Verona Research Facility
Germany Road
Verona, New York

Remedial Investigation and Feasibility Study

Work Plan

Prepared for:

Air Force Research Laboratory
Rome Research Site

150 Electronic Parkway
Rome, New York 13441

September 2013

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Prepared By:

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ENVIRONMENTAL • TRANSPORTATION • CIVIL

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September 2013

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1.0 Introduction

Lu Engineers has prepared this Remedial Investigation/Feasibility Study (RI/FS) Work Plan on behalf of the Air Force Research Laboratory (AFRL), Rome Research Site (RRS), Civil Engineering Branch, Environmental and Occupational Health Office (RIOC) for approval by the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER). This plan has been prepared in substantial accordance with DER-10 "Technical Guidance for Site Investigation and Remediation," and Interim Final guidance for conducting Remedial Investigations and Feasibility Study (October 1988-Office of Solid Waste and Emergency Response (OSWER) Directive No. 9355.3-01).

The RI/FS efforts described in this plan represent a full delineation of remedial concerns that were presented in the August 2013 Environmental Baseline Survey (EBS) Report completed for RRS-owned property at the Verona Research Facility (VRF). The location of the VRF is indicated on Figure 1, Site Location Map. The EBS report has identified nine areas of concern (AOC) requiring additional remedial investigation:

VRF-AOC-01- Sanitary Sewer System
VRF-AOC-02- Primary Power System
VRF-AOC-03- Former Petroleum Storage
VRF-AOC-04- Former Solvent Disposal
VRF-AOC-05- Former PCB-Containing Equipment
VRF-AOC-07- Waste Disposal Area (WDA)-03 Former Landfill
VRF-AOC-08- B1233 Investigation and Cleanup
VRF-AOC-09- Site-wide Groundwater Contamination
VRF-AOC-10- Site-wide Soil contamination

The location of each AOC is indicated on the Site Plan (Figure 2). Other AOCs identified in the August 2013 EBS Report (AOC-06 Former Ozone Depleting Compound-Containing Equipment and AOC-07 Waste Disposal Areas 1 and 2) do not require additional investigation and, therefore, are not included in this work plan.

The purpose of planned RI/FS activities is to delineate and characterize these AOCs and provide sufficient information to adequately evaluate remedial alternatives, if necessary. Planned RI efforts will generally include: geophysical survey, test pit excavations, soil borings, monitoring well installations, and soil and groundwater sampling to further characterize the Site.

Implementation of the work described in this RI/FS Work Plan will result in greater understanding of environmental impacts to surface and subsurface soil, underground utilities and groundwater associated with the historic use of the Site. The findings of the RI will assist in determination of appropriate remedial measures to address the identified environmental impacts. Completion of a Feasibility Study (FS) is also included as part of the Scope of Work presented in this work plan.

2.0 Background Information and Previous Investigations

2.1 Site Description and Setting

The VRF is located at 5586 Germany Road, Verona, New York. The location of the VRF is indicated on the Site Location Map (Figure 1). The Site Plan (Figure 2) provides detail on the site layout as well as the location of relevant utilities and features. Approximately 494.3 acres are located within the VRF. It should be noted that the VRF was originally 512.5 acres and approximately 18.195 acres of the former Space Command Complex has been occupied by the Oneida Indian Nation since 2009. The Space Command Complex is located on the eastern central portion of the VRF and is not included as part of this RI/FS.

The VRF is one of three remote facilities of RRS, associated with the former Griffiss Air Force Base (GAFB), located just east of Rome, New York. The VRF is located 15 miles southwest of the former GAFB (currently utilized as the Griffiss Business and Technology Park (GBTP)), on Germany Road in the Town of Verona, New York, in western Oneida County.

Developed portions of the property are oriented in a northwest-southeast configuration parallel to and bounded by Germany Road. The Site is also bounded by residential and agricultural properties to the northeast, east, and southeast. Route 31 and residential and agricultural properties are located to the south to the Site. Open land is located to the north and west of the Site. Brandy Brook flows through the southern portion of the Site. All surrounding properties, with the exception of the Space Command Complex and roadways, are privately owned.

2.2 Site History

The VRF, initially known as the Verona Test Annex, was purchased from three individual owners and six joint ownerships between 1949 and 1970 (nine parcels totaling 512.5 acres) by the Rome Air Development Center (RADC) (later renamed Rome Laboratory and currently is known as RRS) for use as an auxiliary research facility to GAFB, located in Rome, NY. The current property owner is the United States Air Force (USAF).

Prior to the construction of the VRF, the land was primarily farmland, undeveloped woods, and grassland. Two farmhouses are known to have existed at the Site. One was located in the grassy field southeast of the Site entrance road and the other was in the wooded area northwest of the Space Command Complex. In addition, two other structures were also located at the Site, in the vicinity of B1253 and B1261. The remains of these two structures and the farmhouse northwest of the Space Command Complex were observed during the previous inspections.

The majority of development of the VRF occurred between 1951 and 1953. The facility was fully operational from 1954 until 1987 and was used to conduct a broad range of electromagnetic research, experimentation, measurements, and capability evaluations. Hazardous materials were often utilized in past reliability research.

From 1987 to 2000, operations at the Site were minimal. However, in 1990 and 1991, the Space Command Complex that contains approximately 18.2 acres of land, was constructed on the eastern central portion of the facility and is currently occupied by the Oneida Indian Nation and owned by the Federal Government. Operations at the VRF ceased in October 2000. The USAF does not own the Former Space Command property.

2.3 Previous Site Assessments and Investigations

Lu Engineers has relied upon a large number of reports and data provided by RRS Civil Engineering Branch, Environmental and Occupational Health Office (RIOCV). It is apparent that environmental sampling, assessment and investigation efforts at the VRF have been conducted by Parsons Engineering Services (Parsons), Sterns and Wheler, LLC, and Lu Engineers (and various subcontractors) as well as RRS itself. Previous environmental work includes, but is not limited to the following:

- Sampling and Analysis Report for Underground Storage Tanks (USTs) at Off-Base Test Annexes by Engineering-Science (ES) in March 1994;
- Base Closure Environmental Assistance Team (BCEAT) Final Report for Griffiss Air Force Base, NY by the USAF in September 1994;
- Phase I PCB Survey conducted in December 1994 by Sterns and Wheler;
- Investigation and Pilot Test completed in September 1995 by Parsons;
- Wetland Study in October 1995 by Geo-Marine, Inc. Engineering;
- Phase I Asbestos Survey in September 1996 by Lu Engineers;
- Phase II PCB Study conducted in December 1996 by Sterns and Wheler;
- PCB sampling at B1239 in 1996 by Lu Engineers;
- Sanitary Sewer Inspection VRF in December 1996 by Sterns and Wheler;
- Review of Verona Test Annex Data from Investigation and Pilot Test conducted in 1996 by Sterns and Wheler;
- Preliminary Site Assessment (PSA) completed in January 1997 by Sterns and Wheler;
- Wetland Delineation in July 1997 by Lu Engineers;
- Phase I Soil Sampling in October 1997 by Sterns and Wheler;
- Phase II PSA completed in December 1997 by Sterns and Wheler;

- Phase I EBS completed in January 1998 by Sterns and Wheler;
- PSA 3rd round of sampling completed in June 1998 by Sterns and Wheler;
- Remedial Construction Documentation Report in August 1998 by Sterns and Wheler;
- Freon Removal from Air Conditioning Units in April 2000;
- UST Removal Program in April-May 2000 by the NYSDEC;
- Asbestos Abatement conducted in 2000;
- Semi-Annual Monitoring Analytical Summary Report completed in January 2001 by Sterns and Wheler;
- Operations, Monitoring and Maintenance (OM&M) Plan in October 2001 by Sterns and Wheler for the Monitored Natural Attenuation (MNA) Program;
- Updated CEBS completed in December 2001 by Sterns and Wheler;
- Natural Attenuation and Monitoring and Bio-remediation ongoing from 2002 to the present. Quarterly reports have been prepared by Lu Engineers;
- Subsurface Characterization Using a Heated Trunkline Membrane Interface Probe (MIP) in 2012 by S2C2, Incorporated contracted by Lu Engineers as part of the 2013 EBS; and
- EBS completed in April 2013 (August 2013 Final) by Lu Engineers.

Additional documents that were found in prior EBS reports include the following:

- NYSDEC Spill Closure Notification for B1225 and B1253 in February 2001.

Previous investigation findings are presented in the August 2013 EBS by Lu Engineers, submitted to NYSDEC. Refer to the EBS report for a full summary of environmental concerns identified, remedial actions completed, and investigation findings to date.

The August 2013 EBS has identified nine AOCs at the VRF requiring additional investigation and remedial effort to define and mitigate soil and groundwater exceedances to allow Unrestricted Use of the property for future owners and/or users. These nine AOCs will be the focus of this RI/FS and are summarized below.

2.3.1 VRF-AOC-01: Sanitary Sewer System

2.3.1.1 Background

Each former laboratory building on the Site was served by a sanitary sewer system that directed waste water into one of 15 septic tanks, which drained by one of two gravity and lift pumping stations into a raised bed sand filter system prior to discharge into Brandy Brook. Location of the raised bed filter system is shown on Figure 4. The septic system discharge was monitored on a quarterly basis by the NYSDEC for organic contaminants and total flow during operation.

The sanitary system also received wastewater from the former Space Command Complex located immediately to the east, which is no longer owned by the USAF. This system also includes a total of approximately 6,900 linear feet of sewer lines that, along with the remaining septic tanks and at least 21 sewer manholes, are completely inundated.

At least three of the septic tanks that remain on the VRF property, have been found to contain elevated concentrations of solvents and/or metals during investigations conducted to date.

2.3.1.2Previous Sampling and Testing

Septic Tanks

On September 12, 2012, one water sample (B1250-W01) was collected from the 4,350-gallon capacity septic tank located at B1250 for VOC analysis. Sample location shown on Figure 5. This sample was found to contain acetone, benzene, chlorobenzene and 1,4-dichlorobenzene at levels exceeding NYSDEC groundwater standards. It is also noted that oil was observed on the surface of this septic tank that requires removal to prevent release into the environment. The oil was also sampled and tested for PCBs (B1250-PCB-01) and found to contain 10 mg per liter of Aroclor 1250.

A detailed inspection of the sewer system was completed on November 9, 2012. Samples were collected from several locations including:

- Manhole #3 (MH-3, Figure 6)
- B1231 septic tank (B1231-SPT-01, Figure 4)
- B1285 septic tank (B1285-SPT-01, Figure 7)
- B1241 sewer wet well (B1241-SPT-01, Figure 4)

Sludge and water were sampled from each location with the exception of B1241 where the depth of the wet well prevented access to any bottom sludge that may have been present. All samples were analyzed for VOCs and RCRA Metals. Water samples were non-detect except for MH-3, which exceeded the NYSDEC standard for dichlorodifluoromethane (Freon). Sludge from MH-3 also exceeded Unrestricted Use Criteria SCOs for PCBs, arsenic, and chromium.

Septic tank sludge at B1231 and B1285 was found to exceed Unrestricted Use SCOs for several RCRA Metals and acetone (see Figures 4 and 7). Sludge sample B1285-SPT-01 also exceeded Unrestricted Use SCOs for chlorobenzene, 2-butanone, and benzene. It is noted that chlorobenzene is also found in soil and groundwater in the area of B1231 and Wheler. However, no such subsurface contamination has been documented with respect to B1285.

<u>Raised Bed Sand Filter System</u>
On September 14, 2012 soil borings B1243-S13 and B1243-S14 were advanced through the filter bed material and soils were sampled for VOCs and RCRA metals. Sampling locations are shown on Figure 4.

Soil sample B1243-S13 was found to contain levels of acetone and 2-butanone exceeding the Unrestricted Use SCOs. A groundwater sample (B1243-W05) obtained from a mini-well installed into boring B1243-S14 yielded no detectable VOCs.

On January 17, 2013 one test pit (TP-12) was excavated to a depth of approximately 10 feet in the center of the filter bed to obtain a representative sample of the material present. Analytical results did not indicate the presence of elevated levels of SVOCS, RCRA Metals, Pesticides or PCBs. However, acetone was observed in this sample exceeding the Unrestricted Use Criteria SCO.

2.3.2 VRF-AOC-02: Primary Power System

2.3.2.1 Background

Primary electrical power was delivered to and between buildings at the VRF with a system of conduits and interconnected manholes. This system includes a total of approximately 9,000 feet of 4-inch diameter electrical conduit and 29 manholes. The main conduit line runs parallel to the access road, east of the sanitary sewer line (see Figures 3-7). All components of this system are inundated and mineral oils have been detected in some of the vaults in the system during EBS inspections conducted since September 2012.

Oil has been observed in certain vaults including, but not limited to those adjacent to B1233, B1239, B1247, B1255, B1263 and B1287. It is inferred that oil entered the primary power system through conduits connecting the vaults to building interiors housing electrical equipment. Vandalism apparently caused the release of oils from various electrical equipment into the conduits, resulting in the presence of oil in the electrical vaults.

PCB abatement was completed at the VRF in the 1990s to remove transformer fluids with PCB concentrations exceeding 50 ppm. Transformers were re-filled with non-PCB mineral oil. Therefore, it is inferred that the oil present in underground electrical vaults is mineral oil containing no PCBs or non-hazardous low-level PCBs.

It is noted that RRS removed oil from the last remaining oil-filled equipment at the Site on November 26, 2012; therefore, additional release of oils into the Primary Power System is not anticipated.

2.3.2.2 Previous Sampling and Testing

Transformer oil (i.e., mineral oil) from B1226 and B1255 was analyzed for VOCs and metals during the recent EBS work. No VOCs or metals were detected in the oil samples (see Tables 1 and 2). The oil has not been analyzed for SVOCs.

The following oil samples were collected from electrical manholes for PCB analysis:

- B1235-PCB-01 (Figure 4);
- B1239-PCB-02 (Figure 4);
- B1247-PCB-02 (Figure 4);
- B1255-PCB-02 (Figure 5);
- B1261-PCB-01 (Figure 5);
- B1263-PCB-02 (Figure 5);
- B1266-PCB-02 (Figure 6);
- B1279-PCB-02 (Figure 7); and
- B1287-PCB-04 (Figure 7).

No PCBs were detected in the oil samples, except for sample B1287-PCB-04 (1.5 ppm) located on the far north end of the main conduit (see Figure 7). Based on these results, the oil present within the underground power system is considered to be non-hazardous.

A water sample was collected from an electrical vault near B1261 (B1261-PCB-01, Figure 5) and found to contain acetone at a concentration exceeding applicable NYSDEC groundwater criteria.

2.3.3 VRF-AOC-03: Former Petroleum Storage

2.3.3.1 Background

A detailed discussion of the past storage of petroleum on the VRF Site was included in the August 2013 EBS Report. The following provides an abbreviated background discussion of past petroleum storage at the Site.

A total of twenty-six (26) petroleum storage tanks have been documented relative to the VRF Site, including eighteen (18) USTs and eight (8) aboveground storage tanks (ASTs) removed between 1988 and 2000. The tanks were generally used to store fuel for boilers and generators located at various buildings within VRF. Former tank locations are shown on Figures 3 through 7.

Documentation reviewed during the EBS generally indicates that all of the former USTs and ASTs were properly removed and affected soils were remediated during the tank closure process. However, several inconsistencies in the records including, but not limited to the NYSDEC Spill records for the tank removal at B1245, suggest that petroleum was observed draining from beneath the adjacent building slab. This condition was reportedly not addressed at that time and indicated the possibility of significant contamination remaining at B1245 and elsewhere.

2.3.3.2 Previous Sampling and Testing

The unclear environmental status of the former tank locations warranted further investigation for the EBS. On January 17, 2013 test pits were excavated at B1245 (TP-11, Figure 4) and B1253 (TP-10, Figure 5) where former tanks had been documented. Detectable levels of various Tentatively Identified Compounds (TICs) were observed in the VOC analytical results, but no regulatory exceedances were noted, likely due to the age of the petroleum. Groundwater samples obtained from each test pit were analyzed for VOCs only and not found to contain elevated VOC concentrations.

Analysis of soils for Total Petroleum Hydrocarbons (TPH) by New York State Department of Health (NYSDOH) Method 310-13 indicated the presence of elevated concentrations of diesel fuel constituents in soils at both B1245 and B1253 and elevated concentrations of lubricating oil constituents at B1253. Lab results for TP-11 at B1245 showed medium weight petroleum hydrocarbons identified as diesel fuel were detected at 690 ppm in soil at a depth of 1.5 feet. TP-10 at B1253 showed heavy weight petroleum hydrocarbons identified as lube oil detected at 1,100 ppm and medium weight diesel hydrocarbons at 370 ppm at 2 feet below grade.

Groundwater samples could not be analyzed for TPH, but free-phase petroleum was noted at both locations during sampling.

The data reviewed to date suggest that petroleum and petroleum constituent concentrations exceeding applicable criteria may remain at each of the known former petroleum storage tank locations at the VRF. Limited investigation of this AOC has been completed to date.

2.3.4 VRF-AOC-04: Former Solvent Disposal

2.3.4.1 Background

Documentation, including the 2001 CEBS report, indicates that "… prior to (1988), hazardous wastes were reportedly disposed of with solid wastes, outside Site buildings, or in building sinks or drains." This finding required that the issue of improper solvent disposal be designated as an AOC. Personnel with first-hand knowledge of past Site activities are not available for interviews.

Two areas of solvent-impacted groundwater were identified during previous UST removal work: B1233 and B1253. Groundwater concentrations in these two areas have been monitored since May 2002 under a long-term monitored natural attenuation (MNA) program. Injections were performed between 2007 and 2011 to enhance the natural attenuation process. Solvent-impacted soil and groundwater identified at B1233 has been thoroughly investigated and a conceptual remedial plan has been developed (see Section 2.3.7).

The potential for solvent impacted soil and/or groundwater has not been investigated at buildings other than B1233 and B1253. It was recommended that the remaining buildings be investigated for impacts of improper solvent disposal.

2.3.4.2 Previous Sampling and Testing

Groundwater monitoring at B1253 has been conducted quarterly by Lu Engineers since 2006, and no solvents have been detected during the last two sampling events. Contaminants of concern for the B1253 MNA program include: vinyl choride, perchloroethylene (PCE), trichloroethene (TCE), and dichloroethenes. In addition to these solvents, at B1233, elevated levels of chlorobenzene were found in soil and groundwater. Soil and groundwater samples collected at B1231/B1233 are discussed in Section 2.3.7.

2.3.5 VRF-AOC-05: Former PCB-Containing Equipment

2.3.5.1 Background

The VRF Site has a well-documented history of PCB-containing equipment. As stated in Section 2.3.2, transformers with oil containing PCB at 50 ppm or greater were previously drained and removed or re-filled with non-PCB mineral oil. Evidence of oil spillage is present in several areas of the Site including the interior of at least 15 of the 27 buildings located on the property. Sampling and testing was conducted as part of the 1997 PSA, EBS work completed in 1998 and 2001 and the 2013 EBS.

The majority of the buildings on the Site are oriented in similar pairs with one being an office/lab and the other a former "powerhouse" containing electrical equipment. It is noted that each of the "powerhouse" buildings housed at least one diesel generator in the past. No generators remain on the Site at the present time.

Paired buildings at the VRF include the following (listed with the larger (lab) building first):

- B1225 and B1227
- B1231 and B1233
- B1245 and B1247
- B1253 and B1255
- B1261 and B1263
- B1269 and B1271
- B1277 and B1279
- B1285 and B1287
- B1250 (Headquarters, no powerhouse associated)

2.3.5.2 Previous Sampling and Testing

In accordance with NYSDEC and RRS requirements, at least two samples were collected from the building interiors and at least one sample was collected from the exterior of each building to evaluate impacts from potential historical PCB-containing oil discharges. The interior of each Site building and related structures, including electrical transformers, and associated equipment, were evaluated for potential environmental impacts. Since the majority of the electrical equipment remaining at the Site is located in or adjacent to the smaller of the paired buildings identified above, these buildings were the focus of the majority of the oil, sludge and concrete chip sampling conducted to date. Concrete flooring and equipment exhibiting oil-like staining and residual oil/grease were the primary areas targeted for sampling and analysis. Exterior locations where transformers and other oil-filled equipment were located in the past were also sampled.

A detailed description of building interior conditions observed during the initial inspection was provided in the August 2013 EBS Report. PCB samples were collected in areas of known contamination and former transformer locations. No evidence of PCB spillage or contamination was noted in the following buildings: B1225, B1226, B1231, B1253, B1261, B1269, B1277 and B1285.

Of the PCB samples collected, only two (2) contained PCBs at levels exceeding the hazardous waste characterization threshold (50 ppm), as shown on Table 4. The two locations characterized as hazardous waste are:

- sample B1233-PCB-02 (Figure 4) sediment collected from a floor trench drain located in B1233 where 490 ppm of Aroclor 1260 was detected; and
- sample B1266-PCB-01 (Figure 6) oil residue collected from an exterior electrical switch panel located near B1266 where 361 ppm of Aroclor 1260 was detected.

A surface soil sample obtained adjacent to B1287 (B1287-SS11, Figure 7) was also found to contain Aroclor 1260 exceeding the Unrestricted Use Criteria SCO of 0.1 ppm. The extent of contamination associated with this location has not been delineated.

Two surface soil samples at B1233 also contain Aroclor 1260 above the Unrestricted Use Criteria SCO (see Section 2.3.7).

No PCB samples were collected from inside B1250 due to limited access. In addition, three former PCB-containing equipment pads were discovered west of B1235 and west of B1250 that have not yet been sampled for PCBs. The location of these concrete structures are shown on Figure 2.

2.3.6 VRF-AOC-07: WDA-03 Former Landfill Site

The 1997 PSA includes a reference to a portion of the property located immediately to the south of B1225 that was used as a landfill for the disposal of filter bed material. Based on review of aerial photos and Site inspection efforts, the former landfill appears to cover an area of approximately 26,000 square feet, shown on Figure 3.

Limited investigation of this area indicates unpermitted disposal of solid waste and suspected disposal of hazardous wastes (i.e., paints, batteries, etc.). No documentation of State or other permitted waste disposal has been identified with respect to the VRF.

2.3.6.1 Previous Sampling and Testing

On January 17, 2013, seven test pits (TP-1 through TP-7, Figure 3) were excavated in the vicinity of the former landfill. Apparent sand filter waste underlain by construction and demolition debris was encountered within the footprint of the former landfill (TP-06 and TP-07) to a depth of approximately 6 to 8 feet below grade. Underlying soils appeared to be consistent with native soils observed elsewhere on the Site. The waste material was found to typically occur below a depth of approximately 1 to 2 feet below grade although metal debris was also observed at the ground surface. Groundwater was encountered at approximately 1 to 2 feet below grade and flowed quickly into the test pits during the excavation process.

The construction/demolition debris observed consisted of a wide variety of materials including metal, concrete, batteries, wire, plastic, and wood. Soil and water samples were collected from TP-05 and TP-07, and a soil sample from TP-04 south of the landfill area. Soils at TP-07 were found to contain the VOCs 2-butanone and acetone at levels exceeding Unrestricted Use Criteria SCOs. No SVOCs, PCBs, Pesticides or RCRA metals were detected in the soil or groundwater samples.

2.3.7 VRF-AOC-08: B1233 Investigation and Cleanup

2.3.7.1 Background

B1233 was a powerhouse for the former B1231 laboratory. Extensive documentation exists with respect to this area of the VRF. Investigation and remedial activities are on-going to address chlorinated solvent and other soil and groundwater contamination located in the vicinity of B1231 and the adjacent B1233. In September 2012, soil sampling at B1233 identified elevated levels of VOCs, pesticides, and PCBs above the NYSDEC Unrestricted Use SCOs.

