KG	390	2.2 U	2.3 U	0.64 J
Sodium	MG/KG	331	140 J	150 J	270 J
Uranium, Total	MG/KG	230	43.1	42.7	21.6
Vanadium	MG/KG	390	38	40	54 J
Zinc	MG/KG	23000	170	150	340 J
Radionuclides (Alpha Spec)					
Thorium-228	PCI/G	5	1.11	1.15	0.849
Thorium-230	PCI/G	5	1.57	1.52	2.14
Thorium-232	PCI/G	5	0.969	1.1	0.761
Uranium-234	PCI/G	13	16.1	17.4	7.07
Uranium-235/236	PCI/G	8	0.629	0.833	0.3
Uranium-238	PCI/G	14	15.4	17.5	6.64
Radionuclides (Gamma Spec)					
Actinium-227	PCI/G	0.5	0.318 U	0.24 U	0.164 U
Cesium-137	PCI/G	11	0.217	0.0585 U	0.62
Radium-226	PCI/G	5	2.42	2.51	1.85
Radium-228	PCI/G	5	0.948	1.76	1.05

Notes:
*Criteria - For organics (VOCs, SVOCs, pesticides, and PCBs): USEPA Regional Screening Levels (RSL), Residential, May 2013; For metals: the greater of either USEPA RSLs or NFSS RI Background Screening Levels, December 2007;
For Ra-226/Ra-228 (sum total of 5 pCi/g), thorium isotopes (sum total of 5 pCi/g): USDOE Order 458.1, June 2011; and
For Ac-227, Cs-137, Pa-231, and uranium isotopes (pCi/g, equivalent to 25 mrem/yr): NUREG 1757 (NRC 2006).
Concentration exceeds criteria.
U - Not detected above the reported quantitation limit.
J - The reported concentration is an estimated value.
NA - Not Analyzed.
R - Data rejected.
Only detected results reported.

TABLE 43
MANHOLE MH08 AND MH41 WATER ANALYTICAL RESULTS
(Page 1 of 2)

Location ID			MH08	MH41
Field Sample ID			MH08MH6.2-0163	MH41MH4.0-4.5-0112
Matrix			WATER	WATER
Sample Depth Interval (ft)			6.2-6.2	4.0-4.5
Date Sampled			12/07/12	11/15/12
Parameter	**Units**	**Criteria***		
Volatile Organic Compounds				
Chloroform	UG/L	7	5 U	0.24 J
Naphthalene	UG/L	10	5 U	0.9 J
Semivolatile Organic Compounds				
bis(2-Ethylhexyl)phthalate	UG/L	5	1 J	9.6 U
Metals				
Aluminum	UG/L	-	30	97
Arsenic	UG/L	25	2 J	100 U
Barium	UG/L	1000	62	92
Boron	UG/L	1000	120	150
Calcium	UG/L	-	120,000	130,000 J
Cobalt	UG/L	-	0.29 J	20 U
Copper	UG/L	200	0.88 J	6.7 J
Iron	UG/L	300	1,200	500 U
Lead	UG/L	25	3 U	0.41 J
Lithium	UG/L	-	18	14
Magnesium	UG/L	35000	62,000	29,000 J
Manganese	UG/L	300	520	100 J
Molybdenum	UG/L	-	3.1 J	5 U
Nickel	UG/L	100	0.7 J	50 U
Potassium	UG/L	-	2,800	1,900
Silver	UG/L	50	R	2 U
Sodium	UG/L	20000	24,000	9,000
Uranium, Total	UG/L	30	135	23.7
Metals (Filtered)				
Aluminum	UG/L	-	30 U	54 J
Arsenic	UG/L	25	1.5 J	100 U
Barium	UG/L	1000	62	87
Boron	UG/L	1000	110 J	140 J
Calcium	UG/L	-	120,000	120,000 J
Cobalt	UG/L	-	0.27 J	20 U
Copper	UG/L	200	3 U	5 J
Iron	UG/L	300	92	500 U
Lead	UG/L	25	3 U	0.23 J
Lithium	UG/L	-	20 J	13 J
Magnesium	UG/L	35000	58,000	29,000 J
Manganese	UG/L	300	570	100 J
Nickel	UG/L	100	0.72 J	50 U
Potassium	UG/L	-	3,000	1,800
Silver	UG/L	50	R	2 U
Sodium	UG/L	20000	22,000	8,600
Uranium, Total	UG/L	30	137	10.7
Zinc	UG/L	2000	13	120 U

Notes:

Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and

For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.

Concentration exceeds criteria.

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

NA - Not Analyzed.

R - Data rejected.

D - Concentration reported from secondary dilution.

Only detected results reported.

