

**DRAFT**

**SOURCE AREA INVESTIGATION WORK PLAN ADDENDUM  
FOR THE FORT DRUM PCE REMEDIAL INVESTIGATION  
FOR SOLVENT CONTAMINANTS  
FORT DRUM, NEW YORK**

**Prepared For:**



U.S. ARMY CORPS OF ENGINEERS, BALTIMORE DISTRICT  
10 South Howard Street  
Baltimore, Maryland 21201

**Prepared By:**

**Plexus Scientific Corporation**



4501 Ford Avenue, Suite 1200  
Alexandria, Virginia

for

**PARS Environmental, Inc.**



500 Horizon Drive, Suite 540  
Robbinsville, New Jersey

**Contract Number: W912DR-10-D-0034  
Delivery Order 0001**

**December 2011**

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## Acronyms and Abbreviations

BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CENAB	U. S. Army Corps of Engineers Baltimore District
CLP/ASP	Contract Laboratory Protocol/Analytical Services Protocol
CSCs	Chlorinated Solvent Compounds
CSM	Conceptual Site Model
ELAP	Environmental Laboratory Accreditation Program
EPCs	Exposure Point Concentrations
ft	Feet
GC/MS	gas chromatography–mass spectrometry
HHRA	Human Health Risk Assessment
L/min	Liters per minute
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NYSDOH	New York State Department of Health
OSL	Old Sanitary Landfill
PARS	PARS Environmental, Inc.
PCE	Tetrachloroethene
PID	Photoionization Detector
Plexus	Plexus Scientific Corporation
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RI	Remedial Investigation
SOW	Scope of Work
USEPA	United States Environmental Protection Agency
USTs	Underground Storage Tanks
VOCs	Volatile Organic Compounds

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## 1.0 INTRODUCTION

The U.S. Army Corps of Engineers Baltimore District (CENAB) has selected PARS Environmental, Inc. (PARS) to provide the required personnel, materials, and services to perform a remedial investigation (RI) near Area 3805, hereafter referred to as the Gasoline Alley Areas 1700, 1800, 1900, and 3800, located at the Fort Drum Military Installation in Fort Drum, New York. PARS has subcontracted Plexus Scientific Corporation (Plexus) to assist with the completion of the CENAB Scope of Work (SOW), dated 10 May 2010. This work will be performed under the Contract No.W912DR-10-D-0034, Delivery Order No. 0001.

The Gasoline Alley Areas 1700, 1800, 1900, and 3800 encompasses the following existing sites: Areas 1995, 3805, and the Old Sanitary Landfill (OSL) (**Figure 1**). Dissolved-phase tetrachloroethene (PCE) contamination was discovered during sampling activities for the Area 3805 investigation and clean-up, conducted separately from this RI. A historical review to determine potential sources of chlorinated solvent compounds (CSCs) was conducted in 2009 (Plexus, 2009). Based on analytical results from samples collected as part of the Source Area Investigation (SAI; Plexus, 2010), it was determined that the presence of vapor phase PCE in nearby buildings 1880 and 1885 should be investigated. To that end, this Work Plan was developed to augment the scope of work outlined in the SAI work plan (Plexus, 2010c) to include sampling of sub-slab and indoor air quality in and beneath those buildings for use in refining the risk assessment model being developed as part of the RI. Recognizing that the heating season typically represents the time when potential exposure to indoor air contamination is at its greatest, this vapor sampling survey will be performed during the heating season to reflect “worst-case scenario” conditions.

### 1.1 Site Background and History

Fort Drum Military Reservation is located in upstate New York approximately 10 miles northeast of Watertown, 80 miles north of Syracuse, and 25 miles southeast of the U.S./Canadian border. Fort Drum occupies a large portion of northeastern Jefferson County and a portion of western Lewis County. The Reservation encompasses approximately 168 square miles. Fort Drum was established in 1906 as a National Guard training facility. During World War II, the Reservation functioned as an operations base and firing range, and provided combat skills training facilities for the 45th Infantry Division and the 4th and 5th Armored Divisions. Additionally, the Reservation conducted small amounts of explosive ordnance disposal. Currently, Fort Drum is the operations headquarters for the 10th Mountain Division (Light Infantry). The Reservation also supports training facilities and services for the U.S. Army National Guard.

Gasoline Alley has been used for fuel storage and dispensing at least since the 1940s, when Fort Drum was expanded. Nine fuel dispensing areas were located along Gasoline Alley where kerosene, gasoline, diesel fuel and JP-4 were stored and dispensed from 22 underground storage

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tanks (USTs) ranging in capacity size from 5,000 to 25,000 gallons. The dispensing areas are referred to as Areas 1195, 1295, 1395, 1495, 1595, 1795, 1895, 1995, and 3805. The USTs, fuel dispensers, and associated piping were removed in 1994 and 1995 (EA, 1996).

The OSL is an approximately 50-acre closed landfill consisting of two cells located on the north side of New York Route 26. Both cells are capped with synthetic covers. The geosynthetic cap for Cell 2 was installed in the Summer of 2008. Leachate from the OSL commingles with the dissolved-phase fuel constituent plume originating at Area 3805, and discharges to the OSL creek via seeps in the face of the ravine on the north side of the OSL. The primary contaminants in the leachate are benzene, toluene, ethylbenzene, and xylene (BTEX); however, preliminary results of the PCE RI suggest that the leachate also contains CSCs (i.e., PCE).

