REMEDIAL ACTION WORK PLAN

BUILDINGS 1231 & 1253
NYSDEC SITE #633046
VERONA RESEARCH FACILITY
TOWN OF VERONA, ONEIDA COUNTY, NEW YORK

Prepared For:

Air Force Research Laboratory/ Rome Research Site
Environmental and Occupational Health Office
150 Electronic Parkway
Rome, New York 14414-4516

Prepared By:

Lu Engineers
175 Sullys Trail, Suite 202
Pittsford, New York 14534

September 2011

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1.0 Introduction

The Air Force Research Laboratory/Rome Research Site, Environmental Health Office (AFRL/RRS/RIOCV) is upgrading a remedial program at Buildings 1231 and 1253 located at the former RRS Verona Research Facility (VRF). These buildings are collectively listed as Inactive Hazardous Waste Site (IHWS) #633046 by the New York State Department of Environmental Conservation (NYSDEC). A long-term monitoring program was initiated in May of 2002 to track natural attenuation of chlorinated solvent contamination identified in groundwater at Buildings 1231 and 1253 and has continued through the first two quarters of 2011. Asymptotic remedial trends indicate that a more aggressive remedial approach will be necessary to facilitate Site closure and de-listing by the NYSDEC.

This Remedial Action Work Plan (RAWP) was completed for RRS to specify the proposed remedial strategy for remediation of residual subsurface contamination present at the Site. This RAWP has been developed in general accordance with NYSDEC Division of Environmental Remediation (DER-10), May 2010 for Site Investigation and Remediation.

This plan identifies Remedial Action Objectives (RAO) and cleanup levels that to be attained to allow Site closure. This RAWP also describes the basis for concluding that the results of the remediation will be protective of public health and the environment.

The proposed Remedial Action (RA) activities for the Site include:

- Mobilization of equipment and materials to the Site
- Injection of liquid remedial agent into the subsurface in affected areas
- Confirmatory groundwater sampling and testing in the areas of concern

The objective of the proposed RA will be to mitigate potential exposures to environmental contaminants in Site groundwater and allow the Site monitoring program to be discontinued and the property de-listed by the NYSDEC.

1.1 Site Background

The VRF comprises a total of 513 acres and was commissioned by the United States government in the early 1950s for radar and electronics research. Prior to acquisition by the government, the property was undeveloped. The site location and layout are indicated on the Site Location Map included as Attachment 1.

The facility originally consisted of 35 buildings and associated structures predominantly located adjacent to Germany Road, a north/south aligned road situated on the eastern portion of the property. Buildings 1231and 1253 are the focus of this monitoring program. Monitoring has been discontinued in Brandy Brook and no contamination has been documented in this area of the Site.

Site topography is generally flat with an average grade elevation of approximately 447 feet above mean sea level. The property is traversed by two water courses including a small creek at the north end of the Site and Brandy Brook, which flows westward toward Oneida Lake through the southern portion of the site. Oneida Lake is located approximately 6 miles west of the VRF. Surface water drains from developed areas in the southern portion of the Site into Brandy Brook via roadside ditches that are generally aligned in a north/south orientation.

Previous environmental investigations indicate that site soils consist of silt, fine-grained sand and clay. Groundwater is typically observed within 5 feet of the ground surface throughout the study areas. Aquifer testing completed in 2002 revealed a hydraulic conductivity of 1.45×10^{-3} feet per minute on the single well (MW-1231C) tested. This hydraulic conductivity value is considered unusually high for fine-grained soils and may indicate significant heterogeneity within the saturated zone.

1.2 Environmental Investigations and Monitoring

Chlorinated volatile organic compounds (CVOCs) were first identified on the site during a preliminary site assessment conducted in 1997. The CVOCs identified included both cis and trans-1,2- dichloroethene (DCE), chlorobenzene (CB) and tetrachloroethene (PCE) in groundwater at Buildings 1231 and 1253. Based on these findings, a two-year monitoring program was implemented that included wells at both buildings and surface water sampling in Brandy Brook.

In January 2001, the NYSDEC designated the VRF site as a Class 4 IHWS, indicating that it is properly closed, but requires continuing management. In order to comply with NYSDEC requirements for on-going management, RRS implemented an Operations, Monitoring and Maintenance (OM&M) Plan for monitored natural attenuation of site contaminants. This plan included quarterly sampling for volatile organics and natural attenuation indicator parameters. This program was conducted from May 2002 through March 2004 and involved groundwater sampling at a total of 11 monitoring wells and three surface water sample locations at Brandy Brook. Budgetary and contractual issues resulted in the discontinuation of quarterly monitoring for an 18-month period. The quarterly sampling schedule was resumed in September 2006.

In a letter dated February 14, 2011, NYSDEC indicated that site Monitored Natural Attenuation should be continued, but that many of the groundwater analytical parameters could be discontinued from all future monitoring. The following sections outline the sampling activity and analytical that was performed on the groundwater samples taken from the site. First quarter 2011 sampling for the site was completed on February 24, 2011.

Subsequent sampling of Site groundwater and surface soils was completed in May, June and July, 2011 and revealed no additional contaminants of concern or trends in the nature and extent of Site contaminants inconsistent with past findings. As a conservative approach toward addressing all residual Site contaminants, groundwater contaminant levels observed in February 2011 and August 2010 are used as a basis for this RAWP. These contaminant levels are represented on the attached Figures 2 and 3.

Based on the continued presence of site contaminants and the government's desire to eventually excess the VRF property, remedial action was recommended to address chlorinated solvents detected in groundwater at levels exceeding NYS Groundwater Standards and NYSDEC guidance (Technical and Operational Guidance Series (TOGS) 1.1.1).

1.3 Summary of Remedy

Groundwater will be treated via in-situ injection of a remedial agent derived from the composting of various materials. Although numerous chemical products are commercially available for in-situ remediation work, RRS has selected this approach as a "green" technology in an effort to maximize compliance with Air Force initiatives encouraging the use of organically-derived, renewable materials to the extent possible.

The selected remedial agent, "Organix Green Liquid" (OGL), is produced through a carefully controlled process involving the processing of organically-grown waste vegetables (tomatoes, cucumbers, squash, cauliflower, cabbage and melons), leaf waste and composted material. These materials and occasionally small quantities of thermally treated cow manure are homogenized and allowed to compost for a period of months. The composting results in the generation of solid material and liquid leachate, which is recycled into the compost bed until the process has been completed as indicated by continual observation during the entire period. The leachate that remains after completion of the composting process, OGL, is stored for later use.

This material will be mobilized to the Site in bulk form. Analytical testing will be conducted on this material for pesticides/herbicides by EPA Method 8151 and RCRA metals by EPA Method 6010/7470 prior to shipment to ensure that no cross-contamination will occur during its use. Analytical results will be provided to NYSDEC for review prior to injection for review and approval. During this Phase I Pilot Testing, the material will be injected into the subsurface at a total of approximately 39 locations including 24 points at B-1231 and 15 points at B-1253. Based on experience at other sites with similar soil conditions, it is assumed that a total of three injections will be necessary and that a total of approximately 1,500-1,800 gallons of OGL will be injected. A discussion on the anticipated effectiveness and concentration of OGL expected to be necessary is included in Section 2.0. The results of the pilot test will be evaluated for the following contingencies:

a. No further action required;

b. Additional injection required;
c. Further evaluation of alternatives for remediation of the site; or
d. Continued monitored natural attenuation.

1.4 Contemplated Use

The contemplated use of the Site is ”Unrestricted”. RRS cannot create or permit deed restrictions. Therefore, the property must be remediated to a pre-development condition.

2.0 Engineering Evaluation of the Remedy / Remedial Action Selection

The following Remedial Action Objectives (RAOs) have been established for the Site.

1. To remove contaminants from the media of concern (groundwater and soil vapor) and establish pre-release conditions if possible. If pre-release conditions cannot be achieved, the above listed Standards, Criteria and Guidance (SCGs) for soil and groundwater will be utilized.
2. To minimize the generation of wastes during the remedial action that require off-Site disposal in land disposal units *(DER-10).*
3. Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
4. Prevent contact with, or inhalation of, volatiles from contaminated groundwater.
5. Remove the source of groundwater contamination.
6. Prevent inhalation of, or exposure from, contaminants volatilizing from contaminants in soil.
7. Prevent migration of contaminants that would result in groundwater or surface water contamination.

Four alternatives have been evaluated in detail for full-scale implementation at the Site including in-situ chemical oxidation (ISCO) using sodium permanganate or Regenox®, total fluids extraction (TFE) and OGL.

It is noted that in addition to the two types of ISCO mentioned herein, various other methods including Fenton’s Reagent, ozone injection and materials such as persulfate and potassium permanganate were considered. These methods were ruled out due to the availability of lower cost alternatives with documented equivalent effectiveness with respect to the contaminants of concern at the Site. Methods such as low temperature thermal desorption and TFE were also ruled out due to cost considerations and performance concerns relating to low permeability saturated soils as indicated by previous testing on the Site. Passive remedial methods such as zero-valent iron and other permeable reactive barrier types were ruled out due to the extremely low hydraulic gradient and low permeability of the affected, saturated Site soils.

The two ISCO methods used on-Site yielded positive remedial results. Sodium permanganate was effective at reducing concentrations of PCE and its daughter products (trichloroethene (TCE), dichloroethene (DCE) and vinyl chloride (VC)) at both B-1231 and 1253. Regenox® was also observed to be effective at reducing PCE and its daughter compounds as well as chlorobenzene (CB), a notoriously recalcitrant organic contaminant.

Although positive pilot testing results were observed including the apparent permanent reduction in CB concentrations, the presence of PCE and PCE breakdown products continues to prevent the Site from closure and de-listing. The aggressive nature of the oxidation facilitated by the ISCO methods implemented to date has a clearly beneficial, but somewhat short-lived effect, CB notwithstanding. It is inferred that the aggressive oxidation, while effectively destroying accessible organic contaminants, has the side effect of quickly releasing sorbed-phase contaminants as it oxidizes natural organic soil components. This process causes the rapid release of sorbed contaminants into solution in the groundwater contributing to the general rebound observed during subsequent sampling events. It is contended that this rebound is accentuated by the low permeability of affected saturated soils on the Site. OGLs were introduced by gravity into the subsurface using existing permanent wells resulting in a limited radial influence for OGL effectiveness, which also is inferred to have enhanced the observed rebound effect.

Despite the documented effectiveness of sodium permanganate and Regenox® at the subject Site and many other sites worldwide, several critical problems were identified during the pilot testing conducted using these two OGLs. Both of these materials are costly due to their proprietary and highly reactive nature. Estimated materials and equipment costs for Regenox® and/or sodium permanganate at similar sites range from $35,000 to $80,000, not including implementation. As discussed above, the non-selective nature of the oxidation caused by these materials also limits effectiveness and can create secondary issues such as contaminant rebound and non-beneficial changes to saturated soil characteristics as discussed below. In addition to their high cost and non-selective reactivity, problems specific to each method are described in the following subsections.

Sodium Permanganate

The most significant issue identified with respect to the use of sodium permanganate as an ISCO material is its extremely hazardous, reactive chemical characteristics. Even in diluted form, sodium permanganate can cause combustion of cellulosic materials and serious burns to personnel handling the material. This material rapidly attacks unprotected steel, pump seals and other materials necessary for the injection process. Sodium permanganate was also observed to react with the site groundwater to form precipitants including oxides of manganese and iron, which required thorough re-development of the

wells used for injection and is likely to have limited its distribution in the subsurface by blocking soil pore spaces.

Regenox®

In addition to the possibility of causing burns to unprotected skin, Regenox® was observed to have an extremely fast and violent reaction with Site groundwater. Immediately upon gravity injection frothing occurred resulting in discharge of a portion of the material to the surface. The shallow groundwater on the Site represents a problem for full-scale implementation of this methodology due to the likelihood of surface breakthrough during the aggressive oxidation process. As is the case with sodium permanganate, the low permeability of site soils also limits the radial influence of the injection process.

Lu Engineers has conducted a series of bench scale tests on the effectiveness of OGL. The material has been proven to be effective for the complete elimination of both chlorinated and non-chlorinated volatile organic contaminants (VOCs) in groundwater. This material is a non-reactive liquid derived from a carefully controlled composting process. The material was initially developed as a safe and renewable non-synthetic fertilizer for use on school ball fields, lawns and other public areas where chemical pesticides and fertilizers have become a concern in recent years. Lu Engineers is currently testing this material for implementation at a gasoline-contaminated site for the County of Monroe, New York. Laboratory analysis to date is consistent with previous findings, indicating effective and rapid elimination of dissolved-phase VOCs in site groundwater.