TABLE 43
MANHOLE MH08 AND MH41 WATER ANALYTICAL RESULTS
(Page 2 of 2)

Location ID			MH08	MH41
Field Sample ID			MH08MH6.2-0163	MH41MH4.0-4.5-0112
Matrix			WATER	WATER
Sample Depth Interval (ft)			6.2-6.2	4.0-4.5
Date Sampled			12/07/12	11/15/12
Parameter	**Units**	**Criteria***		
Miscellaneous Parameters				
Alkalinity, hydroxide (as CaCO3)	MG/L	-	330	360
Alkalinity, Total (as CaCO3)	MG/L	-	330	360
Chloride	MG/L	250	11 D	6.7
Fluoride	MG/L	1.5	0.51	0.36
Nitrate-Nitrogen (as N)	MG/L	10	0.066	0.18
Nitrite-Nitrogen	MG/L	1	0.02 U	0.2 J
Sulfate (as SO4)	MG/L	250	240 D	78
Total Dissolved Solids	MG/L	-	740	540
Radionuclides (Alpha Spec)				
Thorium-228	PCI/L	15	0.0101 U	-0.00659 U
Thorium-230	PCI/L	15	0.0773 J	-9.10E-08 U
Uranium-234	PCI/L	27	47.1	10.1
Uranium-235/236	PCI/L	27	2.42	0.37
Uranium-238	PCI/L	27	50.1	8.51
Radionuclides (Filtered - Alpha Spec)				
Thorium-228	PCI/L	15	0.00486 U	0.0235 U
Thorium-230	PCI/L	15	0.0176 U	0.0433 U
Thorium-232	PCI/L	15	0.00726 U	-0.00296 U
Uranium-234	PCI/L	27	43.3	9
Uranium-235/236	PCI/L	27	1.66	0.389
Uranium-238	PCI/L	27	37.9	8.28
Radionuclides (Radon Emanation)				
Radium-226	PCI/L	3	0.22	0.331 U
Radionuclides (Filtered - Radon Emanation)				
Radium-226	PCI/L	3	0.364	0.0832 U
Radionuclides (Gas Flow Proportional)				
Radium-228	PCI/L	5	0.21 U	0.464 J
Radionuclides (Filtered - Gas Flow Proportional)				
Radium-228	PCI/L	5	0.393 J	0.257 U

Notes:
Criteria* - For organics, metals, and inorganics: NYSDEC Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. February 16, 2008, Class GA; and
For total uranium, Ra-226/Ra-228 (sum total of 5 pCi/L), alpha emitters - thorium isotopes (15 pCi/L), uranium isotopes (30 ug/L x 0.9 pCi/ug = 27 pCi/L): USEPA, National Primary Drinking Water Regulations, EPA 816-F-09-004, May 2009.
Concentration exceeds criteria.
U - Not detected above the reported quantitation limit.
J - The reported concentration is an estimated value.
NA - Not Analyzed.
R - Data rejected.
D - Concentration reported from secondary dilution.
Only detected results reported.

TABLE 44
AQUEOUS INVESTIGATIVION DERIVED WASTE ANALYTICAL RESULTS
(Page 1 of 2)

Location ID		IDW	IDW	IDW	IDW	IDW	IDW	IDW	IDW	IDW
Field Sample ID		425 TANK	FRAC TANK	MW949 WATER	TANK 1	TANK 2	TANK 3	TANK 6	TANK 7	TANK 8
Matrix		WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
Date Sampled		12/18/12	12/18/12	12/18/12	12/18/12	12/18/12	12/18/12	12/18/12	12/18/12	12/18/12
Parameter	Units									
Volatile Organic Compounds										
1,2-Dichloroethene (cis)	UG/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2 J
1,2-Dichloroethene (total)	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 J
Acetone	UG/L	20 U	8.6 J	20 U	12 J	7.6 J	24	10 J	20 U	20 J
Chloroform	UG/L	5 U	5 U	5 U	5 U	5 U	0.46 J	5 U	5 U	5 U
Naphthalene	UG/L	5 U	10	5 U	3.4 J	5 U	5 U	1.4 J	5 U	5 U
Xylene (total)	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	1.1 J	10 U	10 U
Semivolatile Organic Compounds										
Acenaphthene	UG/L	9.5 U	2.3 J	9.5 U	1.1 J	2.3 J	9.6 U	9.7 U	9.5 U	9.6 U
Benzyl alcohol	UG/L	9.5 U	9.5 U	9.5 U	9.5 U	9.6 U	5.2 J	3.5 J	9.5 U	25
bis(2-Ethylhexyl)phthalate	UG/L	9.5 U	9.5 U	9.5 U	9.5 U	7.8 J	1.9 J	9.7 U	9.5 U	9.6 U
Carbazole	UG/L	9.5 U	34	9.5 U	22	9.6 U	1.2 J	14	9.5 U	9.6 U
Dibenzofuran	UG/L	9.5 U	9.5 U	9.5 U	9.5 U	1.2 J	9.6 U	9.7 U	9.5 U	9.6 U
Dimethylphthalate	UG/L	9.5 U	9.5 U	9.5 U	9.5 U	9.6 U	5.7 J	9.7 U	9.5 U	9.6 U
Di-n-octylphthalate	UG/L	14 U	14 U	14 U	14 U	3.2 J	14 U	15 U	14 U	14 U
Fluoranthene	UG/L	9.5 U	4.4 J	9.5 U	1.7 J	4.4 J	9.6 U	9.7 U	9.5 U	9.6 U
Fluorene	UG/L	9.5 U	9.5 U	9.5 U	9.5 U	1.8 J	9.6 U	1.8 J	9.5 U	9.6 U
Naphthalene	UG/L	9.5 U	7.1 J	9.5 U	2 J	9.6 U	9.6 U	2.5 J	9.5 U	9.6 U
Phenanthrene	UG/L	9.5 U	9.5 U	9.5 U	9.5 U	9.6 U	9.6 U	1.6 J	9.5 U	9.6 U
Phenol	UG/L	14 U	14 U	14 U	14 U	14 U	14 U	15 U	14 U	6.3 J
Pyrene	UG/L	9.5 U	3.1 J	9.5 U	9.5 U	2.6 J	9.6 U	9.7 U	9.5 U	9.6 U
Pesticide Organic Compounds										
gamma-Chlordane	UG/L	0.048 U	0.094 U	0.049 U	0.048 U	0.048 U	0.048 U	0.015 J	0.048 U	0.048 U
Heptachlor	UG/L	0.096 U	0.18 J	0.098 U	0.095 U	0.095 U	0.095 U	0.097 U	0.095 U	0.095 U
TCLP Pesticide Organic Compounds										
Heptachlor	UG/L	1.1 J	1.3 J	0.5 U	3.1 J	0.5 U	1.5 J	0.5 U	0.5 U	1.7 J
Metals										
Arsenic	UG/L	10 U	10 U	10 U	1.4 J	1.3 J	3.9 J	10 U	1.8 J	10 U
Cadmium	UG/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.18 J	0.5 U	0.5 U	0.5 U
Chromium	UG/L	10 U	29	10 U	6.3 J	10 U	10	7.6 J	10 U	530
Copper	UG/L	1.5 J	2.7 J	0.58 J	2.8 J	0.83 J	41	2.2 J	1.2 J	14
Lead	UG/L	3 U	0.17 J	3 U	0.74 J	0.24 J	4.8	3 U	3 U	0.27 J
Mercury	UG/L	0.18 U	0.064 J	0.18 U	0.18 U	0.18 U	0.06 J	0.18 U	0.18 U	0.065 J
Molybdenum	UG/L	12	14	16	4.5 J	4.1 J	5.7	12	11	100
Nickel	UG/L	2.6 J	1.3 J	1 J	2.1 J	0.84 J	7.2	1 J	0.74 J	1.6 J
Phosphorus, Total (as P)	UG/L	60 U	26 J	14 J	29 J	12 J	220	60 U	60 U	18 J
Selenium	UG/L	5 U	5 U	5 U	5 U	5 U	3.7 J	5 U	5 U	10
Silver	UG/L	0.22 J	0.22 J	0.11 J	0.77 J	0.67 J	0.52 J	2 U	2 U	0.21 J
Zinc	UG/L	24	12 U	36	12 U	12 U	36	12 U	12 U	12 U