Documented groundwater contamination is present at B1231 and is included as part of the NYSDEC IHWDS listing. On-going monitoring and remediation at these buildings has been conducted by the RRS and reviewed by the NYSDEC. While additional characterization is underway as part of the EBS process, the monitored natural attenuation (MNA) program for B1231 has been suspended in lieu of the analysis of remedial alternatives for source area cleanup.

2.3.7.2 Previous Sampling and Testing

Although levels of cVOCs have generally decreased in the area of B1231 over the past several years due to MNA and bioremediation, the presence of cVOCs had not been completely eliminated. The initial sampling and testing at B1233 conducted for the August 2013 EBS suggested the possibility that the source of the cVOCs in this area was close to B1233-S04, which was taken immediately adjacent to a floor trench outfall on the east side of the building (Figure 4). For this reason, a detailed subsurface investigation of the eastern area of B1233 was conducted to attempt to identify the nature and extent of contamination in this area.

Lu Engineers subcontracted S2C2, Incorporated to perform a Membrane Interface Probe (MIP) investigation using direct push methods. This investigation approach, coupled with conventional direct-push (Geoprobe®) sampling methods and laboratory analysis, was used to identify the vertical and aerial extent of cVOC contamination in the area of B-1233. A full summary of results is presented in the August 2013 EBS report.

The highest levels of soil contamination were observed at B1233 (B1233-S04, Figure 4) where 1,4-dichlorobenzene, chlorobenzene, acetone, PCBs, and pesticides exceed Unrestricted Use SCOs. The PCB concentration in soil sample B1233-S04 was 49.5 ppm, within 1 ppm of the NYSDEC hazardous waste level, and therefore it is likely that soils in the vicinity of B1233-S04 can be considered hazardous waste.

Exeedances of groundwater standards were also noted at B1233 (B1233-W04) for chlorobenzene, dichlorobenzenes, and trichlorbenzenes. It is noted that the levels of chlorobenzenes observed at B1233 each exceeded the applicable NYSDEC groundwater standards by three orders of magnitude. The mini-well water sample obtained at B1231 (B1231-W03) did not yield detectable levels of chlorobenzenes or other volatile organics.

Remedial work, including building demolition and soil removal, are planned to address contamination at B1233.

2.3.8 VRF-AOC-09: Site-Wide Groundwater Conditions

2.3.8.1 Background

Previous investigations have identified the presence of elevated levels of various solvents and RCRA metals in groundwater at a number of locations throughout the developed portion of the VRF Site. Certain areas have undergone extensive groundwater investigation including MNA associated with RRS' efforts to de-list the VRF from the NYSDEC IHWDS registry (B1231 and B1253). Other areas of the property were investigated in the past, but incomplete documentation exists with respect to current conditions such as the past presence of elevated levels of chlorinated solvents and RCRA metals at B1245 and elsewhere. The occurrence of groundwater contamination at B1231 and B1253 has been used as a possible indication of the occurrence of elevated levels of VOCs and other groundwater contaminants throughout developed portions of the VRF in areas where similar past use occurred.

Currently, a total of twelve 2-inch diameter drilled monitoring wells and seven 1-inch diameter mini-wells are located on the VRF Site. Permanent monitoring wells are located at B1231 and B1253, and at two other locations not associated with buildings on the northern and western portions of the site respectively. Mini-wells were installed during the August 2013 EBS to assess groundwater conditions at other locations (see Figures 3 through 7).

MNA sampling is conducted quarterly at B1253 and the last two sampling events did not detect contaminants of concern. B1231 groundwater investigation and remediation is on-going – see Section 2.3.7.

2.3.8.2 Previous Sampling and Testing

In addition to the on-going MNA sampling conducted at B1231 and B1253, groundwater at the VRF has been sampled via mini-wells at a total of seven locations including:

- BN1219-W06 (Figure 5),
- B1227-W02 (Figure 3),
- B1231-W03 (Figure 4),
- B1233-W04 (Figure 4),
- B1243-W05 (Figure 4),
- B1266-W07/B1266-W07R (Figure 6), and
- B1287-W08 (Figure 7).

Each of these groundwater samples was analyzed for VOCs and PCBs. Groundwater has also been sampled directly from test pits at four locations: TP-05, TP-07, TP-10 and TP-11.

It is understood that conditions associated with cVOC, PCB, and pesticide contamination at B1231 and B1233 are being addressed as a discrete remedial effort (VRF-AOC-08) as described previously. It is further understood that the on-going occurrence of low levels of cVOCs at B1253 and B1255 is being addressed by continuing MNA with the concurrence of the NYSDEC for eventual closure.

Low-level solvents were detected above groundwater standards from mini-wells sampled at isolated locations near BN1219 and B1266. Groundwater sampled at BN1219 (BN1219-W06) yielded 4.77 ug/L of 1,2-dichloroethane (1,2-DCA) slightly above the NYSDEC groundwater standard of 3 ug/L. Two groundwater samples obtained adjacent to B1266 (B1266-W07 and B1266-W07R- replacement) exceeded the groundwater standard for vinyl chloride, as shown on Table 3.

Additional delineation, characterization, and possibly remediation, will be necessary to mitigate groundwater impacts observed at BN1219 and B1266.

2.3.9 VRF-AOC-10: Site-Wide Soil Conditions

2.3.9.1 Background

Previous investigations have identified the presence of elevated levels of various solvents and heavy metals in soils at a number of locations throughout the developed portion of the VRF Site.

During a Site visit in April 2013, two soil piles partially covered with a tarp were identified on the northwestern portion of the Site that warrant additional investigation. Additional investigation is also warranted for disturbed ground observed on the northwestern corner of the VRF property.

2.3.9.2 Previous Sampling and Testing

Developed areas of the Site near former lab buildings were partially investigated in September 2012 and indicated elevated levels of acetone in subsurface soils at the following sample locations:

- TP-07 (Figure 3)
- TP-12 (Figure 4)
- B1231-S03 (Figure 4)
- B1233-S04 and B1233-MIP14 (Figure 4)
- B1243-S13 (Figure 4)
- B1245-S05 (Figure 4)
- B1261-S06 (Figure 5)
- B1271-S09 (Figure 6)
- B1287-S10 (Figure 7)

Acetone detected in subsurface soils above the Unrestricted Use SCO of 50 ppb ranged from 68.6 ppb to 416 ppb. Samples were collected from varying depths up to 10 feet below grade.

2-Butanone was also detected above the Unrestricted Use SCO of 120 ppb in subsurface soils at the following locations:

- TP-07 (Figure 3)
- B1243-S13 (Figure 4)

In addition, PCB-contaminated surface soil was identified adjacent to B1287 (B1287-SS11, Figure 7). Additional investigation will be required to delineate these soil impacts.

Note: Acetone and 2-butanone are naturally occurring contaminants as well as laboratory solvents. The Site-wide occurrence of acetone in both soil and groundwater samples suggests that the VRF Site may have elevated background concentrations of these naturally occurring contaminants. Refer to Section 4.3 for discussion of soil background sampling.

3.0 Preliminary Conceptual Site Model

A preliminary conceptual site model describing the anticipated subsurface conditions, contaminant types, and distribution patterns is presented in this section. The preliminary conceptual site model has been used as the basis for the investigative work described herein, and the data collected during the RI will be used to refine this model as the project progresses and assist in evaluating remedial options for the Site. This preliminary conceptual site model identifies and describes: (1) the known or potential sources of contamination; (2) the types of contaminants and affected media; (3) release mechanisms and potential migration pathways; and (4) actual/potential human health and environmental receptors.

Historically, the VRF site was used to conduct a broad range of electromagnetic research, experimentation, measurements, and capability evaluations. It also served as a centralized data reduction/processing and software development facility for a number of GAFB data acquisition sites. Hazardous materials were often utilized in past reliability research. The facility was fully operational from 1954 to 1987. All operations at VRF ceased in October 2000.

3.1 Known or Suspected Sources of Contamination

This conceptual site model is based on previous findings presented in the August 2013 EBS Report. Known or suspected on-site sources of contamination, the type of contaminants at each source, and current information on extent of contamination are listed below in this section.

3.1.1 Septic Tanks/Sewer System

The sanitary sewer system is a suspected source of contamination due to past waste disposal practices. At least eight septic tanks remain on the VRF property. Water and sludge samples collected from the tanks contain elevated levels of solvents (acetone, 2-butanone, benzene, chlorobenzene, 1,4-dichlorobenzene) and heavy metals. Known septic tank locations and sewer lines are shown on the attached figures.

Water collected from Manhole-3 (MH-3, Figure 6) located east of B1266 contained elevated levels of dichlorodifluoromethane (Freon), arsenic, and chromium.

The raised bed sand filter system is also a suspected source of contamination. Elevated concentrations of acetone and 2-butanone were detected in a subsurface sample (B1243-S13) collected from the filter bed at a depth of 7.5-8 feet, as shown on Figure 4. Acetone was also detected above the Unrestricted Use SCO in underlying native silt/clay soil in TP-12 at a depth of 10 feet. No groundwater contaminants were detected in a mini-well (B1243-W05) sampled within the filter bed.

3.1.2 B1233 Trench Drain

The main contaminants of concern at B1233 are chlorobenzenes in subsurface soil and groundwater. The source area has been delineated during previous investigations and the hot spot spears to be adjacent to the south corner of B1233 where the floor trench drain discharges to the ground surface. Chlorobenzenes were detected in soil up to 105 ppm at a depth of 4.5 to 6.5 feet below grade, and in groundwater at levels up to 2,250 ppb. Also acetone, PCE, pesticides, and PCBs were detected above Unrestricted Use SCOs in source area soils between 4.5 and 10 feet below grade.

The vertical and aerial extent of VOC contamination at B1233 has been generally delineated through installation of 15 MIP points to a depth of 16 feet below grade, as presented in the August 2013 EBS Report.

The floor trench drain in B1233 contains sediments with hazardous waste levels of PCBs. Surface soils near the trench drain discharge pipe at the south corner of B1233 are also impacted by PCBs, as shown on Figure 4. The PCB concentration in surface soil near the trench drain outfall (B1233-SS-01) was 25.9 ppm; B1233-SS02 to the south was 1.91 ppm.

3.1.3 Former USTs

Former USTs that stored fuel oil for boilers and generators have been identified as potential source areas for petroleum contamination. Underground tanks were historically located on the north side of the laboratory and powerhouse buildings. All tanks have reportedly been removed; however, evidence of petroleum impacts were observed in shallow soils at B1245 and B1253 during test pit investigation in January 2013. Free-phase petroleum was noted on groundwater at both locations during sampling. It is possible that other former UST locations may also have petroleum impacts to soil and/or groundwater.

3.1.4 Former Landfill

Fill material consisting of apparent former filter bed sand and construction and demolition debris (metal, concrete, wire, plastic, wood, batteries, etc.) is present in the former landfill area on the south end of the VRF. The landfill area is approximately 26,000 square feet. This fill material is a potential source of metals, PCBs, and VOC impacts to soil and groundwater in the area of the landfill.

A perched water sample from TP-07 collected from approximately 6 feet below grade contained 250 ppb of 2-butanone and 930 ppb acetone, which exceed groundwater standards. These compounds were also detected in a soil sample (B1243-S13) collected within the filter bed, and acetone was detected in water from TP-12 within the filter bed system.

The top 1 to 2 feet of fill generally consists of filter bed sand underlain be construction and demolition debris to a depth of 6 to 8 feet below grade. The aerial extent of fill material warrants further delineation.

3.1.5 PCB-Containing Equipment

The VRF has a well-documented history of PCB-containing equipment and evidence of spillage of transformer oil is present in several areas of the Site including the interior of at least 15 of the 27 buildings remaining. All known PCB-containing equipment has been removed from the Site; however, previous sampling has revealed two locations of PCB-containing sludge/residue characterized as hazardous waste:

- sample B1233-PCB-02 (Figure 4) sludge collected from a floor trench drain located in B1233 where 490 ppm of Aroclor 1260 was detected; and
- sample B1266-PCB-01 (Figure 6) oil residue collected from an exterior electrical switch panel located near B1266 where 361 ppm of Aroclor 1260 was detected.

In addition, the PCB concentration in soil sample B1233-S04 was 49.5 ppm, within 1 ppm of the NYSDEC hazardous waste level, and therefore it is likely that soils in the vicinity of B1233-S04 can be considered hazardous waste, as discussed in Section 2.3.7.2.

Surface soils on the east side of B1287 and B1233 were found to contain PCBs exceeding the Unrestricted Use Criteria SCO. The extent of PCB contamination associated with B1287 has not been delineated.

3.2 Potential Release Mechanisms and Pathways for Contamination Migration

Potential release mechanisms and contaminant migration pathways away from known or suspected source areas may have included one or more of the following:

- Surficial flow across surfaces, possibly enhanced by precipitation events;
- Volatilization directly from the ground surface into the air.
- Preferential subsurface migration within subsurface utilities; and
- Migration horizontally and vertically through the overburden soil, fill, or groundwater.

3.3 Potential Human and Environmental Receptors

The Site is currently vacant and access is controlled by locked gates at roadway entrances; however, trespassing and vandalism have been an on-going problem for the property. There could be human receptors if the Site is redeveloped and the contaminants are not adequately addressed. Currently, there are no on-site or off-site human receptors. The area is serviced by public water supply, and groundwater is not used as a potable source of water. There is some potential that off-site migration of contaminants could impact environmental and/or human receptors should contaminants from the sewer system enter Brandy Brook, located on the southern portion of the Site. Brandy Brook flows west and discharges to Oneida Creek.

Based on site visits and review of mapping and information for the EBS, there are no sensitive receptors located within one-half mile of the Site. No potable water supply wells were identified within one-half mile of the Site.

There are approximately 383 acres of Federal jurisdictional wetlands within the VRF Site, including Brandy Brook and surrounding floodplain wetlands. Brandy Brook is classified as a Class C stream by the NYSDEC.

There are no known nearby sources of contamination. The Former Space Command Complex located on the eastern portion of the former VRF is currently occupied by the Oneida Indian Nation and owned by the Federal Government (not the USAF).

4.0 Remedial Investigation Scope of Work

The rational for the selected Scope of Work is based on the historical uses and investigations conducted at the Site to date. Portions of the Site have been investigated and limited remediation has also been completed, while further investigation is necessary at other Site locations. The work plan approach presented illustrates how the activities will satisfy the data needs. All investigation efforts will be closely coordinated with RRS and the NYSDEC prior to mobilization and during all field activities.

Proposed sample locations are shown on the attached Figures 2 through 7. Proposed locations are subject to change based on field conditions and investigation results. NYSDEC approval will be obtained prior to modification of the scope of work presented in this Section.

4.1 Site Preparation and Security

Entrance to the Site from Germany Road is gated and locked; however, trespassing and vandalism is an on-going concern at the Site. The Site is owned by the USAF and therefore, only individuals with appropriate prior authorization will be permitted onto the Site.

Prior to initiation of the RI efforts, a utility clearance will be obtained for the entire property and the landfill area will be mowed to allow for a geophysical survey to be conducted. An access path will also need to be cleared to the three remote concrete pads, located west of the buildings (Figure 2). A portable restroom will be mobilized to the Site for the duration of this fieldwork.

The Site buildings are vacant and locked/boarded to prevent access. Access to B1250 will need to be obtained for PCB sample collection. Caution should be taken while entering the buildings based on the fact that they have been unoccupied for several years and friable asbestos is present in many locations. Proper personal protection equipment (PPE) such as Tyvek suits and half-face respirators with particulate cartridges must be worn when entering buildings posted for asbestos. Additional health and safety concerns are detailed in the Health and Safety Plan (HASP), Appendix B.

4.2 Geophysical Survey

A geophysical survey will be conducted in the landfill area (Figure 3) to identify buried metal objects. The area anticipated to be surveyed is shown on Figure 3. A Geonics, Incorporated EM-61 magnetometer (or equivalent) will be used to conduct the survey. This piece of equipment is reliable, cost effective and readily available for use.

A reference grid will be laid out and marked on the ground surface with paint or pin flags to facilitate data acquisition along lines spaced 5 feet apart. Corners of the grid will be logged with a survey-grade GPS unit. Data will be recorded digitally by a data logger at a rate of approximately 2 measurements per foot along the survey lines spaced 5 feet apart. The proposed grid is approximately 260 feet by 170 feet and it is anticipated that the area will be surveyed along approximate northwest/southeast grid lines. This grid layout is subject to change based on Site conditions at the time of the survey. Proposed changes to the geophysical grid size and/or location will be discussed with NYSDEC prior to commencement of the survey.

The data stored in the equipment will be downloaded to a computer for contouring and interpretation. A geophysical map of the property will be created which will identify significant buried ferro-metallic features.

4.3 Soil and Groundwater Background Evaluation

Background subsurface soil and groundwater sampling is proposed to evaluate if site-specific cleanup objectives are applicable for acetone and 2-butanone. The background soil and groundwater evaluation will be conducted in accordance with NYSDEC DER-10 Section 3.5.3(c). To determine Site background concentrations, five (5) soil and groundwater samples will be collected from undeveloped up-gradient areas of the VRF, as shown on Figure 2.

Two existing monitoring wells (one on the northwest portion of the Site and one at the southwest end, Figure 2) will be utilized to obtain groundwater samples. A backhoe or excavator will be used to excavate test pits for the collection of subsurface soil samples and groundwater grab samples. Samples will be collected from varying depths, up to 10 feet below grade, to correspond with previous soil sample depths.

The two existing monitoring wells to be utilized for background groundwater sampling will be developed prior to sample collection. Well development will consist of gentle surging and purging using a submersible pump or PVC bailer. Well data and purge water observations will be recorded on Well Development Logs.

Background soil and groundwater samples will be analyzed for VOCs (EPA Method 8260). Analytical results may be used to develop Site-specific SCOs for acetone and 2-butanone, with approval from NYSDEC and NYSDOH.

4.4 Test Pit Excavations

It is anticipated that approximately seventy-four (74) test pit excavations will be completed to further investigate subsurface concerns in the landfill area, septic filter bed, unknown soil piles, former UST locations, septic tank locations, and suspected solvent disposal areas. Test pits will also be completed to obtain background soil and groundwater samples, as described in Section 4.3 above.

A conventional 200-series excavator will be used to excavate the landfill and soil pile locations. A mini-excavator will be utilized to excavate the former tank and septic tank locations. Test pit depth will vary depending on location, intent, and characteristics observed. The test pits will be excavated and sampled according to the methods and procedures detailed in the QAPP included in Appendix C. All field and sampling equipment will be decontaminated in accordance with NYSDEC-approved decontamination procedures described in the QAPP, Appendix C.

Field screening with a PID and observations made during excavation activities will be recorded on test pit logs. Soil samples will be obtained from each test pit and analyzed as detailed below.

Proposed Number of Test Pits	Location and Description	Analysis
13	Landfill where sand filter bed disposal occurred (see Figure 3)	• VOC- EPA Method 8260 • RCRA Metals- EPA Method 6010B/7470A • PCBs- EPA Method 8082
1	B1243 filter bed discharge area (see Figure 4)	• VOC- EPA Method 8260 • RCRA Metals- EPA Method 6010B/7470A
7	Former tank locations at B1225, B1231,B1250, B1261, B1269, B1277, and B1285 (Figures 3-7)	• VOC- EPA Method 8260 + STARS • TPH- NYSDOH Method 310.13
28 (4 at each powerhouse)	1 on each side of powerhouses: B1227, B1247, B1255, B1263, B1271, B1279, B1287 (Figures 3-7)	• VOC- EPA Method 8260 + STARS • TPH- NYSDOH Method 310.13
4	1 on each side of powerhouse B1233 (see Figure 4)	• VOC- EPA Method 8260 + STARS • TPH- NYSDOH Method 310.13 • PCBs- EPA Method 8082 • Pesticides- EPA Method 8081B
2	Soil piles on northwestern portion of the Site (see Figure 2)	• VOC- EPA Method 8260 • RCRA Metals- EPA Method 6010B/7470A
2	Disturbed ground, northwestern corner (see Figure 2)	• VOC- EPA Method 8260 • RCRA Metals- EPA Method

Proposed Number of Test Pits	Location and Description	Analysis
		6010B/7470A • PCBs- EPA Method 8082
11	Adjacent to septic tank locations (current and former) at B1225, B1226, B1231, B1245, B1253, B1261, B1250, B1269, B1277, between B1277 and B1285, and B1285	• VOC- EPA Method 8260 + STARS • RCRA Metals- EPA Method 6010B/7470A
1	Adjacent to MH-3 (see Figure 6)	• VOC- EPA Method 8260 + STARS • RCRA Metals- EPA Method 6010B/7470A
5	Background soil sample locations (see Figure 2)	• VOC- EPA Method 8260

Excavated material will be backfilled after field screening and sampling is complete. Water sampling at the test pit locations is not anticipated. However, one or more groundwater monitoring mini-wells may be installed during the backfilling process for potential future sampling as described in Section 4.9.

Lu Engineers will provide work zone air monitoring during excavation activities using a PID to ensure that workers are not exposed to elevated concentrations of VOCs.

4.5 Surface Soil Sampling

Four (4) surface soil samples will be collected to further delineate PCB impacts near B1287 (see Figure 7). Samples will be collected from 0 to 2 inches below vegetation cover with a stainless steel trowel or spoon and transferred into glass sample jars, which will be decontaminated after each use, as described in the QAPP, Appendix C.

Surface soil samples will be submitted for laboratory analysis of PCB (EPA Method 8082).

4.6 Sediment Sampling

Three (3) sediment samples will be collected from Brandy Brook, which runs in an east-west orientation across the southern portion of the Site. Anticipated sample locations are shown on Figures 3 and 4.

Sediment samples will be collected using a pre-cleaned, long-handled dipper to transfer the sediment into the appropriate sample containers. The dipper will be decontaminated after each use, as described in the QAPP, Appendix C. Samples will be screened with a PID and observations made will be documented in the field log book.

Sediment samples will be obtained and analyzed as detailed in the following table.

Proposed # of Samples	Location and Description	Analysis
3	Discharge location of the sand filter bed system to Brandy Brook (see Figure 4)	• VOCs – EPA 8260 • SVOCs – EPA Method 8270 • RCRA Metals – EPA Method 6010B/7470A • PCBs - EPA Method 8082 • Pesticides- EPA Method 8081B
	Up- gradient at the convergence of a drainage ditch that runs in a north-south orientation (see Figure 3)	
	Down- gradient at the convergence of a drainage ditch that runs in a north-south orientation (see Figure 4)	

4.7 Septic Tank and Pump Station Sampling

Sediment and water samples will be collected from the remaining septic tanks and pump stations that have not been sampled to more fully characterize waste materials within the sanitary sewer system. Proposed sample locations are shown on Figures 3 through 7 and detailed in the table below.

Proposed # of Samples		Location	Analysis
Sediment	Water		
1	1	B1225 septic tank (Fig. 3)	• VOCs – EPA Method 8260 • RCRA Metals – EPA Method 6010B/7470A • PCBs - EPA Method 8082
1	1	B1226 septic tank (Fig. 3)	
1	-	B1241 pump station (Fig. 4)	
1	1	B1273 pump station (Fig. 6)	
1	-	B1250 septic tank (Fig. 5)	
1	1	B1269 septic tank (Fig. 6)	
1	1	B1277 septic tank (Fig. 7)	
1	1	Septic tank between B1279 and B1285 (Fig. 7)	

Samples collected from the septic tanks and pump stations will be collected using a pre-cleaned dipper which will be decontaminated after each use, as described in the QAPP (Appendix C). Samples will be screened with a PID and observations will be documented in the field log book.