In response to the earlier dissolved phase PCE detections, in the Fall of 2010, Plexus conducted Phase I, II, and III of the CENAB SOW, dated 10 May 2010, which included (among other tasks) drilling and installation of groundwater monitoring wells, soil and groundwater sampling, and soil-pore gas sampling. Concurrent with drilling, activities, soil and groundwater samples were collected and analyzed in “real-time” to aid in the placement and of subsequent borings and wells, and to delineate the vertical and horizontal extent of PCE impacts. The samples collected were analyzed for volatile organic compounds (VOCs) in accordance with United States Environmental Protection Agency (USEPA) Method 8260. The highest concentrations of PCE in groundwater were found in Area 1800 at monitoring well PCERI-MW19S, just to the north of Buildings 1885 and 1880 (**Figure 2**). The most elevated concentrations of PCE in soil were also found in this area. During the Summer of 2011, eight soil gas samples were collected around the perimeter of building 1885 and analyzed for VOCs in accordance with USEPA Method TO-15. The samples collected on the eastern portion of the building yielded low concentrations of PCE in soil vapor, while slightly elevated concentrations were identified in a boring positioned in the southwest corner of building 1885 (SG-8, **Figure 3**). These soil gas results prompted the Army to take voluntary proactive measures to ensure the health and safety of the building occupants.

## **2.0 VAPOR INTRUSION SURVEY OBJECTIVES**

As stated in Section 1.0, the primary objective of this vapor sampling survey is to ascertain the presence (or absence) of vapor phase PCE in and beneath Buildings 1880 and 1885 for use in augmenting the risk assessment being performed as part of the PCE RI. Buildings 1885 and 1880 are the closest occupied structures to the highest concentration of the PCE groundwater contamination. It is important to note that this study is intended for screening purposes only and is being conducted voluntarily by the Army. Should the results of the study indicate that PCE vapors are present at levels that pose a hazard to the occupants of Buildings 1880 and 1885, additional investigation measures may be required that are beyond the scope of the PCE RI. Specific objectives of the vapor intrusion investigations conducted at Buildings 1885 and 1880 include:

- 
- Supporting the RI in determining all potential receptors of VOC contamination;
  - Evaluating the potential of migration of VOCs in the soil vapor from the PCE groundwater plume; and
  - Assess the impact or potential impact of the soil vapor through the RI Screening Level Human Health Risk Assessment (HHRA).

These objectives will be achieved by completing three work components: 1) a physical building survey, 2) collection and analysis of sub-slab soil vapor samples, and 3) collection and analysis of indoor air quality samples. These activities are described below. All work performed as part of this source area supplemental RI will be conducted in accordance with the “Quality Assurance Program Plan (QAPP) Environmental Investigation for Fort Drum” (Plexus, 2010b).

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### 3.0 PHYSICAL BUILDING SURVEY

A physical survey will be conducted at Buildings 1885 and 1880 prior to conducting the vapor intrusion survey. The purpose of the physical building survey is to obtain a qualitative assessment of factors, such as infrastructure characteristics that may potentially influence the air sampling study results. The physical building survey will also include data collection regarding occupants' lifestyles and building use, including (but not limited to):

- Interviewing building occupants;
- Collecting information on:
  - The building layout, garages, and utility entrances into the building;
  - Ventilation system design;
  - Foundation conditions;
  - Presence of foundation sumps; and
  - Building materials.
- Use of cleaning products;
- Indoor storage of paints;
- Petroleum hydrocarbon products;
- Use of aerosol consumer products; and
- Smoking.

A copy of the physical building survey questionnaire is provided in **Appendix A**, "Field Forms."

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## 4.0 VAPOR INTRUSION SURVEY SCOPE OF WORK

Vapor sampling will include collection of collocated sub-slab soil vapor and indoor air samples (“sample pairs”). A total of three sample pairs will be collected from Building 1885 (**Figure 3**). Additionally, one additional sample pair will be collected from a location to be based on the results of the physical building survey. The additional sample location will be based on the following criteria:

- In the vicinity of known contamination to qualitatively and/or quantitatively characterize the contamination;
- Elevated readings are obtained in the building when screening with field equipment such as a photoionization detector (PID);
- If significant odors are present and the source needs to be characterized; or
- If the building is prone to groundwater intrusion or flooding (e.g., sump pit overflows).

A total of two sample pairs will be collected from Building 1880 (**Figure 4**). One ambient air sample will be collected outside, upwind and adjacent to the buildings, one duplicate [Quality Assurance/Quality Control (QA/QC)] sample, as well as, one matrix spike and matrix spike duplicate (MS/MSD) sample will be collected for QA/QC purposes. All samples will be collected over an 8-hour (working shift) duration. The 8-hour sample collection time for a 6-liter capacity Summa canister corresponds to a maximum soil gas sample collection flow rate of approximately 0.0125 liters per minute (L/min.). QA/QC measures implemented during air sampling events will include maintaining a minimum residual negative pressure in the Summa canisters of approximately 1 to 5 inches of mercury in order to maintain this sampling rate.