Notes:

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

R - Data rejected.

Only detected results reported, except metals and radionuclides.

TABLE 44
AQUEOUS INVESTIGATIVION DERIVED WASTE ANALYTICAL RESULTS
(Page 2 of 2)

Location ID		IDW	IDW	IDW	IDW	IDW	IDW	IDW	IDW	IDW
Field Sample ID		425 TANK	FRAC TANK	MW949 WATER	TANK 1	TANK 2	TANK 3	TANK 6	TANK 7	TANK 8
Matrix		WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
Date Sampled		12/18/12	12/18/12	12/18/12	12/18/12	12/18/12	12/18/12	12/18/12	12/18/12	12/18/12
Parameter	Units									
TCLP Metals										
Barium	UG/L	34 J	28 J	43 J	19 J	20 J	31 J	26 J	12 J	190
Chromium	UG/L	25 U	32	25 U	25 U	25 U	25 U	9.3 J	25 U	610
Mercury	UG/L	0.2 J	0.17 J	0.22 J	1.5 U	1.5 U	0.12 J	0.23 J	0.17 J	0.16 J
Selenium	UG/L	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	8.3 J
RCRA Characteristics										
Corrosivity (as pH)	S.U.	7.21	8.61 J	8.85	8.04 J	7.56 J	7.66 J	7.45	8.84	11.3 J
Miscellaneous Parameters										
Oil & Grease (HEM)	MG/L	5 U	4.7 U	2 J	4.7 U	4.7 U	4.8 U	4.7 U	4.7 U	4.8 U
Total Organic Carbon (TOC)	MG/L	6.1	7.9	4.4	5.4	4.1	120	120	9.7	150
Total Suspended Solids	MG/L	4 U	4 U	4	10	4 U	120	4 U	4 U	6
Radionuclides (Alpha Spec)										
Thorium-228	PCI/L	0.0382 U	-0.00223 U	0.0681	0.0705 U	0.00822 U	0.0788 U	0.0321 U	0.0208 U	0.2 U
Radionuclides (Alpha Spec)										
Thorium-230	PCI/L	0.0688 J	0.00291 U	0.0843 J	0.0493 U	0.0247 U	0.118 U	0.0401 U	0.0114 U	0.017 U
Thorium-232	PCI/L	-0.00254 U	-0.00895 U	0.016 U	0.00324 U	0.00546 U	0.0646 U	-0.00266 U	-0.00232 U	0.00423 U
Uranium-234	PCI/L	384	0.508	0.324	0.814	2.59	1.79	18.5	49.9	0.00377 U
Uranium-235/236	PCI/L	16.8	0.0192 U	0.0486	0.0654	0.149	0.084	1.09	2.48	0.2 U
Uranium-238	PCI/L	386	0.479	0.341	0.684	2.46	1.69	17.9	49.7	0.2 U
Radionuclides (Gamma Spec)										
Actinium-227	PCI/L	-20.5 U	-8.47 U	2.54 U	-9.79 U	5.69 U	-3.21 U	4.45 U	-25.6 U	-5.31 U
Actinium-228	PCI/L	6.23 U	12.6 U	-0.939 U	16.3 U	13.1 U	6.2 U	14.4 U	-1.73 U	3.35 U
Bismuth-212	PCI/L	26.8 U	18.2 U	-20.3 U	13.6 U	9.7 U	-15.9 U	22.6 U	14.8 U	11.9 U
Bismuth-214	PCI/L	-6.34 U	-6.43 U	4.99 U	-5.46 U	-14.5 U	-4.56 U	-11 U	70.9	1.52 U
Cesium-137	PCI/L	-7.55 U	-0.583 U	2.11 U	-1.18 U	1.56 U	-4.05 U	1.96 U	-4.84 U	1.67 U
Lead-210	PCI/L	-25.3 U	32.5 U	38.3 U	108 U	-0.631 U	96.6 U	48.4 U	25.5 U	58.4 U
Lead-212	PCI/L	6.6 U	9.58 U	4.72 U	-5.58 U	1.89 U	-1.45 U	-0.545 U	4.27 U	-4.94 U
Lead-214	PCI/L	-7.92 U	-12.4 U	10.3 U	5.71 U	10.3 U	-2.76 U	-4.51 U	53.5	-15.2 U
Potassium-40	PCI/L	-168 U	-69.5 U	17 U	-95.9 U	-57.7 U	36.5 U	-38.6 U	-63.4 U	121 U
Protactinium-231	PCI/L	3 U	48.5 U	-28.5 U	13 U	28.5 U	23.5 U	41.1 U	3.23 U	-6.03 U
Radium-226	PCI/L	-6.34 U	-6.43 U	4.99 U	-5.46 U	-14.5 U	-4.56 U	-11 U	70.9	1.52 U
Radium-228	PCI/L	6.23 U	12.6 U	-0.939 U	16.3 U	13.1 U	6.2 U	14.4 U	-1.73 U	3.35 U
Thallium-208	PCI/L	-3.77 U	-5.14 U	-4.12 U	2.89 U	-8.66 U	1.49 U	-2.49 U	-0.956 U	3.63 U
Thorium-232	PCI/L	6.23 U	12.6 U	-0.939 U	16.3 U	13.1 U	6.2 U	14.4 U	-1.73 U	3.35 U
Thorium-234	PCI/L	302	74.3 U	55.5 U	19.4 U	247 U	155 U	-47.8 U	92 U	141 U
Uranium-235	PCI/L	35.3 U	24.3 U	25.6 U	3.76 U	28.8 U	2.41 U	21.4 U	10.5 U	-9.37 U
Uranium-238	PCI/L	302	74.3 U	55.5 U	19.4 U	247 U	155 U	-47.8 U	92 U	141 U