4.8 Former PCB-Containing Equipment Sampling

PCB samples will be collected from B1250 and other remote concrete structures shown on Figure 2 where sampling was not previously completed. Transformer oil previously sampled at B1226 and B1255 will be re-sampled for analysis of SVOCs, which were not analyzed during the EBS sampling.

Samples will be collected as described in the QAPP, Appendix C. Observations made will be appropriately documented in the field log book. Samples will be collected and analyzed as detailed in the table below.

Proposed # of Samples	Location and Description	Analysis
4*	B1250 where prior sampling has not been conducted	• PCBs - EPA Method 8082
3 concrete chip samples	3 concrete structures west of the buildings (see Figure 2)	• PCBs - EPA Method 8082
2 oil samples	Transformers at B1226 and B1255 that were previously tested for VOCs and Metals only	• SVOCs-EPA Method 8270

*The four (4) samples collected from within B1250 will be dependent upon materials observed at the time of the investigation.

4.9 Subsurface Soil Borings

Approximately eight (8) direct-push soil boring points will be installed at the locations shown in Figures 3 through 7. Boring locations were selected to delineate subsurface contamination identified during previous EBS work.

Subsurface soil samples will be collected and analyzed as detailed in the following table.

Proposed # of Borings	Location and Description	Analysis
4	B1253 to further delineate petroleum impacts identified during prior test pit excavation in January 2013 (Fig. 5)	• VOC- EPA Method 8260 + STARS • TPH- NYSDOH Method 310.13
4	B1245 to further delineate petroleum impacts identified during prior test pit excavation in January 2013 (Fig. 4)	• VOC- EPA Method 8260 + STARS • TPH- NYSDOH Method 310.13

One soil sample will be collected at each boring at up to 15 feet below ground surface. The samples will be collected using a direct-push (Geoprobe®) unit with disposable polyethylene sample sleeves. All soil samples will be screened with a PID, characterized, and their subsurface lithology recorded on boring logs. The depth to groundwater and lithology will be considered when determining the depth of the soil borings and corresponding sample depths. Boring spoils will be returned to the ground in the vicinity of the borehole.

The direct-push equipment in contact with soils will be appropriately decontaminated prior to each use, as described in the QAPP and below:

1. Removal of gross debris;
2. Scrubbing equipment with brushes in Alconox solution;
3. Rinsing equipment with distilled water;
4. Triple-rinsing equipment with distilled water; and
5. Allowing equipment to air dry.

4.10 Additional Groundwater Investigation

Up to ten (10) groundwater mini-wells are to be installed in borings described above and/or during test pit backfilling (Section 4.3). Wells placed to monitor petroleum contamination will be screened through the water interface, and wells placed to monitor solvent contamination will be screened at approximately 10 to 15 feet below the ground surface, or as indicated by the screening during the boring installation process.

Proposed # of Mini-wells	Location and Description	Analysis
3	B1266 mini-wells where low-level solvents were previously detected above groundwater standards (Fig. 6)	• VOC- EPA Method 8260
1	B1219 mini-wells where low-level solvents were previously detected above groundwater standards (Fig. 5)	• VOC- EPA Method 8260
6	Landfill Area, to establish groundwater flow direction and quality (Figure 3)	• VOCs – EPA Method 8260 • RCRA Metals – EPA Method 6010B/7470A • PCBs - EPA Method 8082

All mini-wells are to be constructed according to the following specifications: A sand filter pack composed of chemically inert, coarse-grained sand will be placed from the bottom of the boring to 1 to 2 feet above the top of the screen. A bentonite seal will be placed above the sand, followed by Portland cement/5% bentonite grout to the surface. The mini-wells will be completed 2 feet above ground surface.

Soil boring and well construction logs will be completed for all well installations.

4.10.1 Mini-Well Installation and Development

After completion of the mini-wells, but not sooner than 48 hours after grouting is completed, development will be accomplished by bailing. No dispersing agents, acids, disinfectants, or other additives will be used during development nor be introduced into the well at any other time. During development, water will be removed throughout the entire water column by periodically lowering and raising the pump intake (or bailer stopping point).

The wells will be developed until turbidity of the discharge is 50 nephelometric turbidity units (NTU) or less. All field instrument measurements made during development will be recorded. The wells will initially be surged in order to draw sediments out of the sand pack and into the well for removal. If after 2 hours the proposed goal of 50 NTU cannot be achieved, the well will be considered as developed and the NYSDEC project manager will be consulted to determine if field-filtering of groundwater samples will be necessary for metals analysis. Water generated from development activities will be discharged to the ground surface.

4.10.2 Groundwater Sampling

Groundwater sampling will be conducted after construction and development of each mini-well is completed, at the locations shown in the above table. Low-flow sampling techniques with a peristaltic pump will be utilized to collect the samples.

Prior to sampling, the water level at each well will be measured in reference to the casing elevation and recorded on a sampling log. Water quality parameters will be recorded in the field including turbidity, pH, conductivity, and temperature, and must stabilize prior to sample collection. Well sampling logs will be completed for each sample.

Groundwater samples collected from mini-wells will be analyzed as outlined in the table above.

4.10.3 Well Survey

A survey of the mini-wells will be performed by a NYS Licensed Surveyor to identify mini-well locations and elevations. An instrument survey will locate the wells to a 0.010 foot accuracy, which will be included in the existing well survey.

4.11 Investigation-Derived Waste Management and Disposal

Disposable sampling equipment will be double-bagged and disposed of as non-hazardous municipal solid waste. Used personal protective equipment will be double-bagged and disposed of as municipal solid waste. Direct push soil samples and drill cuttings will be screened for VOCs with the PID, and will be placed in or adjacent to sample locations. Well purge water will be released on-Site to the ground surface in the area of the well and allowed to infiltrate the ground and not run-off the Site.
Further information regarding investigation-derived waste can be found in the QAPP in Appendix C.

4.12 Soil Vapor Intrusion Evaluation

The soil vapor intrusion pathway will be evaluated as part of the RI. The Site is currently unoccupied and it is understood that all remaining buildings are planned for demolition by the USAF in the future. Therefore, soil vapor intrusion sampling is not anticipated as part of this investigation.

4.13 Fish and Wildlife Resources Impact Analysis (FWRIA)

The purpose of a FWRIA is to identify actual or potential impacts to fish and wildlife resources from the site contaminants of ecological concern. The FWRIA Decision Key (NYSDEC DER-10 Appendix 3C) will be completed to determine if a FWRIA is needed based on the findings of this RI.

4.14 Quality Assurance/ Quality Control

All sampling and equipment decontamination will be conducted in accordance with the QAPP, included in Appendix C.

Paradigm Environmental Services, Inc., a NYSDOH ELAP certified laboratory, will conduct all analytical laboratory testing. Further details on the analytical laboratory QA/QC program for this project are provided in the QAPP. Split samples will be provided to the NYSDEC as requested for analysis by others.

Vali-Data of WNY or Ms. Nancy Potack, MWBE, will prepare Data Usability Summary Reports (DUSR) in accordance with the provisions set forth in Appendix 2B of the NYSDEC “DER-10 Technical Guidance for Site Investigation and Remediation” dated May

2010. The findings of the DUSR(s) will be incorporated in analytical laboratory tables that will be included in the RI and other associated reports as applicable. Further information is provided in the QAPP.

4.15 Health and Safety Plans

Monitoring of the work area and screening of soil and groundwater will be conducted throughout the duration of field activities to assure the safety of on-Site workers. A copy of the Site-Specific Health and Safety Plan (HASP) is provided as Appendix A.

Air monitoring of the work areas and environmental media therein will be conducted using a PID equipped with a 10.2 eV lamp (or equivalent).

Based on the remote location of the Site, all proposed sampling locations are within the Site and the fact that the Site is 494 acres, and the lack of nearby neighbors and/or receptors, community air monitoring is not necessary at the Site.

5.0 Feasibility Study Approach

5.1 Feasibility Study Process

The Feasibility Study activities will include the following steps and considerations:

- Describe the baseline and/or current situation and summarize the synthesize the results of the RI and related documents.
- Establish Remedial Action Objectives (RAOs) and preliminary remedial goals that permit a range of remedial alternatives to be developed
- Develop general response actions that may be taken to meet the RAOs
- Compare results with remedial action levels (RALs) to identify volume areas to which general response actions (GRA) may be applied.
- Identify and screen GRAs, remedial technology types, and specific process options suited to Site conditions.
- Assemble the technology types and process options into remedial alternatives and using USEPA's evaluation criteria.

5.2 Development and Screening of Alternatives

A representative range of applicable technologies and responses will be assembled into a set of potential remedial alternatives. Applicable or Relevant and Appropriate Requirements (ARARs) are considered in each step of this process.

- RAOs will be established, specifying the contaminants of concern (COCs), media of interest, and exposure pathways. RAOs are objectives for the protection of public health and the environment and are developed based on contaminant-specific standards and guidance to address contamination at the Site.

- GRAs that could be used to meet the RAOs will be identified. GRAs are media-specific procedures that must be taken to fulfill the established RAOs for the Site. These procedures involve remediation approaches that consist of various technologies and process options. GRAs include: treatment, containment, excavation, extraction, disposal, and institutional actions (i.e., deed restrictions).
- Media COC results will be compared to RALs.
- Applicable remedial technologies for each medium will be identified and screened. The screening processes will eliminate technologies that cannot be implemented for technical reasons and identify the technologies that may be best suited to site conditions.
- A set of appropriate remedial alternatives will be formed by combining selected representative technologies and responses.

Remedial alternatives will be screened and analyzed in accordance with *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA, 1988*).* The remedial alternatives evaluation will include the guidance provided by the *DER-10, TAGM#HWR-90-4030 Selection of Remedial Actions at Hazardous Waste Sites* (NYSDEC, 1990) and *6 NYCRR Part 375.* Specifically, the first step of the screening process will be conducted for the purpose of reducing the number of alternatives that are carried into the detailed analysis stage.

In the preliminary screening stage of the FS, remedial alternatives will be evaluated, using the three criteria of effectiveness, implement ability, and cost. Effectiveness refers to the ability of a remedial action to protect human health and the environment. The short-term impacts during the remedial construction and implementation are considered at this stage, as well as the long-term effectiveness of the remedial action after it is completed. The expected duration of the effectiveness is estimated for each alternative. Implementability refers to the realistic capability to actually implement as alternative. Technical implementability of a remedial alternative involves the ability to construct and operate the alternative, and to rely on the alternative to meet the performance requirements and consistently achieve the RAOs. At this stage of the FS, the performance of technologies will be reviewed. Administrative implement ability refers to the ability to obtain the required permits and stakeholder approvals for the action, regulatory compliance, and the availability and capacity of off-Site services such as treatment, storage, and disposal. Cost refers to the relative estimated cost of all aspects (i.e., design, capital cost, and operation and maintenance cost) to implement each alternative. In addition to these three criteria, the preliminary screening stage of the FS will include evaluation of alternatives and include opportunities for reducing the environmental footprint of remedial design and construction activities and include consideration of the sustainability of the alternative.

5.3 Treatability Study Investigations and Pilot Tests

During the performance of the FS, additional data may be necessary to evaluate the extent and effectiveness of potential technologies so that the FS can be used to develop and evaluate alternatives for remediation of the Site. Among other information, these data needs may include the performance of treatability studies to assess the applicability of specific technologies under conditions present in the Site and/or conducting pilot studies to determine the effectiveness of full-scale technologies at the Site. If treatability studies and/or pilot tests are required, they will be conducted generally following the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (USEPA, 1988)* and the *Guidance for Conducting Treatability Studies under CERCLA (USEPA, 1992b).* Work plans, including supporting plans, will be prepared for any treatability studies or pilot tests performed. The results will be incorporated into the FS Report.

5.4 Detailed Analysis of Alternatives

The purposes of the detailed analysis of alternatives is to provide a systematic evaluation of the alternatives. The following factors will be considered:

- Overall protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and performance
- Reduction of toxicity, mobility, or volume through treatment
- Short-term impacts and effectiveness
- Implementability
- Cost-effectiveness

In addition to the criteria evaluated in the FS, USEPA will evaluate two additional modifying criteria in the proposed plan: State acceptance and Community acceptance. A comparative analysis of the alternatives will be prepared once the evaluation of each individual alternative is complete. The comparative analysis will discuss the advantages and disadvantages of the alternatives in relation to one another so that the important issues for final remedial action are clearly identified. Upon completion of the individual and comparative evaluations, a proposed remedial action will be described using the best alternative developed.

6.0 Remedial Investigation/Feasibility Study Report

Once the contract laboratory has provided all analytical data and all information has been evaluated, Lu Engineers will develop a Remedial Investigation report on the findings of the investigation activities. The report will be prepared as indicated by the following outline:

- Executive Summary
- Introduction
- Study Area Investigation
- Physical Characteristics of the Study Area
- Nature and Extent of Contamination
- Contaminant Fate and Transport
- Exposure Assessment
- Summary and Conclusions

The report will carefully document all investigative activities and analytical results and will be supplemented with photographic documentation, subsurface soil logs and cross sections, study area plans that indicate groundwater flow direction and sub aerial contaminant distribution. Future use of the Site will be considered. Site specific contaminant levels will be compared to NYSDEC 6NYCRR Part 375-6 Remedial Program Soil Cleanup Objectives and NYSDEC Groundwater Quality Regulations (6NYCRR Part 703).

A Feasibility Study report will be completed, generally following *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA, 1988). The report will discuss each of the evaluation criteria for each alternative and will be submitted to the NYSDEC for review. A preferred remedy that is protective of public health and the environment, complies to the maximum extent practicable with the Standards, Criteria, and Guidance (SCGs) and cleanup objectives, reflects a preference for treatment over simple disposal and is cost effective will be recommended. The following outline of the FS Report will be used as a guide:

- Introduction and background
- Identification and Screening Technologies
- Development and Screening of Alternatives
- Detailed Analysis of Alternatives
- Proposed Remedial Plan for the Study Area

7.0 Project Organization

The personnel for this project are anticipated as follows:

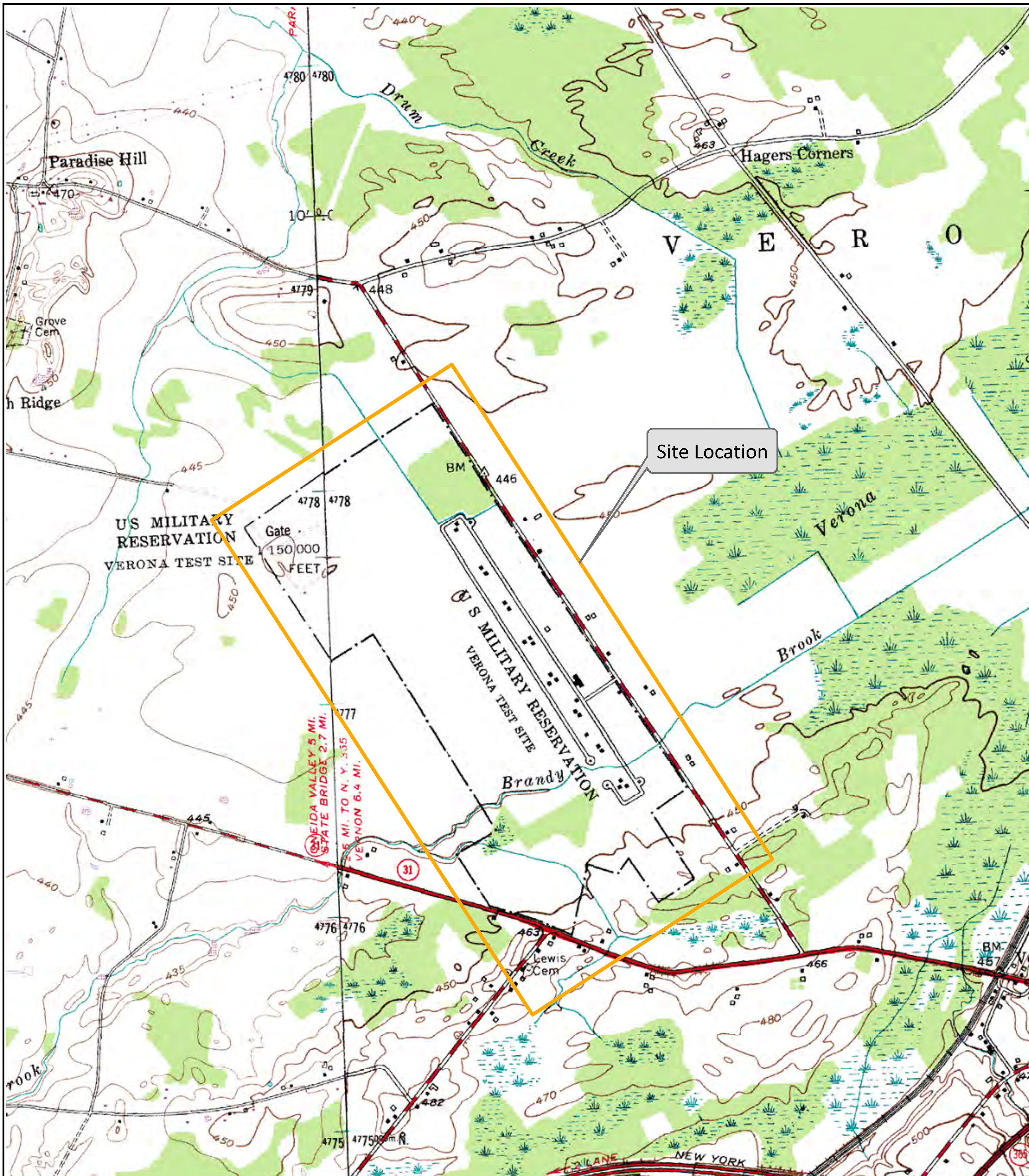
Greg Andrus, CHMM	Project Director/Manager
Steve Campbell	Quality Assurance Officer
Eric Detweiler	Field Team Leader/Geologist/Site Safety Officer
Laura Neubauer	Alternate Field Team Leader
Bryan Bancroft	Environmental Scientist
Janet Bissi	Field Technician
Sara Kashtan	Field Technician

Subcontractors

Paradigm Environmental	Analytical Laboratory
Trec Environmental	Excavation Contractor
Op-Tech Environmental	Alternate Excavation Contractor
SJB Drilling	Well and Boring Installations
Advanced Waste Solutions	Waste Disposal
Nancy Potak	Data Validation
ValiData of WNY	Data Validation

8.0 Schedule

It is assumed that NYSDEC will review and approve this work plan by September 16, 2013. Field work will commence on or about September 16, 2013. Field activities and laboratory analysis will require an estimated three (3) months to complete.
The RI Report will be submitted for review 30 calendar days from receipt of all validated analytical. The FS Report will be submitted for review 60 calendar days from submittal of the RI Report.



1:24,000

0 1,000 2,000 4,000
Feet

N

New York Quadrangle Location

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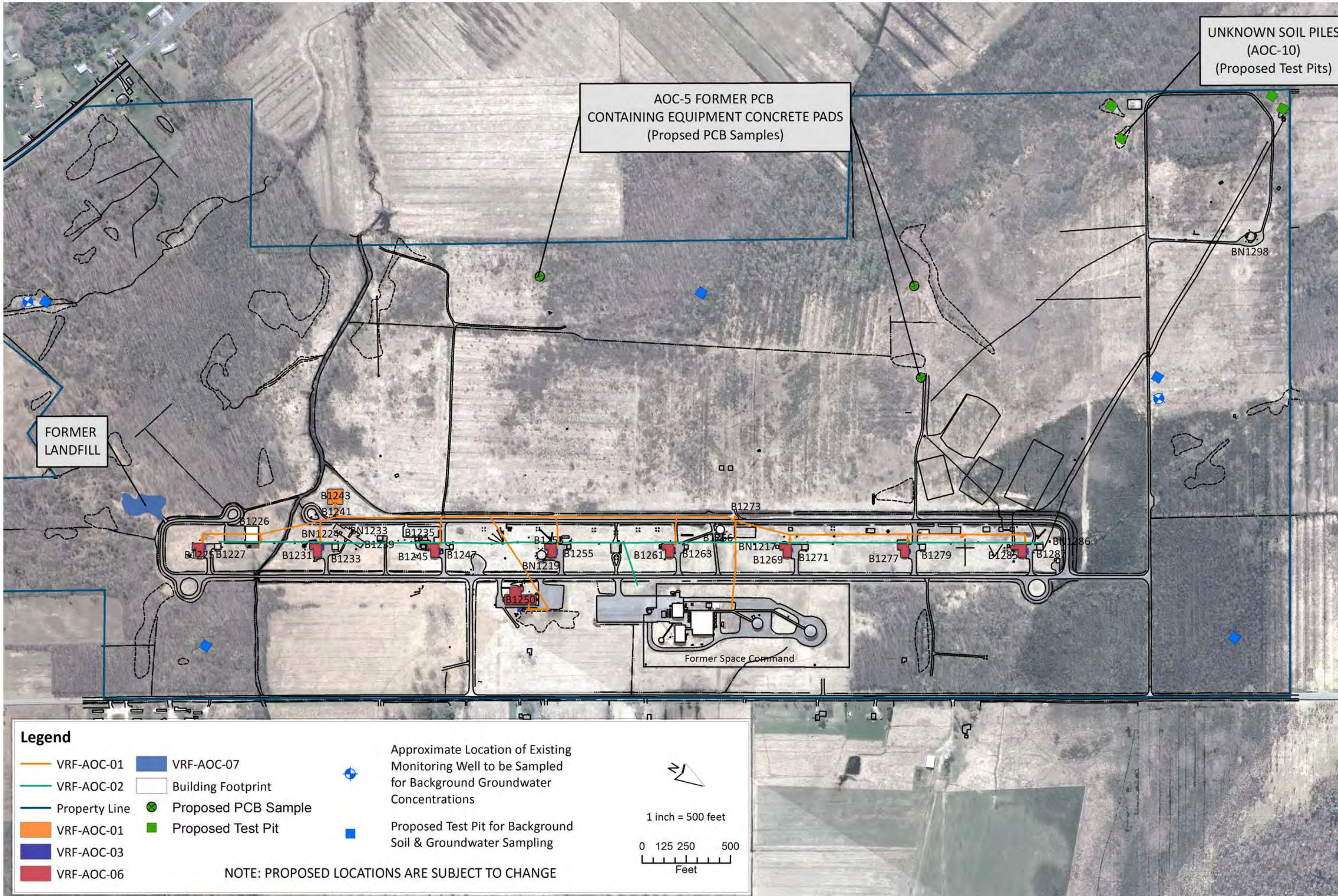
ENVIRONMENTAL • TRANSPORTATION • CIVIL

FIGURE 1 - SITE LOCATION MAP
VERONA RESEARCH FACILITY
VERONA, NY

DATE: AUGUST 2013
SCALE: 1:24,000
DRAWN/CHECKED: GLA/SMK
DATA SOURCE: USGS Digital Raster Graphic quadrangle 1978