Indoor and outdoor air sampling canisters will be placed in the breathing zone between 3 and 5 feet (ft) above the ground surface. The ambient outdoor air sample will be collected upwind of the building during each 8-hour sampling event. The sampling canisters will be positioned in the sampling locations as to minimize disturbance of both the sampler itself, as well as any personnel present in the building at the time of sampling.

The sub-slab samples will be collected immediately beneath the on-grade slab and adjacent to the indoor air canister location. The sub-slab probe will be installed by drilling a 1/2- to 1-inch diameter hole through the slab with a drill. Prior to drilling activities, all necessary permits will be obtained and the location of all sub-slab utilities will be identified and marked. For dust prevention the location will be covered by a towel or cloth and drilling will proceed through a pre-cut hole in the cloth. After drilling through the slab, the slab thickness will be measured and recorded. Sample tubing will be inserted from the base of the slab to the ground surface. The drill hole will be filled with pre-hydrated granular cement/bentonite to ground surface. Drilling and sampling equipment will be decontaminated prior to installation of each sample tube.



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The air samples will be analyzed using USEPA Method TO-15 gas chromatography–mass spectrometry (GC/MS) methodology. This analysis will provide results for a full TO-15 list of VOCs. All soil vapor samples will be analyzed by a laboratory with Environmental Laboratory Accreditation Program (ELAP) certification, as specified in New York State Department of Health (NYSDOH) guidance (NYSDOH, 2006).

#### **4.1 Indoor Air Gas Screening**

The sample analytical data will be compared to both the NYSDOH target indoor air concentrations as well as the USEPA chemical-specific generic soil gas screening criteria. If any VOCs are detected in soil gas, indoor ambient air, or outdoor ambient air samples at concentrations greater than the New York State target indoor air concentrations or the USEPA generic soil gas screening criteria, these exceedences will be reported in the RI report.

#### **4.2 Sub-Slab Vapor Samples**

Sub-slab vapor samples are collected to characterize the nature and extent of soil vapor contamination immediately beneath a building with a basement foundation and/or a slab on-grade. Sub-slab vapor sampling results are used in conjunction with indoor air and outdoor air sampling results to characterize the extent of subsurface vapor contamination. Data will be compared to the Soil Vapor/Indoor Air Action Matrix 2 (NYSDOH, 2006) as a preliminary means of determining whether further action may be required.

#### **4.3 Sample Analyses and Validation**

Analytical data collected during the soil vapor intrusion survey will be validated to demonstrate the usability of the data to support the conclusions of the vapor intrusion survey study. All analytical work will be subcontracted to Accutest, an ELAP-certified and Contract Laboratory Protocol/Analytical Services Protocol (CLP/ASP)-certified laboratory. All analytical data generated by Accutest will be assessed and validated by a Data Validator/Chemist in accordance with the “QAPP Environmental Investigation for Fort Drum” (Plexus, 2010b).

#### **4.4 Environmental Health and Exposure Assessment**

The exposure assessment task will present the exposure setting, including a description of the local land and water uses. The Conceptual Site Model (CSM) will describe the source(s) of contamination, the release and transport mechanisms, and the potentially exposed human populations and exposure pathways to be evaluated. The USEPA ProUCL software program will be used to calculate the exposure point concentrations (EPCs), where appropriate. EPCs will describe the model to estimate exposure doses, present the parameters that will be used to estimate exposure doses, and include references to the appropriate guidance. Vapor intrusion pathways will be evaluated for the commercial/industrial worker and residential scenarios.

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## **5.0 Report**

Following the completion of the vapor intrusion survey, a finalized report, analytical data, and associated figures will be included with the Final Gasoline Alley Areas 1700, 1800, 1900, and 3800 Remedial Investigation Report.

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## 6.0 REFERENCES

EA, 1996. *Final Report for Field and Analytical Services, Removal of 22 Underground Storage Tanks at Gasoline Alley*, Fort Drum, New York. May.

Plexus Scientific Corporation, 2009. *Draft Historical Document Review Report and Groundwater Investigation, Area 1895, 1995 and 3805*, Fort Drum, New York. October.

Plexus Scientific Corporation, 2010a. *Work Plan for the Fort Drum PCE Remedial Investigation for Solvent Contaminants*, Fort Drum, New York. August.

Plexus Scientific Corporation, 2010b. *Draft QAPP, Environmental Investigation for Fort Drum*, Fort Drum, New York. August.