Research and literature review conducted to date have provided a preliminary understanding of the chemical processes involved in the elimination of VOCs in groundwater facilitated by OGL. It is inferred that in addition to enhancing microbial activity by acting as a nutrient source for indigenous microbes, an electrochemical reaction is occurring. It is the manufacturer's contention that humic and fulvic acid are present in the OGL product.

Results from a recent bench-scale study completed on this material are presented in the following two tables. The first table indicates analytical results taken after one week of exposure of contaminated groundwater to OGL at varying concentrations. The second table indicates the analytical results after two weeks of exposure to OGL in solution.

OGL Bench Study Results Week 1

Compounds	Lu 0 BioAgent Straight	Lu A Sample + No BioAgent	Lu B Sample + 0.1% BioAgent	Lu C Sample + 1% BioAgent	Lu D Sample + 10% BioAgent
Methylene Chloride	-	32.5	37.4	66.4	93.3
Tetrachloroethane	-	11.4	10.3	-	-
m,p-Xylene	-	125	-	-	-
o-Xylene	-	192	36.4	57.1	80.5
Isopropylbenzene	-	64.8	-	-	-
n-Propylbenzene	-	110	-	-	-
1,3,5-Trimethylbenzene	-	516	57.5	159	218
1,4,4-Trimethylbenzene	-	1121	-	-	-
sec-ButylBenzene	-	32.6	-	-	-
p-Isopropyltoluene	-	55.1	25.6	28.6	29.7
Napthalene	-	827	-	31.2	134
Alkyl Benzene RT 9.661	-	631	-	-	-
Alkyl Benzene RT 9.981	-	262	72.5	118	157
Alkyl Benzene RT 10.649	-	754	179	331	465
Alkyl Benzene RT 10.974	-	265	-	108	128

OGL Bench Study Results Week 2

Compounds	Lu 0 BioAgent Straight	Lu A Sample + No BioAgent	Lu B Sample + 0.1% BioAgent	Lu C Sample + 1% BioAgent	Lu D Sample + 10% BioAgent
Methylene Chloride	-	35.1	33.1	71	139
Tetrachloroethane	-	10.5	-	-	-
m,p-Xylene	-	109	-	-	-
o-Xylene	-	167	-	-	-
Isopropylbenzene	-	52.5	-	-	-
n-Propylbenzene	-	89	-	-	-
1,3,5-Trimethylbenzene	-	437	-	36	-
1,4,4-Trimethylbenzene	-	960	-	-	-
sec-ButylBenzene	-	26.6	-	-	-
p-Isopropyltoluene	-	44.1	-	-	-
Napthalene	-	834	-	-	-
Alkyl Benzene RT 9.661	-	599	-	-	-
Alkyl Benzene RT 9.981	-	253	-	35	-
Alkyl Benzene RT 10.649	-	759	-	103	-
Alkyl Benzene RT 10.974	1.1.1 -	1.1.2 237	1.1.3 -	1.1.4 -	1.1.5 -

As indicated by the preceding laboratory data, PCE and its daughter products were completely removed from the contaminated water. Other previously detected VOCs were also eliminated.
Lu Engineers, with the assistance of the State University of New York at Geneseo's Microbiology Department, is continuing to research the mechanisms creating the observed remedial effect described above. To date, this work has included testing for pathogens, which revealed negative results, and extensive research into the electrochemical processes involved. Another testing process is currently underway, which will further define the optimal concentrations for remediation of specific contaminants, and component enzymes in the OGL material.

2.1 Protection of Human Health and the Environment

The proposed OGL injection program will achieve the RAOs by destroying the primary source contaminants, TCE, PCE, DCE and VC and other organic contaminants in the subsurface. Use of the OGL material will typically result in the production of non-hazardous by-products, therefore, no waste products will be generated or disposed of.

In-situ treatment is also preferred because it prevents human contact with contaminated groundwater or subsurface soils during the remediation process.

2.2 Standards, Criteria, and Guidance (SCGs)

The following SCGs are applicable to this Site.

1. NYSDEC Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) Ambient Water Quality Standards and Guidance Values, dated June 1998. These standards are based on groundwater as a drinking water source.
2. NYS Class GA Groundwater Quality Standards, 6 NYCRR Part 703.5.

Specific remedial objectives for Site-related constituents are shown in the following tables.

Table 1. Remedial Objectives for Groundwater

Parameter	Groundwater Standard[1]	Objectives
Trichloroethene (TCE)	5 ppb	<5 ppb
Tetrachloroethene (PCE)	5 ppb	<5 ppb
cis-1,2-dichloroethene	5 ppb	<5 ppb

1- NYS Class GA Groundwater Quality Standards (6 NYCRR Part 703.5)

2.3 Short-term Effectiveness and Impacts

The short-term effectiveness, OGL persistence and radial influence of the injection program will be evaluated as work progresses by means of field and laboratory analytical testing. Sampling and testing will be conducted on wells located in the injection area(s). One month after the last injection, samples will be obtained from

nearby wells for laboratory analysis of VOCs (EPA Method 8260). It is anticipated that the RAOs can be achieved in less than one year.

Safety risks to Lu Engineers' staff, subcontractors, and other Site workers during handling of the OGL are minimal, but will be taken into account during all site activities. These preventive measures are incorporated into the site-specific Health and Safety Plan (HASP) (Attachment A) and will be strictly enforced.

2.4 Long-term Effectiveness and Permanence

The proposed injection program is designed to be a permanent remedy by destroying the contaminant source in Site groundwater and saturated soils. Once the source area has been remediated, it is anticipated that residual impacts to unsaturated soils and/or soil vapor will diminish due to the natural process of reductive dechlorination in the subsurface.

The potential exists for rebound in post-remedial groundwater contaminant concentrations. This may occur via (1) mass transfer from adsorbed and dense non-aqueous phase liquid (DNAPL) into the groundwater, and (2) contaminant mass transport in groundwater to monitoring well sample locations. To evaluate the potential for rebound, semi-annual groundwater sampling will be conducted for a period of two years.

The results of this sampling will be used to determine the long-term effectiveness and permanence of the selected remedy.

2.5 Reduction of Toxicity, Mobility, or Volume

The proposed remedy is designed to treat an approximate 5,000 ft^2 source area as shown in Figures 2 and 3.

The complete removal of chlorinated VOCs will be achieved through chemical reactions. This is an irreversible treatment process that eliminates the toxicity, mobility, and volume of groundwater contamination at the source via chemical processes in the subsurface. The process will prevent the potential for further migration of groundwater contamination at the Site and eliminate the source of volatile soil vapor contaminants.

2.6 Implementability

The proposed injection program is fairly simple to implement and biofouling or similar issues are not anticipated.

Lu Engineers and approved subcontractors are readily available to provide the necessary resources for installation of the injection wells, chemical injection, and short-term and long-term operation and maintenance (O&M) activities.

Prior to injection and after the final injection, Lu Engineers will notify the USEPA and NYSDEC of the planned OGL injections. No permits are necessary for the proposed injection system as the injection process is "authorized by rule".

3.0 Project Plans and Specifications

This Section describes the tasks necessary to construct and implement the proposed remedy. All remedial activities will be performed under the supervision of Lu Engineers and the NYSDEC, as appropriate.

3.1 OGL Injection

It is assumed that the material will be pumped into the ground using a Geoprobe 6610D rig, or equivalent between approximately 12 to 5 feet below grade to directly contact the affected groundwater zone above the documented underlying glacial till. It is also assumed that the injection process will be repeated 3 times over a 60 day period depending on the analytical results observed once injection is underway. Laboratory analysis will be conducted on affected wells periodically as agreed to under the approved work plan described above. Sampling and laboratory analysis will be conducted in such a way as to avoid sample duplication with respect to the current Monitored Natural Attenuation program.

Approximately 10 to 20 gallons of OGL will be injected into each of the points once every two to three weeks. The location of each proposed injection point is indicated on the attached Figures 2 and 3. A 20-foot spacing between proposed injection points is based on findings at other remedial sites with similar soils. The OGL solution is aqueous and no precipitates or coagulation is anticipated. It is inferred that the hydraulic pressure of the injection process and temporary mounding at each injection site will facilitate adequate lateral distribution of the material throughout the affected areas.

The injection process will be documented in the site log book during each injection event. The amount of OGL injected, injection pressures and related information will be documented for future reference.

3.2 Groundwater Monitoring & Sampling

Groundwater levels will be collected from all of the on-Site wells prior to each injection, and at least once a month, to evaluate any changes in groundwater flow patterns resulting from implementation of the remedy.

Existing monitoring wells in the area will be tested by field and laboratory methods to evaluate the effectiveness of the injection program. At a minimum, these wells include MW-1231 C, E, F and H and MW-1253 E, F, H and I. It is estimated that three to four groundwater samples will be collected from existing wells during the injection program. The samples will be collected using low flow methods as used during all previous sampling events and submitted to an appropriately qualified laboratory for analysis by

EPA method 8260. Category B deliverables are not anticipated for this portion of the sampling program.

One month after the final injection, groundwater samples will be collected from the previously described monitoring wells. Groundwater sampling procedures are detailed in the attached QAPP (Attachment C). These post-injection samples will be submitted to the laboratory for analysis by EPA Method 8260. This analysis will be repeated 6 months and again 12 months after completion of the injection process. It is noted that the frequency of post-injection sampling is subject to change based on the findings observed during the injection process and on-going discussions with the NYSDEC.

The sampling results will be submitted to the NYSDEC for review and evaluated to determine if the groundwater monitoring can be terminated. Monitoring for metals may be eliminated based on preliminary sampling results and approval from the NYSDEC.

In conjunction with this Phase I Pilot study, biannual groundwater monitoring will continue in the spring and fall of each year. Once groundwater limits have reached acceptable NYSDEC limits, quarterly sampling will be conducted for a period of two years prior to consideration of delisting by the NYSDEC and NYSDOH.

3.3 Site Control

Additional site control and safety measures are included in the HASP (Attachment A).

3.4 Vapor Mitigation Plan

A vapor mitigation plan is not necessary for this project since no occupied buildings or soil vapor related impacts are anticipated.

3.5 Site Management Plan

If necessary, a Site Management Plan (SMP) will be created for submission to the NYSDEC. The SMP will include:

- An Operation, Maintenance, and Monitoring (OM&M) Plan;
- Institutional and Engineering Control Plan;
- Soil Management Plan;
- Reporting provisions;
- Provisions for implementing corrective actions, if necessary; and
- Provisions for site closure and well decommissioning.

The SMP will be signed and stamped by a licensed professional engineer and submitted with the Final Engineering Report (FER).

4.0 Institutional Controls

Long-term institutional controls are not anticipated to be necessary for this project

5.0 Health and Safety Plans

A site-specific HASP has been prepared for this project and is included as Attachment A. The HASP also includes a Community Air Monitoring Plan (CAMP) (Attachment B). The HASP and CAMP will be reviewed by all employees before starting Site work. Monitoring of the work area and screening of soil and groundwater will be conducted throughout the duration of RA activities using a MiniRAE 2000 PID, or equivalent.

Lu Engineers' employees and subcontracted personnel will have completed the OSHA 40-hour HAZWOPER training with current refresher courses. A copy of the HASP will be available onsite at all times during remedial activities.

6.0 Quality Assurance/Quality Control

Lu Engineers is responsible for the project management, coordination and scheduling, subcontracting, and quality assurance/quality control (QA/QC) of RA activities. General QA/QC procedures, including sample preparation and holding times, are described in the Quality Assurance Project Plan (Attachment C).

Except as noted, analytical work will be performed by an appropriately qualified ELAP/CLP certified subcontracted laboratory. Analytical methods reflect the requirements of the NYSDEC Analytical Services Protocol (ASP), Revised June 2000.

7.0 Reporting and Schedule

Upon receipt and review of all necessary data, a FER will be prepared including:

- A description of the remedy, as constructed, pursuant to the RAWP;
- A summary of all remedial actions completed;
- A list of cleanup levels/RAOs applied to the remedial actions;
- An evaluation of the effectiveness of the remedy;
- Tables and figures containing all pre-and post-remedial data keyed appropriately so that completion of the remedial action will be documented. The figures will clearly indicate the volume of contaminated media (groundwater and soil vapor), which was remediated;
- A detailed description of any Site restoration activities (if any);
- A description of institutional controls employed at the Site;
- A Site Plan with "as-built" drawings that include all changes made to the final design during construction, permanent structures, injections wells, monitoring wells, or other remedial structures, as well as documented areas of changed conditions or removals;
- SMP, as a separate document, signed and stamped by a licensed P.E.;
- Certification that the RAWP was implemented;

- Fully executed manifests documenting any off-Site transport of waste material;
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables in PDF format;
- Coordinates for all injection points, using the NAD 83 UTM Zone 18 (NYTM) coordinate system;
- Summary tables of all field measurements including water level elevations, results of colorimetric tests, and air monitoring results;
- Permits or registrations that were obtained to implement the remedy;
- Sample collection logs;
- Photographs of remedial activities;
- Data usability summary reports (DUSR); and
- Any other information requested from the NYSDEC;

A project schedule, including all anticipated fieldwork and report submission, is included in Attachment D.