DATE: AUGUST 2013

SCALE: 1 inch= 600 feet

DRAWN/CHECKED: GLA/SMK

DATA SOURCE: NYS GIS CLEARINGHOUSE ORTHOIMAGERY

FIGURE 2
SITE PLAN
VERONA RESEARCH FACILITY
VERONA, NY

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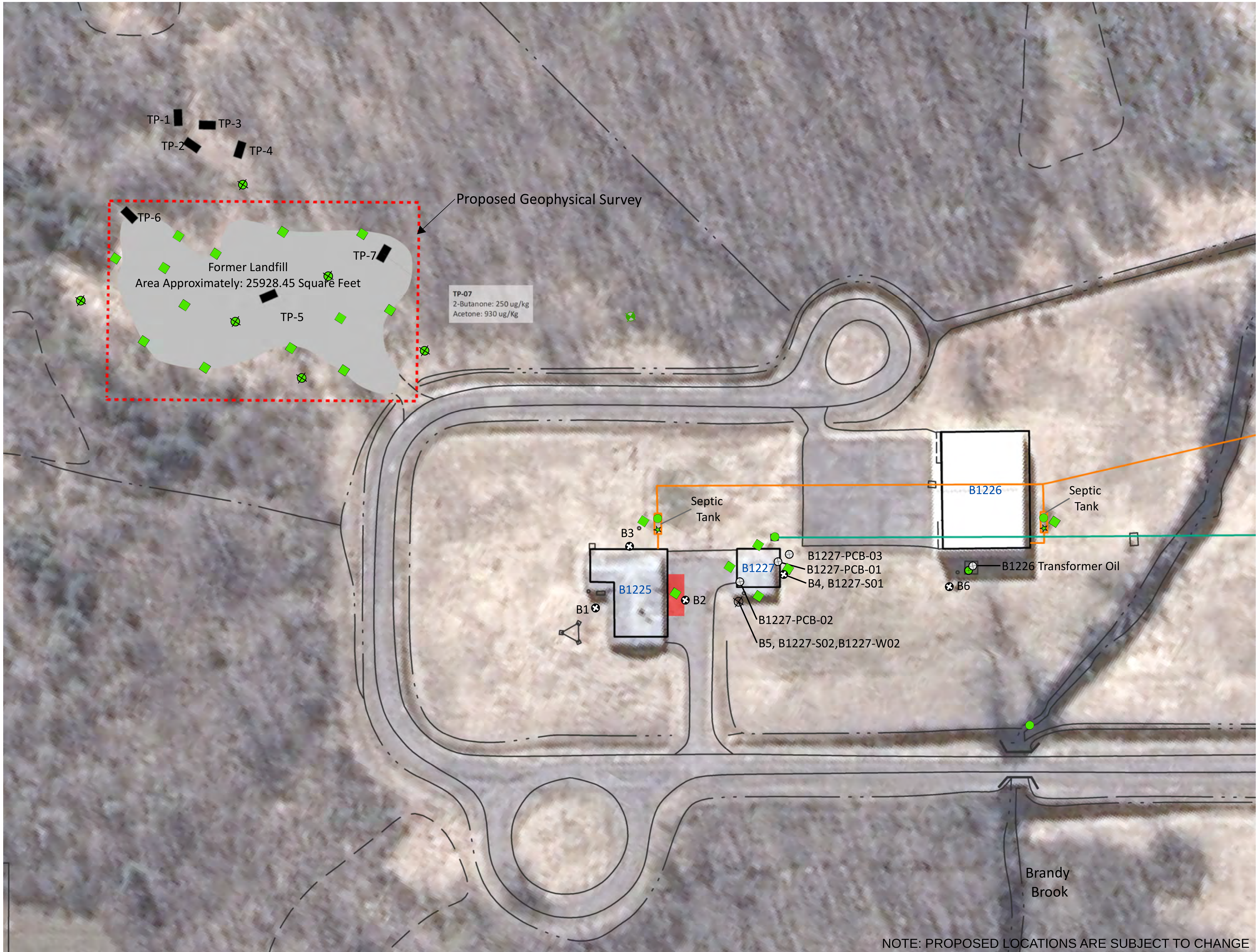


Existing Well
Sewer Line
Electric Line
Testpit
Former Tank Location
proposed_geophysical
Building Footprint
Landfill

Previous Sample:

Water
Manhole
Miniwell
Monitoring Well
Boring
MIP
PCB
Sediment
Surface Soil Sample

Proposed Sample:

Water
Miniwell
Boring
PCB
Sediment
Surface Soil
Testpit

SCALE:

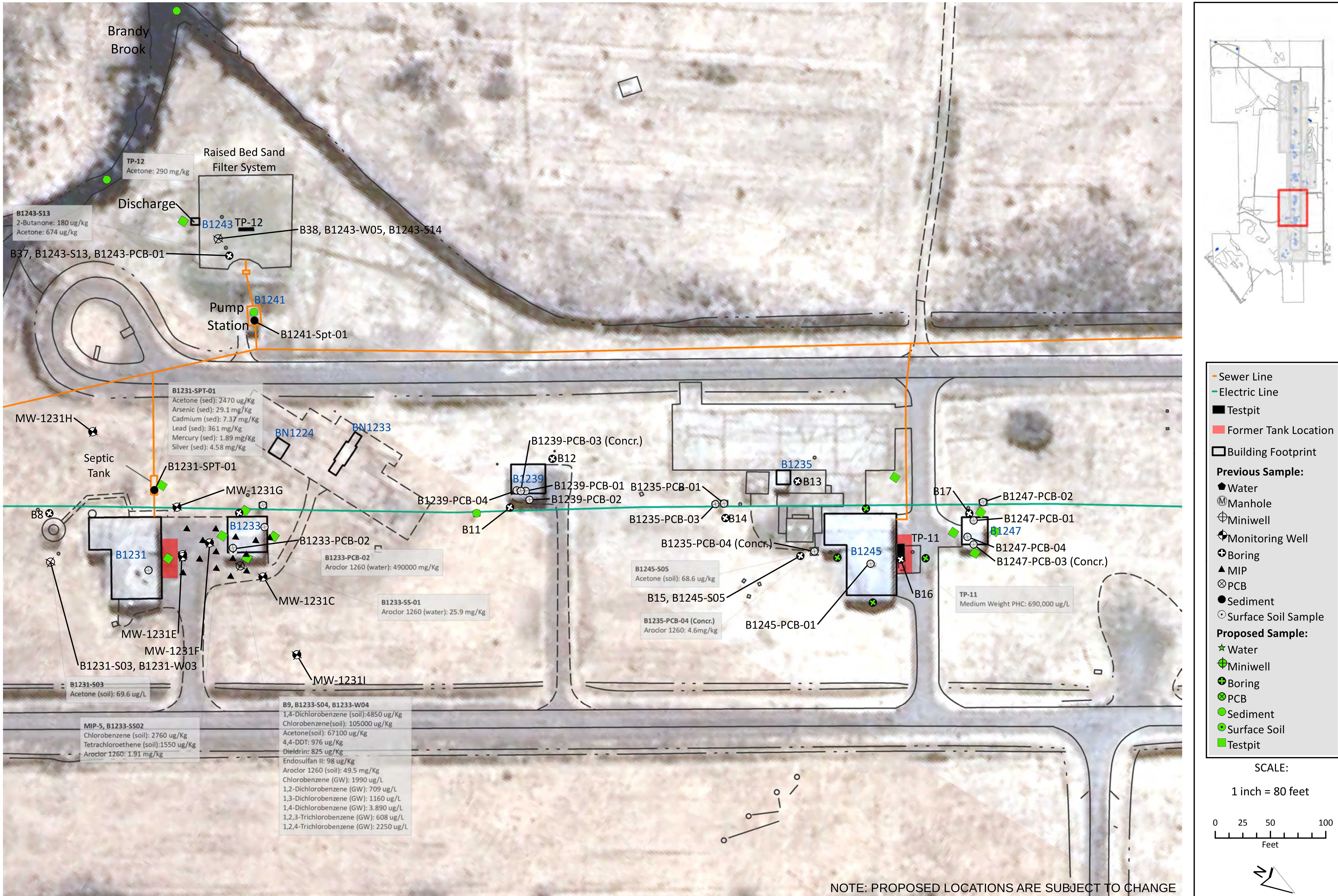
1 inch = 80 feet

0 25 50 100
Feet

DATE: AUGUST 2013
SCALE: 1 inch= 80 feet
DRAWN/CHECKED: SMK/LMN/GLA
DATA SOURCE:
NYS GIS CLEARINGHOUSE
ORTHOIMAGERY

FIGURE 3
VERONA RESEARCH FACILITY
VERONA, NY

Lu Engineers



DATE: AUGUST 2013

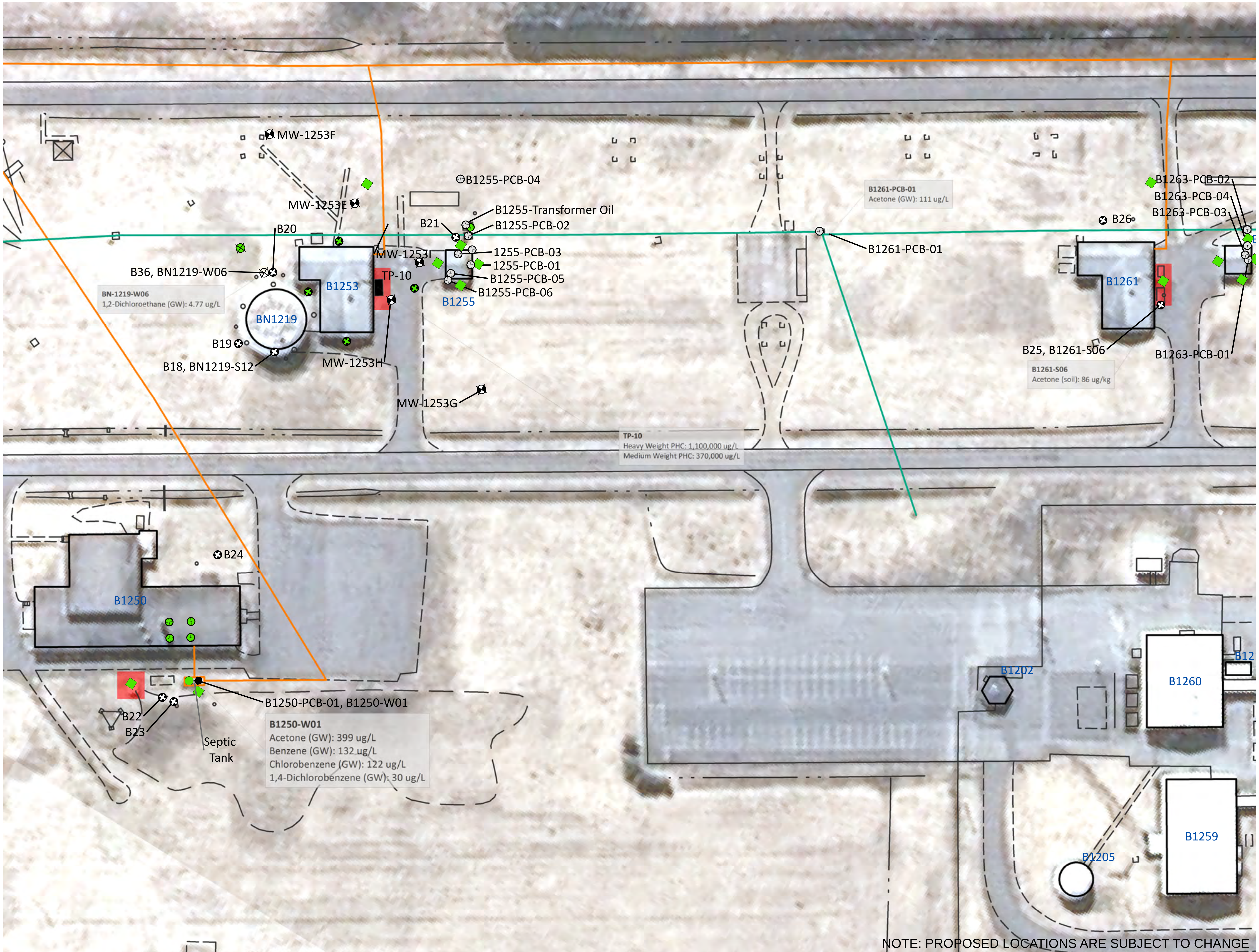
SCALE: 1 inch= 80 feet

DRAWN/CHECKED: SMK/LMN/GLA

DATA SOURCE:
NYS GIS CLEARINGHOUSE
ORTHOIMAGERY

FIGURE 4
VERONA RESEARCH FACILITY
VERONA, NY

Lu Engineers



- Sewer Line
- Electric Line
- Testpit
- Former Tank Location
- Building Footprint

Previous Sample:

- Water
- Manhole
- Miniwell
- Monitoring Well
- Boring
- MIP
- PCB
- Sediment
- Surface Soil Sample

Proposed Sample:

- Water
- Miniwell
- Boring
- PCB
- Sediment
- Surface Soil
- Testpit

SCALE:

1 inch = 80 feet

0 25 50 100
Feet

DATE: AUGUST 2013

SCALE: 1 inch= 80 feet

DRAWN/CHECKED: SMK/LMN/GLA

DATA SOURCE: NYS GIS CLEARINGHOUSE ORTHOIMAGERY

FIGURE 5

VERONA RESEARCH FACILITY

VERONA, NY

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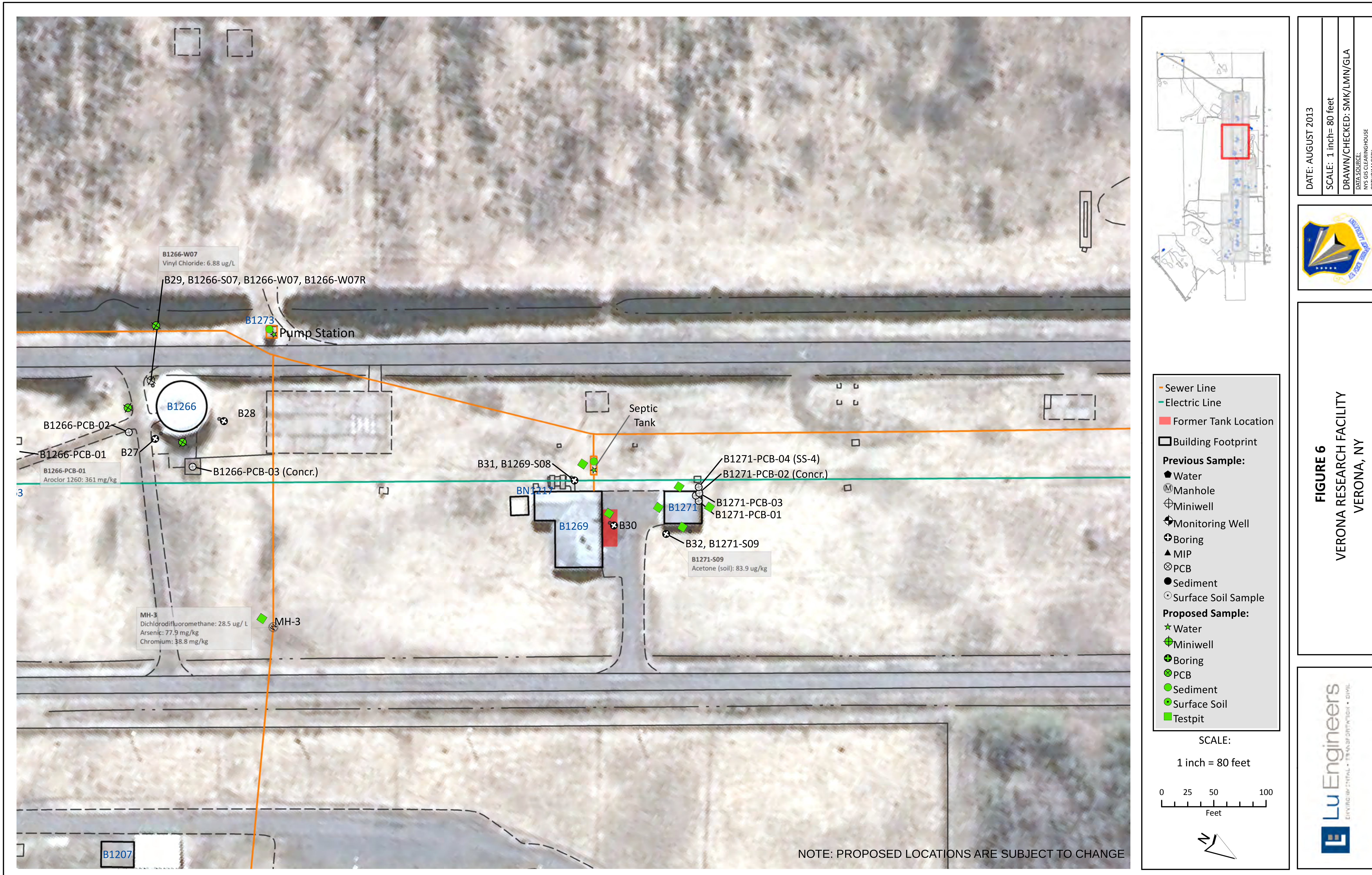
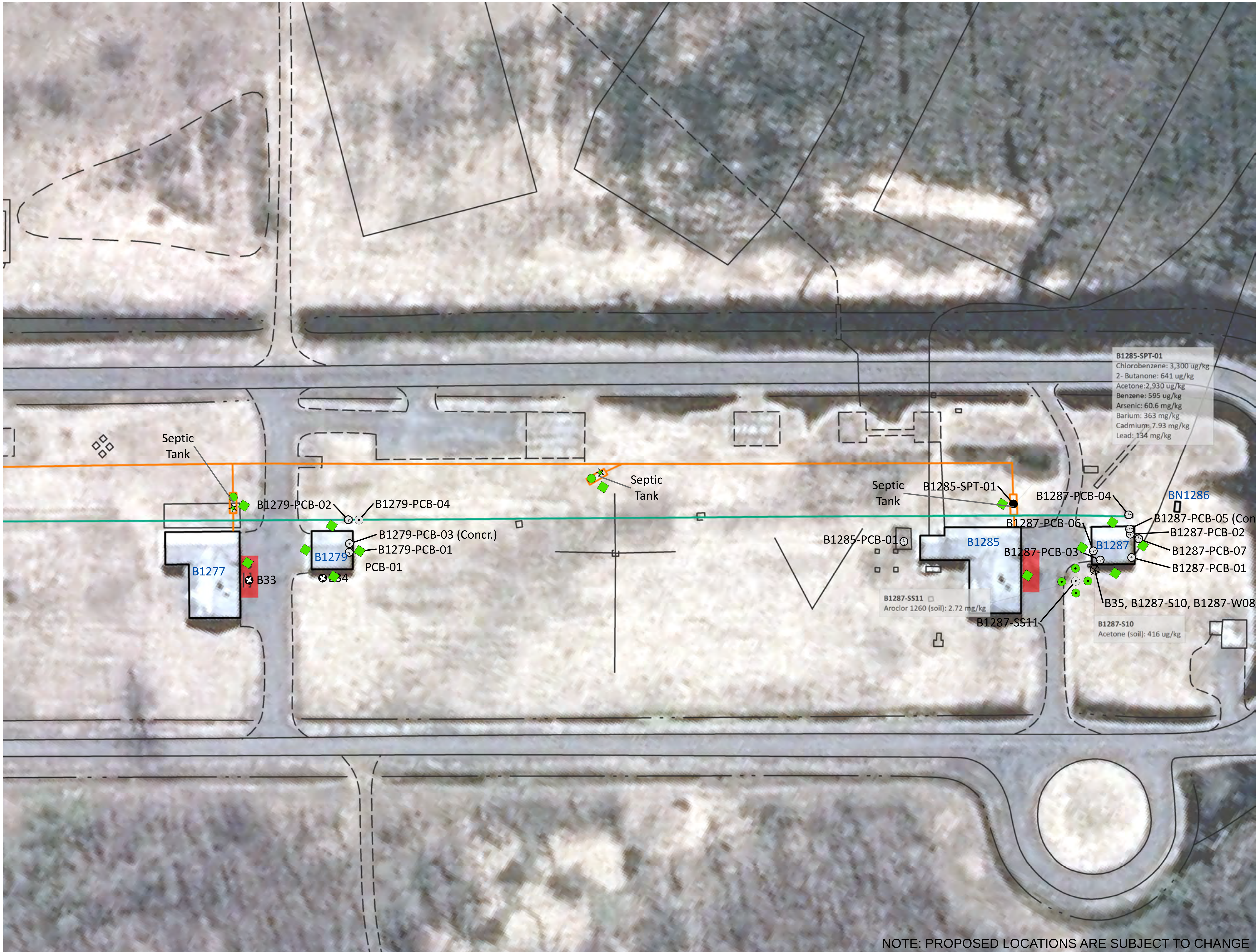

B1266-W07
Vinyl Chloride: 6.88 ug/L
B29, B1266-S07, B1266-W07, B1266-W07R
B1273
Pump Station
B1266
B28
B1266-PCB-02
B1266-PCB-01
B27
B1266-PCB-01
Aroclor 1260: 361 mg/kg
B1266-PCB-03 (Concr.)
Septic
Tank
B31, B1269-S08
BN1217
B1269
B30
B1271-PCB-04 (SS-4)
B1271-PCB-02 (Concr.)
B1271
B1271-PCB-03
B1271-PCB-01
B32, B1271-S09
B1271-S09
Acetone (soil): 83.9 ug/kg
MH-3
Dichlorodifluoromethane: 28.5 ug/ L
Arsenic: 77.9 mg/kg
Chromium: 38.8 mg/kg
MH-3
B1207
NOTE: PROPOSED LOCATIONS ARE SUBJECT TO CHANGE
Sewer Line
Electric Line
Former Tank Location
Building Footprint
Previous Sample:
Water
Manhole
Miniwell
Monitoring Well
Boring
MIP
PCB
Sediment
Surface Soil Sample
Proposed Sample:
Water
Miniwell
Boring
PCB
Sediment
Surface Soil
Testpit
SCALE:
1 inch = 80 feet
0 25 50 100
Feet
DATE: AUGUST 2013
SCALE: 1 inch= 80 feet
DRAWN/CHECKED: SMK/LMN/GLA
DATA SOURCE:
NYS GIS CLEARINGHOUSE
ORTHOIMAGERY
FIGURE 6
VERONA RESEARCH FACILITY
VERONA, NY
Lu Engineers



Sewer Line
Electric Line
Former Tank Location
Building Footprint

Previous Sample:
- Water
- Manhole
- Miniwell
- Monitoring Well
- Boring
- MIP
- PCB
- Sediment
- Surface Soil Sample

Proposed Sample:
- Water
- Miniwell
- Boring
- PCB
- Sediment
- Surface Soil
- Testpit

SCALE:

1 inch = 80 feet

0 25 50 100
Feet

DATE: AUGUST 2013
SCALE: 1 inch= 80 feet
DRAWN/CHECKED: SMK/LMN/GLA
DATA SOURCE:
NYS GIS CLEARINGHOUSE
ORTHOIMAGERY

FIGURE 7
VERONA RESEARCH FACILITY
VERONA, NY

Lu Engineers

Appendix A-
Analytical Results Tabulation

VOCs, SVOCs, and Pesticides

Detected Parameters[1]	Unrestricted Use[2]	Commercial Use[3]	MH-3	BN1219-S12	B1226 Transformer Oil	B1227-S02	B1231-S03	B1231-SPT-01	B1233-SS02 (MIP05)	B1233-S04	B1233-S-MIP14 (1-3)	B1233-S-MIP15 (6.5-7.5)	B1233-S-MIP05 (8-10)	B1233-S-MIP12 (10-11)	B1233-S-MIP12 (13.5-14)	B1233-SS01 (TD)	MW1231E-S (12-13.5)
		Sample Media:	SED	SOIL	OIL/WASTE	SOIL	SOIL	SED	SS	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SS	SOIL
EPA 8260 - Volatile Organics																	
1,4-Dichlorobenzene	1,800	130,000	ND	ND	ND	ND	ND	**187**	ND	**4,850**	ND	ND	**133**	ND	ND	ND	ND
Chlorobenzene	1,100	500,000	ND	ND	ND	**30.3**	**90**	**154**	ND	**105,000**	ND	ND	**2,760**	ND	ND	ND	**1,960**
1,3-Dichlorobenzene	2,400	280,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**61.5**	ND	ND	ND	ND
Cis-1,2-Dichloroethene	250	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**14.7**	ND	ND
2-Butanone	120	500,000	ND	ND	ND	ND	ND	ND	ND	ND	**45.3**	ND	ND	ND	ND	ND	ND
Acetone	50	500,000	ND	ND	ND	ND	**69.6**	**2,470**	**37.5**	**67100 B**	**164**	ND	ND	ND	ND	ND	ND
Benzene	60	44,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	5,900	500,000	ND	ND	ND	**9.34**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	NA	NA	ND	ND	ND	**43.2**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	1,300	150,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1,550**	ND	**8.92**	ND	ND
Toluene	700	500,000	ND	ND	ND	ND	ND	**219**	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	470	200,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**91.1**	**25.7**	ND	ND	ND
EPA 8270- Semi-Volatile Organics																	
1,4-Dichlorobenzene	1,800	130,000	NA	NA	NA	ND	NA	NA	NA	**1,260**	NA	NA	ND	NA	NA	ND	NA
2-Methylnaphthalene	12,000	500,000	NA	NA	NA	ND	NA	NA	NA	**1,360**	NA	NA	ND	NA	NA	ND	NA
Fluorene	30,000	500,000	NA	NA	NA	ND	NA	NA	NA	**474**	NA	NA	ND	NA	NA	ND	NA
Naphthalene	12,000	500,000	NA	NA	NA	ND	NA	NA	NA	**378**	NA	NA	ND	NA	NA	ND	NA
Phenanthrene	100,000	500,000	NA	NA	NA	ND	NA	NA	NA	**742**	NA	NA	ND	NA	NA	ND	NA
EPA 8081- Pesticides																	
4,4'-DDT	3.3	47,000	NA	NA	NA	ND	NA	NA	NA	**976**	NA	NA	NA	NA	NA	NA	NA
Dieldrin	5	1,400	NA	NA	NA	ND	NA	NA	NA	**825 C**	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	2,400	200,000	NA	NA	NA	ND	NA	NA	NA	**98**	NA	NA	NA	NA	NA	NA	NA

1 - All values presented in micrograms per kilogram (ug/kg).
2 - 6 NYCRR Part 375-6.8 - Table 375-6.8(a): Unrestricted Use Soil Cleanup Objectives
3 - 6 NYCRR Part 375-6.8 - Table 375-6.8(b): Restricted Use Soil Cleanup Objectives
ND- Not detected above reporting limit
NA - Not Applicable/Not Analyzed
C- concentrration differs by >40% between the primary and secondary columns
B-compound detected in associated method blank

SED - sediment
SS - surface soil

(shaded) Value Exceeds Unrestricted SCOs

VOCs, SVOCs, and Pesticides

Detected Parameters[1]	Unrestricted Use[2]	Commercial Use[3]	B1243-S13	B1243-S14	B1245-S05	B1255 Transformer Oil	B1261-S06	B1266-S07	B1269-S08	B1271-S09	B1285-SPT-01	B1287-S10	B1287-SS11
		Sample Media:	SOIL	SOIL	SOIL	OIL/WASTE	SOIL	SOIL	SOIL	SOIL	SED	SOIL	SS
EPA 8260 - Volatile Organics													
1,4-Dichlorobenzene	1,800	130,000	**24.1**	ND	**22.6**	ND	ND	ND	ND	ND	**201**	ND	ND
Chlorobenzene	1,100	500,000	**156**	**11.8**	**144**	ND	**17.8**	**8.05**	**14.1**	ND	**3,300**	ND	ND
1,3-Dichlorobenzene	2,400	280,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,2-Dichloroethene	250	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	120	500,000	**180**	ND	ND	ND	ND	ND	ND	ND	**641**	**91.2**	ND
Acetone	50	500,000	**674**	ND	**68.6**	ND	**86**	**26**	ND	**83.9**	**2,930**	**416**	ND
Benzene	60	44,000	ND	ND	ND	ND	ND	ND	ND	ND	**595**	ND	ND
Isopropylbenzene	5,900	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	1,300	150,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	700	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	470	200,000	ND	ND	ND	ND	ND	ND	**24.1**	ND	ND	ND	ND
EPA 8270- Semi-Volatile Organics													
1,4-Dichlorobenzene	1,800	130,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	12,000	500,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	30,000	500,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	12,000	500,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	100,000	500,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
EPA 8081- Pesticides: NA													

1 - All values presented in micrograms per kilogram (ug/kg).
2 - 6 NYCRR Part 375-6.8 - Table 375-6.8(a): Unrestricted Use Soil Cleanup Objectives
3 - 6 NYCRR Part 375-6.8 - Table 375-6.8(b): Restricted Use Soil Cleanup Objectives
ND- Not detected above reporting limit
NA - Not Applicable/Not Analyzed

[green box] Value Exceeds Unrestricted SCOs
SED - sediment
SS - surface soil

VOCs, SVOCs, and Pesticides - Test Pits

Detected Parameters[1]	Unrestricted Use[2]	Commercial Use[3]	TP-04	TP-05	TP-07	TP-09	TP-10	TP-11	TP-12	WDA-02-01	WDA-02-02
		Sample Media:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
EPA 8260 - Volatile Organics											
1,4-Dichlorobenzene	1,800	130,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	1,100	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	2,400	280,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,2-Dichloroethene	250	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	120	500,000	ND	ND	**250**	ND	ND	ND	**76**	ND	ND
Acetone	50	500,000	ND	ND	**930**	ND	ND	ND	**290**	ND	ND
Benzene	60	44,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	NA	NA	ND	ND	**12**	ND	ND	ND	ND	ND	ND
Isopropylbenzene	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	1,300	150,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	700	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-Dichloroethene	190	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	470	200,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
EPA 8270- Semi-Volatile Organics											
1,4-Dichlorobenzene	1,800	130,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	12,000	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	30,000	500,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	100,000	500,000	ND	ND	ND	ND	ND	**450***	ND	ND	ND
Pyrene	100,000	500,000	ND	ND	ND	ND	ND	**460***	ND	ND	ND
NYSDOH 310-13 Total Petroleum Hydrocarbons											
Heavy Weight PHC (Lube Oil)	100,000	500,000	NA	NA	NA	NA	**1,100,000**	ND	NA	NA	NA
Medium Weight PHC (Diesel)	100,000	500,000	NA	NA	NA	NA	**370,000**	**690,000**	NA	NA	NA
EPA 8081- Pesticides: none detected											

1 - All values presented in micrograms per kilogram (ug/kg).
2 - 6 NYCRR Part 375-6.8 - Table 375-6.8(a): Unrestricted Use Soil Cleanup Objectives
3 - 6 NYCRR Part 375-6.8 - Table 375-6.8(b): Restricted Use Soil Cleanup Objectives
ND- Not detected above reporting limit
NA - Not Applicable/Not Analyzed

(Shaded cells) Value Exceeds Unrestricted SCOs

RCRA Metals

Detected Parameters[1]	Unrestricted Use[2]	Commercial use[3]	MH-3	B1226 Transformer Oil	B1231-SPT-01	B1233-S-M1P15 (8-10)	B1233-SS01 (TD)	B1243-S13	B1243-S14	B1255 Transformer Oil	B1285-SPT-01
		Sample Media:	SED	OIL/WASTE	SED	SOIL	SS	SOIL	SOIL	OIL/WASTE	SED
RCRA Metals											
Arsenic	13	16	**77.9**	<0.994	**29.1**	**1.91**	**11.4 D**	**10.5**	<1.13	<0.986	**60.6**
Barium	350	400	<284	<0.94	**149**	**16.9**	**36.9 D**	**166**	**30.3**	<0.986	**363**
Cadmium	2.5	9.3	<14.2	<0.497	**7.37**	<0.606	<0.667	<.0573	<.567	<0.493	**7.93**
Chromium	30	1500	**38.8**	<0.994	**13.8**	**6.14**	**4.18 D**	**11.7**	**6.88**	<0.986	<13.5
Lead	63	1000	<28.4	<0.994	**361**	**2.03**	**13.3 D**	**7.85**	**2.75**	<0.986	**134**
Mercury	0.18	2.8	<0.235	<0.0085	**1.89**	<0.0098	**0.0341 D,M**	**0.0383**	<0.0087	<0.0079	**0.441**
Selenium	3.9	1500	<28.4	<0.994	<3.38	<1.21	<1.33	**1.51**	<1.13	<0.986	<13.5
Silver	2	1500	<28.4	<0.994	**4.58**	<1.21	<1.33	<1.15	<1.13	<0.986	<13.5

Detected Parameters[1]	Unrestricted Use[2]	Commercial use[3]	TP-04	TP-05	TP-07	TP-09	TP-10	TP-11	TP-12	WDA-02-01	WDA-02-02
		Sample Media:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
RCRA Metals											
Arsenic	13	16	**4.5**	**3.4**	**7.7**	**7.0**	**5.0**	**6.6**	**5.8**	**3.2**	**4.5**
Barium	350	400	**99.0**	**54.0**	**63.0**	**110.0**	**22.0**	**19.0**	**74.0**	**37**	**51**
Cadmium	2.5	9.3	<0.77	<0.57	**0.68**	**0.99**	<0.58	<0.51	<0.69	<0.70	**0.088**
Chromium	30	1500	**15.0**	**4.7**	**12.0**	**18.0**	**7.4**	**2.7**	**8.5**	**13**	**13**
Lead	63	1000	**14.0**	**3.7**	**12.0**	**26.0**	**4.7**	**9.9**	**3.8**	**76**	**63**
Mercury	0.18	2.8	**0.13**	**0.02**	**0.03**	**0.12**	**0.016**	<0.0097	**0.029**	0.046	**0.056**
Selenium	3.9	1500	<1.5	<1.1	<1.3	<1.7	<1.2	<1.0	<1.4	<1.4	<1.4
Silver	2	1500	<1.5	<1.1	<1.3	<1.7	<1.2	<1.0	<1.4	<1.4	<1.4

1 - results presented in milligrams per kilogram (mg/kg)
2 - 6 NYCRR Part 375-6.8 - Table 375-6.8(a): Unrestricted Use Soil Cleanup Objectives
3 - 6 NYCRR Part 375-6.8 - Table 375-6.8(b): Restricted Use Soil Cleanup Objectives
D-result obtained from dilution

Value Exceeds Unrestricted Use SCOs

SED - sediment
SS - surface soil

Water Results- VOCs

Detected Parameters[1]	NYSDEC Groundwater Standards[2]	MH-3	BN1219-W06	B1227-W02	B1231-SPT-01	B1231-W03	B1233-W04	B1241- SPT-01	B1243-W05	B1250-W01
	Sample Type:	manhole	mini-well	mini-well	septic tank	mini-well	mini-well	septic tank	mini-well	septic tank
EPA 8260 - Volatile Organics										
Acetone	50*	ND	ND	ND	ND	ND	ND	ND	ND	**399**
Benzene	5	ND	ND	ND	ND	ND	ND	ND	ND	**132**
2-Butanone	50	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	5	ND	ND	ND	ND	ND	**1,990**	ND	ND	**122**
1,2-Dichlorobenzene	3	ND	ND	ND	ND	ND	**709**	ND	ND	ND
1,3-Dichlorobenzene	3	ND	ND	ND	ND	ND	**1,160**	ND	ND	ND
1,4-Dichlorobenzene	3	ND	ND	ND	ND	ND	**3,890**	ND	ND	**30**
Dichlorodifluoromethane	5	**28.5**	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	3	ND	ND	ND	ND	ND	**608**	ND	ND	ND
1,2,4-Trichlorobenzene	3	ND	ND	ND	ND	ND	**2,250**	ND	ND	ND
1,2-Dichloroethane	3	ND	**4.77**	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND	**3.29**	ND	ND	**2.62**	ND	ND
Vinyl chloride	2	ND	ND	ND	ND	ND	ND	ND	ND	ND
RCRA Metals[3]										
Barium	1	<0.1	NA	NA	**0.235**	NA	NA	**0.19**	NA	NA

Detected Parameters[1]	NYSDEC Groundwater Standards[2]	B1261-PCB-01	B1266-W07	B1266-W07R	B1287-W08	B1285-SPT-01	TP-05	TP-07	TP-10	TP-11
	Sample Type:	elec. vault	mini-well	mini-well	mini-well	septic tank	test pit	test pit	test pit	test pit
EPA 8260 - Volatile Organics										
Acetone	50*	**111**	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	5	ND	ND	ND	**2.35**	ND	ND	ND	ND	ND
2-Butanone	50	**17.6**	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	3	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	3	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	3	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	3	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	3	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	2	ND	**6.88**	**4.7**	ND	ND	ND	ND	ND	ND
RCRA Metals[3]										
Barium	1	NA	NA	**0.58**	NA	<0.1	NA	NA	NA	NA

1- results shown in micrograms per liter (ug/l)
2- 6 NYCRR Part 703.5 or NYSDEC Guidance Value [TOGS 1.1.1]
3- results shown in milligrams per liter (mg/l)
* -NYSDEC Guidance Value (TOGS 1.1.1)
[shaded box] Value Exceeds NYS Ambient Groundwater Standards

ND - not detected above method detection limit
NA - not analyzed

PCB Sample Results

Detected PCBs[1]	Unrestricted Use[2]	Commercial Use[3]	Hazardous Waste Listing[4]	B1227-S01	B1227-S02	B1227-PCB-01 (concr.)	B1227-PCB-03	B1227-W02	B1231-PCB-01	B1231-W03	B1231-SPT-01	B1231-SPT-01	B1233-SS01 (TD)	B1233-SS02 (MIP05)	B1233-S04	B1233-S-MIP05 (8-10)	B1233-S-MIP12 (10-11)	B1233-S-MIP12 (13.5-14)	B1233-S-MIP14 (1-3)	B1233-S-MIP15 (6.5-7.5)
			Sample Type:	SOIL	SOIL	CHIP	SS	GW	SED/WASTE	GW	WATER	SED	SS	SS	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Aroclor 1260	0.1	1	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	**25.9**	**1.91**	**49.5**	ND	ND	ND	ND	ND

Detected PCBs[1]	Unrestricted Use[2]	Commercial Use[3]	Hazardous Waste Listing[4]	B1233-PCB-01	B1233-PCB-01	B1233-PCB-02	B1233-PCB-03	B1233-W04	B1235-PCB-01	B1235-PCB-04 (Concr.)	B1239-PCB-01	B1239-PCB-02	B1239-PCB-03 (Concr.)	B1239-PCB-04	B1241-SPT-01	B1243-S13	B1243-S14	B1243-W05	B1245-S05	B1245-PCB-01
			Sample Type:	SLUDGE	WATER	SED/WASTE	OIL	GW	OIL	CHIP	OIL	OIL/WATER	CHIP	SS	WATER	SOIL	SOIL	GW	SOIL	OIL
Aroclor 1260	0.1	1	50	**25.9**	ND	**490**	ND	ND	ND	**4.6**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Detected PCBs[1]	Unrestricted Use[2]	Commercial Use[3]	Hazardous Waste Listing[4]	B1247-PCB-01	B1247-PCB-02	B1247-PCB-02	B1247-PCB-03 (Concr.)	B1250-PCB-01	B1250-PCB-02 (Concr.)	B1250-W01	BN1219-W06	B1255-PCB-01	B1255-PCB-02	B1255-PCB-03	B1255-PCB-04	B1255-PCB-05 (Concr.)	B1255-PCB-06	B1255-PCB-07	B1261-PCB-01	B1261-PCB-01
			Sample Type:	SED/WASTE	OIL/WATER	SS	CHIP	OIL/WATER	CHIP	WATER	GW	SED	OIL	OIL	SED/WASTE	CHIP	SS	SS	WATER	OIL
Aroclor 1260	0.1	1	50	ND	ND	ND	ND	**10**	ND	ND	ND	ND	ND	ND	**1.22**	ND	ND	ND	ND	ND

Detected PCBs[1]	Unrestricted Use[2]	Commercial Use[3]	Hazardous Waste Listing[4]	B1263-PCB-01	B1263-PCB-02	B1263-PCB-03 (Concr.)	B1263-PCB-04	B1263-PCB-05	B1266-PCB-01	B1266-PCB-02	B1266-PCB-03 (Concr.)	B1266-W07	MH-3	MH-3	B1271-PCB-01	B1271-PCB-02 (Concr.)	B1271-PCB-03	B1271-PCB-04	B1279-PCB-01	B1279-PCB-02
			Sample Type:	SED/WASTE	OIL	CHIP	SS	SS	SLUDGE	OIL/WATER	CHIP	GW	WATER	SED	SLUDGE	CHIP	SS	SS	SLUDGE	OIL
Aroclor 1260	0.1	1	50	ND	ND	ND	ND	ND	**361**	ND	ND	ND	ND	**33.9**	ND	ND	ND	ND	ND	ND

Detected PCBs[1]	Unrestricted Use[2]	Commercial Use[3]	Hazardous Waste Listing[4]	B1279-PCB-03 (Concr.)	B1279-PCB-04	B1285-PCB-01 (Concr.)	B1285-SPT-01	B1285-SPT-01	B1287-PCB-01	B1287-PCB-01 (resample)	B1287-PCB-02	B1287-PCB-03	B1287-PCB-04	B1287-PCB-05 (Concr.)	B1287-PCB-06 (Concr.)	B1287-PCB-07	B1287-SS11	B1287-W08	B1298-PCB-01	NWGate-PCB-01 (Concr.)
			Sample Type:	CHIP	SS	CHIP	WATER	SED	SED/WASTE	SED/WASTE	SLUDGE	SLUDGE	OIL	CHIP	CHIP	SS	SS	GW	SLUDGE	CHIP
Aroclor 1260	0.1	1	50	ND	ND	ND	ND	ND	**3.66**	**10.6**	ND	**6.53**	**1.5**	ND	ND	ND	**2.72**	ND	**2.98**	ND

Detected PCBs[1]	Unrestricted Use[2]	Commercial Use[3]	Hazardous Waste Listing[4]	TP-04	TP-05	TP-07	TP-09	TP-10	TP-11	TP-12	WDA-02-01	WDA-02-02	MW1231E-S(12-13.5')
			Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Aroclor 1260	0.1	1	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

1 - All values presented in milligrams per kilogram (mg/kg).
2 - 6 NYCRR Part 375-6.8 - Table 375-6.8(a): Unrestricted Use Soil Cleanup Objectives
3 - 6 NYCRR Part 375-6.8 - Table 375-6.8(b): Restricted Use Soil Cleanup Objectives
4 - NYSDEC Listing for Hazardous Waste 6 NYCRR Part 371.4(e)

Value Exceeds Unrestricted Use SCO [green]
Value Exceeds Commercial Use SCOs [orange]
Value Exceeds Haz Waste Level [red]

ND- Not detected above reporting limit
SS- sediment
SED- sediment

Note: B1235-PCB-02 and 03 not analyzed
B1227-PCB-02 was not a valid sample

Appendix B-
Health and Safety Plan

Lu Engineers
ENVIRONMENTAL • TRANSPORTATION • CIVIL

Verona Research Facility
Germany Road
Town of Verona
Oneida County, New York

Health and Safety Plan

Prepared for:

Air Force Research Laboratory
Rome Research Site

150 Electronic Parkway
Rome, New York 13441

September 2013

Verona Research Facility
Germany Road
Town of Verona
Oneida County, New York

Health and Safety Plan

Prepared for:

Air Force Research Laboratory
Rome Research Site

150 Electronic Parkway
Rome, New York 13441

Prepared By:

Lu Engineers
ENVIRONMENTAL • TRANSPORTATION • CIVIL

175 Sully's Trail, Suite 202
Pittsford, New York 14534

September 2013

Table of Contents

Lu Engineers
Site Safety Plan

A. GENERAL INFORMATION

Project Title:	Verona Research Site	Lu Project No.	13163-01
	Oneida County, New York		
	Remedial Investigation/Feasibility Study		
Project Director and Manager:	Gregory L. Andrus, CHMM		
Site Safety Officer:	Eric Detweiler		
Location:	Germany Road		
	Town of Verona, Herkimer County, New York		
Prepared by:	Janet M. Bissi, CHMM	Date Prepared:	August 27, 2013
		Date Revised:	September 13, 2013
Approved by:	Gregory L. Andrus, CHMM	Date Approved:	
Site Safety Officer Review:	Eric Detweiler	Date Reviewed:	

Scope/Objective of Work:

The purpose of planned Remedial Investigation/Feasibility Study (RI/FS) activities is to delineate and characterize the AOCs identified in the August 2013 Environmental Baseline Survey (EBS) Report and to provide sufficient information to adequately evaluate remedial alternatives, if necessary. The Scope of Work includes the following tasks:

- Task 1: Geophysical Survey
- Task 2: Test pit excavation
- Task 3: Surface soil sampling
- Task 4: Sediment Sampling from Brandy Brook
- Task 5: Septic Tank and Pump Station Sampling
- Task 6: Former PCB-Containing Equipment Sampling
- Task 7: Sub-Surface Investigation (Test Pits and Soil Borings)
- Task 8: Groundwater Investigation (Mini-Well Installation & Sampling)
- Task 9: Site Survey

Implementation of the tasks above will result in greater understanding of environmental impacts to surface and subsurface soil, underground utilities, and groundwater associated with the historic use of the Site.

Proposed Date of Field Activities: September 23, 2013 – December 23, 2013

Background Information: [ ] Complete [X] Preliminary (limited analytical data)

Overall Chemical Hazard: [ ] Serious [ ] Moderate
[X] Low [ ] Unknown

Overall Physical Hazard: [ ] Serious [ ] Moderate
[X] Low [ ] Unknown

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):
[X] Liquid [X] Solid [X] Sludge [X] Gas/Vapor

Characteristic(s):
[X] Flammable/Ignitable [X] Volatile [X] Corrosive [ ] Acutely Toxic
[ ] Explosive (moderate) [ ] Reactive [X] Carcinogen [ ] Radioactive
Other: ______

Physical Hazards:
[X] Overhead [ ] Confined Space [X] Below Grade [X] Trip/Fall
[X] Puncture [ ] Burn [X] Cut [X] Splash
[X] Noise [X] Other: Heat Stress/Cold Stress

Site History/Description and Unusual Features:
The Verona Research Facility (VRF), initially known as the Verona Test Annex, is located at 5586 Germany Road, in the Town of Verona, Oneida County, New York. The current VRF property (including the Space Command Complex currently utilized by the Oneida Indian Nation) includes approximately 512-acres of land developed with approximately 27 buildings, including laboratories and powerhouses. The property was developed in the 1950s to support research and development of precision antenna systems and aircraft navigation equipment, including electronic countermeasure and electronic counter-countermeasure research. Operations at VRF ceased in 2000.

A full description of the Site history is detailed in the 2013 EBS Report.

Locations of Chemicals/Wastes: Soil, groundwater, septic system, communication conduits, and sediments.