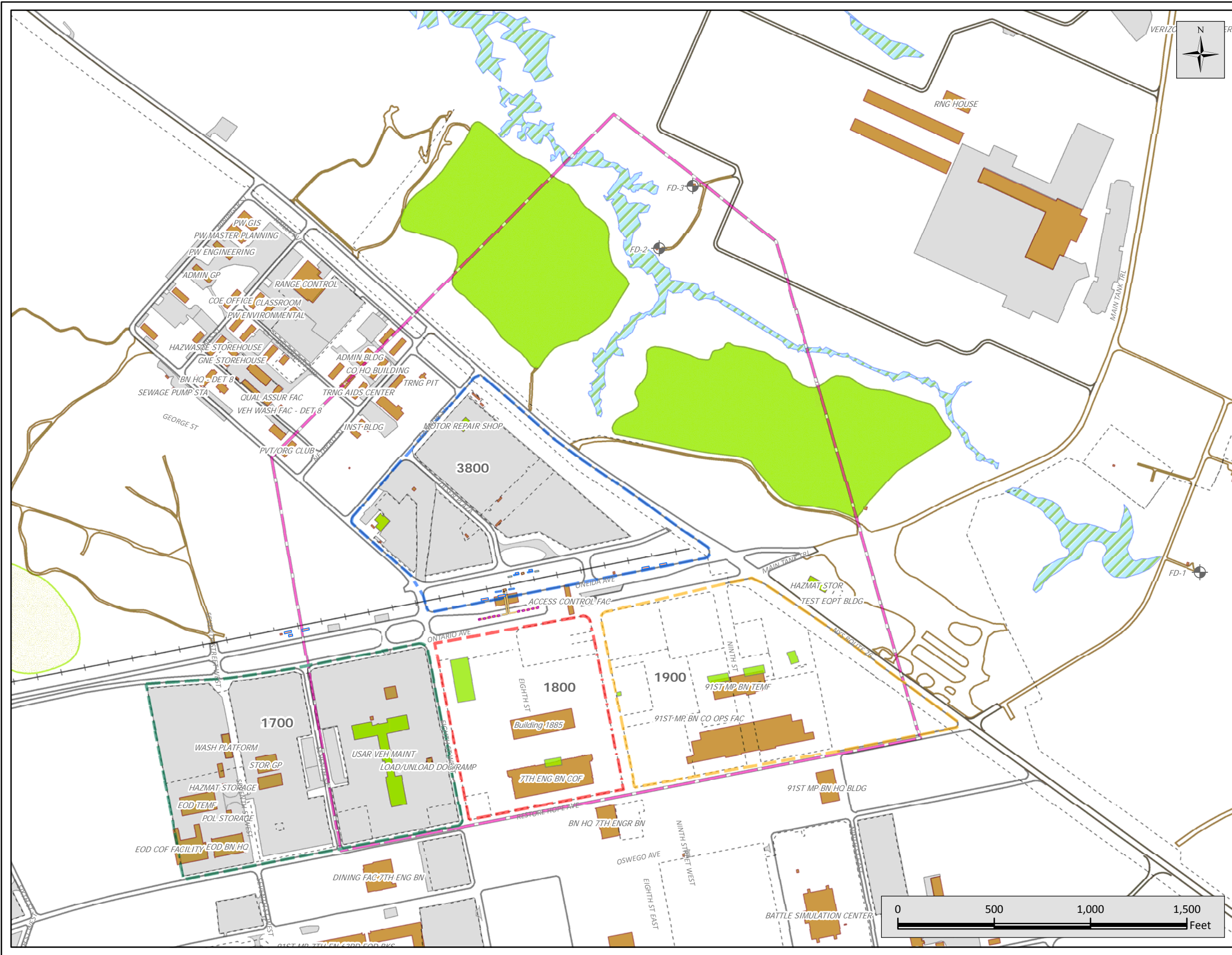
New York State Department of Environmental Conservation, December 25, 2002. *Draft DER-10 Technical Guidance for Site Investigation and Remediation*.

New York State Department of Health, October 2006. *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York*.

United States Environmental Protection Agency, January 1999. *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition*.

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## **FIGURES**



**Legend**

- RI Study Area
- Area 1700
- Area 1800
- Area 1900
- Area 3800
- Potential Hazardous Waste Sources
- Underground Filling Pipes
- Fence Line
- Rail Road
- Paved Road
- Unpaved Road
- Landfill Site
- Wetlands
- Building
- Paved Area
- Monitoring Wells

**Pump House Features**

- Dispenser
- Overhead Truck Dispenser
- Pump House
- UST

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Suite 1200  
Alexandria, VA 22302  
(P) 703.820.3339  
(F) 703.845.8568