Periodic progress reports will be submitted to NYSDEC and include a description of work completed during the reporting period, problems encountered, sampling results, and any changes to the scope of work. These reports will be submitted electronically in portable document format (PDF) with searchable text, by the 10th day of each month.

8.0 Project Organization

The project team is anticipated to be as follows:

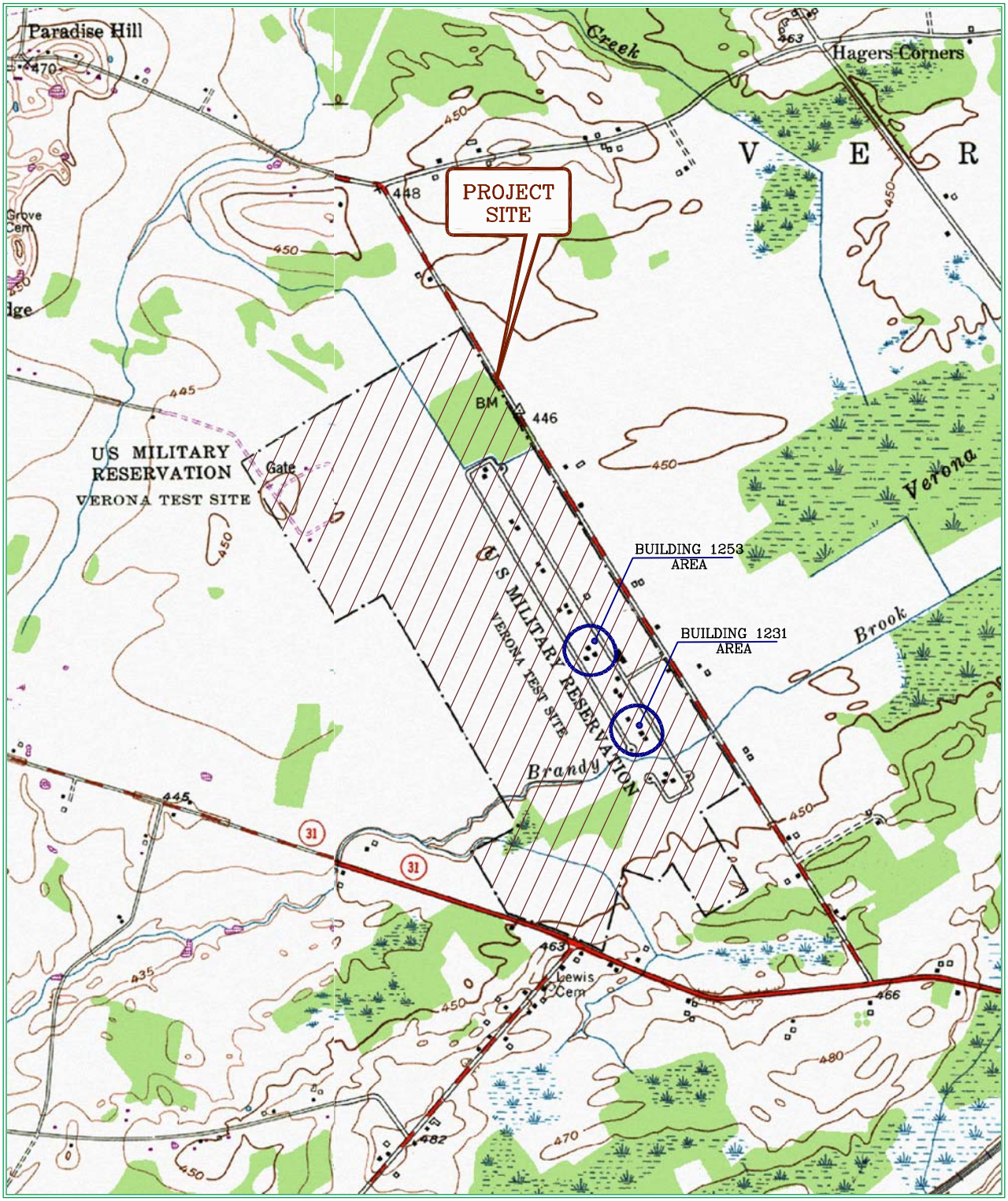
Greg Andrus, CHMM	Project Manager
Bryan Bancroft	Quality Assurance Officer
Eric Detweiler	Field Geologist

Subcontractors

Paradigm Laboratories	Analytical Laboratory
Trec Environmental	Geoprobe Contractor

Qualifications for Lu Engineers' personnel are included in Attachment E.

Figures



SCALE: 1" = 2000'

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NEW YORK QUADRANGLE LOCATION

Lu Engineers
ENVIRONMENTAL • TRANSPORTATION • CIVIL

SITE LOCATION MAP

VERONA RESEARCH FACILITY
MNA STUDY
VERONA, NEW YORK

DATE:	JUNE 2009
SCALE:	1:24,000
DRAWN BY:	DLS
MAP SOURCE:	VERONA QUADRANGLE NEW YORK – ONEIDA COUNTY 7.5 MINUTE SERIES (TOPOGRAPHIC) 1955

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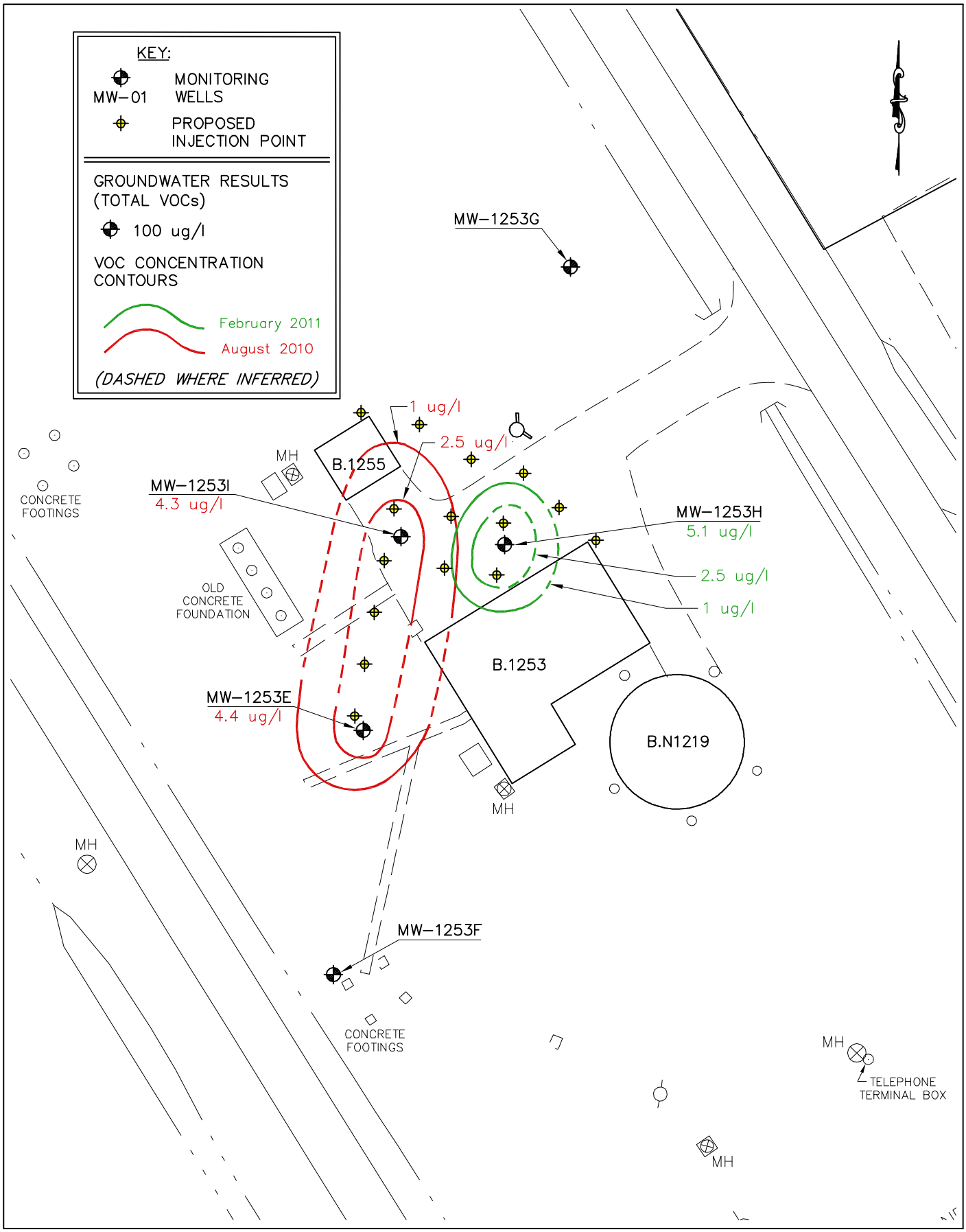

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VERONA RESEARCH FACILITY

PROPOSED INJECTION PLAN – B.1253
AUGUST 2010 TOTAL VOC CONCENTRATIONS
VERONA, NEW YORK

DATE:	SEPTEMBER 2011
SCALE:	1" = 50'
DRAWN BY:	DLS
CHECKED BY:	GLA

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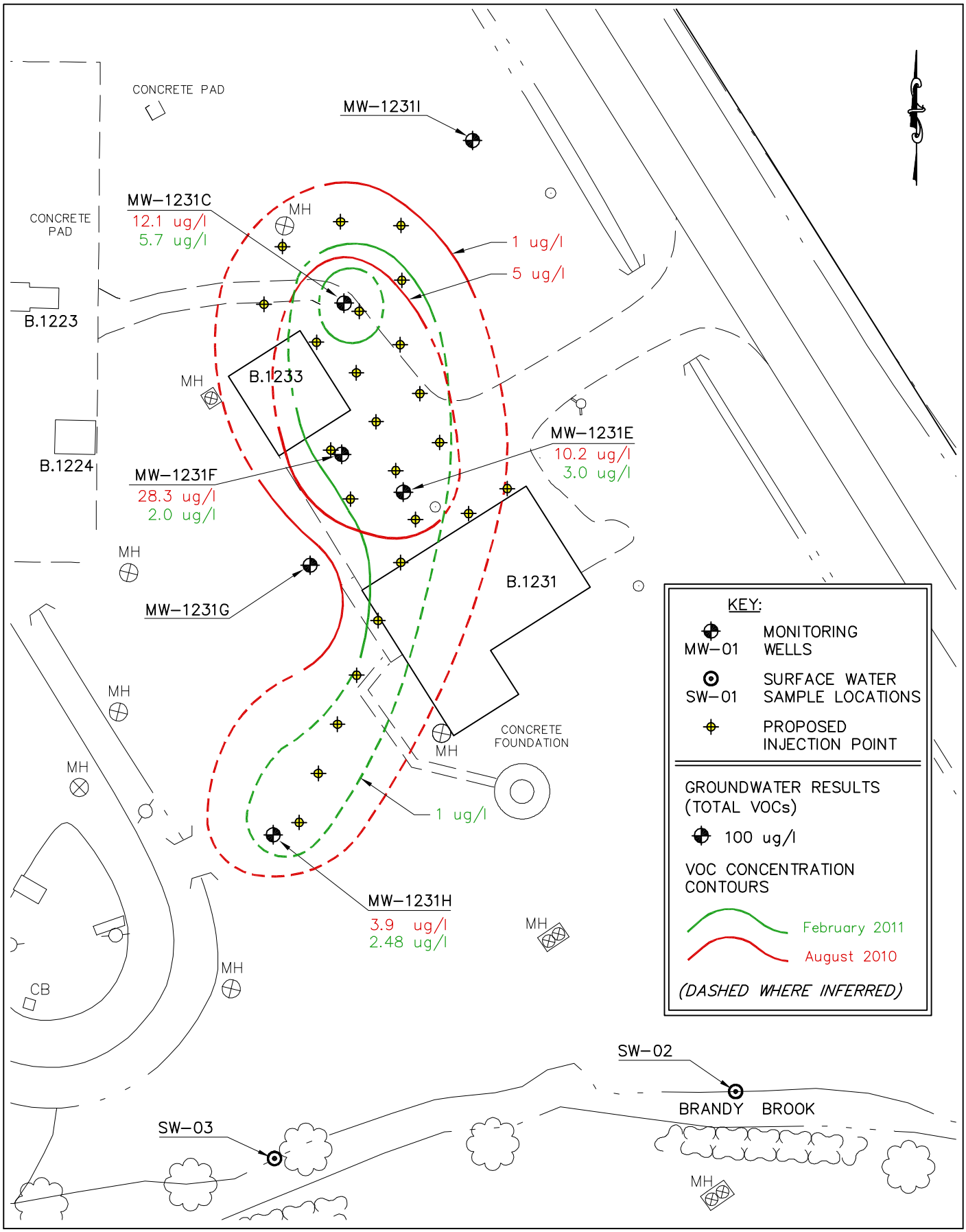