Estimated Volume of Chemicals/Wastes: unknown

Site Currently in Operation: [ ] Yes [X] No [ ] Not Applicable

C. HAZARD EVALUATION

PHYSICAL HAZARD EVALUATION:		
TASK	**HAZARD(S)**	**HAZARD PREVENTION**
Tasks 1 through 9	Heat stress/ cold stress exposure	Implement heat stress management techniques such as shifting work hours, increasing fluid intake, and monitoring employees. **See Appendix A.**
	Weather Extremes	Establish site-specific contingencies for severe weather situations. Discontinue work in severe weather.
	Slip/ trip/ fall	Observe terrain and be aware of the dangers of machete, while walking to minimize slips and falls. Steel-toed boots provide additional support and stability. Use adequate lighting. Inspect Site and mark existing hazards.
	Noise	**See Appendix B**
	Native wildlife presents the possibility of insect bites and associated diseases.	Avoid wildlife when possible. Use insect repellant. Check for ticks on skin and clothing.
	Biological (flora, fauna, etc.)	Be aware of sharp, rough vegetation especially during geophysical survey. Wear proper work boots and clothing.
Tasks 2-8	General physical hazards associated with drilling and excavating operations (overhead equipment, noise).	Hard hats and steel-toed boots required while working around heavy equipment. Keep a safe distance from equipment. **See Appendix B.**
	Heavy Equipment Operation	Define equipment routes, traffic patterns, and site-specific safety measures. Ensure that operators are properly trained and equipment has been properly inspected and maintained. Verify back-up alarms. Ensure that ground spotters are assigned and informed of proper hand signals and communication protocols. Identify special PPE and monitoring needs. Ensure that field personnel do not work in close proximity to operating equipment. Ensure that lifting capacities, load limits, etc., are not exceeded. Overhead obstructions and falling objects.
	Overhead Hazards/ Falling Objects	Wear hard hat. Identify overhead hazards prior to each task.
	Contact with or inhalation of contaminants, potentially in high concentration in soil.	To minimize exposure to chemical contaminants, a thorough review of suspected contaminants should be completed and implementation of an adequate protection program.
	Power Tools	Ensure compliance with 29 CFR 1910 Subpart P.
	Utility Lines	Identify/locate existing utilities prior to work. Ensure overhead utility lines are at least 25 feet away from project activities. Contact utilities to confirm locations, as necessary.
	Contact with or inhalation of decontamination solutions.	Material Safety Data Sheets for all decon solutions. First aid equipment available.

Physical Hazard Evaluation: Basic health and safety protection (steel-toed boots, work clothes, and safety glasses or goggles) will be worn by all personnel at all times. Any allergies should be reported to the Site Safety Officer prior to the start of the project. Respirators and Tyvek suits required for entry into buildings posted for asbestos.

D. SITE SAFETY WORK PLAN

Site Control: Entrances to the Site are gated and locked. Only authorized personnel may enter the Site. On-site buildings are posted for asbestos contamination and therefore, no buildings will be entered unless prior authorization has been granted and proper PPE is worn.

Perimeter Identified?	**[Y]**	**Site Secured?**	**[N]**
Work Areas Designated?	**[Y]**	**Zone(s) of contamination identified?**	**[Y]**

Anticipated Level of Protection (cross-reference task numbers in Section C):

Level of PPE:	A	B	C	D
		For entering on-Site buildings only	Available	X

All Site work will be performed at Level D (steel-toed boots, work clothes, eye protection, gloves and hard hats) unless monitoring indicates otherwise. Chemical resistant boots or booties shall be worn as appropriate to avoid contact with wet areas.

Level C will be available and shall be donned if sustained photoionization detector (PID) readings exceed 5 ppm and/or olfactory indications warrant. If building entrance is necessary,

Level B (Tyvek suits and half-face air respirators with HEPA cartridges) will be worn and disposed of within the buildings upon exiting.

Air Monitoring:

Contaminant	Monitoring Device	Frequency
Organic Vapors	MiniRAE 3000 PID	As Necessary

Action Level:
PID readings of **>5 ppm to 10 ppm** above background in the breathing zone, sustained for greater than 1 minute,

Action: Hault work activities and move away from the vapor source. Consider vapor suppression actions. If PID readings drop to within 5 ppm above background, work may resume with continuous air monitoring.

PID readings of **10 ppm to <25 ppm** above background at breathing zone, sustained for greater than 1 minute,
Action: Stop work and consider upgrade to Level C protection.

PID readings of **>25 ppm** above background at breathing zone, sustained for greater than 1 minute,

Action: Stop work.
All air monitoring results as well as wind direction and speed (estimates) will be documented in the site-specific log book.

Decontamination Solutions and Procedures for Equipment, Sampling Gear, etc.
Specified in work plan.

Personnel Decon Protocol: Soap, water, and paper towels or baby wipes will be available for all personnel and will be used before eating, drinking or leaving the site. Personnel will shower upon return to home or hotel. Disposable PPE will be double bagged and disposed of in a sanitary waste dumpster. Tykev suits will be disposed of in the site buildings upon exiting the building.

Decon Solution Monitoring Procedures, if Applicable: Based on previous investigations, it is assumed that decontamination solutions may be discharged onsite to the ground surface.

Special Site Equipment, Facilities or Procedures (Sanitary Facilities and Lighting Must Meet 29CFR 1910.120): Due to the remote location of the Site, personnel will be required to maintain the Buddy System. All parties will be required to attend an on-Site briefing, which will identify the roles of each organization's personnel and will integrate emergency procedures for all Site participants. A portable restroom will be mobilized the Site for the duration of field activities.

Site Entry Procedures and Special Considerations: Entry to the Site should be limited to authorized personnel, through the main gate, in accordance with the AFRL and VRS regulations. The Buddy System should be employed when on-site and entering and exiting the Site, along with the work zone areas.

Work Limitations (time of day, weather conditions, etc.) and Heat/Cold Stress Requirements: All work will be completed during daylights hours. Severe inclement weather may be cause to suspend outdoor activities. Cold stress protocol will dictate work/rest regimen. Heavy equipment will not be used during electrical storms. No transfer of materials can be conducted outside of normal RRS working hours.

Investigation Derived Material (i.e., Expendables, Decon Waste, Cuttings) Disposal:
Specified in work plan.

Sampling Handling Procedures Including Protective Wear: All sample handling will be performed while wearing nitrile gloves. To minimize hazards to lab personnel, sample volumes will be no larger than necessary, and the outside of all sample containers will be wiped clean prior to shipment.

Accident and Injury Reporting: Any work-related incident, accident, injury, illness, exposure, or property loss must be reported to the Lu Engineers project manager. This includes:

- Accident, injury, illness, or exposure of an employee;
- Injury of a subcontractor;
- Damage, loss, or theft of property, and/or

- Any motor vehicle accident regardless of fault, which involves a company vehicle, rental vehicle, or personal vehicle while employee is acting in the course of employment.

E. TRAINING REQUIREMENTS

All personnel conducting field activities on site are required to have completed training sessions in accordance with Occupational Safety and Health Administration (OSHA) for Parts 1926 and 1910 (Title 29 Code of Federal Regulations [CFR] Part 1926.65 and Part 1910.120 - Hazardous Waste Operations and Emergency Response- 'HazWOPER'). This training shall consist of a minimum of 40 hours of instruction off-site and three days of actual field experience under the direct supervision of a trained, experienced supervisor. Each employer will maintain documentation stating that its on-site personnel have complied with this regulation.

In addition, each employee PPE worn by each employee will be in compliance with OSHA Parts 1910.132-140. Also, each employee needed to wear a respirator will be in compliance with OSHA Respiratory Protection standards Part 1910.134.

All personnel will have reviewed this HASP and received a site-specific health and safety briefing prior to participating in field work.

All visitors entering the work area must review the HASP and be equipped with the proper PPE. All site personnel and visitors shall sign the last page of the HASP as an acknowledgement that they have read and understand the Site health and safety requirements.

Medical Surveillance Requirements: All Lu Engineers field staff who engage in onsite activities for 30 days or more per year participate in a medical monitoring program and have completed applicable training per 29CFR 1910.120. Respiratory protection program meets requirements of 29CFR 1910.134.

Team Member*	**Responsibility**
Gregory L. Andrus	Project Manager & Field Team Leader
Laura Neubauer	Alternate Field Team Leader
Eric Detweiler	Field Geologist/Site Safety Officer
Sara Kashtan	Field Technician
Janet Bissi	Field Technician

* All entries into the work zone require use of "Buddy System".

F. EMERGENCY INFORMATION

LOCAL RESOURCES

Ambulance:	911
Hospital Emergency Room:	Oneida Health Care Center
	321 Genesee Street, Oneida New York
Poison Control Center:	911
Police (include local, county sheriff, state):	911
Fire Department:	911
Airport:	N/A
Laboratory:	Paradigm Environmental Services, Inc. 179 Lake Ave., Rochester, NY 14608 (585) 647-3311
UPS/Federal Express:	**Nearest Fed Ex**: 115 Dry Rd., Oriskany, NY 13424 (last ground pickup 6:00 pm M-F) **Nearest UPS**: 761 Lenox Ave, Oneida, NY 13421 (last ground pickup 4:00 pm M-F) Alternate UPS: 5880 Success Dr., Rome, NY (last ground pickup 6:00 pm M-F)

SITE RESOURCES

Site Emergency Evaluation Alarm Method:	Sound vehicle horn
Water Supply Source:	Gallons of water will be available in vehicles
Telephone Location, Number:	None available
Cellular Phone, if Available:	Onsite cell # TBD
Other: IFOCV Office	(315) 330-2098

EMERGENCY CONTACTS

1. Fire/Police:		911
2. Lu Engineers, Safety Director:		(585) 385-7417 (office)
3. Lu Engineers, Gregory L. Andrus		(585) 385-7417, Ext. 215 (office) (585) 732-5786 (Cellular phone)

EMERGENCY ROUTES

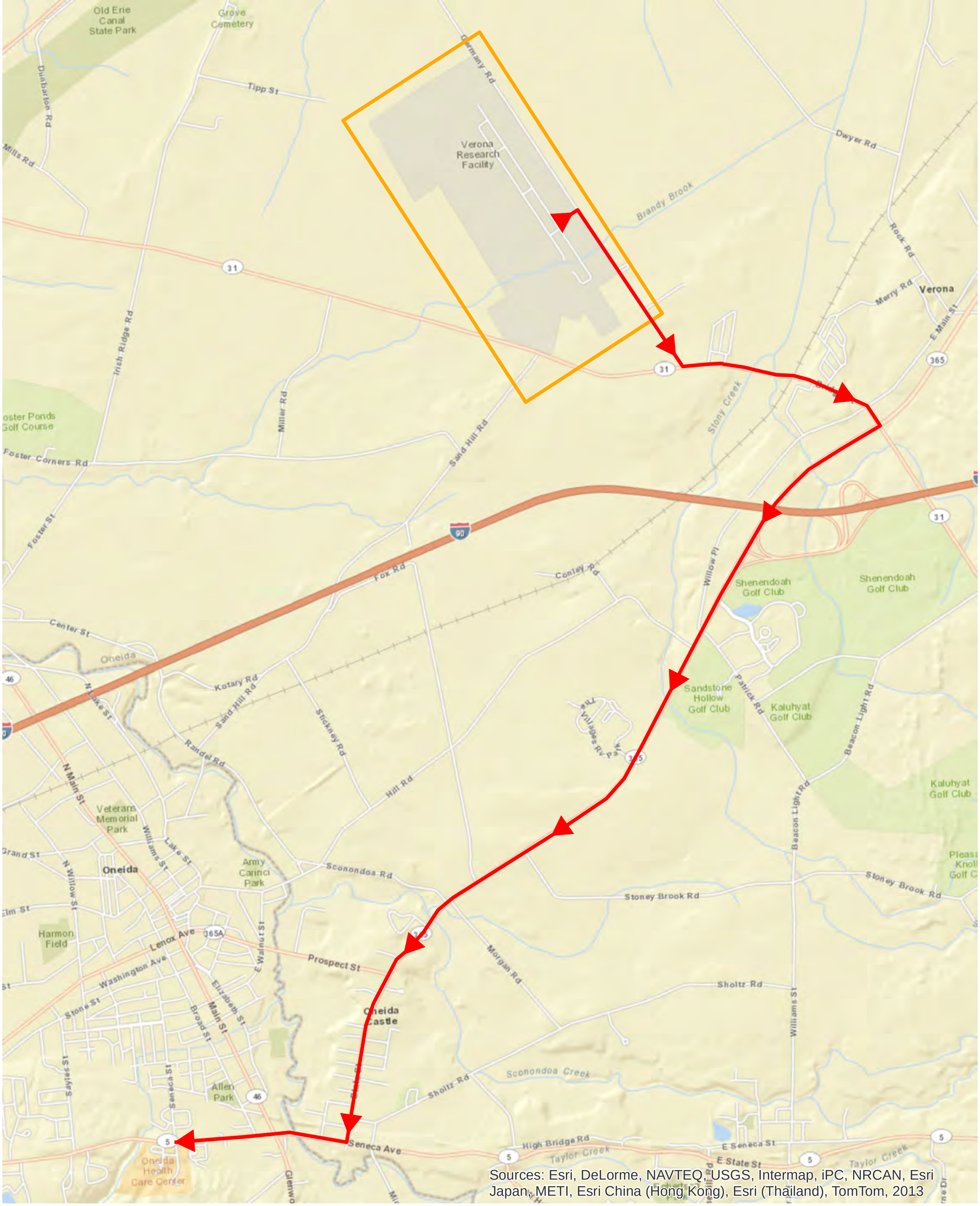
Note: Field team must know route(s) prior to start of work.

Directions from the site to Oneida Health Care Center (map on following page):
Proceed east to main gate. Turn right onto Germany Road. Turn left onto NYS 31 and proceed east to NYS Route 365. Veer right (west) onto NYS Route 365. Proceed 4.8 miles to State Route 5. Turn right (west) onto State Route 5 and proceed 1 mile. Hospital is on the left side of the road at the intersection of Seneca Street and State Route 5.

On-site Assembly Area: At Site entry point.

Off-site Assembly Area: Consult with RRS/IFCOV.

Emergency egress routes to get off-Site: East or west on Germany Road.



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HOSPITAL ROUTE MAP
VERONA RESEARCH FACILITY
VERONA, NY

DATE: AUGUST 2013	
SCALE: 1:24,000	
DRAWN/CHECKED: GLA/SMK	
DATA SOURCE: USGS Digital Raster Graphic quadrangle 1978	

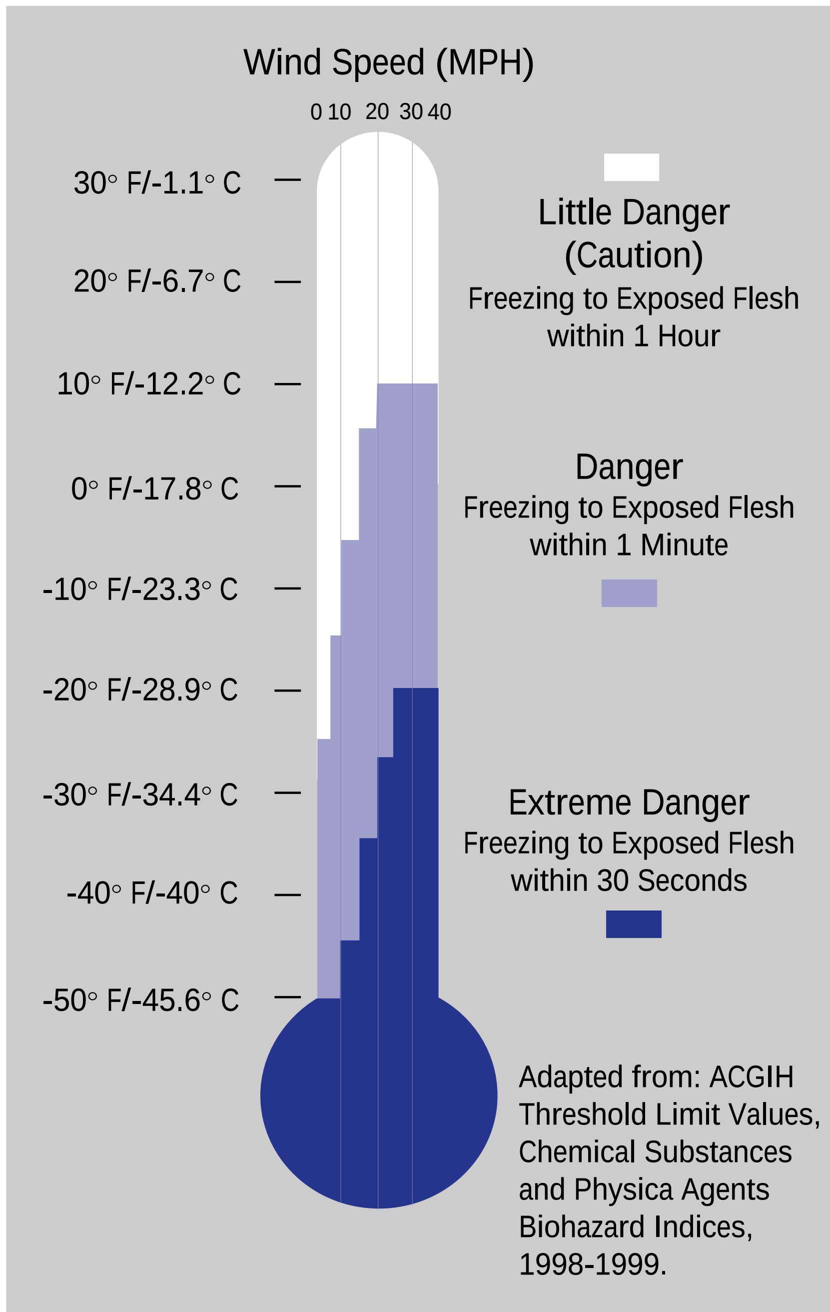
APPENDIX B-1

COLD EXPOSURE

THE COLD STRESS EQUATION

LOW TEMPERATURE + WIND SPEED + WETNESS = INJURIES & ILLNESS

When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result. **Hypothermia** can occur when *land temperatures* are **above** freezing or *water temperatures* are below 98.6°F/ 37°C. Cold-related illnesses can slowly overcome a person who has been chilled by low temperatures, brisk winds, or wet clothing.



Adapted from: ACGIH Threshold Limit Values, Chemical Substances and Physica Agents Biohazard Indices, 1998-1999.

U.S. Department of Labor
Occupational Safety and Health Administration
OSHA 3156
1998

FROST BITE

What Happens to the Body:

FREEZING IN DEEP LAYERS OF SKIN AND TISSUE; PALE, WAXY-WHITE SKIN COLOR; SKIN BECOMES HARD and NUMB; USUALLY AFFECTS THE FINGERS, HANDS, TOES, FEET, EARS, and NOSE.

What Should Be Done: (land temperatures)

- Move the person to a warm dry area. Don't leave the person alone.
- Remove any wet or tight clothing that may cut off blood flow to the affected area.
- **DO NOT** rub the affected area, because rubbing causes damage to the skin and tissue.
- **Gently** place the affected area in a warm (105°F) water bath and monitor the water temperature to **slowly** warm the tissue. Don't pour warm water directly on the affected area because it will warm the tissue too fast causing tissue damage. Warming takes about 25-40 minutes.
- After the affected area has been warmed, it may become puffy and blister. The affected area may have a burning feeling or numbness. When normal feeling, movement, and skin color have returned, the affected area should be dried and wrapped to keep it warm. **NOTE:** If there is a chance the affected area may get cold again, do not warm the skin. If the skin is warmed and then becomes cold again, it will cause severe tissue damage.
- Seek medical attention as soon as possible.

HYPOTHERMIA - (Medical Emergency)

What Happens to the Body:

NORMAL BODY TEMPERATURE (98.6° F/37°C) DROPS TO OR BELOW 95°F (35° C); FATIGUE OR DROWSINESS; UNCONTROLLED SHIVERING; COOL BLUISH SKIN; SLURRED SPEECH; CLUMSY MOVEMENTS; IRRITABLE, IRRATIONAL OR CONFUSED BEHAVIOR.

What Should Be Done: (land temperatures)

- Call for emergency help (i.e., Ambulance or Call 911).
- Move the person to a warm, dry area. Don't leave the person alone. Remove any wet clothing and replace with warm, dry clothing or wrap the person in blankets.
- Have the person drink warm, sweet drinks (sugar water or sports-type drinks) if they are alert. **Avoid drinks with caffeine** (coffee, tea, or hot chocolate) or alcohol.
- Have the person move their arms and legs to create muscle heat. If they are unable to do this, place warm bottles or hot packs in the arm pits, groin, neck, and head areas. **DO NOT** rub the person's body or place them in warm water bath. This may stop their heart.

What Should Be Done: (water temperatures)

- Call for emergency help (Ambulance or Call 911). Body heat is lost up to 25 times faster in water.
- **DO NOT** remove any clothing. Button, buckle, zip, and tighten any collars, cuffs, shoes, and hoods because the layer of trapped water closest to the body provides a layer of insulation that slows the loss of heat. Keep the head out of the water and put on a hat or hood.
- Get out of the water as quickly as possible or climb on anything floating. **DO NOT** attempt to swim unless a floating object or another person can be reached because swimming or other physical activity uses the body's heat and reduces survival time by about 50 percent.
- If getting out of the water is not possible, wait quietly and conserve body heat by folding arms across the chest, keeping thighs together, bending knees, and crossing ankles. If another person is in the water, huddle together with chests held closely.

How to Protect Workers

- Recognize the environmental and workplace conditions that lead to potential cold-induced illnesses and injuries.
- Learn the signs and symptoms of cold-induced illnesses/injuries and what to do to help the worker.
- Train the workforce about cold-induced illnesses and injuries.
- Select proper clothing for cold, wet, and windy conditions. Layer clothing to adjust to changing environmental temperatures. Wear a hat and gloves, in addition to underwear that will keep water away from the skin (polypropylene).
- Take frequent short breaks in warm dry shelters to allow the body to warm up.
- Perform work during the warmest part of the day.
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Use the buddy system (work in pairs).
- Drink warm, sweet beverages (sugar water, sports-type drinks). Avoid drinks with caffeine (coffee, tea, or hot chocolate) or alcohol.
- Eat warm, high-calorie foods like hot pasta dishes.

Workers Are at Increased Risk When…

- They have predisposing health conditions such as cardiovascular disease, diabetes, and hypertension.
- They take certain medication (check with your doctor, nurse, or pharmacy and ask if any medicines you are taking affect you while working in cold environments).
- They are in poor physical condition, have a poor diet, or are older.

APPENDIX B-2

ADDITIONAL POTENTIAL PHYSICAL AND CHEMICAL HAZARDS

ADDITIONAL POTENTIAL PHYSICAL AND CHEMICAL HAZARDS	
POTENTIAL PHYSICAL HAZARDS	**CONTROL METHODS**
Overhead Hazards/Falling Objects	Overhead hazards will be identified prior to each task (i.e., inspecting drill rig mast, building structure). Hard hats will be required for each task that poses an overhead hazard.
Contact with Utilities	Prior to initiating site activities, all utilities will be located by the appropriate utility company and will be marked and/or barricaded to minimize the potential of accidental contact. A minimum distance of 25 feet between the derrick and overhead power lines must be maintained at all times.
Noise Exposure	Areas of potentially high sound pressure levels (>85 dBA) will be restricted to authorized personnel only. Engineering controls will be used to the extent possible. Hearing protection will be made available to all workers on site. Exposure to time-weighted average levels in excess of 85 dBA is not anticipated.
POTENTIAL CHEMICAL HAZARDS	**GENERAL CONTROL METHODS**
Contaminant Inhalation	Direct reading instruments (Op-Tech) and/or olfactory indications will be used to monitor airborne contaminants. Established Lu Engineers' action levels will limit exposure to safe levels. Respiratory protection will be used as appropriate.
Contaminant Ingestion	Standard safety procedures such as restricting eating, drinking, and smoking to the support zone and utilizing proper personal decontamination procedures will minimize ingestion as a potential route of exposure.
Dermal Contaminant Contact	The proper selection and use of personal protective clothing and decontamination procedures will minimize dermal contaminant contact.
Potential contact with lower concentration waste and naturally occurring contaminants (i.e., methane)	Dermal contact with contaminants will be minimized by proper use of the following PPE: • Tyvex coveralls • Neoprene gloves • Booties (latex) or over-boots.