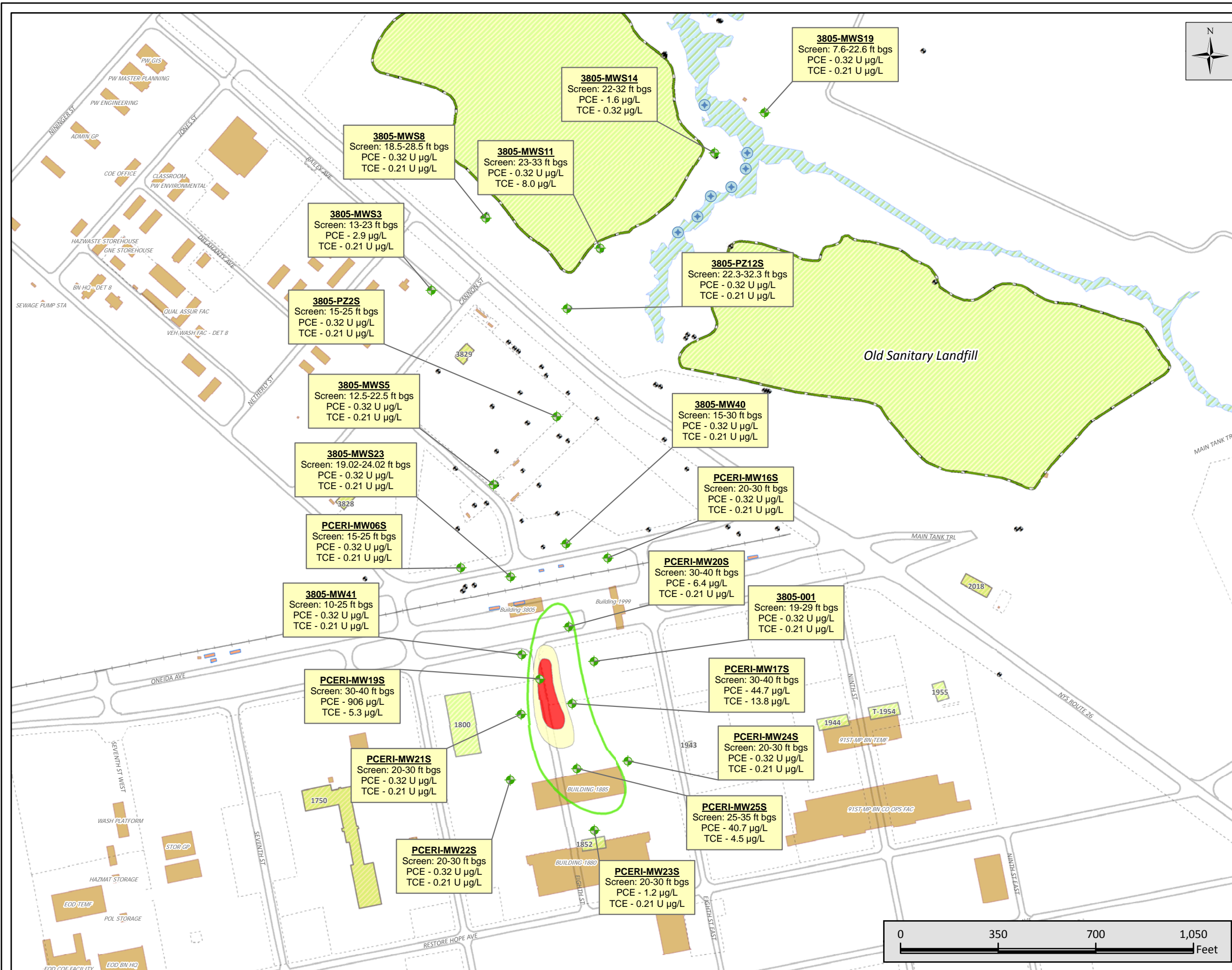
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Date: December 2011

**FIGURE 1**

**Site Boundary Map**

**Vapor Intrusion Survey  
Fort Drum, New York**





**Legend**

- ◆ Shallow PCERI-MW
- ◆ Swim/SD/SW Locations
- ◆ Existing Monitoring Well Locations
- Landfill
- Potential Hazardous Waste Sources
- Former UST
- Fence Line
- Rail Road
- Paved Road
- Wetlands
- Building

**Shallow PCE Plume (µg/L)**

- 5-99
- 100-500
- >500

PCE - Tetrachloroethene  
TCE - Trichloroethene  
µg/L - micrograms per Liter

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**FIGURE 2**

**Shallow PCE Groundwater Results Fall 2011**

**Vapor Intrusion Survey Fort Drum, New York**



**Legend**

- 1885 Floorplan
- Proposed Vapor Intrusion Sample Locations
- Indoor Air Sample Location
- Sub-Slab Vapor Sample Location
- Soil Gas Locations