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VERONA RESEARCH FACILITY

PROPOSED INJECTION PLAN – B.1231
AUGUST 2010 TOTAL VOC CONCENTRATIONS
VERONA, NEW YORK

DATE:	SEPTEMBER 2011
SCALE:	1" = 50'
DRAWN BY:	DLS
CHECKED BY:	GLA

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Attachment A

Health and Safety Plan

HEALTH AND SAFETY PLAN
FOR REMEDIAL ACTION PLAN

BUILDINGS 1231 & 1253
NYSDEC SITE #633046
VERONA RESEARCH FACILITY
TOWN OF VERONA, ONEIDA COUNTY, NEW YORK

Prepared For:

Air Force Research Laboratory/ Rome Research Site
Environmental and Occupational Health Office
150 Electronic Parkway
Rome, New York 14414-4516

Prepared By:

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

September 2011

Table of Contents

LU ENGINEERS
SITE SAFETY PLAN

A. GENERAL INFORMATION

Project Title: Verona Research Site #633046 Lu Project No. 13417-05
Oneida County, New York
Remedial Action

Project Manager: Gregory L. Andrus, CHMM Project Director: Steven A. Campbell, CHMM

Location: Buildings 1231 and 1253, Verona Research Site
Town of Verona, Oneida County, New York

Prepared by: Janet M. Bissi, CHMM Date Prepared: October 2011
Date Revised:

Approved by: Gregory L. Andrus, CHMM Date Approved: October 2011

Site Safety Officer Review: Eric Detweiler Date Reviewed:

Scope/Objective of Work:

- Task 1: Mobilization of equipment and materials to the Site
- Task 2: Installation of injection wells
- Task 3: Injection of liquid remedial agent (Organix Green Liquid) into the subsurface in affected areas
- Task 4: Confirmatory groundwater sampling and testing in the areas of concern

Proposed Date of Field Activities: Fall/Winter 2011

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

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

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

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

[X] Liquid [X] Solid [ ] Sludge [ ] Gas/Vapor

Characteristic(s):

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

Physical Hazards:

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

Site History/Description and Unusual Features:

The Verona Research Facility comprises a total of 513 acres and was commissioned by the United States government in the early 1950s for radar and electronics research. The facility is located in a rural area and originally consisted of 35 buildings and associated structures predominantly located adjacent to Germany Road, a north/south aligned road situated on the eastern portion of the property. A Preliminary Site Assessment (PSA) was completed in 1997. Three areas of concern consisting of about 1 acre total were identified. An area of PCB-contaminated soil was identified adjacent to Building 1233, and low level groundwater contamination with chlorinated solvents was identified in the area of Buildings 1231 and 1253. Buildings 1231 and 1253 are the focus of this monitoring program. The chlorinated solvent plumes are relatively short and shallow and remain on Site. Subsequent investigations by the US Air Force were unable to identify any significant source areas of chlorinated solvents. Excavation of PCB-contaminated soils down to 3 ft was completed on 1998 with a total removal of 20 cubic yards of contaminated soil from the southwest area and 80 cubic yards from the northwest area of Building 1233 to below soil cleanup standards in July of 1998. Since 2001, Monitored Natural Attenuation (MNA) monitoring has been conducted on the chlorinated solvent contaminated groundwater plumes in areas of Buildings 1231 and 1253.

Locations of Chemicals/Wastes: Soil and groundwater

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 1-4	General physical hazards associated with drilling operations.	Hard hats, eye protection, and steel-toed boots required at all times. Keep safe distance from machines and all moving parts. Only operator and helper are to be in "work zone".
	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.
	Fire and Explosion	Inform personnel of the location(s) of potential fire/explosion hazards. Establish site-specific procedures for working around flammables. Ensure that appropriate fire suppression equipment and systems are available and in good working order. Define requirements for intrinsically safe equipment. Identify special monitoring needs. Remove ignition sources from flammable atmospheres. Coordinate with local fire-fighting groups regarding potential fire/explosion situations. Establish contingency plans and review daily with team members.
	Overhead Hazards/ Falling Objects	Wear hard hat. Identify overhead hazards prior to each task.
	Utility Lines.	Identify location(s) prior to work, maintain 25-foot minimum distance to overhead utilities.
	Slip/ tripping/ fall	Observe terrain and equipment while walking to minimize slips and falls. Steel-toed boots provide additional support and stability. Use adequate lighting. Wear hard hat. Inspect all lifting equipment prior to use.
	Back strain and muscle fatigue, ergonomic stress due to lifting.	Use proper lifting techniques and limit load to prevent back strain.
	Noise	**See Appendix B**
	Heat stress/ cold stress exposure	Implement heat stress management techniques such as shifting work hours, increasing fluid intake, and monitoring employees**. See Appendix A.**
	Sunburn	Apply sunscreen, wear appropriate clothing.
	Weather Extremes	Establish site-specific contingencies for severe weather situations. Discontinue work in severe weather.
	Native wildlife presents the possibility of insect bites and associated diseases.	Avoid wildlife when possible. Use insect repellant.
	Biological (flora, fauna, etc.)	Establish site-specific procedures for working around identified hazards.
	Contact with or inhalation of contaminants, potentially in high concentration in sampling media and/or fire and explosion.	To minimize exposure to chemical contaminants, a thorough review of suspected contaminants should be completed and implementation of an adequate protection program. Under-ground vaults to be ventilated during inspections.
	Contact with or inhalation of decontamination solutions.	Material Safety Data Sheets for all decon solutions. First aid equipment available. **See Appendix C.**

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.

D. SITE SAFETY WORK PLAN

Site Control: Only personnel approved by the Air Force Research Laboratory (AFRL) is allowed on-Site.

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

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

A	B	C	D
		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. Gloves will be worn if contact with Site soil, sediment or water is anticipated, due to concerns of contamination. Level C will be available, and used when indicated by elevated PID readings.

Air Monitoring*:

Contaminant	Monitoring Device	Frequency
Organic Vapors	MiniRAE 2000 PID	Continuous
Ignition Sources	o2/Explosimeter	Continuous
Particulate	MiniRam	Continuous

*Continuous perimeter air monitoring for VOCs and particulates will performed during intrusive activities and is described in the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP) (Appendix B of the Remedial Action Work Plan).

Lu Engineers (Lu) will also conduct continuous air monitoring of worker breathing zone air during intrusive investigations. If action levels are exceeded during intrusive investigation, appropriate precautions will be taken, as described below.

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.

O_2 readings must remain between 19.5% and 22.0%. Explosivity must be above 10% lower explosive level (LEL). The area must be evacuated and ignition sources eliminated if levels are not within their standard. These atmosphere factors will be measured at a position that would give the earliest indication of a hazardous condition forming not at the breathing zone. Appropriate actions, initially evacuation of the immediate work area, will be taken if established action levels area exceeded.

If particulate levels exceed a level of 2.5 times background (upwind levels subtracted from downwind concentration) or a level of 150 mcg/m^3, dust control measures will be initiated and the dust generating activity suspended until levels decrease below the action level. Perimeter monitoring will be conducted if the action level is obtained at the work area.

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 rendered unusable and disposed of as stated in work plan.

Decon Solution Monitoring Procedures, if Applicable: Contractor's controlled/ decon waste container.

Special Site Equipment, Facilities or Procedures (Sanitary Facilities and Lighting Must Meet 29CFR 1910.120):
Restrooms and potable water are available for use on Site.

Site Entry Procedures and Special Considerations: Entry to the Site should be limited through the main gate and in accordance with the AFRL and Verona Research Site regulations. The Buddy System should be employed at all times onsite 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. Heavy equipment will not be used during electrical storms.

General Spill Control, if Applicable: N/A

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 chemically-resistant 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, 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
Greg Andrus	Project Manager
Bryan Bancroft	Quality Assurance Officer
Eric Detweiler	Site Safety Officer/Field Geologist

* All entries into the work zone require "Buddy System" use. All Lu Engineers' field staff participated in a medical monitoring program and have completed applicable training per 29CFR 1910.120. Respiratory protection program meets requirements of 29CFR 1910.134.

F. EMERGENCY INFORMATION

LOCAL RESOURCES

Ambulance:	911
Hospital Emergency Room:	Rome Memorial Hospital (315) 338-7000 1500 North James Street, Rome, New York 13440
Poison Control Center:	911
Police (include local, county sheriff, state):	911
Fire Department:	911
Airport:	N/A
Laboratory:	N/A
UPS/Federal Express:	N/A

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:	Eric Detweiler (585)278-8202
Radio:	TBD
Other:	TBD

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.

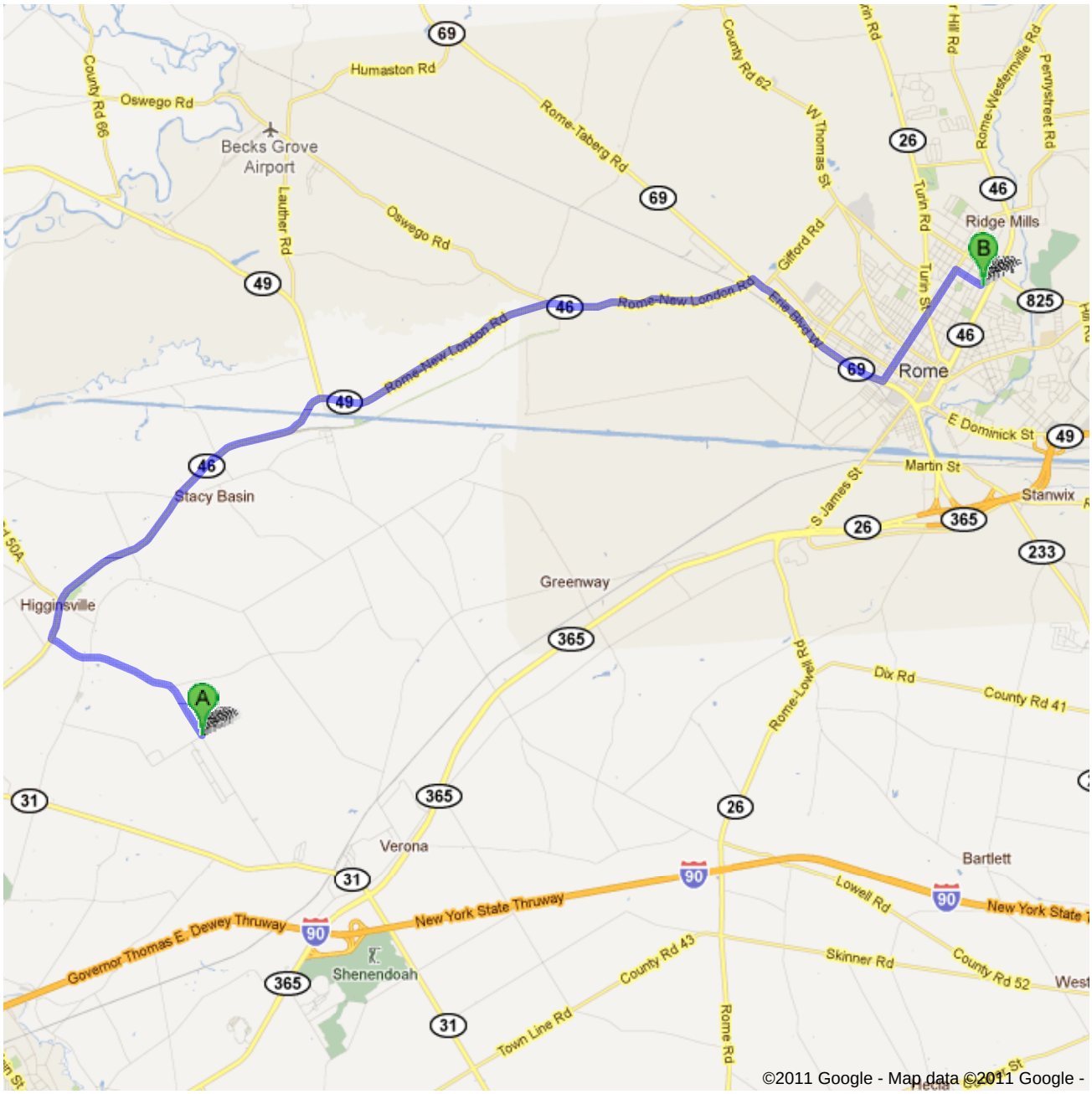
Directions from the Site to Rome Memorial Hospital (map and directions on following page):

On-site Assembly Area: At Site entry point.