APPENDIX B-3

CHEMICAL HAZARD EVALUATION

CHEMICAL HAZARD EVALUATION										
Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
2-8	Acetone	1000 ppm	250 ppm	500 ppm	Y	Inh, Ing, Con	Irritation to eyes, nose, or throat, skin, skin burns, loss of coordination and equilibrium	Sharp penetrating odor, mint like	1.1	9.69
2-8	Aroclor 1260 (PCB)*	0.5 sk mg/m^3	---	0.5 sk mg/m^3	Y	Abs, Inh, Ing	Irritation to eyes and skin; dermatitis, liver damage	---	---	---
2-8	Arsenic*	0.010 mg/m^3	---	0.01 mg/m^3	Y	Inh, Ing, Abs, Con	Coughing, irritation to eyes, nose, throat, respiratory tract, inflammation of mucous membranes, dyspnea (labored breathing), cyanosis, and rales (rattle breathing), vomiting, bloody diarrhea, cold clammy skin, low blood pressure, weakness, headache cramps, convulsions, coma, redness, burns to skin	Odorless/silver gray or tin white brittle (metal, inorganic), also can be in solution (clear & odorless)	---	---
2-8	Asbestos*	0.1 fibers/cc	---	0.2 - 2.0 fibers/cc	N	Inh, Ing	None.	Odorless	---	---
2-8	Barium	0.5 mg/m^3	---	0.5 mg/m^3	N	Inh, Ing, Con	Irritation to eyes, nose, throat, or skin; stomach pains, slow pulse, irregular heart beat	Odorless	---	---

CHEMICAL HAZARD EVALUATION										
Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
2-8	Benzene*	1 ppm	---	10 ppm	Y	Inh, Abs, Ing, Con	Irritation to eyes, skin, nose, respiratory system; headache, nausea, dizziness, drowsiness, unconsciousness, harmful, fatal if aspirated into lungs	Colorless to light yellow liquid, sweet aromatic odor	0.5	9.25
2-8	Cadmium*	0.005 mg/m^3	LFC	0.01 mg/m^3	N	Inh, Ing, Con	Irritation to eyes, nose, throat, cough, tight chest/pain, dyspnea, pulmonary edema, sweating, chills, slow pulse, muscle aches, weakness, death	Silvery/white (blue tinged) lustrous solid, odorless	---	N/A
2-8	Chlorobenzene	75 ppm	---	10 ppm	Y	Inh, Ing, Con	Irritation skin, eyes, nose, respiratory tract, coughing, shortness of breath, dizziness, incoordination, unconsciousness. GI irritation, toxic may cause systematic poisoning, nausea, vomiting, diarrhea	Colorless liquid, faint almond-like odor	0.4	9.06
2-8	Chromium (metal)	1.0 mg/m^3	0.5 mg/m^3	0.5 mg/m^3	N	Inh, Ing, Con	Irritation to eyes, skin and respiratory tract (lungs), ulceration of skin and mucous membranes, rash, electrolyte disturbances	Blue-white to steel gray lustrous brittle hard, odorless solid	---	N/A
2-8	1,2-Dichloroethane*	1 ppm	40 mg/m^3	10 ppm	Y	Inh, Ing, Abs, Con	Nausea, vomiting mental confusion, headache, skin burns, dermatitis, cornea (eye) damage	Pleasant chloroform odor, sweet taste	NR	11.05

CHEMICAL HAZARD EVALUATION										
		Exposure Limits (TWA)							FID/PID	
Task Number	Compound	PEL	REL	TLV	Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	Relative Response	Ioniz. Poten. (eV)
2-8	4,4'-DDT*	1 mg/m^3		1 mg/m^3		Avoid physical contact	N/A (Toxic irritant)			
2-8	Dichlorobenzene (p-)	75 ppm	---	10 ppm	Y	Inh, Ing, Abs, Con	Irritation to eyes, nose, throat, skin, loss of consciousness, cyanosis, irregular pulse	Moth balls	---	---
2-8	Dichlorodifluoromethane (CFC 12)	1000 ppm	1000 ppm	---	N	Inh, skin or eye contact	Dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite	Colorless, odorless gas	---	11.75
2-8	Dieldrin	N/A	---	N/A	Y	Inh, Con, Abs	Irritation to eyes, nose, throat, skin, death	---	---	---
2-8	Diesel Fuel	N/A	---	N/A	Y	Ing, Ing, Abs, Con	Irritation to eyes, lungs, skin	Gasoline	---	---
2-8	Endosulfan II (beta)	---	---	---	N	Inh, Ing, Con	N/A (Toxic irritant)	Grayish-white powder (pesticide)	---	N/A

CHEMICAL HAZARD EVALUATION										
Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
2-8	Lead	0.05 mg/m^3	0.05 mg/m^3	0.05 mg/m^3	Y	Inh, Ing, Con	Poison, abdominal pain, spasms, nausea, vomiting, headache, irritation to eyes; skin, weakness, metallic taste, anorexia/loss of appetite, insomnia, facial pallor, colic, anemia, tremor, “lead line” in gums, constipation, abdominal pain, paralysis in wrists and ankles, encephalopathy (inflammation of brain)	Odorless	---	---

CHEMICAL HAZARD EVALUATION

Task Number	Compound	Exposure Limits (TWA) PEL	REL	TLV	Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID Relative Response	FID/PID Ioniz. Poten. (eV)
2-8	Mercury	0.1 sk mg/m^3 ceiling	0.1 mg/m^3 ceiling 0.05 mg/m^3 ceiling	0.025 sk mg/m^3	Y	Inh, Abs, Ing, Con	Severe respiratory tract damage, sore throat, coughing, pain, tightness in chest, breathing difficulties, headache, muscle weakness, anorexia, GI disturbances, ringing in ear, liver changes fever, bronchitis, pneumonitis, burning in mouth, abdominal pain, vomiting, corrosive ulceration, bloody diarrhea, weak & rapid pulse, paleness, exhaustion, tremors, collapse, thirst, burns and irritates skin, eyes, blurred vision, pain in eyes	Silver-white, heavy, odorless liquid metal	---	N/A
2-8	Methyl Ethyl Ketone (2-Butanone, MEK)	200 ppm	200 ppm	200 ppm	Y	Inh, Ing, Con	Irritation to eyes, nose; skin, dizziness, nausea, drowsiness, CNS depression, unconsciousness	Mint or acetone-like	0.9	9.51
2-8	Silver	0.01 mg/m^3	---	0.1 mg/m^3	Y	Inh, Ing, Con	Blue gray eyes, irritation to nasal septum, throat, skin, ulcerations to skin, GI disturbances	White to gray lustrous/ metallic solid, odorless	---	---

CHEMICAL HAZARD EVALUATION										
		Exposure Limits (TWA)							FID/PID	
Task Number	Compound	PEL	REL	TLV	Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	Relative Response	Ioniz. Poten. (eV)
2-8	1,2,3-Trichlorobenzene	---	---	---	Y	Inh, Ing	Causes eye, skin, and respiratory tract irritation. Harmful if swallowed.	White solid with a sharp chlorobenzene odor. (mothlike) Insoluble in water and denser than water.	---	
2-8	Trichlorobenzene (1,2,4-Trichlorobenzene)	N/A	---	N/A	N	Inh, Abs, Ing, Con	Irritation to eyes, mucous membranes, possible liver, kidney damage	Colorless to white liquid, aromatic odor (@ 63 F turns solid/ crystalline)	---	N/A
2-8	Trichloroethene* (TCE)	100 ppm (per 6/97 NIOSH Pocket Guide)	25 ppm (per 2005 NIOSH Pocket Guide)	10 ppm	Y	Inh, Abs, Ing, Con	Irritation to eyes, skin, mucous membranes and GI, headache, vertigo, fatigue, giddiness, tremors, vomiting, nausea, may burn skin, visual disturbance, paresthesia, cardiac arrhythmias	Colorless liquid, sometimes dyed blue, chloroform odor	---	9.45
2-8	Vinyl Chloride*	1 ppm	---	1 ppm	Y	Inh, Con	Dulled auditory and visual response, headache, weakness, frostbite, GI bleeding, pallor or cyanosis of extremities, abdominal pain, bleeding	Colorless liquefied gas, pleasant odor at high concentrations (3000 ppm)	2.0	9.99

KEY:

PEL = Permissible Exposure Limit
REL = Recommended Exposure Limit
--- = Information not available
TLV = Threshold Limit Value(ACGIH)

Inh = Inhalation
Ing = Ingestion
mg/m^3 = Milligrams per cubic meter
* = Chemical is a known or suspected carcinogen

Abs = Skin Absorption
Con = Skin and/or eye Contact
ppm = Parts per million
sk = Skin notation

Appendix C
Quality Assurance Project Plan

Lu Engineers
ENVIRONMENTAL • TRANSPORTATION • CIVIL

Verona Research Facility
Germany Road
Town of Verona
Oneida County, New York

Quality Assurance Project Plan

Prepared for:

Air Force Research Laboratory
Rome Research Site

150 Electronic Parkway
Rome, New York 13441

September 2013

Verona Research Facility
Germany Road
Town of Verona
Oneida County, New York

Quality Assurance Project Plan

Prepared for:

Air Force Research Laboratory
Rome Research Site

150 Electronic Parkway
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Prepared By:

175 Sully's Trail, Suite 202
Pittsford, New York 14534

September 2013

Table of Contents

1.0 Introduction

This Quality Assurance Project Plan (QAPP) was prepared in accordance with the United States Environmental Protection Agency (US EPA) Region 2 "Guidance for the Development of Quality Assurance Project Plans for Environmental Monitoring Projects" (April 2004) and is subject to the review and approval by the New York State Department of Environmental Conservation (NYSDEC) for the Verona Research Facility (VRF), Town of Verona, New York. This QAPP provides quality assurance/quality control (QA/QC) protocols and guidance that are to be followed when implementing the Remedial Investigation/Feasibility Study (RI/FS) Work Plan for the Site to ensure that data of a known and acceptable precision and accuracy are generated.

The QAPP also provides a summary of the project, identifies personnel responsibilities, and provides procedures to be used during sampling of environmental media, other field activities, and the analytical laboratory testing of samples.

1.1 Project Scope and Objective

The QAPP applies to the aspects of the project associated with the collection of field data, laboratory testing of field samples and QA/QC samples, and evaluation of the quality of data that is generated. The scope of work is described in the RI/FS Work Plan Section 4.0. In general, the project objective is to obtain sufficient information to further characterize the nature and extent of contamination on the Site to assist in the development of a technical remedial action plan.

2.0 Project Organization and Responsibility

Project organization and tentative personnel to implement the work are outlined in this section of the QAPP.

2.1 Rome Research Site Project Manager

Ms. Jacklyn Karam will serve as the Rome Research Site (RRS) Project Manager on this project. Ms. Karam will review project documents, assist in key decisions as they relate to various components of the project, etc., as deemed necessary by RRS.

2.2 Lu Engineers Organization

Lu Engineers will provide environmental consulting and engineering for the project. Additional information regarding key personnel is provided as follows, and resumes of key personnel are included in the RI/FS Work Plan - Attachment D.

Project Director and Manager

The project director and manager for this project will be Gregory Andrus, CHMM. As project director, Mr. Andrus will have overall responsibility for ensuring that the project meets client objectives and Lu Engineers' quality standards. In addition, the project director will be responsible for technical quality control and project oversight and will provide the project manager with access to upper management.

As project manager, Mr. Andrus will be responsible for implementing the project and will have the authority to commit the resources necessary to meet project objectives and requirements. The project manager's primary function is to ensure that technical, financial, and scheduling objectives are achieved. The project manager will provide the major point of contact and control for matters concerning the project.

Quality Assurance Officer (QAO)

The QA officer responsible for QA/QC on this project is Steven A. Campbell. The QAO may conduct audits of the operations at the Site to ensure that work is being performed in accordance with the QAPP.

Technical Staff

The technical staff (team members) for this project will be drawn from Lu Engineers pool of resources. The technical team staff will be utilized to gather and analyze data and to prepare various task reports and support materials. All of the designated technical team members are experienced professionals who possess the degree of specialization, training and technical competence required to effectively and efficiently perform the required work.

2.3 Analytical Laboratory

Paradigm Environmental Services Inc. of Rochester, New York will provide analytical services for the project. Paradigm is a New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) Contract Laboratory Protocol (CLP)-certified laboratory (ELAP ID 10958). A copy of Paradigm's Statement of Qualifications is available upon request.

The laboratory Project Manager for this project is Jane Deloia.

The laboratory QA Manager is Bruce Hoogester.

2.4 Data Validation Staff

All environmental data will be validated in accordance with the USEPA Region 2, Data Validation SOPs for SW-846 methods. The third party data validation staff is to be determined.

If necessary, data validation will include technical specialists who remain independent of the laboratory and project management. The staff will independently validate analytical data to assess and summarize their accuracy, precision, and reliability and determine their usability. The staff will also perform audits and document the historical record of project activities, including any factors affecting data usability, such as data discrepancies and deviations from standard practices.

3.0 Quality Assurance/Quality Control

As part of this QAPP, QA/QC protocol and procedures have been developed and are described below. The objective of the QA/QC protocol and procedures is to ensure that the information, data, and decisions associated with this project are technically sound and properly documented. These QA/QC protocol and procedures will be modified in supplemental work plans when deemed appropriate.

3.1 Operation and Calibration of On-Site Monitoring Equipment

The on-Site monitoring equipment includes volatile organic compound (VOC) monitors, particulate monitors, electronic water level indicators, water quality meters, and Global Positioning System (GPS) units. Operation and calibration of monitoring equipment anticipated for use during the project are discussed below.

3.1.1 VOC Monitoring Equipment

Real-time monitoring for VOCs will be conducted to evaluate the nature and extent of petroleum discharges at the Site and to monitor worker breathing zone air as noted in the Health and Safety Plan (HASP). The primary field instrument for monitoring VOCs will be a photoionization detector (PID). It is anticipated that a MiniRAE 3000 PID equipped with a 10.6 eV lamp will be used during this project. An accredited firm/testing laboratory will calibrate the equipment on a yearly basis. During fieldwork, the PID will be calibrated on a daily basis in accordance with the manufacturer’s specifications. Isobutylene gas will be used to calibrate the PID prior to use and as necessary during fieldwork. Daily PID calibrations will be recorded in the field logbook.

3.1.2 Miscellaneous Field Monitoring Equipment

Several other types of field monitoring equipment will be used during the project, including:

- An electronic static water level indicator;
- A YSI Professional Plus water quality meter that measures pH, specific conductivity, temperature, dissolved oxygen, and oxygen-reduction potential; and
- A LaMotte 2020e turbidity meter.

These meters will be calibrated, operated, and maintained in accordance with the manufacturer's recommendations.

3.2 Surface Soil, Sediment and Water Sampling

Surface soil and sediment samples will be collected from locations indicated on the sample location maps, Figures 2-7 of the RI/FS Workplan. Samples will be obtained with a pre-cleaned stainless steel trowel or spoon and transferred to the appropriate clean glass containers. Sufficient sample volume (as specified by the laboratory) will be collected to fill the sample bottles. All tools to be used will be decontaminated according to procedures outlined in Section 4.0 prior to usage. Non-Aqueous waste samples collected from the septic tank and pump stations will be collected using a dipper.

Any observable physical characteristics of the soil, sediment or non-aqueous water as it is being sampled (i.e., color, odor, physical state) will be recorded on appropriate sampling logs (i.e., surface soil, sediment, septic tank, pump station and electrical conduit sampling logs).

3.3 PCB Samples

Concrete chip samples will be collected from the three(3) structures on the western portion of the Site. Four (4) chip or oil samples will be collected from within B1250 and analyzed for oil. Two (2) oil samples will be collected from transformers at B1226 and B1225 that were previously tested for VOCs and metals.

Bulk solid sampling typically includes removing a small portion of the potentially contaminated material for analytical testing. For example, a sediment, oil, or concrete chip sample would be the quantity of material needed by the laboratory for analytical testing, removed directly from the suspect area. Care will be taken to ensure that only the desired material is included in the final sample so as not to skew the sample analysis results.

3.4 General Soil Screening and Logging

During subsurface investigation, a Lu Engineers field team member will document visual observations, screen the soils with a PID, collect selected samples for laboratory analysis, photograph the field work, and prepare the appropriate field logs to document pertinent information. Pertinent information will be recorded on test pit logs and boring/well logs, and will include:

- Date, location identification, and project identification;
- Name of individual completing the log;
- Name of contractor;
- Equipment make and model, and auger size;
- Drilling methods used;

- Depths recorded in feet and fractions thereof referenced to ground surface;
- Standard penetration test (American Standards Testing Materials (ASTM) D-1586) blow counts;
- Sample depth interval and % recovered;
- Description of soil type using the Unified Soil Classification System or New York State Department of Transportation (NYSDOT) Soil Control Procedure STP-2 “An Engineering Description of Soils, Visual-Manual Procedure”;
- Depth of water encountered;
- Well specifications (materials, screened interval, etc.); and
- PID screening results of soil samples.

Logs for wells advanced into bedrock will also include pertinent information pertaining to the following characteristic noted on the bedrock cores:

- Bedrock type and lithology;
- Core Recovery Calculations and Rock Quality Determinations (RQDs);
- Bedrock field strength, color, and texture;
- Bedrock degree of decomposition, weathering, and disintegration;
- Bedrock fracture types (i.e., vertical, lateral, diagonal, mechanical), density, and fracture infilling; and
- The anticipated formation name.

3.4 Well Development

After completion of the wells, but not sooner than 48-hours after grouting is completed, development will be accomplished using submersible pumps. No dispersing agents, acids, disinfectants, or other additives will be used during development nor will they be introduced into the well at any other time. During development, water will be removed throughout the entire water column by periodically lowering and raising the pump intake.

Well development will consist of gentle surging followed by pumping the well to remove sediments from the well screen and surrounding formation. In a case where considerable drill water is lost to the formation during drilling, an attempt to remove a volume of water greater than the volume lost will be made. If this is not feasible, a greater amount of time between development and groundwater sampling will be allotted.

The development process will continue until clarity (goal of <50 NTUs) of the discharge is achieved, the well is purged dry repeatedly, or for a maximum of two hours. Pertinent information from development activities will be recorded on Well Development Field Forms.

3.5 Low-Flow Groundwater Purging and Sampling

Prior to purging and sampling, static water level measurements will be taken from each well using a Solinst water level meter, or similar instrument. The presence and thickness of any light non-aqueous phase liquids (LNAPL) will be noted in the field logbook.

A portable peristaltic pump (i.e., Geopump) connected to new disposable polyethylene tubing will be used for collection of groundwater samples. The tubing will be lowered into the well and positioned at or slightly above the mid-point of the well screen. Care will be taken to install and lower the tubing slowly in order to minimize disturbance of the water column.

A pumping rate of less than 500 ml/min will be selected. The water level in the well will be measured and the pump rate will be adjusted until the drawdown is stabilized.
The water level in the well will be measured periodically using an electronic water level meter to ensure optimum flow rate for purging and sampling.

When the water level in the well has stabilized (i.e., goal of <0.3 feet of drawdown once stabilized), water quality parameters will be monitored at a frequency of 3-5 minutes with a YSI Professional Plus (or equivalent) water quality meter using an in-line flow-through cell. Turbidity will be measured with a LaMotte 2020e (or equivalent) turbidity meter. Water quality indicator parameters will be considered stabilized after three consecutive readings of each of the following parameters are achieved:

- pH (± 0.1)
- specific conductance (± 3%)
- dissolved oxygen (± 10%)
- oxidation-reduction potential (± 10 mV)
- temperature (± 10%)
- turbidity (± 10%, when turbidity is greater than 10 NTUs)

Following stabilization of water quality parameters, the flow-through cell will be disconnected and a groundwater sample will be collected from the tubing. The pumping rate during sampling will remain at the established purge rate or it may be adjusted downward to minimize aeration. A pumping rate below 250 ml/min will be used when collecting VOC samples.

Field observations, water quality parameters, and other pertinent information obtained during sampling will be recorded on Low-Flow Groundwater Sampling Field Records.

3.6 Field QC Samples

Various types of field QC samples are used to check the cleanliness and effectiveness of field handling methods. They are analyzed in the laboratory as samples, and their purpose is to assess the sampling and transport procedures as possible sources of sample contamination and document overall sampling and analytical precision.

- **Trip Blanks** are similar to field blanks with the exception that they are not exposed to field conditions. Their analytical results give the overall level of contamination from everything except ambient field conditions. Trip blanks are prepared at the lab prior to the sampling event and shipped with the sample bottles.

  Trip blanks are prepared by adding organic-free water to a 40-ml volatile organic analysis (VOA) vial. One trip blank will be used with every batch of water samples shipped for volatile organic analysis. Each trip blank will be transported to the sampling location, handled like a sample, and returned to the laboratory for analysis without being opened in the field.

- **Field Equipment/Rinseate Blanks** are blank samples designed to demonstrate that sampling equipment has been properly prepared and cleaned before field use and that cleaning procedures between samples are sufficient to minimize cross-contamination. Rinseate blanks are prepared by passing analyte-free water over sampling equipment and analyzing the samples for all applicable parameters. If a sampling team is familiar with a particular site, its members may be able to predict which areas or samples are likely to have the highest concentration of contaminants. Unless other constraints apply, these samples should be taken last to avoid excessive contamination of sampling equipment. Rinseate blanks are not required if dedicated sampling equipment is used for sample collection.

- **Field Duplicates** consist of a set of two (2) samples collected independently at a sampling location during a single sampling event. Field duplicates can be sent to the laboratory so that they are indistinguishable from other analytical samples and personnel performing the analysis are not able to determine which of the samples field duplicates are. Field duplicates are designed to assess the consistency of the overall sampling and analytical system.

Field QC samples and the frequency of analysis for this project are summarized in Table 1.

4.0 Equipment Decontamination Procedures

All decontamination will be performed in accordance with NYSDEC-approved decontamination procedures. Sampling methods and equipment have been chosen to minimize decontamination requirements and prevent the possibility of cross-contamination.

Split-spoons, other non-disposable sampling equipment, and stainless steel spoons will be decontaminated using the following procedure:

- Alconox/tap water wash
- Tap water rinse
- Deionized/distilled water rinse
- Air dry

During periods of transportation and non-use, all decontaminated sampling equipment should be wrapped in aluminum foil.

One field rinsate blank will be collected for each type of equipment used each day a decontamination event is carried out.

If necessary, a temporary decontamination pad will be established in a secure area on-site using 6-mil polyethylene sheeting. The equipment and associated tooling will be decontaminated using steam-cleaning methods at the designated location. Fluids generated during decontamination will be collected in the plastic-lined decontamination pad. All decontamination wastes will be transferred into drums or an on-site holding tank for appropriate staging and disposal. The RRS contractor/representative will be responsible for proper staging and disposal of all investigation-derived wastes. Final disposal of soils and water will be dependent on the results of the soil and groundwater analyses to be conducted during this investigation.