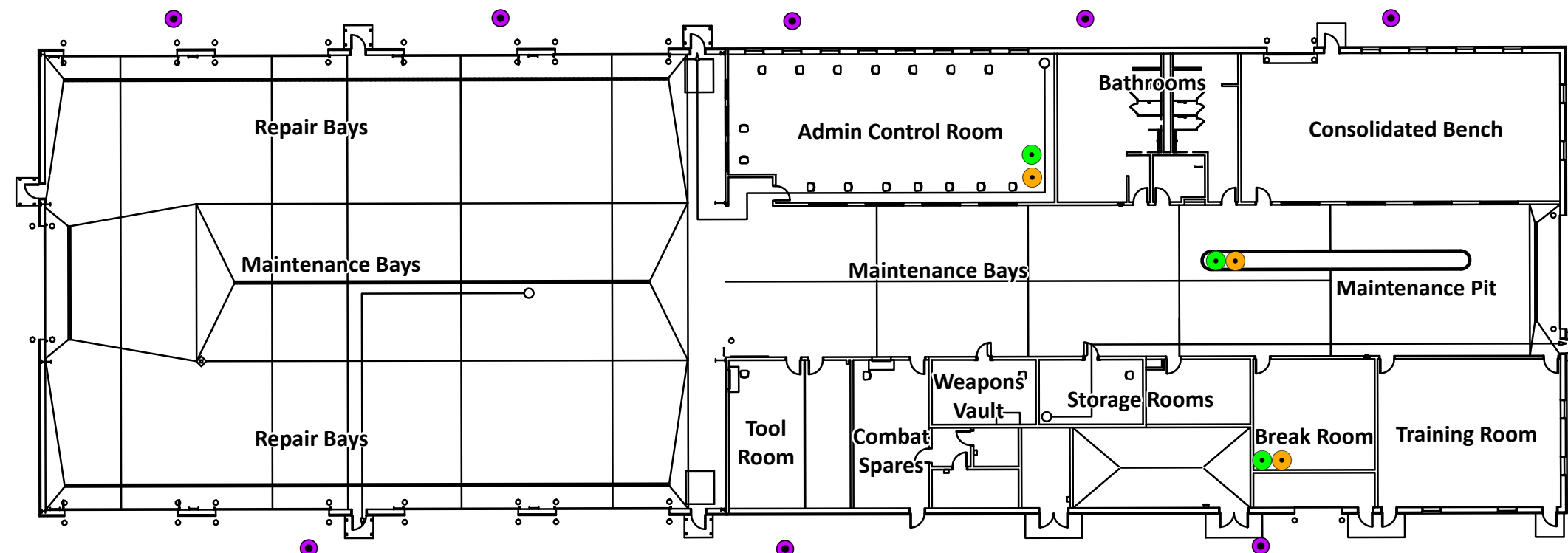
SG-5		
Analyte	Value	Units
PCE	3.9	µg/m <sup>3</sup>
TCE	ND	µg/m <sup>3</sup>

SG-4		
Analyte	Value	Units
PCE	16	µg/m <sup>3</sup>
TCE	ND	µg/m <sup>3</sup>

SG-3		
Analyte	Value	Units
PCE	16	µg/m <sup>3</sup>
TCE	ND	µg/m <sup>3</sup>

SG-2		
Analyte	Value	Units
PCE	32	µg/m <sup>3</sup>
TCE	ND	µg/m <sup>3</sup>

SG-1		
Analyte	Value	Units
PCE	16	µg/m <sup>3</sup>
TCE	ND	µg/m <sup>3</sup>



SG-6		
Analyte	Value	Units
PCE	16	µg/m <sup>3</sup>
TCE	ND	µg/m <sup>3</sup>

SG-7		
Analyte	Value	Units
PCE	5.8	µg/m <sup>3</sup>
TCE	ND	µg/m <sup>3</sup>

SG-8		
Analyte	Value	Units
PCE	171	µg/m <sup>3</sup>
TCE	2.1	µg/m <sup>3</sup>

SG - Soil Gas Location  
PCE - Tetrachloroethene  
TCE - Trichloroethene  
µg/m<sup>3</sup> - micrograms per cubic meter



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**FIGURE 3**

**Building 1885  
Sub-Slab Vapor and  
Indoor Air Sampling Locations**

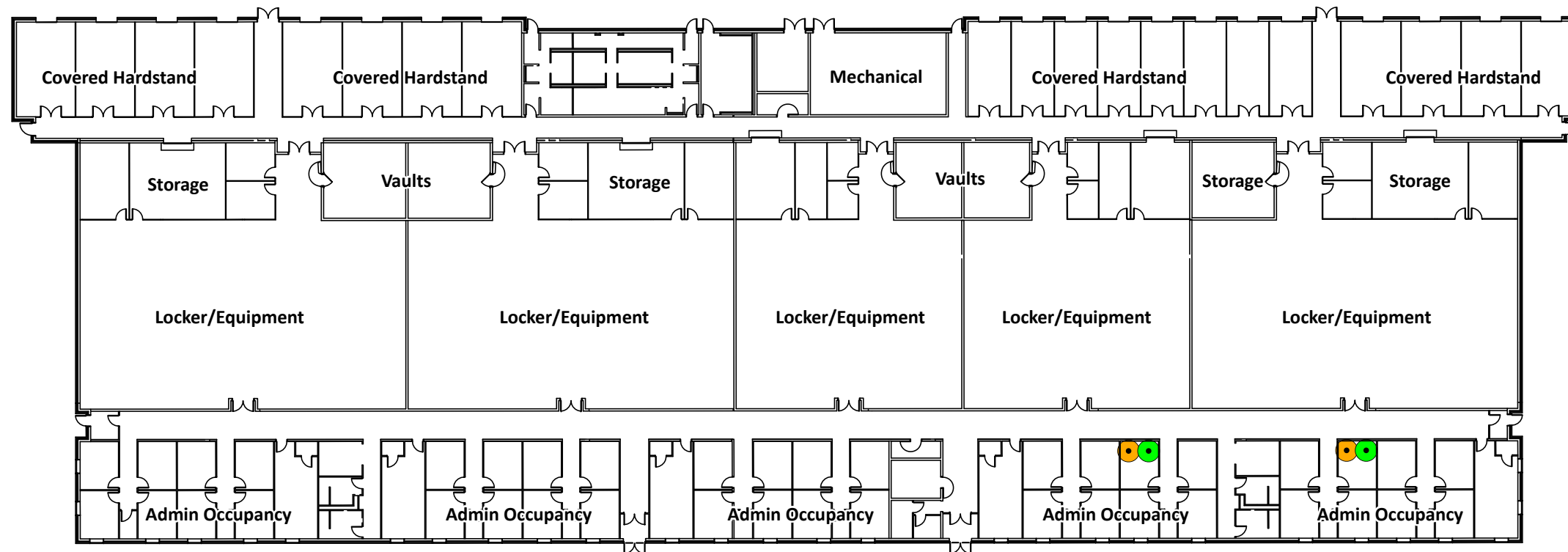
**Vapor Intrusion Survey  
Fort Drum, New York**