Off-site Assembly Area: On Germany Road, across from the Site entry point.

Emergency egress routes to get off-Site: Follow Germany Road, east or west.

Directions to Rome Memorial Hospital
Rome, New York - (315) 338-7000
15.2 mi – about **27 mins**
Verona Research Facility
Health and Safety Plan



Germany Rd, Verona, NY

	1. Head **northwest** on **Germany Rd** toward **Carpenter Rd** About 5 mins	go 2.1 mi total 2.1 mi
46	2. Turn right onto **NY-46 N** About 12 mins	go 9.4 mi total 11.5 mi
	3. Turn right onto **Erie Blvd W** About 4 mins	go 1.9 mi total 13.4 mi
	4. Turn left onto **S Madison St** About 5 mins	go 1.5 mi total 14.9 mi
	5. Turn right onto **W Oak St** About 1 min	go 0.3 mi total 15.2 mi

Rome Memorial Hospital
Rome, New York - (315) 338-7000

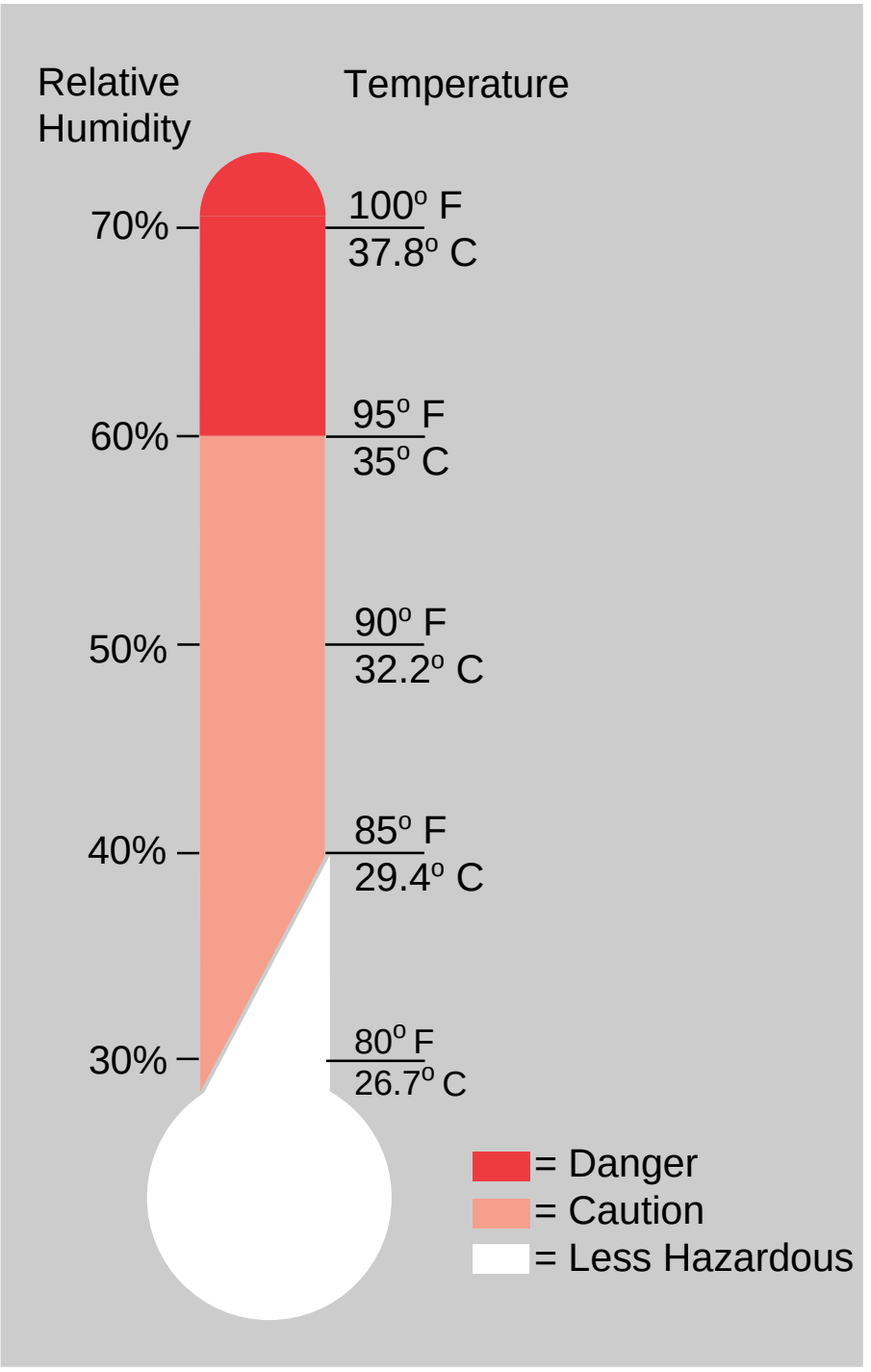
APPENDIX A

HEAT STRESS AND COLD EXPOSURE

THE HEAT EQUATION

HIGH TEMPERATURE + HIGH HUMIDITY + PHYSICAL WORK = HEAT ILLNESS

When the body is unable to cool itself through sweating, **serious** heat illnesses may occur. The most severe heat-induced illnesses are **heat exhaustion** and **heat stroke**. If actions are not taken to treat heat exhaustion, the illness could progress to heat stroke and possible **death**.



U.S. Department of Labor
Occupational Safety and Health Administration
OSHA 3154
1998

HEAT EXHAUSTION

What Happens to the Body:

HEADACHES, DIZZINESS/LIGHT HEADEDNESS, WEAKNESS, MOOD CHANGES (irritable, or confused/can't think straight), FEELING SICK TO YOUR STOMACH, VOMITING/THROWING UP, DECREASED and DARK COLORED URINE, FAINTING/PASSING OUT, and PALE CLAMMY SKIN.

What Should Be Done:

- Move the person to a cool shaded area to rest. Don't leave the person alone. If the person is dizzy or light headed, lay them on their back and raise their legs about 6-8 inches. If the person is sick to their stomach lay them on their side.
- Loosen and remove any heavy clothing.
- Have the person drink some cool water (a small cup every 15 minutes) if they are not feeling sick to their stomach.
- Try to cool the person by fanning them. Cool the skin with a cool spray mist of water or wet cloth.
- If the person does not feel better in a few minutes call for emergency help (Ambulance or Call 911).

(If heat exhaustion is not treated, the illness may advance to heat stroke.)

HEAT STROKE—A MEDICAL EMERGENCY

What Happens to the Body:

DRY PALE SKIN (no sweating), HOT RED SKIN (looks like a sunburn), MOOD CHANGES (irritable, confused/not making any sense), SEIZURES/FITS, and COLLAPSE/PASSED OUT (will not respond).

What Should Be Done:

- Call for emergency help (Ambulance or Call 911).
- Move the person to a cool shaded area. Don't leave the person alone. Lay them on their back and if the person is having seizures/fits remove any objects close to them so they won't strike against them. If the person is sick to their stomach lay them on their side.
- Remove any heavy and outer clothing.
- Have the person drink some cool water (a small cup every 15 minutes) if they are alert enough to drink anything and not feeling sick to their stomach.
- Try to cool the person by fanning them. Cool the skin with a cool spray mist of water, wet cloth, or wet sheet.
- If ice is available, place ice packs under the arm pits and groin area.

How to Protect Workers

- Learn the signs and symptoms of heat-induced illnesses and what to do to help the worker.
- Train the workforce about heat-induced illnesses.
- Perform the heaviest work in the coolest part of the day.
- Slowly build up tolerance to the heat and the work activity (usually takes up to 2 weeks).
- Use the buddy system (work in pairs).
- Drink plenty of cool water (one small cup every 15-20 minutes)
- Wear light, loose-fitting, breathable (like cotton) clothing.
- Take frequent short breaks in cool shaded areas (allow your body to cool down).
- Avoid eating large meals before working in hot environments.
- Avoid caffeine and alcoholic beverages (these beverages make the body lose water and increase the risk for heat illnesses).

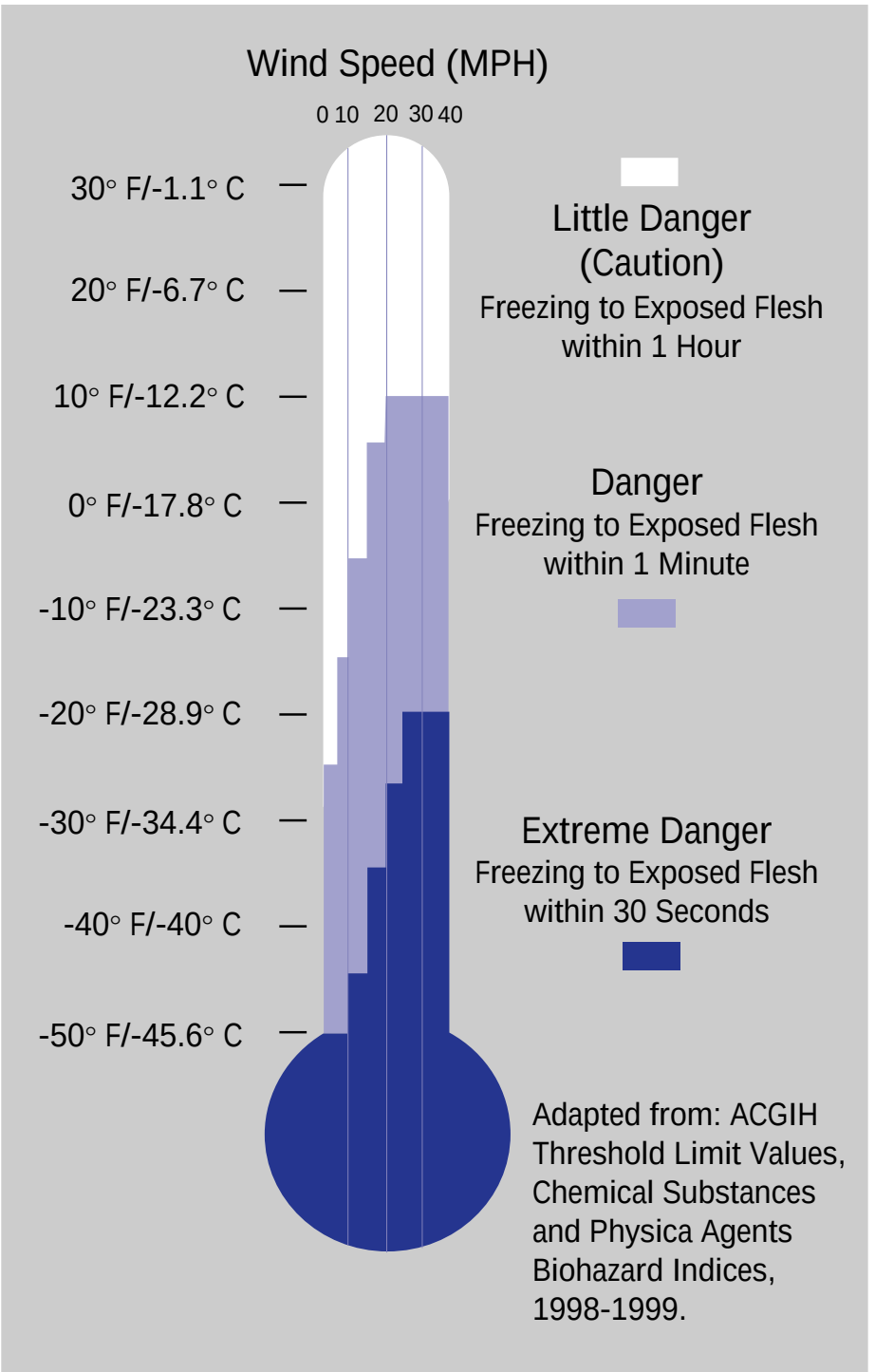
Workers Are at Increased Risk When

- They take certain medication (check with your doctor, nurse, or pharmacy and ask if any medicines you are taking affect you when working in hot environments).
- They have had a heat-induced illness in the past.
- They wear personal protective equipment (like respirators or suits).

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.



