**From:** Destefanis, Karen <Karen.Destefanis@wsp.com>
**Sent:** Tuesday, May 15, 2018 3:48 PM
**To:** Spellman, John (DEC)
**Cc:** Manolakas, Michael; Douglas.Smith@sony.com; 'Scott E. Furman (sfurman@sprlaw.com)'
**Subject:** Former Materials Research Corporation, Orangeburg, Rockland County, BCP Site C344070

John

Attached is a link to access the final version of the Remedial Action Work Plan for the Former Materials Research Corporation site. The plan incorporates the March 2018 and October 23,2017 responses. Please let me know if you need a hard copy of the report. We will be submitting a hard copy to the Orangeburg Library repository later this week.

Please let me know if I should also forward this link to Steve Karpinski (NYSDOH).

Regards,

Karen

**Karen Destefanis, PG, LEP**
Lead Hydrogeologist

Leggette, Brashears & Graham is now WSP.
Phone: +1 203-929-8555
Email: Karen.Destefanis@wsp.com
Please note I have a new email address.

WSP USA
4 Research Drive, Suite 204
Shelton, CT 06484
**wsp.com**

# REMEDIAL ACTION WORK PLAN
# FORMER MATERIALS RESEARCH CORPORATION
# ROCKLAND COUNTY, NEW YORK

## NYSDEC BCP Number: C344070

Prepared For:

Former Materials Research Corporation
542 Route 303

June 2015
(Revised: October 2015)
(Revised: May 2018)

Prepared By:

LBG ENGINEERING SERVICES, P.C.
Professional Environmental & Civil Engineers
4 Research Drive, Suite 204
Shelton, CT 06484

# CERTIFICATIONS

I, Mark Goldberg, am currently a registered professional engineer licensed by the State of New York. I have primary direct responsibility for implementation of the remedial program for the Former Materials Research Corporation (Former MRC) Site (NYSDEC Site No. C344070).

I certify that the Site description presented in this RAWP is similar to the Site descriptions presented in the Brownfield Cleanup Agreement for Former MRC and related amendments.

I certify that this plan includes proposed use restrictions, Institutional Controls, Engineering Controls, and plans for all operation and maintenance requirements applicable to the Site and provision for development of an Environmental Easement to be created and recorded pursuant ECL 71-3605 [if Track 1 is not achieved]. This RAWP requires that all affected local governments, as defined in ECL 71-3603, will be notified that such Easement has been recorded. This RAWP requires that a Site Management Plan must be submitted by the Applicant for the continual and proper operation, maintenance, and monitoring of all Engineering Controls employed at the Site, including the proper maintenance of all remaining monitoring wells, for approval by the Department.

I certify that this RAWP has a plan for transport and disposal of all soil, fill, fluids and other material removed from the property under this Plan, and that all transport and disposal will be performed in accordance with all local, State and Federal laws and requirements. All exported material will be taken to facilities licensed to accept this material in full compliance with all Federal, State and local laws.

I certify that this RAWP has a plan for import of all soils and other material from offsite (if required) and that all activities of this type will be in accordance with all local, State and Federal laws and requirements.

I certify that that this RAWP has a plan for nuisance control during the remediation and all invasive development work, including a dust, odor and vector suppression plan and that such plan is sufficient to control dust, odors and vectors and will prevent nuisances from occurring.

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

Mark Goldberg, PE #084326-1 5/11/18 Mark M. Goldberg
NYS Professional Engineer # Date Signature

MARK M. GOLDBERG
084326-1

Note: include PE stamp

It is a violation of Article 130 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 130, New York State Education Law.

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# LIST OF ACRONYMS

AOC - Area of Concern
AGV - Alternative Guidance Values
BCP - Brownfield Cleanup Program
CAMP - Community Air Monitoring Plan
CERCLA - Environmental Response, Compensation, and Liability Act
COC - Certificate of Completion
CQAP - Construction Quality Assurance Plan
DCA - Dichloroethane
DCE - Dichloroethene
DER-10 - Division of Environmental Remediation – 10 (Technical Guidance for Site Investigation and Remediation)
DNAPL - Dense Non-Aqueous Phase Liquid
DO - Dissolved Oxygen
DSHM - Division of Solid and Hazardous Materials (NYSDEC Division)
EC - Engineering Controls
ECL - Environmental Conservation Law
EDD - Electronic Data Deliverable
EFR - Enhanced Fluid Recovery
ELAP - Environmental Laboratory Accreditation Program
ESA - Environmental Site Audit
FER - Final Engineering Report
ft$^2$ - Square Feet
ft bg - Feet Below Grade
ft btfs - Feet Below Top of Floor Surface
ft/ft - foot per foot
gpm - gallons per minute
GWQS - Groundwater Quality Standards
HASP - Health and Safety Plan
HAZWOPER - Hazardous Waste Operations and Emergency Response
HSA - Hollow Stem Auger
IC - Institutional Controls
IL - Instrumentation Laboratory
IRM - Interim Remedial Measures
ISCO - In Situ Chemical Oxidation
LBG - Leggette, Brashears & Graham, Inc.
L/min - Liters per minute
MRC - Materials Research Corporation
mg/kg - milligrams per kilogram
NAPL - Non-Aqueous Phase Liquid
NYCRR - New York Codes, Rules and Regulations
NYS DEC - New York State Department of Environmental Conservation
NYS DOH - New York State Department of Health
ORP - Oxygen Reduction Potential
OSHA - Occupational Safety and Health Administration

# LIST OF ACRONYMS
## (continued)

| | | |
|---|---|---|
| PCB | - | Polychlorinated Biphenyls |
| PCE | - | Tetrachloroethene/Tetrachloroethylene/Perchloroethylene |
| PDF | - | Portable Document Format |
| PID | - | Photoionization Detector |
| PNOD | - | Permanganate Natural Oxidant Demand |
| ppb | - | Parts per Billion |
| ppbv | - | Parts per Billion Volume |
| ppm | - | Parts per Million |
| Praxair | - | Praxair Surface Technologies |
| PVC | - | Polyvinyl Chloride |
| QA/QC | - | Quality Assurance and Quality Control |
| QAPP | - | Quality Assurance Project Plan |
| RA | - | Remedial Action |
| RAO | - | Remedial Action Objectives |
| RAWP | - | Remedial Action Work Plan |
| RCDH | - | Rockland County Department of Health |
| RCRA | - | Resource Conservation and Recovery Act |
| RI | - | Remedial Investigation |
| SCG | - | Standards, Criteria, and Guidance |
| SCO | - | Soil Cleanup Objective |
| SEQRA | - | State Environmental Quality Review Act |
| Site | - | Materials Research Corporation<br>542 Route 303, Orangetown, NY |
| SMP | - | Site Management Plan |
| SoMP | - | Soil/Materials Management Plan |
| Sony | - | Sony Electronics, Inc. |
| SOP | - | Contractors Site Operations Plan |
| SPDES | - | State Pollutant Discharge Elimination System |
| SSDS | - | Sub-Slab Depressurization System |
| STARS | - | Spill Technology and Remediation Series |
| SVE | - | Soil Vapor Extraction |
| SVI | - | Soil Vapor Intrusion |
| SWPPP | - | Storm-Water Pollution Prevention Plan |
| TAGM | - | Technical and Administrative Guidance Memorandum |
| TAL | - | Target Analyte List |
| TCL | - | Target Compound List |
| TOGS | - | Technical and Operational Guidance Series |
| 1,1,1-TCA | - | 1,1,1-Trichloroethane |
| TCE | - | Trichloroethene/Trichloroethylene |
| µg/kg | - | Micrograms Per Kilogram |
| µg/l | - | Micrograms Per Liter |
| UST | - | Underground Storage Tank |
| VOCs | - | Volatile Organic Compounds |

# REMEDIAL ACTION WORK PLAN
# FORMER MATERIALS RESEARCH CORPORATION
# ROCKLAND COUNTY, NEW YORK

## EXECUTIVE SUMMARY

The former Materials Research Corporation (MRC) Site (Site ID #C344070) is located at 542 Route 303, Orangetown, Rockland County, New York (figure 1). The 2.72-acre property operated as a manufacturing facility and was purchased from MRC by Praxair Surface Technologies (Praxair), the current facility owner/operator in 1999. On June 19, 2009, Sony Electronics, Inc. (Sony) submitted an application to the New York State Department of Environmental Conservation (NYSDEC) to enter the Brownfield Cleanup Program (BCP) contained in Article 27, Title 14 of the Environmental Conservation Law (ECL). Sony entered the BCP for the former MRC Site as a Participant as defined in ECL-27-1405 (1)(a). The former MRC Site was accepted into the program on February 11, 2010. Prior to entering into the BCP, site assessments and investigations were conducted under a NYSDEC Voluntary Cleanup Agreement (Site ID V00317-3) effective September 21, 2001.

The Site is located in an area of Orangetown which is predominantly industrial and commercial with lesser amounts of residential properties throughout. The Site is located in the hamlet of Orangeburg, at the intersection of Route 303 and Glenshaw Road and consists of a 43,000 ft$^2$ one-story building. The Site is operated as a manufacturing facility which engages in metal purification and production of metal targets used in sputtering machines. The current operations at the Site are essentially unchanged since the former MRC began manufacturing metal targets at the facility in 1961. The Site is an active RCRA large quantity generator of hazardous waste (EPA ID NYD001386077).

### Summary of Remedial Investigations

The Site has been subject to assessment and investigation activities since 1997. Detailed information for each assessment or investigation is presented in the following documents:

- *Environmental Site Assessment, Materials Research Corporation, 542 Route 303, Orangetown, Rockland County, New York* (LBG, September 1997);

- *Summary of Investigations, 542 Route 303, Orangetown, New York* (LBG, November 1999).
- *Environmental Site Investigation, Materials Research Corporation, 542 Route 303, Orangetown, Rockland County, New York* (LBG, November, 2002);
- *Results of Soil-Vapor Investigation, Materials Research Corporation, 542 Route 303, Orangetown, Rockland County, Site ID No. V-00317-3* (LBG, May 6, 2004);
- *Sub-Slab Depressurization System Letter, Former Materials Research Corporation, Orangetown, Rockland County, Site ID No. V-00317-3* (LBG, December 23, 2005);
- *Former Materials Research Corporation, Supplemental Scope of Study, Orangetown, New York* (LBG, November, 2007, Revised April 2008);
- *Supplemental Investigation, Former Materials Research Corporation, 542 Route 303, Orangetown, New York* (LBG, January, 2011).
- *Pilot Test Program, Former Materials Research Corporation, 542 Route 303, Orangetown, New York* (LBG, June, 2013).

Based on the historical environmental investigations performed, the contamination beneath the Site consists of.

1. Soil Contamination

Twenty-four soils samples were collected and analyzed from four boring locations in an effort to identify a source area associated with the TCE impacts at the Site. The boring locations were chosen based on the results of a NYSDEC approved soil vapor survey that was conceived to investigate whether the source of such impacts resides beneath the building. Limited soil contamination has been identified under the former MRC building. One shallow soil sample collected from 2 to 4 feet from under the building floor slab contained halogenated volatile organic compounds (VOCs) exceedances of the Restricted Industrial Use criteria and three samples collected from 25 to 27 feet in borings drilled in the southeast corner of the Site contained halogenated VOCs exceedances of the Protection of Groundwater SCOs. No other exceedances have been documented in any of the soil samples collected from under the building at the Site. The soil sample collected under the raised portion of the building is suspected to be fill-related because concentrations of TCE in the soil immediately below were four orders of magnitudes lower. The source of TCE may be from a release inside the building related to onsite activities or may be related to the fill that was used to raise the grade under this portion of the building. With the exception of the one sample collected from under the raised portion of the building, none of the soil samples that were collected above the water table throughout the Site contained VOCs at concentrations indicative of a source area. Halogenated VOCs that were detected above criteria along the southeast corner of the Site were located at depth with no evidence of impact in the soils above. There were comprehensive soil investigations completed in the southeast side of the Site, none of which identified source VOCs in the unsaturated zone. Halogenated VOCs that were detected in the vadose zone throughout the Site are attributed to off-gassing from groundwater. Halogenated VOCs sporadically detected within the saturated zone are predominantly attributed to the groundwater quality entering the Site. While no Site-specific source area was identified in the soils, the environmental investigations indicate that a source of the halogenated VOCs detected along the western border may be either from offsite or associated with the historic operations along the western exterior side of the Site building. Although no significant on-site source area has been identified, the detection of TCE in the fill under the building (boring MW-23I (2 to 4 ft bg)) is evidence of an onsite release of TCE. Further, while the source or sources of halogenated VOCs, including TCE, at depth in the southeast corner of the property have not been identified, an interim remedial measure was performed in this area of the Site to address the impacts. Based on the outcome of all of the investigations performed to date, the data indicates that the source of the impacts to the southeast corner of the Site is likely from off-site however, it may be a result of onsite activities as well as potential migration of the contaminant through the complex geologic formation underlying the Site. A subslab depressurization system has been installed beneath the floor slab of the building to assure that any vapors that accumulate beneath such slab do not enter the building. In addition, the building's floor has been sealed with an epoxy barrier coat. Because the pathways to contamination associated with the soil sample collected from under the raised portion of the building have been eliminated, no soil excavation is proposed.

### 2. Groundwater Contamination

Environmental investigations conducted at the property document impact to groundwater by halogenated VOCs along the western boundary of the Site and affecting the western portion of the Site building and the southeastern corner of the Site property. Investigations completed indicate that a source of the halogenated VOCs detected along the western border may be either from off site or associated with the historic operations and located along the western exterior side of the Site building. Generally low concentrations of halogenated VOCs are identified hydraulically downgradient (southeast) of the suspected source area along the western side of the property. The investigations indicate that the VOC plume attributed to the western portion of the Site is contained onsite.

A second area containing halogenated VOC-impacted groundwater was identified near the southeastern portion of the Site. Based on extensive investigations completed at this portion of the property, an onsite source was not identified. An evaluation of the chemical gradient within groundwater shows no connection with the VOCs detected in the western portion of the Site. Based on the disparity in chemical composition and concentrations detected in the groundwater from the western side of the property and the southeast side of the property, the halogenated VOC contamination in the southeastern portion of the Site is believed to be emanating from a separate source. Although no specific source area(s) has been identified, the detection of TCE under the building and the occurrence of TCE at depth in the southeast corner may be a result of onsite disposal activities as well as potential migration of the contaminant through the complex geologic formation underlying the Site. Regardless of the source, the concentrations of dissolved phase contamination detected in the onsite groundwater in the southeastern portion of the property are being addressed through the NYSDEC Interim Remedial Measure (IRM) that was approved by the NYSDEC on November 5, 2013 and the western portion of the Site through this RAWP.

### 3. Soil-Vapor Contamination

A soil vapor survey was conducted under the concrete floor slab of the western half of the building in 2003 in response to the 2002 investigation. The 2002 investigation results identified soils beneath the western half of the building (constructed nine years after the eastern half) as a potential source of the halogenated VOC compounds. However, a subsequent soil investigation was conducted in 2010 under the western side of the building and no release areas of halogenated VOCs were detected beneath this portion of the building.

## Qualitative Human Health Exposure Assessment

The contamination beneath the Site is the result of historical activities on the Site, as well as contributions from offsite sources. The contaminants are not used at the workplace, therefore there are no direct occupational exposure pathways for Site workers via ingestion, inhalation or dermal contact. A possible exposure route of contaminants in the subsurface is through soil vapor intrusion (SVI). Interim Remedial Measures (IRMs) completed at the Site include installation of a sub-slab depressurization system. The soil vapor IRM component was constructed in January 2005 and started in February 2005 in response to a 2004 soil-vapor investigation conducted in the interior of the building. This sub-slab depressurization system was constructed to prevent potential VOC vapors from entering the building. The system consists of four sub-slab suction points and high suction fans, installed throughout the building. These systems have been continually operated since the initial start-up (February 2005). As a result of the operation of the sub-surface depressurization system, Site workers are not exposed to vapors from possible contaminants in the subsurface.

The potential for contaminant exposure at the surrounding properties is by way of an exposure of direct physical contact to impacted soils, soil vapor or groundwater. The physical location of the contamination associated with chemicals of concern at surrounding properties is in the subsurface groundwater at depths greater than 10 feet below ground surface. The majority of the surrounding area is paved and covered with buildings, and groundwater is not used for potable water supplies with the exception of two properties located on South Greenbush Road which currently have point of entry treatment systems installed on their private wells. The likelihood of humans being exposed through ingestion and/or dermal contact is presumed to be minimal.

The likelihood of human exposure to soil vapor contamination on adjacent commercial properties associated with chemicals of concern emanating from the Site is unlikely based on the groundwater sampling that shows impacts from the western portion of the property to be generally contained within the property boundary (based on groundwater results from wells MW-9S, MW-10S and MW11S) and the determination that the hydrogeologic position of the closest adjacent building is cross-gradient of impacts at the Site. A review of VOC concentrations on the southeast corner of the property show that high concentrations of VOCs are present within the property boundary (wells EW-7 through EW-12), and VOCs are either not detected or at substantially lower concentrations near the property boundary (wells MW-

12, MW-15S, MW-21 and MW-22). Soil-vapor intrusion at offsite buildings is unlikely because of the distance from the Site to the nearest building, the concentrations in groundwater exiting the Site and the likely interception of vapors by the stormwater drain and other utilities buried under Route 303.

The IRM to address groundwater in the southeast corner of the property consists of *in situ* chemical oxidation (ISCO) treatment using sodium permanganate. The groundwater IRM component was initiated in December 2013 following the November 2013 approval from NYSDEC. The groundwater IRM is ongoing.

## Summary of the Remedy

This RAWP was developed based on the results of the historical investigations completed at the Site (1997-2013) including: the 1997 Phase I Investigation; the 1999 subsurface investigation and database review; the 2002 Phase II Subsurface Investigation consisting of soil sampling, groundwater monitoring and aquifer testing; the 2003 Soil Vapor Investigation beneath the concrete floor slab of the western half of the former MRC building; the IRM sub-slab depressurization system that was constructed in 2005; the 2006-2007 Supplemental Investigation consisting of additional groundwater monitoring, a focused soil sampling program in the southeast corner of the property and investigation of the facility's floor-drainage system; a 2009 focused IRM consisting of a four-event enhanced fluid recovery performed in the southeast corner of the property between January and April 2009; the NYSDEC-approved 2011 Supplemental Investigation consisting of a focused subsurface investigation under the western portion of the building and groundwater monitoring; and the results of a 2013 ISCO Pilot Test conducted along the western portion of the Site.

The remedial goals of the proposed RAWP are to:

- reduce concentrations of the dissolved phase contamination in the groundwater onsite (on the western portion of the property) to background levels;

In order to achieve these goals, the following Remedial Action (RA) activities are proposed to be implemented at the Site. Engineering Controls and Institutional Controls will be maintained until the goal of the RA is achieved at the Site.

1. Sub-Slab Depressurization System (SSDS)

The SSDS will continue to be operated to remove VOC vapors that may remain beneath the onsite building as well as to prevent potential future accumulation of VOC vapors beneath the building slab. Maintaining a negative pressure beneath the building, and the ongoing removal of VOC vapor beneath the building will prevent intrusion of the vapors into the onsite building.

### 2. In-Situ Chemical Oxidation (ISCO)

As part of the approach to address the dissolved-phase VOC contamination, chemically enhanced remediation of groundwater will be utilized. In-situ chemical oxidation is a remedial approach that works by breaking down dissolved phase VOCs. Based on the positive results from an ISCO pilot test conducted in 2012-2013, this technology will be expanded further along the western portion of the property.

Concentrations of dissolved phase contamination detected in the onsite groundwater in the southeastern portion of the property are currently being addressed through the NYSDEC Interim Remedial Measure (IRM) that was approved by the NYSDEC on November 5, 2013.

### 3. Groundwater Monitoring

A groundwater monitoring program will be implemented following the ISCO treatment at the Site. This monitoring will allow continual evaluation of the progress of the remedial actions at the Site. Periodic monitoring will continue until the remedial goals for the Site are achieved.

### 4. Recording of a Deed Restriction

Following completion of the RA activities, an Environmental Easement will be recorded for the Site with the Rockland County Clerk's office. This document shall serve as an Institutional Control (IC) and will reference the Site Management Plan (SMP) for the Site that serves to ensure continued operation of the Engineering Controls (EC) that prevent future exposure to any residual contamination remaining at the Site.

5. Implementation of a Site Management Plan (SMP)

A SMP will be developed for long-term management of residual contamination. The Site Management activities will be implemented following completion of the RA activities. Site Management is the last phase of remediation and begins with the approval of the Final Engineering Report (FER) and issuance of the Certificate of Completion (Release). Site Management continues in perpetuity or until released in writing by NYSDEC. The SMP is intended to provide a detailed description of the procedures required to manage residual contamination left in place at the Site following completion of the Remedial Action.

# REMEDIAL ACTION WORK PLAN
# FORMER MATERIALS RESEARCH CORPORATION
# ROCKLAND COUNTY, NEW YORK

## 1.0 INTRODUCTION

Sony Electronics, Inc. (Sony) entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) in June, 2009, to investigate and remediate a 2.72-acre property located at 542 Route 303, in Orangetown, Rockland County, New York. Sony is a Participant in the Brownfield Cleanup Program. The Site is currently utilized for industrial purposes. When completed, the Site will continue to be used for industrial purposes

This Remedial Action Work Plan (RAWP) summarizes the nature and extent of contamination as determined from data gathered during the Remedial Investigation (RI), and Supplemental Remedial Investigations performed between 1997 and 2010. The RAWP provides an evaluation of applicable Remedial Action alternatives, their associated costs, and the recommended and preferred remedy. The remedy described in this document is consistent with the procedures defined in DER-10 and complies with all applicable standards, criteria and guidance. The remedy described in this document also complies with all applicable Federal, State and local laws, regulations and requirements. The NYSDEC and New York State Department of Health (NYSDOH) have determined that this Site does pose a significant threat to human health and the environment. However, the RI for this Site did not identify fish and wildlife resources. Therefore, the selected remedy does not have to account for impacts to fish and wildlife resources.

A formal Remedial Design document will not be prepared.

### 1.1 Site Location and Description

The Site is located in the County of Rockland, Orangetown, New York and is identified as Parcel 70.19, Section 1, Lot 46 on the Orangetown Tax Map. A United States Geological Survey (USGS) topographical quadrangle map (figure 1) shows the Site location. The Site is situated on an approximately 2.72-acre area bounded by the Praxair headquarters building to the north, Glenshaw Street to the south, Route 303 to the east, and railroad tracks to the west (see figure 2). A boundary map is attached to the BCA as required by Environmental Conservation Law (ECL)

Title 14 Section 27-1419. The 2.72-acre property is fully described in Appendix I – Metes and Bounds.

The property contains an approximately 43,000 ft$^2$ one-story building. The original building was constructed in 1961, with additions in the rear half of the building constructed in 1969 and in 1981. The property is surrounded by a mix of residential, commercial and industrial properties, as well as a railroad right-of-way.

### 1.2 Contemplated Redevelopment Plan

The Remedial Action to be performed under the RAWP is intended to make the Site protective of human health and the environment. This condition will be consistent with the contemplated end use as an industrial facility. However, the Remedial Action contemplated under this RAWP may be implemented independent of any proposed redevelopment plan.

### 1.3 Description of Surrounding Property

The Site is located in an industrial/commercial area with some residential properties located to the east. The adjacent property north of the Site is the Praxair headquarters building and parking lot; to the south is Instrumentation Laboratory (IL) on the south side of Glenshaw Street; to the east of the Site is vacant and residential property (located east of Route 303); and to the west of the Site, beyond the railroad right-of-way is a development identified as the Interstate Distribution Center which contains commercial and industrial businesses. This area of Orangetown is zoned for residential, commercial and laboratory/industrial uses. The property is zoned as laboratory/office. Additionally, the Sparkill Creek is located approximately 700 feet east of the Site. There are no schools, day care facilities or hospitals in the immediate vicinity of the Site.

## 2.0 DESCRIPTION OF REMEDIAL INVESTIGATION FINDINGS

This RAWP was developed based on the results of the historical investigations performed at the Site. The 1997 Phase I Environmental Site Assessment (ESA) was prepared before the ASTM E 1527 standard was in effect (2000) but is reflective of industry standards of the time. The 1999 Phase II Investigation included a subsurface investigation and an environmental file review. In September 2001 Sony entered into the NYSDEC Voluntary Cleanup Program (VCP) to perform environmental investigations of the Site (#V00317-3). Following entrance into the VCP, the 2001-2002 Phase II Subsurface Investigation was completed in accordance with the February 2001 NYSDEC-approved work plan and the February 2002 work plan amendment. The 2003 Soil Vapor Investigation was conducted in accordance with the NYSDEC-approved 2003 work plan and amendment responses. The 2006-2007 Supplemental Investigation was completed in accordance with the December 2006 NYSDEC-approved work plan. The 2010 Supplemental Investigation, which was included with the BCP application, was completed in accordance with the 2010 NYSDEC-approved work plan. The 2012 – 2013 ISCO Pilot Test program was completed in accordance with the 2012 NYSDEC-approved work plan.

## 2.1 Site History

### 2.1.1 Past Uses and Ownership

The MRC facility purifies metals and forms metal targets used in sputtering machines that manufacture chips for electronic equipment. The sputtering process creates a metallic coat onto a silicon disk. The property contains an approximately 43,000 $ft^2$, one-story building. The original building, approximately 20,300 $ft^2$, was constructed in 1961; an additional 20,750 $ft^2$, located in the western half of the building, was constructed in 1969. A final addition of 1,920 $ft^2$ was located in the western rear of the building (the hazardous materials storage area), was constructed in November 1981. In 1999, Praxair purchased the property from MRC and their (Praxair's) current operations at the Site are essentially unchanged since MRC began manufacturing metal targets at the facility in 1961. The property is provided a potable water supply from United Water Company and is connected to public sanitary sewer.

### 2.1.2 Sanborn Maps

To develop a more complete historical profile of the Site, LBG requested a search of available Sanborn map databases during the 1997 Phase I ESA. Sanborn maps, originally created to aid insurance underwriters in assessing the potential for fire risk, also contain information on the structure's use and the location of any fuel and chemical storage areas on a site. A search of the Sanborn database did not identify Sanborn maps for the property. Documentation that Sanborn maps were not identified for the Site is included in Appendix II.

## 2.2 Geological Conditions

Based on the remedial investigation activities performed at the Site, the geologic conditions have been comprehensively characterized. The unconsolidated materials at the former MRC property primarily consist of reddish-brown fine sand with some silt to reddish-brown clay with some silt. Finer-grained materials primarily consisting of clay and silt were identified on the western portion of the property. Unconsolidated materials on the remaining portion of the Site primarily consist of fine sand and some silt with lenses of silts and fine sand. Unconsolidated materials observed under the western portion of the building during the 2010 Supplemental Investigation consist of brown fine sand and silt with some clay. Bedrock has been encountered at depths ranging from 17 to 52 ft bg, rising from the western portion of the Site (44 to 52 ft bg) to the eastern portion of the Site (17 to 32 ft bg). Bedrock was observed to consist of competent red sandstone which correlates with the mapped Brunswick Formation of the Newark Group of Upper Triassic age. Geologic cross sections and a summary table of well construction details are included in Appendix III.

Depth to groundwater levels within the overburden have ranged between 1.8 and 16.5 feet below the top of the well casing (ft bc) in 1999 with a more extreme range observed during the drought of 2002 (between 4.7 to 24.7 ft bc). The overall direction of groundwater flow in the saturated unconsolidated material is from northwest to southeast across the property. The current 2012, 2013 and 2014 water-table and potentiometric surface contour maps of the shallow and deep overburden are included in Appendix IV.

As documented in past investigations, unconsolidated materials at the Site are poor water-bearing units with a median hydraulic conductivity across the property calculated at 0.60 ft/day (feet per day) (LBG, 2002). The average groundwater flow velocity across the property was calculated to be 0.058 ft/day (approximately 21 feet per year) (LBG, 2002).

## 2.3 Summary of Remedial Investigations Performed

In 1997, LBG was retained by Sony to conduct a Phase I ESA as part of a pending property transfer. As a result of the Phase I ESA, LBG conducted comprehensive subsurface investigations throughout the Site between 1999 and 2010. Subsurface investigations have included the collection of 156 soil samples for analysis of VOCs from 45 test borings located outside of the building footprint and 24 soil samples for analysis of VOCs from 4 test borings located inside the building footprint. Groundwater investigations completed in the overburden between 1999 and 2010 included the collection and analysis of 153 groundwater samples from 37 overburden monitoring wells (8 located offsite) and 7 test borings located outside of the building footprint and 8 groundwater samples from 4 monitor wells located inside the building. An additional 7 wells were constructed and 74 groundwater samples were collected as part of a pilot test conducted on the western side of the Site between 2012 and 2013. A soil vapor survey under the western portion of the building was conducted in 2003 and included collecting 9 soil vapor samples from beneath the concrete floor slab. Summaries of the investigations and remedial actions completed by LBG are presented below and the summary tables are included in Appendix V (soil), Appendix VI (groundwater) and Appendix VII (soil vapor). Beginning in 2002, all analytical results were reported following DEC ASP Category B deliverable package.

### 2.3.1 1997 Phase I Environmental Site Assessment

As part of the Phase I ESA, LBG completed a review of Federal and State environmental databases for the subject and surrounding properties pursuant to 1997 ASTM standards. The Phase I identified several potential areas of concern (AOC) and recommended a limited soil and groundwater sampling program for further characterization of the AOCs. The AOCs that were identified included:

- a former septic system area;
- two active loading dock areas where hazardous materials were handled;
- vicinity of a failed drainage pipe;
- rear portion of the property which included a natural depression and drainage swale that received storm-water runoff; and
- a former transformer.

### 2.3.2 1999 Phase II Investigation

In response to AOCs identified during the 1997 ESA, LBG completed a Phase II subsurface investigation at the Site and conducted a file review to identify all releases documented by the Region II United States Environmental Protection Agency and Region III NYSDEC at and surrounding the former MRC property. The subsurface investigation included drilling 11 test borings (8 completed as monitor wells), collection of 2 surficial soil samples, and collection and analyses of groundwater and soil samples.

AOCs identified during the environmental Site investigation included the following:

- The historical use of 1,1,1-trichloroethane (TCA) and the generation of metal solutions. Locations of concern include the former septic leach field on the northeastern portion of the property, the loading dock areas on the southern side of the facility, the hazardous material storage area on the western side of the facility and a former TCA storage area identified in the north-central portion of the facility (identified during the 1999 file search).
- The release of highly acidic water (pH 2.0 to 3.0) from a corroded discharge pipe, which was connected to the precious metals refining room on the northern side of the facility.
- The potential PCB-containing pad-mounted transformer formerly located on the southern side of the facility.

Nine test borings were drilled by hollow-stem auger and soil samples were collected using split-spoon samples. The test borings were completed to depths ranging from 7 ft bg (TB-1) to 20 ft bg (MW-3). Two test borings were hand augered to a depth of 4.5 ft bg.

As part of the investigation, several soil samples were submitted for laboratory analysis for the presence of halogenated VOCs by EPA Method 8021B and total RCRA metals. There were no detections of halogenated VOCs in any of the soil samples collected. Metals were detected in the soil samples at concentrations below the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) recommended soil clean-up objectives. The levels detected are representative of background soil concentrations.

The test borings that were completed as monitor wells ranged in depth from 15 to 20 ft bg. Two monitor wells (MW-5D and MW-6D) were drilled to the top of bedrock (depth ranging between 41 and 45 ft bg). Monitor wells MW-2, MW-5S, MW-5D, MW-6S and MW-6D were installed as upgradient monitor points to identify any VOCs migrating onto the former MRC property from the west.

Groundwater samples were collected in July and September 1999 from the monitor wells using the low-stress purging and sampling technique. Groundwater was analyzed for halogenated VOCs by EPA Method 8021B and RCRA metals. There were no detections of dissolved metals in any of the samples analyzed. VOCs were not detected in the groundwater samples collected from monitor wells MW-1 and MW-2. The occurrence of the VOCs above the criteria was limited to two monitor wells (MW-3 and MW-4) located on the western and southern sides of the facility.

In addition, VOCs were detected in the upgradient monitor well clusters (MW-5S/MW-5D and MW-6S/MW-6D).

As part of the Phase II investigation, LBG conducted a detailed review (Freedom of Information Act) of releases that had occurred at the property upgradient of the MRC facility. Detailed files that were reviewed were maintained at the Rockland County Department Health (RCDH). Files were reviewed for the Interstate Distribution Center and Conrail Railway. Nearby properties Aluf Plastics, Glenshaw Glass Company and NYNEX were identified during the search as having environmental files and as being a former or current occupant at the now-identified Interstate Distribution Center. There were no environmental files identified for the Conrail Railway. The Glenshaw Glass Company and Aluf Plastics warehouse were located directly west of the MRC property, while the manufacturing building and discharge outfall pipes were located southwest of the MRC property.

As documented in the files maintained at RCDH, the regional groundwater quality within the bedrock aquifer has been impacted by halogenated VOCs. Tricholorethylene (TCE) and PCE have been documented in the western hydraulically upgradient bedrock aquifer. These groundwater impacts were identified by the RCDH (March 23, 1982, RCDH Memorandum) to be the result of an "improperly maintained 2,500 gallon waste storage tank" located on the former Glenshaw Glass property. Other documented releases of halogenated VOCs on the western abutting property include the unauthorized discharge of fluids to the western abutting stream by Aluf Plastics. Discharges containing halogenated VOCs to the stream by Glenshaw Glass in the 1980s were also documented by the RCDH. Other likely sources of the western upgradient impacts include the documented release of halogenated VOCs at the Blauvelt Laundry site.

### 2.3.3 2001-2002 Phase II Subsurface Investigation

Between October 2001 and April 2002, LBG completed an extensive field investigation at the Site which consisted of drilling 56 soil borings, collecting and analyzing 44 soil samples, installing 16 monitor wells and collecting and analyzing 35 groundwater samples. The investigation was completed in two phases.

During the first phase of the field investigation, a total of 40 soil borings were drilled to depths ranging from 2 to 40 ft bg using the probing/direct-push method with a drill-rig mounted on a truck (Geoprobe rig). Soil samples were collected every 10 feet and a total of 26 soils samples were analyzed for halogenated VOCs by EPA Method 8021B. In addition to the soil samples, 14 groundwater samples were collected from the Geoprobe boreholes using a screen point sampler. All groundwater samples were analyzed for halogenated VOCs by EPA Method 8021B. Groundwater samples were collected at every 10-foot interval that was identified to be saturated. Because of the slow progress and depth limitations associated with the direct-push drilling method, the drilling operation was halted.

The second phase of the investigation included drilling 16 soil borings with the use of a hollow-stem auger drill rig (HSA) and completing them as monitor wells, collecting and analyzing 7 surficial soil samples and 11 soil boring samples for halogenated VOCs by EPA Method 8021B. In addition, 21 groundwater samples were collected for analysis. Eight of the monitor well locations were completed as cluster wells (2-inch diameter shallow “S” and deep “D” wells). As part of the investigation, slug tests were conducted in several monitor wells in order to determine the hydraulic conductivity of the saturated sediments throughout the Site

The results from the 2001-2002 investigation document that there were no VOCs identified in the shallow soils at the Site and no evidence that direct exposure of VOCs is a potential concern. In addition, no residual sources of VOCs were identified in the unsaturated soils. Groundwater data demonstrated that some halogenated VOCs were entering the Site from the upgradient property. TCA was identified in 14 of the 31 groundwater sampling locations. Based on the distribution and concentration of the TCA concentrations, no onsite TCA source was identified. The results of the subsurface groundwater investigations revealed the potential of a VOC source area located beneath the southwestern portion of the former MRC building with degradation of the potential source material (TCE) occurring. The data documented that the VOC plume attributed to this release is primarily contained on the Site. During this investigation, a second potential VOC source area was identified near the southeastern portion of the Site with high concentrations of TCE and PCE in the groundwater near one well (MW-12).

Based on the results of the investigation, several data gaps were identified including the need for additional groundwater monitoring to determine seasonal flow directions and gradients; additional groundwater quality monitoring to assess trends; further subsurface investigations of two potential VOC source areas: one located beneath the southwestern portion of the former MRC building and the second located near the southeastern portion of the Site.

### 2.3.4 2003 Soil-Vapor Investigation

On December 29, 2003, LBG conducted a soil-vapor investigation beneath the concrete floor slab of the western half of the former MRC building. Nine soil-vapor samples were collected from under the building at specific locations determined in the field by NYSDEC and NYSDOH personnel. All samples were submitted to the laboratory for VOC analysis by EPA Method TO-15. The laboratory results document both PCE and TCA were detected in the soil vapor samples, indicating a possible source of the VOCs beneath the southwestern portion of the building.

### 2.3.5 2006-2007 Supplemental Investigation

In 2006 and 2007, LBG conducted a Supplemental Investigation at the Site to evaluate the source of the halogenated VOCs, specifically TCE and PCE that was detected in the groundwater in the southeastern portion of the property and to address specific concerns of the NYSDEC and NYSDOH. These concerns included evaluating the status of the facility floor-drainage system, determining if a release of halogenated VOCs had occurred at the SPDES outfalls at the facility, and to document the groundwater quality of the bedrock aquifer beneath the Site. The field investigation was conducted in a manner to characterize the underlying soil and groundwater quality both vertically and horizontally.

Between May and August 2006, a total of 16 overburden soil borings were drilled and 15 monitor wells were constructed on the Site. The 16 overburden soil borings were located on the southeastern portion of the property, in the vicinity of existing Monitor Well MW-12 and in close proximity to an offsite storm drainage system which halogenated VOCs were detected in 1981. The borings were advanced to the top of bedrock (depths ranging from 19 to 30 ft bg) using HSA. Soil samples were collected continuously from grade to the top of bedrock or refusal. A total of 107 soil samples collected from 11 of the 16 soil borings were submitted to the laboratory and analyzed for halogenated VOC analysis by EPA Method 8021B. No constituents were detected above the NYSDEC TAGM recommended soil clean-up objectives. None of the soil samples collected above the water table contained VOCs at concentrations indicative of a source area.

Nine overburden monitor wells were installed in the vicinity of existing Monitor Well MW-12 with two of the nine wells completed as a shallow and deep well cluster (MW-17S and MW-17D). In addition to the overburden wells, six bedrock monitor wells were installed throughout the site. The overburden wells were drilled to depths ranging from 18 to 28 ft bg and the bedrock wells were drilled to depths ranging from 150 to 182 ft bg using a HSA drill rig. The major water-bearing fractures in the bedrock wells were determined based on an evaluation of downhole video camera inspections. As part of the Supplemental Investigation, the location and elevation of all of the onsite wells were surveyed by a New York State licensed surveyor.

In April 2007, groundwater samples were collected from the onsite overburden and bedrock monitor wells and from four offsite overburden wells using the low-stress purging and sampling technique. Multiple samples were collected from the bedrock monitor wells, at the major water-bearing fracture zones that had been identified by the downhole video camera survey. All samples were analyzed for halogenated VOC by EPA Method 8021B.

Overall, concentrations of halogenated VOCs within the overburden groundwater declined since the 2002 sampling event. The peak concentrations of halogenated VOCs (sum of VOC detected greater than 100 micrograms per liter (µg/l) detected in the overburden groundwater during the 2007 sampling event were identified in the monitor wells located along Glenshaw Street (MW-9D and MW-10D), two monitor wells located west of the Site building (MW-7S and MW-3D), a well located southeast of the building (MW-14D), and three monitor wells located on the southeastern portion of the Site (MW-16S, MW-17D and MW-22). The highest VOC concentrations were identified on the southeastern portion of the Site along Glenshaw Street.

Halogenated VOCs were detected in all six bedrock wells and were detected above the NYSDEC Technical and Operational Guidance Series (TOGS) values in the hydraulically upgradient monitor wells MW-1B and MW-10B. Groundwater quality in the bedrock aquifer on the hydraulically downgradient portion of the Site (MW-3B, MW-7B, MW-8B and MW-12B) contained trace concentrations of halogenated VOCs, all of which were below the NYSDEC TOGS guidance values.

As part of the Supplemental Investigation, a Site inspection of the floor drainage system inside the former MRC facility was conducted. The floor drainage system was consistent with the existing floor drain plan. Additionally, all drains, with the exception of those which discharge outside of the building, were capped or sealed.

Water and sediment grab samples were collected from two SPDES outfall locations on the south and southeastern portion of the Site. These outfalls are used for the discharge of non-contact cooling water from the floor drainage system of the onsite facility. In October 2006, samples were collected from the standing water and the accumulated sediments at the bottom of the basins, and submitted to the laboratory for halogenated VOC analysis. Trace concentrations of VOCs (most notably PCE and chloroform) were detected in the water and sediment samples collected in the two SPDES outfalls. As a result of the VOC detections in the 2006 samples, a second set of water and sediment samples were collected in April 2007. The samples contained trace amounts of VOCs in the sediment but not in the grab water sample. Similar to the October 2006 sediment results, chloroform and PCE were detected in the sediment samples. In addition, TCE was detected in both of the outfall sediment samples. The source of the VOCs is unknown, since reportedly only non-contact cooling water is discharged through these outfall locations.

### 2.3.6 Focused Interim Remedial Action – Enhanced Fluid Recovery

In 2009, a focused IRM on groundwater in the southeastern portion of the Site was conducted voluntarily to evaluate the feasibility of improving the quality of VOC-impacted groundwater in this area of the property. Based on the Site conditions, specifically the low permeable environment that would be conducive for effectively dewatering the overburden formation, enhanced fluid recovery (EFR) was chosen for the IRM. Four EFR events were conducted between February and April 2009. The EFR was performed by extracting groundwater and vapor utilizing a high-vacuum from monitor well MW-17D, treating evacuated effluent vapors and properly disposing the evacuated groundwater. During each EFR event groundwater was extracted multiple times from MW-17D for one to two continuous hours before disengaging the vacuum and allowing the well to recharge before repeating the evacuation procedure.

During the EFR events the formation did not respond as anticipated because there was little impact observed to groundwater levels, there was evidence of a rise in water levels in certain monitor wells during the EFR activities, and during one event following a large rain/snow melt event, there was a significant increase in the volume of water evacuated from MW-17D. As a result of these observations, another source of recharge to the southeastern portion of the Site is suspected. This was further supported by the groundwater quality collected before, during and after the EFR events. The groundwater quality in several monitor wells that were sampled following the large rain/snow melt EFR event contained aromatic VOCs (benzene, toluene, xylene and methyl tert butyl ethylene (MTBE).

Based on these factors and the proximity to the nearby utility corridor along Route 303 and Glenshaw Street, it was concluded that the EFR activities were impacted by direct recharge from the nearby utility corridor.

### 2.3.7 2010 Supplemental Investigation

In 2010, a Supplemental Investigation was conducted beneath the western portion of the former MRC building to locate a potential source of the halogenated VOCs detected in groundwater along this portion of the property.

Between June and August 2010, a total of 4 soil borings were drilled in the western interior of the former MRC building and completed as groundwater monitoring wells. The borings were advanced to the maximum depth the rig could penetrate through the overburden with depths ranging from 21 to 34 ft btfs (feet below top of the floor surface). Soil samples were collected continuously from approximately 3 ft btfs to drilling refusal. A total of 24 soil samples collected from the 4 soil borings were submitted to the laboratory and analyzed for halogenated VOC analysis by EPA Method 8260, ethene and ethylene, sulfide, sulfate, nitrate, ammonia, chloride and total organic carbon. With the exception of one shallow soil sample (identified as fill) that contained exceedances of the Restricted Industrial Use criteria, no other exceedances were detected in any of the soil samples collected from the vadose zone under the building. The soil sample collected immediately below the shallow fill sample with the Restricted Industrial Use exceedance was below criteria, with the detected VOCs approximately 4 orders of magnitude lower than those detected in the soil sample collected immediately above. Although no specific source area was identified from under the building, either above or below the water table, the detection of TCE in the shallow soil interval at one location may be indicative of an onsite release of TCE.

In August and November 2010, a total of 37 groundwater samples were collected from 21 exterior and 4 interior monitor wells. The 2010 groundwater quality results from the exterior wells located along the western half of the Site continued to show high VOC concentrations, particularly in the vicinity of well cluster MW-7. The groundwater quality results from the 4 interior wells contained several halogenated VOCs including TCE, 1,1,1 TCA, 1,1 dichoroethene (1,1 DCE), 1,1 dichloroethane (1,1 DCA) and cis 1,2 dichloroethene (cis 1,2 DCE). All were detected at low concentrations and were not indicative of groundwater near a VOC source area.

Groundwater beneath the building had a similar chemical composition to groundwater detected in the upgradient monitor well clusters (MW-3 and MW-7) but at substantially lower concentrations. The Supplemental Investigation did not identify a significant onsite source area under the building. The investigation concluded that the likely source for groundwater impact observed along the western portion of the building was located either hydraulically upgradient or in the vicinity of MW-7. Based on the chemical composition of contaminants and magnitude of VOCs detected in exterior well MW-9, an offsite upgradient release along Glenshaw Street impacting onsite water quality along the southwestern portion of the property is suspected.

### 2.3.8 2013 Pilot Test Supplemental Investigation

In 2012 – 2013, LBG conducted an *in-situ* chemical oxidation (ISCO) pilot test on the western portion of the property. The test was conducted to verify that a proposed ISCO remedy would be successful to remediate groundwater containing halogenated VOCs and to identify means to improve full scale effectiveness and efficiency. The ISCO pilot test included installing an injection well, four extraction wells and a pair of monitor wells located downgradient of the pilot test area. The purpose of the extraction wells was to distribute the ISCO treatment (liquid sodium permanganate) throughout the formation during the pilot test.

Between September and October 2012, seven wells were installed on the western portion of the property. Six of the wells were completed to approximately 42 ft bg and one monitor well was completed to a depth of 25 ft bg. Baseline groundwater samples were collected in November 2012 from 20 wells located in the pilot test area prior to the injection of the ISCO treatment (liquid sodium permanganate). Following the baseline sampling, liquid sodium permanganate was injected over a four-day period in November and December 2012. In total, 1,290 gallons of liquid sodium permanganate solution was injected into the formation and 4,143 gallons of water was extracted from the ISCO pilot test area. A total of 74 groundwater samples were collected during the pilot test from monitor wells located in and upgradient of the pilot test area (prior to the injection/extraction activities and approximately 30, 60 and 90 days following the last injection/extraction activity).

Groundwater results following the ISCO treatment demonstrated that overall, the sodium permanganate is the most viable remedial option for the Site. The sodium permanganate was effective in reducing the chlorinated ethene concentrations in most of the test area. Elevated baseline concentrations of TCE, cis-1,2 DCE and vinyl chloride detected in most wells located in the pilot test area were reduced to concentrations below the laboratory reporting limit. In addition, groundwater results confirmed that sodium permanganate was effectively distributed throughout the aquifer through injection and extraction methods, allowing sufficient contact with the chemical oxidant.

## 2.4 Contamination Conditions

Based on the historical environmental investigations performed onsite, the primary contaminants of concern consist of dissolved-phase halogenated VOCs in groundwater and halogenated VOCs in soil vapor.

Investigations indicated that onsite release of TCE has occurred beneath the building. This release was only found above restricted industrial criteria in material identified as fill beneath the slab. If the source of the TCE impacts is not attributable to fill material, but rather to an uncontrolled release of TCE, then it could be a contributing source of groundwater impacts. In this hypothetical scenario which does not appear to be supported by the data collected, TCE would need to migrate from the vadose zone to the saturated zone. The TCE could then either sorb to saturated soils and slowly dissolve in groundwater, or continue to migrate through fractured zones in the saturated low-permeable unconsolidated materials (i.e. preferential pathways), and migrate downward, and possibly with groundwater towards the southeast. If migration of NAPL occurs, residuals of the VOCs would be present along the path in which the NAPL migrated. Under this scenario, and based on the extremely low permeable unconsolidated material at the site, one could predict the typical characteristics of a plume. In such a case, one would anticipate a plume with high concentrations at the source (i.e., in groundwater beneath the building, or a trail leading from beneath the building to the southeast), and contaminants to move within groundwater from the source primarily by diffusion (possibly creating more of an oblong or radial spread plume, with concentrations declining substantially as they migrate farther from the source(s)). The voluminous data that has been collected at the Site does not support the hypothesis that the source of groundwater contamination is from beneath the building. A compelling fact is that tetrachloroethylene (PCE, a parent product of TCE) was not detected in the soil or groundwater beneath the building, but has been detected in other locations outside the building. This is also true for other chemicals. In addition, the shape of the plume is not what one would anticipate if the plume were emanating from beneath the building, or if NAPL has migrated through saturated soils from beneath the building through preferential pathways in the unconsolidated material towards the southeast. It is extremely unlikely that a release beneath the building would have impacted saturated soils beneath the building and then migrated beyond the footprint of the building without leaving similar chemistry in the groundwater beneath the building.