**Legend**

- Building 1880 Floor plan
- Proposed Vapor Intrusion Sample Locations
- Indoor Air Sample Location
- Sub-Slab Soil Vapor Sample Location



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**FIGURE 4**

**Building 1880  
Air Sampling Locations**

**Vapor Intrusion Survey  
Fort Drum, New York**



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**APPENDIX A**  
**Field Forms**

**INDOOR AIR BUILDING SURVEY  
and SAMPLING FORM**

Preparer's name: \_\_\_\_\_ Date: \_\_\_\_\_

Preparer's affiliation: \_\_\_\_\_ Phone #: \_\_\_\_\_

Site Name: \_\_\_\_\_ Case #: \_\_\_\_\_

**Part I - Occupants**

Building Address: \_\_\_\_\_

Property Contact: \_\_\_\_\_ Owner / Renter / other: \_\_\_\_\_

Contact's Phone: home ( ) \_\_\_\_\_ work ( ) \_\_\_\_\_ cell ( ) \_\_\_\_\_

# of Building occupants: Children under age 13 \_\_\_\_\_ Children age 13-18 \_\_\_\_\_ Adults \_\_\_\_\_

**Part II – Building Characteristics**

Building type: residential / multi-family residential / office / strip mall / commercial / industrial

Describe building: \_\_\_\_\_ Year constructed: \_\_\_\_\_

Sensitive population: day care / nursing home / hospital / school / other (specify): \_\_\_\_\_

Number of floors below grade: \_\_\_\_\_ (full basement / crawl space / slab on grade)

Number of floors at or above grade: \_\_\_\_\_

Depth of basement below grade surface: \_\_\_\_\_ ft. Basement size: \_\_\_\_\_ ft<sup>2</sup>

Basement floor construction: concrete / dirt / floating / stone / other (specify): \_\_\_\_\_

Foundation walls: poured concrete / cinder blocks / stone / other (specify) \_\_\_\_\_

Basement sump present? *Yes / No* Sump pump? *Yes / No* Water in sump? *Yes / No*

Type of heating system (circle all that apply):

hot air circulation	hot air radiation	wood	steam radiation
heat pump	hot water radiation	kerosene heater	electric baseboard
other (specify): _____			

Type of ventilation system (circle all that apply):

central air conditioning	mechanical fans	bathroom ventilation fans	individual air
conditioning units	kitchen range hood fan	outside air intake	
other (specify): _____			

Type of fuel utilized (circle all that apply):

Natural gas / electric / fuel oil / wood / coal / solar / kerosene

Are the basement walls or floor sealed with waterproof paint or epoxy coatings? *Yes / No*

Is there a whole house fan? *Yes / No*

Septic system? *Yes / Yes (but not used) / No*

Irrigation/private well? *Yes / Yes (but not used) / No*

Type of ground cover outside of building: grass / concrete / asphalt / other (specify) \_\_\_\_\_

Existing subsurface depressurization (radon) system in place? *Yes / No* *active / passive*

Sub-slab vapor/moisture barrier in place? *Yes / No*  
 Type of barrier: \_\_\_\_\_

**Part III - Outside Contaminant Sources**

Contaminant site (1000-ft. radius): \_\_\_\_\_

Other stationary sources nearby (gas stations, emission stacks, etc.): \_\_\_\_\_

Heavy vehicular traffic nearby (or other mobile sources): \_\_\_\_\_

**Part IV – Indoor Contaminant Sources**

Identify all potential indoor sources found in the building (including attached garages), the location of the source (floor and room), and whether the item was removed from the building 48 hours prior to indoor air sampling event. Any ventilation implemented after removal of the items should be completed at least 24 hours prior to the commencement of the indoor air sampling event.

<b>Potential Sources</b>	<b>Location(s)</b>	<b>Removed (Yes / No / NA)</b>
Gasoline storage cans		
Gas-powered equipment		
Kerosene storage cans		
Paints / thinners / strippers		
Cleaning solvents		
Oven cleaners		
Carpet / upholstery cleaners		
Other house cleaning products		
Moth balls		
Polishes / waxes		
Insecticides		
Furniture / floor polish		
Nail polish / polish remover		
Hairspray		
Cologne / perfume		
Air fresheners		
Fuel tank (inside building)		NA
Wood stove or fireplace		NA
New furniture / upholstery		
New carpeting / flooring		NA
Hobbies - glues, paints, etc.		