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 (35^0 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

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 C

HAZARD EVALUATION SHEETS / MSDS

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)
1-4	Tetrachloroethylene (PCE)	100 ppm	---	25 ppm	Y	Inh, Abs, Ing, Con	Irritation to eyes, nose, upper respiratory tract, throat; skin, flush face, dizziness, giddiness, headache, intoxication, nausea, vomiting, abdominal pain, diarrhea, systemic effects	Colorless liquid, mild chloroform odor	---	9.32
1-4	1,2-Dichloroethene (cis and Trans)	200 ppm	200 ppm	-----	Y	Inh, Ing, skin and/or eye contact	irritation eyes, respiratory system; central nervous system depression	colorless liquid, slightly acrid, Chloroform-like odor	0.5	9.25
1-4	Trichloroethene (TCE)	100 ppm (per 6/97 NIOSH Pocket Guide)			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	---	-----
	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

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)
1-4	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 Inh = Inhalation Abs = Skin Absorption
REL = Recommended Exposure Limit Ing = Ingestion Con = Skin and/or eye Contact
--- = Information not available mg/m^3 = Milligrams per cubic meter ppm = Parts per million
TLV = Threshold Limit Value(ACGIH) * = Chemical is a known or suspected carcinogen sk = Skin notation

APPENDIX D

EQUIPMENT CHECKLIST

EQUIPMENT CHECKLIST

PROTECTIVE GEAR			
LEVEL A	**N/A**	**LEVEL B**	**N/A**
SCBA		SCBA	
SPARE AIR TANKS		SPARE AIR TANKS	
ENCAPSULATING SUITE (Type)		PROTECTIVE COVERALL (Type)	
SURGICAL GLOVES		RAIN SUIT	
NEOPRENE SAFETY BOOTS		BUTYL APRON	
BOOTIES		SURGICAL GLOVES	
GLOVES (Type)		GLOVES (Type)	
OUTER WORK GLOVES		OUTER WORK GLOVES	
HARD HAT		NEOPRENE SAFETY BOOTS	
CASCADE SYSTEM		BOOTIES	
5-MINUTE COOLING VEST		HARD HAT WITH FACE SHIELD	
		CASCADE SYSTEM	
		MANIFOLD SYSTEM	
LEVEL C		**LEVEL D**	
ULTRA-TWIN RESPIRATOR	X	ULTRA-TWIN RESPIRATOR (available)	
POWER AIR PURIFYING RESPIRATOR		CARTRIDGES (Type GMC-H)(available)	
CARTRIDGES (Type GMC-H)	X	5-MINUTE ESCAPE MASK (available)	
5-MINUTE ESCAPE MASK		PROTECTIVE COVERALL (Type Tyvek/Saranax)	
PROTECTIVE COVERALL (Type Tyvek/Saranax)	X	RAIN SUIT (available)	X
RAIN SUIT		NEOPRENE SAFETY BOOTS	
BUTYL APRON		BOOTIES (available)	
SURGICAL GLOVES	X	NITRILE	
GLOVES (Type: Nitrite/Neoprene)	X	HARD HAT (available)	X
OUTER WORK GLOVES		SAFETY GLASSES	X
NEOPRENE SAFETY BOOTS		GLOVES (Type: Surgical)	X
HARD HAT WITH FACE SHIELD	X	WORK GLOVES (Type: Leather, Neoprene/Nitrile)(available)	X
BOOTIES	X	SAFETY BOOTS	X
HARD HAT		SAFETY VEST (Green and yellow with reflective stripes)	

EQUIPMENT CHECKLIST

INSTRUMENTATION	NO.	FIRST AID EQUIPMENT	NO.
OVA		FIRST AID KIT	X
THERMAL DESORBER		OXYGEN ADMINISTRATOR	
O_2/EXPLOSIMETER W/CAL.KIT (Drilling)	X	STRETCHER	
PHOTOVAC TIP		PORTABLE EYE WASH	
PID	X	BLOOD PRESSURE MONITOR	
MAGNETOMETER		FIRE EXTINGUISHER	X
PIPE LOCATOR			
WEATHER STATION		**DECON EQUIPMENT**	
DRAEGER PUMP, TUBES ( )		WASH TUBS	
BRUNTON COMPASS		BUCKETS	X
MONITOX CYANIDE		SCRUB BRUSHES	X
HEAT STRESS MONITOR		PRESSURIZED SPRAYER	
NOISE EQUIPMENT		DETERGENT (Type: Alconox) = TSP	X
PERSONAL SAMPLING PUMPS		SOLVENT (HEXANE)	
MINI-RAM (Particulates) (Drilling)	X	PLASTIC SHEETING	
		TARPS AND POLES	
		TRASH BAGS	X
RADIATION EQUIPMENT		TRASH CANS	
DOCUMENTATION FORMS		MASKING TAPE	
PORTABLE RATEMETER		DUCT TAPE	X
SCALER/RATEMETER		PAPER TOWELS	X
NaI Probe		FACE MASK	
ZnS Probe		FACE MASK SANITIZER	
GM Pancake Probe		FOLDING CHAIRS	
GM Side Window Probe		STEP LADDERS	
MICRO R METER		DISTILLED WATER	X
ION CHAMBER			
ALERT DOSIMETER			
MINI-RAD			

EQUIPMENT CHECKLIST

SAMPLING EQUIPMENT	NO.	MISCELLANEOUS (cont.)	NO.
4-OZ BOTTLES	X	BUNG WRENCH	
1 LITER AMBER BOTTLES	X	SOIL AUGER	
VOA BOTTLES	X	PICK	
SOIL SAMPLING (CORING) TOOL		SHOVEL	X
SOIL VAPOR PROBE		CATALYTIC HEATER	
THIEVING RODS WITH BULBS		PROPANE GAS	
SPOONS	X	BANNER TAPE	
GENERAL TOOL KIT	X	SURVEYING METER STICK	X
FILTER PAPER		CHAINING PINS AND RING	X
PERSONAL SAMPLING PUMP SUPPLIES		TABLES	
4-OZ JARS	X	WEATHER RADIO	
		BINOCULARS	
VAN EQUIPMENT		MEGAPHONE	
TOOL KIT	X	PORTABLE RADIOS (2)	X
HYDRAULIC JACK	X	CELL PHONE	X
LUG WRENCH	X	CAMERA	
TOW CHAIN		HEARING PROTECTION	X
VAN CHECK OUT			
GAS		**SHIPPING EQUIPMENT**	
OIL		COOLERS	X
ANTIFREEZE		PAINT CANS WITH LIDS, 7 CMIPS EACH	
BATTERY	X	VERMICULITE	
WINDSHIELD WASH	X	SHIPPING LABELS	
TIRE PRESSURE		DOT LABELS: “DANGER”, “UP”;	
		“INSIDE CONTAINER COMPLIES...”;	
MISCELLANEOUS		“HAZARD GROUP”	
PITCHER PUMP		STRAPPING TAPE	
SURVEYOR’S TAPE	X	BOTTLE LABELS	
100 FIBERGLASS TAPE	X	BAGGIES	X
300 NYLON ROPE		CUSTODY SEALS	X
NYLON STRING		CHAIN-OF-CUSTODY FORMS	X
SURVEYING FLAGS	X	FEDERAL EXPRESS FORMS	
FILM		CLEAR PACKING TAPE	X
WHEEL BARROW			

Attachment B

Community Air Monitoring Plan

New York State Department of Health
Generic Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

Source: DRAFT DER-10 Technical Guidance for Site Investigation and Remediation, December 2002- Appendix 1A

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m_3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m_3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m_3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m_3 of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

Source: DRAFT DER-10 Technical Guidance for Site Investigation and Remediation, December 2002- Appendix 1A

Attachment C

Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN
FOR REMEDIAL ACTION PLAN

BUILDINGS 1231 & 1253
NYSDEC SITE #633046
VERONA RESEARCH FACILITY
TOWN OF VERONA, ONEIDA COUNTY, NEW YORK

Prepared For:

Air Force Research Laboratory/ Rome Research Site
Environmental and Occupational Health Office
150 Electronic Parkway
Rome, New York 14414-4516

Prepared By:

Lu Engineers
175 Sullys Trail, Suite 202
Pittsford, New York 14534

September 2011

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Tables

1.0 Introduction

This Quality Assurance Project Plan (QAPP) was prepared as an integral part of the Remedial Action Work Plan (RAWP) for the Former Verona Research Facility and is subject to the review and approval by the New York State Department of Environmental Conservation (NYSDEC). The project work will be performed by Lu Engineers, or conducted under their discretion by NYSDEC-approved contractors. Project-specific descriptions can be found in the RAWP.

This QAPP presents the policies, organization, objectives, functional activities, and specific quality assurance (QA) and quality control (QC) activities that will be implemented by Lu Engineers for this project. This QAPP is designed to ensure that all technical data generated by Lu Engineers is accurate, representative, and will ultimately withstand legal scrutiny.

All QA/QC procedures are implemented in accordance with applicable professional technical standards, NYSDEC and Environmental Protection Agency (EPA) requirements, government regulations and guidelines, and specific project goals and requirements. This QAPP is prepared in accordance with NYSDEC and EPA QAPP guidance documents.

This QAPP incorporates the following activities:

- Sample Management and chain of custody;
- Document control;
- Laboratory quality control; and
- Review of project deliverables.

Analytical samples will be collected in the field utilizing standard operating procedures (SOPs) and sent to the contracted New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) Contract Laboratory Program (CLP)-certified laboratory for analysis, as necessary. Non-ASP laboratory analysis will also be used during the implementation of the remedial program. All analysis will be completed by ELAP certified laboratories. Field data compilation, tabulation, and analysis will be checked for accuracy. Calculations and other post-field tasks will be reviewed by field personnel and the project manager.

Equipment used to take field measurements will be maintained and calibrated in accordance with established procedures. Records of calibration and maintenance will be kept in the field logbook, as necessary.

Document control procedures will be used to coordinate the distribution, coding, storage, retrieval, and review of all data collected during all sampling tasks. These include, but are not limited to, the sampling of groundwater and soil vapor.

In addition, the laboratory has developed SOPs for individual analytical methods and internal QC procedures. These documents are an important aspect of their QA program and are available for review upon request.

2.0 Project Objectives

The intent of this project is to implement an Organix Green Liquid (OGL) injection program to destroy chlorinated solvent contamination in saturated soils and groundwater in the vicinity of Buildings 1231 and 1253 at the Former Verona Research Facility. Injection of this material into the Site groundwater via direct injection methods will be conducted for three events. Sampling and laboratory analyses of groundwater will be used to evaluate the short-term and long-term effectiveness of the injection program.

A complete project description, including Site history and background information, and the scope of work is described in the RAWP.

3.0 Project Organization

The personnel anticipated for this project are as follows:

Greg Andrus, CHMM	Project Manager
Bryan Bancroft	Quality Assurance Officer
Eric Detweiler	Field Geologist

Subcontractors

Paradigm Laboratories	Analytical Laboratory
Trec Environmental	Geoprobe Contractor

Qualifications for Lu Engineers' personnel are included in Appendix E of the RAWP.

4.0 Sampling Procedures

4.1 Sampling Design

Sampling for this project is designed to evaluate the effectiveness of the OGL injections. Groundwater samples will be collected from MW-1231 C, E, F and H and MW-1253 E, F, H and I one month after the final injection to determine the short-term effectiveness of the remedy. To determine the long-term effectiveness, samples will be collected semi-annually from each of these wells for two years following the remedial activities.

Groundwater samples will be analyzed for target compound list (TCL) volatile organic compounds (VOCs).

Plans showing the proposed injection and monitoring well locations are provided as Figures 2 and 3 in the RAWP.

4.2 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. Rigorous documentation of all field QC samples in the Site logbooks is mandatory.

- **Trip Blanks** are similar to field blanks with the exception that they are not exposed to field conditions. Their analytical results help assess the potential for cross-contamination of volatile organics while samples are held in a cooler and transported. 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 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/Rinsate 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. Rinsate 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. Rinsate 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 are field duplicates. Field duplicates are designed to assess the consistency of the overall sampling and analytical system.
- **Matrix Spike (MS) Samples** are used to assess matrix interference effects on the laboratory method, as well as to evaluate instrument performance. A sample spike 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.

- **Matrix Spike Duplicate (MSD) Samples** 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 relative percent difference (RPD) between the values of the matrix spike and matrix spike duplicate for organics 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.

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

4.3 Decontamination Procedures

All decontamination will be performed in accordance with NYSDEC approved procedures. Sampling methods and equipment have been chosen to minimize decontamination requirements and prevent the possibility of cross-contamination. Disposable sampling equipment (i.e., disposable bailers, HDPE tubing) will be used to the extent possible to minimize the need for equipment decontamination. Groundwater sampling will be performed using new dedicated, disposable bailers.