A second hypothesis could be that TCE was released from beneath the building and followed the floor drainage lines, and then sorbed to saturated soils southeast of the building. By this pathway, the chemicals do not necessarily need to be detected in groundwater beneath the building, and they could reside sorbed to soils southeast of the building. The building would act as a cap for any soils that are impacted in the vadose zone beneath the building. Under this scenario, it would not explain how groundwater is impacted to the west and immediately south of the building; considering groundwater flow is to the east-southeast, and the drainage lines extend to the southeast. Evidence of separate sources of VOCs to the southeast of the building and the remainder of the Site are further supported by the substantially different chemical composition of contamination in these areas. Based on the concentrations of VOCs present on the southeast corner of the Site, it is clear that there is a continuing source of VOCs in the vicinity of this portion of the property, and it may be in the form of NAPL.

### 2.4.1 Conceptual Model of Site Contamination

- The onsite contamination consists of dissolved-phase halogenated VOCs in groundwater and halogenated VOCs in soil vapors.
- The offsite contamination consists of dissolved-phase halogenated VOCs in groundwater and halogenated VOCs in soil vapors.

### 2.4.2 Description of Areas of Concern (AOCs)

The primary AOCs at the Site include:

- Dissolved-phase halogenated VOC contamination onsite and offsite to the west and south of the former MRC building. A more detailed description of the distribution and extent of the contamination in the groundwater is provided in Section 2.4.3.2

### 2.4.3 Identification of Standards, Criteria and Guidance

The NYSDEC 6 NYCRR Part 375 Restricted Use Soil Cleanup Objectives (SCOs) for Industrial Use are proposed as a benchmark to compare soil analytical results. For constituents that were detected but do not have established SCOs under Part 375 (Restricted Use), the Final Commissioner Policy, CP-51 supplemental soil clean-up objectives are proposed. The contaminants of concern for the Site are TCE and associated breakdown products and the soil criteria are summarized on table 1. Parameters detected only in groundwater and not believed to be from an onsite source were not included in the SCOs table. These included aromatic VOCs (benzene, toluene, xylene and MTBE) that were drawn onto the Site during IRM activities discussed in Section 2.3.6; isolated occurrences or laboratory artifacts (bromomethane, bromodichloromethane, carbon tetrachloride).

Although no private potable water supplies are located within the immediate area of the former MRC property, as per New York State Code, all fresh groundwater in New York State are classified as GA. The groundwater cleanup standards and/or guidance values are presented in the NYSDEC, Division of Water TOGS; Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (revised June 2004). However, because groundwater from the most upgradient wells (offsite well clusters MW-5 and MW-6) are impacted by halogenated VOCs, the proposed cleanup goal for the onsite groundwater should take into consideration the background concentrations documented in the groundwater flowing from the most proximate upgradient wells. For parameters that do not have background detections (were not detected in the upgradient, offsite wells) the analytical results will be compared to the groundwater standards listed in TOGS 1.1.1. These criteria are summarized on Table 2. Background concentrations identified in Table 2 may be further refined if additional groundwater samples are collected from existing or proposed upgradient/background monitoring wells.

#### 2.4.3.1 Summary of Soil/Fill

A summary of detected VOCs in soils is presented in Appendix V. Based on the laboratory results, low concentrations of halogenated VOCs (specifically TCE and PCE) were detected in the soils underlying the southeast corner of the Site. Concentrations of TCE ranged from below the detection limit of 0.01 mg/kg (milligram per kilogram) to 0.60 mg/kg (boring B1-06 at 20 to 22 ft bg). Concentrations of PCE ranged from below the detection limit (0.01 mg/kg) to 0.055 mg/kg (boring B1-06 at 24 to 26 ft bg). Breakdown compound cis 1,2 DCE was also detected in a few soil samples at low concentrations, ranging from below the detection limit (0.005 mg/kg) to 0.002 mg/kg (boring MW-17D at 2 to 4 ft bg). None of these concentrations exceed the Part 375 Restricted Use SCOs. During the recent 2013-2014 IRM conducted at the southeast portion of the property, a saturated soil sample collected from a newly-installed well (EW-11 at 25 to 27 ft bg) contained TCE at a concentration of 160 mg/kg, PCE at a concentration of 0.076 mg/kg and cis 1,2 DCE at a concentration of 0.013 mg/kg, all below the SCOs. The soils surrounding this well were subsequently treated with sodium permanganate as part of the IRM activities.

Soil samples collected along the western portion of the property contained low concentrations of halogenated VOCs. Concentrations of TCE ranged from below the detection limit (0.001 mg/kg) to 0.036 mg/kg (boring MW-7D at 10 to 12 ft bg). Concentrations of PCE ranged from 0.003 mg/kg (borings B-7, B-8 and B-9 at 10 ft bg) to 0.017 mg/kg (boring B-8 at 20 ft bg). Breakdown compound cis 1,2 DCE was also detected in a few soil samples at low concentrations, ranging from below the detection limit (0.001 mg/kg) to 0.01 mg/kg (boring MW-7D at 10 to 12 ft bg). None of these concentrations exceed the Part 375 Restricted Use SCOs.

Soil samples under the building also contained halogenated VOCs. Trichloroethylene, cis 1,2 DCE and 1,1 DCE were detected in the fill under the building at concentrations of 730 mg/kg, 530 mg/kg and 3.9 mg/kg, respectively (boring MW-23I at 2-4 ft btfs). Trichloroethylene, cis 1,2 DCE and 1,1 DCE were detected at significantly lower concentrations of 0.027 mg/kg, 0.04 mg/kg and below the detection limit of 0.0016 mg/kg, respectively, in the sample collected immediately below (boring MW-23I at 4 to 4.9 ft btfs). Concentrations of TCE from soil samples collected below the fill ranged from below the detection limit (0.0006 mg/kg) to 0.0061 mg/kg (boring MW-23I at 10 to 12 ft btfs). Concentrations of cis 1,2 DCE from soil samples collected below the fill ranged from below the detection limit (0.0006 mg/kg) to 0.0051 mg/kg (boring MW-23I at 10 to 12 ft btfs). PCE was not detected in any fill or soil samples collected under the building. With the exception of the VOCs detected above criteria in the unsaturated fill sample collected from MW-23I (2 to 4 ft btfs), no constituents in any of the subsurface soil samples collected throughout the Site were detected above the NYSDEC 6 NYCRR Part 375 Restricted Industrial Use SCOs.

The soil sample locations are shown on figure 3.

### 2.4.3.2 Summary of Groundwater Data

A summary of detected VOCs in groundwater is presented in Appendix VI. Based on the laboratory results, concentrations of halogenated VOCs were detected in groundwater underlying the Site. Generally, concentrations of halogenated VOCs have declined over time in the existing monitor well network.

In November 2012, prior to performing the focused ISCO pilot test on the western portion of the (see Section 2.3.8), concentrations of TCE in groundwater along the western portion of the property ranged from below the detection limit (5 µg/l) to 1,000 µg/l (MW-27D). Only trace concentrations of PCE were documented in the November 2012 groundwater results, ranging from below the detection limit (5 µg/l) to 3.6 µg/l (MW-6D). Breakdown compounds cis 1,2 DCE and vinyl chloride were also documented in the November 2012 groundwater collected from the western portion of the property ranging from below the detection limit (5µg/l) to 890 µg/l and 160 µg/l, respectively (both compounds detected in MW-27D). In addition, 1,1,1 TCA and 1,1 DCA were documented in groundwater collected in November 2012 at concentrations ranging from below the detection limit (5 µg/l) to 66 µg/l and 89 µg/l, respectively (both compounds detected in EW-3). A significant improvement in groundwater quality was observed following the ISCO pilot test in the focused area on the western portion of the property. However, the 2013 groundwater results demonstrate that TCE, 1,1 DCA, 1,1 DCE, cis 1,2 DCE, trans 1,2 DCE and vinyl chloride exceed the background concentrations and the NYSDEC TOGS along the western portion of the property.

Groundwater samples collected in 2010 from under the building also contained several halogenated VOCs, including TCE, 1,1,1 TCA, 1,1 DCE, 1,1 DCA and cis 1,2 DCE. All halogenated VOCs were generally detected at low concentrations and not indicative of groundwater near a VOC source area. Concentrations of TCE, the VOC with the highest concentration detected in the interior wells, ranged from 0.91J µg/l (MW-25I) to 69 µg/l (MW-26I). Concentrations of 1,1 DCE and cis 1,2 DCE ranged from below the laboratory detection limit (0.95 µg/l ) to 12 µg/l (1,1 DCE detected in MW-23I) and 40 µg/l (cis 1,2 DCE detected in MW-26I), respectively. Concentrations of 1,1,1 TCA ranged from below the laboratory detection limit (0.95 µg/l) to 7.4 µg/l (MW-25I). The only halogenated VOC detected above criteria in groundwater from under the building was cis 1,2 DCE (MW-23I and MW-26I). The most likely source of halogenated VOCs detected beneath the western portion of the building is from a hydraulically upgradient source or, based on the detection of TCE under the building, a potential source under the building associated with an on-site release or deleterious fill material. None of the constituents detected in groundwater, with the exception of cis 1,2 DCE, were above the background concentrations. However, concentrations of TCE, 1,1,1 TCA, 1,1 DCE, and cis 1,2 DCE were detected above the NYSDEC TOGS (5 µg/l) in several wells under the building.

Concentrations of TCE documented in November 2010 in groundwater along the southeastern portion of the property ranged from 25 µg/l (MW-15) to 17,000 µg/l (MW-17D). Only isolated detections of PCE were documented in the November 2010 groundwater results, ranging from 2.4 µg/l (MW-16) to 36 µg/l (MW-17S). Breakdown compound cis 1,2 DCE was also documented in the November 2010 groundwater samples that were collected along the southeastern corner of the property, ranging in concentration from below the laboratory detection limit (5 µg/l) to 85 µg/l (MW-17S). In addition, 1,1,1 TCA was documented in groundwater collected in November 2010 at concentrations ranging from below the laboratory detection limit (5 µg/l) to 35 µg/l (MW-17S). Vinyl chloride was not detected in any of the 2010 groundwater samples collected from monitor wells located at the southeast corner of the property. Concentrations of carbon tetrachloride along the southeastern portion of the property ranged from below the laboratory detection limit (1 µg/l) to 400 µg/l (MW-17D). The 2010 groundwater results indicate that TCE, PCE, cis 1,2 DCE and carbon tetrachloride exceed the background concentrations and the NYSDEC TOGS. In addition, concentrations of 1,1,1 TCA exceed the NYSDEC TOGS. Although no specific source area(s) has been identified, the detection of TCE under the building and the occurrence of TCE at depth in the southeast corner may be a result of on-site releases as well as potential migration of the contaminant through the complex geologic formation underlying the Site. However, none of the soil investigations completed in the vicinity of the piping in the southeast corner (OF-1 and OF-2) identified source VOCs in the unsaturated zone.

Groundwater samples collected downgradient of the Site under the IL property contained halogenated VOCs. Groundwater samples collected in 2007 document TCE at concentrations ranging from below the laboratory detection limit (5 µg/l) to 950 µg/l (IL-MW-8), 1,1 DCE and cis 1,2 DCE at concentrations ranging from below the laboratory detection limit (5 µg/l) to 24 µg/l (1,1 DCE in IL-MW-8) and 43 µg/l (cis 1,2 DCE in IL-MW-8), respectively. Concentrations of 1,1,1 TCA ranged from below the laboratory detection limit (5 µg/l) to 7.0 µg/l (IL-MW-8). The 2007 groundwater results indicate that concentrations of TCE and cis 1,2 DCE exceed background concentrations and the NYSDEC TOGS. In addition, 1,1,1 TCA, 1,1 DCE and 1,1 DCA concentrations were above the NYSDEC TOGS.

The groundwater sample locations are shown on figure 3.

#### 2.4.3.3 Onsite Soil Vapor Contamination

A summary of detected VOCs in soil vapor is presented in Appendix VII. Based on the laboratory results, two parent products (PCE and 1,1,1 TCA) were identified in the soil vapor at concentrations that indicated potential source areas under the building.

Soil vapor samples under the building contained PCE at concentrations ranging from below the detection limit (2 ppbv (parts per billion per volume)) to 1,400 ppbv (SV-2) and TCE at concentrations ranging from below the detection limit (38 ppbv) to 1,000 ppbv (SV-2). Concentrations of 1,1 DCE and cis 1,2 DCE ranged from below the detection limit (2 µg/l) to 1,500 ppbv (SV-9) and 32,000 ppbv (SV-2), respectively. Concentrations of 1,1,1 TCA ranged from below the detection limit (2 ppbv) to 8,000 ppbv (SV-6). The laboratory results of the soil vapor survey suggested that a possible source of the halogenated VOCs was present beneath the southwestern portion of the building. A subsequent soil investigation conducted under the western side of the building in 2010 (see Section 2.3.7) demonstrated that although no specific VOC source area was identified beneath the southwestern portion of the building, either above or below the water table, one detection of TCE in a shallow soil interval above criteria is evidence of an on-site release of TCE.

The soil vapor sample locations are shown on figure 3.

### 2.4.4 Significant Threat

The NYSDEC and NYSDOH have determined that this Site does pose a significant threat to human health and the environment.

## 2.5 Environmental and Public Health Assessments

### 2.5.1 Qualitative Human Health Exposure Assessment

As part of the Public Health and Environmental Assessments, a qualitative human health and exposure assessment was performed. Based on previous investigations performed at the Site, halogenated VOCs were determined to be present in the subsurface (groundwater and soil vapor).

Summary tables presenting laboratory results for soil, groundwater and soil vapor samples collected as part of the environmental investigations are included in Appendix V, VI and VII, respectively.

The contamination beneath the Site is the result of historical activities on the Site and/or surrounding properties. The workplace activities at the Site has operated as a manufacturing facility which purifies metals and forms metal targets used in sputtering machines that manufacture chips for electronic equipment. Hazardous materials, both virgin and waste materials are used in the manufacturing operation and Site workers are involved in directly handling some of the contaminants. As such, a direct exposure pathway exists for Site workers via ingestion, inhalation or dermal contact. Additionally, a possible exposure route is through soil vapor intrusion, however, this has been mitigated with the installation and operation of the sub-slab depressurization system discussed in further detail in Section 2.6.

The possible contamination exposure route at the surrounding properties is if a contaminant is finding its way into food, water or air supplies. The physical location of the contamination is dissolved in groundwater below the subsurface. None of the results from soil samples collected on the property are indicative of a source area. Groundwater exiting the property along the southwestern property edge have demonstrated concentrations below background with the exception of cis 1,2 DCE detected at approximately 25 µg/l in the deeper well MW-10D. Groundwater exiting the property along the southeastern property edge (MW-18, MW-15, MW-12, MW-21) demonstrated TCE concentrations below 10 µg/l in 2010 (MW-18) and below 25 µg/l (MW-12) and 5 µg/l (MW-15 and MW-21) in 2013. Groundwater exiting the property along the far eastern border (MW-22) contained TCE at concentrations of 30 µg/l in 2013. Presently it is unclear if, and to what extent the VOCs detected in groundwater around the building are related to VOCs detected in groundwater along Glenshaw Street. VOCs detected in wells along Glenshaw Street may be related to possible releases from upgradient properties or an offsite storm drainage system that reportedly had been impacted by halogenated VOCs in the early 1980's.

The majority of the surrounding area is paved and covered with buildings. As such, the potential for humans being directly exposed through ingestion and/or dermal contact is minimal. For people working at downgradient commercial properties, the potential exposure route is through soil vapor intrusion through the concrete slabs in the building's floor. In 2007, a groundwater sampling event was conducted at the Site and included four monitor wells located in the unpaved portion of the downgradient IL property. With the exception of the most eastern IL well (IL-MW-8) which is located near the western edge of Route 303 and the utility corridor running along the street, only trace VOCs were detected in the downgradient IL wells. Two wells (IL-MW-8 and IL-MW-9) were resampled in February 2014 and concentrations in IL-MW-8 were reduced compared to the 2007 data. Based on the regional groundwater flow direction, the concentrations detected in IL-MW-8 would not impact under the IL building.

Additionally, based on the historical activities (and chemicals associated with those activities), Sony never used PCE or TCE during their occupation of the former MRC building as part of its operations. The historical review of surrounding properties indicates that there were numerous industrial and commercial operations which potentially used PCE, TCE and/or other chlorinated solvents in their operations. As such, any PCE, TCE impact to the indoor air at downgradient properties cannot be attributed to Sony-related activities at the Site. However, it is unknown if these compounds were used at the Property prior to Sony’s ownership.

### 2.5.2 Contaminant Fate and Transport

The onsite and offsite contamination, as delineated through historical subsurface investigations, consists of VOCs which are present in the soil, groundwater and soil vapor. There are several factors that affect contaminant migration in the matrices onsite and offsite (soil, groundwater and soil vapor). Each of these factors were evaluated and the concerns associated with the presence of contamination in the subsurface are presented herein.

The results of laboratory analyses of soil, groundwater and soil vapor samples indicate that contaminants associated with the chemicals used onsite, as well as chemicals not listed as having been used as part of the Site operations (specifically PCE and TCE), are present beneath the Site and the easternmost portion of the downgradient IL property.

Primary routes of migration for VOCs are dissolved-phase contamination flow within the groundwater, and migration of soil vapors (resulting from volatilization of residual contamination in the subsurface soils as well as VOCs in groundwater). The migration of the dissolved phase contamination is related to the natural hydraulic flow of the groundwater. The migration of the VOCs in the soil vapor however, is not constrained by hydrogeologic factors. The analytical results of groundwater samples collected at downgradient groundwater monitoring wells along the southern and southwestern property boundary indicate that the contaminated groundwater has been confined to the property limits. Contaminants in groundwater flowing off of the southeastern corner of the property (MW-18, MW-15, MW-12 and MW-21) do not contain significant concentrations and as such, is not negatively impacting the downgradient IL building.

No dense non-aqueous phase liquid (DNAPL) has been measured/observed in any of the onsite or offsite monitoring wells.

While DNAPL has not been observed or measured in any of the onsite or offsite monitoring wells, based on the concentrations of VOCs detected in groundwater on the southeast corner, in the absence of any known release in at least the past 20 years, it is likely that the continuing high concentrations of VOCs in groundwater are attributable to DNAPL in the vicinity of the impacts. The NYSDEC contends that the source of the NAPL is likely from disposal from beneath the building and/or to the building Outfalls, OF-1 and OF-2. Investigations have indicated that the impacts at the Site are at least partially attributable to offsite releases from upgradient properties and from the utility corridor along Glenshaw Street where there have been documented releases. In either case, NAPL would have a low mobility in the low permeable unconsolidated materials on and surrounding the Site. One would anticipate NAPL would migrate through fractures in the unconsolidated materials, and sorb or pool in silt and clay lenses. VOCs would slowly dissolve from the NAPL, and any plume would be oblong or radial, with the primary transport mechanism being diffusion. Near the NAPL one would typically see the highest concentrations of the source VOCs, with breakdown products becoming more prevalent further away from the source. Many factors determine how and at what rate VOCs may degrade, and those include hydrogeologic characteristics, geochemistry and the indigenous microbial population.

A review of VOC concentration on the southeast corner of the property show that high concentrations of VOCs are present within the property boundary (wells EW-7 through EW-12), and VOCs are either not detected or at substantially lower concentrations near the property boundary (wells MW-12, MW-15S, MW-21 and MW-22). This would indicate that the transport of VOCs in groundwater is limited, and may be constricted by the formation or local hydrogeologic features such as the stormwater drain along Glenshaw Street. LBG has shown during the evacuation of wells in this area, that water from this stormwater drain flows onto the Site, so it may be acting as a hydraulic boundary. Complete degradation of VOCs in this portion of the Site is extremely limited, as vinyl chloride, ethene and ethane have only sporadically been detected in groundwater at trace concentrations in this portion of the Site. Methane has been detected at generally higher concentrations along Glenshaw Street; however, these detections are likely associated with ongoing leakage of wastewaters from the municipal storm drain.

### 2.5.2.1 Soil

Extensive investigations conducted at the Site did not identify a source area on the property. Trace VOCs were detected in soils collected above and below the water table throughout the Site. Trace concentrations detected in the vadose zone are attributed to off-gassing from groundwater and trace concentrations detected within the saturated zone are attributed to groundwater. Because the Site and the surrounding area are primarily paved with limited recharge areas (with the exception of an open swale located west of the property and lawn area adjacent to Route 303), and the underlying unconsolidated formation consists of less-permeable fine sand and silt (with finer grained clay and silt observed on the western portion of the Site) infiltration and downward percolation of water can be considered a minimal contributor to transport. As such, transport within the vadose (unsaturated) zone is by gravity and lateral diffusion throughout the pore spaces. Additionally, any contaminants which reached the water table will spread laterally (primarily in the direction of the hydraulic gradient which is southeast toward Route 303).

### 2.5.2.2 Groundwater

The transport of dissolved-phase VOCs in groundwater (mass or solute transport) is dependent on the properties of the VOCs as well as the Site-specific hydraulic properties. The primary variable for dissolved-phase contaminant transport is groundwater flow. This variable determines the direction which the contamination plume will spread. The transport of the VOCs by advection is a function of the quantity of the groundwater flowing within the subsurface. As the resulting plume moves downgradient, the plume widens/spreads vertically and laterally and concentrations decrease away from the source (dispersion). Additionally, dissolved phase VOCs will move from an area of greater concentration (source area) to an area where it is less concentrated, also known as diffusion. Diffusion will occur as long as a concentration gradient exists, irrespective of movement of the groundwater. Based on the 2002 historical subsurface investigations performed at the Site, the hydraulic gradient beneath the Site is approximately 0.039 foot per foot. Based on an evaluation of the data collected from the subsurface investigation, the median hydraulic conductivity across the Site was calculated to be 0.60 ft/day. The average groundwater flow velocity across the Site was calculated to be 0.058 ft/day (approximately 21 ft/yr). Considering the groundwater flow velocity at the Site, it is reasonable to conclude that the migration of VOCs within the overburden at the Site is dominated by diffusion and dispersion, rather than advective flow.

#### 2.5.2.3 Soil Vapor

Similarly to transport in groundwater, transport in the vapor phase may also be described by advection and dispersion. In most cases mechanical dispersion is ignored because vapor velocities are generally too small because of steady state conditions (no forced air flow in the subsurface). As a result, the effects of diffusion are generally much greater than dispersion in the vapor phase. Additionally, based on this ‘steady state’ condition, soil vapor migration direction cannot be determined without quantitative sampling. This sampling has been performed at the Site and results of the investigation are summarized in Section 2.3.4. Molecular diffusion coefficients are approximately four orders of magnitude greater in the vapor phase than in the liquid phase. As such, residual contamination in the vadose zone will impact soil vapor faster than residual contamination impacting the groundwater (from the smear zone and/or NAPL). Mitigation of exposure through soil vapor intrusion has been addressed with the installation and operation of the sub slab depressurization system discussed in Section 2.6.

VOC concentration on the southeast corner of the property show that high concentrations of VOCs are present within the property boundary, and VOCs are either not detected or at substantially lower concentrations near the property boundary (wells MW-12, MW-15S, MW-21 and MW-22). This would indicate that the transport of VOCs in groundwater is limited, and may be constricted by the formation or local hydrogeologic features such as the stormwater drain along Glenshaw Street. LBG has shown during the evacuation of wells in this area, that water from this stormwater drain flows onto the Site, so it may be influencing flow.

Injections of sodium permanganate on the southeast corner of the Site as part of an interim remedial action have produced substantial reductions in VOC concentrations. TCE in MW-17D has declined from over 50,000 micrograms per liter (ug/l) to below the laboratory reporting limit. This reduction has been observed in multiple onsite wells, and similar reductions in TCE concentrations have been measured for multiple sampling rounds on the offsite monitoring wells.

Based on the groundwater flow direction, VOCs migrating off the property at the southeast corner of the Site are not impacting offsite receptors. The closest buildings are the Instrumentation Laboratory building (approximately 275 feet south), and two residential homes located on the east side of Route 303, one due east approximately 450 feet and one southeast approximately 350 feet of the former MRC Site. As shown by figure D-5A (Appendix IV), the Instrumentation Laboratory building is located cross-gradient to the former MRC property and would not be impacted by soil vapors. Based on the flow direction, soil-vapor intrusion at the offsite buildings is unlikely because the VOCs would flow between the two buildings, towards the open wooded area. In addition, soil-vapor intrusion at the offsite buildings is unlikely because the migration would be limited by the geology, the distance from the Site to the nearest buildings, the lower concentrations in groundwater exiting the Site and the likely interception of vapors by the stormwater drain and other utilities buried under Route 303.

The potential for offsite soil vapor is addressed by the partial impediment along Glenshaw Street and reduction of VOCs in onsite and offsite groundwater resulting from the implementation of the interim remedial action.

### 2.5.3 Fish and Wildlife Remedial Impact Analysis

Based on historical investigations performed at and surrounding the Site, the pathway with the potential to impact fish and wildlife as a result of the contamination originating from the Site is through groundwater containing elevated concentrations of VOCs. A review of water quality collected from downgradient monitoring locations along the property boundary (MW-1, MW-13, MW-15, MW-21) show no significant groundwater contamination (total VOC concentrations at each well less than 5 µg/l). However, one well located at the southeast corner of the property (MW-22) contained 68 µg/l total VOCs. Historical VOC concentrations detected in groundwater are presented in Appendix VI.

The Sparkill Creek is located approximately 700 feet downgradient of the property boundary, east of the Route 303 and Glenshaw Road utility corridors. A sampling program conducted by RCDH on the Sparkill Creek in 2001 showed that low concentrations of solvents and MTBE were present in the creek and its tributaries up to 2.5 miles to the south of the former MRC Facility. Concentrations of the solvents detected in the river increased with distance from the former MRC Facility, demonstrating that there are sources of these contaminants to the south of the property.

## 2.6 Interim Remedial Actions

Interim Remedial Measures (IRMs) at the Site consist of a sub-slab depressurization system and groundwater treatment along the southeast corner of the property. The IRM depressurization system was constructed in January 2005 and activated in February 2005 in response to a 2003 soil-vapor investigation conducted in the interior of the building. This sub-slab depressurization system was constructed to prevent potential VOC vapors from entering the building. The system consists of four sub-slab suction points and "very high suction fans" (producing a maximum vacuum of 50 inches of water column), installed throughout the building. The system has been continually operated since the initial start-up (February 2005).

In 2009, a focused IRM via enhanced fluid recovery (EFR) was conducted on the southeastern portion of the property to determine the feasibility of improving VOC-impacted groundwater in this area. Four EFR events were completed between January and April 2009. The EFR remediation was performed by extracting groundwater and vapor from monitor well MW-17D utilizing a high vacuum. A combined total of 1,365 gallons of groundwater was extracted as part of the IRM. During the activities, all wastewater was stored in the vacuum truck tank and properly disposed. In addition, the evacuated effluent vapors generated during the EFR activities were treated through a G2 carbon system prior to discharge to the atmosphere.

Based on the response of water levels in the unconsolidated formation during the EFR activities, another source of recharge was identified, most likely related to the nearby utility corridor. A significant increase in volume evacuated from well MW-17D was observed during the EFR activities that were conducted after a large rain/snow melting event. In addition, detections of aromatic VOCs (notably toluene) which had not been present in groundwater prior to the focused IRM were observed in several monitor wells following the EFR activities. Based on the EFR response, it was concluded that the nearby utility corridor located on Glenshaw Street and Route 303 is contributing recharge to the southeast corner of the Site which is negatively impacting groundwater.

Following the EFR activities, the overall 2013 groundwater quality in the monitor well network located in this portion of the Site was similar or lower than the 2009 water quality data with the exception of an increase in TCE concentration in MW-17S (340 µg/l to 5,300 µg/l) and a decrease in TCE concentration in MW-17D (45,000 µg/l to 13,000 µg/l).

In 2012, an *in-situ* chemical oxidation (ISCO) pilot test was conducted on the western portion of the Site to determine if remediation by sodium permanganate was a feasible remediation alternative. In total, 1,290 gallons of liquid sodium permanganate solution was injected into the formation and 4,143 gallons of groundwater was extracted from the proposed ISCO pilot test area. Groundwater quality monitored during the pilot test demonstrated that a 10 to 20 percent permanganate solution was highly effective in reducing the chlorinated ethane concentrations. The injection/extraction activities were successful in mobilizing the sodium permanganate solution through the formation in the pilot test area. This was supported by the groundwater quality results. Elevated baseline concentrations of TCE, cis-1,2 DCE and vinyl chloride detected in most wells located within the pilot test area were reduced to concentrations below the laboratory reporting limit following the permanganate solution injection/extraction activities. However, laboratory data from limited wells sampled in December 2014 demonstrated that VOC concentrations rebounded and in one location, to pre-injection levels. Case studies show that some rebound usually occurs, however, the complete rebound observed in one monitor well may be attributed to the tighter geological formation in this area, where a slightly higher silt content was observed and desorption from the silt may have occurred. The rebound may also reflect re-contamination of the formation from a presumed nearby source.

Based on the success of the 2012 ISCO pilot test along the western portion of the property an IRM to treat groundwater along the southeastern corner of the Site using sodium permanganate was proposed and approved in November 2013 by NYSDEC. This IRM is currently ongoing. Ninety-day post treatment groundwater quality indicate that the elevated baseline concentrations of TCE, PCE and cis-1,2 DCE detected in most wells located within the IRM area have been reduced to concentrations below the laboratory reporting limit.

## 2.7 Remedial Action Objectives

Based on the continued use of the property as an industrial facility and the results of the environmental investigations performed at the former MRC property, the following Remedial Action Objectives (RAOs) have been identified.

### 2.7.1 Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater containing contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of VOCs emanating from contaminated groundwater.

RAOs for Environmental Protection

- Restore ground water aquifer, to the extent practicable, to background conditions.
- Prevent the discharge of contaminants to surface water.
- Remove the source of groundwater contamination (if identified), if practicable.

### 2.7.2 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of, or exposure to, contaminants volatilizing from contaminated soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

### 2.7.3 Soil Vapor

RAOs for Public Health Protection

- Prevent inhalation of, or exposure to, contaminants volatilizing from contaminated soil or groundwater.
- Prevent migration of contaminants that would result in soil vapor intrusion.

## 3.0 DESCRIPTION OF REMEDIAL ACTION PLAN

### 3.1 Evaluation of Remedial Alternatives

This section lists several potential remedial technologies available for the remediation of contaminated groundwater, soil and soil vapor along the western portion of the Site. The factors considered during this analysis of remedial alternatives are: protection of human health and the environment; compliance with standards, criteria, and guidance (SCGs); short-term effectiveness and impacts; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume of contaminated material; implementability; cost effectiveness; community acceptance and land use. Even though impacted source soils were not identified as part of the investigations, the remediation technologies that were considered as part of this evaluation can address impacted soil, if present, and groundwater.

Remedial action standards, criteria and guidance documents utilized at the Site to direct the progress of the remedial investigation activities and IRMs, as well as to evaluate remedial alternatives include the following:

- 6 NYCRR Part 375-6 Soil Cleanup Objectives
- CP-51 / Soil Cleanup Guidance – October 21, 2010;
- New York State Groundwater Quality Standards – 6 NYCRR Part 703;
- NYSDEC Ambient Water Quality Standards and Guidance Values – TOGS 1.1.1;
- NYSDEC Program Policy DER-10 Technical Guidance for Site Investigation and Remediation – May 3, 2010;
- NYSDEC Draft Brownfield Cleanup Program Guide – May 2004;
- Site-specific Health and Safety Plan (HASP) and New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan;
- NYS Waste Transporter Permits – 6 NYCRR Part 364; and
- NYS Solid Waste Management Requirements – 6 NYCRR Part 360 and Part 364.

#### 3.1.1 Development of Alternatives

The factors considered during this analysis of remedial alternatives are: protection of human health and the environment; compliance with standards (background); duration of effectiveness and impacts; permanence; reduction of toxicity, mobility, or volume of contaminated material; implementability; and cost effectiveness.

Site soil conditions are a major limiting factor for any proposed remedy at this Site. The unconsolidated materials at the Site consist primarily of fine sand with some silt to clay. Groundwater generally flows from the northwest to southeast. The overall hydraulic gradient onsite was determined to be 0.039 ft/ft and the median hydraulic conductivity (K) across the Site is 0.60 ft/day or $6.9 \times 10^{-6}$ ft/sec.

Traditional remedial strategies such as dual-phase extraction systems, air sparge/soil vapor extraction systems, pump and treat systems and soil excavation with offsite disposal were evaluated and eliminated. These remedies were eliminated because of the large area to be treated, space needed for onsite treatment equipment, cost, reliability of performance and long-term commitment (10 to 20 years) associated with any type of traditional pumping system. In addition, because a soil source has not been identified, excavation and soil removal is not considered a viable remedial alternative.

Alternative in-situ remedial strategies were evaluated, including micro-scale zero valent iron, bioremediation and chemical oxidation. LBG conducted a treatability study using micro-scale zero valent iron to treat Site soils. The results of the treatability study demonstrated that micro-scale zero valent iron would be an effective treatment. However, because buried utilities were later identified in the proposed treatment area and the micro-scale zero valent iron could not be effectively delivered through wells or direct push, this treatment alternative was eliminated.

Chemical oxidation treatments that were considered as potential remedial alternatives included: potassium permanganate, sodium permanganate, activated sodium persulfate and Modified Fenton Reagent (MFR). Persulfate and MFR were eliminated because of a number of factors, including:

- limited chemical longevity (1-3 months),
- explosive potential (MFR),
- greater potential of mobilizing metals,
- safety concerns associated with chemical handling,
- concerns related to potential buried utility exposure, and
- concern with oxidant delivery.

The following five remedial alternatives for the Site were evaluated:

Alternative 1: No Action
Monitored Natural Attenuation
Institutional/Administrative Controls

Alternative 2: Bioremediation
Carbon Amendment
Micro Organisms

Alternative 3: Biosupplement
Organic Hydrogen Donors
Vitamins
Nutrients

Alternative 4: Chemical Oxidation
Potassium or Sodium Permanganate

Alternative 5: Excavation to Unrestricted-Use SCOs with Off-Site Treatment/Disposal, Surface Cover

A detailed analysis of these five remedial alternatives is provided below.

### 3.1.1.1 Alternative 1 - No Action

Alternative 1 leaves the Site as it is. “No Action” is used as a baseline option for all Sites. Under this alternative, the Participant would undertake no activity toward cleanup or risk mitigation at the Site. Natural processes, such as degradation, adsorption, dispersion, dilution, and volatilization would be the only source of contaminant removal. The “No Action” alternative does not employ pro-active remedial measures and relies on periodic monitoring to verify that natural attenuation is occurring.

**Evaluation of Alternative 1 – No Action**

| Criterion | Discussion |
|---|---|
| Protection of Human Health & the Environment | *Advantages:*<br>· VOC concentrations will slowly decrease over time through natural attenuation.<br>*Disadvantages:*<br>· May take decades for concentrations to decrease to SCGs/background. |
| Compliance with SCGs | Meeting SCGs/background will likely take decades. |

| Criterion | Discussion |
|---|---|
| Short-Term Effectiveness | *Advantages:*<br>· No increase in risk to workers, community or environment.<br>*Disadvantages:*<br>· Cannot achieve closure in the shorter duration. |
| Long-Term Effectiveness | *Advantages:*<br>· No increase in risk to workers, community or environment as long as no one is using water for potable supply and building is not constructed over plume without vapor controls.<br>*Disadvantages:*<br>· Not effective in meeting SCGs/background within a shorter duration. |
| Reduction in Toxicity, Mobility & Volume | *Advantages:*<br>· Organic contamination may eventually reduce to meet SCGs/background.<br>*Disadvantages:*<br>· Not effective in meeting SCGs/background within a shorter durations. |
| Implementability | *Advantages:*<br>· Easily implemented.<br>*Disadvantages:*<br>· None. |

### 3.1.1.2 Alternative 2 - Bioremediation

Under Alternative 2, groundwater would be treated by bioremediation. The existing groundwater quality in the western portion of the property indicates that reductive dechlorination is naturally occurring (however, at a very slow rate) and the natural underlying conditions of the Site are conducive for biodegradation. Biodegradation occurs as micro-organisms (typically containing dehalococcoides (DHC) and dehalobacter (DHB) bacteria) break down contaminants (reductive dechlorination) by using them as a food source or co-metabolizing them with a food source. End products under anaerobic conditions include reduced hydrocarbons (ethenes and ethanes), methane, hydrogen gas, carbon dioxide, sulfides. Depending on conditions, vinyl chloride may be an additional end by-product in an anaerobic environment, in which aerobic conditions are necessary to achieve the aforementioned degraded constituents.

The presence of vinyl chloride in the Site groundwater indicates that there is some natural biodegradation occurring. However, soil laboratory results for the Site indicate that DHC does not appear to be abundantly present. With the deficiency of naturally-occurring DHC, biostimulation and bioaugmentation would be required to effectively bioremediate the soil and groundwater. This would be achieved by adding micro-organisms (containing DHC and DHB) with a carbon amendment food source (emulsified vegetable oil) which combined, would enhance the natural reductive conditions at the Site.

A series of injection wells and extraction wells would be drilled throughout the western portion of the property in order to introduce the carbon amendment and micro-organisms (containing DHC and DHB). An estimated 24 injection/extraction wells would be placed throughout the western portion of the property (4 are already present as part of the 2012-2013 pilot test program) to depths of approximately 40 feet below grade (top of bedrock). Initially the carbon amendment would be injected into the underlying formation and drawn through the formation utilizing the network of injection/extraction wells. In addition, 8 existing wells (well clusters MW3SD, MW-7SD, MW-9SD and MW-27SD) located in the proposed treatment area will be included in the injection/extraction network. The carbon amendment treatment would be followed by bioaugmentation once the formation reached optimal conditions (typically one month or more following the addition of the carbon amendment). Based on the size of the treatment area (115 ft by 60 ft by 33 ft), one application associated with the bioremediation will require approximately 15,000 pounds of the carbon amendment, followed by approximately 100 liters of the micro-organisms. Groundwater monitoring would be used to track the decline in halogenated VOC concentrations resulting from the contaminant degradation processes. This alternative assumes two applications would be required with five to six years of post-treatment groundwater monitoring.

The primary concern regarding the bioremediation alternative is that it is unclear if microbes added to the aquifer would thrive. The laboratory testing completed to date has provided no evidence that the existing microbial population has dechlorinated VOCs beyond vinyl chloride. In addition, testing of the underlying formation indicates that DHC does not appear to be present. It is unknown why the bacteria are not present. The concern associated with this alternative is the survival and sustainability of the micro-organisms if they are introduced to the Site.

**Evaluation of Alternative 2 – Bioremediation**

| Criterion | Discussion |
|---|---|
| Protection of Human Health & the Environment | *Advantages:*<br>· Promotes natural biodegradation.<br>· In-situ remediation.<br>· DHC documented in degrading chlorinated ethenes to ethene and DHB documented in degrading 1,1,1 TCA and 1,1 DCA to chloroethane. |

| Criterion | Discussion |
|---|---|
| | *Disadvantages:*<br>· May take at least 5 to 6 years for concentrations to decrease to acceptable levels.<br>· Daughter products will be created as part of the degradation process. |
| Compliance with SCGs | Remedial objectives would be met if the micro-organisms survive and sustain in the existing environment. Under ideal conditions, will take at least 5 to 6 years. |
| Short-Term Effectiveness | *Advantages:*<br>· No increase in risk to workers, community or environment.<br>*Disadvantages:*<br>· Daughter products will be created as part of the degradation process.<br>· May require multiple applications of carbon amendment and/or micro-organisms.<br>· Will require frequent monitoring to assure micro-organisms are surviving. |
| Long-Term Effectiveness | *Advantages:*<br>· Effective as long as micro-organisms are sustainable until complete degradation of contaminants occurs.<br>*Disadvantages:*<br>· Ineffective if micro-organisms cannot survive/sustain until complete degradation of contaminants occurs. |
| Reduction in Toxicity, Mobility & Volume | *Advantages:*<br>· Organic contamination will reduce to meet SCGs/background.<br>*Disadvantages:*<br>· Reduction of concentrations may take at least 5 to 6 years to meet SCGs/background. |
| Implementability | *Advantages:*<br>· No long-term maintenance required.<br>· No utilities required.<br>*Disadvantages:*<br>· Will require injection/extraction wells to distribute carbon amendment and micro-organisms throughout formation. |

Bioremediation may be considered on a smaller scale to address potential localized recalcitrant areas following chemical oxidation. In this scenario, delivery and growth of micro-organisms may potentially be accomplished using an in-situ bioreactor.

#### 3.1.1.3 Alternative 3 - Biosupplement

Alternative 3 employs a variation of Alternative 2. Under Alternative 3 groundwater would be treated by organic hydrogen donors, vitamins and nutrients to stimulate any naturally-occurring micro-organisms. Based on the concentrations of the chlorinated compounds present in the groundwater, a solution of calcium propionate, hydrolyzed kelp, nutrients, vitamins and sodium sulfite would be used. Calcium propionate and kelp provide a variety of organic carbon and hydrogen donors needed for dehalogenation. In addition, the use of kelp would provide a source of nutrients and vitamins. Actual Vitamin $B_{12}$ and $B_2$ would be added to the solution to promote efficient electron transfer and enhance the last stage dechlorination of vinyl chloride. The sodium sulfite would act as an oxygen scavenger, iron reducer and sulfate source which would promote anaerobic conditions favorable for biodegradation. The solution would be introduced into the underlying formation through injection and extraction activities using the proposed 24 injection/extraction wells and existing monitor wells described under Alternative 2.

Initially, compressed air would be delivered to the saturated zone at approximately 100 psi (pounds per square inch) to establish preferential pathways and voids. Following the initial compressed air treatment, the biosupplement solution would be injected into the underlying formation. Based on the size of the treatment area (115 ft by 60 ft by 33 ft), one application of approximately 5,900 pounds of the biosupplement solution would be required. Monitoring would be used to track the decline in concentrations resulting from the contaminant degradation processes. This alternative assumes two applications would be required with 4 to 5 years of post-treatment groundwater monitoring if the natural bacteria respond favorably to the biosupplement solution.

The principal concern regarding the biosupplemental remediation alternative, as discussed in the previous section, is that it is unclear if the microbes needed for the bioremediation to occur are already present in the underlying formation. The laboratory testing completed to date demonstrates that DHC does not appear to be abundantly present at the Site. It is unknown if the existing microbes will respond to the biosupplemental remediation and if dechlorination beyond vinyl chloride is attainable. It is uncertain if additional microbes will be required and if they would thrive.

### Evaluation of Alternative 3 – Biosupplement

| Criterion | Discussion |
|---|---|
| Protection of Human Health & the Environment | *Advantages:*<br>· Promotes natural biodegradation.<br>· In-situ remediation.<br>*Disadvantages:*<br>· Will take at least 4 to 5 years for concentrations to decrease to SCGs/background levels.<br>· Daughter products will be created as part of the degradation process. |
| Compliance with SCGs | Remedial objectives would be met. Under ideal conditions, will take at least 4 to 5 years. |
| Short-Term Effectiveness | *Advantages:*<br>· No increase in risk to workers, community or environment.<br>*Disadvantages:*<br>· Daughter products will be created as part of the degradation process.<br>· May require additional applications of biosupplement solution.<br>· May require addition of micro-organisms. |
| Long-Term Effectiveness | *Advantages:*<br>· Effective as long as naturally-occurring micro-organisms are present and respond to biosupplement.<br>*Disadvantages:*<br>· Ineffective if micro-organisms do not respond to biosupplement. |
| Reduction in Toxicity, Mobility & Volume | *Advantages:*<br>· Organic contamination will reduce to meet SCGs/background.<br>*Disadvantages:*<br>· Reduction of concentrations will take at least 4 to 5 years to meet SCGs. |
| Implementability | *Advantages:*<br>· No long-term maintenance required.<br>· No utilities required.<br>*Disadvantages:*<br>· Will require injection/extraction wells to distribute solution throughout formation. |

### 3.1.1.4 Alternative 4 –Permanganate Chemical Oxidation

Alternative 4 treats the western portion of the property through *in-situ* chemical oxidation (ISCO). Chemical oxidation using permanganate (sodium or potassium) has been shown to degrade halogenated VOCs in soil and groundwater. The primary oxidation reaction involves spontaneous cleavage of the organic compound carbon-carbon bond. Once the double bond is broken, the unstable intermediates are converted to carbon dioxide and manganese dioxide, which precipitates out of solution.

Studies have demonstrated that permanganate can be considered for sites with hydraulic conductivities ranging from $10^{-6}$ ft/sec ≤ K ≤$10^{-7}$ ft/sec ft. The median hydraulic conductivity (K) across the Site is 0.60 ft/day or 6.9 x $10^{-6}$ ft/sec. In addition, the permanganate natural oxidant demand (PNOD) in soils collected from under the western portion of the building range from 0.2 g/kg to 0.5 g/kg. The average PNOD in soils collected in the parking lot southwest of the building was slightly higher at 1.5 g/kg. Remediation sites with a PNOD that is less than 10 g/kg are favorable for in situ chemical oxidation with permanganate. In 2012 – 2013 an ISCO pilot test was conducted southwest of the building. Approximately 1,200 gallons of 20 percent liquid sodium permanganate was introduced into the formation underlying the study area. The sodium permanganate generally reduced the TCE concentrations by 2 to 3 orders of magnitude in the pilot test area. Below is a table summarizing the pros and cons of the two types of permanganate reagent.

| **Permanganate** | **Pros** | **Cons** |
|---|---|---|
| Sodium ($NaMNO_4$) | · Fast reaction with double bonded halogenated VOCs.<br>· Reaction relatively quick and no daughter products produced as long as sufficient amount of product present.<br>· Requires less injection time and volume compared to $KMNO_4$.<br>· No significant VOC off-gas produced by heat of reaction.<br>· Density driven advection can improve distribution of the oxidant in a heterogeneous aquifer. | · $NaMNO_4$ poses handling risks.<br>· Potential to precipitate solids and clog aquifer pores and/or well screens.<br>· $NaMNO_4$ has higher chemical costs compared to $KMNO_4$.<br>· Perception concerns associated with compound color if breakthrough occurs.<br>· Potential to temporarily mobilize metals in groundwater over short term. |
| Potassium<br>($KMNO_4$) | · Relatively stable and can diffuse into low permeable zones over time.<br>· Not a significant health and safety hazard.<br>· No significant VOC off-gas produced by heat of reaction.<br>· Density driven advection can improve distribution of the oxidant in a heterogeneous aquifer. | · Dust hazard.<br>· Delivered as solid. Low solubility and temperature dependent.<br>· Requires additional screening and permitting to comply with Chemical Facility Anti-Terrorism Standards rules and regulations.<br>· Perception concerns associated with compound color if breakthrough occurs.<br>· Requires more complex equipment.<br>· Potential to precipitate solids and clog aquifer pores.<br>· Potential to temporarily mobilize metals in groundwater over short term. |

Based on the less complex delivery equipment required and reduced exposure hazards (dust) at the active facility, liquid sodium permanganate would be the chemical oxidant of choice. The sodium permanganate would be introduced into the underlying formation on the western side of the property through injection and extraction activities. In addition to the four injection/extraction wells previously installed as part of the 2012-2013 pilot test, 20 wells would be constructed in the proposed treatment area. Each well would be used as both an injection and extraction well to maximize the delivery of the permanganate solution and minimize the potential amount of solution purged from the formation during the extraction activities. The use of each well would alternate as both an injection point and extraction point to evenly distribute the permanganate solution throughout the formation. Based on the size of the treatment area (115 ft by 60 ft by 33 ft), approximately 28,000 pounds of sodium permanganate would be required that would be distributed to all of the injection points. Areas with higher halogenated VOC concentrations in groundwater would be treated with a 20 percent solution and areas with lower halogenated VOC concentrations in groundwater would be treated with a 5 to 10 percent solution. Based on 2013 water quality results from samples collected in the northern portion of the treatment area (near well cluster MW-3 and MW-7), halogenated VOC concentrations are reducing through diffusion, advection and dispersion and therefore remediation in the northern periphery will rely on Monitoring Natural Attenuation. Groundwater monitoring would be used to track the decline in concentrations resulting from the contaminant degradation processes. This alternative assumes two to three years of post-treatment groundwater monitoring.