Part V – Miscellaneous Items

Do any occupants of the building smoke? *Yes / No* How often? \_\_\_\_\_

Last time someone smoked in the building? \_\_\_\_\_ hours /days ago

Does the building have an attached garage directly connected to living space? *Yes / No*

If so, is a car usually parked in the garage? *Yes / No*

Are gas-powered equipment or cans of gasoline/fuels stored in the garage? *Yes / No*

Do the occupants of the building have their clothes dry cleaned? *Yes / No*

If yes, how often? weekly / monthly / 3-4 times a year

Do any of the occupants use solvents in work? *Yes / No*

If yes, what types of solvents are used? \_\_\_\_\_

If yes, are their clothes washed at work? *Yes / No*

Have any pesticides/herbicides been applied around the building or in the yard? *Yes / No*

If so, when and which chemicals? \_\_\_\_\_

Has there ever been a fire in the building? *Yes / No* If yes, when? \_\_\_\_\_

Has painting or staining been done in the building in the last 6 months? *Yes / No*

If yes, when \_\_\_\_\_ and where? \_\_\_\_\_

Part VI – Sampling Information

Sample Technician: \_\_\_\_\_ Phone number: ( ) \_\_\_\_\_ - \_\_\_\_\_

Sample Source: Indoor Air / Sub-Slab / Near Slab Soil Gas / Exterior Soil Gas

Sampler Type: Tedlar bag / Sorbent / Stainless Steel Canister / Other (specify): \_\_\_\_\_

Analytical Method: TO-15 / TO-17 / other: \_\_\_\_\_ Cert. Laboratory: \_\_\_\_\_

Sample locations (floor, room):

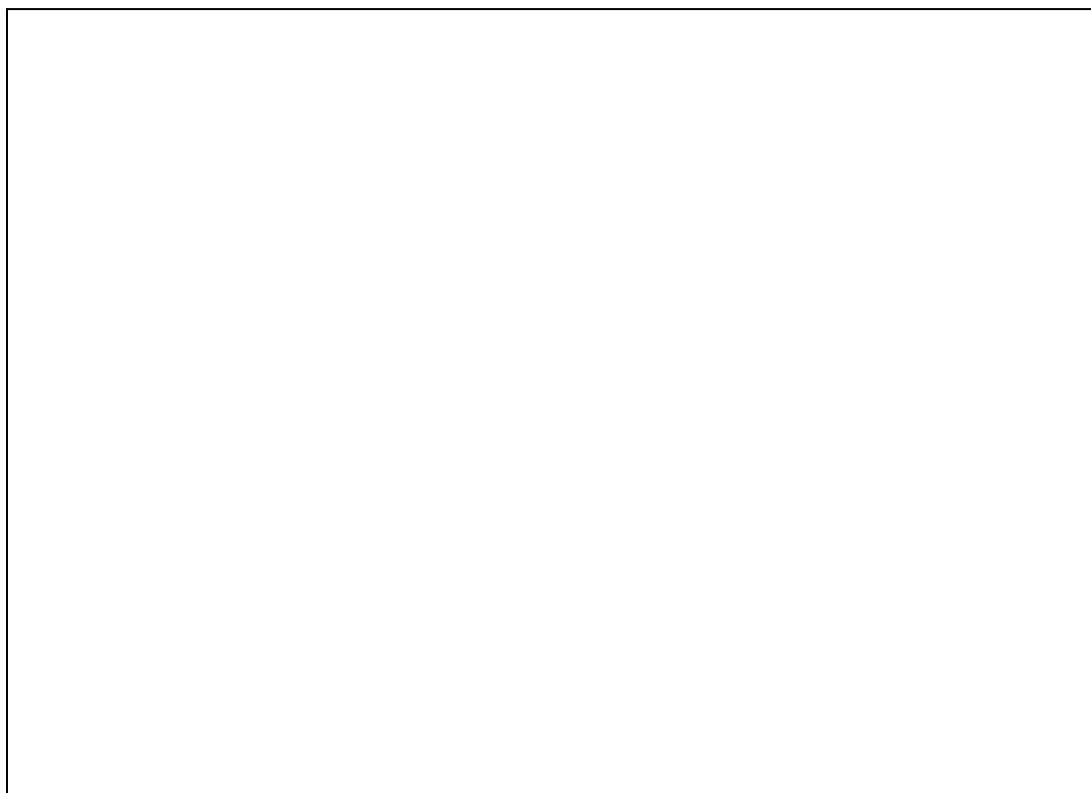
Field ID # \_\_\_\_\_ - \_\_\_\_\_ Field ID # \_\_\_\_\_ - \_\_\_\_\_

Field ID # \_\_\_\_\_ - \_\_\_\_\_ Field ID # \_\_\_\_\_ - \_\_\_\_\_

Were “Instructions for Occupants” followed? *Yes / No*

If not, describe modifications: \_\_\_\_\_

*Provide Drawing of Sample Location(s) in Building*



Part VII - Meteorological Conditions

Was there significant precipitation within 12 hours prior to (or during) the sampling event?    *Yes / No*

Describe the general weather conditions: \_\_\_\_\_

\_\_\_\_\_

Part VIII – General Observations

Provide any information that may be pertinent to the sampling event and may assist in the data interpretation process.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_