All drilling equipment will be decontaminated prior to drilling, after drilling each injection well, and prior to leaving the Site. Special attention will be given to the drilling assembly, augers, and polyvinyl chloride (PVC) casing.

Drill cuttings and water generated during drilling will remain onsite. Waters generated by decontamination or by developing, purging, or pumping the wells that exhibit elevated photoionization detector (PID) readings or other evidence of contamination will be stored in drums or an onsite holding tank.

If necessary, a temporary decontamination pad will be established in a secure area onsite using 6-mil polyethylene sheeting. The drill rig 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 pad. All decontamination wastes will be transferred into drums or an onsite holding tank for appropriate staging and disposal. The Subcontractor will be responsible for proper staging and disposal of all investigation derived wastes (IDW). Final disposal of soils and water will be dependent on the results of the groundwater analyses to be conducted during this RAWP.

4.4 Sampling Methods

4.4.1 Injection

A Geoprobe 6610D or equivalent rig will be used for direct injection of all materials.

4.4.2 Groundwater Sampling Procedures

Static water levels will be measured to within 0.01-foot prior to purging and sampling. Purging and sampling of each well will be accomplished using dedicated disposable PVC bailers on new polypropylene line. All wells will be purged a minimum of three volumes of water standing in the casing or to dryness. Temperature, pH, conductivity, and turbidity will be measured and recorded during purging.

Groundwater samples will be collected according to the following procedures.

- Water clarity will be quantified during sampling with a turbidity meter;
- When transferring water from the bailer to sample containers, care will be taken to avoid agitating the sample, since agitation promotes the loss of volatile constituents;
- Any observable physical characteristics of the groundwater (i.e., color, sheen, odor, turbidity) at the time of sampling will be recorded; and
- Weather conditions (i.e., air temperature, sky condition, recent heavy rainfall, drought conditions) at the time of sampling will be recorded.

All groundwater samples and their accompanying QA/QC samples will be analyzed as specified in the RAWP.

4.5 Sample Documentation

4.5.1 Logbooks

All field activities will be documented in a field logbook. This logbook will provide a record of activities conducted at the Site. All entries will be signed and dated at the end of each day of fieldwork. The field logbook will include the following: date and time of all entries; names of all personnel on Site; weather conditions (temperature, precipitation, etc.); location of activity; and description of activity.

In addition, Lu Engineers will complete the following standard field forms as necessary:

- Boring logs
- Well construction detail
- Groundwater elevations, development, and sampling logs
- Summa® canister data sheets
- Chain of custody for all analytical laboratory sampling

As with any data logbooks, no pages will be removed for any reason. If corrections are necessary, these must be made by drawing a single line through the original entry (so that the original entry can still be read) and writing the corrected entry alongside it. The correction must be initialed and dated.

4.5.2 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 Mylar tape). Generally, the format will include the following:

- Two or three letters identifying the type of sample:
  MW- groundwater sample
- Three letters identifying Lu Engineers: JCL
- Two numbers identifying a sample location;
- Additional letters identifying special parameters, if applicable:
  D – Field Duplicate
  MS – Matrix Spike
  MD - Matrix Spike Duplicate

Example: MW-JCL-1231F a sub-slab soil vapor sample collected from location 1231F.

Each sample will be labeled and sealed immediately after 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.

The laboratory sample number will appear on a barcode label affixed to each sample, extract, or digestate.

4.6 Field Instrumentation

All instruments and equipment used during sampling and analysis will be operated, calibrated and maintained according to manufacturer's guidelines and recommendations. Operation, calibration, and maintenance will be performed by personnel properly trained in these procedures. Documentation of calibration information will be maintained in the appropriate log book or reference file and will be available upon request. Instruments will be calibrated before each use.

5.0 Sample Handling and Custody

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. Chain-of-custody requirements are compliant with EPA sample-handling 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

For sampling performed by Lu Engineers, new sample containers obtained from a reliable supplier will be provided by the analytical laboratory. All containers provided by the laboratory are precleaned (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. In addition, all water samples for volatile analysis will be preserved with HCl to a pH of less than 2. A list of preservatives and holding times for each type of analysis is included on the attached Table 2.

Sample preservation will be verified at the lab 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 Field Custody Procedures

- Sample bottles must be obtained precleaned 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 transferred 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.

5.2.1 Custody Seals

Custody seals are preprinted adhesive-backed seals with security perforations 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.

5.2.2 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 (i.e., 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.

5.3 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.

5.3.1 Sample Packaging

Samples must be packaged carefully to avoid breakage or 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.
- The cooler will be labeled as containing a hazardous material if it contains medium or high-hazard samples. Labeling requirements differ depending on the type of material being shipped; the majority of soil samples may be shipped as a class "9" hazardous material with the proper shipping name "OTHER REGULATED SUBSTANCES (ENVIRONMENTAL SAMPLES)."
- A hazardous material shipping manifest will be completed for each cooler of medium to high-hazard samples and affixed to the lid of the cooler.
- Low-hazard environmental samples do not require a hazardous material shipping manifest. The words "LABORATORY SAMPLES" should be printed on the top of the cooler for low-hazard samples.
- Samples packaged and shipped as limited-quantity radioactive material must comply with DOT and shipper regulations for package contamination limits, surface exposure rate, and airbill completion.

5.3.2 Shipping Containers

Environmental samples will be properly packaged and labeled for transport and dispatched for analysis to the appropriate subcontracted laboratory for geotechnical analyses. 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.

5.3.3 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.

5.4 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 anomaly is 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 sample tracking 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 Methods

Groundwater sample analysis will be performed by Paradigm Environmental Services, a NYSDOH ELAP-certified analytical laboratory. General analytical and organic methods to be performed by the laboratory for this project are listed in Table 1 of this QAPP.

Table 1
Proposed Sampling and Analysis Summary

Sample Type	Sample Location	Analytical Parameter	Analytical Method	Reporting Level	Estimated# Field Samples	Field Duplicates	Blanks		MS/MSD	Total
							Equip	Trip		
Groundwater	MW-1231 C, E, F & H and MW-1253 E, F, H & I	TCL VOCs	8260	Category B	**24**	**3**	**-**	**3**	**3/3**	**36**

6.1 Analytical Capabilities

The analytical laboratory is fully equipped for analysis of all types of water, air, and soil samples for chemical contaminants, bacteriological quality, and general characterization. Proven and approved analytical techniques are used, backed up by a rigorous system of QC and QA checks to ensure reliable and defensible data. All laboratory work is performed in accordance with guidelines established by EPA, the NYSDOH, and the National Institute of Safety and Health (NIOSH).

Organic analysis is accomplished by gas chromatography (GC), high performance liquid chromatography (HPLC), and or GC/mass spectrometry (MS).

Laboratory procedures to be utilized for sample preparation and analysis are referenced in the NYSDEC ASP.

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.

6.2 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.

6.2.1 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.

6.2.2 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 identify the concentration of the compound in the environmental sample. A minimum of three calibration standards will be used to generate a standard curve for all analyses.

6.2.3 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.

6.2.4 Spike Sample

A sample spike 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 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.

6.2.5 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.

6.2.6 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 prior to instrumental analysis.

6.2.7 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.

6.2.8 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.

6.3 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 National Institute of Standards and Technology (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

7.1 Deliverables

Once the contract laboratories have provided all analytical data and sampling information has been evaluated, Lu Engineers will develop a Final Engineering Report (FER) for the remedy. The report will be prepared as indicated by the following general outline:

1.0 Introduction
2.0 General Site Information
3.0 Description of the Remedy
4.0 Summary of Remedial Actions
5.0 Results
6.0 Conclusions & Recommendations

The report will carefully document all remedial activities and will be supplemented with photographic documentation, maps, figures, tables, sample logs, DUSRs, and lab results.

A Site Management Plan (SMP) will be prepared and submitted along with the FER.

7.1.1 Category B Data Package

The final round of groundwater samples and all vapor intrusion samples will be reported by the laboratory with NYSDEC ASP Category B deliverables. The Category B data package includes:

- A detailed summary of the report contents and any quality control outliers or corrective actions taken.
- Chain of Custody documentation
- Sample Information including: date collected, date extracted, date analyzed, and analytical methods.
- 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
- Method detection limits and/or instrument detection limits
- Run logs, standard preparation logs, and sample preparation logs
- Percent solids (where applicable).

7.1.2 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 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.

7.2 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.

7.2.1 Data Usability

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. Adherence to appropriate sample preservation and holding times for applicable analyses is critical to ensuring data usability. Table 2 identifies applicable holding times for this project.

Groundwater Sample Preservation and Holding Times
Table 2

Parameter	Method Number	Container Type and Size	Preservation	Holding Time*
TCL VOCs	8260	3 x 40-ml. VOA	Cool to 4°C; minimize headspace; HCl to pH<2	5 days unpreserved / 12 days preserved

* Holding times are based on verified time of sample receipt (VTSR) at the laboratory

Attachment D

Schedule

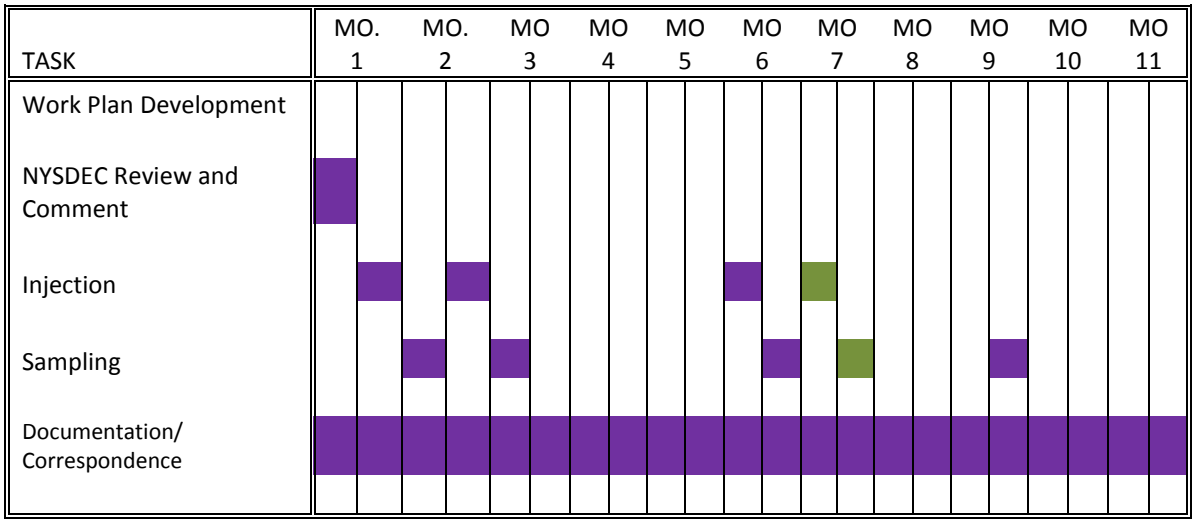
Attachment D

PROPOSED SCHEDULE FOR RRS VERONA
SITE REMEDIAL PILOT STUDY
29-Oct-11

MO= Month

Estimated Injection/Sampling event

Possible Injection/Sampling event pending funding



Attachment D

Qualifications

Biography

Mr. Andrus' 23 years of experience includes a diverse range of geological and environmental engineering projects. Mr. Andrus has assisted numerous petroleum facilities with environmental compliance planning and related issues. Projects have ranged from large international petroleum industry clients and federal facilities to small commercial and retail facilities.

Project Experience

Sewall's Island, ERP Brownfield Investigation, City of Watertown, NY

Mr. Andrus is the Project Manager in charge of completing a Remedial Investigation/Alternatives Analysis Report (RI/AAR) on Sewall's Island for the City of Watertown, New York. The site consists of 11 parcels representing a total of 15.18 acres. Our scope of work on this project includes completion of a NYSDEC approved and funded Environmental Assessment and an Interim Remedial Measures (IRMs), a geophysical survey, identification of asbestos containing materials in on-site debris, Remedial Investigation, completion of an instrument survey, a Remedial Investigation/ Alternatives Analysis Report and participating in public meetings to inform the public of findings and recommendations pursuant to requirements of the ERP program.

Rome Research Site, Environmental Term Contract, USAF, Rome, NY

Program Manager: Mr. Andrus served as Program Manager for four consecutive multi-year IDIQ contracts to provide civil and environmental engineering services to the AFRL/RRS at the former Griffiss Air Force Base. Under these contracts, Lu Engineers has conducted wetland delineations, multiple BRAC site investigations and cleanups, decommissioning of wells, archaeological surveys, UST closures and disposal area closures, design of backflow preventers; on-call environmental sampling services, demolition and hazmat assessment asbestos surveys and wastewater sampling. Work has been completed on Air Force Projects throughout NYSDEC Region 6 and in other areas of New York state.