The principal concerns regarding any in-situ chemical oxidation remediation is the effectiveness in distributing the reagent in the treatment zone and the potential excessive loss of the chemical oxidant through reaction with the natural organics in the soil. Because the PNOD is very low at the Site (average of 1 g/kg (gram per kilogram) across the western portion of the property), this potential loss is not a driving concern. However, based on the Site geology, the distribution of the chemical oxidant to the contaminated media is the primary concern. In order for the remediation to be successful, an adequate volume of oxidant contacting the entire target zone will be required. The success of the remediation will be dependent on the delivery.

### Evaluation of Alternative 4 – Sodium Permanganate Chemical Oxidation

| Criterion | Discussion |
|---|---|
| Protection of Human Health & the Environment | *Advantages:*<br>· In-situ remediation.<br>· No significant VOC off-gas produced by heat of reaction.<br>*Disadvantages:*<br>· Potential to mobilize metals in groundwater.<br>· Poses handling risks. |
| Compliance with SCGs | Remedial objectives would be met if the oxidant can be effectively distributed through the formation. Potentially completed within 2 years. |
| Short-Term Effectiveness | *Advantages:*<br>· Effective as long as sufficiently delivered to subsurface.<br>· Oxidizes over extended period increasing possibility of contact with contamination.<br>*Disadvantages:*<br>· Potential to temporarily mobilize metals in groundwater over the short term.<br>· May require second limited application. |
| Long-Term Effectiveness | *Advantages:*<br>· Effective as long as sufficiently delivered to subsurface.<br>*Disadvantages:*<br>· Ineffective if cannot be sufficiently distributed throughout the formation before the oxidant reaction is spent.<br>· Dissolved contaminant concentrations may rebound following treatment. |
| Reduction in Toxicity, Mobility & Volume | *Advantages:*<br>· Organic contamination will be reduced, potentially meeting SCGs/background.<br>*Disadvantages:*<br>· Temporary increase in metal mobility, particularly chromium.<br>· Can cause clogging of aquifer through precipitation of minerals (manganese) in pore spaces. |
| Implementability | *Advantages:*<br>· No long-term maintenance required.<br>· No utilities required.<br>*Disadvantages:*<br>· Will require injection/extraction wells to distribute sodium permanganate throughout formation.<br>· Can temporarily kill indigenous subsurface microbe population. |

#### 3.1.1.5 Alternative 5 – Excavation to Unrestricted-Use SCOs with Off-Site Treatment/Disposal, Surface Cover

Alternative 5 would provide for unrestricted use of the Site. Under this alternative, the Participant would undertake to excavate impacted soils underlying the property until post-excavation samples confirm that all remaining soils meet the unrestricted use standards set forth in 6 NYCRR Part 375-3.8 (e)(1). Because no source area has been identified, this would require removing the unsaturated and saturated soils down to 30 feet on the eastern side of the property and 45 feet on the western side of the property. In addition, soils under the western portion of the building would require excavation. Because of the high water table conditions, a significant dewatering system would be required in order to achieve the proposed excavation depths. In order to excavate to the depths required, dewatering wells would be closely spaced together. The dewatering system would also require treatment of groundwater prior to being discharged to the sanitary sewer. Based on the size of the property, the alternative would require a minimum of 2 to 3 years to complete. The "Excavation to Unrestricted Use Action" alternative would offer protectiveness to human health and the environment but effectiveness would be compromised by any historic upgradient releases re-contaminating the underlying soils.

### Evaluation of Alternative 5 – Excavation to Unrestricted-Use SCOs with Off-Site Treatment/Disposal, Surface Cover

| **Criterion** | **Discussion** |
|---|---|
| Protection of Human Health & the Environment | *Advantages:*<br>· Offers protectiveness and achieves Remedial Action Objectives by removing soil from the Site.<br>*Disadvantages:*<br>· Significant disruption to or termination of the existing business operations. Will require construction of new building and relocation of existing business to a secure location prior to excavation activities. |
| Compliance with SCGs | Complies with the applicable SCGs by removing soil from the Site which contains contaminants exceeding the Unrestricted-Use SCOs. |
| Short-Term Effectiveness | *Advantages:*<br>· None.<br>*Disadvantages:*<br>· Potential increase in risk to workers, community and/or environment associated with construction, direct contact, increased traffic, soil erosion/migration and airborne dust.<br>· Cannot achieve closure in the short duration.<br>· Large volume of soil requiring excavation, management and transportation off the Site would require high levels of truck traffic.<br>· Poses significant health and safety risk if business operations are not relocated prior to commencement of remediation activities.<br>· The remedial alternative will require approximately 3 years to complete. |

| **Criterion** | **Discussion** |
|---|---|
| Long-Term Effectiveness | *Advantages:*<br>· Removal of soils with concentrations in excess of the Unrestricted-Use SCOs from the Site; as a result it would offer long-term effectiveness and potential permanence.<br>*Disadvantages:*<br>· Duration to achieve complete construction of new building, soil removal and Site restoration. Likelihood of recontamination by upgradient off-site sources. |
| Reduction in Toxicity, Mobility & Volume | *Advantages:*<br>· Complete removal of soil and offsite disposal of the impacted soil would substantially reduce the volume and mobility of organic contaminants at the Site. Ex-situ off-site soil disposal would reduce toxicity.<br>*Disadvantages:*<br>· Effective in meeting SCGs/background but may be impacted by upgradient releases. |
| Implementability | *Advantages:*<br>· Technically implementable.<br>*Disadvantages:*<br>· Cost prohibitive.<br>· Disruption to or termination of existing business operations makes this alternative infeasible.<br>· Requires sophisticated dewatering and shoring system to achieve excavation depths of 30 to 45 feet. Would require segmented approach to achieve Site remediation.<br>· The remedial alternative will require a minimum of 3 years to complete. |

In order to achieve this alternative, construction of a new building would be necessary in order for uninterrupted business operations. Because of space limitations, relocating a building on the property would be a challenge and therefore would likely require relocating the business to an alternative location. Soil excavation with the Site partially occupied would be a massive endeavor and would pose unnecessary risk to health and safety throughout the remediation activities. It is unlikely that the property owner would be amenable to relocating their business operations because of the sensitive nature of their business operations, the sophisticated and delicate nature of the equipment and machinery utilized in the current operations and the high level of security required. This alternative would not likely to be tolerated by the current site owner. In addition, the costs associated with constructing a new building or relocating the existing business are prohibitive.

Other alternatives that may achieve unrestricted use of the Site are installation and operation of duel-phase extraction (DPE) system or in-situ thermal desorption. The DPE would require the installation of many multi-phase extraction wells throughout the property, at close-spaced intervals, in order to dewater the entire underlying saturated aquifer. The system would also cause substantial disruption to the existing business, as deep wells would need to be installed throughout the western portion of the building. Because of the tight spacing and business requirement for a dust free work environment; it is likely that the business operations would need to be moved to allow the extraction points to be installed inside the building. It is difficult to place a cost on the temporary relocation of a business. Although the cost for this alternative would be less than the soil excavation alternative, a DPE system could require 15 to 20 years of operation, and there is no certainty that the system would be able to achieve the unrestricted use clean-up goals. In-situ thermal desorption would provide greater likelihood of success of remediation, and could achieve cleanup objectives within 6 months to a year from the start of the system; however, installation of this type of system would require an even higher density of heating points versus the extraction points required for the DPE system. Further, such a system would require an upgrade to the electric capacity of the service entering the building and a safe area for the operation of high resistance equipment. As with the DPE, the business would need to be relocated so that the high density heating points could be installed inside the building. Based on previous estimates WSP has received for in-situ thermal desorption, and the area requiring remediation at the Site, the cost for this remedial option would be similar to excavation and disposal cost.

### 3.1.1.6 Summary of Comparative Analysis of Alternatives

This section summarizes the evaluation of the five remedial alternatives: Alternative 1 - No Action, Alternative 2 – Bioremediation, Alternative 3 – Biosupplement, and Alternative 4 – Sodium Permanganate Chemical Oxidation, Alternative 5 – Excavation to Unrestricted-Use SCOs with Off-Site Treatment/Disposal, Surface Cover.

Alternative 1- No Action would be protective of public health as long as the groundwater is not used for potable supply, and a building is not constructed over the plume without vapor controls. Limited annual monitoring would be conducted to allow regulatory agencies to assess natural attenuation of the contaminants in groundwater and the subsequent rate of reduction. Although there are no risks associated with this remedial option, Alternative 1 would provide no short-term effectiveness in protecting workers. Alternative 1 would be the least effective remedial alternative in the long-term because no steps are taken to reduce risks. Alternative 1 would likely reduce contaminant toxicity, mobility and/or volume. However, monitoring will be necessary to verify natural attenuation is occurring. Alternative 1 would be easily implemented because no active remedial actions would be involved; however, the unknown duration of cleanup makes Alternative 1 undesirable.

Alternative 2 - Bioremediation would be protective of human health and the environment by promoting dechlorination through natural biodegradation. Alternative 2 would meet the RAOs provided that the micro-organisms introduced into the formation can survive and sustain until the bioremediation is complete. Because the carbon amendment and micro-organisms are non-toxic and are added in-situ, there would be little risk associated with the remediation and would provide the most short-term effectiveness with respect to protection of human health and the environment. If the micro-organisms can thrive in this environment, this option would likely provide long-term effectiveness, and reduce contaminant toxicity or volume under ideal conditions within five to six years. However because the micro-organisms are not naturally sufficiently present, there is no evidence that complete degradation of the VOCs can be achieved at the Site through bioremediation. Alternative 2 can be implemented by constructing a series of injection and extraction wells. On a smaller scale, bioremediation may be used to address local recalcitrant areas by injecting and growing micro-organisms with use of a bioreactor(s).

Alternative 3 – Biosupplement would be protective of human health and the environment if the natural micro-organisms indigenous to the Site are receptive to the biosupplement solution. Because the biosupplement solution is non-toxic and is added in-situ, there would be little risk associated with the remediation. Similar to Alternative 2, the biosupplement remediation alternative would provide the most short-term effectiveness in terms of protection of human health and the environment because it is non-toxic. If the micro-organisms are present and respond to the biosupplement solution then Alternative 3 would meet the RAOs, provide long-term effectiveness and reduce contaminant toxicity, mobility, and volume under ideal conditions within four to five years. However because the natural micro-organisms are not prolific, there is no evidence that complete degradation of the VOCs can be achieved at the Site through bioremediation. Alternative 3 can also be implemented by constructing a series of injection and extraction wells.

Alternative 4 – Sodium Permanganate Chemical Oxidation would be protective of human health and the environment by destroying the contaminants, ultimately down to carbon dioxide and water. This alternative would meet the RAOs provided that the oxidant can be effectively distributed throughout the formation before the oxidant reaction expires. Alternative 4 is considered to pose the most potential short-term threat to workers during the remedial actions. If the oxidant delivery is successful, this option would likely provide long-term effectiveness, however, there have been documented cases where dissolved contaminant concentrations have rebounded following treatment. This reaction is caused by the reagent consuming the natural organic matter in soil and releasing sorbed contaminants to groundwater, which would affect the long-term effectiveness of the remediation. However, the rebound affect usually occurs in more permeable soils. Since the PNOD at the Site is extremely low and the formation consists of fine sands and silt, a significant release of sorbed contaminants before the oxidant reaction expires is not anticipated. If the oxidant can be effectively distributed throughout the formation, Alternative 4 can reduce contaminant toxicity or volume within two years. Alternative 4 can be implemented by constructing a series of injection and extraction wells.

Alternative 5 – Excavation to Unrestricted-Use SCOs with Off-Site Treatment/Disposal, Surface Cover would be protective of public health because all impacted soils underlying the Site would be permanently removed. Alternative 5 would provide no short-term effectiveness in protecting workers but would be the most effective remedial alternative in the long-term because any source area contamination would be removed. However, recontamination of the soils from exposure to impacted groundwater emanating from upgradient source(s) is a possibility. Alternative 5 would reduce contaminant toxicity, mobility and/or volume. Theoretically, if the soils are not re-exposed to an offsite source, no post-remediation monitoring would be necessary. Alternative 5 would be infeasible to implement because the business operations would need to be relocated prior to initiating any remedial action. As a result of the material disruptions to the industrial operations of the property owner at the site, it is unlikely the property owner would be agreeable to relocation. Technically this alternative would be extraordinarily difficult to implement because of the large volume of soil and water management that would be required and the necessity of removing the building from the site in order to access the impacted soils. Due to these technical and practical challenges Alternative 5 is not feasible and is therefore undesirable.

### 3.1.1.7 Cost

The preliminary cost estimates for Alternatives 1 to 5 have been evaluated. The cost estimate for Alternative 1 includes institutional controls (such as deed restrictions) and long-term monitoring. For purposes of this evaluation, long-term monitoring was assumed to consist of one sampling event per year for 30 years. The treatment alternative with the lowest cost is Alternative 1, however, this alternative is the least desirable because of the duration to meet the cleanup goals. The treatment alternative with the highest cost is Alternative 5. These costs are summarized in the table below.

**Cost Comparison of Proposed Alternatives**

| Alternative | Capital Cost | Post-Remediation Monitoring Cost | Total |
|---|---|---|---|
| 1-No Further Action[1/] | $ 23,000 | $585,000 | $608,000 |
| 2-Bioremediation[2/] | $831,450 | $217,500 - $261,000 | $1,048,950 - $1,092,450 |
| 3-Biosupplement[3/] | $800,975 | $180,000 - $225,000 | $980,975 - $1,025,975 |
| 4-Sodium Permanganate Chemical Oxidation[4/] | $579,310 | $48,000 - $72,000 | $627,310 - $651,310 |
| 5- Excavation to Unrestricted-Use SCOs with Off-Site Treatment/Disposal, Surface Cover [5/] | $39,635,000 | $0 | $39,635,000 |

1/ Assumes 30 years of annual groundwater monitoring of 30 wells.

2/ Assumes 2 applications of remediation treatment and 5-6 years of semi-annual post-treatment groundwater monitoring of 24 onsite and 8 offsite wells. This cost does not evaluate smaller scale application via bioreactors.

3/ Assumes 2 applications of remediation treatment and 4-5 years of post-treatment groundwater monitoring of 24 onsite and 8 offsite wells.

4/ Assumes 1.5 application of remediation treatment and 2-3 years of semi-annual post-treatment groundwater monitoring of 24 onsite and 8 offsite wells.

5/ Assumes no post-remediation monitoring will be required.

The cost breakdown for each alternative is included in Appendix VIII.

### 3.1.1.8 Conclusion

The active treatment alternatives (Alternatives 2, 3 and 4) are the most realistic alternatives for achieving the cleanup goals. Treatment alternative 5 is the most unrealistic alternative to implement because of the large volume of soil and water that will need to be managed during the excavation activities and due to the fact that the manufacturing operations would have to be relocated and significant components of the building would have to be removed, and subsequently restored, to provide access to the impacted media. The in-situ chemical oxidation alternative (Alternative 4) is a lower cost alternative than the bioremediation/biosupplement active treatment alternatives (Alternatives 2 and 3). The higher costs for the bioremediation active treatment alternatives reflect the longer time needed to achieve and monitor the remediation progress compared to the quicker reacting in-situ chemical oxidation treatment.

Neither Alternative 2 or 3 are considered to be as reliable as Alternative 4. The sections above provide information on the advantages and disadvantages of each alternative as well as site-specific factors that were considered when selecting the preferred remedy. Site conditions demonstrate that some naturally-occurring dechlorination is occurring. However, the bacteria required to continue the degradation of the VOCs process beyond vinyl chloride do not appear to be present in natural abundance. The primary concern related to the bioremediation/biosupplement remediation is that the bacteria will not survive or sustain long enough until complete dechlorination is achieved, even with the addition of the carbon amendment/micro-organisms, or the biosupplemental solution. Additionally, bacteria may ultimately have to be introduced into the formation if the biosupplemental solution (Alternative 3) does not enhance and stimulate bacteria growth.

Overall, the bioremediation alternatives (Alternatives 2 and 3) will take longer to meet cleanup goals compared to the chemical oxidation alternative (Alternative 4) and are considered to be less predictable for a favorable outcome. This is a function of the time necessary for the amendments/solutions to augment the formation for optimal bacteria growth and sustenance. Therefore, Alternative 4 has been determined to be the most appropriate method for remediation of the Site. It is anticipated that this remedial alternative will be effective at bringing the onsite groundwater contamination to background levels.

### 3.2 Selection of the Preferred Remedy

The objective of the RAWP is to apply the best technologies for remediation of soil, groundwater and soil vapors and to control the offsite migration of groundwater and vapors contaminated with VOCs. The preferred remedy (Alternative 4) was selected as a result of several evaluation criteria previously defined. The following land use factors were used to evaluate the selected Remedial Action alternative: zoning; applicable comprehensive community master plans or land use plans**;** surrounding property uses; citizen participation; environmental justice concerns; land use designations; population growth patterns; accessibility to existing infrastructure; proximity to cultural resources; proximity to natural resources; offsite groundwater impacts; proximity to floodplains; geography and geology of the Site; and current institutional controls.

### 3.2.1 Zoning

The Site is located in the Town of Orangetown, Hamlet of Orangeburg, Rockland County, New York. The Site is a commercial property located in a laboratory office district (LO). This zoning allows land use at the Site to include research, experiment/testing labs, and manufacturing of prototype products. If contaminated soils are encountered during the RA activities then remediating the Site with site-specific cleanup objectives meeting Track 2 restricted use soil cleanup objectives (for restricted industrial use), as well as Site background and NYSDEC TOGS Series 4046 groundwater quality standards, are considered to be conservative cleanup objectives. However, because the soil sample from under the raised portion of the building that contained halogenated VOCs above the Restricted Industrial Use is located beneath the building's sealed concrete floor and is served by a sub-slab depressurization system, no soil excavation is proposed.

Additionally, the zoning of the Site would allow for the implementation of the preferred remedy.

### 3.2.2 Applicable Comprehensive Community Master Plans or Land Use Plans

On May 12, 2003, the Town Board of the Town of Orangetown adopted the Town of Orangetown Comprehensive Plan. This plan incorporated the Route 303 Overlay Zoning District that was adopted by the Town in January 2002 and the recommendations of the December 2002 Route 303 Sustainable Development Study. The Route 303 Overlay Zoning District is intended to limit the size and extent of large-scale retail development, restrict certain land uses, and promote enhancement of open space along the Route 303 corridor through landscape screening to buffer commercial uses. The Route 303 Sustainable Development Study promotes the development of non-retail commercial facilities such as office and research campuses. Included in the study was the recommendation to develop a bike and pedestrian trail along the Sparkill Creek. The 2003 Comprehensive Plan included the recommendation to protect the Sparkill Creek watershed by limiting development directly adjacent to the Creek and requiring any existing developments along the Creek to mitigate any adverse environmental impacts.

There is no proposed zoning change in the vicinity of the Site. The current configuration of the paved area setback of the former MRC property to Route 303 ranges between 25 and 50 feet. This setback is maintained as lawn which conforms to the Route 303 Overlay Zoning Controls. In addition, the Site is located approximately 700 feet west of the Sparkill Creek, which is located on the opposite side (east side) of Route 303. Considering the Site will not likely be rezoned and is outside the Sparkill Creek Greenway, the Comprehensive and Land Use Plans would not prohibit the implementation of the preferred remedy.

### 3.2.3 Surrounding Property Uses

The former MRC Site is surrounded by a mix of residential, commercial and industrial properties, as well as a railroad right-of-way. To the north of the Site is the Praxair headquarters building; to the south of the Site is Instrumentation Laboratory. To the east of the Site is vacant and residential property. To the west is a property generally identified as Interstate Distribution Center which contains Aluf Plastics Inc., NYNEX and Pavion Ltd.

The area within one mile of the former MRC Site is zoned for residential, commercial and laboratory/industrial uses. A copy of the land zoning map encompassing the Site (as generated for the 2003 Comprehensive Plan) is included in Appendix IX.

### 3.2.4 Citizen Participation

Citizen participation is required as part of the BCP. Prior to major milestones in the progress of the work, Fact Sheets will be mailed out to a public contact list. The Fact Sheets will list the time frame for a public comment period as well as locations of document repositories where previously submitted reports are available for review. Based on the results of the public comment period for the RAWP, modifications will be made to the document, if necessary, after evaluation of the comments by both the participant as well as participating parties (including NYSDEC, NYSDOH and RCDH). Following the completion of the public comment period, the RAWP will be implemented.

### 3.2.5 Environmental Justice Concerns

The QA/QC methodologies implemented at the Site, as well as the collaborative over-sight by state agencies (NYSDEC and NYSDOH), will ensure environmental justice for all citizens adjacent to and surrounding the Site.

The 2011 Draft Town of Orangetown Comprehensive Plan Update Study indicates that the majority of the Town's 2010 population is white (81.9%); 6.0% black or African-American; 6.9% Asian and 9.9% Hispanic/Latinos. Another resource was utilized to further investigate census information for the hamlet of Orangeburg (USA City Facts). The 2010 Census information for the hamlet of Orangeburg has a demographic profile indicating the following distribution: white – 77.3%; Asian – 13.2%; Hispanic – 10.9%; black or African American – 4.0%; American Indian/Alaska native – 0.2%; and native Hawaiian/other pacific islander – 0%; some other race – 2.0%; two or more races (non-Hispanic). Based on this demographic information, there are no significant concentrations of groups/communities within the Site census tract that may be disadvantaged due to socio-economic conditions or as a result of language barriers.

### 3.2.6 Land-Use Designations

The land use designation for the Site is laboratory-office district (LO). The LO District permits offices, laboratories and schools by right. The land use designations for the area surrounding the Site consists of: laboratory-office district, light industrial district (LI); and medium density residential district consisting of single-family 15,000 s. f. lots (R-15). The LI District permits manufacturing, wholesale, warehouse and storage uses, offices, commercial recreation and theatres by right. Further north of the Site there is a retail-commercial district, community shopping district. There are vacant properties located immediately east of the Site, on the eastern side of Route 303 as well as further north and south of the Site. The land use designations of the Site and the area surrounding the Site would not prohibit the implementation of the preferred remedy.

### 3.2.7 Population Growth Patterns

Population growth patterns within the area surrounding the Site are increasing. The 2010 census for the hamlet of Orangeburg was 4,568, an increase of 34.8 percent from the 2000 census. The 2010 United States Census reported a total Town population of 49,212 persons, an increase of 3.1 percent from the 2000 Census population. The population growth pattern of the area surrounding the Site would not prohibit the implementation of the preferred remedy.

### 3.2.8 Accessibility to Existing Infrastructure

The accessibility to existing infrastructure at the Site and in the area surrounding the Site would not prohibit the implementation of the preferred remedy.

### 3.2.9 Proximity to Cultural Resources

No cultural resources are documented in the immediate vicinity of the Site. Based on the small area of which the implementation of the proposed remedy would encompass, the proximity of the Site to cultural resources would not prohibit the implementation of the preferred remedy.

### 3.2.10 Proximity to Natural Resources

The Site is located approximately 700 feet west of the Sparkill Creek. The implementation of the proposed remedy will address the offsite migration of contaminated groundwater, reducing (with the long-term goal of eliminating) the dissolved-phase VOC concentrations potentially migrating to the Sparkill Creek. As such, the proposed remedy would both eliminate residual source material from the subsurface as well as much of the dissolved-phase contamination. By doing so, it will lower dissolved-phase VOC concentrations, thereby reducing the contaminant mass migrating off the Site.

### 3.2.11 Offsite Groundwater Impacts

The implementation of the proposed remedy will address potential offsite migration of contamination by: remediation of residual soil contamination under the building via an SSDS; and chemical oxidation injections to address dissolved-phase contamination. The combination of these engineering controls will help to remediate offsite groundwater impacts.

### 3.2.12 Proximity to Floodplains

The Site is not located in or adjacent to a floodplain and as such, no floodplain issues need to be addressed. Therefore, the proximity of the Site to floodplains would not prohibit the implementation of the preferred remedy.

### 3.2.13 Geography and Geology of the Site

The geography and geology of the Site and the area surrounding the Site, as described earlier in this document, would not prohibit the implementation of the preferred remedy.

### 3.2.14 Current Institutional Controls

Currently the Site, which has entered in the BCP, has no institutional controls. The environmental work which has been performed at the Site has been performed according to NYSDEC-approved work plans. Additionally, a specific Health and Safety Plan developed for the Site (which includes a CAMP) provides safety guidance for all environmental work performed in association with the remedial investigations.

Based on the land use factors as they exist in the area surrounding the Site, the preferred remedy is acceptable.

## 3.3 Summary of Selected Remedial Actions

The objective of the RAWP is to apply the best technologies for remediation of soil, groundwater and soil vapors and to control the offsite migration of groundwater and vapors contaminated with halogenated VOCs.

The soil, groundwater and soil vapor data obtained from the subsurface investigations performed at the Site indicate that groundwater and soil vapor contain halogenated VOCs at concentrations exceeding their respective guidance values. As such, the following remedial actions will be performed to address the remaining contamination beneath the Site and adjacent areas. Several Engineering Controls and Institutional Controls will be maintained until the goal of each element of the Remedial Action is achieved at the Site.

1. Sub-Slab Depressurization System (SSDS)
2. In-Situ Chemical Oxidation (ISCO)
3. Replacement and Additional Monitoring Well Installation
4. Groundwater Monitoring
5. Recording of a Deed Restriction
6. Implementation of a Site Management Plan

### 3.3.1 Sub-Slab Depressurization System (SSDS)

A SSDS was installed under the onsite building in 2005. Based on results from a pilot test conducted in 2004, the SSDS was constructed by dividing the building into four sections and installing one SSDS in each section. The locations of the suction points were selected to reduce the potential for damage to the system from manufacturing activities being conducted in the areas and to provide adequate sub-slab depressurization. The locations of the depressurization systems are shown on figure 4. The fans selected for the system were chosen based on the vacuum performance specifications identified by the manufacturer. The fans selected for the system are classified as “very-high suction” fans in that they produce a maximum vacuum of 50 in. WC. The piping used in construction includes 3-inch diameter PVC for the influent and 2-inch diameter PVC for the effluent, based on the sizes of the influent and effluent of the selected fans. The SSDS will continue to be operated to remove contaminated soil vapor that is currently present beneath the onsite building as well as to prevent future accumulation of soil vapor beneath the building slab. Post mitigation monitoring to document the effectiveness of the system will be included as part of the SMP. The removal of soil vapor with elevated VOC concentration will mitigate soil vapor intrusion within the onsite building, and will help to prevent offsite migration of soil vapor. In addition, the floor slab has been sealed with a barrier coating which provides a secondary means of preventing vapor intrusion into the building.

### 3.3.2 In-Situ Chemical Oxidation (ISCO)

As part of the approach to address dissolved-phase VOC contamination, chemically-enhanced remediation of groundwater will be utilized. The ISCO approach will be performed on the western portion of the Site using sodium permanganate as the chemical oxidant. Sodium permanganate is an advanced chemical oxidation technology (provided by Carus Corporation or other qualified vendor) that destroys contaminants through controlled chemical reactions. Permanganate is a strong oxidizing agent that effectively oxidizes organic compounds containing carbon-carbon double bonds.

The sodium permanganate will be delivered to the Site as a 40-percent solution which will be mixed on site with an appropriate volume of water to yield an approximate 5 to 20-percent sodium permanganate solution by volume. The percent solutions (5 to 20 percent) will be dependent on the area-specific groundwater quality which will be determined through baseline groundwater sampling conducted prior to the ISCO injections.

Once in the subsurface, the sodium permanganate produces a cascade of efficient oxidation reactions by a number of mechanisms including hydroxylation, hydrolysis or cleavage. These reactions ultimately break down a wide range of chlorinated alkenes to carbon dioxide, water, chloride ions and manganese dioxide.

Based on the success of a 2012 – 2013 ISCO pilot test that was performed along the western portion of the property (refer to Section 2.3.8), the solution will be delivered using gravity-flow techniques into a series of permanent wells and distributed throughout the formation by extracting groundwater and vapor from nearby permanent wells. The permanent wells will be used alternately as injection wells and extraction wells, located in parallel rows, to maximize the delivery potential of the permanganate solution. These wells will be located approximately 15 to 20 feet apart (where possible) to more effectively mobilize the permanganate solution. This distance was chosen based on field observations during the 2012 - 2013 ISCO pilot test which documented an approximate 25 foot radius of influence from each extraction well. Based on these observations, reducing the distance between the injection/extraction points (where possible) should promote more efficient delivery of the oxidant to nearby extraction wells.

Prior to commencing the drilling activities, an underground utility survey will be conducted in the proposed treatment area under LBG supervision. This survey will be performed to confirm that there are no structures present in the proposed well locations. In addition, Call Before You Dig will be contacted prior to the drilling activities to mark out the treatment area. No wells will be installed within ten feet of any underground utility or structure. All borings will be drilled using a hollow-stem auger rig (HSA). Soil samples will be collected from select boring locations for general field screening and geologic logging purposes. Soil samples from the select borings will be collected at 5-foot intervals from grade to the completion depth using a 2-inch outer diameter, 2-foot long split spoon. All split-spoon samples will be geologically logged in accordance with ASTM D 2487 and ASTM D 2488.

Each soil sample will be placed into a dedicated, sealed plastic bag and the headspace within the bag will be screened for the presence of VOCs with a photoionization detector (PID) with a 10.6 eV bulb that will be calibrated to an isobutylene standard. Because the purpose of the soil sample is to characterize the underlying geology, no laboratory analysis is anticipated with the exception of limited testing for the permanganate natural oxidant demand (PNOD). However, if grossly impacted soil is observed, then the impacted soil will be submitted to a certified NYSDOH Environmental Laboratory Approval Program (ELAP) laboratory. Any soil sample submitted to the laboratory will be analyzed for halogenated VOCs by EPA Method 8260. If the laboratory analyses confirm gross soil contamination, the network may be modified to focus on the impacted area. In addition, a composite soil sample will be collected between 15 to 40 ft bg from 5 to 10 proposed borings. The composite soil sample will be analyzed for PNOD (ASTM D7262-07 Test Method A) to determine appropriate permanganate solutions. Soils with a PNOD that is less than 10 g/kg are favorable for *in-situ* chemical oxidation with permanganate. LBG will communicate these results to the NYSDEC; any changes to the proposed network would only be implemented with NYSDEC concurrence. All split spoon samplers will be washed with Alconox and water and rinsed between each use. All excess soil cuttings generated at each location during the drilling activities will be containerized in individual 55 gallon drums. The soil will be characterized and properly disposed. Each boring will be completed as a permanent well, in the manner described below.

Twenty (20) 2-inch diameter injection/extraction wells will be drilled on the western side of the property (figure 5)[1]. The well borings will be advanced to approximately 42 ft bg (feet below grade) using a HSA drill rig. The results from the 2012 - 2013 ISCO pilot test demonstrated that the injection and extraction wells can be completed as 2-inch diameter wells and still maintain good interconnection with the formation. In addition, to prevent siltation of the well, the screen openings will not exceed 20-slot. The borehole for the 2-inch diameter wells will be drilled with a minimum of 4 ¼ inch ID (inner diameter) / 8 ¼ inch OD (outer diameter) HSA. Each well will be completed using 2-inch Schedule 40 PVC (SCH 40 PVC) components, including SCH 40 PVC, 20-slot screen and SCH 40 PVC riser pipe. To more effectively isolate the shallow formation from the deep formation each injection/extraction well will be constructed to include a blank casing between screen settings which should isolate the permanganate delivery to the upper and lower overburden formations during the injection/extraction activities. Each well will be screened from approximately 7 ft bg to 27 ft bg and 32 ft bg to 42 ft bg, separated by a 5 foot 2-inch diameter PVC blank casing set at approximately 27 ft bg to 32 ft bg. The screen will be connected to 2-inch

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[1] Location and number of wells may change based on Site operations and/or groundwater conditions. The NYSDEC would be notified of any changes in the quantity of wells, or if the locations of the wells are significantly different.

diameter PVC riser casing. The riser will extend from the top of the screen to grade. The annular space surrounding, and 0.5 foot above the well screen will be filled with FilterSil No. 1 or 2 gravel pack. A 4-foot bentonite seal will be placed between 27.5 and 31.5 ft bg (surrounding the blank casing) and 2 feet above the top of the gravel pack above the upper screen (approximately 4.5 ft bg). The remainder of the 2-inch diameter well will be sealed with a Portland cement/bentonite slurry grout, from the top of the bentonite seal to approximately 1.5 to 2 ft bg. Each well will be equipped with watertight locking well cap and completed at the surface with a flush-mounted locking well vault set in cement.

The wells will be developed within one week of completion. A minimum of three volumes of water will be removed from each well and development will be deemed complete when normal hydraulic conductivity with the aquifer has been restored. All well-purging activities will be properly recorded. All wastewater generated during the groundwater sampling event will be containerized in drums. The wastewater will then be characterized and properly disposed.

The locations of the proposed injection/extraction areas are shown on figure 5. A diagram showing the design detail for each monitor well is shown in figure 6.

Volume application rates of the sodium permanganate will be based on the manufacturer's recommendations which include the area to be treated, site specific PNOD and subsurface soil and groundwater contaminant concentrations. The data calculations used to determine the amount of the liquid sodium permanganate necessary to treat the western portion of the Site are attached in Appendix X**.**

### 3.3.3 Replacement and Additional Monitoring Well Installation

Several upgradient groundwater monitoring wells (MW-6S and MW-6D) were destroyed or compromised during snow plowing activities in the winter of 2013. As a result, the compromised groundwater monitoring wells should be replaced to monitor upgradient groundwater quality. Two additional well clusters (shallow and deep) located in the vicinity of clusters MW-5 and MW-6 are recommended for further characterization of upgradient groundwater quality flowing onto the Site. The new proposed well clusters will be drilled using HSA and will be installed in a manner consistent with the specifications of well cluster MW-5 and MW-6. These proposed wells are needed to adequately characterize and document the upgradient water quality migrating onto the Site. Installation of the proposed wells will be contingent on permission granted by the offsite property owner.

In addition to the upgradient monitor wells, two well clusters (MW-28 and MW-29) are proposed east and hydraulically downgradient of the treatment area (figure 5). Each well cluster will consist of a shallow and deep 2-inch diameter monitor well. One soil boring for each well cluster will be advanced using HSA to approximately 42 ft bg and will be completed as a deep ground-water monitor well using 2-inch PVC components, including SCH 40 PVC, 10-slot screen and SCH 40 PVC riser pipe. A 20-foot length of screen will be placed at the bottom of the boring and connected to 2-inch diameter PVC riser casing. The riser will extend from the top of the screen to grade. The annular space surrounding, and 2 feet above the well screen will be filled with FilterSil No. 1 gravel pack. A 2-foot bentonite seal will be placed above the gravel pack. The remainder of the well will be backfilled with a bentonite slurry grout to approximately 2 ft bg. A shallow boring will be drilled next to each deep monitor well using HSA and 20 feet of screen will be set across the water table (assumed to be around 5 ft bg). Each shallow monitor well will be completed in the same manner as the deep monitor well. All wells will be equipped with watertight locking well caps and completed at the surface with flush-mounted road boxes set in cement.

The wells will be developed within one week of completion. A minimum of three volumes of water will be removed from each well and development will be deemed complete when normal hydraulic conductivity with the aquifer has been restored. All well-purging activities will be properly recorded. All wastewater generated during the groundwater sampling event will be containerized in drums. The wastewater will then be characterized and properly disposed.

### 3.3.4 Groundwater Monitoring

A quarterly groundwater monitoring program at the Site will be initiated for the first year following the permanganate application and then semi-annually after the first year to assess the results of remediation, until residual groundwater concentrations are found to be at or below background or NYSDEC standards, or have become asymptotic over an extended period. Site background and NYSDEC TOGS GWQS are presented in table 2. The monitoring program will include measuring depth to water levels and collecting groundwater samples from a select onsite and offsite monitoring well network. Prior to sampling, the wells will be opened and the water levels will be recorded on field sheets. The levels will be measured to an accuracy of ±0.01 foot using an electronic water-level meter. The fluid-level measurements and the top-of-casing elevation of each well will be used to calculate the corrected groundwater elevation at each point in the well network. The corrected groundwater elevations will be used to construct groundwater elevation contour maps and to determine the direction of groundwater flow.

Following water-level measurements, groundwater samples will be collected from select wells using the low-stress purging and sampling technique. The methodology for this technique is outlined in the September 19, 2017 USEPA Region I, "Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells". In general, this procedure consists of removing groundwater from a well at an extremely low flow rate (e.g., 0.1 to 0.4 L/m [liters per minute]) using a bladder pump, centrifugal pump or peristaltic pump. For wells set in low permeable materials, an even lower flow rate than 0.1 L/m may be required. Groundwater parameters will be monitored continuously using a multi-parameter water-quality monitoring system. Measurements for pH, conductivity, turbidity, dissolved oxygen (DO), temperature, and oxygen reduction potential (ORP) will be obtained as the groundwater is purged through a flow-cell. A sample is collected once stabilization has been achieved for the following parameters and variances for three consecutive readings: turbidity (10 percent for values greater than 1 NTU, DO (10 percent), specific conductance (3 percent), temperature (3 percent), pH (0.1 units) and ORP (10 millivolts). The groundwater samples will be stored on ice in a cooler to maintain a constant temperature until delivery to the laboratory.

Quality Assurance and Quality Control (QA/QC) samples, including a duplicate and a trip blank will accompany the groundwater sample shipment. The groundwater samples will be analyzed by a NYSDOH certified laboratory for halogenated VOCs by EPA Method 8260 and methane. In addition, groundwater from one upgradient shallow/deep well cluster and two downgradient shallow/deep well clusters will be sampled for arsenic, chromium, lead and chloride. These parameters were chosen because they were observed during the 2012-2013 pilot test to be more mobile in an oxidized state than other metals that were monitored. All laboratory results will be reported in the NYSDEC-approved EQuIS Electronic Data Deliverable (EDD) format. The results of the quarterly groundwater monitoring program will be summarized in the annual Site Management Report.

### 3.3.5 Chemical Oxidant Injection

A 5 to 20-percent liquid sodium permanganate solution will be injected into the proposed 2-inch diameter injection/extraction wells (solution concentration may be reduced in the field to enhance distribution into the aquifer). In areas where there is less impact (i.e. the northern edge of the treatment area), a 5-percent liquid sodium permanganate solution will be injected into the proposed 2-inch diameter injection/extraction wells. Based on the results of the 2012-2013 pilot test (refer to Section 2.3.8), the treatment distribution has been modified to maximize the delivery of the permanganate solution and minimize the potential amount of solution purged from the formation during the extraction activities. The proposed delivery design will utilize each well as both an injection and extraction point versus a single-use injection point surrounded by extraction wells. The proposed injection/extraction wells will be located in parallel rows (figure 5) and the permanganate will be initially introduced to the northernmost injection point, while groundwater is extracted from the nearest southern point. The progression of the permanganate solution will be monitored based on field observations. Once the permanganate has been successfully introduced and distributed from the first injection point to the first extraction point, the permanganate will then be introduced into the extraction well and the injection/extraction activities will continue. This process of alternating functions between wells (injection/extraction) will be conducted down each row. Permanganate introduced into the southernmost injection well will be extracted from the nearest northernmost well in the row immediately adjacent to the injection well. The alternate use of each well as both an injection point and an extraction point will allow better distribution of the permanganate solution throughout the formation. As demonstrated during the 2014 IRM activities along the southeast corner of the property, simultaneous injections into two to three wells located along parallel rows was also effective in distributing the permanganate solution. Injection of the permanganate solution into multiple wells may be considered during the injection/extraction activities if it will promote more efficient distribution of the permanganate solution. The sodium permanganate will be delivered to the Site as a 40-percent solution by weight, which will be mixed on site in a dedicated tote with an appropriate volume of water to yield an approximate 5 to 20-percent sodium permanganate solution by volume. The solution will be delivered to the injection wells through either a flexible vinyl hose or chemical hose directly from the permanganate mixing tote.

The permanganate injection will be conducted by gravity flow and will be introduced into the entire well column of the injection wells. Initially the permanganate solution will be introduced to the bottom portion of the injection well to promote delivery of the permanganate solution to the lower portion of the formation (32 to 42 ft bg). Groundwater and vapor will be extracted from the nearby extraction wells utilizing a high vacuum system (trailer mounted or vacuum truck). Water will be extracted from the well at an average vacuum of 20 inches of mercury. The evacuated effluent vapors generated during the extraction activities will be treated through a G2 carbon system prior to discharging to the atmosphere. Groundwater will either be containerized in a vacuum truck for offsite disposal, or, if possible, into a ~20,000 gallon frac tank before being treated and discharged into the sanitary sewer.

The proposed area to be remediated will be treated with a 5 to 20 percent sodium permanganate mixture, based on the VOC concentrations detected in the groundwater. Areas with low VOCs (primarily in the northern portion of the remediation area) will be treated with approximately 1,965 gallons of 5-percent solution (approximately 190 gallons of sodium permanganate mixed with 1,775 gallons of water). Approximately 3,495 gallons of 10-percent solution (approximately 700 gallons of sodium permanganate mixed with 2,795 gallons of water) will be injected in the vicinity of well clusters MW-7 and MW-9. Approximately 3,245 gallons of a 20-percent mixture (approximately 1,400 gallons of sodium permanganate mixed with 1,845 gallons of water) will be introduced into the remaining portion of the ISCO treatment (includes the western-most border and area near IW-1. Using the alpha-numeric grid shown on figure 7, the 5 percent solution will be added in injection points located between rows H and I and columns 2 through 4; the 10 percent solution will be added in injection points located between rows F and H and columns 2 through 4 and between rows A and B and columns 1 through 4; and the 20 percent solution will be added in injection points located between rows B and I and columns 1 and 2 and between rows B and F and columns 1 through 4. The data calculations used to determine the amount of the liquid sodium permanganate necessary to treat the area are included in Appendix X.

The 40-percent liquid sodium permanganate will be ordered from the supplier a minimum of two weeks prior to the commencement of the remediation activities. The sodium permanganate will be delivered directly to the injection/extraction subcontractor in dedicated containers where they will be stored in a cool dry place until the ISCO remediation activities are ready to commence.

Carbon tetrachloride and TCA were documented at high concentrations in the groundwater during the IRM of the southeast corner. Because sodium permanganate is not effective in remediating these two compounds, these will be addressed using a different chemical oxidant agent. The NYSDEC will be notified in writing to any changes in the proposed oxidant treatment.

### 3.3.6 Recording of a Deed Restriction

Following completion of the RA activities, an Environmental Easement will be recorded for the Site with the Rockland County Clerk's office. This document will act as an Institutional Control to ensure continued operation of the Engineering Controls, and to prevent future exposure to any residual contamination remaining at the Site.

### 3.3.7 Implementation of a Site Management Plan (SMP)

A SMP will be developed for long-term management of residual contamination following completion of the RA activities. Site Management is the last phase of remediation and begins with the approval of the Final Engineering Report (FER) and issuance of the Certificate of Completion for the RA. Site Management continues in perpetuity or until released from this obligation in writing by NYSDEC. The SMP is intended to provide a detailed description of the procedures required to manage residual contamination left in place onsite and offsite following completion of the RA in accordance with the BCP and with the NYSDEC. A detailed description of the SMP is presented later in Section 9.2.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP. Any and all deviations from the RAWP will be promptly reported to NYSDEC for approval and fully explained in the FER.

### 3.3.8 Remedial Action Target

The target of the Remedial Action for the Site is achievement of groundwater cleanup standards and/or guidance values, taking into consideration the background concentrations documented in the groundwater flowing from the most proximate upgradient wells or reduction of groundwater VOC concentrations to an asymptotic level acceptable to NYSDEC.

# 4.0 REMEDIAL ACTION PROGRAM

## 4.1 Governing Documents

Several governing documents were developed in order to ensure safe and efficient performance of required remedial activities. The documents developed and/or utilized during remedial investigation activities, IRM activities, and monitoring activities or those that will be utilized during implementation of the RAWP and subsequent Site monitoring are summarized below.

### 4.1.1 Site-Specific Health & Safety Plan (HASP)

All remedial work performed under this plan will be in full compliance with governmental requirements, including Site and worker safety requirements mandated by Federal OSHA.

The Participant and associated parties preparing the remedial documents submitted to the State and those performing the construction work, are completely responsible for the preparation of an appropriate Health and Safety Plan (HASP) and for the implementation of that work according to that plan and applicable laws. As such, LBG has prepared a Site-specific HASP for the environmental investigation and remediation activities performed in association with the former MRC Site, which is presented in Appendix XI. The HASP and requirements defined in this RAWP pertain to all remedial and invasive work performed at the Site until the issuance of a Certificate of Completion.

The Site Safety Coordinator will be Mrs. Mel Sheperd. A resume will be provided to NYSDEC prior to the start of remedial construction.

There is no confined space entry proposed for the remediation activities. However, if unanticipated confined space entry should be required, it will comply with all OSHA requirements to address the potential risk posed by combustible and toxic gasses.

### 4.1.2 Quality Assurance Project Plan (QAPP)

The QAPP provides a framework for how environmental data will be collected to achieve specific project objectives, and describes the procedures that will be implemented to obtain data of known and adequate quality. This document includes proposed sampling methods and analytical methods for end-point sampling. The Site-specific QAPP is included in Appendix XII.

### 4.1.3 Construction Quality Assurance Plan (CQAP)

During the performance of all Remedial Action (RA) construction activities, QA/QC methodologies will be applied in the field and in the lab to ensure quality. These methodologies will consist of performing required activities to industry standards. All personnel will have had the proper training and experience necessary to fulfill project-specific responsibilities. Project coordination meetings will occur between the Participant and its representatives, remedial or environmental subcontractors, and other involved parties prior to each major phase of the RA activities.

#### 4.1.3.1 Responsibilities and Authority Organization

LBG will act as the Remedial Engineer (representative for Participant) and will be responsible for all sampling, hydrogeologic, health and safety, reporting and oversight aspects of the RA activities. LBG will utilize several contractors for the completion of the RA activities, among them an environmental laboratory, an environmental services company and an environmental drilling company. An organization chart is included in table 3.

The Remedial Engineer will be responsible for review and finalization of the RAWP, as well as ensuring that RAWP activities are carried out as outlined in the work plan.

#### 4.1.3.2 Qualifications of the Quality Assurance Personnel

All personnel certifying any aspect of the project will have the appropriate required certification(s). All personnel working on the Site as part of the RA activities will have at a minimum a 40-hour OSHA HAZWOPER certification. This certification will be validated with annual 8-hour refresher courses. Additionally, all personnel will be subject to their specific company medical monitoring program (i.e., annual physical).

#### 4.1.3.3 Monitoring Testing and Frequency

Onsite monitoring will be performed in accordance with the NYSDEC generic Community Air Monitoring Plan. The NYSDEC generic Community Air Monitoring Plan includes real-time air monitoring for VOCs and/or particulates. Details of the CAMP is presented in Section 5.4.12 and included in the HASP (Appendix XI).

#### 4.1.3.4 Sampling Activities

Pre and post - ISCO injection groundwater samples will be collected to monitor the effectiveness of the sodium permanganate treatment. Groundwater samples will be collected a minimum of one week prior to the injection activities and then 60 days, 90 days and then quarterly for the first year following the last injection. If sampling results of the first annual sampling round do not the meet the remedial objectives, groundwater monitoring may continue on a semi-annual basis until the remedial objectives are met or the NYSDEC indicates sampling is no longer required.

#### 4.1.3.5 Requirements for Project Coordination Meetings

The Participant representatives will schedule project coordination meetings between Praxair, remedial or environmental subcontractors, and other involved parties. These coordination meetings will, at a minimum, consist of a conference call between all parties involved outlining upcoming remedial activities. Additionally, there will be a health and safety meeting prior to the commencement of the remedial activities.

#### 4.1.3.6 Reporting Requirements

This description is presented in Section 4.4.

#### 4.1.3.7 Final Documentation Retention

Copies of all final documentation (including reports, lab analysis, permits, etc.) will be retained by the Participant and made available for review upon request.

### 4.1.4 Soil/Materials Management Plan (SoMP)

The objective of the Soils/Materials Management Plan (SoMP) is to set guidelines for management of excavated material during any ground invasive activities performed at the Site. No soil source has been identified on the Site and no bulk soil removal is proposed. The SoMP will be utilized during all remedial action activities performed onsite as outlined in this RAWP, as well as for any future ground invasive work (if necessary) that is performed under the subsequent Site Management Plan.