Notes:

U - Not detected above the reported quantitation limit.

J - The reported concentration is an estimated value.

R - Data rejected.

Only detected results reported, except metals and radionuclides.

TABLE 45
SOLID INVESTIGATIVION DERIVED WASTE ANALYTICAL RESULTS

Location ID		IDW	IDW	IDW	IDW	IDW	IDW	IDW	IDW
Field Sample ID		COOLER	MW944-945	MW946-949	MW950, 951,956-960	MW952-955	SHELBYS	WC-178	WEC 1-5
Matrix		SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
Date Sampled		12/19/12	12/19/12	12/19/12	12/19/12	12/19/12	12/19/12	12/19/12	12/19/12
Parameter	Units								
Volatile Organic Compounds									
1,2,4-Trimethylbenzene	UG/KG	15,000	5.9 U	6 U	6 U	6.3 U	5.8 U	2.8 J	6 U
1,3,5-Trimethylbenzene (Mesitylene)	UG/KG	2,900	5.9 U	6 U	6 U	6.3 U	5.8 U	0.83 J	6 U
4-Isopropyltoluene (p-Cymene)	UG/KG	1,500	5.9 U	6 U	6 U	6.3 U	5.8 U	0.32 J	6 U
Acetone	UG/KG	160	24 U	1,600	24 U	8.5 J	23 U	46	24 U
Carbon disulfide	UG/KG	28 U	5.9 U	6 U	1.7 J	6.3 U	5.8 U	5 U	6 U
Chloroform	UG/KG	6.8 J	5.9 U	6 U	6 U	6.3 U	5.8 U	5 U	6 U
Cyclohexane	UG/KG	7.1 J	12 U	12 U	12 U	13 U	12 U	1 J	0.51 J
Ethylbenzene	UG/KG	110	5.9 U	6 U	6 U	0.46 J	5.8 U	1.5 J	6 U
Methyl ethyl ketone (2-Butanone)	UG/KG	28 J	24 U	24 U	24 U	25 U	23 U	23	24 U
Methylcyclohexane	UG/KG	5 J	12 U	12 U	12 U	13 U	12 U	10 U	12 U
Methylene chloride	UG/KG	56 U	12 U	12 U	6 U	6.3 U	4 J	10 U	12 U
Naphthalene	UG/KG	11,000	5.9 U	6 U	6 U	6.3 U	5.8 U	5 U	6 U
n-Butylbenzene	UG/KG	3,400	5.9 U	6 U	6 U	6.3 U	5.8 U	5 U	6 U
n-Propylbenzene	UG/KG	1,400	5.9 U	6 U	6 U	6.3 U	5.8 U	0.4 J	6 U
sec-Butylbenzene	UG/KG	1,300	5.9 U	6 U	6 U	6.3 U	5.8 U	5 U	6 U
Styrene	UG/KG	12 J	5.9 U	6 U	6 U	6.3 U	5.8 U	5 U	6 U
Tetrachloroethene	UG/KG	16 J	0.76 J	6 U	6 U	6.3 U	5.8 U	0.77 J	0.5 J
Toluene	UG/KG	11 J	5.9 U	2.1 J	2.2 J	6.3 U	5.8 U	2.7 J	6 U
Xylene (total)	UG/KG	500	12 U	12 U	12 U	2.7 J	12 U	7.9 J	12 U
Semivolatile Organic Compounds									
1,1-Biphenyl	UG/KG	300 J	390 U	390 U	390 U	410 U	380 U	330 U	390 U
2,4,5-Trichlorophenol	UG/KG	34,000	390 U	390 U	390 U	410 U	380 U	330 U	390 U
2-Chloronaphthalene	UG/KG	1,700	390 U	390 U	390 U	410 U	380 U	330 U	390 U
2-Methylnaphthalene	UG/KG	3,700	390 U	390 U	390 U	410 U	380 U	330 U	390 U
Benzaldehyde	UG/KG	600	390 U	390 U	390 U	410 U	380 U	330 U	390 U
Benzo(a)pyrene	UG/KG	410	390 U	390 U	390 U	410 U	380 U	330 U	390 U
Benzo(b)fluoranthene	UG/KG	350 J	390 U	390 U	390 U	410 U	380 U	330 U	390 U
Benzo(g,h,i)perylene	UG/KG	840	390 U	390 U	390 U	410 U	380 U	330 U	390 U