5.0 Sample Handling and Custody Requirements

This section describes procedures for sample handling and chain-of-custody to be followed by Lu Engineers sampling personnel and the analytical laboratory. The purpose of these procedures is to ensure that the integrity of the samples is maintained during their collection, transportation, storage, and analysis. All chain-of-custody requirements comply with SOPs (Standard operating procedures) indicated in EPA sample-handling protocols, described in the EPA QAPP guidance and Contract Laboratory Protocols.

Sample identification documents will be carefully prepared so that sample identification and chain-of-custody can be maintained and sample disposition controlled. Sample identification documents include field notebooks, sample labels, custody seals, chain-of-custody records, and laboratory sample log-in and tracking forms.

The primary objective of the chain-of-custody procedures is to provide an accurate written record that can be used to trace the possession and handling of a sample from the moment of its collection through it analyses. A sample is in custody if it is:

- In someone's physical possession;
- In someone's view;
- Locked up; or
- Kept in a secured area that is restricted to authorized personnel.

5.1 Sample Containers and Preservation

New laboratory-grade sample containers obtained from a reliable supplier will be provided by the analytical laboratory. All containers provided by the laboratory are pre-cleaned (Level 1), with Certificates of Analysis available for each bottle type. Certifications of Analysis provided by the vendor are kept on file by the laboratory.

All samples will be stored on ice pending delivery to the laboratory. A list of preservatives and holding times for each type of analysis is included in the following table.

Table 5.1
Sample Preservation and Holding Times

Sample Matrix	Analysis	Container Type and Size	Preservation	Holding Time
Soil and Sediment	VOC	2-4 oz. wide mouth glass jar with Teflon-lined cap	Cool to 4^oC; minimize headspace	14 days
	SVOC	2-4 oz. amber wide mouth glass jar with Teflon-lined cap	Cool to 4^oC	14 days
	Metals	8 oz. glass	Cool to 4^oC	6 months
	PCBs	8 oz. amber glass jar with Teflon-lined cap	Cool to 4^oC	14 days
	Pesticides	8 oz. amber glass jar with Teflon-lined cap	Cool to 4^oC	14 days
	Total Petroleum Hydrocarbon	4 oz. wide mouth glass jar with Teflon-lined cap	None	14 days
PCB samples	PCB	Concrete chip, wipe, or bulk sample	Cool to 4^oC	40 Days
Groundwater and water	VOC	3 - 40-ml.glass vial with Teflon-lined cap	Cool to 4^oC; minimize headspace	14 days
	Metals Mercury	40-ml. polyethylene or glass	HNO_3 to a pH <2	6 months 28 Days
	PCBs	2 - ½ L Amber Glass Jars	Cool to 4^oC	7 days
Waste samples	TCLP- metals Mercury Cyanide	1 L polyethylene or glass jar	Cool to 4^oC; HNO_3 to pH<2	6 months 28 Days 14 Days
	TCLP- VOC	3 - 40-ml.glass vial with Teflon-lined cap	Cool to 4^oC	14 days
	TCLP- SVOC	2 - ½ L Amber Glass Jars with Teflon-lined cap	Cool to 4^oC	14 days

* Holding times are based on verified time of sample receipt

Sample preservation will be verified at the lab just prior to extraction, digestion, and/or analysis and the pH will be recorded in the extraction/digestion logbook. The pH may be checked upon arrival, if desired. If the samples are improperly preserved, a QA/QC discrepancy form will be submitted to the lab manager and QA coordinator for appropriate follow-up action (i.e., evaluation of the data during the data validation process and, if necessary, additional instruction of personnel regarding proper procedures).

5.2 Sample Identification

All containers of samples collected by Lu Engineers from the project will be identified using a format identified in the field on a label affixed to the sample container (labels are to be covered with clear tape). Generally, the format will include the following.

- Building number or location if applicable (i.e., B1250; MH-Manhole; WDA- Waste Disposal Area; etc.); leave blank if Test Pit or Geoprobe sample is not associated with a specific building or area
- One, two or three letters identifying the type of sample:

  GP- Geoprobe soil sample
  TP- test pit soil sample
  MW- groundwater sample
  WB- well boring soil sample
  SV- soil vapor sample
  SS- surface soil sample
  S-soil
  W-water
  PCB- PCB sample
  SPT- Septic system
- Two numbers identifying a sample number;
- Additional letters identifying special parameters, if applicable.

  D – Field Duplicate
  MS – Matrix Spike
  MD- Matrix Spike Duplicate

Example: B1227-PCB-03 is a PCB oil sample collected from B1227. WDA-02-01 is a soil sample collected from Waste Disposal Area (WDA)-02.

Each sample will be sealed and labeled immediately after collection. To minimize handling of sample containers, labels may be filled out prior to sample collection. The sample label will be filled out using waterproof ink and will be firmly affixed to the sample containers and protected with Mylar tape. The sample label will give the sample number, the date of the collection, analysis required, and pH and preservation, if appropriate.

5.3 Field Custody Procedures

- Sample bottles must be obtained pre-cleaned from the laboratory or directly from an approved retail source. All containers will be prepared in a manner consistent with the NYSDEC ASP 1991 bottle-washing procedures.

  Coolers or boxes containing cleaned bottles should be sealed with a custody tape seal during transport to the field or while in storage prior to use.
- All containers will have assigned lot numbers to ensure traceability through the supplier.
- As few persons as possible should handle samples.
- The sample collector is personally responsible for the care and custody of samples collected until the samples are relinquished to another person or dispatched properly under chain-of-custody rules.
- The sample collector will record sample data in the field notebook.
- The project manager will determine whether proper custody procedures were followed during the fieldwork and decide if additional samples are required.

5.3.1 Custody Seals

Custody seals are preprinted adhesive-backed seals with security slots designed to break if the seals are disturbed. A custody seal is placed over the cap of individual sample bottles by the sampling technician. Sample shipping containers (coolers, cardboard boxed, etc., as appropriate) are sealed in as many places as necessary to ensure security. Seals must be signed and dated before use. Strapping tape should be placed around the lid to ensure that seals are not accidentally broken during shipment and in a manner that allows easy removal by laboratory personnel. On receipt at the laboratory, the custodian must check (and certify, by completing logbook entries) that seals on boxes and bottles are intact.

5.3.2 Chain-of-Custody Record

The chain-of-custody record must be fully completed in duplicate, using black carbon paper where possible, by the field technician who has been designated by the project manager as responsible for sample shipment to the appropriate laboratory for analysis. In addition, if samples are known to require rapid turnaround in the laboratory because of project time constraints or analytical concerns (e.g., extraction time or sample retention period limitations, etc.), the person completing the chain-of-custody record should note these constraints in the “Remarks” section of the custody record. An example custody record is as follows:

PARADIGM ENVIRONMENTAL SERVICES, INC.

179 Lake Avenue, Rochester, NY 14608 Office (585) 647-2530 Fax (585) 647-3311

CHAIN OF CUSTODY

REPORT TO:			INVOICE TO:				
COMPANY:			COMPANY: Same			LAB PROJECT #:	CLIENT PROJECT #:
ADDRESS:			ADDRESS:				
CITY:	STATE:	ZIP:	CITY:	STATE:	ZIP:	TURNAROUND TIME: (WORKING DAYS)	
PHONE:	FAX:		PHONE:	FAX:		STD	OTHER
ATTN:			ATTN:			☐ 1 ☐ 2 ☐ 3 ☐ 5	☐
COMMENTS:						Quotation #	

PROJECT NAME/SITE NAME:

REQUESTED ANALYSIS

	DATE	TIME	COMPOSITE	GRAB	SAMPLE LOCATION/FIELD ID	MATRIX	NUMBER OF CONTAINERS											REMARKS	PARADIGM LAB SAMPLE NUMBER
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

****LAB USE ONLY BELOW THIS LINE****

Sample Condition: Per NELAC/ELAP 210/241/242/243/244

Receipt Parameter	NELAC Compliance	
Container Type:	Y ☐	N ☐
Comments:		
Preservation:	Y ☐	N ☐
Comments:		
Holding Time:	Y ☐	N ☐
Comments:		
Temperature:	Y ☐	N ☐
Comments:		

Sampled By	**Date/Time**	Total Cost:
Relinquished By	**Date/Time**	
Received By	**Date/Time**	P.I.F.
Received @ Lab By	**Date/Time**	

5.4 Sample Handling, Packaging and Shipping

The transportation and handling of samples must be accomplished in a manner that not only protects the integrity of the sample but also prevents any detrimental effects due to the possible hazardous nature of samples. Regulations for packaging, marking, labeling, and shipping hazardous materials are promulgated by the United States Department of Transportation (DOT) in the Code of Federal Regulations, 49 CFR 171 through 177.

5.4.1 Sample Packaging

Samples must be packaged carefully to avoid breakage or cross-contamination and must be shipped to the laboratory at proper temperatures. The following sample packaging requirements will be followed:

- Sample bottle lids must never be mixed. All sample lids must stay with the original containers.
- The sample bottle should never be completely filled except for VOA bottles. At a minimum, a 10% void space should be left in the bottle to allow for expansion.
- All sample bottles must be sealed around the neck or the jar lid with clear tape. Any custody seals should be affixed prior to sealing the bottle.
- All sample bottles shall be placed in plastic Zip-lock bags to minimize contact with inert packing material, unless foam inserts are used.
- Foam inserts should be used as inert packing material when shipping low hazard water samples via a common carrier to the laboratory.
- Low-hazard environmental samples are to be cooled. "Blue ice" or some other artificial icing material, or ice placed in plastic bags, may be used. Ice will not be used as a substitute for packing material.
- A duplicate custody record must be placed in a plastic bag and taped to the inside of the cooler lid. Custody seals are affixed to the sample cooler.

5.4.2 Shipping Containers

Environmental samples will be properly packaged and labeled for transport and dispatched for analysis to the appropriate subcontracted laboratory. A separate chain-of-custody record must be prepared for each container. The following requirements for marking and labeling of shipping containers will be observed:

- Use abbreviations only where specified;
- The words "This End Up" or "This Side Up" must be clearly printed on the top of the outer package. Upward-pointing arrows should be placed on the sides of the package. The words "Laboratory Samples" should also be printed on the top of the package; and

- After a container has been closed, two custody seals are placed on the container—one on the front and one on the back. The seals are protected from accidental damage by placing strapping tape over them.

Field personnel will make timely arrangements for transportation of samples to the laboratory. When custody is relinquished to a shipper, field personnel will telephone the laboratory custodian to inform him of the expected time of arrival of the sample shipment and to advise him of any time constraints on sample analysis.

5.4.3 Shipping Procedures

- The coolers in which the samples are packed must be accompanied by a chain-of-custody record. When transferring samples, the individuals relinquishing and receiving them must sign, date, and note the time on the record. This record documents sample custody transfer.
- Samples must be dispatched to the laboratory for analysis with a separate chain-of-custody record accompanying each shipment. Shipping containers must be sealed with custody seals for shipment to the laboratory. The method of shipment, name of courier, and other pertinent information are entered in the “Remarks” section of the chain-of-custody record.
- All shipments must be accompanied by the chain-of-custody record identifying their contents. The original record accompanies the shipment, and the yellow copy is retained by the site team leader.
- If sent by mail, the package is registered with return receipt requested. If sent by common carrier, a bill of lading is used. Freight bills, Postal Service receipts, and bills of lading are retained as part of the permanent documentation.
- Samples must be shipped to the analytical laboratory within 24 to 48 hours from the time of collection.

5.5 Laboratory Custody Procedures

The designated sample custodian at the laboratory will be responsible for maintaining the chain-of-custody for samples received at the lab. Among other things, the custodian must adhere to the following basic requirements:

- When the sample arrives at the lab, the custodian will complete a Cooler Receipt & Preservation Form for each cooler/package container.
- Upon receipt, the coolers are examined for the presence and condition of custody seals, locks, shipping papers, etc. Shipping labels are removed and placed on scrap paper and added to the receiving paper work. The custodian then completes the chain-of-custody record by signing and recording the date and time the package is opened.
- Acceptance criteria for cooler temperature is 0-6^{o}C. If a cooler exhibits a temperature outside this range, the anomalies are noted on the Cooler Receipt & Preservation Form.

- The custodian will then unload the samples from the cooler(s)/container(s), assign an identification number to each sample container, and affix a barcode label to each sample container for logging in and out of the LIMS system.

Adherence to this procedure will ensure that all samples can be referenced in the computer tracking system. All sample control and chain-of-custody procedures applicable to the analytical laboratory are presented in laboratory SOPs available for review.

6.0 Analytical Quality Assurance/Quality Control

All laboratory analyses will be performed by Paradigm Environmental Services INC., an accredited and appropriately certified (NYSDEC ELAP CLP) analytical laboratory.

Method detection limits are determined according to procedures outlined in 40 CFR Part 136, Appendix B or EPA CLP. General analytical detection limits are usually determined by the lowest point on the curve. Detection limits are determined at least annually for all appropriate analytical methods. A listing of the laboratory's method detection limits is available upon request.

6.1 Quality Control Samples

Laboratory QC consists of analysis of laboratory blanks, duplicates, spikes, standards, and QC check samples as appropriate to the methodology. These laboratory QC samples are described below.

6.1.1 Laboratory Blanks

Three types of laboratory blanks, one or more of which will be utilized depending on the analysis are described below:

- Method blanks consist of analyte-free water and are subjected to every step of the analytical procedure to determine possible contamination.
- Reagent blanks are similar to method blanks but incorporate only one of the preparation reagents in the analysis. When a method blank indicates significant contamination, one or more reagent blanks are analyzed to determine the source.
- Calibration blanks consist of pure reagent matrix and are used to zero an instrument's response, thus establishing the baseline.

6.1.2 Calibration Standards

A calibration standard may be prepared in the laboratory by dissolving a known amount of a pure compound in an appropriate matrix. The final concentration calculated from the known quantities is the true value of the standard. The results obtained from these standards are used to generate a standard curve and thereby quantitate the compound in the environmental sample. A minimum of three calibration standards will be used to generate a standard curve for all analyses.

6.1.3 Reference Standard

A reference standard is prepared in the same manner as a calibration standard but from a different source. Reference standards may be obtained from the EPA.

The final concentration calculated from the known quantities is the “true” value of the standard. The important difference in a reference standard is that it is not carried through the same process used for the environmental samples, but is analyzed without digestion or extraction. A reference standard result is used to validate an existing concentration calibration standard file or calibration curve.

6.1.4 Spike Sample

A spike sample is prepared by adding to an environmental sample (before extraction or digestion) a known amount of pure compound of the same type that is to be assayed for in the environmental sample. Spikes are added at one to 10 times the expected sample concentration or approximately 10 times the method detection limit. These spikes simulate the background and interferences found in the actual samples, and the calculated percent recovery of the spike is taken as a measure of the accuracy of the total analytical method.

A blank spike is the same as a spike sample except the spike is added to analyte-free water. The blank spike is used to determine whether the sample preparation and analysis are under control.

6.1.5 Surrogate Standard

A surrogate is prepared by adding a known amount of pure compound to the environmental sample; the compound selected is not one expected to be found in the sample, but is similar in nature to the compound of interest. Surrogate compounds are added to the sample prior to extraction or digestion. Surrogate spike concentrations indicate the percent recovery of the analytes and, therefore, the efficiency of the methodology.

6.1.6 Internal Standard

Internal standards are similar to surrogate standards in chemical composition but are used to quantify the concentration of analytes sampled based on the relative response factor. Internal standards are added to the environmental sample just prior to instrumental analysis.

6.1.7 Laboratory Duplicate or Matrix Spike Duplicate

Laboratory duplicates are aliquots of the same sample that are split prior to analysis and treated exactly the same throughout the analytical method. Spikes and duplicates for the batch are normally aliquots of the same sample.
For organics, spikes are added at approximately 10 times the method detection limit. The RPD between the values of the matrix spike and matrix spike duplicate for organics or between the original and the duplicate for inorganics is taken as a measure of the precision of the analytical method.

In general, the tolerance limit for RPDs between laboratory duplicates should not exceed 20% for validation in homogeneous samples.

6.1.8 Check Standard/Samples

Inorganic and organic check standards or samples are prepared with reference standards or are available from the EPA. They are used as a means of evaluating analytical techniques of the analyst. Check standards or samples are subjected to the entire sample procedure, including extraction, digestion, etc., as appropriate for the analytical method utilized. The check standard or sample can provide information on the accuracy of the analytical method independent of various sample matrices.

6.2 Laboratory Instrumentation

Laboratory capabilities will be demonstrated initially for instrument and reagent/standards performance as well as accuracy and precision of analytical methodology. A discussion of reagent/standard procedures and brief descriptions of calibration procedures for major instrument types follow.

All standards are obtained directly from EPA or through a reliable commercial supplier with a proven record for quality standards. All commercially supplied standards will be traceable to EPA or NIST reference standards and appropriate documentation will be obtained from the supplier. In cases where documentation is not available, the laboratory will analyze the standard and compare the results to a known EPA-supplied or previous NIST-traceable standard.

All sections of the laboratory will have SOP for standard and reagent procedures to document specific standard receipt, documentation, and preparation activities. In general, the individual SOPs incorporate the following items:

- Documentation and labeling of date received, lot number, date opened, and expiration date;
- Documentation of traceability;
- Preparation, storage, and labeling of stock and working solutions; and
- Establishing and documenting expiration dates and disposal of unusable standards.

Each laboratory instrument will be labeled clearly with a unique identifier that relates to all laboratory calibration documentation. Laboratory SOPs and calibration procedures are detailed in the laboratory’s Quality Assurance Manual, available upon request.

7.0 Data Reporting and Validation

Laboratory test results will be reported in NYSDEC Analytical Services Protocol (ASP) Category B deliverable reports. In addition, analytical results will be provided using an electronic database deliverable format.

7.1 Category B Data Package

All analytical data will be reported by the laboratory with NYSDEC ASP Category B deliverables. The Category B data package includes:

1. A detailed summary of the report contents and any quality control outliers or corrective actions taken.
2. Chain of Custody documentation
3. Sample Information including: date collected, date extracted, date analyzed, and analytical methods.
4. Data (including raw data) for:
   - samples
   - laboratory duplicates
   - method blanks
   - spikes and spike duplicates
   - surrogate recoveries
   - internal standard recoveries
   - calibrations
   - any other applicable QC data
5. Method detection limits and/or instrument detection limits
6. Run logs, standard preparation logs, and sample preparation logs
7. Percent solids (where applicable).

7.2 Quality Assurance Reports

For the laboratory, a general QA report summarizing problems encountered throughout the laboratory effort, including sample custody, analyses, and reporting, is provided to Lu Engineers' project QA management by the QA coordinator. This report identifies areas of concern and possible resolutions in an effort to ensure data quality.

Upon completion of a project sampling effort, analytical and QC data will be included in a comprehensive report that summarizes the work and provides a data evaluation. A discussion of the validity of the results in the context of QA/QC procedures will be made, as well as a summation of all QA/QC activity.

Serious analytical or sampling problems will be reported to NYSDEC. Time and type of corrective action, if needed, will depend on the severity of the problem and relative overall project importance. Corrective actions may include altering procedures in the field, conducting an audit, or modifying laboratory protocol. All corrective actions will be implemented after notification and approval of NYSDEC.

In addition to the laboratory report narrative, QA data validation reports that include any contractual requirements will also be provided to NYSDEC. These QA reports will be submitted with the analytical data, on a monthly basis, or at the conclusion of the project.

7.3 Data Validation and Usability

Prior to the submission of the report to NYSDEC, all data will be evaluated for precision, accuracy, and completeness.

QA/QC requirements from both methodology and company protocols will be strictly adhered to during sampling and analytical work. All data generated will be reviewed by comparing and interpreting results from instrumental responses, retention time, determination of percent recovery of spiked samples or blanks, and reproducibility of duplicate sample results. All calculations and data manipulations are included in the appropriate methodology references. Control charts and calibration curves will be used to review the data and identify outlying results.

7.3.1 Data Validation

If necessary, a third-party validator will be responsible for an independent review of all analytical work performed under the NYSDEC ASP-CLP protocol. The functions will be to assess and summarize the quality and reliability of the data for the purpose of determining its usability and to document for the historical record of each site any factors affecting data usability, such as discrepancies, poor laboratory practices, and site locations that are difficult to analyze. The data validator will be responsible for determining completeness and compliance. Lu Engineers' QA officer will be responsible for determining data usability and overseeing the work of the data validator.

Information available to the data validator and the QA officer for performance of these functions include the NYSDEC ASP Category B data package, information from the sampling team regarding field conditions and field QA samples, chain-of-custody and shipping forms. The data package is designed to provide all necessary documentation to verify compliance with NYSDEC ASP CLP protocol and the accuracy and reliability of the reported results.

The laboratory will deliver the data package to the project QA coordinator for processing prior to submission to the data validator. The project QA coordinator will review the report for immediate problems, summarize the data for in-house use, and process the work order for the third-party data-validation subcontract within five working days.

In order to effectively review the data package, the data validator will obtain a general overview of each case. This includes the exact number of samples, their assigned numbers, and their matrix. The data validator will deliver the data validation report within 30 days of receipt of the data package.

If a problem arises between the data validator and the laboratory, the data validator must submit written questions to the laboratory. The laboratory will be required to respond in writing within 10 working days to correct any deficiencies. If the data validator does not receive a written response from the laboratory within the specified time period, the data in question shall be considered noncompliant.

Sampling locations will be obtained from the sampling records, such as the chain-of-custody forms. This information is necessary for preparation of the data summary, evaluation of adherence to sample holding times, discussion of matrix problems, and discussion of contaminants detected in the samples.

The following is a brief outline of the data validation process:

- Compilation of all samples with the dates of sampling, laboratory receipt, and analysis;
- Compilation of all QC samples, such as field blanks, field duplicates, MS/MSD samples, laboratory blanks, and laboratory replicates;
- Review of chain-of-custody documents for completeness and correctness;
- Review of laboratory analytical procedure and instrument performance criteria;
- Qualification of data outside acceptable QC criteria ranges;
- Preparation of a memorandum summarizing any problems encountered and the potential effects on data usability;
- Preparation of a data summary, including validated results, with sample matrix, location, and identification; and
- Tabulation of field duplicates, laboratory replicate, and blank results.

Copies of all data validation and usability reports, as well as all data summary packages, will be provided to the NYSDEC project manager. In addition, copies of all analytical raw data will be provided to NYSDEC upon request.

7.3.2 Data Usability

If required, a Data Usability Summary Report (DUSR) will be provided after review and evaluation of the analytical data package. The DUSR will contain required elements listed in Appendix 2B of *DER-10 Technical Guidance for Site Investigation and Remediation*.

The DUSR will include a description of the samples and analytical procedures used. Any data deficiencies, protocol deviations, or quality control problems will be discussed as to their effect on data results. The report will also include any suggestions for resampling or reanalysis.

TABLE 1:
SAMPLING AND ANALYSIS SUMMARY

Sample Type	Sample Location	Analytical Parameter	Analytical Method	Reporting Level	# Field Samples	Field Duplicates	Blanks		MS/MSD	Total
							Equip	Trip		
Soil (surface soil, test pits, soil borings)	(see Work Plan Fig. 3-7)	VOCs + STARS, TPH, RCRA Metals, PCBs, Pesticides	8260, 310.13, 6010B/7470A, 8082,8081B	Category B (Level IV)	92	5	1 (borings)	-	5/5	108
Sediment	Brandy Brook	VOCs Plus NYSDEC STARS, SVOCs, RCRA Metals, PCBs, Pesticides	8260, 8270, 6010B/7470A, 8082,8081B		3	1	-	-	1/1	6
Groundwater (mini-wells)	(see Work Plan Fig. 3-7)	VOCs + STARS, RCRA Metals, PCBs	8260, 6010B/7470A, 8082		10	1	-	1	1/1	14