During the RA activities additional onsite drilling will be performed. All excess soil cuttings generated at each location during the drilling activities will be containerized in individual labeled 55 gallon drums. One composite sample (for VOCs) will be collected for every 6.5 to 7 cubic yards of drummed soil (or at a frequency required by the disposal facility). Soil samples will be composited by placing equal portions of soil from 25 separate drums into pre-cleaned jars provided by the laboratory. If the soil cuttings are containerized in roll off containers instead, then one composite soil sample will be collected per roll off container. Sample jars will then be labeled and a chain-of-custody form will be prepared. The soil will be characterized and transported to an offsite permitted waste management facility for disposal.

Although there is no evidence to indicate that there are any buried drums or USTs underlying the Site, if any are encountered during drilling activities, they will be properly removed (in the case of drums) or closed per 6NYCRR Part 595 and/or Part 613 (in the case of tanks), and any associated waste will be characterized and properly disposed offsite. The soil/fill surrounding the buried drums or USTs will be considered as potentially contaminated and will be stockpiled and characterized. Post-excavation samples will be collected and analyzed from the sidewalls/bottom of any drum or tank excavation as per DER-10 Section 5.4.

This plan is not intended to serve as a design document for construction activities related to redevelopment activities. The SoMP for the Site is outlined in Section 5.4.

### 4.1.5 Stormwater Pollution Prevention Plan (SWPPP)

All necessary and appropriate actions will be taken to ensure that New York State Storm-Water Management Regulations (including physical methods to control and/or divert surface water flows and to limit the potential for erosion and migration of Site soils, via wind or water) are met. As such a Site-specific Storm Water Pollution Prevention Plan (SWPPP) was prepared and is included in Appendix XIII.

The erosion and sediment controls will be in conformance with requirements presented in the New York State Guidelines for Urban Erosion and Sediment Control. All soil cuttings will be stored in sealed containers or covered with plastic to avoid any contamination via wind or rain water.

### 4.1.6 Community Air Monitoring Plan (CAMP)

Environmental air monitoring and visual observation will be conducted during the remedial activities by LBG. The proposed program consists of two primary forms of environmental monitoring: particulates (dust) and volatile organic compounds. The purpose of the NYSDEC generic Community Air Monitoring (CAMP) is to ensure that the engineering controls designed to protect the community from fugitive releases are functioning properly and, should any such releases occur, ensure immediate notice thereof so that appropriate abatement actions may be implemented. The NYSDEC generic CAMP has been included in Section 5.4.12 and in the HASP (Appendix XI).

### 4.1.7 Contractors Site Operations Plan (SOP)

The Remediation Engineer will review all plans and submittals for this remedial project (including those listed above and contractor and sub-contractor document submittals) and confirms that they are in compliance with this RAWP. The Remediation Engineer is responsible to ensure that all later document submittals for this remedial project, including contractor and sub-contractor document submittals, are in compliance with this RAWP. All remedial documents will be submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work.

### 4.1.8 Community Participation Plan

All historical documents related to the environmental activities performed at the Site have been filed with the NYSDEC as well as a public document repository (Orangeburg Library). The document repository (Orangeburg Library) will be inspected prior to implementation of the RAWP to ensure/verify that they contain all of applicable project documents.

A certification of mailing will be sent by the Participant to the NYSDEC project manager following the distribution of all Fact Sheets and notices that includes: (1) certification that the Fact Sheets were mailed, (2) the date they were mailed; (3) a copy of the Fact Sheet, (4) a list of recipients (contact list); and (5) a statement that the repository was inspected on a specific date and that it contained all of applicable project documents.

No changes will be made to approve Fact Sheets authorized for release by NYSDEC without written consent of the NYSDEC. No other information, such as brochures and flyers, will be included with the Fact Sheet mailing.

The approved Community Participation Plan for this project is attached in Appendix XIV.

The document repository has been established at the following location and contains all applicable project documents:

Orangeburg Library
20 South Greenbush Road
Orangeburg, New York 10962
Telephone: (845) 359-2244
Hours of Operation:
Mon. thru Thur. - 10 a.m. to 9 p.m.
Fri and Sat. - 10 a.m. to 5 p.m.
Sat. - 10 a.m. to 3 p.m.
Sun. – 1 p.m. to 5 p.m.

In addition to the above-listed public document repository location, all files and/or reports associated with the environmental activities at the Site are maintained and available for review at the NYSDEC Central Office. The information for this office is:

NYSDEC Central Office

625 Broadway
Albany, NY 12233
(518) 402-9662 (call in advance for appointment)
Hours: Mon. to Fri. 9 a.m. to 5 p.m.

## 4.2 General Remedial Construction Information

### 4.2.1 Project Organization

LBG will act as the remedial contractor (representative for Participant) and will be responsible for all sampling, hydrogeologic, health and safety, reporting and oversight aspects of the RA activities. An organization chart is included in table 3.

Key LBG project personnel are listed below along with brief descriptions of their experience and anticipated project responsibilities.

Resumes of key personnel involved in the Remedial Action are included in Appendix XV.

***Michael Manolakas, Senior Vice President and Principal-in-Charge***

Mr. Manolakas is one of the managing directors of LBG and has been with the firm since 1994. Mr. Manolakas has over 20 years of experience with groundwater supply and contamination projects (including New York projects) in the U. S. He currently manages sites undergoing investigations and remediation as part of the RCRA Corrective Action Hazardous Waste Cleanup Program, Connecticut Property Transfer and Consent Order Programs.

As Principal-in-Charge, Mr. Manolakas' responsibilities would include contract execution and overall quality assurance and quality control. He will be briefed regularly by the Project Manager and will review all final work products.

### ***Mark Goldberg, P.E., Engineer - Remedial Engineer***

Mr. Goldberg is a Senior Environmental Engineer of LBG Engineering Services has over 20 years of environmental engineering experience. Mr. Goldberg’s engineering experience includes but is not limited to: remediation system selection and design, operation and maintenance of remedial systems , site inspections, environmental site investigation, remedial investigations, feasibility studies, development of Spill Prevention, Control and Countermeasures Plans, Stormwater Pollution Prevention Plans, Emergency Response Plans and Community Participation Plans.

As Remedial Engineer, Mr. Goldberg will fulfill the project obligations as outlined in Section 4.2.2. Mr. Goldberg will work with LBG personnel and collaborate directly with the Principal-in-Charge as well as the Project Manager.

### ***Karen Destefanis, Associate - Project Manager***

Ms. Destefanis has been with LBG since 1987 and has been an Associate with the company since 2000. Ms. Destefanis has worked on many contaminated site remediation projects in Connecticut and New York for both public and private entities. Additionally, Ms. Destefanis has experience with completing investigations of sites regulated by CERCLA, RCRA and Connecticut Remediation Regulations.

As Project Manager, Ms. Destefanis would be the primary contact for the project and would be responsible for coordinating and conducting all tasks necessary to complete the required scope of work. Ms. Destefanis will coordinate the work of sub-contractors involved in all aspects of the proposed RAWP and would report directly to the Principal-in-Charge and the Remedial Engineer.

The Project Manager will be responsible for all appropriate communication with NYSDEC and NYSDOH.

***Melanie Sheperd, Senior Hydrogeologist - Health and Safety Officer***

Mrs. Sheperd has been with LBG since 2006 and has been a Senior Hydrogeologist with the company since 2008. Mrs. Sheperd's hydrogeologic experience includes but is not limited to: collection of soil and groundwater samples; drilling supervision; developing and testing recovery wells; monitoring well design; supervision of hazardous soil and liquid removals; UST closures; and air monitoring.

As Health and Safety Officer/Sampling Technician, Mrs. Sheperd would be responsible for implementation, enforcement and monitoring of the Health and Safety Plan. The Health and Safety Officer/Sampling Technician would also be responsible for the pre-Remedial Action indoctrination and periodic training of all personnel entering and/or working at the Site with regard to the HASP. Mrs. Sheperd would assist the Program Geologist as well as work with all associated sub-contractors and would report directly to the Project Manager.

***Lucas Williamson, Hydrogeologist - Program Geologist***

Mr. Williamson, a Hydrogeologist, has been with LBG since 2012. Mr. Williamson's hydrogeologic experience includes but is not limited to: collection of soil and groundwater samples; drilling supervision and formation sampling during the installation of groundwater monitor and recovery wells; UST closures, development and test pumping of recovery wells, supervision of hazardous soils/liquids removal; and air monitoring.

As Program Geologists, Mr. Williamson would be responsible for soil boring/monitoring well installation oversight, well development, ISCO treatment oversight, soil sampling, groundwater sampling, additional sampling should it become necessary and oversight of all Remedial Action activities. Mr. Williamson would work with all associated sub-contractors and would report directly to the Project Manager.

### 4.2.2 Remedial Engineer

The Remedial Engineer for this project will be Mr. Mark Goldberg. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the remedial program for the former MRC Site (NYSDEC Site No. C344070). The Remedial Engineer will certify in the FER that the remedial activities were observed by qualified environmental professionals under his supervision and that the remediation requirements set forth in the RAWP and any other relevant provisions of ECL 27-1419 have been achieved in full conformance with that Plan. Other Remedial Engineer certification requirements are listed later in this RAWP.

The Remedial Engineer will coordinate the work of other contractors and subcontractors involved in all aspects of remedial construction, including soil excavation, stockpiling, characterization, removal and disposal, air monitoring, emergency spill response services, import of back fill material (if required), and management of waste transport and disposal. The Remedial Engineer will be responsible for all appropriate communication with NYSDEC and NYSDOH.

The Remedial Engineer will review all pre-remedial plans submitted by contractors for compliance with this RAWP and will certify compliance in the FER.

The Remedial Engineer will provide the certifications listed in Section 10.1 in the FER.

### 4.2.3 Remedial Action Construction Schedule

A schedule for performance of the remedial work is presented in Section 11.0. This schedule is broken down into Remedial Action elements.

### 4.2.4 Work Hours

The hours for operation of remedial action will conform to the Orangetown Department of Buildings construction code requirements or according to specific variances issued by that agency. The anticipated work hours for activities outlined in this RAWP will be from approximately 7:00 AM until 5:00 PM. NYSDEC will be notified by the Participant of any variances issued by the Department of Buildings. NYSDEC reserves the right to deny alternate remedial action hours.

### 4.2.5 Site Security

All remedial action activities will be performed in accordance with the Site-specific HASP, which is presented in Appendix XI. During all remedial activities, access onsite and offsite will be limited and all persons entering the Remedial Action area of the Site will be required to sign a log book and meet all applicable health and safety requirements. All soil borings or other excavations (excavation activities not anticipated, but if required) will be secured during non-working hours. The sodium permanganate and its associated mixing tanks will be secured in the subcontractor’s locked vehicle each night. The vehicle will be located in a secure area on the Site.

Adequate danger signs, barriers, etc., will be placed to effectively warn the public of hazards as well as to restrict access to dangerous areas. Necessary barricades, walkways, lighting, and posting will be provided for the protection of the public prior to the start of remedial action activities. Drilling or ISCO operations on or near state, county, or city streets, access ways, or other locations where there is extensive interface with the public and/or motorized equipment will not start until the area surrounding the work zone has been made safe for the public. Additionally, the onsite Health and Safety Officer will monitor operations during the remedial activities to ensure that applicable protective measures are in place and functioning.

### 4.2.6 Traffic Control

The basic objective of traffic control is to permit the contractor to work within the public right of way efficiently and effectively while maintaining a safe, uniform flow of traffic. The construction work and the public traveling through the work zone in vehicles, bicycles or as pedestrians must be given equal consideration when developing a traffic control plan. All proposed work will be restricted to the Site. However, if there is a need for road traffic to be diverted and/or stopped to accommodate RA activities, a flagger will be used. The flaggers will wear hard hats and high-visibility day-glow vests. When/if working at dusk, the vest will have light-reflective strips. The Health and Safety Officer will assign the traffic control personnel.

All construction vehicles will be equipped with backing alarms and *Slow Moving Vehicle* signs when appropriate. All operators must be qualified and trained to operate the equipment they are using. If a vehicle will be parked alongside the road, orange safety cones will be placed around it to alert drivers.

Offsite transport vehicles will be inspected prior to exiting the Site to ensure they meet the requirements established for offsite waste transport. They will be inspected at the work area for caked on soils or debris, and for transport integrity (i.e. leaking trailer bed, appropriately covered). At this location, corrective measure will be taken prior to leaving the Site.

### 4.2.7 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during onsite drilling activities, sampling will be performed on product, groundwater and surrounding soils. Chemical analytical work will initially be for halogenated VOCs. The list of analysis may be expanded, based on the initial sample results. Analyses will not be otherwise limited without NYSDEC approval. Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. These findings will be also included in daily and periodic electronic media reports.

### 4.2.8 Worker Training and Monitoring

All personnel working on the Site as part of the Remedial Action activities will have at a minimum a 40-hour OSHA HAZWOPER certification. This certification will be validated with annual 8-hour refresher courses. Additionally, all personnel will be subject to their specific company medical monitoring program (i.e., annual physical).

### 4.2.9 Agency Approvals

The Participant has addressed all SEQRA requirements for this Site. All permits or government approvals required for remedial construction have been, or will be, obtained prior to the start of remedial construction.

The planned end use for the Site is in conformance with the current zoning for the property as determined by Orangetown Department of Planning. A Certificate of Completion will not be issued for the project unless conformance with zoning designation is demonstrated.

The need for the following permits, certificates or other approvals or authorizations are anticipated to perform the remedial and development work:

- Orangetown Industrial Wastewater Permit
- RCDH Resource Evaluation well drilling permit

If any additional permits are deemed necessary, they will be obtained by the Participant's consultant.

### 4.2.10 NYSDEC BCP Signage

A project sign will be erected at the main entrance to the Site prior to the start of any remedial activities. The sign will indicate that the project is being performed under the New York

State Brownfield Cleanup Program. The sign will meet the detailed specifications provided by the NYSDEC Project Manager.

### 4.2.11 Pre-Construction Meeting with NYSDEC

There are no construction activities proposed for the RA, with the exception of the drilling and installation of additional wells throughout the Site. In lieu of a pre-construction meeting, the Participant's representative will, at a minimum, notify the NYSDEC of upcoming activities via telephone communication.

### 4.2.12 Emergency Contact Information

An emergency contact sheet with names and phone numbers is included in table 4. That document defines the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency.

### 4.2.13 Remedial Action Costs

The total estimated cost of the Remedial Action is $627,300 - $ 651,300. An itemized and detailed summary of estimated costs for completing Alternative 4 activities as well as a cost estimate for monitoring is included in Appendix VIII.

## 4.3 Site Preparation

### 4.3.1 Mobilization

Mobilization for RA activities will be performed on a daily basis. Machinery including the drilling rig, vacuum trucks, support trucks will be stored on the former MRC Site. If this is not possible, then required machinery will be mobilized to the Site daily. No remedial equipment, materials, or temporary structures shall be placed on the streets without proper local permits.

### 4.3.2 Erosion and Sedimentation Controls

No soil excavation is proposed as part of the RAWP, therefore, large areas of exposed soil requiring traditional erosion and sedimentation controls is not anticipated. Sedimentation controls will be employed during drilling activities which will be located in areas exposed to the elements. Soil cuttings generated by the drill rig will be maintained around the immediate vicinity of the borehole and soil cuttings will be containerized continuously throughout the drilling activities to prevent sediments from flowing/mobilizing across the pavement. If the duration of the drilling activity at the individual borehole will be longer than a single day, then the area will be cleaned and any residual soil cuttings will be containerized. Catch basin mats for nearby storm-water catch basins will be employed during the ISCO injection/extraction activities and is explained further in Section 4.3.8.

### 4.3.3 Stabilized Construction Entrance(s)

Continuity will be established between the arrival path, the dedicated truck wash area (if necessary) and the egress path so that trucks do not impede/restrict the activities of the active facility and do not spread contaminated material when departing the Site.

### 4.3.4 Utility Marker and Easements Layout

The Participant and its contractors will be solely responsible for the identification of utilities that might be affected by work under the RAWP and implementation of all required, appropriate, or necessary health and safety measures during performance of work under this RAWP. The Participant and its contractors will be solely responsible for safe execution of all invasive and other work performed under this RAWP. The Participant and its contractors will obtain any local, State or Federal permits or approvals pertinent to such work that may be required to perform work under this RAWP. Approval of this RAWP by NYSDEC does not constitute satisfaction of these requirements.

The presence of utilities and easements on the Site has been investigated by the Remedial Engineer. It has been determined that no risk or impediment to the planned work under this RAWP is posed by utilities or easements on the Site. In addition, prior to any drilling activities an underground utility survey will be performed to confirm that no underground structures are present.

### 4.3.5 Sheeting and Shoring

Soil excavation is not proposed as part of the RA activities. As a result, sheeting and shoring do not pertain to the RAWP. However, if required, any necessary local, State or Federal permits will be obtained prior to any sheeting and/or shoring activities. Additionally, all necessary health and safety measures will be implemented during the performance of work under the approved Plan.

### 4.3.6 Equipment and Material Staging

Because of the Site size limitations, all efforts will be made to have waste material generated during drilling and well development characterized and removed from the Site prior to remediation activities. Drill cuttings and well development water will be containerized in 55 gallons drums and stored in a secure area located on the former MRC Site until they can be properly disposed offsite. If extracted groundwater during the ISCO activities cannot be discharged into the Town's sanitary sewer system, then the water will be stored in a frac tank(s) stored onsite until the groundwater can be properly disposed. Required machinery will be stored on the former MRC Site at a designated location. With the exception of the temporary frac tanks, if equipment storage becomes problematic then it will be mobilized to the Site daily.

### 4.3.7 Decontamination Area

To facilitate working in the containment area while ensuring the safety for workers and the public, the Site will be divided into three (3) delineated areas:

- *The "Work Zone"*

  Passage into the area where drilling or ISCO activities are conducted (the "work zone") will be strictly limited to those individuals performing the activities, and the tools and equipment necessary to complete the tasks. Dust suppression will be implemented as needed to limit fugitive dust emissions. Utilizing hoses during drilling activities, dust generation will be controlled and prevented with a water spray, and any accumulated dust shall be washed off of individuals, tools and equipment. The water spraying dust suppression during the drilling activities is a conservative approach to mitigate the migration of particulates offsite. The ISCO remediation involves the mixing of liquid sodium permanganate with water, therefore, no dust will be generated during the ISCO treatment. As outlined in the HASP and CAMP (Appendix XI), continuous monitoring for VOCs will be performed during the drilling, ISCO and groundwater sampling activities.

Worker level of protection will be based on VOC levels (as measured by a PID) above background and is outlined in the HASP.

- *The "Contamination Reduction Zone"(CRZ)*

  To prevent the spread of gross contamination, equipment in contact with gross contamination will be decontaminated after use. During remediation, soil and liquids adhered to vehicles and equipment will be removed in the CRZ prior to such vehicles and equipment leaving the zone. Drill cuttings on augers or sampling equipment will be containerized in 55 gallon drums. Any residual soil on the augers or sampling equipment will be washed in a portable trough with potable water. Soil cuttings and decontamination liquids generated by the decontamination process will be containerized and tested prior to offsite disposal. Any disposable personal protection equipment will also be containerized and properly disposed.

- *The "Clear Zone"*

  All remaining areas of the Site not included in the "work zone" or the "CRZ", shall be free for movement and activity, and not subject to this procedural plan.

### 4.3.8 Site Fencing & Spill Mat

There are no excavation activities proposed as part of the site remediation. However, if required, temporary silt fencing will be installed and maintained until such time that they are no longer required for remedial action activities. If required, silt fences will be provided and installed in accordance with the New York Guidelines for Urban Erosion and Sediment Control and they will be cleaned to maintain desired removal performance and prevent structural failure of the fence. Removed sediment will be stockpiled and characterized prior to offsite disposal.

Overland runoff over the southern and western half of the Site where the RA activities will occur is directed to onsite and offsite storm water catch basins. Runoff in the vicinity of the loading docks would flow into the storm-water catch basin located off the southeast corner of the building and into the town storm-water system along Glenshaw Street and Route 303 or into a storm-water catch basin located on Glenshaw Street approximately 80 feet south of the south-central side of the building. In addition, there is a small drainage swale located west of the building. This swale is located beyond the property boundary and contains natural vegetation with trees and underbrush and empties into a natural depression adjacent to the railroad right-of-way. There is a storm-water catch basin east of the swale that diverts storm water to the drainage swale. During the proposed RA sodium permanganate injection activities a spill mat will be placed over any storm-water catch basins in the immediate vicinity of the injection activities.

#### 4.3.9 Demobilization

Following the completion of the RA activities, all disturbed areas at the Site associated with the RAWP (including remediation areas as well as support areas [e.g., staging areas, CRZ, storage areas, temporary water management area(s), and access areas]) will be restored to pre-remediation conditions. Additionally, temporary access areas will be restored to pre-remediation conditions. All general refuse, as well as materials associated with sediment and erosion control measures utilized at the Site (if applicable), will be disposed of in accordance with applicable rules and regulations. Any decontamination waste generated at the Site will be sampled and submitted to a NYSDOH certified laboratory for waste characterization and will be transported offsite to a permitted waste management facility for disposal.

### 4.4 Reporting

Pertinent details from the daily and monthly reports will be included in the Final Engineering Report.

#### 4.4.1 Daily Reports

Daily Field Sheets will be maintained by onsite field personnel and will outline remedial activities performed for each day. These Daily Field Sheets will be submitted to NYSDEC and NYSDOH Project Managers (via e-mail) by the end of each work week following the reporting period and will include:

- An update of progress made during each reporting day;
- Locations of work and quantities of material imported and exported from the Site;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP findings;
- An explanation of notable Site conditions.

Daily reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill), requests for changes to the RAWP or other sensitive or time critical information. However, such conditions must also be included in the daily reports. Emergency conditions and changes to the RAWP will be addressed directly to the NYSDEC Project Manager via personal communication.

Daily Reports will include a description of daily activities, keyed to an alpha-numeric map for the Site that identifies work areas. These reports will include a summary of air sampling results, odor and dust problems and corrective actions, and all complaints received from the public.

A Site map that shows a predefined alpha-numeric grid for use in identifying locations described in reports submitted to NYSDEC is attached in figure 7.

The NYSDEC assigned project number (C344070) will appear on all reports.

### 4.4.2 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers within one week following the end of the month of the reporting period and will include:

- Activities relative to the Site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (i.e., number of injection/extraction wells completed, amount of permanganate injected, etc.);
- Description of approved activity modifications, including changes of work scope and/or schedule;
- Sampling results received following internal data review and validation, as applicable; and
- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays.

### 4.4.3 Other Reporting

Photographs will be taken during the remedial activities. Photos will illustrate remedial program elements and will be of acceptable quality. Representative photos of the Site prior to any RA activities will be provided. Representative photos will be provided of each contaminant source, source area and Site structures before, during and after remediation. Photos will be submitted to NYSDEC on CD or other acceptable electronic media and will be sent to NYSDEC's Project Manager (2 copies) and to NYSDOH's Project Manager (1 copy). CD's will have a label and a general file inventory structure that separates photos into directories and sub-directories according to logical Remedial Action components. A photo log keyed to photo file ID numbers will be prepared to provide explanation for all representative photos.

Job-site record keeping for all remedial work will be appropriately documented. Upon request, these records will be available for inspection by NYSDEC and NYSDOH staff.

### 4.4.4 Complaint Management Plan

Complaints from the public regarding nuisance or other site conditions will be handled on an individual basis. Once a complaint is filed with regards to site RA activities, the NYSDEC will be notified and all required steps will be taken to rectify the cause of the complaint.

### 4.4.5 Deviations from the Remedial Action Work Plan

Once initiated, should Site conditions require deviation from the approved RAWP, the NYSDEC will be notified in writing once the necessity is evident. A request for a change to the RAWP will be submitted the NYSDEC. The written request will outline the effect of the deviations on overall remedy. Upon approval for changes/editions to the RAWP from the NYSDEC, the modifications will be implemented.

## 5.0 REMEDIAL ACTION: MATERIAL REMOVAL FROM SITE

The material that is anticipated to be removed from the Site as part of the remedial action includes, but is not limited to, any soils excavated in association with drilling or other ground invasive activities. Soil generated as the result of drilling activities will be either stored in 55-gallon steel drums and/or in a lined and covered roll-off container pending waste characterization and offsite disposal. The RAWP addresses groundwater remediation through ISCO treatment. As discussed in Sections 3.3.2. and 3.3.5., the western portion of the property will be treated *in-situ* with sodium permanganate. Proposed injection/extraction well locations are shown on figure 5.

The FER will include a survey of the exact locations of all wells associated with the RAWP.

## 5.1 Soil Clean-up Objectives

With the exception of one isolated soil sample collected from under the building, no other exceedences were documented in any of the soils collected from under the Site. As a result, no soil source area has been identified. If, during the course of the RAWP a soil source is discovered, then the Soil Cleanup Objectives for this Site will be the Track 2 Restricted Use Soil Cleanup Objectives for Restricted Commercial Use listed in table 1.

Soil and materials management onsite and offsite will be conducted in accordance with the Soil Management Plan as described below. With the exception of drill cuttings generated during the well installation activities, no soil excavation is proposed.

Although not anticipated, any UST closures will, at a minimum, conform to criteria defined in DER-10.

## 5.2 Remedial Performance Evaluation (Post Excavation End-Point Sampling)

No soil excavation is proposed as part of the Remedial Action. Therefore, post-excavation end-point sampling will not be necessary. All drill cuttings generated during the drilling activities will be containerized and then characterized for proper offsite disposal.

To monitor the effectiveness of the ISCO remediation, background groundwater samples will be collected prior to the injection/extraction activities. Post-injection groundwater samples will be collected 60- and 90-days following the last injection treatment. Quarterly groundwater samples will be collected thereafter.

## 5.3 Estimated Material Removal Quantities

No soil excavation is proposed as part of the Remedial Action. Therefore, no Site soil/fill removal or backfill is proposed.

## 5.4 Soil/Materials Management Plan

All intrusive work associated with the RAWP, as well as any future intrusive work that will disturb residual contamination, will be performed in accordance with the Soil Management Plan (SoMP), which is detailed in Section 4.1.4. Additionally, activities will be conducted in accordance with the procedures defined in the Health and Safety Plan (HASP) and Community

Air Monitoring Plan (CAMP) prepared for the Site. The HASP and CAMP are presented in Appendix XI.

### 5.4.1 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment will be performed by a qualified environmental professional during all remedial and development excavations into known or potentially contaminated material (Residual Contamination Zone). Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during the remedy and during development phase, such as excavations for foundations and utility work, prior to issuance of the COC.

If any primary contaminant sources (including but not limited to tanks and hotspots) are identified during the Remedial Action they will be surveyed by a surveyor licensed to practice in the State of New York. This information will be provided on maps in the FER.

Screening will be performed by qualified environmental professionals. Resumes will be provided upon request for all personnel responsible for field screening (i.e. those representing the Remedial Engineer) of invasive work for unknown contaminant sources during remediation and development work.

### 5.4.2 Stockpile Methods

There is no excavation proposed as part of the Remedial Action. Any soil cuttings generated during drilling will be containerized and then characterized for proper offsite disposal. Although not anticipated, if soil stockpiling becomes necessary, then the stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced. Soil stockpiles will be continuously encircled with silt fences. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

### 5.4.3 Materials Excavation and Load Out

The Remediation Engineer or a qualified environmental professional under his/her supervision will oversee all drilling activities and ISCO injection/extraction work. Soil excavation is not proposed as part of the Remedial Action, therefore the excavation and load-out of all excavated material is not applicable.

The Applicant and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the Site has been investigated by the Remedial Engineer. It has been determined that no risk or impediment to the planned work under this RAWP is posed by utilities or easements on the Site. An underground utility survey will be conducted prior to the proposed well drilling activities, to confirm that there are no underground utilities or buried structures at proposed drilling locations in the Remedial Action area. If encountered, proposed well locations will be adjusted accordingly.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck wash will not be required for the proposed Remedial Action.

Development-related grading cuts and fills will not be performed without NYSDEC approval and will not interfere with, or otherwise impair or compromise, the performance of remediation required by this plan.

Mechanical processing of historical fill and contaminated soil onsite is prohibited.

If identified during the Remedial Action, all primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, Remedial Investigation, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. The survey information will be shown on maps to be reported in the FER.

### 5.4.4 Materials Transport Offsite

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

The approved truck transport routes which will be utilized during the implementation of the RAWP are presented on figure 8. Truck transport routes will access the Site from Glenshaw Street, via Route 303. All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes. The New York State Thruway (Interstate 287) and Route 303 are the primary access to the Site. These routes take into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting offsite queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. In addition to requiring all trucks to utilize approved truck transport routes, all trucks will be prohibited from stopping and idling in residential neighborhood areas in the vicinity of the project Site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used. Based on the proposed remedy, limited truck transportation is expected during the Remedial Action.

### 5.4.5 Materials Disposal Offsite

All soil/fill/solid waste generated during drilling activities will be removed from the Site. The soils will be characterized prior to disposing to an offsite facility. Waste disposal from soil cuttings generated during previous drilling activities were characterized as non-hazardous waste. Waste disposal will be conducted in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. Based on historic waste characterization, disposal of soil/fill from this Site is proposed for non-hazardous solid debris, non RCRA, non-DOT waste. If required, a formal request with an associated plan will be made to NYSDEC's Project Manager. Unregulated offsite management of materials from this Site is prohibited without formal NYSDEC approval.

Material that does not meet Track 1 unrestricted SCOs will be prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

Non-hazardous historic fill and contaminated soils taken offsite will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Historical fill and contaminated soils from the Site are prohibited from being disposed at Part 360-16 Registration Facilities (also known as Soil Recycling Facilities).

Soils that are contaminated but non-hazardous and are being removed from the Site are considered by the Division of Solid & Hazardous Materials (DSHM) in NYSDEC to be Construction and Demolition (C/D) materials with contamination not typical of virgin soils. These soils may be sent to a permitted Part 360 landfill. They may be sent to a permitted C/D processing facility without permit modifications only upon prior notification of NYSDEC Region 2 DSHM. This material is prohibited from being sent or redirected to a Part 360-16 Registration Facility. In this case, as dictated by DSHM, special procedures will include, at a minimum, a letter to the C/D facility that provides a detailed explanation that the material is derived from a DER remediation Site, that the soil material is contaminated and that it must not be redirected to onsite or offsite Soil Recycling Facilities. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported.

The FER will include an accounting of the destination of all material removed from the Site during this Remedial Action, including excavated soil, contaminated soil, historic fill, solid waste, and hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. This information will also be presented in a tabular form in the FER.

Bill of Lading system or equivalent will be used for offsite movement of non-hazardous wastes and contaminated soils. This information will be reported in the FER.

Although not anticipated, hazardous wastes derived from onsite will be stored, transported, and disposed of in full compliance with applicable local, State, and Federal regulations. Appropriately licensed haulers will be used for material removed from this Site and will be in full compliance with all applicable local, State and Federal regulations.

Waste characterization will be performed for offsite disposal in a manner suitable to the receiving facility and in conformance with applicable permits. Sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the FER. All data available for soil/material to be disposed at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt.

### 5.4.6 Materials Reuse Onsite

No Site material will be reused for backfill.

### 5.4.7 Fluids Management

All liquids to be removed from the Site, including extracted groundwater, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. If permitted by the Town, liquids may be discharged into the Orangetown sewer system.

Dewatered fluids will not be recharged back to the land surface or subsurface of the Site. Purge water generated during well development and groundwater sampling events will be managed offsite.

Discharge of water generated during remedial construction to surface waters (i.e., a local pond, stream or river) is prohibited without a SPDES permit.

### 5.4.8 Demarcation

No soil excavation activities are proposed for the Remedial Action. All injection and extraction wells constructed on the Site will be surveyed by a New York State licensed surveyor. The survey will define the top elevation of the monitor well and ground surface at the well head.

A map showing the survey results will be included in the Final Remediation Report and the Site Management Plan.

### 5.4.9 Backfill from Offsite Sources

There is no backfilling proposed as part of the Remedial Action. The annular space for all proposed wells will be filled with clean gravel, bentonite and a bentonite-cement slurry grout in conformance with RCDH requirements. All surface completion of the proposed wells will be flush-mounted curb boxes set in concrete.

### 5.4.10 Stormwater Pollution Prevention

A SWPPP that conforms to the requirements of NYSDEC Division of Water guidelines and NYS regulations is presented in Appendix XIII. The purpose of the SWPPP is to ensure that appropriate steps are taken to keep storm water from being adversely impacted by pollutants or sediment and creating further problems downstream. As such the SWPPP for the Site:

1. identifies the possible sources of pollutants, including sediment, on the Site;
2. describes how stormwater could transport these materials;
3. describes the control measures taken to keep these materials out of stormwater;
4. sets up a procedure for monitoring the effectiveness of the control measures; and,
5. specifies what steps are to be taken in case of a spill [or if other problems are discovered].

Barriers and hay bale checks will be installed, if necessary (they are not anticipated), and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the RAWP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

As specified in the SWPPP, a spill mat will be placed over the stormwater drain located next to the drainage swale (approximately 35 feet west of the property edge) if it is topographically lower than the injection area during the injection activities. In addition, prior to the injection activities, a sodium permanganate-compatible boom will be placed downslope of the injection well to prevent overland flow of any potential release during the transfer from the mixing tote to the injection well. Throughout the injection activities, there will be a 4,000 gallon vacuum truck on Site that can be used for an Emergency Response to capture any overflow or spill. In addition, sodium thiosulfate will be onsite to neutralize any significant release, if needed.

### 5.4.11 Contingency Plan

If USTs or other previously unidentified contaminant sources are found during onsite remedial activities, sampling will be performed on product, sediment and surrounding soils, etc. Chemical analytical work will be for VOCs, the chemicals of concern identified during previous investigations. Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. These findings will be also included in daily and periodic electronic media reports.

### 5.4.12 Community Air Monitoring Plan

Air monitoring will be performed during the following activities: ground invasive work; well development, groundwater sampling and during the ISCO groundwater extraction activities; and any other activities which may release VOCs into the atmosphere. The monitoring plan will be in accordance with the generic Community Air Monitoring Plan (CAMP), as outlined in Appendix 1A of the Final DER-10 Technical Guidance for Site Investigation and Remediation and included in the Site-specific HASP (Appendix XI).

The generic CAMP includes continuous monitoring for all ground intrusive activities (which would include the installation of soil borings or monitor wells) and periodic monitoring for VOCs during non-intrusive activities (collection of groundwater samples, ISCO injection/extraction activities). The specific VOC and particulate monitoring requirements, including:

- Monitoring frequency
- Response Levels; and
- Actions.

The location of sampling stations will vary based on wind direction and will be determined daily by the onsite supervisor (HSO, project manager, etc.). The location of sampling stations for each day's activities will be recorded in the Daily Report.

Exceedances observed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers and included in the Daily Report.

### 5.4.13 Odor, Dust and Nuisance Control Plan

Odor, dust and other nuisances will be maintained within acceptable levels to be protective of the health and safety of onsite workers and the community, and to minimize potential nuisance to the community.

The monitoring programs and action levels for odor, dust and other nuisances are established in the Site-Specific Health and Safety Plan (Appendix XI). The procedures below outline passive mitigation measures inherent in the design of the RAWP followed by steps to be taken should an action level be exceeded. In the event that an odor, dust or other nuisance action level is exceeded, it will likely be exceeded first in the work zone before being exceeded at the Site perimeter. Ongoing monitoring within the work zone and if necessary, immediate mitigation of potential impacts as action levels are approached will serve to prevent action levels being exceeded at the Site perimeter.

Community complaints will be handled in a manner similar to the exceedance of an action level, but will also include assessment of the root cause analysis of the complaint and adequacy of monitoring measures in addition to revising mitigation measures if appropriate. If a community complaint is received, the following will be documented under this procedure to address the steps taken to further mitigate the impacts identified, and the follow-up measures/monitoring to confirm that appropriate corrective action(s) have been implemented:

- time, date and person that identified an issue;
- the nature of the issue;
- the steps taken to assess the root cause of the issue;
- mitigation measures implemented; and
- follow-up measures or monitoring conducted to confirm the issue is resolved. The periodic assessments of the odor control system will be documented.

The FER will include the following certification by the Remedial Engineer: “I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology defined in the Remedial Action Work Plan.”

### 5.4.13.1 Odor Control Plan

This odor control plan consists of passive and active mitigation measures capable of controlling emissions of nuisance odors onsite and offsite. The following odor control methods may be used at the Site:

***Passive Mitigation Measures:***

- Soil cuttings generated during drilling will be immediately containerized to reduce the amount of odor generation associated with the total surface area and duration of exposure from stockpiled soils, and from the double-handling of waste.
- Open boreholes of uncompleted wells will be covered each night.
- Rolloffs will be covered with plastic polyethylene liner.
- The waste trucking route will be directed through the approved truck route (see Section 5.4.4) mitigating the potential for increased odor in the residential areas.
- Trucks transporting wastes offsite will be covered.

***Active Mitigation Measures:***

- The rate of work may be slowed or suspended in times of high odor release.
- Highly odoriferous processes may be limited to specific times of day, temperatures or wind conditions.
- If necessary, an odor control system utilizing a non-toxic, odor neutralizing solution, such as “airSolution” (Ecolo Odor Control Systems) or an odor controlling foam may be used at the Site.
- In the event that odor cannot be controlled within the work area and/or the community, remediation activities of odoriferous waste may be suspended during times when winds are blowing toward the residential areas, warm weather, and/or during times of day when there is generally a higher public presence outside (commuting times, lunch hour and after school).
- Where odor nuisances have developed during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided due to onsite conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering sodium permanganate, sodium permanganate handling equipment [and handling areas] under tented containment structures equipped with appropriate air venting/filtering systems.

If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Applicant's Remediation Engineer, who is responsible for certifying the FER.

### 5.4.13.2 Dust Control Plan

This dust control plan consists of passive and active mitigation measures capable of controlling emissions of dust during invasive onsite work. The following dust mitigation measures may be utilized at the Site:

***Passive Mitigation Measures:***

- Most of the soil cuttings generated during drilling activities will be moist to wet and have a low potential for dust generation.
- Soil cuttings will be containerized as they are generated during drilling activities, which will serve to reduce the wind generation of dust and the spread of dust.
- The transfer of the soil cuttings directly to containers will reduce the amount of dust generation associated with the double-handling of waste.
- Containers (55 gallon drums or rolloffs) will be covered at the end of each work day or when the container has been filled.

In the event that a dust action level is exceeded, the Contractor will identify the source of the elevated dust and take immediate steps to reduce dust to acceptable levels. The specific action taken will depend on the source of the elevated dust. Potential mitigation measures that the Contractor may use are presented below.

***Active Mitigation Measures:***

- Dust suppression will be achieved through the use of water misting (provided by onsite municipal water).
- Work may be suspended if conditions of high dust generation cannot be controlled.
- Vehicles will be decontaminated before departing the Site.

- Onsite roads will be limited in total area to minimize the area required for water spraying.

#### 5.4.13.3 Other Nuisances

Noise levels are expected to remain below the action level (85 dBA which is the maximum level of exposure for 8 hours in a 24 hour period) at the Site perimeter. In the event that a noise action level is exceeded, the Contractor will identify the source of the elevated noise and take immediate steps to reduce noise to acceptable levels. The specific action taken will depend on the source of the elevated noise and may include, for example, turning off all idling vehicles or removing a piece of equipment from service. All remedial work will conform, at a minimum, to the Orangetown noise control standards.

## 6.0 RESIDUAL CONTAMINATION TO REMAIN ONSITE

Because residual contaminated soil, groundwater and soil vapor will exist beneath the Site after the remedy is complete, Engineering and Institutional Controls (ECs and ICs) are required to protect human health and the environment. These ECs and ICs are described below. Long-term management of EC/ICs and of residual contamination will be executed under a Site specific Site Management Plan (SMP) that will be developed and included in the FER.

ECs will be implemented to protect public health and the environment by appropriately managing residual contamination. The Controlled Property (the Site) will have 3 primary EC systems. These are: (1) a composite cover system consisting of asphalt covered roads, concrete covered sidewalks, and concrete building slabs; (2) a sub-slab depressurization system; and (3) in-situ chemical oxidation.

ICs will also be implemented to protect public health and the environment by appropriately managing access to residual contamination associated with the Site. The Site will have 2 primary IC systems. These are: (1) recording of a Deed Restriction; and, (2) implementation of the Site Management Plan.

The FER will report residual contamination on the Site in tabular and map form. This will include presentation of exceedances of TAGM 4046 SCOs and background and NYS groundwater standards.

## 7.0 ENGINEERING CONTROLS: COMPOSITE COVER SYSTEM

### 7.1 Composite Cover System

Exposure to residual contaminated soils will be prevented by an engineered, composite cover system that exists at the Site. This composite cover system is comprised of asphalt covered roads and parking areas, concrete covered sidewalks, and concrete building slabs.

A map showing the aerial distribution of each of the cover types to be built (if required) at the Site will be included in the FER.

A Soil/Material Management Plan will be included in the Site Management Plan and will outline the procedures to be followed in the event that the composite cover system and underlying residual contamination are disturbed after the Remedial Action is complete. Maintenance of this composite cover system will be described in the Site Management Plan in the FER.

## 8.0 ENGINEERING CONTROLS: TREATMENT SYSTEMS

The Engineering Controls to be implemented in the remedy include: an existing composite cover system (described in Section 7), an existing sub-slab depressurization system; and in-situ chemical oxidation. The description of each EC is presented below.

### 8.1 Composite Cover System

The composite cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in perpetuity.

### 8.2 Sub-Slab Depressurization System

A SSDS was installed under the former MRC building in 2005, as described in Section 2.6, above. The SSDS acts as an EC to prevent soil vapor intrusion from the subsurface to the former MRC building.

#### 8.2.1 Criteria for Completion of Remediation/Termination of Remedial System

The active SSDS will not be discontinued without written approval by NYSDEC and NYSDOH. A proposal to discontinue the active SSDS may be submitted by the property owner based on confirmatory data that justify such request. Systems will remain in place and operational until permission to discontinue use is granted in writing by NYSDEC and NYSDOH.

### 8.2.2 General Operation and Maintenance

The general operation and maintenance of the SSDS will include periodic inspection of the mechanical equipment for wear and preventative maintenance. As prescribed in the NYS DOH final guidance document entitled "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" dated October 2006, routine maintenance will occur every 12 to 18 months. Routine maintenance will include:

- Visual inspection of the system,
- Identification and repair of leaks, and
- Inspection of the exhaust or discharge point to verify no air intakes have been located nearby.

## 8.3 In-Situ Chemical Oxidation

The ISCO approach will be performed at onsite locations. This EC works by eliminating dissolved-phase VOC contamination from migrating offsite. A detailed description of the ISCO application is provided in Section 3.3.

Volume and density application rates for sodium permanganate will be based on the manufacturer's recommendations. Calculation spreadsheets from the manufacturer stating recommended dosage rates is included in Appendix X and will be included in the FER.

The injection/extraction activities will commence following well construction, well development and groundwater baseline sampling. All sodium permanganate applications will be performed between March and December. Any potential sodium permanganate applications proposed between December through February will be contingent upon weather conditions.

All as-built drawings, diagrams, calculation and manufacturer documentation for treatment will be presented in the FER.

### 8.3.1 Criteria for Completion of Remediation/Termination of Remedial System

Groundwater monitoring activities to assess the in-situ chemical oxidation of dissolved-phase VOCs will continue until residual groundwater concentrations achieve groundwater cleanup standards/guidance values, taking into consideration the background concentrations documented in the groundwater flowing from the most proximate upgradient wells or have become asymptotic over an extended period. Monitoring will continue until permission to discontinue is granted in writing by NYSDEC and NYSDOH. Monitoring activities will be outlined in the Monitoring Plan of the SMP.

### 8.3.2 General Operation and Maintenance

The operation and maintenance of this EC consists of quarterly groundwater monitoring program, which will be employed to evaluate the effectiveness of the in-situ chemical oxidation. Additionally, if the first in-situ chemical oxidation round produces a significant reduction in dissolved-phase VOC concentrations but does not reach Site background or established NYSDEC groundwater quality standards, then additional targeted injections would be considered. The NYSDEC will be consulted and their approval will be received prior to any additional chemical oxidation applications and/or injection rounds.

## 9.0 INSTITUTIONAL CONTROLS

After the remedy is complete, it is anticipated that the Site will have residual contamination remaining in place. Institutional Controls (ICs) for the residual contamination have been incorporated into the remedy to render the overall Site remedy protective of public health and the environment. Two IC elements have been designed to ensure continual and proper management of residual contamination in perpetuity: an Environmental Easement and a Site Management Plan. A Site-specific Environmental Easement will be recorded with Rockland County to provide an enforceable means of ensuring the continual and proper management of residual contamination and protection of public health and the environment in perpetuity or until released in writing by NYSDEC. It requires that the grantor of the Environmental Easement and the grantor's successors and assigns adhere to all Engineering and Institutional Controls (ECs/ICs) placed on this Site by this NYSDEC-approved remedy. ICs provide restrictions on Site usage and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. The Site Management Plan (SMP) describes appropriate methods and procedures to ensure compliance with all ECs and ICs that are required by the Environmental Easement. Once the SMP has been approved by the NYSDEC, compliance with the SMP is required by the grantor of the Environmental Easement and grantor's successors and assigns.

## 9.1 Environmental Easement

An Environmental Easement, as defined in Article 71 Title 36 of the Environmental Conservation Law, is required when residual contamination is left onsite after the Remedial Action is complete. If the Site will have residual contamination after completion of all Remedial Actions then an Environmental Easement is required. As part of this remedy, an Environmental Easement approved by NYSDEC will be filed and recorded with the Rockland County Clerk. The Environmental Easement will be submitted as part of the FER.

The Environmental Easement renders the Site a Controlled Property. The Environmental Easement must be recorded with the Rockland County Clerk before the Certificate of Completion can be issued by NYSDEC. A series of Institutional Controls are required under this remedy to implement, maintain and monitor these Engineering Control systems, prevent future exposure to residual contamination by controlling disturbances of the subsurface soil and restricting the use of the Site to commercial or industrial uses only. These Institutional Controls are requirements or restrictions placed on the Site that are listed in, and required by, the Environmental Easement. Institutional Controls can, generally, be subdivided between controls that support Engineering Controls, and those that place general restrictions on Site usage or other requirements. Institutional Controls in both of these groups are closely integrated with the Site Management Plan, which provides all of the methods and procedures to be followed to comply with this remedy.

The Institutional Controls that support Engineering Controls for this Site are:

- Compliance with the Environmental Easement by the Grantee and the Grantee's successors and adherence of all elements of the SMP is required;
- All ECs must be operated and maintained as specified in the SMP;
- A composite cover system consisting of asphalt-covered roads, concrete covered sidewalks, and concrete building slabs must be inspected, certified and maintained as required in the SMP;
- An existing soil vapor mitigation system consisting of a sub-slab depressurization system under the ground floor of the building must be inspected, certified, operated and maintained as required by the SMP;
- All ECs on the Controlled Property must be inspected and certified at a frequency and in a manner defined in the SMP;
- Periodic groundwater and other environmental monitoring must be performed as defined in the SMP;
- Data and information pertinent to Site Management for the Controlled Property must be reported to the NYSDEC at the frequency and in a manner defined in the SMP;

- Onsite environmental monitoring devices, including but not limited to, groundwater monitor wells, must be protected and replaced as necessary to ensure proper functioning in the manner specified in the SMP;
- ECs may not be discontinued without an amendment or extinguishment of the Environmental Easement.

As noted, ICs may be modified, added or deleted from this list as warranted by Site conditions and deemed necessary by NYSDEC.

Adherence to these ICs for the Site is mandated by the Environmental Easement and will be implemented under the SMP (discussed in the next section). The Controlled Property (Site) will also have a series of ICs in the form of Site restrictions and requirements. The Site restrictions that apply to the Controlled Property are:

- Vegetable gardens and farming on the Controlled Property are prohibited;
- Use of groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for intended purpose;
- All future activities on the Controlled Property that will disturb residual contaminated material are prohibited unless they are conducted in accordance with the soil management provisions in the SMP;
- The Controlled Property may be used for restricted commercial or industrial use only, provided the long-term Engineering and Institutional Controls included in the Site Management Plan are employed;
- The Controlled Property may not be used for a higher level of use, such as restricted residential use without an amendment or extinguishment of this Environmental Easement; and,
- Grantor agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP.

NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow. This annual statement must be certified by an expert that the NYSDEC finds acceptable.

### 9.2 Site Management Plan

Site Management is the last phase of remediation and begins with the approval of the FER and issuance of the Certificate of Completion (COC) for the Remedial Action. The SMP is submitted as part of the FER but will be written in a manner that allows its removal and use as a complete and independent document. Site Management continues in perpetuity or until released in writing by NYSDEC. The property owner is responsible to ensure that all Site Management responsibilities defined in the Environmental Easement and the SMP are performed.

The SMP is intended to provide a detailed description of the procedures required to manage residual contamination left in place at the Site following completion of the Remedial Action in accordance with the BCA with the NYSDEC. This includes: (1) development, implementation, and management of all Engineering and Institutional Controls; (2) development and implementation of monitoring systems and a Monitoring Plan; (3) development of a plan to operate and maintain any treatment, collection, containment, or recovery systems (including, where appropriate, preparation of an Operation and Maintenance Manual), if applicable; (4) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC; and (5) defining criteria for termination of treatment system operation.

To address these needs, this SMP will include four plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of Site Monitoring; (3) an Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems, if applicable; and (4) a Site Management Reporting Plan for submittal of data, information, recommendations, and certifications to NYSDEC. The SMP will be prepared in accordance with the requirements in NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation, dated May, 2010, and the guidelines provided by NYSDEC.

Site management activities, reporting, and EC/IC certification will be scheduled on a certification period basis. The certification period will be annually. The SMP will be based on a calendar year and will be due for submission to NYSDEC by March 1 of the year following the reporting period.

The SMP will include a monitoring plan for groundwater at the down-gradient Site perimeter to evaluate Site-wide performance of the remedy. No exclusions for handling of residual contaminated soils will be provided in the SMP. All handling of residual contaminated material will be subject to provisions contained in the SMP.

## 10.0 FINAL ENGINEERING REPORT

A Final Engineering Report (FER) and Certificate of Completion (COC) will be submitted to NYSDEC following implementation of the Remedial Action defined in this RAWP. The FER provides the documentation that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The FER will provide a comprehensive account of the locations and characteristics of all material removed from the Site including the surveyed map(s) of all sources. The FER will include as-built drawings for all constructed elements, certifications, manifests, bills of lading as well as the complete Site Management Plan (formerly the Operation and Maintenance Plan). The FER will provide a description of the changes in the Remedial Action from the elements provided in the RAWP and associated design documents. The FER will provide a tabular summary of all performance evaluation sampling results and all material characterization results and other sampling and chemical analysis performed as part of the Remedial Action. The FER will provide test results demonstrating that all mitigation and remedial systems are functioning properly. The FER will be prepared in conformance with DER-10.

Where determined to be necessary by NYSDEC, a Financial Assurance Plan will be required to ensure the sufficiency of revenue to perform long-term operations, maintenance and monitoring tasks defined in the Site Management Plan and Environmental Easement. This determination will be made by NYSDEC in the context of the FER review.

The FER will include written and photographic documentation of all remedial work performed under this remedy.

The FER will provide a thorough summary of all residual contamination left on the Site after the remedy is complete. Residual contamination includes all contamination that exceeds the TAGM 4046 SCOs. A table that shows exceedances from TAGM 4046 SCOs for all soil/fill remaining at the Site after the Remedial Action and a map that shows the location and summarizes exceedances from TAGM 4046 SCOs for all soil/fill remaining at the Site after the Remedial Action will be included in the FER.

The FER will provide a thorough summary of all residual contamination that exceeds the SCOs defined for the Site in the RAWP and must provide an explanation for why the material was not removed as part of the Remedial Action. Currently the only soil exceedance documented under the Site has been an isolated sample from under the building slab floor. No other potential source area has been identified. A table that shows residual contamination in excess of Site SCOs and a map that shows residual contamination in excess of Site SCOs will be included in the FER.

The FER will include an accounting of the destination of all material removed from the Site, including excavated contaminated soil, historic fill, solid waste, hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material will also include records and approvals for receipt of the material. It will provide an accounting of the origin and chemical quality of all material imported onto the Site. As previously discussed, no excavation is proposed, therefore only soil cuttings generated during drilling activities will require disposal. In addition, groundwater generated during well development, groundwater sampling and extraction activities will require disposal.

As required, all project reports will be submitted in digital form on electronic media (PDF) before approval of a FER and issuance of a Certificate of Completion can be accepted.

### 10.1 Certifications

The following certification will appear in front of the Executive Summary of the Final Engineering Report. The certification will be signed by the Remedial Engineer [Mark Goldberg] who is a Professional Engineer registered in New York State. This certification will be appropriately signed and stamped. The certification will include the following statements:

I, Mark Goldberg, am currently a registered professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the former Materials Research Corporation Site (NYSDEC BCA Site No. C344070).

I certify that the Site description presented in this FER is identical to the Site descriptions presented in the Environmental Easement, the Site Management Plan, and the Brownfield Cleanup Agreement for the former Material Research Corporation and related amendments.

I certify that the Remedial Action Work Plan dated [month day year] and Stipulations [if any] in a letter dated [month day year] and approved by the NYSDEC were implemented and that all requirements in those documents have been substantively complied with.

I certify that the remedial activities were observed by qualified environmental professionals under my supervision and that the remediation requirements set forth in the Remedial Action Work Plan and any other relevant provisions of ECL 27-1419 have been achieved.

I certify that all use restrictions, Institutional Controls, Engineering Controls, and all operation and maintenance requirements applicable to the Site are contained in an Environmental Easement created and recorded pursuant ECL 71-3605 and that all affected local governments, as defined in ECL 71-3603, have been notified that such easement has been recorded. A Site Management Plan has been submitted by the Applicant for the continual and proper operation, maintenance, and monitoring of all Engineering Controls employed at the Site, including the proper maintenance of all remaining monitoring wells, and that such plan has been approved by the NYSDEC.

I certify that the export of all contaminated soil, fill, water or other material from the property was performed in accordance with the Remedial Action Work Plan, and were taken to facilities licensed to accept this material in full compliance with all Federal, State and local laws.

I certify that all import of soils from offsite, including source approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan.

I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology and soil screening methodology defined in the Remedial Action Work Plan.

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class “A” misdemeanor, pursuant to Section 210.45 of the Penal Law.

It is a violation of Article 130 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 130, New York State Education Law.

## 11.0 SCHEDULE

A schedule of Remedial Actions is included below. It subdivides work elements and provides estimated dates for performance of work and deliverables.

The Participant will implement the Remedial Action activities following NYSDEC approval of the final RAWP. The schedule will follow the general outline below:

| | |
|---|---|
| Installation of Injection/Extraction Wells | 60 days after RAWP approval[2] |
| Installation of Offsite Replacement Wells | 60 days after RAWP approval |
| Initiate ISCO Treatment | 90 days after RAWP approval |
| Post Remediation Groundwater Monitoring | 60 days following last ISCO Treatment (1st round) |
| Site Management | Immediately upon FER/SMP approval |
| Periodic Certification (outlined in SMP) | Annually |

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[2] All field activities must be approved by the site owner; therefore, this schedule may need to be adjusted. The NYSDEC will be advised if the schedule is modified.

# TABLES

# TABLE 1

# FORMER MATERIALS RESEARCH CORPORATION
## 542 ROUTE 303
## ORANGETOWN, NEW YORK

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## Track 2 Restricted Use Soil Cleanup Objectives

**(As Per 6 NYCRR Part 375-6)**

| Contaminant | CAS Number | Recommended Soil Cleanup Objective (ppm [1)]/mg/kg [2)]) | | | | |
|---|---|---|---|---|---|---|
| | | Protection of Public Health | | | Protection of Ecological Resources | Protection of Groundwater |
| | | Restricted Residential | Restricted Commercial | Restricted Industrial | | |
| Tetrachloroethene | 127-18-4 | 19 | 150 | 300 | 2 | 1.3 |
| Trichloroethene | 79-01-6 | 21 | 200 | 400 | 2 | 0.47 |
| 1,1-Dichloroethene | 75-35-4 | 100 [a] | 500 [b] | 1,000 [c] | NS | 0.33 |
| 1,2-Dichloroethene (cis) | 156-59-2 | 100 [a] | 500 [b] | 1,000 [c] | NS | 0.25 |
| 1,2-Dichloroethene (trans) | 156-60-5 | 100 [a] | 500 [b] | 1,000 [c] | NS | 0.19 |
| Vinyl Chloride | 75-01-4 | 0.9 | 13 | 27 | NS | 0.02 |

1) - parts per million

2) - milligrams per kilogram

NS = Not specified

a - The SCOs for unrestricted, restricted-residential and ecological resources use were capped at a maximum value of 100 ppm, as discussed in Section 9.3 in the TSD

b - The SCOs for restricted-commercial use were capped at a maximum value of 500 ppm, as discussed in Section 9.3 of the TSD

c - The SCOs for restricted-industrial use and the protection of groundwater were capped at a maximum value of 1,000 ppm, as discussed in Section 9.3 in the TSD

# TABLE 2

# FORMER MATERIALS RESEARCH CORPORATION
542 ROUTE 303
ORANGETOWN, NEW YORK

## Groundwater Quality Standards (Cleanup Objectives)
**(As per background concentrations and NYSDEC 1 Technical and Operational Guidance Series 4046)**

| Contaminant | Site Background Concentrations (ppb 2)/ug/l 3)) | NYSDEC Groundwater Quality Standards (ppb 2)/ug/l 3)) |
|---|---|---|
| Tetrachloroethene | 7.9 | 5 |
| Trichloroethene | 140 | 5 |
| cis-1,2-Dichloroethene | 7 | 5 |
| trans 1,2-Dichloroethene | 5 | 5 |
| 1,1,1- Trichloroethane | 62 | 5 |
| 1,1-Dichloroethene | 66 | 5 |
| 1,1-Dichloroethane | 5 | 5 |
| 1,2-Dichloroethane | 0.6 | 0.6 |
| Vinyl Chloride | 2 | 2 |
| Carbon Tetrachloride | 5 | 5 |
| Chloroform | 7 | 7 |
| Benzene | 1 | 1 |
| Toluene | 5 | 5 |
| o-Xylene | 5 | 5 |
| m,p-Xylene | 5 | 5 |
| Total Xylenes | 5 | 5 |
| Methyl tert butyl ethylene | 10 | 10 |
| Bromomethane | 5 | 5 |
| Bromodichloromethane | 50 | 50 |

1) - New York State Department of Environmental Conservation

2) - parts per billion

3) - micrograms per liter

# TABLE 3

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

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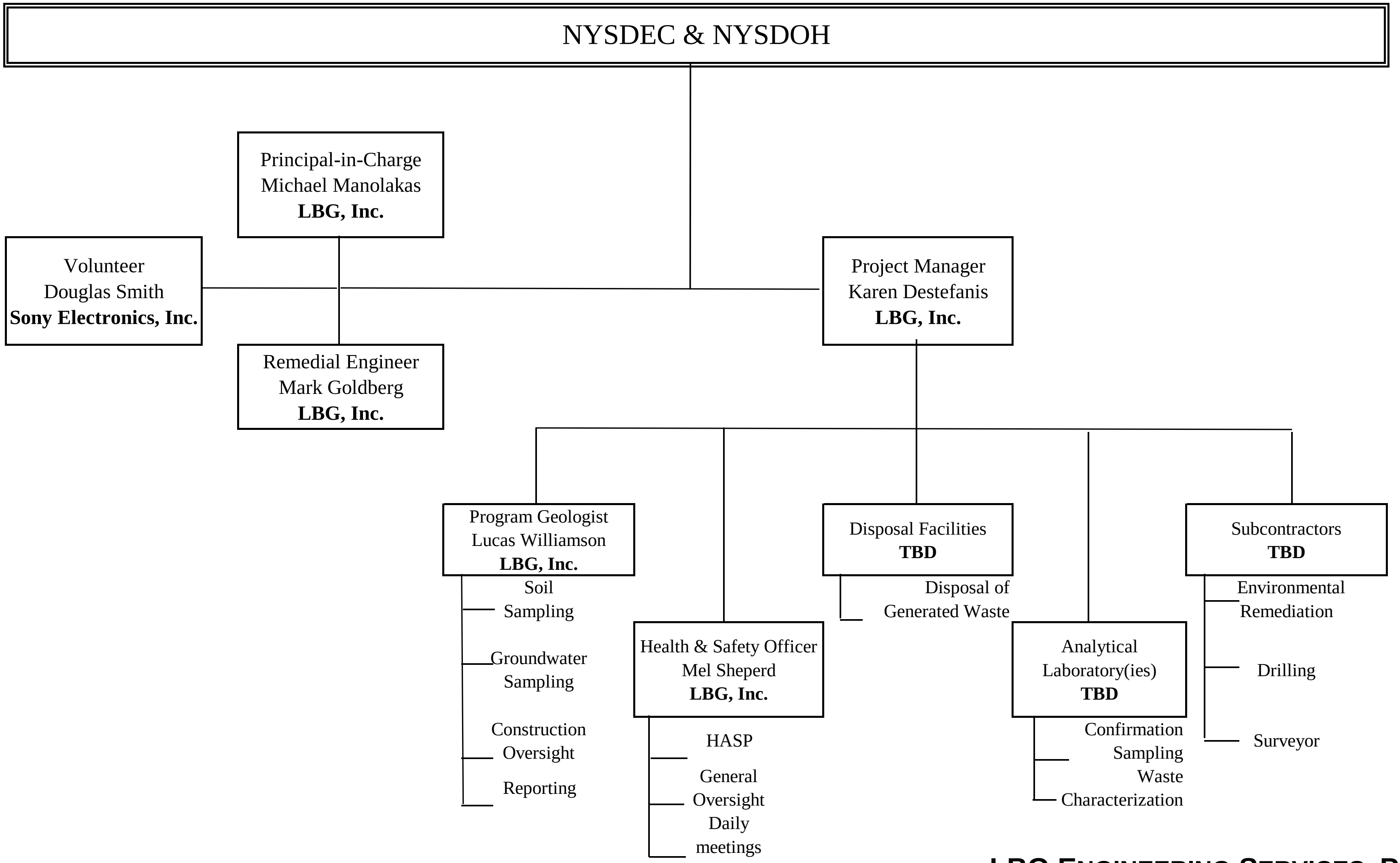
Project Organization Chart



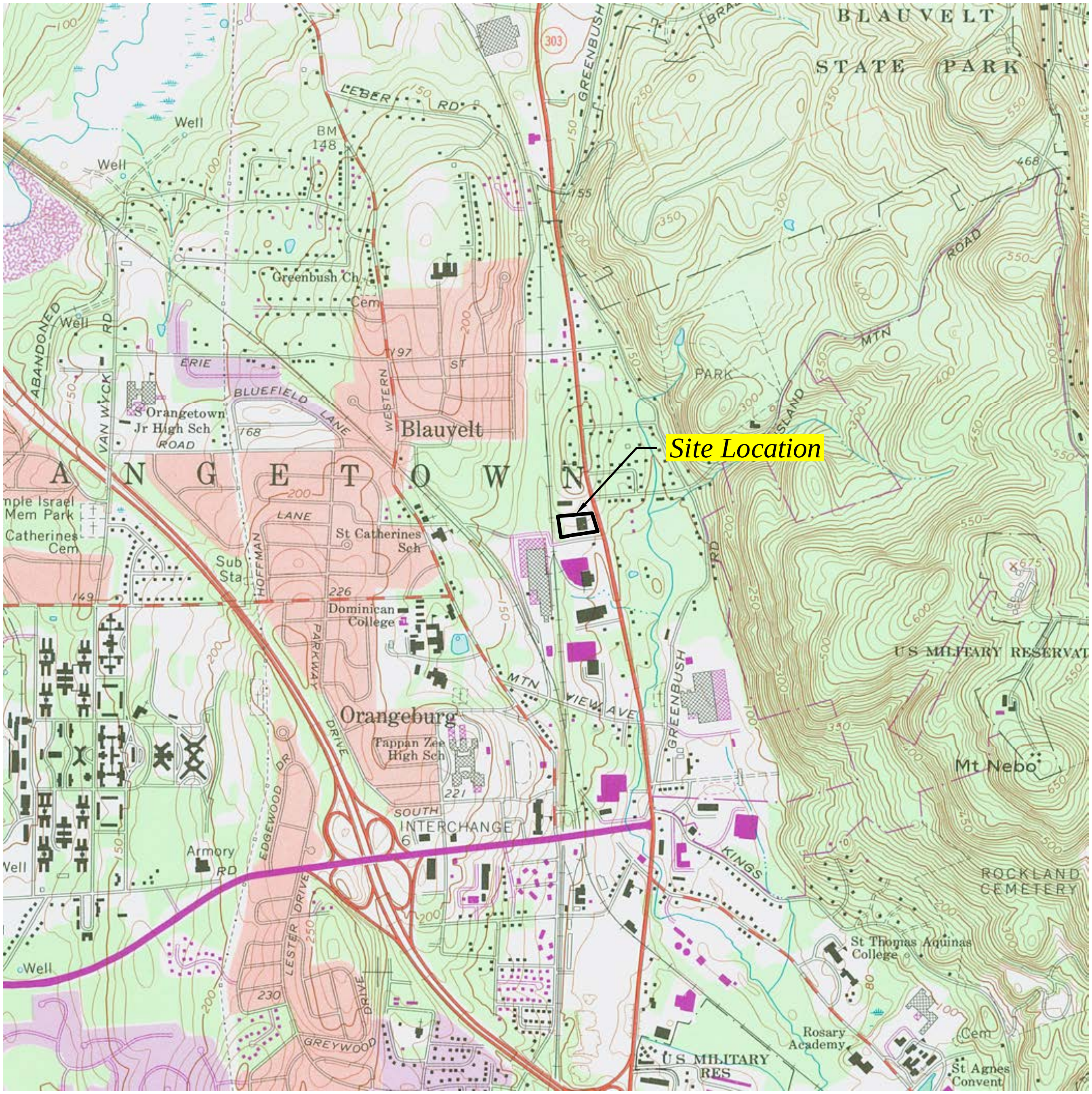
# TABLE 4

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

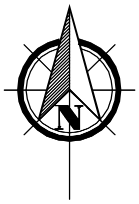
## Emergency Contact List

| Name | Organization | e-mail | Phone | Mailing Address |
|---|---|---|---|---|
| Kevin Carpenter, P.E. | NYSDEC | kevin.carpenter@dec.ny.gov | (518) 402-9662 | 625 Broadway<br>Albany, NY 12233-7014 |
| Steven Karpinski | NYSDOH<br>Bureau of Environmental Exposure Investigation | steven.karpinski@health.ny.gov | (518) 402-7860 | Empire State Plaza, Corning Tower<br>Room 1787<br>Albany, NY 12237 |
| Douglas Smith | Sony Electronics, Inc.<br>(Volunteer) | Douglas.Smith@am.sony.com | (858) 942-2729 | 16530 Via Esprillo<br>San Diego, CA 92127 |
| Scott Furman | Sive Paget & Riesel, P.C.<br>(Volunteer's Counsel) | sfurman@sprlaw.com | (212) 421-2150 | 460 Park Avenue - 10th Floor<br>New York, New York 10022 |
| Michael Manolakas | LBG, Inc.<br>(Volunteer's Consultant) | mmanolakas@lbgct.com | (203) 929-8555 | 4 Research Drive<br>Suite 204<br>Shelton, CT 06484 |
| Karen Destefanis | | kdestefanis@lbgct.com | | |

# FIGURES



SOURCE: USGS TOPOGRAPHIC QUADRANGLE NYACK, NEW YORK (PHOTOREVISED 1979).



QUADRANGLE LOCATION

SCALE IN FEET

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## SITE MAP

| DATE | REVISED |
|---|---|
| | |
| | |
| | |
| | |
| | |

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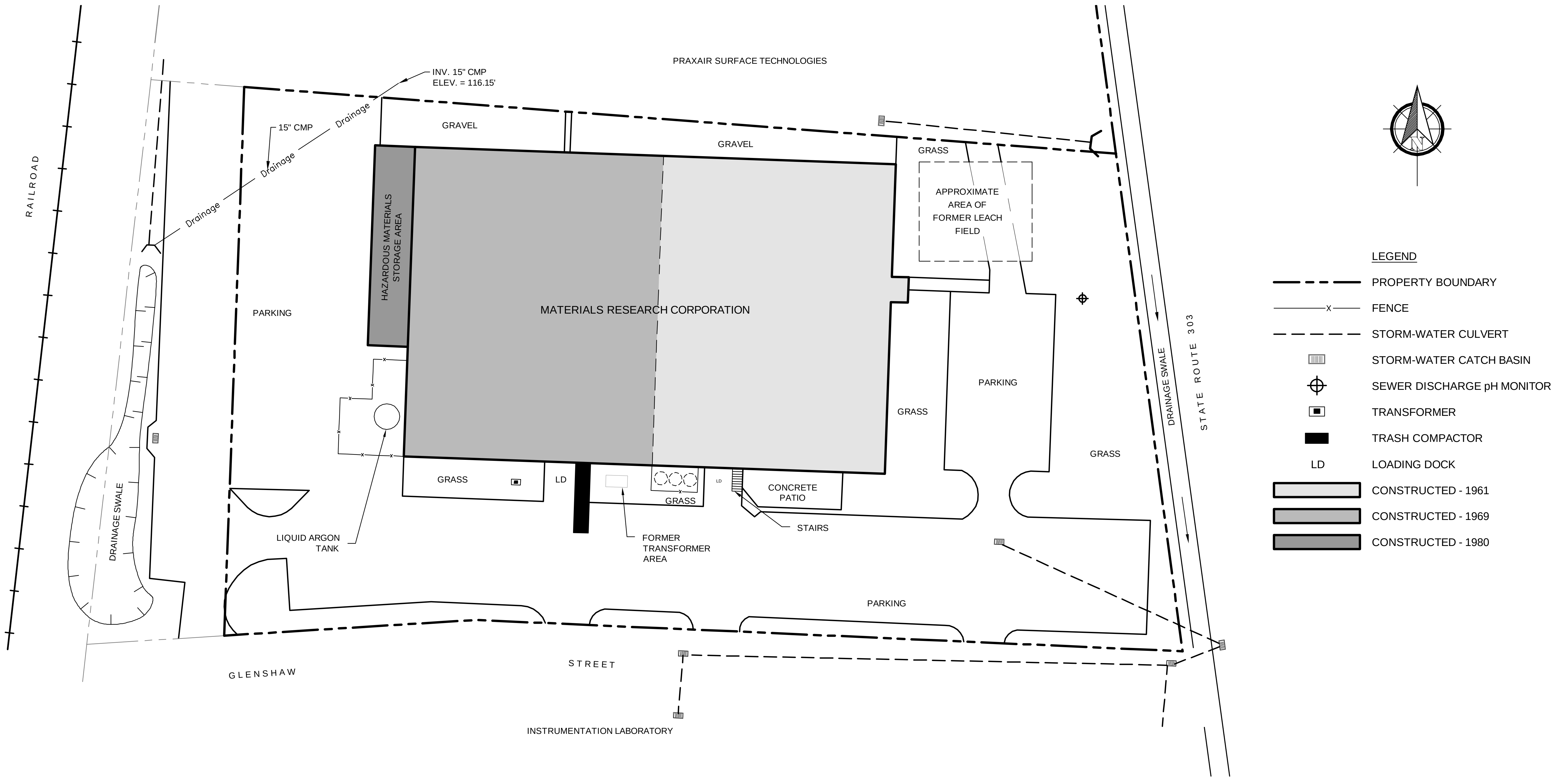
Professional Environmental and Civil Engineers
4 Research Drive
Suite 204
Shelton, Connecticut 06484
(203) 929-8555

| DRAWN: | RAC | CHECKED: | KD | DATE: | 05/21/15 | FIGURE: | 1 |
|---|---|---|---|---|---|---|---|

O:\DWG\SONY\ORANGE\2015\RAWP\F1-SLM.dwg, Layout1, 10/1/2015 9:31:46 AM, AcroPlot.pc3



# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## SITE MAP

| DATE | REVISED |
|---|---|
| | |
| | |
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| | |

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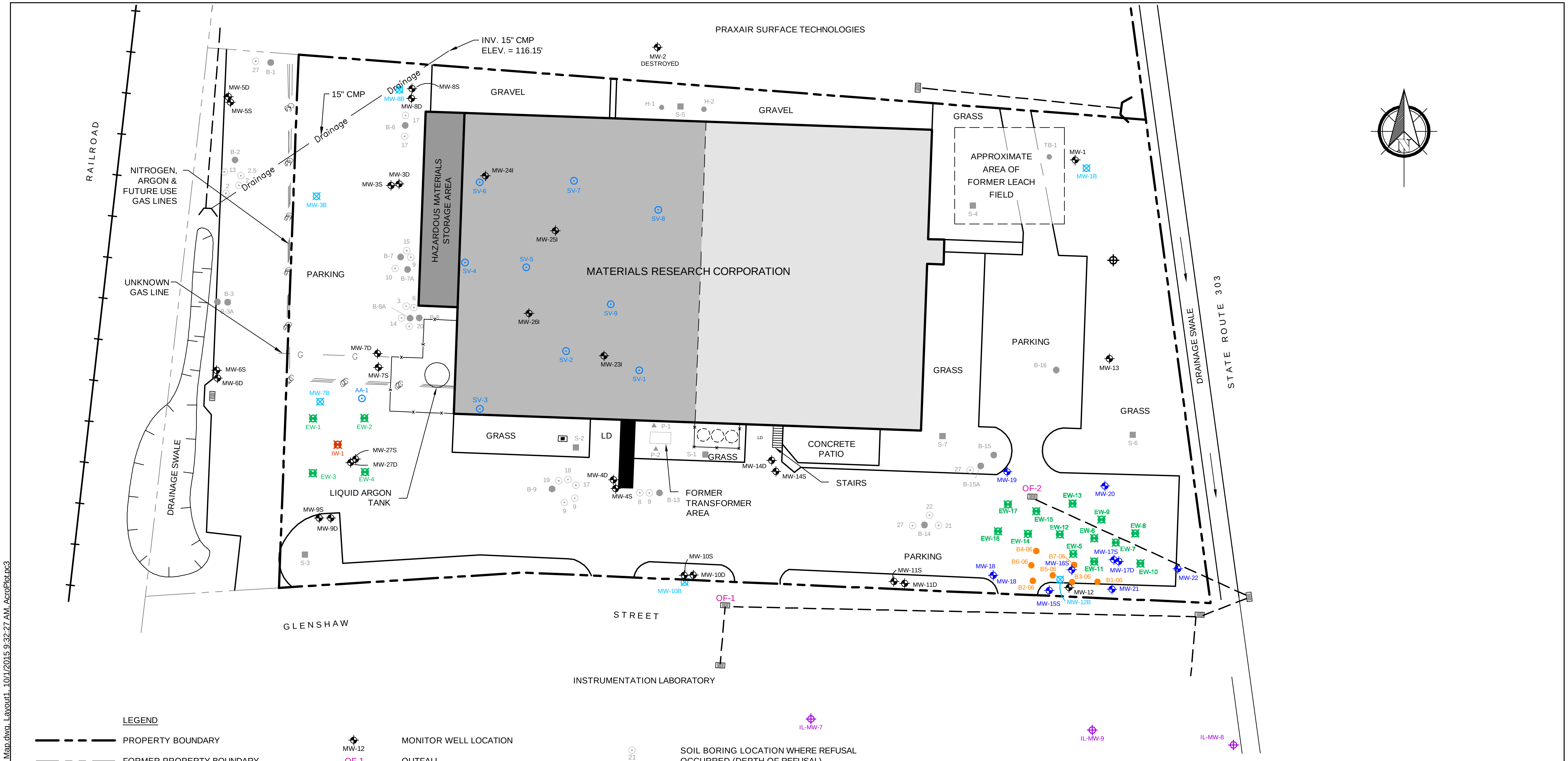
DRAWN: RAC CHECKED: KD DATE: 05/21/15 FIGURE: 2

O:\DWG\SONY\ORANGE\2015\RAWP\F2-Site Map.dwg, Layout1, 10/1/2015 9:32:07 AM, AcroPlot.pc3



LEGEND

| | |
|---|---|
| ▬ ▬ ▬ | PROPERTY BOUNDARY |
| — — — | FORMER PROPERTY BOUNDARY |
| —×—×— | FENCE |
| — — — | STORM-WATER PIPING |
| ▤ | STORM-WATER CATCH BASIN |
| ⊕ | SEWER DISCHARGE pH MONITOR |
| ▣ | TRANSFORMER |
| ■ | TRASH COMPACTOR |
| LD | LOADING DOCK |
| ▭ | CONSTRUCTED - 1961 |
| ▭ | CONSTRUCTED - 1969 |
| ▭ | CONSTRUCTED - 1980 |
| MW-12 | MONITOR WELL LOCATION |
| OF-1 | OUTFALL |
| EW-1 | 2-INCH DIAMETER EXTRACTION WELL LOCATION |
| IW-1 | 4-INCH DIAMETER INJECTION WELL LOCATION |
| B1-06 | 2006 SOIL BORING LOCATION |
| TB-1 | 1999 HOLLOW STEM AUGER SOIL BORING |
| H-1 | 1999 HAND AUGER SOIL BORING LOCATION |
| P-1 | 1999 SURFICIAL SOIL SAMPLE LOCATION AND LOCATION OF 2001 PROPOSED HAND AUGER SOIL BORING |
| S-1 | SURFICIAL SAMPLE |
| B-14 | SOIL BORING LOCATION |
| 21 | SOIL BORING LOCATION WHERE REFUSAL OCCURRED (DEPTH OF REFUSAL) |
| IL-MW-7 | APPROXIMATE LOCATION OF EXISTING INSTRUMENTATION LABORATORY MONITOR WELL |
| MW-10B | 2006 BEDROCK MONITOR WELL |
| MW-15S | 2006 OVERBURDEN MONITOR WELL |
| SV-2 | SOIL-VAPOR SAMPLING LOCATION |

NOTE: WELL LOCATIONS ARE APPROXIMATE.

0 50
SCALE IN FEET

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## MONITOR WELL AND SUBSURFACE SAMPLE LOCATIONS

| DATE | REVISED |
|---|---|
| | |
| | |
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| | |
| | |

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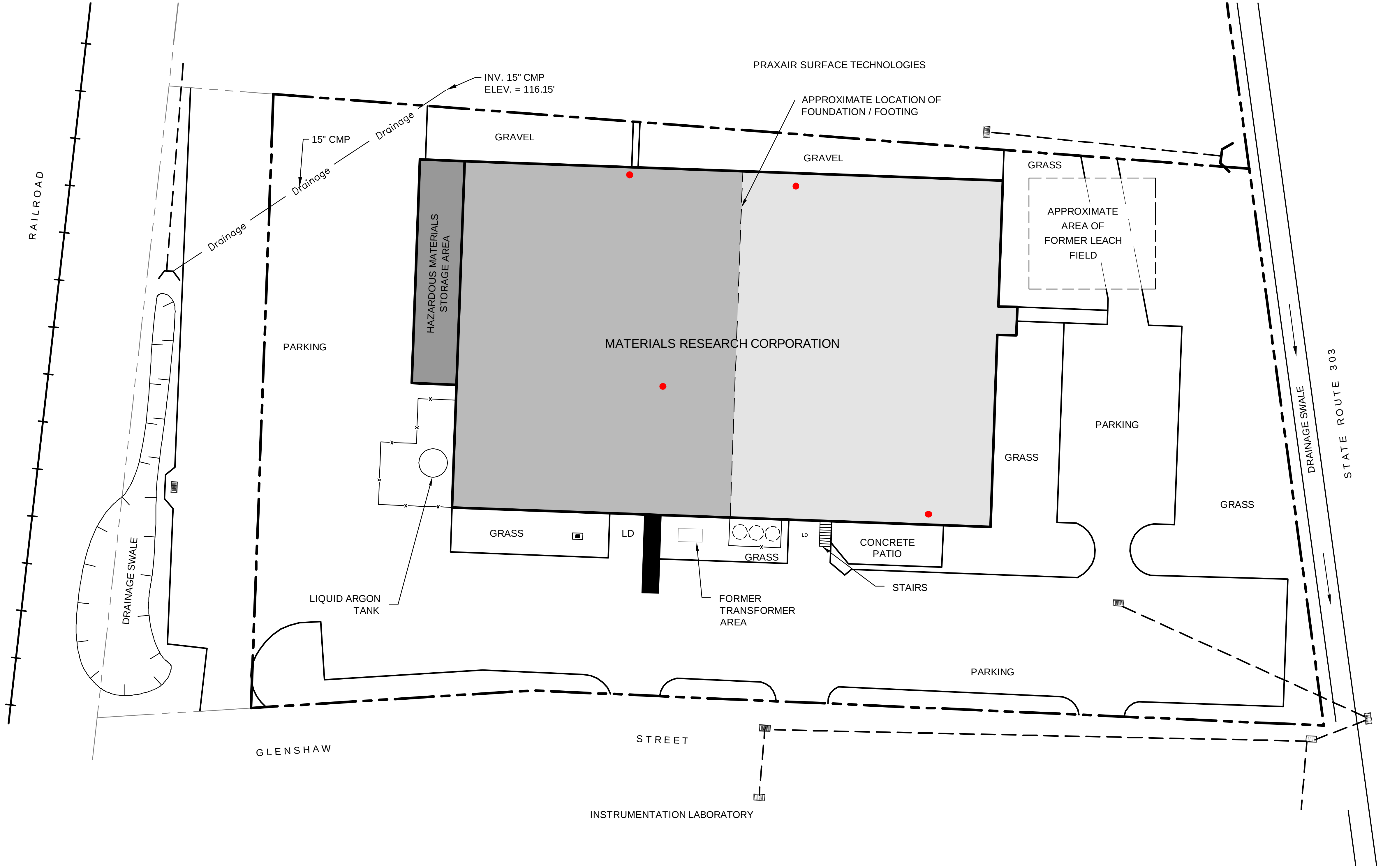
| DRAWN: | RAC | CHECKED: | KD | DATE: | 05/21/15 | FIGURE: | 3 |
|---|---|---|---|---|---|---|---|

O:\DWG\SONY\ORANGE\2015\RAWP\F3-Well & Sample Map.dwg, Layout1, 10/1/2015 9:32:27 AM, AcroPlot.pc3



LEGEND

| | |
|---|---|
| ▬ ▬ ▬ | PROPERTY BOUNDARY |
| ——x—— | FENCE |
| — — — | STORM-WATER CULVERT |
| ▥ | STORM-WATER CATCH BASIN |
| ▣ | TRANSFORMER |
| ■ | TRASH COMPACTOR |
| LD | LOADING DOCK |
| ▭ | CONSTRUCTED - 1961 |
| ▭ | CONSTRUCTED - 1969 |
| ▭ | CONSTRUCTED - 1980 |
| ● | SUB-SLAB DEPRESSURIZATION SYSTEM SUCTION POINT |

NOTE:
PILOT TEST CONDUCTED AT 7.5 INCHES OF WATER COLUMN AT SUCTION POINT, INSTALLED SYSTEM FAN PRODUCES 50 INCHES OF WATER COLUMN.

0 50
SCALE IN FEET

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

SUB-SLAB DEPRESSURIZATION SYSTEM

| DATE | REVISED |
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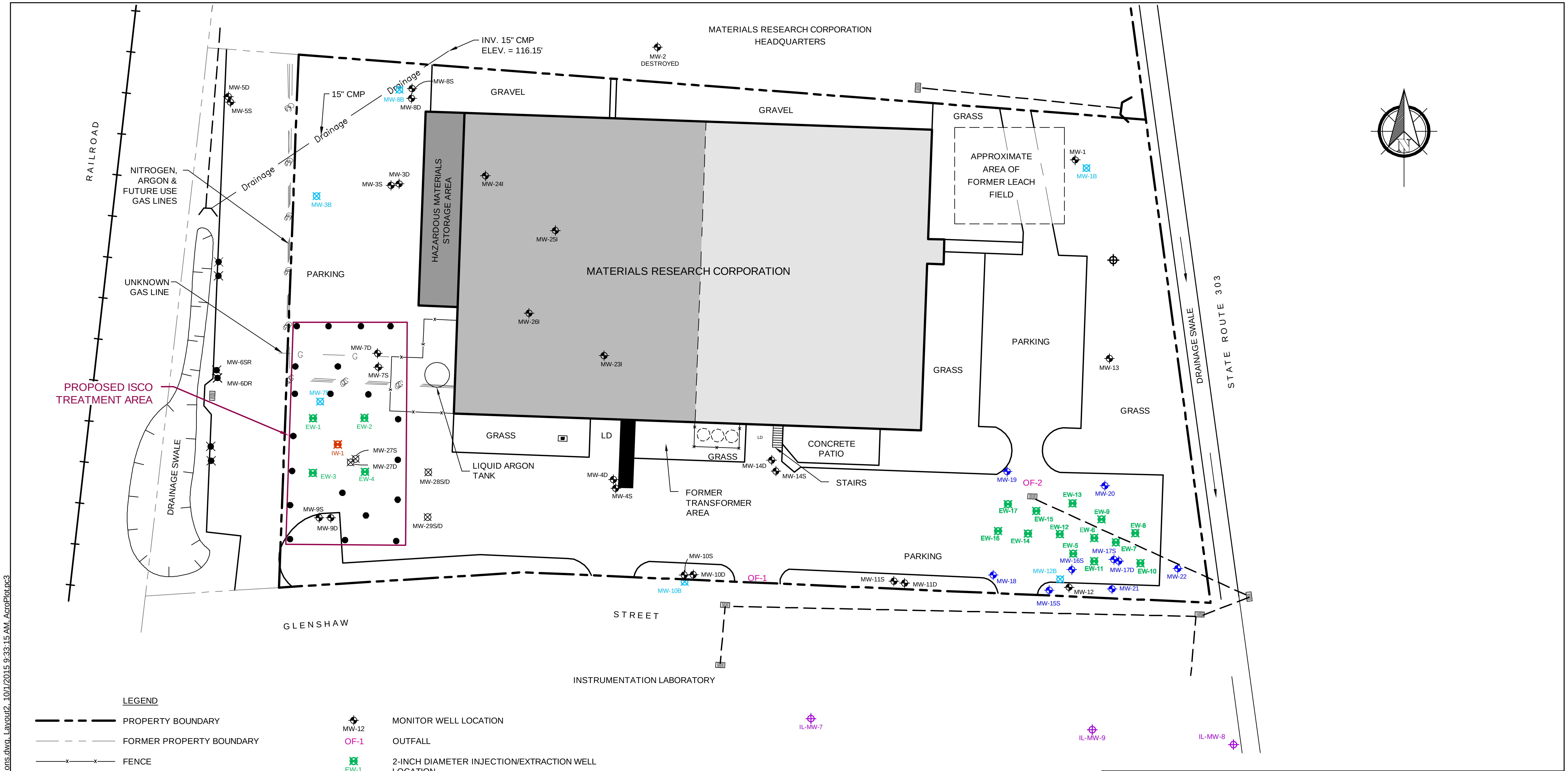
DRAWN: RAC CHECKED: KD DATE: 09/30/15 FIGURE: 4

O:\DWG\SONY\ORANGE\2015\RAWP\F4-Sub-Slab.dwg, Layout1, 10/1/2015 9:32:47 AM, AcroPlot.pc3



LEGEND

| | |
|---|---|
| ▬ ▬ ▬ | PROPERTY BOUNDARY |
| — — — | FORMER PROPERTY BOUNDARY |
| —x—x— | FENCE |
| — — — | STORM-WATER PIPING |
| ▭ | STORM-WATER CATCH BASIN |
| ⌖ | SEWER DISCHARGE pH MONITOR |
| ▣ | TRANSFORMER |
| ■ | TRASH COMPACTOR |
| LD | LOADING DOCK |
| ⬜ | CONSTRUCTED - 1961 |
| ▨ | CONSTRUCTED - 1969 |
| ▩ | CONSTRUCTED - 1980 |

| | |
|---|---|
| ⌖ MW-12 | MONITOR WELL LOCATION |
| OF-1 | OUTFALL |
| ⊗ EW-1 | 2-INCH DIAMETER INJECTION/EXTRACTION WELL LOCATION |
| ⊗ IW-1 | 4-INCH DIAMETER INJECTION WELL LOCATION |
| ⌖ IL-MW-8 | APPROXIMATE LOCATION OF EXISTING INSTRUMENTATION LABORATORY MONITOR WELL |
| ⊗ MW-1B | 2006 BEDROCK MONITOR WELL |
| ⌖ MW-15S | 2006 OVERBURDEN MONITOR WELL |
| ⊗ MW-28 | PROPOSED MONITOR WELL CLUSTER LOCATION |
| ● | PROPOSED 2-INCH DIAMETER INJECTION/EXTRACTION WELL LOCATION |
| ✱ | PROPOSED OFFSITE MONITOR WELL LOCATION |

NOTE: WELL LOCATIONS ARE APPROXIMATE.

0 50
SCALE IN FEET

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## PROPOSED ISCO WELL LOCATIONS

| DATE | REVISED |
|---|---|
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| | |

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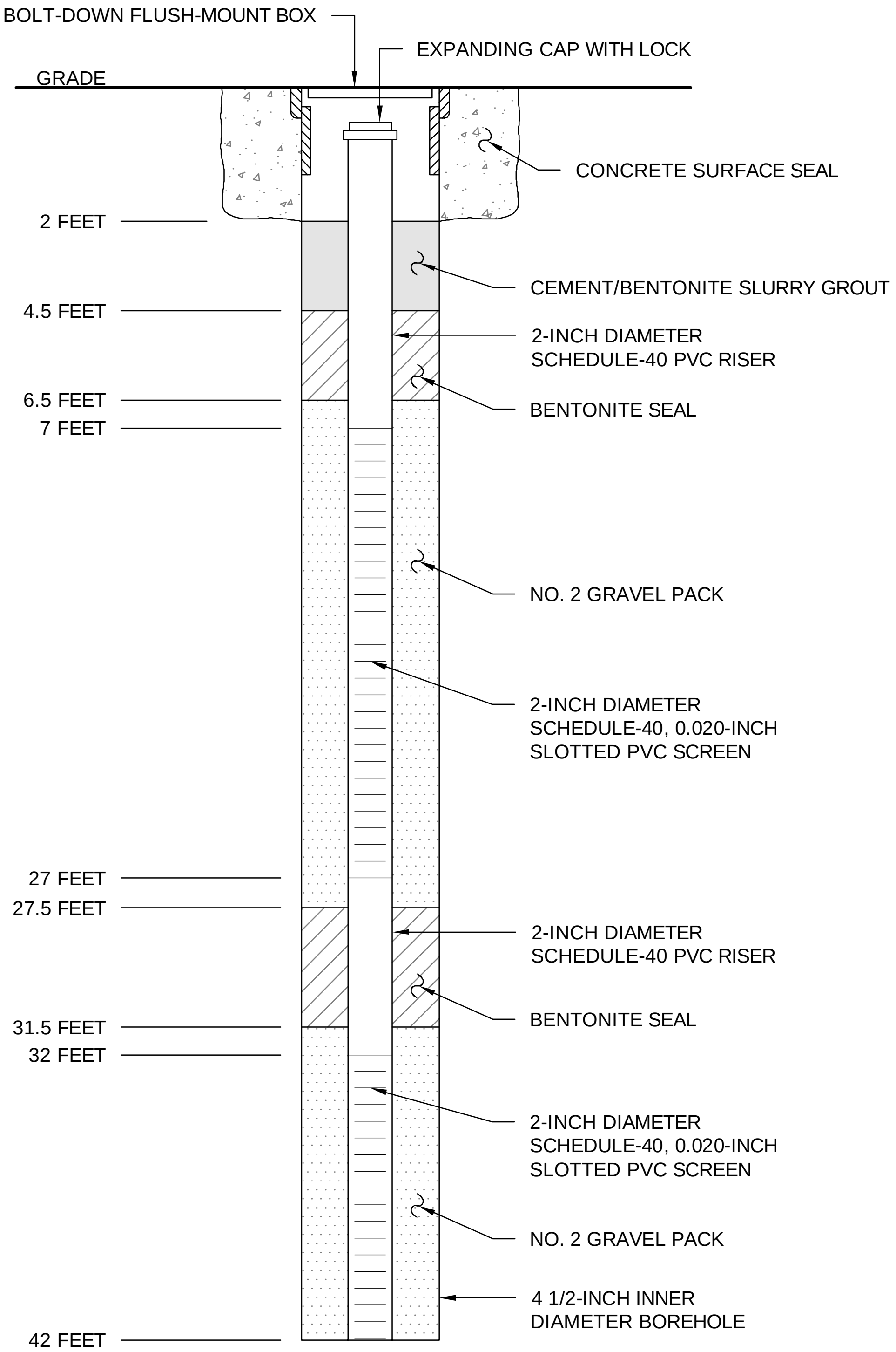
Shelton, Connecticut 06484
(203) 929-8555

DRAWN: RAC CHECKED: KD DATE: 10/01/15 FIGURE: 5

O:\DWG\SONY\ORANGE\2015\RAWP\F5-ISCO Locations.dwg, Layout2, 10/1/2015 9:33:15 AM, AcroPlot.pc3



# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## PROPOSED WELL CONSTRUCTION DIAGRAM

| DATE | REVISED |
|---|---|
| | |
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| | |

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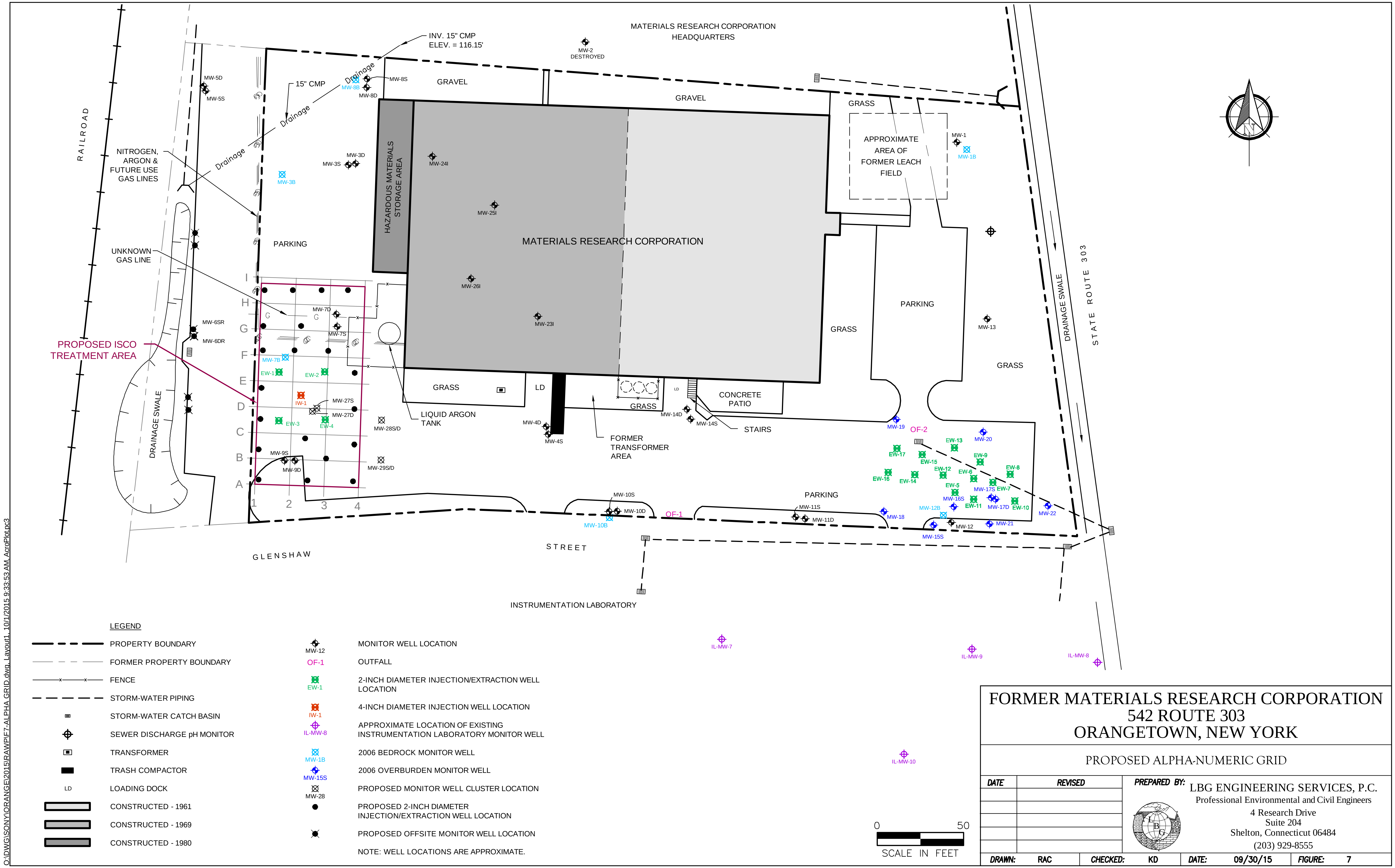
(203) 929-8555

**DRAWN:** RAC **CHECKED:** KD **DATE:** 10/01/15 **FIGURE:** 6

O:\DWG\SONY\ORANGE\2015\RAWP\F6-Well Diagram.dwg, Layout1, 10/1/2015 9:33:34 AM, AcroPlot.pc3



LEGEND

| | |
|---|---|
| ▬ ▬ ▬ | PROPERTY BOUNDARY |
| — — — | FORMER PROPERTY BOUNDARY |
| —x—x— | FENCE |
| – – – – | STORM-WATER PIPING |
| ▤ | STORM-WATER CATCH BASIN |
| ⊕ | SEWER DISCHARGE pH MONITOR |
| ▣ | TRANSFORMER |
| ■ | TRASH COMPACTOR |
| LD | LOADING DOCK |
| ▭ | CONSTRUCTED - 1961 |
| ▭ | CONSTRUCTED - 1969 |
| ▭ | CONSTRUCTED - 1980 |

| | |
|---|---|
| ⊕ MW-12 | MONITOR WELL LOCATION |
| OF-1 | OUTFALL |
| ⊠ EW-1 | 2-INCH DIAMETER INJECTION/EXTRACTION WELL LOCATION |
| ⊠ IW-1 | 4-INCH DIAMETER INJECTION WELL LOCATION |
| ⊕ IL-MW-8 | APPROXIMATE LOCATION OF EXISTING INSTRUMENTATION LABORATORY MONITOR WELL |
| ⊠ MW-1B | 2006 BEDROCK MONITOR WELL |
| ⊕ MW-15S | 2006 OVERBURDEN MONITOR WELL |
| ⊠ MW-28 | PROPOSED MONITOR WELL CLUSTER LOCATION |
| ● | PROPOSED 2-INCH DIAMETER INJECTION/EXTRACTION WELL LOCATION |
| ✱ | PROPOSED OFFSITE MONITOR WELL LOCATION |

NOTE: WELL LOCATIONS ARE APPROXIMATE.