Benzo(k)fluoranthene	UG/KG	94 J	390 U	390 U	390 U	410 U	380 U	330 U	390 U
bis(2-Ethylhexyl)phthalate	UG/KG	14,000	81 J	130 J	90 J	410 U	220 J	81 J	390 U
Chrysene	UG/KG	200 J	390 U	390 U	390 U	410 U	380 U	330 U	390 U
Di-n-butylphthalate	UG/KG	130 J	390 U	390 U	390 U	410 U	380 U	330 U	390 U
Fluoranthene	UG/KG	730	390 U	390 U	390 U	410 U	380 U	330 U	390 U
Fluorene	UG/KG	130 J	390 U	390 U	390 U	410 U	380 U	330 U	390 U
Indeno(1,2,3-cd)pyrene	UG/KG	540	390 U	390 U	390 U	410 U	380 U	330 U	390 U
Naphthalene	UG/KG	5,800	390 U	390 U	390 U	410 U	380 U	330 U	390 U
Phenanthrene	UG/KG	250 J	390 U	390 U	390 U	410 U	380 U	330 U	390 U
Pyrene	UG/KG	1,600	390 U	390 U	390 U	410 U	380 U	330 U	390 U
Pesticide Organic Compounds									
4,4'-DDE	UG/KG	50	1 J	2 U	2 U	2.1 U	2 U	1.7 U	2 U
4,4'-DDT	UG/KG	1.9 U	1.9	2 U	1.1 J	2.1 U	2 U	1.7 U	2 U
Endosulfan I	UG/KG	21	2 U	2 U	2 U	2.1 U	2 U	1.7 U	2 U
Endosulfan sulfate	UG/KG	73	2 U	2 U	2 U	2.1 U	2 U	1.7 U	2 U
Methoxychlor	UG/KG	87	3.9 U	4 U	3.9 U	4.1 U	3.8 U	3.4 U	3.8 U
Metals									
Uranium, Total	MG/KG	0.657	3.41	2.21	2.56	6.22	2.13	7.65	5.36
TCLP Metals									
Arsenic	UG/L	5 J	500 U	14 J	10 J	7.5 J	9.8 J	49 J	500 U
Barium	UG/L	1,700	930	590	540	530	1,400	130	590
Cadmium	UG/L	23	13 U	13 U	13 U	13 U	6 J	13 U	13 U
Chromium	UG/L	340	25 U	25 U	10 J	10 J	25 U	25 U	8 J
Lead	UG/L	1,500	250 U	16 J	15 J	5.8 J	17 J	13 J	5.3 J
Mercury	UG/L	0.45 J	R	1.5 U	R	1.5 U	1.5 U	R	1.5 U
Selenium	UG/L	14 J	500 U	20 J	16 J	10 J	23 J	500 U	11 J
Radionuclides (Alpha Spec)									
Thorium-228	PCI/G	0.223	0.9	0.896	0.961	0.922	0.842	19	0.932
Thorium-230	PCI/G	0.227	0.753	0.826	0.792	0.675	0.867	3.08	2.97
Thorium-232	PCI/G	0.185	0.882	0.837	0.865	0.833	0.913	18.6	0.813
Uranium-234	PCI/G	0.308	0.614	0.605	0.877	2.53	0.66	2.14	1.52
Uranium-235/236	PCI/G	0.0049 U	0.037	0.0233	0.0414 U	0.133	0.0258	0.084	0.0791
Uranium-238	PCI/G	0.336	0.578	0.667	0.764	2.44	0.567	2.07	1.44
Radionuclides (Gamma Spec)									
Actinium-227	PCI/G	0.0406 U	-0.0196 U	-0.54 U	0.184 U	0.209 U	0.109 U	-0.0597 U	-0.767 U
Cesium-137	PCI/G	-0.0202 U	0.0198 U	-0.0348 U	-0.00098 U	-0.0182 U	0.00779 U	-0.00012 U	0.169 U
Radium-226	PCI/G	0.278 J	1.05	1	0.961	1	0.816	1.3	2.7
Radium-228	PCI/G	0.114 U	1.09	1.37	0.907	0.77	1.39	15.4	0.731

Notes:
U - Not detected above the reported quantitation limit.
J - The reported concentration is an estimated value.
R - Data rejected.
Only detected results reported, except radionuclides.