Former Frink America property, NYSDEC Voluntary Cleanup Work Plan, Clayton, NY

Project Engineer. The former Frink America property underwent a Site Investigation under the NYSDEC Environmental Restoration Program. The goal of the project was to identify the vertical and horizontal extent of contamination located on site in order to establish an appropriate cleanup alternative. Mr. Andrus prepared scoping, budget, hydrogeological and engineering review, and liason with the NYSDEC Region 6 Office in Watertown, NY

Orchard-Whitney Brownfield Investigation, Rochester, NY

Project Manager. Lu Engineers is currently providing environmental services for the Orchard-Whitney Brownfield site for the City of Rochester under the NYSDEC Environmental Restoration Program. The 3.9 acre site is located in a strategic economic development area of the City. The goal of this project is to generate a NYSDEC approved Site Investigation/Remedial Alternatives Report (SI/RAR). Mr. Andrus is the Project Manager leading the current remedial investigation and interim remedial measures. The nature and extent of petroleum and metals contamination is being defined and required cleanup is being implemented.

Greg Andrus, CHMM

Environmental Remediation Group Leader

Education

B.S., Geology

Hydrogeology, Graduate Level Studies

Certifications

Certified Hazardous Materials Manager

OSHA 40-Hour Training and Refresher Courses

OSHA Confined Space Entry Training

Air Program Information Management Systems

ACHMM Finger Lakes Chapter, Former President

PC Application in Risk Assessment, Modeling and GIS

New York State Council of Professional Geologists

National Groundwater Association

Town of Clarkson, ERP Investigation, Clarkson, NY

Mr. Andrus is managing the remedial investigation and interim remedial measures on a former gas/service station located on Route 104 in the Town of Clarkson. He prepared an ERP application to obtain funding, and a Remedial Investigation Work Plan for NYSDEC approval and guided this small community through the ERP process.

Port Leyden ERP Investigation; Town of Leyden, NY

Mr. Andrus is the project manager for this NYSDEC funded ERP site that was a former gas/service station. The site investigation included a geophysical investigation to identify tanks and underground utilities, soil borings, test pits, soil vapor intrusion sampling, well installation, and the removal of six underground storage tanks as an IRM. Approximately 800 tons of petroleum contaminated soils were also removed and disposed. Engineering controls including sub-slab depressurization systems were designed and installed. Mr. Andrus also prepared cost estimates, bid documents and specifications on behalf of the Town of Leyden.

Churchville Ford, Private Brownfield Site

Lu Engineers conducted a Site Investigation under the NYSDEC Brownfield Program at the Churchville Ford Site. The goal of the project was to identify the vertical and horizontal extent of chlorinated solvent contamination in order to establish an appropriate cleanup alternative. Mr. Andrus provided scoping, budget, and hydrogeological expertise, engineering review, and remedial design. The site is currently in the remediation phase of the Brownfield Program.

Former Davis-Howland Oil Company Facility, Rochester, NY

Mr. Andrus was the Project Manager for continued remedial design, construction oversight and remedial operations and maintenance on this NYSDEC IHWS site contaminated with chlorinated solvent. This $2 million project involved the implementation of remedial activities including trailer mounted remediation system with groundwater pump and treatment, vapor extraction and air sparging. Treatment included a thermal/catalytic oxidizer. He managed a soil vapor intrusion investigation on residential/commercial properties in the area. He oversaw interior vapor sampling and sub-slab basement ambient air sampling in residences surrounding the site.

Karenlee Drive, Henrietta, NY

Lu Engineers completed and implemented a Work Plan for the former wastewater treatment plant at 100 Karenlee Drive in the Town of Henrietta in accordance with the NYSDEC Voluntary Cleanup Program. Mr. Andrus provided oversight of installation of seven monitoring wells, the collection of subsurface soil samples during the well installation, the collection of water samples from the installed wells and the collection of eight surface soil samples. After all of the information had been obtained a report describing the findings of the investigation was prepared for the Town of Henrietta facilitating site closure under the NYSDEC BCP allowing future residential development.

Hidden Valley Electronics Inactive Hazardous Waste Site, Vestal, NY

Project Manager for design/build environmental remediation services at the former Hidden Valley Electronics in Vestal, NY. The property consists of a 13,215 square foot former manufacturing building and a paved/gravel parking lot in a mixed commercial/residential district. Mr. Andrus installed a sub-slab ventilation/soil vapor extraction (SVE) system at the site to draw contaminated soil vapor from beneath the slab-on-grade floor of the main site building. Extensive soil vapor intrusion testing was conducted at nearby residences as part of this project.

Bryan Bancroft

Environmental Technician

Biography

Mr. Bancroft has **8 years of experience** including wetland delineation and mitigation, environmental site assessments, stormwater and sediment/erosion management, air monitoring for asbestos abatement projects, hydraulic studies and landfill monitoring.

Project Experience

Former Griffiss Air Force Base, Phase I and II EBS, Rome, NY

Conducted Phase I and II Environmental Baseline Surveys for a number of buildings for the U.S. Air Force at the Rome, NY facilities. Work conducted included investigations in accordance with applicable USAF and ASTM protocols of existing site conditions. Testing included the use of photoionization detector to test for volatile organic vapors, sampling and testing of soils for RCRA metals, and swipe samples for PCB analysis. Remediation included asbestos and hazardous material removal and disposal.

Newport Research Facility, Building 1605, Rome Research Site, Tanner Hill, NY

Mr. Bancroft assisted with the implementation of the environmental remediation portion of a Phase II Environmental Baseline Survey at Building 1605 of the Newport Research Facility. Included the preparation of wells for the installation of a total fluids extraction remediation system, and monitoring of the system.

Karenlee Drive, Phase II Site Investigation and Tank Removal, Henrietta, NY

Mr. Bancroft was part of the team performing the Phase II Environmental Site Assessment of a former sewage treatment plant in Henrietta, NY. Work included exploratory excavation of former tank sites, test pit examination of former sludge drying bed area, analysis of soils using photoionization detector for volatile organic vapors, and observation of underground fuel oil tank removal.

Phase I ESA – 100 Jay Scutti Boulevard, Rochester, NY

Mr. Bancroft assisted with the Phase I ESA update for property located at 100 Jay Scutti Boulevard, Rochester, NY.

Brownfield-Photech site, Driving Park Avenue, Rochester, NY

Mr. Bancroft assisted in the Federal Wetland Delineation on a 12.7 acre Brownfield industrial site located on Driving Park Avenue in the City of Rochester, NY. The 1987 Army Corps of Engineers Delineation Method was used. Wetland areas included wooded and shrub-scrub communities. Sampling was conducted to characterize the soils, hydrology and vegetation. A global positioning system (GPS) was used to locate the delineation flags.

Garlock Sealing Technologies, Palmyra, NY

Lu Engineers performed federal and state wetland delineation on 60+ acres of industrial property for Garlock Sealing Technologies in Palmyra, NY. Mr. Bancroft assisted in the delineation of a wetland area using the 1987 Corps of Engineers delineation method.

Education

MPS, 2005, Water & Wetland Resources, SUNY College of Environmental Science and Forestry, Syracuse, NY

BS, Environmental Management, 2002, Rochester Institute of Technology, Rochester, NY

Biography

Mr. Detweiler's 16 years of experience includes a diverse range of geological and environmental engineering projects. Areas of specialization include site assessment, remedial investigation/ site characterization, site remediation, and regulatory compliance. Eric is our lead inspector working with Lu field crews and overseeing subcontractors during drilling, geoprobe work, test excavations, and installation of all types of remedial systems. He is familiar with (and well regarded by) all of the remediation staff in the NYSDEC Watertown Regional office. During his career, Eric has also provided building demolition oversight, asbestos and lead inspections, land surveying services and wetland delineations.

Project Experience

Former Frink America property, NYSDEC ERP, Clayton, NY

Lu Engineers conducted a Remedial Investigation (RI) and Interim Remedial Measures (IRMs) under the NYSDEC ERP program at the former Frink America property in Clayton, NY. Mr. Detweiler conducted aquifer testing, soil vapor sampling, and supervised the installations of soil borings, test pits, and monitoring wells to delineate the vertical and horizontal extent of contaminant migration. Mr. Detweiler assisted in the writing of the RI/FS Report including the evaluation of appropriate remedial alternatives and supervised all IRM activities including: the excavation and disposal of 19,000 tons of contaminated soil. He used a Trimble GPS unit with to locate underground utilities, relevant site features, soil boring points, confirmatory sample points, monitoring wells and to demarcate excavation area boundaries. His time spent on this project was instrumental to its success.

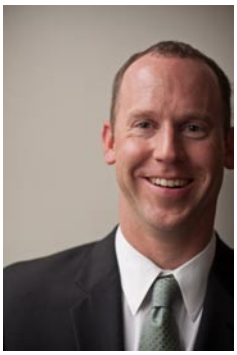
Sewall's Island ERP Assessment, Watertown, NY

Lu Engineers conducted remedial investigation of a former paper machine manufacturing facility on this ERP project. The scope of work included surface and subsurface soil sampling, monitoring well installations, groundwater sampling, test pitting, a geophysical survey, surveying, and the preparation of remedial alternatives report. Mr. Detweiler conducted sampling and provided oversight for all investigative and remedial tasks. Future remedial tasks include operation and maintenance of a Total Fluids Extraction system to remediate diesel fuel contamination in groundwater at the Site. Mr. Detweiler will continue to be a vital professional in this project's success.

Churchville Ford, NYSDEC BCP Investigation, Churchville, NY

A subsurface investigation was conducted to identify the nature and extent of contamination under the NYS Brownfield Cleanup Program at the Churchville Ford site. Mr. Detweiler developed a Work Plan which specified all investigation, sampling and testing methods to be used. Mr. Detweiler's field services included soil and sediment sampling, a storm water drainage system investigation, a groundwater investigation including monitoring well installations, sampling and aquifer testing, evaluation of an oil/water separator soil vapor intrusion sampling, a residential well survey, a topographic survey, installation of remedial injection wells, oversight of a remedial injection system, and development of the final Engineering Report.

Eric Detweiler
Geologist / Hydrogeologist



Education

B.S., Geology

Certifications

OSHA 40-hour Hazardous Waste Site Operations and Emergency Response Certification

OSHA Confined Space Entry Training

NYSDOL Asbestos Building Inspector Certification

New York State Council of Professional Geologists

Wilcox Press, ERP Investigation and Cleanup, Dansville, NY

The former Wilcox Press site underwent a full environmental investigation and cleanup under the NYSDEC Environmental Restoration Program. The project involved a full remedial investigation and feasibility study (RI/FS), selection of remedial measures, tank removals, and contaminated soil removal. At the facility is in a largely residential area special precautions were necessary to protect neighbors and their children. Mr. Detweiler supervised all field crews and sub-consultants during the project. He also performed air monitoring on the project site and along the projects perimeter to ensure that the project was being completed in a safe manner for the community. Eric completed all necessary reports for the project and submitted them to the NYSDEC for approval. The cleanup documents have been approved by the NYSDEC and project completion is estimated for the Fall of 2011.

Orchard-Whitney ERP Investigation, City of Rochester, NY

Lu Engineers is currently providing environmental services for the Orchard-Whitney Brownfield site for the City of Rochester under the NYSDEC Environmental Restoration Program. The goal of this project is to generate a NYSDEC approved Site Investigation/Remedial Alternatives Report (SI/RAR). Mr. Detweiler has performed a variety of tasks including: a hazardous materials assessment within the former building structures, hazardous materials sampling to determine the presence of hazardous wastes during active asbestos abatement, and contractor oversight during hazardous materials removal. Mr. Detweiler was responsible for contractor oversight during building demolition activities (including Community Air Monitoring), aquifer testing, oversight of test pit excavations, investigation/evaluation and remediation of nine underground storage tanks, installation of monitoring wells, and delineation of contamination resulting from former plating operations at the Site.

Longway's Diner, Soils Removal, Pamelia, NY

Lu Engineers designed and implemented a petroleum contaminated soils excavation plan which was completed under the jurisdiction of NYSDEC's Regional Office in Watertown, NY. Mr. Detweiler assisted with the selection of an excavation contractor to remove and dispose of contaminated soils. He also selected an analytical laboratory to complete rapid turnaround results to facilitate streamlined backfilling of the excavation. Eric oversaw the excavation of approximately 8,500 tons of contaminated soils, completed all sampling to document that the excavation was clean prior to closure, wrote the final report for the project and was instrumental in obtaining a closure letter from the NYSDEC.