O:\DWG\SONY\ORANGE\2015\RAWP\F7-ALPHA GRID.dwg, Layout1, 10/1/2015 9:33:53 AM, AcroPlot.pc3

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## PROPOSED ALPHA-NUMERIC GRID

| DATE | REVISED |
|---|---|
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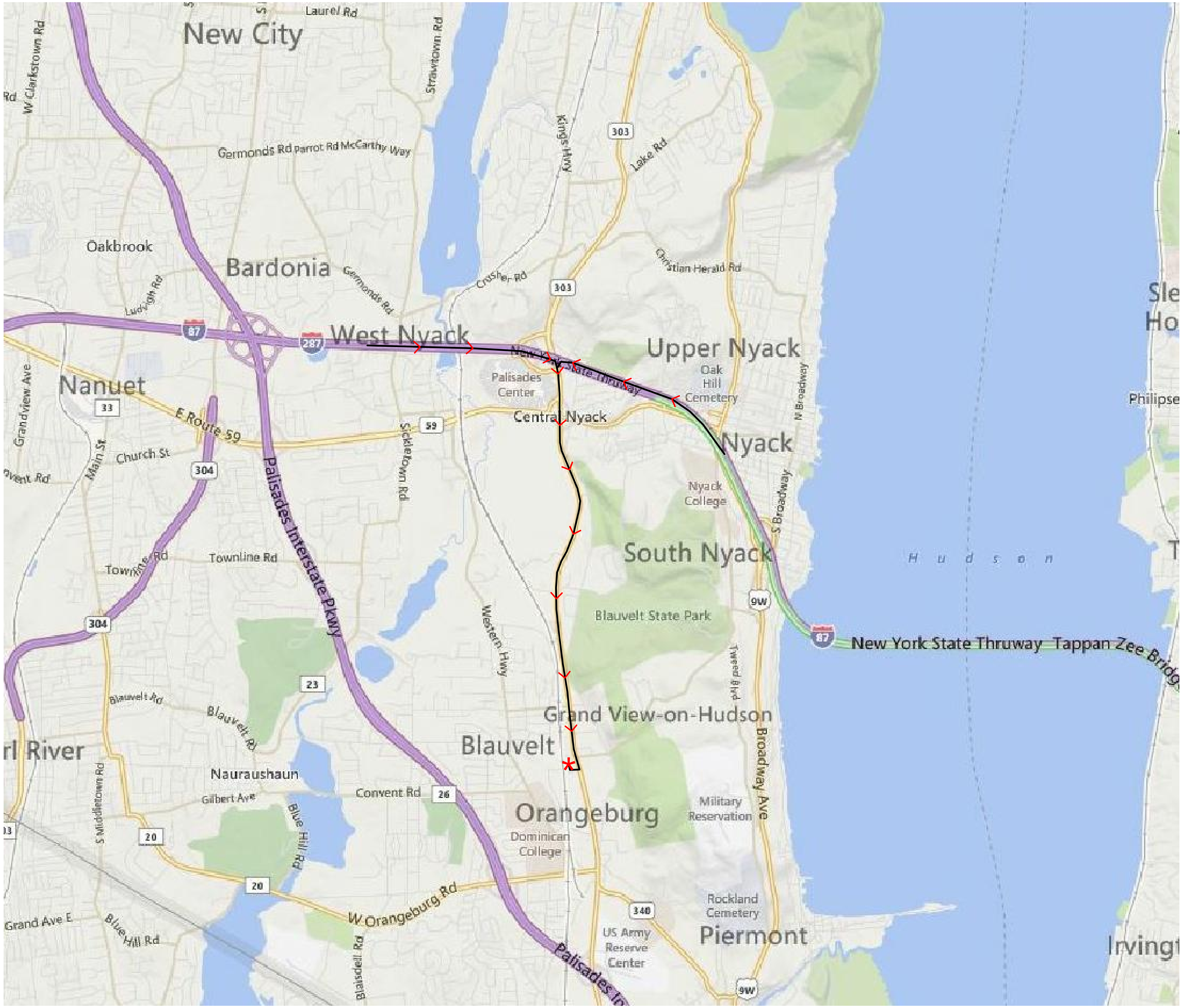
Suite 204
Shelton, Connecticut 06484
(203) 929-8555

DRAWN: RAC CHECKED: KD DATE: 09/30/15 FIGURE: 7



TRUCK ROUTE - OVERALL
SCALE: 1" = 4000'

TRUCK ROUTE - ENLARGEMENT
SCALE: 1" = 500'

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## PROPOSED TRUCK ROUTE

| DATE | REVISED |
|---|---|
| | |
| | |
| | |
| | |
| | |

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Shelton, Connecticut 06484
(203) 929-8555

**DRAWN:** RAC **CHECKED:** KD **DATE:** 09/30/15 **FIGURE:** 8

O:\DWG\SONY\ORANGE\2015\RAWP\F8-Truck Route.dwg, Layout1, 10/1/2015 9:34:11 AM, AcroPlot.pc3

# APPENDIX I

# PROPERTY METES AND BOUNDS

B 70.19-1-46

| SECTION NO. | | LOT NO. | | STREET | | SIDE | CARD NO. |
|---|---|---|---|---|---|---|---|
| ~~90~~ | | 29 ~~10~~ | | Route 303 | 70.19-1-46 | | 17 |
| 30 | 80 | 742<br>~~842~~ | 2 | OWNER | Material Research Corp | | |

| RECORD OF TRANSFER | DATE | BK | PG | I.R.S. |
|---|---|---|---|---|
| National Community Bank of Rutherford | 4/15/66 | 807 | 600 | |
| materials Research Corporation | 1/16/90 | 391 | 1335 | 225000 |
| Praxair Surface Technologies Inc | 1/15/99 | 1999 | 62245 | 2,100,000 |

REMARKS: DATA

Joe Muscarelli Bids -
Deasec -
Send Income Form

NEW ASSESSMENT - 1969
OLD ASS. 37,850.00

OWNER FEELS. D.P.
NOT ENOUGH FOR BLDG.
THEY WANT TO FIGURE
ON 40 YR. LIFE
Myer
HABERMAN

INTERIOR INSPECTED:

DATE:

| PERMIT NO. | C.O. NO. | DESCRIPTION | APPROX. COST | DATE |
|---|---|---|---|---|
| 15466 | ✓ | 2,000 ft of Blacktop | 1660 | 1/74 |
| 15375 | | A/G storage tank (Liquid Argon) | 597 | 4/74 |
| 16738 | | B/G chem storage tanks | | 12/74 |
| 16729 | | Interior Alterations | | 12/74 |
| 17182 | | (Material Research Corp) | 4000 | 4/78 |
| 17184 | | Interior Alterations | 25,000 | 4/78 |

| LIGHT DIST. | FIRE DIST. | WATER DIST. | SEWER DIST. | LIBRARY DIST. |
|---|---|---|---|---|
| | | | | |

| SUMMARY | | |
|---|---|---|
| 19 68 | LAND | ~~12,600~~ |
| | BLDGS. | ~~78,450~~ |
| | TOTAL | ~~91,050~~ |
| 19 | LAND | 12,600 |
| | BLDGS. | 70,350 |
| | TOTAL | 82,950 |
| 19 | LAND | 12,600 |
| | BLDGS. | 85,350 |
| | TOTAL | 97,950 |
| 19 | LAND | 12,600 |
| | BLDGS. | 146,100 |
| | TOTAL | 158,700 |
| 19 72 | LAND | 16,650 |
| | BLDGS. | 146,100 |
| | TOTAL | 162,750 |
| 19 | LAND | 19,350 |
| | BLDGS. | 146,100 |
| | TOTAL | 165,450 |
| 19 75 | LAND | 19,350 |
| | BLDGS. | 146,500 |
| | TOTAL | 165,850 |
| 19 78 | LAND | 22,450 |
| | BLDGS. | 150,700 |
| | TOTAL | 173,150 |

PHOTOGRAPH

1/70 - Mr. Post inquired re increase of $15,000
Was told partial on new add'T - C.R.

ACREAGE COMPUTATIONS

| LAND TYPE | # OF ACRES | PRICE | TOTAL | DEPR. | VALUE | Ea. Fact. | ASSESSMENT |
|---|---|---|---|---|---|---|---|
| HOUSE LOT | 1.4 | 30,000 | 30,000 | 42000 | ~~30000~~ | | |
| CLEARED FRONT | 1 | 15,000 | 15000 | 15000 | ~~1500~~ | 7th | 1972-73 |
| REAR | 1 | 7500 | | 7500 | ~~15000~~ | | |
| WASTE FRONT | | | | 64500 | | ~~30~~ | ~~19350~~ |
| REAR | ~~1.4~~ | ~~7,500~~ | ~~10500~~ | | ~~10500~~ | | |
| | | | | | ~~55500~~ | ~~30~~ | ~~16650~~ |
| | 3.4 | 222,000 | 74,800 | | ~~42000~~ | ~~30~~ | ~~12600~~ |
| | | | | | | 30 | 22,450 |

LOT COMPUTATIONS

| FRONT | DEPTH | STREET PRICE | DEPTH % | FRONT FT. PRICE | TOTAL | DEPR. | COR. INF. | VALUE | Ea. Fact. | ASSESSMENT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 14 | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

ORANGETOWN, N. Y.

---

Meyer Haberman
Assistant to the President

MATERIALS RESEARCH CORPORATION
Orangeburg, New York

---

Claire W. Baughman
Corporate Manager of Enviromental
Health and Safety

MATERIALS RESEARCH CORPORATION
Orangeburg, New York 10962

(914) 359-4200
Fax: (914) 425-6075

Orangeburg

# COMMERCIAL PROPERTY

| SECTION NO. | LOT NO. | STREET | SIDE | CARD NO. |
|---|---|---|---|---|
| 80 | 742 2 | Route 303<br>OWNER Material Research Corp | | |

| RECORD OF TRANSFER | DATE | BK | PG | I.R.S. |
|---|---|---|---|---|
| National Community Bank of Rutherford | | | | |
| Material Research Corp | 1/16/90 | 391 | 1335 | -0- |
| Town of Orangetown | 4/26/96 | 1997 | 50243 | — |
| | | | | |
| | | | | |
| | | | | |

REMARKS:

Original/Card 152,700
Card # 2 1,650
154,350

| | SUMMARY | |
|---|---|---|
| 19 | LAND | 22,450 |
| | BLDGS. | 154,350 |
| | TOTAL | 176,800 |
| 19 | LAND | |
| | BLDGS. | |
| | TOTAL | |
| 19 | LAND | |
| | BLDGS. | |
| | TOTAL | |
| 19 | LAND | |
| | BLDGS. | |
| | TOTAL | |
| 19 | LAND | |
| | BLDGS. | |
| | TOTAL | |
| 19 | LAND | |
| | BLDGS. | |
| | TOTAL | |
| 19 | LAND | |
| | BLDGS. | |
| | TOTAL | |
| 19 | LAND | |
| | BLDGS. | |
| | TOTAL | |

INTERIOR INSPECTED:

DATE:

| PERMIT NO. | C.O. NO. | DESCRIPTION | APPROX. COST | DATE |
|---|---|---|---|---|
| | | [illegible] Exh - Storage | 22,000 | 11/81 |
| | | | | |
| [illegible] | Permit Date | Alter [illegible] for [illegible] [illegible] work. | 119,000 | 2/23/94 Inspection |
| [illegible] | [illegible] | [illegible] light [illegible] | [illegible] | |

| LIGHT DIST. | FIRE DIST. |
|---|---|
| | |

| LAND TYPE | # OF ACRES |
|---|---|
| HOUSE LOT | |
| CLEARED FRONT | |
| REAR | |
| WASTE FRONT | |
| REAR | |
| | |
| | |

| FRONT | DEPTH | STREET PRICE | DEPTH % | FRO |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

PHOTOGRAPH

| FOUNDATION | |
|---|---|
| CONCRETE WALLS | ✓ |
| CEMENT BLK. WALLS | |
| BRICK WALLS | |
| STONE WALLS | |

**BASEMENT AREA** 0

| ¼ | ½ | ¾ | FULL |
|---|---|---|---|
| | | | |

| EXTERIOR WALLS | |
|---|---|
| SOLID COM. BRICK | |
| COM. BR. ON C. B. | |
| FACE BR. ON COM. BR. | |
| FACE BR. ON C. B. | |
| FACE BR. VEN. | |
| CEMENT OR CINDER BLK | |
| REIN. CONCRETE | |
| CUT STONE FACING | |
| STONE OR T. C. TRIM | |
| STUCCO ON | |
| SIDING OR SHINGLES | |
| PARTY WALLS | |
| PLATE GLASS FRONT | |

| ROOFING | |
|---|---|
| COMPOSITION OR T. & G. | |
| METAL | ✓ |
| WOOD DECK | |
| METAL DECK | |

| FLOORS | B | 1ST | 2ND | 3RD |
|---|---|---|---|---|
| CONCRETE | | | | |
| EARTH | | | | |
| PINE | | | | |
| HARDWOOD | | | | |
| SINGLE FL. | | | | |
| ASPH. TILE | | 3/4 | | |
| TERRAZZO | | | | |
| WOOD JOIST | | | | |
| STEEL JOIST | | | | |
| REIN. CONC. | | 5" | | |

| CEILINGS | |
|---|---|
| LATH & PLASTER | |
| COMPO. BOARD | |
| ACOUSTICAL | 3/4 |

| INTERIOR FINISH | |
|---|---|
| LATH & PLASTER | |
| DRYWALL | |
| WALLBOARD | |
| UNFIN. INT. | ✓ |

| PARTITIONS | |
|---|---|
| LATH AND PLASTER | |
| DRYWALL | |
| BRICK | |
| C. BLK. | [illegible] |

| HEATING | |
|---|---|
| STEAM | |
| HOT WATER | ✓ |
| HOT AIR | |
| GAS | |
| OIL BURNER | |
| COAL STOKER | |
| NO HEATING | |
| AIR COND. — REFRIG. | ✓ |
| AIR COND. — WATER | |

| WIRING | |
|---|---|
| FLEXLUME OR EQUAL | |
| PIPE CONDUIT | |

| PLUMBING | |
|---|---|
| BATH ROOMS | |
| TOILET ROOMS | |
| WATER CLOSET EXTRA | |
| LAVATORY EXTRA | |
| SINK EXTRA | |
| URINALS | |
| NO PLUMBING | |

| TILING | |
|---|---|
| BATH RM. FL. & WAINS. | |
| TOILET RM. FL. & WAINS. | 3 |
| BATH ROOM FLR. | |
| TOILET ROOM FLR. | |

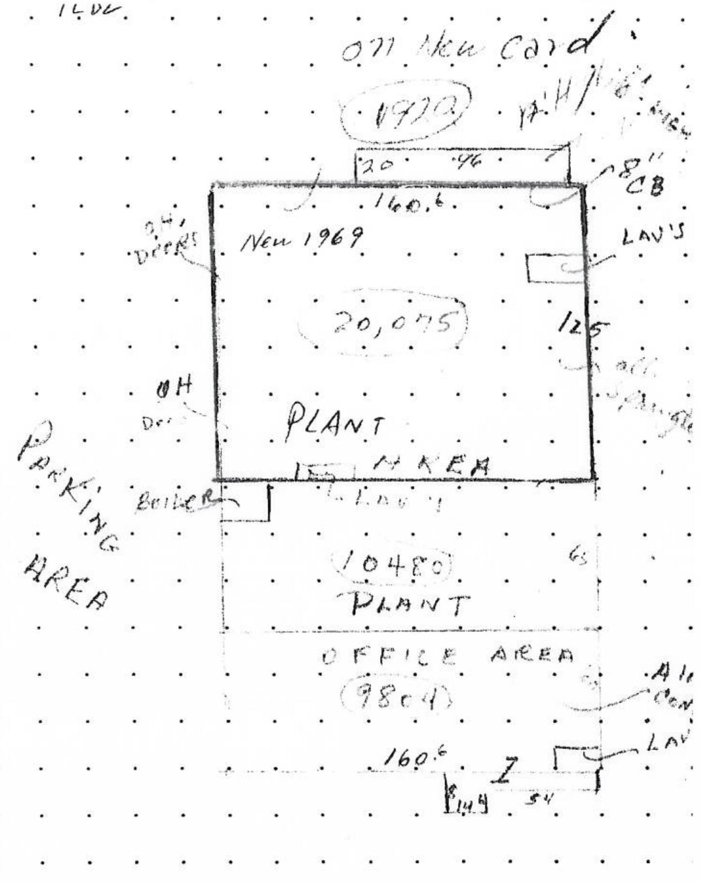
| MISCELLANEOUS | |
|---|---|
| FIREPROOF CONSTR. | |
| MILL CONSTRUCTION | |
| FIRE RESISTING | |
| STEEL FRAME | |
| STEEL BEAMS & COLS. | |
| TIMBER BEAMS & COLS. | |
| STEEL TRUSSES | |
| [illegible] | |
| SPRINKLER SYST. | 100% ✓ |
| PASSENGER ELEV. | |
| FREIGHT ELEV. | |
| INCINERATOR | |
| FIREPLACES | |
| CHIMNEYS | [illegible] |
| [illegible] | |
| STEEL FRAME SASH | |
| WOOD FRAME SASH | |

| BUILDING COMPUTATION | | | |
|---|---|---|---|
| 10480 | S. F. | 11.40 | 119472 |
| 9804 | S. F. | 14.90 | 141177 |
| | S. F. | | |
| | S. F. | | |
| | S. F. | | |
| | S. F. | | |
| | S. F. | | |
| | S. F. | | |
| | S. F. | | |

**REPLACEMENT VALUE** 260649

| RENTAL CAPITALIZATION | |
|---|---|
| LAND | |
| VACANCY | |
| HEATING | |
| WATER | |
| ELECTRICITY | |
| JANITOR | |
| INSURANCE | |
| MAINTENANCE | |
| MANAGEMENT | |
| | |
| TOTAL FLAT EXPENSES | |
| GROSS ANNUAL INCOME | |
| LESS FLAT EXPENSES | |
| BALANCE FOR CAP. | |
| CAP. RATE | |
| REFLECTED CAP. VALUE | |

| LOCATION | | |
|---|---|---|
| GOOD | FAIR | POOR |
| LISTER | DATE | |
| | 9/[illegible] | |



## OCCUPANCY DETAIL & INCOME

[illegible]

carry over from below 146,100

Additional Black Top [illegible] @ 30¢ 600 30% 200.

A/G storage tank (liquid Argon) 5' Dia 575 30% 200

@ 2,000

3- 10,000 B/G chemical storage tank 6,000 146,500

3 3,000 B/G [illegible] 4,200

150,700

[illegible] 5,000

14,000 X30 4200

| OCCUPANCY | CONSTRUCTION | SIZE | AREA | CLASS | AGE | REMOD. | COND. | REPL. VAL. | Phy. Dep. | PHYS. VALUE | Funct. Dep. | ACTUAL VAL. | Eq. Fact. | ASSESSMENT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 PLANT & OFFICE | 1 S. BLK. | 125X160 | 10480<br>9804 | III | 1962 | EXISTING | | 260049 | 5 | 247616 | | | 30 | 74285 |
| 2 PAVING | | | 19500 | 25 | [illegible] | | | 4875 | | 4875 | | | 30 | [illegible] |
| 3 ~~WARE~~ HOUSE | (New Add'T) | 160⁶x125 | 20,075 | 10.95 | 1969 | new | | 219821 | 3 | 213226 | | | 30 | 6396 |
| 4 PAVING | (ADDiTional Parking) | | 27,500 | 30 | 1969 | | | | | 8250 | | | 30 | 2480 |
| 5 [illegible] | | | | | | | | | | 1300 | | | 30 | 3900 |
| | | | | | | | | | | | | TOTAL | | 146,10 |

Standard N Y B T.U. Form 8004 10M 11-84 -Quitclaim Deed - Individual or Corporation (Single Sheet)

09:115

②

CONSULT YOUR LAWYER BEFORE SIGNING THIS INSTRUMENT — THIS INSTRUMENT SHOULD BE USED BY LAWYERS ONLY

THIS INDENTURE, made the 16 day of January, nineteen hundred and ninety

BETWEEN

JEROME JOHNSON, as Escrow Agent for undisclosed
principals, 53 Burd Street, Nyack, NY 10960

party of the first part, and

MATERIALS RESEARCH CORPORATION, a domestic corporation,
having a place of business at Route 303,
Orangeburg, NY 10962

party of the second part,

See 80 Blk 742 Lot 2

$10.00

WITNESSETH, that the party of the first part, in consideration of ten dollars paid by the party of the second part, does hereby remise, release and quitclaim unto the party of the second part, the heirs or successors and assigns of the party of the second part forever,

ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the

SEE SCHEDULE "A" ATTACHED HERETO AND MADE A PART HEREOF

Also designated on the Town of Orangetown Tax Maps as
Section 80, Block 742, Lot 2

TOGETHER with all right, title and interest, if any, of the party of the first part of, in and to any streets and roads abutting the above described premises to the center lines thereof; TOGETHER with the appurtenances and all the estate and rights of the party of the first part in and to said premises; TO HAVE AND TO HOLD the premises herein granted unto the party of the second part, the heirs or successors and assigns of the party of the second part forever.

AND the party of the first part, in compliance with Section 13 of the Lien Law, hereby covenants that the party of the first part will receive the consideration for this conveyance and will hold the right to receive such consideration as a trust fund to be applied first for the purpose of paying the cost of the improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purpose.

The word "party" shall be construed as if it read "parties" whenever the sense of this indenture so requires.

IN WITNESS WHEREOF, the party of the first part has duly executed this deed the day and year first above written.

IN PRESENCE OF:

Jerome Johnson

JEROME JOHNSON, as Escrow Agent
for undisclosed principals

BOOK 0391 PAGE 133[illegible]

STATE OF NEW YORK, COUNTY OF ROCKLAND ss.:

On the 16 day of January 19 90, before me personally came
JEROME JOHNSON

to me known to be the individual described in and who executed the foregoing instrument, and acknowledged that he executed the same.

Rita Callan
Notary Public

RITA CALLAN
Notary Public, State of New York
No 4779316
Qualified in Rockland County 71
Commission Expires September 30, 1990

STATE OF NEW YORK, COUNTY OF ss.:

On the day of 19 , before me personally came

to me known to be the individual described in and who executed the foregoing instrument, and acknowledged that executed the same.

STATE OF NEW YORK, COUNTY OF ss.:

On the day of 19 , before me personally came
to me known, who, being by me duly sworn, did depose and say that he resides at No. ;

that he is the
of
, the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the board of directors of said corporation, and that he signed h name thereto by like order.

STATE OF NEW YORK, COUNTY OF ss.:

On the day of 19 , before me personally came
the subscribing witness to the foregoing instrument, with whom I am personally acquainted, who, being by me duly sworn, did depose and say that he resides at No. ;

that he knows

to be the individual described in and who executed the foregoing instrument; that he, said subscribing witness, was present and saw execute the same; and that he, said witness, at the same time subscribed h name as witness thereto.

# Quitclaim Deed

TITLE NO.

JEROME JOHNSON, as Escrow Agent
for undisclosed principals
TO
MATERIALS RESEARCH CORPORATION

STANDARD FORM OF NEW YORK BOARD OF TITLE UNDERWRITERS
*Distributed by*
**HOME TITLE DIVISION**
**CHICAGO TITLE**
**INSURANCE COMPANY**

SECTION 80
BLOCK 742
LOT 2
COUNTY OR TOWN Orangetown

Recorded at Request of
Home Title Division
CHICAGO TITLE INSURANCE COMPANY

Return by Mail to

FRANK DAVIS, Esq.
Curtis, Mallet-Prevost
101 Park Avenue
New York, NY 10178-0061
Zip No.

SPACE FOR USE OF RECORDING OFFICE

BOOK 0391 PAGE 1336

## DESCRIPTION

ALL that certain tract, piece or parcel of land, situate, lying and being in the Town of Orangetown, County of Rockland and State of New York, more particularly bounded and described as follows:

BEGINNING at the intersection of the westerly line of Route #303 with the northerly line of Glenshaw Street as said street is laid out and described in a deed made by Karl F. Kirchner to the Town of Orangetown recorded in Liber 721 of conveyances at page 565; and from thence running (1) along the westerly line of Route #303 North 18° 01' 50" West 258.61 feet to a corner; thence (2) South 84° 04' 40" West 504.19 feet to a corner; thence (3) South 04° 30' 22" East 298.00 feet to the northerly line of Glenshaw Street; thence (4) along said northerly line of Glenshaw Street North 75° 22' 20" East 204.18 feet to a point; thence (5) still along said northerly line of Glenshaw Street North 81° 36' 20" East 363.95 feet to the point or place of beginning.

Said parcel being more particularly described according to a survey made by Henry Horowitz, P.E., P.L.S., dated February 25, 1981 and last revised March 29, 1988, as follows:

ALL that certain lot, piece or parcel of land, situate, lying and being in the Town of Orangetown, County of Rockland, State of New York, being more particularly bounded and described as follows:

BEGINNING at the intersection of the westerly line of Route #303 with the northerly line of Glenshaw Street as said street is laid out and described in a Deed made by Karl F. Kirchner to the Town of Orangetown recorded in Liber 721 cp 565; and from thence running:

(1) along the westerly line of Route #303 North 22° 16' 52" West 256.81 feet to a corner; thence

(2) South 79° 49' 38" West 504.20 feet to a corner; thence

(3) South 08° 45' 24" East 298.00 feet to the northerly line of Glenshaw Street; thence

(4) along said northerly line of Glenshaw Street North 71° 07' 18" East 204.18 feet to a point; thence

(5) still along said northerly line of Glenshaw Street North 77° 19' 18" East 363.95 feet to the point or place of beginning.

2/962

**ROCKLAND COUNTY CLERK**
**LAND RECORDS DIVISION**
**RECORDING PAGE**

02646

NUMBER OF INSTRUMENTS: 1

TOTAL AMT. RECEIVED: $ 931-

RECEIVED FROM:

- AMERICAN
- COTTAGE
- COLONIAL
- DUFFY
- ELLNER
- CHAS DEMPSTER
- FIRST ABSTRACT
- HERITAGE
- NY ABSTRACT
- JADE
- LAND SERVICES
- LAURA
- LEGEND
- MC CALL
- MONTE
- RAMAPO ABSTRACT
- RECORD DATA
- ROCKWEST
- SAC TITLE
- SELLICK
- STATE ABSTRACT
- TICOR
- U.S. LIFE (TITLE USA)
- WESTSHORE ABSTRACT

[✓ OTHER:] CTI Abstract

TYPE OF INSTRUMENT: Deed

RECORDINGS FEE: $ 20-

AFFIDAVIT: $ 6-

RECORD RETENTION $ 5.00

TRANSFER TAX: $ 900-

MORTGAGE TAX: $

Condo

1-2 Family

Commercial

TOTAL MTG TAX: $

CASH -- [✓ CHECK] -- CHARGE

NO FEE--EXEMPT

AMT. OF MORTGAGE: $

MORTGAGE TYPE:

A----B----C----D----E

- 01 CLARKSTOWN
- 02 HAVERSTRAW
- 03 ORANGETOWN
- 04 RAMAPO
- 05 STONY POINT
- 09 UNKNOWN

TRANSFER TAX #

RECEIVED
$ 900.--
REAL ESTATE
JAN 17 1990
TRANSFER TAX
ROCKLAND
COUNTY

JAN 17 1990

Serial No. CC __________ Date

RECEIVED TAX ON ABOVE MO

TOTAL $

Edward Gorman

EDWARD GORMAN, COUNTY CLERK
ROCKLAND COUNTY

RECORD & RETURN TO:

ENVELOPE SUBMITTED

I HEREBY CERTIFY THAT THE WITHIN AND FOREGOING WAS RECORDED IN THE CLERK'S OFFICE FOR ROCKLAND CO., NY
JAN 17 1990 AT 12:05
IN LIBER 391 PAGE 1335 OF LAND RECORDS.

Edward Gorman

COUNTY CLERK, ROCKLAND COUNTY

BOOK 0391 PAGE 1339

lvw
#1150-SCS

LIBER 807 PAGE 600 02905

as of

THIS INDENTURE, Made/the 28th day of January , in the year of our Lord, One Thousand Nine Hundred Sixty-five, Between PEOPLES TRUST COMPANY OF BERGEN COUNTY, as Trustee for "The Profit Sharing Plan of JOS. L. MUSCARELLE, INC." under Agreement dated December 2, 1954, having its Principal Office at 210 Main Street, in the City of Hackensack, County of Bergen, and State of New Jersey, Party of the First Part, and NATIONAL COMMUNITY BANK OF RUTHERFORD, as Successor Trustee for "The Profit Sharing Plan of JOS. L. MUSCARELLE, INC." under Agreement dated December 2, 1954, as Amended, having its Principal Office at 24 Park Avenue, in the Borough of Rutherford, County of Bergen, and State of New Jersey, Party of the Second Part,

WITNESSETH, That the Party of the First Part, in consideration of One Dollar and other good and valuable considerations, lawful money of the United States paid by the Party of the Second Part, and by the Party of the Second Part taking title subject to the Mortgage and Leases referred to below, does hereby grant and release unto the said Party of the Second Part, its successors or assigns, All right, title and interest of the Party of the First Part of, in and to, the building and improvements erected, constructed and at the expense of the said JOS. L. MUSCARELLE, INC., upon the following premises:

Situate, lying and being in the Town of Orangetown, County of Rockland, State of New York, more particularly described as follows:

BEGINNING at the intersection of the Westerly line of Route #303 with the Northerly line of Glenshaw Street as said street is laid out and described in a Deed made by Karl F. Kirchner to the Town of Orangetown recorded in Liber 721 Cp 565; and from thence running (1) along the Westerly line of Route #303 North 18 degrees 01 minutes 50 seconds West 256.81 Feet to a corner; thence (2) South 84 degrees 04 minutes 40 seconds West 504.19 Feet to a corner; thence (3) South 04 degrees 30 minutes 22 seconds East 298.00 Feet to the Northerly line of Glenshaw Street; thence (4) along said Northerly line of Glenshaw Street North 75 degrees 22 minutes 20 seconds East 204.18 Feet to a point; thence (5) still along said Northerly line of Glenshaw Street North 81 degrees 34 minutes 20 seconds East 363.95 Feet to the point or place of BEGINNING.

Being the same premises described in a certain Lease made by Karl F. Kirchner to Jos. L.Muscarelle,Inc., dated August 15, 1961, recorded August 28, 1961, in Liber 735 of Conveyances at page 293, in the Office of the Clerk of the County of Rockland, New York.

And being the same premises conveyed in a certain Deed made by Jos. L. Muscarelle, Inc. to Peoples Trust Company of Bergen County, a New Jersey Banking Corporation, having its principal office at 210 Main Street, Hackensack, New Jersey, as Trustee for Profit Sharing Plan of Jos. L. Muscarelle,Inc., under Agreement dated December 2, 1954, dated and acknowledged as of February 1, 1963, and recorded in the Clerk's Office of Rockland County, State of New York, on February 4, 1963 in Liber 756 of Deeds, at page 754&c.

The consideration for the foregoing Deed is less than One Hundred Dollars ($100.00), and therefore not subject to United States Documentary Revenue Stamps, in that the purpose of the Deed is to transfer Title from the Grantor in a Fiduciary capacity to a Successor Fiduciary Grantee, in a like capacity.

TO HAVE AND TO HOLD the said right, title and interest of the Party of the First Part, hereby granted, unto the Party of the Second Part, its successors and assigns, forever.

SUBJECT, however, to the following:

1. The lien of a First Mortgage made by JOS. L. MUSCARELLE, INC., and KARL F. KIRCHNER, to THE MUTUAL BENEFIT LIFE INSURANCE COMPANY, dated June 28, 1962 and given to secure the original amount of $175,000.00.

2. A 99 year Lease for land only, dated August 15, 1961, between KARL F. KIRCHNER, as Lessor and JOS.L.MUSCARELLE, Inc., as Lessee, which Lease runs for a period from February 1, 1962 to August 4, 2060.

3. A Sub-Lease for land and building improvements thereon, dated August 15, 1961, between JOS. L. MUSCARELLE, INC., as Lessor and MATERIALS RESEARCH CORPORATION, as Lessee, for an initial term of twenty-five years and extensions thereof.

4. A certain Agreement dated August 15, 1961, between KARL F. KIRCHNER, as Lessor, JOS. L. MUSCARELLE, INC., as Sublessor and MATERIALS RESEARCH CORPORATION, as Sublessee.

AND the party of the First Part, in compliance with Section 13 of the Lien Law, covenants that the Party of the

LIBER 807 PAGE 602

First Part will receive the consideration for this conveyance and will hold the right to receive such consideration as a Trust Fund, to be applied first for the purpose of paying the cost of the improvement and will apply the same first to the payment of the cost of the improvement before using any part of the total of the same for any other purpose.

IN WITNESS WHEREOF, the Party of the first Part has duly executed this Deed, the day and year first above written.

PEOPLES TRUST COMPANY OF BERGEN COUNTY,
as Trustee for "The Profit Sharing Plan of
JOS. L. MUSCARELLE, INC." under Agreement
dated December 2, 1954
By:

Asst. Vice President
H. S. STOTTER

ATTEST:

Eleanore Jacod
Asst. Secretary
ELEANORE JACOD

STATE OF NEW JERSEY :
SS:
COUNTY OF BERGEN :

On the 2nd day of March, 1966, before me personally came HARRY S. STOTTER to me known, who being by me duly sworn, did depose and say that he resides at 217 Taylor Road, Paramus, N.J. that he is the Asst. Vice President of PEOPLES TRUST COMPANY OF BERGEN COUNTY, as Trustee for "The Profit Sharing Plan of JOS. L. MUSCARELLE, INC." under Agreement dated December 2, 1954, the Corporation described in and which executed the above Instrument; that he knows the Seal of said Corporation; that the Seal affixed to said Instrument is such Corporate Seal; that it was so affixed by order of the Board of Directors of said Corporation, and that he signed his name thereto by like order.

Catherine H. Patwell

CATHERINE H. PATWELL
NOTARY PUBLIC OF NEW JERSEY
MY COMMISSION EXPIRES AUG. 26, 1969

**STATE OF NEW JERSEY**
**COUNTY OF BERGEN** } ss.

I, ALEXANDER ALLAN, Clerk of the County of Bergen (and also Clerk of the County Court of Bergen County, the same being a Court of Record of the aforesaid County, having by law a seal)

DO HEREBY CERTIFY, That CATHERINE H. PATWELL Esquire, whose name is subscribed to the attached certificate of acknowledgment, proof or affidavit, was at the time of taking said acknowledgment, proof or affidavit, a NOTARY PUBLIC, duly commissioned and sworn and residing in said State, and was, as such NOTARY PUBLIC, an officer of said State duly authorized by the laws thereof to take and certify the same, as well as to take and certify the proof and acknowledgment of deeds for the conveyance of land, tenements or hereditaments, and other instruments in writing to be recorded in said State, and that the said acknowledgment is duly executed and taken according to the laws of said State, and that full faith and credit are and ought to be given to his official acts; and I further certify that I am well acquainted with his handwriting and verily believe the signature to the attached certificate is his genuine signature.

And I do further certify that the impression of the seal of such NOTARY PUBLIC is not required by the laws of this State to be filed in my office.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal this 11th day of April A. D. 19 66

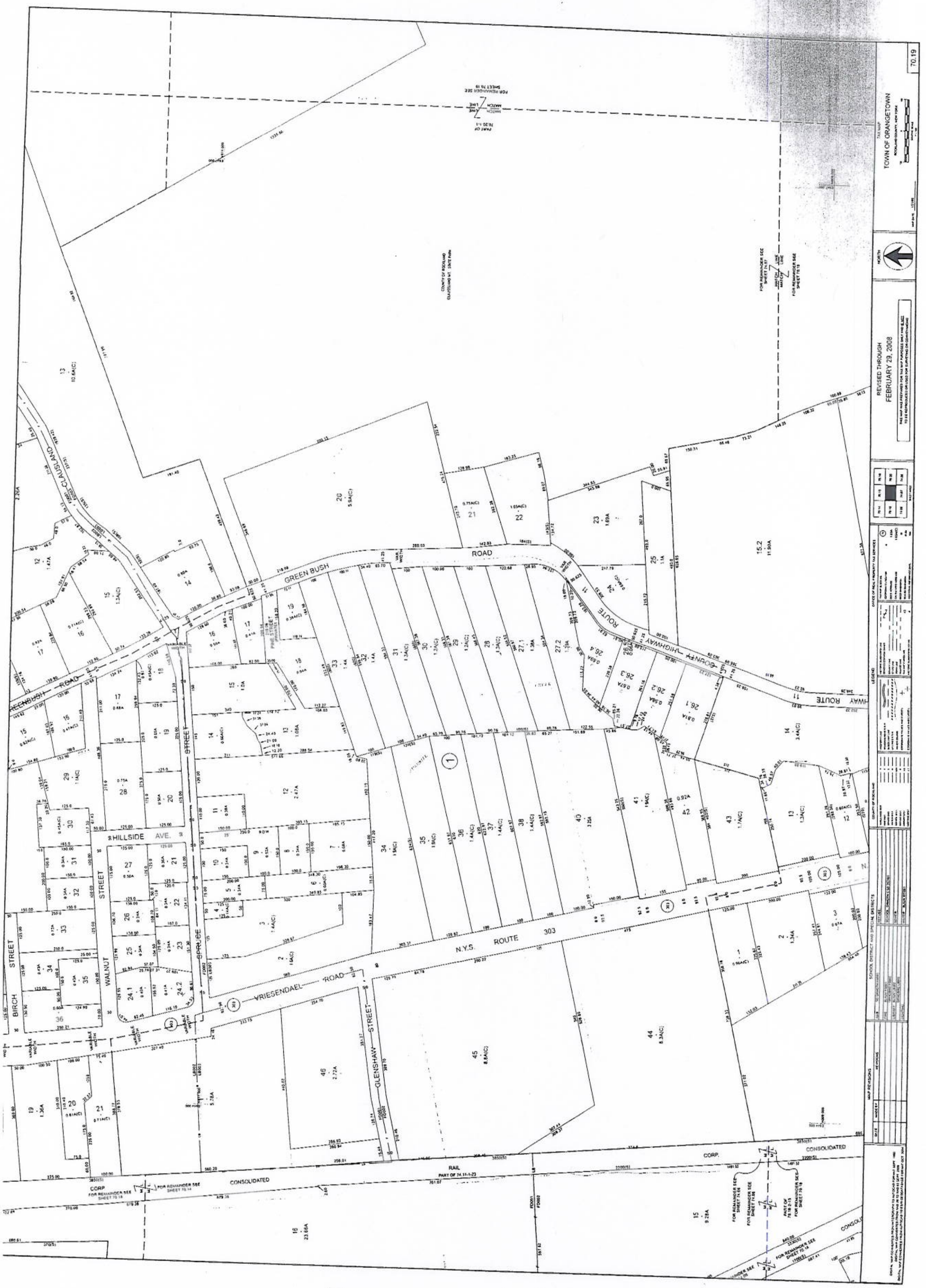
Alexander Allan Clerk

By: William M. Einreinhofer Deputy
William M. Einreinhofer

RECORDED APR 15 1966 9:00 A.M.

August H. Hansen, CLERK

LIBER 507 PAGE 603

TAX MAP
TOWN OF ORANGETOWN
ROCKLAND COUNTY, NEW YORK
70.19
NORTH
REVISED THROUGH
FEBRUARY 29, 2008
GREEN BUSH ROAD
COUNTY HIGHWAY ROUTE 11
N.Y.S. ROUTE 303
VRIESENDAEL ROAD
SPRUCE STREET
WALNUT STREET
BIRCH STREET
HILLSIDE AVE.
GLENSHAW STREET
CLAUSLAND
PINE STREET
CONSOLIDATED RAIL CORP.
COUNTY OF ROCKLAND
CLAUSLAND MT. STATE PARK
MATCH LINE
FOR REMAINDER SEE SHEET 70.15
FOR REMAINDER SEE SHEET 70.18
FOR REMAINDER SEE SHEET 70.14
FOR REMAINDER SEE SHEET 74.07
FOR REMAINDER SEE SHEET 74.08
20 5.5A(C)
21 0.75A(C)
22 1.05A(C)
23 1.69A
15.2 11.90A
14 3.4A(C)
13 10.6A(C)
40 3.25A
44 8.3A(C)
45 8.8A(C)
46 2.72A
16 23.66A
15 9.28A
LEGEND
SCHOOL DISTRICT AND SPECIAL DISTRICTS
MAP REVISIONS

# APPENDIX II

# SANBORN INQUIRY

Environmental Data Resources, Inc.
an edr™ company

"Linking Technology with Tradition"

# Sanborn™ Map Report

**Ship to:** Michael Manolakas
Leggette, Brashears & Graham
126 Monroe Turnpike
Trumbull, CT 06611

1011889KJG 203-452-3110

**Order Date:** 8/10/1999 **Completion Date:** 08/11/1999
**Inquiry #:** 399816.2S
**P.O. #:** NA
**Site Name:** Materials Research Corporation
**Address:** 542 Route 303
**City/State:** Orangetown, NY 10962
**Cross Streets:** Glenshaw Street

This document reports that the largest and most complete collection of Sanborn fire insurance maps has been reviewed based on client-supplied information, and fire insurance maps depicting the target property at the specified address were not identified.

## NO COVERAGE

---

All maps provided pursuant to a Sanborn™ Map Report are currently reproducible of fire insurance maps owned or licensed by Environmental Data Resources, Inc. NO WARRANTY, EXPRESSED OR IMPLIED IS MADE WHATSOEVER. ENVIRONMENTAL DATA RESOURCES, INC. SPECIFICALLY DISCLAIMS THE MAKING OF ANY SUCH WARRANTIES, INCLUDING WITHOUT LIMITATION, WARRANTIES AS TO ACCURACY, VALIDITY, COMPLETENESS, SUITABILITY, CONDITION, QUALITY, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR USE OR PURPOSE WITH RESPECT TO THE REPORT, THE MAPS, THE INFORMATION CONTAINED THEREIN, OR THE RESULTS OF A SEARCH OR OTHERWISE. ALL RISK IS ASSUMED BY THE USER. Environmental Data Resources, Inc. assumes no liability to any party for any loss or damage whether arising out of errors or omissions, negligence, accident or any other cause. In no event shall Environmental Data Resources, Inc., its affiliates or agents, be liable to anyone for special, incidental, consequential or exemplary damages.