TABLE 46

MONITORING WELL SOIL AND GROUNDWATER SAMPLE COMPARISON

Well	Total Depth (ft)	Sample Intervals (ft)	Gamma Down-hole (cpm)	GM Pancake (cpm)	Alpha (cpm)	Beta (cpm)	Rationale	Observations	Total Uranium (mg/kg)	Total Uranium (unfiltered phosphorimetry) (ug/l)
MW944	17	0.0-0.5	7596	48	4	172	Surface soil sample	Silty sand and gravel	2.14	NS
		2.0-2.5	13646	28	0	216	High gamma	Silty sand	3.00	
		10.0-11.0	11606	58	0	188	Midpoint of screen	Silty sand	1.89	
		13.0-13.5	12176	82	0	184	High GM	Silty clay	2.50	
MW945	20	0.0-0.5	7518	40	0	207	Surface soil sample	Topsoil	2.35	NS
		3.5-4.0	12940	48	4	206	High gamma	Silty clay	3.20	
		9.5-10.0	11800	64	0	206	Midpoint of screen	Clayey silt	2.11	
		12.5-13.0	9736	62	0	176	2nd high GM	Silty clay - clayey silt	2.05	
MW946	15	0.0-0.5	7072	44	4	170	Surface soil sample	Topsoil	2.44	NS
		6.0-6.5	12354	76	2	254	High gamma	Silty clay	2.64	
		8.0-8.5	11234	56	2	230	Midpoint of screen	Clayey silt - silty clay	1.83	
		12.0-12.5	12664	36	6	274	High alpha	Gray clay	2.56	
MW947	20	0.0-0.5	8092	62	2	206	Surface soil sample	Topsoil	2.65	NS
		2.0-2.5	12060	74	4	244	High GM	Silty clay	2.79	
		14.0-14.5	8898	24	0	200	Midpoint of screen	Silty sand	1.80	
		18.0-18.5	13140	42	2	248	High gamma	Gray silty clay	3.01	
MW948	15	0.0-0.5	8384	34	0	192	Surface soil sample	Topsoil	2.70	NS
		5.5-6.0	12666	44	0	244	High gamma	Silty clay	2.55	
		10.0-10.5	12542	58	0	224	Midpoint of screen	Silty clay	2.52	
		13.0-13.5	12356	78	0	204	High GM	Silty clay	2.27	
MW949	40	0.0-0.5	9188	46	0	188	Surface soil sample	Topsoil	2.62	0.363J
		16.0-16.5	11556	86	4	258	High GM	Silty sand	2.56	
		29.5-30.0	12626	62	0	244	High gamma	Silty clay	2.95	
		34.5-35.0	10320	54	2	238	Midpoint of screen	Silty sand	2.55	
MW950	20	0.0-0.5	6778	60	0	198	Surface soil sample	Topsoil	4.21	29.4
		2.0-2.5	14266	58	8	252	High gamma	Clayey silt - silty clay	2.57	
		10.5-11.0	12508	80	4	248	High GM	Clayey silt - silty clay	2.02	
		15.0-15.5	12682	66	2	256	Midpoint of screen	Silty clay	2.55	
MW951	20	0.0-0.5	9554	58	2	220	Surface soil sample	Topsoil	4.21	2,090
		15.0-15.5	12030	70	0	228	Midpoint of screen	Clayey silt	2.57	
		17.5-18.0	12636	54	0	240	High gamma	Gray clay	2.02	
		18.5-19.0	12378	98	2	234	Hi GM	Gray clay	2.18	
MW952	10	0.0-0.5	9950	62	0	294	Surface soil sample	Topsoil	15.9	286
		4.0-4.5	12324	72	4	254	Second highest GM	Clayey silt - silty clay	3.99	
		6.0-6.5	13112	60	4	202	High gamma	Clayey silt - silty clay	3.08	
		6.5-7.0	12964	72	6	260	Midpoint of screen	Clayey silt - silty clay	2.60	
MW953	10	0.0-0.5	10842	90	0	286	Surface soil sample	Topsoil	18.5	1,970
		1.0-2.0	15516	68	4	342	High gamma	Silty clay	45.3	
		4.0-4.5	14046	90	8	354	High GM	Silty clay	54.4	
		6.0-6.5	13292	74	2	312	Midpoint of screen	Silt and sand	31.4	