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# APPENDIX III

# GEOLOGIC CROSS SECTIONS

# APPENDIX III

## TABLE 1

## FORMER MATERIAL RESEARCH CORPORATION
542 ROUTE 303
ORANGETOWN, NEW YORK

---

### Summary of On Site Monitor Well Construction Details

| Well ID | Date Installed | Well Diameter | Screen Slot Size | Total Casing Depth (feet) | Total Boring Depth (feet) | Depth to Rock (feet) | Screen Setting (ft bg) | Surveyed PVC Elevation (ft msl) | Depth to Water (ft btoc) 8/29/2010 |
|---|---|---|---|---|---|---|---|---|---|
| **Overburden Wells** | | | | | | | | | |
| MW-1 | 7/9/1999 | 2-inch | 10 | 17 | 17 | 17[1/] | 12-17 | 116.79 | 16.5 |
| MW-2 | 7/9/1999 | 2-inch | 10 | 20 | 20 | -- | 10-20 | 120.37 | Destroyed |
| MW-3S | 7/9/1999 | 2-inch | 10 | 20 | 20 | -- | 10-20 | 115.92 | 5.91 |
| MW-3D | 4/4/2002 | 2-inch | 10 | 45 | 52 | 50 | 30-45 | 115.95 | 6.45 |
| MW-4S | 7/9/1999 | 2-inch | 10 | 15 | 15 | -- | 5-15 | 111.79 | 6.15 |
| MW-4D | 3/26/2002 | 2-inch | 10 | 38 | 42 | 42 | 23-38 | 111.77 | 6.22 |
| MW-5S | 9/8/1999 | 2-inch | 10 | 20 | 20 | -- | 10-20 | -- | NM |
| MW-5D | 9/8/1999 | 2-inch | 10 | 45 | 48.25 | 48 | 25-45 | -- | NM |
| MW-6S | 9/8/1999 | 2-inch | 10 | 20 | 20 | -- | 10-20 | -- | NM |
| MW-6D | 9/8/1999 | 2-inch | 10 | 41.5 | 44.25 | 44 | 26.5-41.5 | -- | NM |
| MW-7S | 4/2/2002 | 2-inch | 10 | 20 | 20 | -- | 5-20 | 115.13 | 5.62 |
| MW-7D | 4/2/2002 | 2-inch | 10 | 40 | 44.5 | 44 | 25-40 | 115.00 | 6.25 |
| MW-8S | 4/3/2002 | 2-inch | 10 | 20 | 20 | -- | 5-20 | 114.63 | 8.53 |
| MW-8D | 4/4/2002 | 2-inch | 10 | 46.5 | 52 | 50 | 30.5-46.5 | 115.20 | 6.14 |
| MW-9S | 4/4/2002 | 2-inch | 10 | 20 | 20 | -- | 5-20 | 115.21 | 6.75 |
| MW-9D | 4/4/2002 | 2-inch | 10 | 44 | 47 | 47 | 29-44 | 114.51 | 6.28 |
| MW-10S | 3/28/2002 | 2-inch | 10 | 20 | 20 | -- | 5-20 | 111.45 | 7.44 |
| MW-10D | 3/28/2002 | 2-inch | 10 | 38 | 47 | 42 | 23-38 | 111.27 | 7.95 |
| MW-11S | 3/28/2002 | 2-inch | 10 | 20 | 20 | -- | 5-20 | 109.94 | 10.25 |
| MW-11D | 3/28/2002 | 2-inch | 10 | 35 | 42 | 38 | 25-35 | 109.82 | 10.51 |
| MW-12 | 3/26/2002 | 2-inch | 10 | 30 | 34 | 34 | 15-30 | 108.20 | 13.85 |
| MW-13 | 3/27/2002 | 2-inch | 10 | 30 | 37 | 35 | 15-30 | 109.63 | 13.79 |
| MW-14S | 3/29/2002 | 2-inch | 10 | 19 | 20 | -- | 4-19 | 110.90 | 5.78 |
| MW-14D | 3/29/2002 | 2-inch | 10 | 37 | 40.5 | 40 | 22-37 | 111.08 | 7.29 |

# APPENDIX III

# TABLE 1

# FORMER MATERIAL RESEARCH CORPORATION
542 ROUTE 303
ORANGETOWN, NEW YORK

---

## Summary of On Site Monitor Well Construction Details

| Well ID | Date Installed | Well Diameter | Screen Slot Size | Total Casing Depth (feet) | Total Boring Depth (feet) | Depth to Rock (feet) | Screen Setting (ft bg) | Surveyed PVC Elevation (ft msl) | Depth to Water (ft btoc) 8/29/2010 |
|---|---|---|---|---|---|---|---|---|---|
| MW-15S | 5/31/2006 | 2-inch | 10 | 20 | 20 | -- | 10-20 | 107.92 | 12.46 |
| MW-16S | 6/5/2006 | 2-inch | 10 | 20 | 24 | -- | 10-20 | 107.97 | 13.13 |
| MW-17S | 5/30/2006 | 2-inch | 10 | 20.5 | 20 | -- | 10.5-20.5 | 108.35 | 13.95 |
| MW-17D | 5/31/2006 | 2-inch | 10 | 28 | 29 | 28.5 | 23-28 | 108.34 | 14.51 |
| MW-18 | 8/14/2006 | 2-inch | 10 | 18 | 19 | -- | 8-18 | 108.49 | 11.27 |
| MW-19 | 8/14/2006 | 2-inch | 10 | 20 | 21 | -- | 10-20 | 108.73 | 9.59 |
| MW-20 | 8/14/2006 | 2-inch | 10 | 20 | 22 | 22 | 10-20 | 108.70 | 12.23 |
| MW-21 | 8/15/2006 | 2-inch | 10 | 20 | 21 | -- | 10-20 | 108.25 | 13.78 |
| MW-22 | 8/15/2006 | 2-inch | 10 | 22 | 23.5 | -- | 7-22 | 108.28 | 14.6 |
| MW-23I | 6/26/2010 | 2-inch | 10 | 24 | 34 | -- | 24-34 | 115.65 | 9.66 |
| MW-24I | 7/18/2010 | 2-inch | 10 | 6 | 21 | -- | 6-21 | 115.61 | 6.14 |
| MW-25I | 7/25/2010 | 2-inch | 10 | 12 | 22 | -- | 12-22 | 115.60 | 7.67 |
| MW-26I | 8/15/2010 | 2-inch | 10 | 14 | 24 | -- | 14-24 | 115.47 | 8.27 |
| MW-27S | 10/13/2012 | 2-inch | 10 | 25 | 25 | -- | 5-25 | NA | NA |
| MW-27D | 10/13/2012 | 2-inch | 10 | 42 | 42 | -- | 22-42 | NA | NA |
| IW-1 | 10/20/2012 | 4-inch | 20 | 42 | 42 | -- | 7-42 | NA | NA |
| EW-1 | 9/29/2012 | 2-inch | 20 | 42 | 42 | -- | 7-42 | NA | NA |
| EW-2 | 9/30/2012 | 2-inch | 20 | 42 | 42 | -- | 7-42 | NA | NA |
| EW-3 | 9/22/2012 | 2-inch | 20 | 42 | 42 | -- | 7-42 | NA | NA |
| EW-4 | 9/23/2012 | 2-inch | 20 | 42 | 42 | -- | 7-42 | NA | NA |
| EW-5 | 12/13/2013 | 2-inch | 20 | 28 | 28 | 28 | 13-18; 21-28 | NA | NA |
| EW-6 | 12/12/2013 | 2-inch | 20 | 28 | 28 | 28 | 13-18; 21-28 | NA | NA |
| EW-7 | 12/13/2013 | 2-inch | 20 | 28 | 28 | 28 | 13-18; 21-28 | NA | NA |
| EW-8 | 12/16/2013 | 2-inch | 20 | 28 | 28 | 28 | 13-18; 21-28 | NA | NA |
| EW-9 | 12/19/2013 | 2-inch | 20 | 28 | 28 | 28 | 13-18; 21-28 | NA | NA |

# APPENDIX III

# TABLE 1

# FORMER MATERIAL RESEARCH CORPORATION
542 ROUTE 303
ORANGETOWN, NEW YORK

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## Summary of On Site Monitor Well Construction Details

| Well ID | Date Installed | Well Diameter | Screen Slot Size | Total Casing Depth (feet) | Total Boring Depth (feet) | Depth to Rock (feet) | Screen Setting (ft bg) | Surveyed PVC Elevation (ft msl) | Depth to Water (ft btoc) 8/29/2010 |
|---|---|---|---|---|---|---|---|---|---|
| EW-10 | 12/16/2013 | 2-inch | 20 | 25 | 26.5 | 26.5 | 15-25 | NA | NA |
| EW-11 | 12/12/2013 | 2-inch | 20 | 28 | 28 | 26 | 13-18; 21-28 | NA | NA |
| EW-12 | 12/19/2013 | 2-inch | 20 | 28 | 28 | 26 | 13-18; 21-28 | NA | NA |
| EW-13 | 6/20/2014 | 2-inch | 20 | 28 | 28 | 27 | 13-18; 21-28 | NA | NA |
| EW-14 | 6/21/2014 | 2-inch | 20 | 28 | 28 | 26 | 18-28 | NA | NA |
| EW-15 | 6/21/2014 | 2-inch | 20 | 28 | 28 | 26 | 18-28 | NA | NA |
| EW-16 | 6/28/2014 | 2-inch | 20 | 28 | 28 | 26 | 18-28 | NA | NA |
| EW-17 | 6/28/2014 | 2-inch | 20 | 28 | 28 | 26 | 18-28 | NA | NA |
| **Bedrock Wells** | | | | | | | | | |
| MW-1B | 7/14/2006 | 4-inch | None | 49.5 | 150.5 | 19.5 | None | 117.23 | 18.13 |
| MW-3B | 7/19/2006 | 4-inch | None | 82 | 182 | 52 | None | 116.07 | 12.29 |
| MW-7B | 7/21/2006 | 4-inch | None | 75 | 175 | 45 | None | 114.65 | 11.00 |
| MW-8B | 7/25/2006 | 4-inch | None | 82 | 182 | 52 | None | 115.53 | 13.98 |
| MW-10B | 7/27/2006 | 4-inch | None | 77 | 177 | 47 | None | 111.61 | 12.02 |
| MW-12B | 7/18/2006 | 4-inch | None | 50 | 150 | 19 | None | 108.19 | 11.14 |

| | |
|---|---|
| -- | Data unavailable |
| ft bg | Feet below grade |
| ft msl | Feet above mean sea level |
| ft btoc | Feet below top of casing |
| NM | Not measured |

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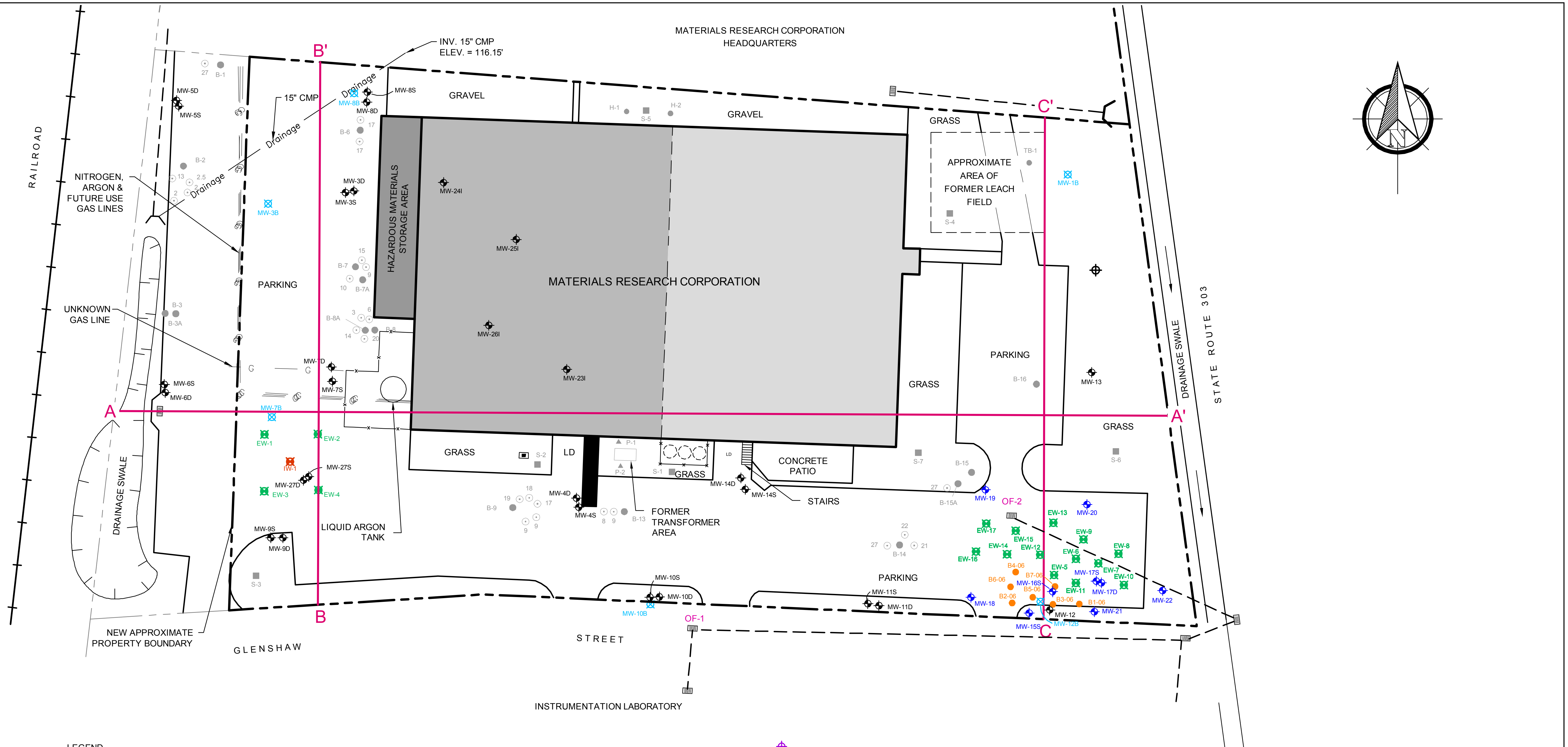


LEGEND

| | | | | | |
|---|---|---|---|---|---|
| ▬ ▬ ▬ | PROPERTY BOUNDARY | MW-12 | MONITOR WELL LOCATION | 21 | SOIL BORING LOCATION WHERE REFUSAL OCCURRED (DEPTH OF REFUSAL) |
| — — — | FORMER PROPERTY BOUNDARY | OF-1 | OUTFALL | IL-MW-7 | APPROXIMATE LOCATION OF EXISTING INSTRUMENTATION LABORATORY MONITOR WELL |
| —x—x— | FENCE | EW-1 | 2-INCH DIAMETER EXTRACTION WELL LOCATION | MW-10B | 2006 BEDROCK MONITOR WELL |
| — — — | STORM-WATER PIPING | IW-1 | 4-INCH DIAMETER INJECTION WELL LOCATION | MW-15S | 2006 OVERBURDEN MONITOR WELL |
| ▪ | STORM-WATER CATCH BASIN | B1-06 | 2006 SOIL BORING LOCATION | | |
| ⊕ | SEWER DISCHARGE pH MONITOR | TB-1 | 1999 HOLLOW STEM AUGER SOIL BORING | | |
| ▣ | TRANSFORMER | H-1 | 1999 HAND AUGER SOIL BORING LOCATION | | |
| ■ | TRASH COMPACTOR | P-1 | 1999 SURFICIAL SOIL SAMPLE LOCATION AND LOCATION OF 2001 PROPOSED HAND AUGER SOIL BORING | | NOTE: WELL LOCATIONS ARE APPROXIMATE. |
| LD | LOADING DOCK | S-1 | SURFICIAL SAMPLE | | |
| ▭ | CONSTRUCTED - 1961 | B-14 | SOIL BORING LOCATION | | |
| ▭ | CONSTRUCTED - 1969 | | | | |
| ▭ | CONSTRUCTED - 1980 | | | | |

0 50
SCALE IN FEET

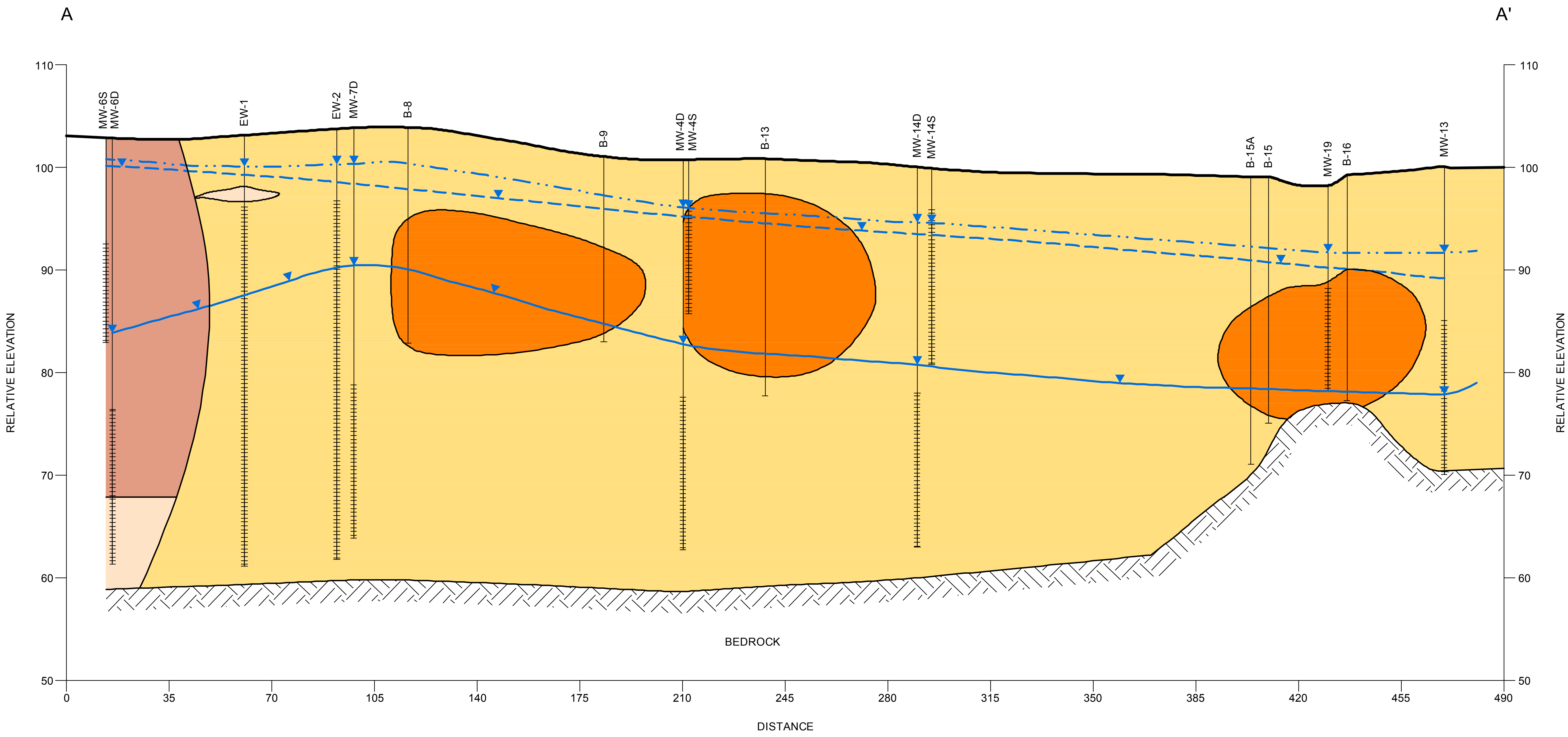
# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

SITE MAP

| DATE | REVISED |
|---|---|
| | |

PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
4 Research Drive
Suite 204
Shelton, Connecticut 06484
(203) 929-8555

DRAWN: RAC CHECKED: KD DATE: 03/19/15 FIGURE: 1



LEGEND

🟨 PRIMARILY CONSISTS OF FINE SAND, SOME SILT

🟧 PRIMARILY CONSISTS OF SILT AND FINE SAND

🟫 PRIMARILY CONSISTS OF SILT AND CLAY

⬜ CLAY

- -▼- - WATER-TABLE ON 9/10/99

—▼— WATER-TABLE ON 4/19/02

-·▼·- WATER-TABLE ON 2/19/13

0 10
VERTICAL SCALE IN FEET

0 35
HORIZONTAL SCALE IN FEET

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## GEOLOGIC CROSS-SECTION A - A'

| DATE | REVISED |
|---|---|
| | |
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PREPARED BY: **LEGGETTE, BRASHEARS & GRAHAM, INC.**
**Professional Groundwater and Environmental Engineering Services**
4 Research Drive
Suite 204
Shelton, Connecticut 06484
(203) 929-8555

DRAWN: RAC CHECKED: KD DATE: 03/20/15 FIGURE: 2

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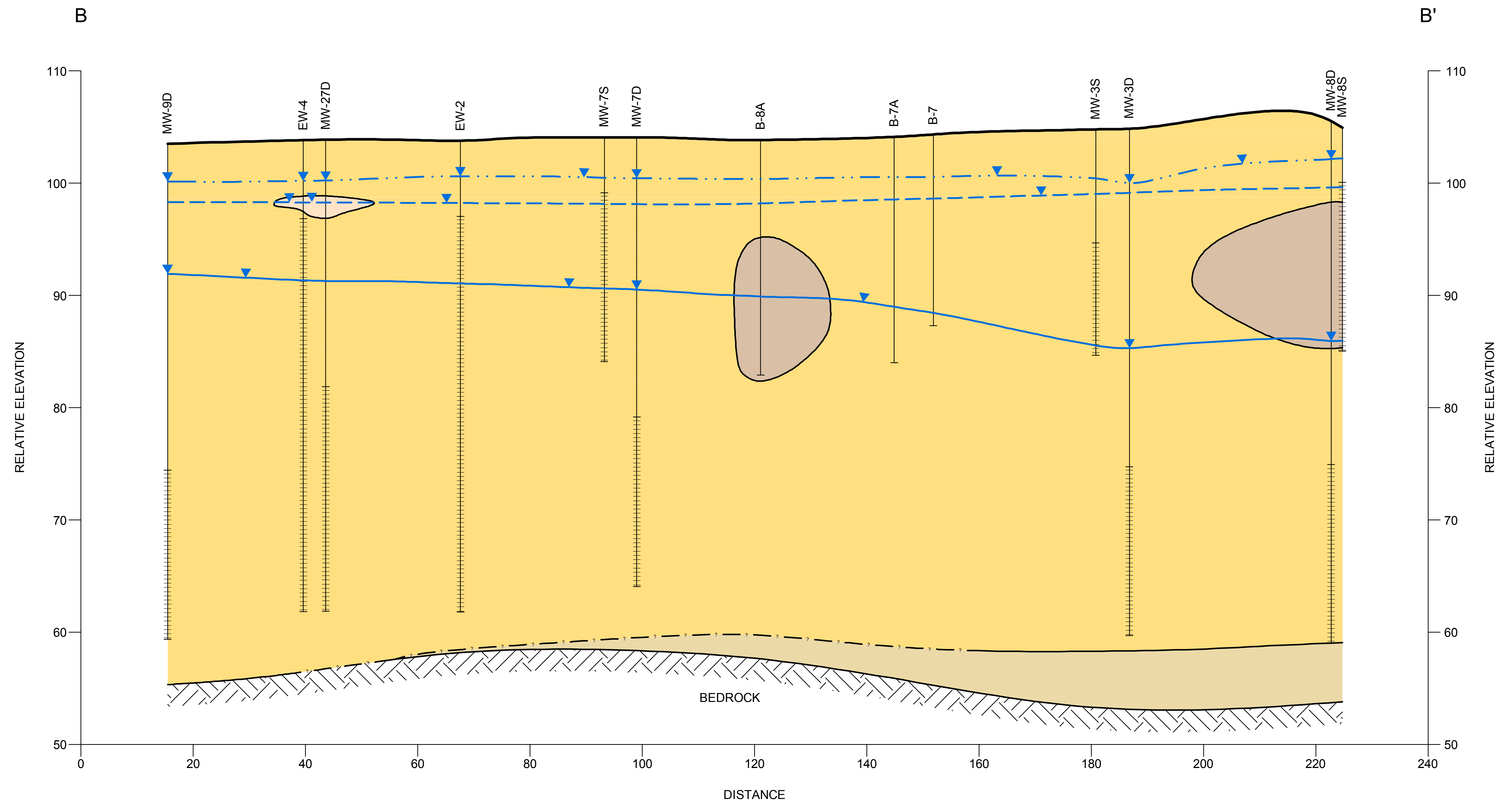

LEGEND

🟨 PRIMARILY CONSISTS OF FINE SAND, SOME SILT

🟫 PRIMARILY CONSISTS OF SILT, SOME FINE SAND

▨ PRIMARILY CONSISTS OF FINE SAND AND SILT

□ CLAY

- -▼- - WATER-TABLE ON 9/10/99

—▼— WATER-TABLE ON 4/19/02

— ·▼· — WATER-TABLE ON 2/19/13

0 10
VERTICAL SCALE IN FEET

0 20
HORIZONTAL SCALE IN FEET

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## GEOLOGIC CROSS-SECTION B - B'

| DATE | REVISED |
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**PREPARED BY:** LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
4 Research Drive
Suite 204
Shelton, Connecticut 06484
(203) 929-8555

**DRAWN:** RAC **CHECKED:** KD **DATE:** 10/23/15 **FIGURE:** 3

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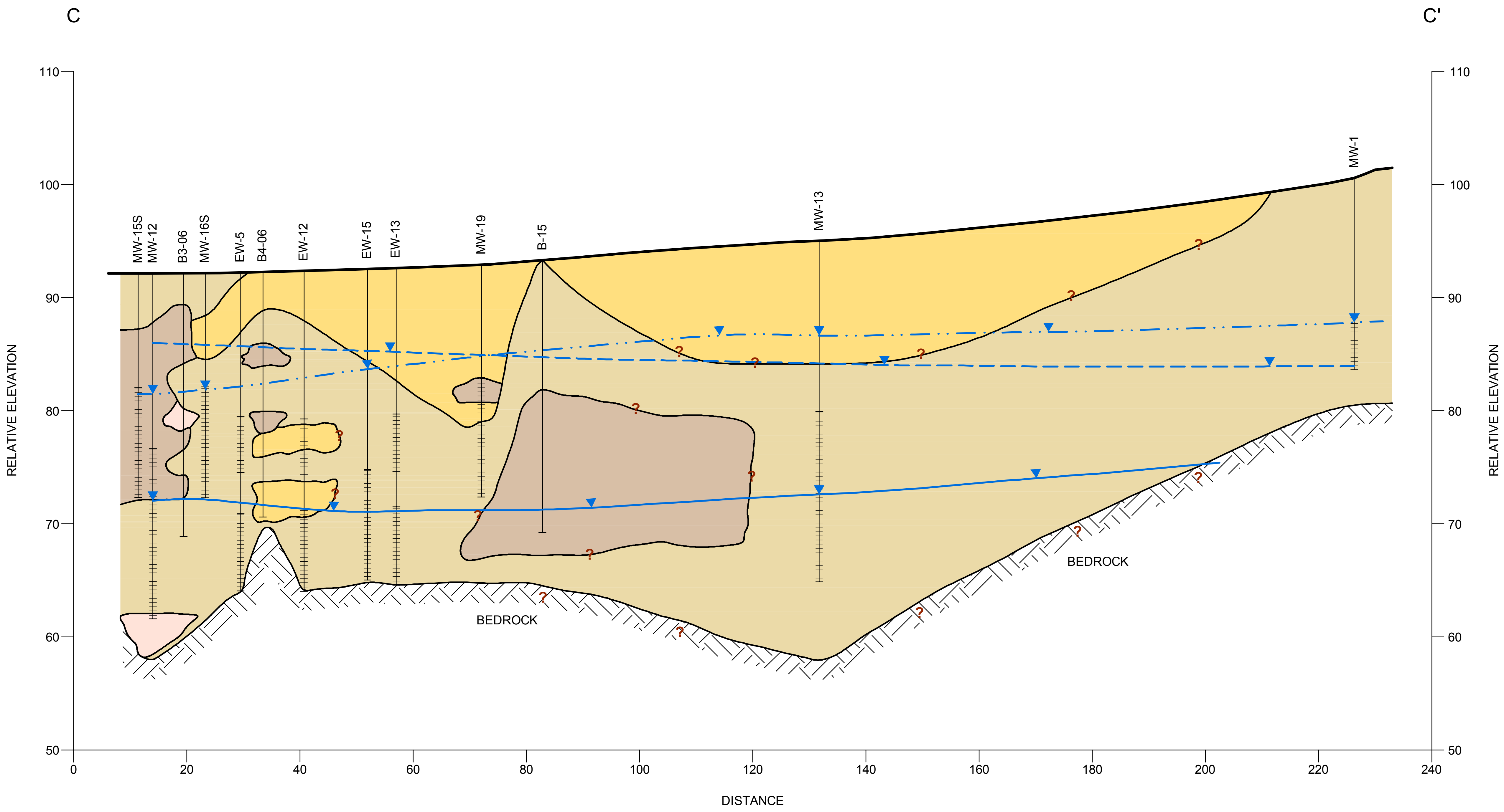

LEGEND

| | |
|---|---|
| 🟨 | PRIMARILY CONSISTS OF FINE SAND, SOME SILT |
| 🟫 | PRIMARILY CONSISTS OF SILT, SOME FINE SAND |
| ▨ | PRIMARILY CONSISTS OF FINE SAND AND SILT |
| ▭ | PRIMARILY CONSISTS OF CLAY, LITTLE SILT |
| - -▼- - | WATER-TABLE ON 9/10/99 |
| —▼— | WATER-TABLE ON 4/19/02 |
| —·▼·— | WATER-TABLE ON 2/19/13 |

0 10
VERTICAL SCALE IN FEET

0 20
HORIZONTAL SCALE IN FEET

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## GEOLOGIC CROSS-SECTION C - C'

| DATE | REVISED |
|---|---|
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PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
4 Research Drive
Suite 204
Shelton, Connecticut 06484
(203) 929-8555

| DRAWN: | RAC | CHECKED: | KD | DATE: | 03/19/15 | FIGURE: | 4 |
|---|---|---|---|---|---|---|---|

GEOLOGIC LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

TRUMBULL, CONNECTICUT

OWNER: SEI

WELL NO.: MW-1

PAGE: 1 OF 1 PAGE

SITE LOCATION: Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:**

**SLOT NO.** 10 **:SETTING:** 12 ft bg to 17 ft bg

**DATE COMPLETED:** July 9, 1999

**DRILLING COMPANY:** Soiltesting Inc.

**DRILLING METHOD:** Hollow Stem Auger

**SAMPLING METHOD:** Split Spoon

**OBSERVER:** Michael Manolakas

**REFERENCE POINT (RP):** Grade

**ELEVATION OF RP:** 91.00 (Relative Datum)

**STICK-UP:**

**SURFACE COMPLETION:** Road box set in cement

**SAND PACK SIZE & TYPE:** Morie No. 1

**SETTING:** 10 ft bg to 17 ft bg

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** 0 ft bg to 12 ft bg

**SEAL TYPE:** Bentonite

**SETTING:** 8 ft bg to 10 ft bg

**BACKFILL TYPE:** Cuttings

**STATIC WATER LEVEL:** ~ 11ft bg

**DEVELOPMENT METHOD:**

**DURATION:** **YIELD:**

**REMARKS:** MW-1 was placed 5 feet south of TB-1

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 10 | C | | | | Sand, fine and silt; trace gravel; compact; reddish brown; dry. |
| 10 | 12 | SS | 20-35-50/5 | 1.5 | 2.2 | SAND, fine; some silt; some medium sand; little clay; compact; reddish brown, damp/wet. |
| 12 | 15 | C | | | | SAND, fine; some silt; some medium sand; little clay; compact; reddish brown, damp/wet. |
| 15 | 17 | SS | 50/5 | 0.5 | 2 | SAND, fine; some silt; some medium sand; little clay; compact; reddish brown, damp/wet. |
| | 17 | | | | | End of boring. |
| | | | | | | |
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|---|---|
| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>WELL NO.: MW-2<br>PAGE: 1 OF 1 PAGE |
| SITE LOCATION: Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.** 10 **:SETTING:** 10 ft bg to 20 ft bg |
| **DATE COMPLETED:** July 9, 1999<br>**DRILLING COMPANY:** Soiltesting Inc. | **SAND PACK SIZE & TYPE:** Morie No. 1<br>**SETTING:** 8 ft bg to 20 ft bg |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:** 2-inch PVC<br>**SETTING:** 0 ft bg to 10 ft bg |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Michael Manolakas | **SEAL TYPE:** Bentonite<br>**SETTING:** 6 ft bg to 8 ft bg |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** 95.53 (Relative Datum) | **STATIC WATER LEVEL:** ~ 12ft bg |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Road box set in cement | **DURATION:** **YIELD:** |

**REMARKS:** Well installed as presumed upgradient monitoring point, therefore no soil samples were collected.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 12 | C | | | | Sand, fine and silt; trace cobbles; compact; reddish brown; damp. |
| 12 | 20 | C | | | | Sand, fine and silt; trace cobbles; compact; reddish brown; damp/wet. |
| | 20 | | | | | End of boring. |
| | | | | | | |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>WELL NO.: MW-3<br>PAGE: 1 OF 1 PAGE |
| SITE LOCATION: Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.** 10 **:SETTING:** 10 ft bg to 20 ft bg |
| **DATE COMPLETED:** July 9, 1999<br>**DRILLING COMPANY:** Soiltesting Inc. | **SAND PACK SIZE & TYPE:** Morie No. 1<br>**SETTING:** 8 ft bg to 20 ft bg |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:** 2-inch PVC<br>**SETTING:** 0 ft bg to 10 ft bg |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Michael Manolakas | **SEAL TYPE:** Bentonite<br>**SETTING:** 6 ft bg to 8 ft bg |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** 90.07 (Relative Datum) | **STATIC WATER LEVEL:** ~ 12 ft bg |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Road box set in cement | **DURATION:** **YIELD:** |

**REMARKS:** MW-3 located at rear of facility near hazardous material loading area.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 3 | C | | | | Sand, fine and silt; compact; reddish brown; dry. |
| 3 | 5 | SS | 20-20-19-22 | 1.5 | 2.6 | SAND, medium; some silt; little clay; compact; reddish brown, damp. |
| 5 | 7 | SS | 34-50/3 | 0.75 | 0 | SAND, medium; some silt; little clay; compact; reddish brown, damp. |
| 7 | 10 | C | | | | SAND, medium; some silt; little clay; compact; reddish brown, damp. |
| 10 | 12 | SS | 35-48-50/2 | 0.75 | 0 | SAND, medium; some silt; little clay; compact; reddish brown, damp. |
| 12 | 20 | C | | | | SAND, medium; some silt; little clay; compact; reddish brown, damp. |
| | 20 | | | | | End of boring. |
| | | | | | | |
| | | | | | | |

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|---|---|
| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO.:** MW-3D<br>**PAGE:** 1 **OF** 2 **PAGE** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.** 10 **:SETTING:** 45 ft bg to 30 ft bg |
| **DATE COMPLETED:** April 4, 2002 | **SAND PACK SIZE & TYPE:** FilterSil 00 |
| **DRILLING COMPANY:** Soiltesting Inc. | **SETTING:** 45.5 ft bg to 28 ft bg<br>**CASING SIZE & TYPE:** 2-inch PVC |
| **DRILLING METHOD:** Hollow Stem Auger | **SETTING:** 0 ft bg to 30 ft bg |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite |
| **OBSERVER:** Andrew Linton | **SETTING:** 28 ft bg to 26 ft bg |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** ~ 19.06ft bg |
| **STICK-UP:** | **DEVELOPMENT METHOD:** Bail Purge |
| **SURFACE COMPLETION:** Road box set in cement | **DURATION:** 3 well volumes **YIELD:** 12 gal |

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 20-23-29-39 | 2.0 | 0.0 | SAND; fine, some silt, little med sand, little gravel, trace clay; brown, some reddish brown; compact. |
| 2 | 5 | C | -- | -- | -- | SAND; fine, some silt, little med sand, little gravel, trace clay; brown, some reddish brown; compact. |
| 5 | 7 | SS | 31-54-52-60 | 2.0 | 0.0 | SAND; fine, little silt, little medium sand, little gravel, trace clay; reddish brown; compact. |
| 7 | 10 | C | -- | -- | -- | SAND; fine, little silt, little medium sand, little gravel, trace clay; reddish brown; compact. |
| 10 | 12 | SS | 27-44-100/5 | 1.65 | 0.0 | SAND; fine, little silt, little gravel, little clay; moist compact; reddish brown. |
| 12 | 15 | C | -- | -- | -- | SAND; fine, little silt, little gravel, little clay; moist compact; reddish brown. |
| 15 | 17 | SS | 59-112/6 | 1.40 | 0.0 | SAND; fine, little silt, little gravel, trace clay,:compact; reddish brown. |
| 17 | 20 | C | -- | -- | -- | SAND; fine, little silt, little gravel, trace clay,:compact; reddish brown. |
| 20 | 22 | SS | 60-82-120/6 | 1.25 | 0.0 | SAND; some silt, little clay, little gravel, compact; reddish brown. |

**OWNER:** SEI

**WELL NO.:** MW-3D **PAGE:** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 22 | 25 | C | -- | -- | -- | SAND; some silt, little clay, little gravel, compact; reddish brown. |
| 25 | 27 | SS | 100/3 | 0.40 | 0.0 | SAND; fine, some silt, little clay, little gravel; moist compact; reddish brown. |
| 27 | 30 | C | -- | -- | -- | SAND; fine, some silt, little clay, little gravel; moist compact; reddish brown. |
| 30 | 32 | SS | 127-100/4 | 0.85 | 0.0 | SAND; little - some silt, little clay, little gravel, trace medium sand,; compact, reddish brown. |
| 32 | 35 | C | -- | -- | -- | SAND; little - some silt, little clay, little gravel, trace medium sand,; compact, reddish brown |
| 35 | 37 | SS | 200/6 | 0.55 | 0.0 | SAND; little-some silt, little clay, little gravel, little medium sand; compact moist; reddish brown. |
| 37 | 40 | C | -- | -- | -- | SAND; little-some silt, little clay, little gravel, little medium sand; compact moist; reddish brown. |
| 40 | 42 | SS | 71-75-100/3 | 1.55 | 0.0 | SAND; fine, some medium sand, little silt, trace clay and gravel; moist-wet compact; reddish brown. |
| 42 | 45 | C | -- | -- | -- | SAND; fine, some medium sand, little silt, trace clay and gravel; moist-wet compact; reddish brown. |
| 45 | 47 | SS | 58-91-100/6 | 1.85 | 0.0 | SAND and SILT; fine, some clay, little small gravel; very compact and wet; reddish brown. |
| 47 | 50 | C | -- | -- | -- | SAND and SILT; fine, some clay, little small gravel; very compact and wet; reddish brown. |
| 50 | 52 | SS | 86-49-56-65 | 1.85 | 0.0 | SANDSTONE; decomposed soft sandstone, fine - medium sand, little silt, little clay; compact; reddish brown. |
| | 52 | | | | | End of boring. |

**GEOLOGIC LOG**

**LEGGETTE, BRASHEARS & GRAHAM, INC.**

**TRUMBULL, CONNECTICUT**

**OWNER:** SEI

WELL NO.: MW-4

PAGE: 1 OF 1 PAGE

SITE LOCATION: Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:**
**SLOT NO.** 10 **:SETTING:** 5 ft bg to 15 ft bg

**DATE COMPLETED:** July 9, 1999

**DRILLING COMPANY:** Soiltesting Inc.

**SAND PACK SIZE & TYPE:** Morie No. 1
**SETTING:** 3 ft bg to 15 ft bg

**CASING SIZE & TYPE:** 2-inch PVC
**SETTING:** 0 ft bg to 5 ft bg

**DRILLING METHOD:** Hollow Stem Auger

**SAMPLING METHOD:** Split Spoon

**OBSERVER:** Michael Manolakas

**SEAL TYPE:** Bentonite
**SETTING:** 1 ft bg to 3 ft bg

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:** Cuttings

**ELEVATION OF RP:** 86.00 (Relative Datum)

**STATIC WATER LEVEL:** ~ 3 ft bg

**STICK-UP:**

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Road box set in cement

**DURATION:** **YIELD:**

**REMARKS:** MW-4 located near southwestern loading dock.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 1 | C | | | | SAND, fine; some silt; compact; brown; dry. |
| 1 | 3 | SS | 5-11-13-13 | 1.5 | 2.4 | Sand, fine and silt; compact; reddish brown, damp. |
| 3 | 5 | C | | | | Sand, fine and silt; compact; reddish brown, wet. |
| 5 | 7 | SS | 8-8-12-13 | 2 | 1 | SILT; some clay; compact; brown, wet. |
| 7 | 15 | C | | | | SILT; some clay; compact; brown, wet. |
| | 15 | | | | | End of boring. |
| | | | | | | |
| | | | | | | |

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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO.:** MW-4D<br>**PAGE:** 1 **OF** 2 **PAGE** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.** 10 **:SETTING:** 38 ft bg to 23 ft bg |
| **DATE COMPLETED:** March 26, 2002 | **SAND PACK SIZE & TYPE:** FilterSil 00 |
| **DRILLING COMPANY:** Soiltesting Inc. | **SETTING:** 39 ft bg to 21 ft bg<br>**CASING SIZE & TYPE:** 2-inch PVC |
| **DRILLING METHOD:** Hollow Stem Auger | **SETTING:** 0 ft bg to 23 ft bg |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite |
| **OBSERVER:** Andrew Linton | **SETTING:** 21 ft bg to 19 ft bg |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** 17.88ft bg |
| **STICK-UP:** | **DEVELOPMENT METHOD:** Bail Purge |
| **SURFACE COMPLETION:** Road box set in cement | **DURATION:** 3 well volumes **YIELD:** 6.5 gal |

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 1 | 3 | SS | 7-25-30-22 | 2.0 | 0.0 | SAND; fine, little silt, trace clay, some gravel; compact; reddish brown |
| 3 | 5 | C | -- | -- | -- | SAND; fine, little silt, trace clay, some gravel; compact; reddish brown |
| 5 | 7 | SS | 7-7-15-8 | 2.0 | 0.0 | SAND; fine, some silt, trace clay, medium sand and gravel; compact; reddish brown |
| 7 | 10 | C | -- | -- | -- | SAND; fine, some silt, trace clay, medium sand and gravel; compact; reddish brown |
| 10 | 12 | SS | 30-39-33-30 | 2.0 | 0.0 | SAND; fine, some silt, trace medium sand, gravel and clay; compact; reddish brown |
| 12 | 15 | C | -- | -- | -- | SAND; fine, some silt, trace medium sand, gravel and clay; compact; reddish brown |
| 15 | 17 | SS | 65-50/4 | 1.0 | 0.0 | SAND; fine, silt, trace clay and gravel, large piece gravel; compact; reddish brown |
| 17 | 20 | C | -- | -- | -- | SAND; fine, silt, trace clay and gravel, large piece gravel; compact; reddish brown |
| 20 | 22 | SS | 30-60/3 | 0.89 | 0.0 | SAND; fine, little medium sand, trace gravel and clay; little silt; compact; moist; brown |
| 22 | 25 | C | | | | SAND; fine, silt, little clay; saturated at 23 ft bg; brown. |

**OWNER:** SEI

**WELL NO.:** MW-4D **PAGE:** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 25 | 30 | C | | | | SAND; fine, silt, little clay; trace gravel; wet; brown. |
| 30 | 35 | C | | | | SAND; fine, silt, little clay; trace gravel; wet; brown. |
| 35 | 40 | C | | | | SAND; fine, silt, little clay; trace gravel; wet; brown. brown. |
| 40 | 43 | C | | | | Top 2 feet: SAND; fine, silt, little clay; trace gravel; wet; brown. brown.<br>Bottom 1 foot: SANDSTONE; decomposed soft sandstone, fine to medium sand, little silt, little clay; compact; reddish brown. |
| | 43 | | | | | End of boring. |

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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>WELL NO.: MW-5S<br>PAGE: 1 OF 1 PAGES |
| SITE LOCATION: Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.** 10 **:SETTING:** 10 ft bg to 20 ft bg |
| **DATE COMPLETED:** September 8, 1999 | **SAND PACK SIZE & TYPE:** Morie No. 1<br>**SETTING:** 8 ft bg to 20 ft bg |
| **DRILLING COMPANY:** Soiltesting Inc. | **CASING SIZE & TYPE:** 2-inch PVC |
| **DRILLING METHOD:** Hollow Stem Auger | **SETTING:** 0 ft bg to 10 ft bg |
| **SAMPLING METHOD:** | **SEAL TYPE:** Bentonite |
| **OBSERVER:** Greg Cellamare | **SETTING:** 6 ft bg to 8 ft bg |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** ~ 7 ft bg |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Road box set in cement | **DURATION:** **YIELD:** |

**REMARKS:** Located near western property line. See geologic log of Monitor Well MW-5D for details of geology and photoionization detector measurements.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
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## GEOLOGIC LOG

**LEGGETTE, BRASHEARS & GRAHAM, INC.**

**TRUMBULL, CONNECTICUT**

**OWNER:** SEI

WELL NO.: MW-5D

PAGE: 1 OF 2 PAGES

SITE LOCATION: Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:**

**SLOT NO.** 10 **:SETTING:** 25 ft bg to 45 ft bg

**DATE COMPLETED:** September 8, 1999

**SAND PACK SIZE & TYPE:** Morie No. 1

**SETTING:** 23 ft bg to 45.5 ft bg

**DRILLING COMPANY:** Soiltesting Inc.

**CASING SIZE & TYPE:** 2-inch PVC

**DRILLING METHOD:** Hollow Stem Auger

**SETTING:** 0 ft bg to 25 ft bg

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite

**OBSERVER:** Michael Manolakas/Greg Cellamare

**SETTING:** 21 ft bg to 23 ft bg and 45.5 ft bg to 48 ft bg

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:** Cuttings

**ELEVATION OF RP:**

**STATIC WATER LEVEL:** ~ 7 ft bg

**STICK-UP:**

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Road box set in cement

**DURATION:** **YIELD:**

**REMARKS:** Located on northeast corner of property. Minie Ray used to measure VOCs. Till started at approximately 20 ft bg.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 1 | C | | | | Silt; some fine sand; trace fine to medium gravel; compact; reddish brown; damp. |
| 1 | 3 | SS | 21-32-37-36 | 1.75 | 0 | Silt; some fine sand; trace fine to medium gravel; compact; reddish brown; damp. |
| 3 | 5 | SS | 20-11-12-26 | 1.5 | 0 | Clay, some silt; trace fine gravel; compact; grey; damp. |
| 5 | 10 | C | | | | Silt; some fine sand; compact; reddish brown; wet at 7 ft bg. |
| 10 | 12 | SS | 11-15-27-34 | 1.75 | 0 | Silt; some clay, trace fine to medium gravel; compact; reddish brown; wet. |
| 12 | 15 | | | | | Silt; some clay, trace fine to medium gravel; compact; reddish brown; wet. |
| 15 | 17 | SS | 26-40-50-38 | 1.75 | 0 | Silt; some clay; trace fine to medium gravel; compact; reddish brown; wet. |
| 17 | 20 | C | | | | Silt; some clay; trace fine to medium gravel; compact; reddish brown; wet. |
| 20 | 22 | SS | 47-50-50/2 | 1.0 | 0 | Clay; some fine to medium gravel; little silt; compact; reddish brown; wet. |
| 22 | 25 | C | | | | Clay; some fine to medium gravel; little silt; compact; reddish brown; wet. |

**OWNER:** SEI

**WELL NO.:** MW-5D
**PAGE:** 2 **OF** 2 **PAGES**

| **DEPTH (FEET)** | | **SAMPLE TYPE** | **BLOW COUNT** | **REC. (FEET)** | **PID READING (PPM)** | **DESCRIPTION** |
|---|---|---|---|---|---|---|
| **FROM** | **TO** | | | | | |
| 25 | 27 | SS | 37-51-48-50 | 1.80 | 0 | Clay; some fine to medium gravel; little silt; compact; reddish brown; wet. |
| 27 | 30 | C | | | | Clay; some fine to medium gravel; little silt; compact; reddish brown; wet. |
| 30 | 32 | SS | 38-43-100 | 0.25 | 0 | Clay; some fine to medium gravel; little silt; compact; reddish brown; wet. |
| 31 | 35 | C | | | | Clay; some fine to medium gravel; little silt; compact; reddish brown; wet. |
| 35 | 37 | SS | 18-70-50/3 | 1.0 | 0 | Clay; some fine to medium gravel; little silt; compact; reddish brown; wet. |
| 37 | 40 | C | | | | Clay; some fine to medium gravel; little silt; compact; reddish brown; wet. |
| 40 | 42 | SS | 50/1 | 0.1 | 0 | Clay; some fine to medium gravel; little silt; compact; reddish brown; wet. |
| 42 | 45 | C | | | | Clay; some fine to medium gravel; little silt; boulder at 43 ft bg to 43.5 ft bg; compact; reddish brown; wet. |
| 45 | 48 | C | | | | Clay; some fine to medium gravel; little silt; compact; reddish brown; wet. |
| 48 | 48.25 | SS | 100/1 | 0.25 | 0 | Bedrock (red sandstone, probably Triassic); dry. |
| 48.25 | | | | | | End of boring. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>WELL NO.: MW-6S<br>PAGE: 1 OF 1 PAGES |
| SITE LOCATION: Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.** 10 **:SETTING:** 10 ft bg to 20 ft bg |
| **DATE COMPLETED:** September 8, 1999 | **SAND PACK SIZE & TYPE:** Morie No. 1 |
| **DRILLING COMPANY:** Soiltesting Inc. | **SETTING:** 8 ft bg to 20 ft bg |
|  | **CASING SIZE & TYPE:** 2-inch PVC |
| **DRILLING METHOD:** Hollow Stem Auger | **SETTING:** 0 ft bg to 10 ft bg |
| **SAMPLING METHOD:** | **SEAL TYPE:** Bentonite |
| **OBSERVER:** Greg Cellamare | **SETTING:** 6 ft bg to 8 ft bg |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** ~ 7.5 ft bg |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Road box set in cement | **DURATION:** **YIELD:** |

**REMARKS:** Located near western property line. See geologic log of Monitor Well MW-6D for details of geology and photoionization detector measurements.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) |  | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO |  |  |  |  |  |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>WELL NO.: MW-6D<br>PAGE: 1 OF 2 PAGES |
| SITE LOCATION: Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.** 10 **:SETTING:** 26.5 ft bg to 41.5 ft bg |
| **DATE COMPLETED:** September 9, 1999<br>**DRILLING COMPANY:** Soiltesting Inc. | **SAND PACK SIZE & TYPE:** Morie No. 1<br>**SETTING:** 25 ft bg to 42 ft bg |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:** 2-inch PVC<br>**SETTING:** 0 ft bg to 26.5 ft bg |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Greg Cellamare | **SEAL TYPE:** Bentonite<br>**SETTING:** 23 ft bg to 25 ft bg and 42 ft bg to 44 ft bg |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** ~ 7.5 ft bg |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Road box set in cement | **DURATION:** **YIELD:** |