TABLE 46

MONITORING WELL SOIL AND GROUNDWATER SAMPLE COMPARISON

Well	Total Depth (ft)	Sample Intervals (ft)	Gamma Down-hole (cpm)	GM Pancake (cpm)	Alpha (cpm)	Beta (cpm)	Rationale	Observations	Total Uranium (mg/kg)	Total Uranium (unfiltered phosphorimetry) (ug/l)
MW954	10	0.0-0.5	10182	62	2	196	Surface soil sample	Topsoil	12.2	218
		2.0-2.5	13354	64	4	342	High gamma	Silty clay	17.4	
		5.5-6.0	13018	88	2	262	High GM	Silty clay	4.95	
		8.5-9.0	11340	56	0	200	Midpoint of screen	Silty clay	2.13	
MW955	15	0.0-0.5	9874	54	0	370	Surface soil sample	Topsoil	51.4	24.7
		0.5-1.0	11820	102	4	360	High GM	Silty clay	53.5	
		2.5-3.0	13408	82	2	304	High gamma	Silty clay	23.1	
		7.0-8.0	9306	62	4	216	Midpoint of screen	Silty sand	1.64	
MW956	20	0.0-0.5	10978	46	0	190	Surface soil sample	Topsoil	2.98	27
		2.0-3.0	13770	42	2	222	High gamma	Silty clay	2.52	
		15.5-16.0	10336	58	12	222	High alpha	Silty sand	5.01 J	
		16.5-17	11228	60	2	228	Midpoint of screen	Silty sand	2.31	
MW957	15	0.0-0.5	9554	48	0	246	Surface soil sample	Topsoil	2.79	2,100
		2.0-2.5	13756	64	2	240	High gamma	Silty clay - clayey silt	3.12	
		4.0-4.5	13594	102	4	366	High GM	Silty clay - clayey silt	30.6	
		7.0-7.5	9494	62	4	242	Midpoint of screen	Silty sand	4.66	
MW958	10	0.0-0.5	10020	62	0	280	Surface soil sample	Topsoil	3.07	33.2
		4.5-5.0	11652	82	6	286	High GM	Silty clay	4.77	
		7.5-8.0	14208	60	4	266	Midpoint of screen	Silty clay	3.31	
		8.5-9.0	14184	52	8	322	2nd highest gamma	Gray silty clay	3.20	
MW959	15	0.0-0.5	9824	50	0	246	Surface soil sample	Topsoil	2.26	41.7
		8.0-8.5	13774	76	2	298	High gamma	Silty clay - clayey silt	3.53	
		13.0-13.5	11554	46	2	240	Midpoint of screen	Silty sand	4.33	
		14.0-14.5	11536	88	2	198	High GM	Gray silty clay	2.61	
MW960	15	0.0-0.5	5210	70	2	214	Surface soil sample	Topsoil	2.97	1,010
		2.0-3.0	14442	80	4	324	High gamma	Clayey silt	29.1	
		9.5-10.0	11084	62	16	200	Midpoint of screen	Silty sand	2.86	
		12.0-12.5	12402	76	6	264	Second highest GM	Gray clay	2.51	

Notes:

- Highest downhole gamma reading in borehole
- Highest GM pancake reading on core sample
- Highest alpha reading on core sample
- Highest beta reading on core sample
- Elevated total uranium concentration
- Exceeds groundwater criteria of 30 ug/l

TABLE 47

Investigative Excavation Soil and Groundwater Comparison

Excavation ID	Observations	Pipelines Found	Samples				
			Soil Sample Location	Maximum Gamma Scan Reading (cpm)	Total Uranium in Soil (mg/kg)	Total Uranium in Groundwater (ug/l)	Groundwater Sample Location
IE1	Excavation along north side of grit chamber, west- central portion of EU11. Subsurface soils consisted of FILL composed of a thin layer of surficial loamy clay underlain by red silty clay with trace to some angular to subangular F-C sand and gravel, underlain by a buried brown topsoil layer and then brown and reddish brown silty clay (CL). Some groundwater seepage occurred from 3 sandy lenses in the west excavation wall from 6.0'-7.5' bgs.	None	Surface soil	16,504	2.74 J	NA	None. Trench collapsed before sample could be collected
			West wall 3.0'-3.5' bgs at interface between red fill and underlying former topsoil layer		4.75		
			West wall 6.0'-7.5' bgs from 3 wet sandy lenses		2.23		
			West end bottom at 9.5'-10' bgs		2.37		
IE2	Excavation along east side of grit chamber, west-central portion of EU11. Subsurface soils consisted of FILL composed of a thin layer of surficial loamy clay underlain by red silty clay with trace to some angular to subangular F-C sand and gravel, underlain by a buried brown topsoil layer and then brown and reddish brown silty clay (CL). An east-west oriented 7.5" OD cast iron pipe was uncovered in the southern portion of the excavation at ~ 3.5' bgs. Gray angular sandy bedding around that pipe produced water.	7.5" OD Cast Iron	Surface soil	17,684	3.00	26.4	From pipe bedding seepage
			North wall 3.5'-4.0' bgs at interface between red fill and underlying former topsoil layer		2.56		
			Bedding material beneath north side of pipe		1.63		
			North end bottom at 9.0'-9.5' bgs		2.76		
IE3	Excavation along south side of grit chamber, west- central portion of EU11. Subsurface soils consisted of FILL composed of a thin layer of surficial loamy clay underlain by red silty clay with trace to some angular to subangular F-C sand and gravel, underlain by a buried brown topsoil layer and then brown and reddish brown silty clay (CL). Some small groundwater seeps were observed at bottom of excavation.	None	Surface soil	17,430	2.38	19.4	Bottom of west side at 8.8'-9.5' bgs
			East wall 3.2'-3.6' bgs at interface between red fill and underlying former topsoil layer		3.82		
			Northwest corner 3.2'-3.6' bgs at interface between red fill and underlying former topsoil layer (2nd highest rad. reading)		4.55		
			East end bottom at 10.2'-10.6' bgs		2.34		
IE4	Excavation along west side of grit chamber, west-central portion of EU11. Subsurface soils consisted of FILL composed of a thin layer of surficial loamy clay underlain by red silty clay with trace to some angular to subangular F-C sand and gravel, underlain by a buried brown topsoil layer and then brown and reddish brown silty clay (CL). A crushed metal drum was found at 2' bgs (no rad. or PID readings over background). An E-W oriented 6" OD cast iron pipe was uncovered at the northern end of the excavation at ~ 2.7' bgs. Gray angular sandy bedding around pipe that produced water.	6" OD Cast Iron	Surface soil	17,316	1.24	44.2	From pipe bedding seepage
			South wall 2.8'-3.2' bgs at interface between red fill and underlying former topsoil layer		1.54		
			Bedding material beneath south side of pipe at 2.7' bgs.		3.97		
			North end bottom at 10.0'-10.5' bgs		2.77		
IE5	Excavation along northwest corner of former decon pad, west-central portion of EU 11. Subsurface soils consisted of FILL composed of a thin layer of surficial loamy clay underlain by red silty clay with trace to some angular to subangular F-C sand and gravel, underlain by a buried brown topsoil layer and then brown and reddish brown silty clay (CL). A northwest-southeast oriented cast iron pipe was uncovered at the southern end of the excavation at ~ 2' bgs. Gray angular sandy bedding around pipe that produced water.	7.5" OD Cast Iron	Surface soil	19,262	3.11	11.8	From pipe bedding seepage
			Northwest corner at 2.0'-2.4' bgs at interface between red fill and underlying former topsoil layer		3.05		
			Bedding material beneath south side of pipe		1.18		
			Center bottom at 11.0'-11.5' bgs		1.62		

TABLE 46
INVESTIGATIVE EXCAVATION OBSERVATIONS

TABLE 47

Investigative Excavation Soil and Groundwater Comparison

Excavation ID	Observations	Pipelines Found	Samples				
			Soil Sample Location	Maximum Gamma Scan Reading (cpm)	Total Uranium in Soil (mg/kg)	Total Uranium in Groundwater (ug/l)	Groundwater Sample Location
IE6	Excavation near southwest corner of former decon pad, west-central portion of EU 11. Subsurface soils consisted of FILL composed of #3 crusher run and loamy clay underlain by red silty clay with trace to some angular to subangular F-C sand and gravel, underlain by a buried brown topsoil layer and then brown and reddish brown silty clay (CL) and brownish to pinkish gray silty clay (CH).	None	Surface soil	17,140	3.01	50.7	Bottom of excavation (mainly from seepage at 0.0-2.0' bgs)
			Northeast corner at 2.5'-3.0' bgs from black silt lens		25.4		
			Northeast corner at 6.0'-8.0' bgs reddish brown silty clay (2nd highest rad. reading)		2.76		
			Bottom at 11.5'-12.0' bgs brownish to pinkish gray silty clay (high rad. reading)		3.23		
IE7	East-northeast of well OW11B, near water and sanitary sewer lines, west-central portion of EU 11. Subsurface soils consisted of FILL composed of a thin layer of surficial loamy clay underlain by red silty clay with trace to some angular to subangular F-C sand and gravel, underlain by brown silty clay (CL) and brownish to pinkish gray silty clay (CH). 9", 15", and 36" OD cast iron pipes were located between ~3'-4.5' bgs and a concrete encased sewer line was encountered at a depth of 8' bgs running beneath the three pipelines. A small amount of groundwater seeped into the excavation between the 9" and 15" OD pipes and along the top of the sewer concrete encasement.	9" OD, 15" OD and 36" OD Cast Iron and a Concrete-Encased Sewer Line	Surface soil	17,986	6.15	7,080	From seepage into a sump dug between 9" OD and 15" OD pipes
			At 4.5'-5.0' bgs beneath bell in 36" OD pipe		45.6		
			Westernmost corner just above concrete encased sewer line at 7.5'-8.0' bgs		8.67		
			Beneath sanitary sewer concrete encasement at 9.0'-9.5' bgs		32.2		
IE8	Southeast of well OW11B near sanitary sewer line, west-central portion of EU 11. Subsurface soils consisted of FILL composed of a thin layer of surficial loamy clay underlain by brown to reddish brown silty clay (CL). A concrete encased sewer line was encountered at 7' bgs. Groundwater seeped into IE8 along the top of the sewer concrete encasement. The water level in nearby manhole MH06 appeared to drop as water was seeping into the excavation indicating likely hydraulic connection.	concrete encased sewer line	Surface soil	18,036	11.8	1,870	Seepage from top of concrete encased sewer line
			West wall of IE-8 near northwest corner		45.9		
			Above concrete encased sewer line at NW end of IE8 from 7.5'-8.0' bgs		12.6		
			Beneath sanitary sewer concrete encasement at 8.0'-9.0' bgs		6.05		

Notes:
1 - Surface soil samples were collected from the locations of the highest gamma radiation reading recorded during pre-work walkover survey.
2 - Sidewall soil samples were collected from the locations of the highest radiation reading recorded in the excavation unless otherwise noted.
3 - Values are the maximum reading recorded in the excavation using an NaI detector.
Elevated uranium concentration, but does not exceed criterion.
Uranium concentration exceeds groundwater criterion.

TABLE 46
INVESTIGATIVE EXCAVATION OBSERVATIONS