**REMARKS:** Located near western property line. Determinator used to measure VOCs. Till started at approximately 17 ft bg.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 1 | C | | | | Silt; compact; reddish brown; damp. |
| 1 | 3 | SS | 18-27-31-34 | 1.75 | 0.6 | Silt; some fine sand; trace medium gravel; compact; reddish brown; damp. |
| 3 | 5 | SS | 13-11-14-24 | 1.0 | 0.8 | Clay, some silt; trace medium gravel; compact; grey-green; damp. |
| 5 | 7 | SS | 24-11-13-16 | 0.75 | 2.0 | Clay, some silt; trace fine to medium gravel; compact; grey-green; damp. |
| 7 | 10 | C | | | | Clay, some silt; trace fine to medium gravel; compact; grey-green; wet at 7.5 ft bg. |
| 10 | 12 | SS | 24-25-23-24 | 1.60 | 1.6 | Silt; some clay, trace fine to medium gravel; compact; reddish brown; wet. |
| 12 | 15 | C | | | | Silt; some clay, trace fine to medium gravel; compact; reddish brown; wet. |
| 15 | 17 | SS | 32-36-41-40 | 1.0 | 2.1 | Silt; some clay, trace fine to medium gravel; compact; reddish brown; wet. |
| 17 | 25 | C | | | | Silt; some clay; trace fine to medium gravel; trace boulder; compact; reddish brown; wet. |
| 25 | 27 | SS | 27-18-24-29 | 1.4 | 1.5 | Clay; some silt; trace fine to medium gravel; compact; reddish brown; wet. |

**OWNER:** SEI

**WELL NO.:** MW-6D
**PAGE:** 2 **OF** 2 **PAGES**

| **DEPTH (FEET)** | | **SAMPLE TYPE** | **BLOW COUNT** | **REC. (FEET)** | **PID READING (PPM)** | **DESCRIPTION** |
|---|---|---|---|---|---|---|
| **FROM** | **TO** | | | | | |
| 27 | 35 | C | | | | Clay; little silt; trace fine to medium gravel; trace boulder; compact; reddish brown; wet. |
| 35 | 37 | SS | 38-50 | 0.5 | 2.5 | Clay; little silt; trace medium gravel; compact; reddish brown; wet. |
| 37 | 44 | C | | | | Clay; little silt; trace medium gravel; compact; reddish brown; wet. |
| 44 | 44.25 | SS | 100/1 | 0.25 | 0 | Bedrock (red sandstone, probably Triassic); dry. |
| 44.25 | | | | | | End of boring. |
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| **GEOLOGIC LOG** | **OWNER:** SEI |
| **LEGGETTE, BRASHEARS & GRAHAM, INC.** | **WELL NO.:** MW-7S |
| **TRUMBULL, CONNECTICUT** | **PAGE:** 1 **OF** 1 **PAGE** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.** 10 **:SETTING:** 5 ft bg to 20 ft bg |
| **DATE COMPLETED:** April 2, 2002 | **SAND PACK SIZE & TYPE:** FilterSil 00 |
| **DRILLING COMPANY:** Soiltesting Inc. | **SETTING:** 4 ft bg to 20 ft bg |
| | **CASING SIZE & TYPE:** 2-inch PVC |
| **DRILLING METHOD:** Hollow Stem Auger | **SETTING:** 0 ft bg to 5 ft bg |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite |
| **OBSERVER:** Andrew Linton | **SETTING:** 2 ft bg to 4 ft bg |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** 8.72 |
| **STICK-UP:** | **DEVELOPMENT METHOD:** Bail Purge |
| **SURFACE COMPLETION:** Road box set in cement | **DURATION:** 3 well volumes **YIELD:** 5.5 gal |

**REMARKS:** See geologic log of Monitor Well MW-7d for details of geology and photoionization detector meaurements.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. | PID READING | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | (FEET) | (PPM) | |
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# GEOLOGIC LOG

**LEGGETTE, BRASHEARS & GRAHAM, INC.**

**TRUMBULL, CONNECTICUT**

**OWNER:** SEI

**WELL NO.:** MW-7D

**PAGE:** 1 **OF** 1 **PAGE**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**DATE COMPLETED:** April 2, 2002

**DRILLING COMPANY:** Soiltesting Inc.

**DRILLING METHOD:** Hollow Stem Auger

**SAMPLING METHOD:** Split Spoon

**OBSERVER:** Andrew Linton

**REFERENCE POINT (RP):** Grade

**ELEVATION OF RP:**

**STICK-UP:**

**SURFACE COMPLETION:** Road box set in cement

**SCREEN SIZE & TYPE:**

**SLOT NO.** 10 **:SETTING:** 25 ft bg to 40 ft bg

**SAND PACK SIZE & TYPE:** FilterSil 00

**SETTING:** 23 ft bg to 40 ft bg

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** 0 to 25 ft bg

**SEAL TYPE:** Bentonite

**SETTING:** 21ft bg to 23 ft bg

**BACKFILL TYPE:** Cuttings

**STATIC WATER LEVEL:** 13.71

**DEVELOPMENT METHOD:** Bail Purge

**DURATION:** 3 well volumes **YIELD:** 8 gal

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 1 | 3 | SS | 13-12-12-16 | 1.0 | 0.0 | SAND; fine, little medium sand, little silt, little gravel, trace clay; compact; brown to brownish gray |
| 3 | 5 | C | -- | -- | -- | SAND; fine, little medium sand, little silt, little gravel, trace clay; compact; brown to brownish gray |
| 5 | 7 | SS | 16-20-26-30 | 1.85 | 0.0 | SAND; fine, little-some gravel, little medium sand, trace silt and clay; compact, reddish brown |
| 7 | 10 | C | -- | -- | -- | SAND; fine, little-some gravel, little medium sand, trace silt and clay; compact, reddish brown |
| 10 | 12 | SS | 55-54-59-65 | 1.75 | 0.0 | SAND; fine, little medium sand, little gravel, trace clay and silt; compact; reddish brown |
| 12 | 15 | C | -- | -- | -- | SAND; fine, little medium sand, little gravel, trace clay and silt; compact; reddish brown |
| 15 | 17 | SS | 75/1 | 0 | 0.0 | No record |
| 17 | 20 | C | -- | -- | -- | SAND; fine, little silt, gravel and clay; compact; brown - gray brown |
| 20 | 22 | SS | 69-80-100/6 | 1.8 | 1.3 | SAND; fine, little silt, gravel and clay; compact; brown - gray brown |
| 22 | 25 | C | -- | -- | -- | SAND; fine, little silt, gravel and clay; compact; brown - gray brown |

**OWNER:** SEI

**WELL NO.:** MW-7D **PAGE: 2 OF 2 PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 25 | 27 | SS | 86-75/1 | 0.75 | 1.5 | SAND; fine, little silt, little trace clay, little-trace gravel; compact; medium brown |
| 27 | 30 | C | -- | -- | -- | SAND; fine, little silt, little trace clay, little-trace gravel; compact; medium brown |
| 30 | 32 | SS | 59-78-70/3 | 1.0 | 0.0 | SAND; fine, silt, some little clay, little gravel; compact; brown-grayish brown |
| | | C | -- | -- | -- | SAND; fine, silt, some little clay, little gravel; compact; brown-grayish brown |
| 35 | 37 | SS | 68-100/4 | 1.25 | 0.5 | SAND; fine, little silt and clay, little gravel; very moist compact; brown |
| 40 | 42.5 | C | -- | -- | -- | boulder or bedrock. |
| 42.5 | 44.5 | SS | 120/6 | 0.5 | 2.0 | Silt and clay, little fine sand and gravel; very moist compact; brown. |
| | 44.5 | | | | | End of boring due to refusal. |

**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**TRUMBULL, CONNECTICUT**

**OWNER:** SEI

**WELL NO:** MW-8S

**PAGE** 1 **OF** 1 **PAGES**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**DATE COMPLETED:** April 3, 2002

**DRILLING COMPANY:** Soil Testing Inc.

**DRILLING METHOD:** Hollow Stem Auger

**SAMPLING METHOD:** Split Spoon

**OBSERVER:** Andrew Linton

**REFERENCE POINT (RP):**

**ELEVATION OF RP:** --

**STICK-UP:**

**SURFACE COMPLETION:** Roadbox set in cement

**SCREEN SIZE & TYPE:** 2” PVC

**SLOT NO.:** 10 **SETTING:** 5 ft bg to 20 ft bg

**SAND PACK SIZE & TYPE:** FilterSil 00

**SETTING:** 40 ft bg to 20 ft bg

**CASING SIZE & TYPE:** 2” PVC

**SETTING:** 0 to 5 ft bg

**SEAL TYPE:** Bentonite

**SETTING:** 2 ft bg to 4 ft bg

**BACKFILL TYPE:** Cuttings

**STATIC WATER LEVEL:**

**DEVELOPMENT METHOD:**

**DURATION:** **YIELD:**

**REMARKS:** See geologic log of Monitor Well MW-8D for details of geology and photoionization detector measurements.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
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# GEOLOGIC LOG
LEGGETTE, BRASHEARS & GRAHAM, INC.
TRUMBULL, CONNECTICUT

**OWNER:** SEI

**WELL NO:** MW-8D

**PAGE** 1 **OF** 2 **PAGES**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2” PVC

**SLOT NO.:** 10 **SETTING:** 30.5 ft bg to 46.5 ft bg

**DATE COMPLETED:** April 4, 2002

**SAND PACK SIZE & TYPE:** FilterSil 00

**DRILLING COMPANY:** Soil Testing Inc.

**SETTING:** 27.5 ft bg to 47 ft bg

**CASING SIZE & TYPE:** 2” PVC

**DRILLING METHOD:** Hollow Stem Auger

**SETTING:** 0.2 to 30.5 ft bg

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite

**OBSERVER:** Andrew Linton

**SETTING:** 24.5 ft bg to 27.5 ft bg and 47 ft bg to 52 ft bg

**REFERENCE POINT (RP):**

**BACKFILL TYPE:** Cuttings

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:** 20.02

**STICK-UP:**

**DEVELOPMENT METHOD:** Bail Purge

**SURFACE COMPLETION:** Roadbox set in cement

**DURATION:** 3 well volumes **YIELD:** 12 gal

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 29-27-31-38 | 1.5 | 0.0 | SAND; fine, some silt, little sand, trace gravel; compact; reddish brown. |
| 2 | 5 | C | | | | SAND; fine, some silt, little sand, trace gravel; compact; reddish brown. |
| 5 | 7 | SS | 32-55-87-62 | 1.8 | 0.0 | SAND; fine, some silt, trace gravel; compact; reddish brown; damp. |
| 7 | 10 | C | | | | SILT; some fine sand, trace gravel; compact; reddish brown; damp. |
| 10 | 12 | SS | 100/4 | 0.4 | 0.0 | SILT; some fine sand, trace gravel; compact; reddish brown; damp. |
| 12 | 15 | C | | | | SILT; some fine sand, trace gravel; compact; reddish brown; damp. |
| 15 | 17 | SS | 79-100/4 | 0.7 | 0.0 | SILT; fine sand, trace gravel; compact; reddish brown; damp. |

**OWNER:** SEI

**WELL NO.:** MW-8D **PAGE** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 17 | 20 | C | | | | SILT; fine sand, trace gravel; compact; reddish brown; damp. |
| 20 | 22 | SS | 16-100/5 | 0.6 | 0.0 | SAND; fine, some silt, trace gravel; compact; reddish brown; damp. |
| 22 | 25 | C | | | 0.0 | SAND; fine, some silt, trace gravel; compact; reddish brown; damp. |
| 25 | 27 | SS | 74-100/2 | 0.5 | 0.0 | SAND; fine, some silt, trace gravel; compact; reddish brown; damp. |
| 27 | 30 | C | | | 0.0 | SAND; fine, some silt, trace gravel; compact; reddish brown; wet. |
| 30 | 32 | SS | 150/5 | 0.4 | 0.0 | SAND; fine, some silt, trace gravel; compact; reddish brown; wet. |
| 32 | 35 | C | | | 0.0 | SAND; fine, some silt, trace gravel; compact; reddish brown; wet. |
| 35 | 37 | SS | 52-65-100/3 | 0.7 | 0.0 | SAND; fine, some silt, little medium sand, trace gravel; compact; reddish brown; wet. |
| 37 | 40 | C | | | 0.0 | SAND; fine, some silt, little medium sand, trace gravel; compact; reddish brown; wet. |
| 40 | 42 | SS | 49-57-38-62 | 1.2 | 0.0 | SAND; fine, some silt, little coarse sand; compact; reddish brown; wet. |
| 42 | 45 | C | | | 0.0 | SAND; fine, some silt, little coarse sand; compact; reddish brown; wet. |
| 45 | 47 | SS | 100-100/4 | 0.0 | 0,0 | SILT and SAND; fine, trace gravel; compact; reddish brown; wet. |
| 47 | 50 | C | | | 0.0 | SILT and SAND; fine, trace gravel; compact; reddish brown; wet. |
| 50 | 52 | SS | 150/5 | 0.4 | 0.0 | Bedrock- red Triassic sandstone; damp. |

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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-9S<br>**PAGE** 1 **OF** 1 **PAGES** |

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|---|---|
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2” PVC<br>**SLOT NO.:** 10 **SETTING:** 5 ft bg to 20 ft bg |
| **DATE COMPLETED:** April 4, 2002 | **SAND PACK SIZE & TYPE:** FilterSil 00 |
| **DRILLING COMPANY:** Soil Testing Inc. | **SETTING:** 35 ft bg to 20 ft bg |
|  | **CASING SIZE & TYPE:** 2” PVC |
| **DRILLING METHOD:** Hollow Stem Auger | **SETTING:** 0 to 5 ft bg |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite |
| **OBSERVER:** Andrew Linton | **SETTING:** 2 ft bg to 4 ft bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** 10.34 |
| **STICK-UP:** | **DEVELOPMENT METHOD:** Bail Purge |
| **SURFACE COMPLETION:** Roadbox set in cement | **DURATION:** 3 well volumes **YIELD:** 5 gal |

**REMARKS:** See geologic log MW-9D for geology details and Photoionization Detector Measurements.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) |  | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
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| FROM | TO |  |  |  |  |  |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-9D<br>**PAGE** 1 **OF** 1 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2" PVC<br>**SLOT NO.:** 10 **SETTING:** 44 ft bg to 29 ft bg |
| **DATE COMPLETED:** April 4, 2002<br>**DRILLING COMPANY:** Soil Testing Inc. | **SAND PACK SIZE & TYPE:** FilterSil 00<br>**SETTING:** 27 ft bg to 44.5 ft bg |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:** 2" PVC<br>**SETTING:** 0 to 29 ft bg |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Andrew Linton | **SEAL TYPE:** Bentonite<br>**SETTING:** 24.5 ft bg to 27 ft bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** 11.76 |
| **STICK-UP:** | **DEVELOPMENT METHOD:** Bail Purge |
| **SURFACE COMPLETION:** Roadbox set in cement | **DURATION:** 3 well volumes **YIELD:** 12 gal |

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 7-11-19-15 | 1.25 | 0.0 | Topsoil –Organics; SAND; fine, little silt, little gravel, trace clay; medium brown, reddish brown. |
| 2 | 5 | C | | | | SAND; fine-medium, some gravel, little silt, little clay, damp, reddish brown |
| 5 | 7 | SS | 4-5-7-6 | 0.0 | 0.0 | No record. |
| 7 | 10 | C | | | | SAND; fine-medium, some gravel, little silt, little clay, damp, reddish brown |
| 10 | 12 | SS | 17-22-21-30 | 1.4 | 0.0 | SAND; fine-medium, some gravel, little silt and clay; wet; reddish brown |
| 12 | 15 | C | | | | SAND; fine-medium, some gravel, little silt and clay; wet; reddish brown |
| 15 | 17 | SS | 60-75/5 | 1.35 | 0.0 | SAND; fine, little medium sand, little gravel, little silt, trace clay; reddish brown; compact moist. |

**OWNER:** SEI

**WELL NO.:** MW-9D **PAGE** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 17 | 20 | C | | | | SAND; fine, little medium sand, little gravel, little silt, trace clay; reddish brown; compact moist. |
| 20 | 22 | SS | 61-98-50/2 | 1.70 | 0.0 | SAND; fine, little clay, little silt, little gravel; compact; brown-reddish brown. |
| 22 | 25 | C | | | | SAND; fine, little clay, little silt, little gravel; compact; brown-reddish brown. |
| 25 | 27 | SS | 103/6 | 1.0 | 0.0 | SAND; fine, some silt, little clay, little gravel; wet; brown to reddish brown. |
| 27 | 30 | C | | | | SAND; fine, some silt, little clay, little gravel; wet; brown to reddish brown. |
| 30 | 32 | SS | 87-5-/3 | 1.05 | 0.0 | SAND; fne, little medium sand and gravel, little silt, trace clay; compact; brown to medium reddish brown. |
| 32 | 35 | C | | | | SAND; fne, little medium sand and gravel, little silt, trace clay; compact; brown to medium reddish brown. |
| 35 | 37 | SS | 165/6 | 0.85 | 0.0 | SAND; fine, little gravel, little silt, trace medium sand and clay; compact; brown to reddish brown. |
| 37 | 40 | C | | | | SAND; fine, little gravel, little silt, trace medium sand and clay; compact; brown to reddish brown. |
| 40 | 42 | SS | 121/5 | 0.85 | 0.0 | SAND; fine, little gravel and silt, trace clay; compact; brown. |
| 42 | 45 | C | | | | SAND; fine, little gravel and silt, trace clay; compact; brown. |
| 45 | 47 | SS | 59-112-100 | 1.5 | 0.0 | SAND; fine, some silt, little clay, little gravel; very compact, moist; brown with some reddish brown. |
| | 47 | | | | | Refusal at bedrock. |
| | | | | | | |

**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**TRUMBULL, CONNECTICUT**

**OWNER:** SEI

**WELL NO:** MW-10S

**PAGE** 1 **OF** 1 **PAGES**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2” PVC

**SLOT NO.:** 10 **SETTING:** 5 ft bg to 20 ft bg

**DATE COMPLETED:** March 28, 2002

**SAND PACK SIZE & TYPE:** FilterSil 00

**SETTING:** 4 ft bg to 20.5 ft bg

**DRILLING COMPANY:** Soil Testing Inc.

**CASING SIZE & TYPE:** 2” PVC

**SETTING:** 0 to 5 ft bg

**DRILLING METHOD:** Hollow Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite

**SETTING:** 3 ft bg to 4 ft bg

**OBSERVER:** Andrew Linton

**REFERENCE POINT (RP):**

**BACKFILL TYPE:** Cuttings

**ELEVATION OF RP:**

**STATIC WATER LEVEL:** 16.63

**STICK-UP:**

**DEVELOPMENT METHOD:** Bail Purge

**SURFACE COMPLETION:** Roadbox set in cement

**DURATION:** 3 well volumes **YIELD:** 1.6 gal

**REMARKS:** See geologic log of Monitor Well MW-10D for details of geology and photoionization detector measurements.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-10D<br>**PAGE** 1 **OF** 2 **PAGES** |

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|---|---|
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2” PVC<br>**SLOT NO.:** 10 **SETTING:** 23 ft bg to 38 ft bg |
| **DATE COMPLETED:** March 28, 2002 | **SAND PACK SIZE & TYPE:** FilterSil 00 |
| **DRILLING COMPANY:** Soil Testing Inc. | **SETTING:** 2 ft bg to 38 ft bg |
| | **CASING SIZE & TYPE:** 2” PVC |
| **DRILLING METHOD:** Hollow Stem Auger | **SETTING:** 0 to 23 ft bg |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite |
| **OBSERVER:** Andrew Linton | **SETTING:** 18 ft bg to 20 ft bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** 17.81 |
| **STICK-UP:** | **DEVELOPMENT METHOD:** Bail Purge |
| **SURFACE COMPLETION:** Roadbox set in cement | **DURATION:** 3 well volumes **YIELD:** 10 gal |

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 4-15-27-27 | 1.4 | 0.0 | SAND; fine, little-some silt, little clay, little-trace gravel; reddish brown |
| 2 | 5 | C | -- | -- | -- | SAND; fine, little-some silt, little clay, little-trace gravel; reddish brown |
| 5 | 7 | SS | 8-12-13-18 | 1.5 | 0.0 | SAND; fine, little silt, little clay, little gravel, trace medium sand; compact, brown to reddish brown |
| 7 | 10 | C | -- | -- | -- | SAND; fine, little silt, little clay, little gravel, trace medium sand; compact, brown to reddish brown |
| 10 | 12 | SS | 28-60-50/2 | 1.3 | 0.0 | SAND; fine, some silt, little clay, trace gravel; moist, compact; brown to reddish brown |
| 12 | 15 | C | -- | -- | -- | SAND; fine, some silt, little clay, trace gravel; moist, compact; brown to reddish brown |
| 15 | 17 | SS | 40-50-50-50/3 | 1.25 | 0.0 | SAND; fine, some silt, little clay and gravel; compact; brown to reddish brown |

**OWNER:** SEI

**WELL NO.:** MW-10D **PAGE** 2 **OF** 2 **PAGES**

| | | | | | | |
|---|---|---|---|---|---|---|
| 20 | 22 | SS | 25-47-41-19 | 1.75 | 0.0 | SILT; some fine sand, little clay, trace gravel; brown ; moist compact |
| 22 | 25 | C | -- | -- | -- | SILT; some fine sand, little clay, trace gravel; brown ; moist compact |
| 25 | 27 | SS | 72-100/5 | 0.45 | 0.0 | SAND; fine, little clay, little silt, some coarse gravel; very compact; brown |
| 27 | 30 | C | -- | -- | -- | SAND; fine, little clay, little silt, some coarse gravel; very compact; brown |
| 30 | 32 | SS | 38-34-31-50/5 | 1.6 | 0.0 | SILT and SAND; fine, little clay, trace gravel; compact, moist; brown |
| 32 | 35 | C | -- | -- | -- | SILT and SAND; fine, little clay, trace gravel; compact, moist; brown |
| 35 | 37 | SS | 36-48-60-47 | 1.8 | 0.0 | SAND; fine, some silt, little gravel, trace clay, trace medium sand; very compact; moist; brown |
| 37 | 40 | C | -- | -- | -- | SAND; fine, some silt, little gravel, trace clay, trace medium sand; very compact; moist; brown |
| 40 | 42 | SS | 48-36-48-35 | 1.75 | 0.0 | Weathered bedrock, some clay, some silt, some fine sand, little gravel; very compact; reddish brown |
| 42 | 45 | C | -- | -- | -- | Weathered bedrock, some clay, some silt, some fine sand, little gravel; very compact; reddish brown |
| 45 | 47 | SS | 50-100/2 | 0.5 | 0.0 | Weathered sandstone, clay and silt, some fine and medium sand; compact, wet; reddish brown |

**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**TRUMBULL, CONNECTICUT**

**OWNER:** SEI

**WELL NO:** MW-11S

**PAGE** 1 **OF** 1 **PAGES**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2” PVC

**SLOT NO.:** 10 **SETTING:** 20 ft bg to 5 ft bg

**DATE COMPLETED:** March 28, 2002

**DRILLING COMPANY:** Soil Testing Inc.

**SAND PACK SIZE & TYPE:** FilterSil 00

**SETTING:** 3.5 ft bg to 25 ft bg

**CASING SIZE & TYPE:** 2” PVC

**DRILLING METHOD:** Hollow Stem Auger

**SETTING:** 0 to 5 ft bg

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite

**OBSERVER:** Andrew Linton

**SETTING:** 2 ft bg to 3.5 ft bg

**REFERENCE POINT (RP):**

**BACKFILL TYPE:** Cuttings

**ELEVATION OF RP:**

**STATIC WATER LEVEL:**

**STICK-UP:**

**DEVELOPMENT METHOD:** Bail Purge

**SURFACE COMPLETION:** Roadbox set in cement

**DURATION:** 3 well volumes **YIELD:**

**REMARKS:** See geologic log of Monitor Well MW-11D for details of geology and photoionization detector measurements.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-11D<br>**PAGE** 1 **OF** 2 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2" PVC<br>**SLOT NO.:** 10 **SETTING:** 25 ft bg to 35 ft bg |
| **DATE COMPLETED:** March 28, 2002 | **SAND PACK SIZE & TYPE:** FilterSil 00<br>**SETTING:** 22 ft bg to 35 ft bg |
| **DRILLING COMPANY:** Soil Testing Inc. | **CASING SIZE & TYPE:** 2" PVC<br>**SETTING:** 0 to 25 ft bg |
| **DRILLING METHOD:** Hollow Stem Auger | |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite<br>**SETTING:** 20 ft bg to 22 ft bg |
| **OBSERVER:** Andrew Linton | |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** Bail Purge |
| **SURFACE COMPLETION:** Roadbox set in cement | **DURATION:** 3 well volumes **YIELD:** |

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 6-8-10-28 | 1.75 | 0.0 | SAND; fine, little silt, trace clay, little gravel, little organics; reddish brown; slightly moist. |
| 2 | 5 | C | -- | -- | -- | SAND; fine, little silt, trace clay, little gravel, little organics; reddish brown; slightly moist. |
| 5 | 7 | SS | 36-52-49-28 | 1.8 | 0.0 | SAND; fine, little medium sand, trace clay, little gravel; compact; redish brown; damp. |
| 7 | 10 | C | -- | -- | -- | SAND; fine, little medium sand, trace clay, little gravel; compact; redish brown; damp. |
| 10 | 12 | SS | 10-100/4 | 1.00 | 0.0 | SAND; fine, little silt, trace clay, trace gravel; compact, damp; brown to reddish brown. |
| 12 | 15 | C | -- | -- | -- | SAND; fine, little silt, trace clay, trace gravel; compact, damp; brown to reddish brown. |
| 15 | 17 | SS | 47-100/5 | 1.10 | 0.0 | SAND; fine, some silt, little clay, little medium sand, trace gravel; compact; reddish gray brown. |

**OWNER:** SEI

**WELL NO.:** MW-11D **PAGE** 2 **OF** 2 **PAGES**

| | | | | | | |
|---|---|---|---|---|---|---|
| 20 | 22 | SS | 36-75-100/2 | 1.20 | 0.0 | SAND; fine, some little medium sand, little clay, little silt, trace gravel; compact, moist; grey reddish brown. |
| 22 | 25 | C | -- | -- | -- | SAND; fine, some little medium sand, little clay, little silt, trace gravel; compact, moist; grey reddish brown. |
| 25 | 27 | SS | 20-30-90/4 | 1.4 | 0.0 | SAND; fine, some silt, little clay, trace medium sand, trace gravel; very compact; reddish brown. |
| 27 | 30 | C | -- | -- | -- | SAND; fine, some silt, little clay, trace medium sand, trace gravel; very compact; reddish brown. |
| 30 | 32 | SS | 100/1 | 0.4 | 0.0 | SAND; medium, sandstone or boulder. |
| 32 | 35 | C | -- | -- | -- | SAND; medium, sandstone or boulder. |
| 35 | 37 | SS | 100/5 | 0.4 | 0.0 | SAND; some clay and fine sand, sandstone fragments; very wet |
| 37 | 40 | C | -- | -- | -- | SAND; some clay and fine sand, sandstone fragments; very wet |
| 40 | 42 | SS | 100/3 | 0.1 | 0.0 | Bedrock |

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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-12<br>**PAGE** 1 **OF** 1 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2” PVC<br>**SLOT NO.:** 10 **SETTING:** 15 ft bg to 30 ft bg |
| **DATE COMPLETED:** March 26, 2002 | **SAND PACK SIZE & TYPE:** FilterSil 00 |
| **DRILLING COMPANY:** Soil Testing Inc. | **SETTING:** 13 ft bg to 30 ft bg |
| | **CASING SIZE & TYPE:** 2” PVC |
| **DRILLING METHOD:** Hollow Stem Auger | **SETTING:** 0 to 15 ft bg |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite |
| **OBSERVER:** Andrew Linton | **SETTING:** 13 ft bg to 11 ft bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** 20.11 |
| **STICK-UP:** | **DEVELOPMENT METHOD:** Bail Purge |
| **SURFACE COMPLETION:** Roadbox set in cement | **DURATION:** 3 well volumes **YIELD:** 4.5 gal |

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| **DEPTH (FEET)** | | **SAMPLE TYPE** | **BLOW COUNT** | **REC. (FEET)** | **PID READING (PPM)** | **DESCRIPTION** |
|---|---|---|---|---|---|---|
| **FROM** | **TO** | | | | | |
| 0 | 2 | SS | 2-3-6-4 | 1.5 | 0.0 | SAND; fine, some silt, trace gravel; compact; reddish brown’ slightly moist |
| 3 | 5 | C | -- | -- | -- | SAND; fine, some silt, trace gravel; compact; reddish brown’ slightly moist |
| 5 | 7 | SS | 12-22-23-30 | 2.0 | 0.0 | SILT; some fine sand, little clay, trace gravel; compact; reddish brown |
| 7 | 10 | C | -- | -- | -- | SILT; some fine sand, little clay, trace gravel; compact; reddish brown |
| 10 | 12 | SS | 20-9-13-19 | 1.25 | 0.0 | SILT; some fine sand, little clay, trace gravel; compact; reddish brown |
| 12 | 15 | C | -- | -- | -- | SILT; some fine sand, little clay, trace gravel; compact; reddish brown |
| 15 | 17 | SS | 14-19-29-30 | 2.0 | 0.0 | SILT; little fine sand, some clay, trace gravel; very compact; reddish brown |
| 17 | 20 | C | -- | -- | -- | SILT; little fine sand, some clay, trace gravel; very compact; reddish brown |
| 20 | 22 | SS | 24-40-60/5 | 1.20 | 0.0 | SAND; fine, some silt, little clay, trace gravel; compact; reddish brown |
| 22 | 25 | C | -- | -- | -- | SAND; fine, some silt, little clay, trace gravel; compact; reddish brown |

**OWNER:** SEI

**WELL NO.:** MW-12 **PAGE** 2 **OF** 2 **PAGES**

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| 25 | 27 | SS | 50-60-100 | 1.20 | 0.0 | SAND; fine, some silt, little clay; very compact |
| 27 | 30 | C | -- | -- | -- | SAND; fine, some silt, little clay; very compact |
| 30 | 32 | SS | 32-33-55-50/1 | 1.35 | 0.0 | CLAY; little silt, little gravel; very compact; sandstone at bottom |
| 32 | 34 | C | -- | -- | -- | CLAY; little silt, little gravel; very compact; sandstone at bottom |
| 34 | | | | | | Bedrock - sandstone |

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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-13<br>**PAGE** 1 **OF** 1 **PAGES** |

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| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2" PVC<br>**SLOT NO.:** 10 **SETTING:** 15 ft bg to 30 ft bg |
| **DATE COMPLETED:** March 27, 2002 | **SAND PACK SIZE & TYPE:** FilterSil 00<br>**SETTING:** 13 ft bg to 31 ft bg |
| **DRILLING COMPANY:** Soil Testing Inc. | **CASING SIZE & TYPE:** 2" PVC<br>**SETTING:** 0 to 15 ft bg |
| **DRILLING METHOD:** Hollow Stem Auger | |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite |
| **OBSERVER:** Andrew Linton | **SETTING:** 13 ft bg to 11 ft bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** 22.12 |
| **STICK-UP:** | **DEVELOPMENT METHOD:** Bail Purge |
| **SURFACE COMPLETION:** Roadbox set in cement | **DURATION:** 3 well volumes **YIELD:** 4.0 gal |

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 13-16-17-32 | 1.0 | 0.0 | Top soil organics, some fine sand, some gravel; moist; brown- reddish brown |
| 2 | 5 | C | -- | -- | -- | Top soil organics, some fine sand, some gravel; moist; brown- reddish brown |
| 5 | 7 | SS | 8-13-12-12 | 2.0 | 0.0 | SAND; fine – medium, little silt, little – trace gravel; reddish brown |
| 7 | 10 | C | -- | -- | -- | SAND; fine – medium, little silt, little – trace gravel; reddish brown |
| 10 | 12 | SS | 38-56-50/4 | 2.0 | 0.2 | SAND; fine, little medium sand and silt, trace clay and gravel; compact; reddish brown; moist |
| 12 | 15 | C | -- | -- | -- | SAND; fine, little medium sand and silt, trace clay and gravel; compact; reddish brown; moist |
| 15 | 17 | SS | 16-45-48-50/4 | 2.0 | 0.3 | SAND; fine, some silt, trace medium sand, trace gravel; compact; moist; reddish brown |
| 17 | 20 | C | -- | -- | -- | SAND; fine, some silt, trace medium sand, trace gravel; compact; moist; reddish brown |

**OWNER:** SEI

**WELL NO.:** MW-13 **PAGE** 2 **OF** 2 **PAGES**

| | | | | | | |
|---|---|---|---|---|---|---|
| 20 | 22 | SS | 43-75-100/4 | 1.8 | 0.4 | SAND; fine, some silt, trace clay, trace gravel; compact; reddish brown; moist |
| 22 | 25 | C | -- | -- | -- | SAND; fine, some silt, trace clay, trace gravel; compact; reddish brown; moist |
| 25 | 27 | SS | 57-78-100/4 | 1.20 | 0.0 | SAND; fine, some silt, trace clay, trace gravel; compact; reddish brown; moist |
| 27 | 30 | C | -- | -- | -- | SAND; fine, some silt, trace clay, trace gravel; compact; reddish brown; moist |
| 30 | 32 | SS | 29-140-100/2 | 1.4 | 0.0 | SAND; fine, silt, little clay and gravel; very compact; reddish brown, slightly moist |
| 32 | 35 | C | -- | -- | -- | SAND; fine, silt, little clay and gravel; very compact; reddish brown, slightly moist |
| 35 | 37 | SS | 100/1 | 0.25 | 0.0 | Sandstone bedrock. Some clay; wet |
| | | | | | | |

# GEOLOGIC LOG
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**TRUMBULL, CONNECTICUT**

**OWNER:** SEI

**WELL NO:** MW-14S

**PAGE** 1 **OF** 1 **PAGES**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2” PVC

**SLOT NO.:** 10 **SETTING:** 4 ft bg to 19 ft bg

**DATE COMPLETED:** March 29, 2002

**SAND PACK SIZE & TYPE:** FilterSil 00

**DRILLING COMPANY:** Soil Testing Inc.

**SETTING:** 2 ft bg to 19 ft bg

**CASING SIZE & TYPE:** 2” PVC

**DRILLING METHOD:** Hollow Stem Auger

**SETTING:** 0 to 4 ft bg

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite

**OBSERVER:** Andrew Linton

**SETTING:** 1 ft bg to 2 ft bg

**REFERENCE POINT (RP):**

**BACKFILL TYPE:** Cuttings

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:**

**STICK-UP:**

**DEVELOPMENT METHOD:** Bail Purge

**SURFACE COMPLETION:** Roadbox set in cement

**DURATION:** 3 well volumes **YIELD:**

**REMARKS:** See geologic log of Monitor Well MW-14D for details of geology and photoionization detector measurements.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
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## GEOLOGIC LOG
LEGGETTE, BRASHEARS & GRAHAM, INC.
TRUMBULL, CONNECTICUT

**OWNER:** SEI

**WELL NO:** MW-14D

**PAGE** 1 **OF** 2 **PAGES**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2” PVC

**SLOT NO.:** 10 **SETTING:** 22 to 37 ft bg

**DATE COMPLETED:** March 29, 2002

**SAND PACK SIZE & TYPE:** FilterSil 00

**SETTING:** 20 to 37.5 ft bg

**DRILLING COMPANY:** Soil Testing Inc.

**CASING SIZE & TYPE:** 2” PVC

**SETTING:** 0 to 22 ft bg

**DRILLING METHOD:** Hollow Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite

**OBSERVER:** Andrew Linton

**SETTING:** 1 to 20 ft bg and 37.5 to 40.5 ft bg

**REFERENCE POINT (RP):**

**BACKFILL TYPE:** Cuttings

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:**

**STICK-UP:**

**DEVELOPMENT METHOD:** Bail Purge

**SURFACE COMPLETION:** Roadbox set in cement

**DURATION:** 3 well volumes **YIELD:**

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 1 | C | -- | -- | -- | SAND; fine, little-some medium sand, little gravel, little silt, trace clay; brown to reddish brown; compact. |
| 1 | 3 | SS | 12-24-28-30 | 1.2 | 0.0 | SAND; fine, little-some medium sand, little gravel, little silt, trace clay; brown to reddish brown; compact. |
| 3 | 5 | C | -- | -- | -- | SAND; fine, little-some medium sand, little gravel, little silt, trace clay; brown to reddish brown; compact. |
| 5 | 7 | SS | 24-47-50-31 | 1.25 | 0.0 | SAND; fine to medium, little silt, little gravel, trace clay; compact; brown. |
| 7 | 10 | C | -- | -- | -- | SAND; fine to medium, little silt, little gravel, trace clay; compact; brown. |
| 10 | 12 | SS | 51-50-50/2 | 1.40 | 0.0 | SAND; fine, some silt, little medium sand, little gravel, trace clay; brown; compact. |
| 12 | 15 | C | -- | -- | -- | SAND; fine, some silt, little medium sand, little gravel, trace clay; brown; compact. |

**OWNER:** SEI

**WELL NO.:** MW-14D **PAGE** 2 **OF** 2 **PAGES**

| | | | | | | |
|---|---|---|---|---|---|---|
| 15 | 17 | SS | 46-75-50/2 | 1.3 | 0.0 | SAND; fine, little silt, little clay, trace gravel; brown; slightly moist; compact. |
| 17 | 20 | C | -- | -- | -- | SAND; fine, little silt, little clay, trace gravel; brown; slightly moist; compact. |
| 20 | 22 | SS | 100/5 | 0.7 | 0.0 | SAND; fine, little silt, little gravel, trace clay; compact; brown. |
| 22 | 25 | C | -- | -- | -- | SAND; fine, little silt, little gravel, trace clay; compact; brown. |
| 25 | 27 | SS | 75-93-50/1 | 0.95 | 0.0 | SAND; fine, little silt, little clay, little gravel; very compact; reddish brown. |
| 27 | 30 | C | -- | -- | -- | SAND; fine, little silt, little clay, little gravel; very compact; reddish brown. |
| 30 | 32 | SS | 100/5 | 0.75 | 0.0 | SAND; fine, little silt, little clay, little gravel; very compact; reddish brown. |
| 32 | 35 | C | -- | -- | -- | SAND; fine, little silt, little clay, little gravel; very compact; reddish brown. |
| 35 | 37 | SS | 120/5 | 0.5 | 0.0 | SAND, fine, some silt, little medium sand, trace clay, little gravel; very compact, brown. |
| 37 | 40 | C | -- | -- | -- | SAND, fine, some silt, little medium sand, trace clay, little gravel; very compact, brown. |
| 40 | 40.5 | SS | 265/5 | 0.35 | 0.0 | Sandstone bedrock, some silt and clay; very compact; very wet. |

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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-15S<br>**PAGE** 1 **OF** 2 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE: 2" PVC**<br>**SLOT NO.:** .010 **SETTING:** 10 to 20 ft. bg |
| **DATE COMPLETED:** May 31, 2006<br>**DRILLING COMPANY:** Soil Testing Inc. | **SAND PACK SIZE & TYPE:** Filtration Sand<br>**SETTING:** 8 to 20 ft. bg |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:** 2"PVC<br>**SETTING:** Grade to 10 ft. bg |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Patrick Welsh | **SEAL TYPE:** Bentonite<br>**SETTING:** 6 to 8 ft. bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Concrete Collar Road Box | **DURATION:** **YIELD:** |

**REMARKS:** Grade starts below 6" of Asphalt. Refusal at 20.5 feet below grade.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) |  | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO |  |  |  |  |  |
| 0 | 5 |  |  |  | 0 | SILT/SAND mix; brown to dark brown, with cobbles 1" – 2" thick |
| 5 | 10 |  |  |  | 0 | SILT; brown, trace sand, compact, dry |
| 10 | 15 |  |  |  | 0 | SILT; brown, trace clay, moist, large gravel |
| 15 | 20 |  |  |  | 0 | SILT; brown to dark brown, compact, moist |

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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-16S<br>**PAGE** 1 **OF** 2 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2” PVC<br>**SLOT NO.:** 0.10 **SETTING:** 10 to 20 ft. bg |
| **DATE COMPLETED:** June 5, 2006 | **SAND PACK SIZE & TYPE:** Morie Grade Filtration Sand<br>**SETTING:** Grade to 6 ft. bg; 8 to 20 ft. bg |
| **DRILLING COMPANY:** Soil Testing Inc. | **CASING SIZE & TYPE:** 2” PVC |
| **DRILLING METHOD:** Hollow Stem Auger | **SETTING:** Grade to 10 ft. bg |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite |
| **OBSERVER:** Patrick Welsh | **SETTING:** 6 to 8 ft. bg; 20 to 23.5 ft. bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Sand |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Concrete collar and road box casing | **DURATION:** **YIELD:** |

**REMARKS:** Grade starts below 5.5” of Asphalt. Refusal at 23.5 feet below grade.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 19-18-5-4 | 0.4 | 25.5 | SAND; dark brown, mainly crushed stone 1” – 2” thick |
| 2 | 4 | SS | 4-6-9-13 | 0.9 | 82.2 | SILT/SAND mix; brown to light brown, wet, large stones throughout |
| 4 | 6 | SS | 16-18-38-40 | 1.15 | 26.2 | Top 0.2’: SAND, black; Bottom: SAND; brown, fine, trace silt, pebbles 0.3” – 0.8” thick |
| 6 | 8 | SS | 32-20-50/4 | 1.0 | 42.3 | SAND; brown, fine, moist, pebbles <0.5” thick |
| 8 | 10 | SS | 4-4-14-10 | 1.0 | 4.8 | SAND/SILT mix; brown to dark brown, wet, pebbles <0.5” thick |
| 10 | 12 | SS | 4-4-11-14 | 1.9 | 61.6 | SILT/SAND mix; wet, brown to light brown |
| 12 | 14 | SS | 26-30-40-49 | 1.2 | 9.5 | SILT; light brown, wet, trace sand, small pebbles <0.2” thick |

**OWNER:** SEI

**WELL NO.:** MW-16S **PAGE** 2 **OF** 2 **PAGES**

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|---|---|---|---|---|---|---|
| 14 | 16 | SS | 26-45-26-32 | 1.5 | 12.2 | SILT/SAND mix; light brown, moist, compact, crushed gray stones |
| 16 | 18 | SS | 50/4 | 0.6 | 0 | SILT/SAND mix; brown, wet, compact |
| 18 | 20 | SS | 16-15-16-11 | 1.3 | 0 | SILT/SAND mix; wet, compact, light brown; pockets of dark grey/black sand |
| 20 | 22 | SS | 26-50/1 | 0.35 | 0 | SILT/SAND mix; brown to dark grey, wet, compact |
| 22 | 24 | SS | 50/1 | 0 | 0 | No Recovery |
| | | | | | | |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-17S<br>**PAGE** 1 **OF** 2 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE: 2" PVC**<br>**SLOT NO.:** 0.010 **SETTING:** 10.5 to 20.5 ft. bg. |
| **DATE COMPLETED:** May 30, 2006<br>**DRILLING COMPANY:** Soil Testing Inc. | **SAND PACK SIZE & TYPE:** Filtration Sand<br>**SETTING:** 7.5 to 20.5 ft. bg |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:** 2"PVC<br>**SETTING:** Grade to 10.5 ft. bg |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Patrick Welsh | **SEAL TYPE:** Bentonite<br>**SETTING:** 7.5 to 8.5 ft. bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Concrete Collar Road Box | **DURATION:** **YIELD:** |

**REMARKS:** Grade starts below 6" of Asphalt. Refusal at 20.5 feet below grade.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| **DEPTH (FEET)** | | **SAMPLE TYPE** | **BLOW COUNT** | **REC. (FEET)** | **PID READING (PPM)** | **DESCRIPTION** |
|---|---|---|---|---|---|---|
| **FROM** | **TO** | | | | | |
| 0 | 5 | | | | 1.2 | SILT/SAND mix; brown to dark brown, with small gravel <0.5" thick |
| 5 | 10 | | | | 0 | SILT/SAND mix; brown, trace clay, with stones 0.75" – 1.5" thick |
| 10 | 15 | | | | 0.4 | SILT; brown to dark brown, trace sand, trace clay, moist, large gravel |
| 15 | 20 | | | | 0 | SILT/SAND mix; compact, wet, brown |

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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-17D<br>**PAGE** 1 **OF** 2 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2 inch PVC<br>**SLOT NO.:** 0.010 **SETTING:** 23 to 28 ft. bg |
| **DATE COMPLETED:** May 31, 2006<br>**DRILLING COMPANY:** Soil Testing Inc. | **SAND PACK SIZE & TYPE:** Morie Grade Filtration Sand<br>**SETTING:** Grade to 3 ft. bg; 8 to 19 ft. bg; and 21 to 28 ft. bg. |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:** 2 inch PVC<br>**SETTING:** Grade to 23 ft. bg |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Patrick Welsh | **SEAL TYPE:** Bentonite<br>**SETTING:** 3 to 8 ft. bg; 19 to 21 ft. bg; and 28 to 29 ft. bg |
| **REFERENCE POINT (RP):** Top of casing | **BACKFILL TYPE:** Sand Chips |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Quikrete Blacktop Patch | **DURATION:** **YIELD:** |

**REMARKS:** Grade starts below 8” of asphalt; Auger refusal at 29 feet below grade.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 6-4-2-2 | 0 | N/A | No recovery. |
| 2 | 4 | SS | 1-3-5-8 | 0.4 | 0 | 2.0-2.4 Sand and silt; trace fine to medium gravel sub-rounded; dark brown; semi-compact; moist. |
| 4 | 6 | SS | 5-16-24-15 | 1.5 | 1.2 | 4.0-5.5 SAND; trace silt; trace medium to fine sub-rounded gravel; brown to dark brown. |
| 6 | 8 | SS | 9-22-17-13 | 1.7 | 0.7 | 6.0-7.7 SILT; trace fine sand; trace medium gravel; brown; compact. |
| 8 | 10 | SS | 15-16-15-18 | 1.5 | 2.4 | 8.0-9.5 SAND; trace silt; trace medium to coarse gravel; brown to light brown |
| 10 | 12 | SS | 9-13-18-15 | 1.5 | 3.2 | 10-11.5 SAND; trace silt; brown to dark brown; moist. |
| 12 | 14 | SS | 15-16-18-43 | 1.4 | 8.0 | 12.0-13.4 SAND; trace coarse gravel; brown; moist. |

**OWNER:** SEI

**WELL NO.:** MW-17D **PAGE** 2 **OF** 2 **PAGES**

| | | | | | | |
|---|---|---|---|---|---|---|
| 14 | 16 | SS | 18-38-38-41 | 1.45 | 35.8 | 14.0-15.45 SILT; trace clay, trace fine to coarse gravel; brown; compact. |
| 16 | 18 | SS | 22-26-38-33 | 1.85 | 61.4 | 16.0-17.85 SILT; trace fine sand; trace fine gravel; brown to light brown, compact. |
| 18 | 20 | SS | 21-42-33-42 | 1.5 | 92.3 | 18.0-18.8 SAND; little medium to coarse gravel; brown; semi-compact.<br>18.8-19.5 SILT; trace clay; brown; compact. |
| 20 | 20.33 | SS | 50/4 | 0.33 | 44.2 | 20.0-20.33 SILT; trace clay; dark brown; compact. |
| 22 | 22.17 | SS | 50/2 | 0.17 | 26.7 | 22.0-22.17 SAND; light brown; gray; dry |
| 24 | 24.18 | SS | 50/2 | 0.18 | 11.4 | 24.0-24.18 SAND; trace fine gravel; brown and light gray sand layers; compact; dry. |
| 26 | 26.33 | SS | 50/4 | 0.32 | 36.5 | 26.0-26.32 SILT; trace fine sand; trace medium gravel; dark brown, compact; wet. |
| 28 | 28.5 | SS | 50/2 | 0.5 | 18.4 | 28.0-28.5 Sand and silt; compact; wet; pieces of dark gray bedrock. |
| | | | | | | Auger refusal at 29 ft. bg. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-18S<br>**PAGE** 1 **OF** 2 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2” PVC<br>**SLOT NO.:** 0.010 **SETTING:** 8 to 18 ft. bg |
| **DATE COMPLETED:** August 14, 2006<br>**DRILLING COMPANY:** Soil Testing Inc. | **SAND PACK SIZE & TYPE:** Morie Grade Filtration Sand<br>**SETTING:** 6 to 18 ft. bg |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:** 2” PVC<br>**SETTING:** Grade to 8 ft. bg |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Patrick Welsh | **SEAL TYPE:** Bentonite<br>**SETTING:** 5 to 6 ft. bg; 18 to 19 ft. bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Concrete collar and road box casing | **DURATION:** **YIELD:** |

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 12-8-5-7 | 0.8 | 29.6 | SAND, fine to medium; some silt; light brown; tan; compact; moist. |
| 0 | 5 | HSA | | | 19.6 | SAND, medium; little silt; little fine to medium gravel; brown;dark brown. |
| 5 | 7 | SS | 31-20-18-19 | 1.1 | 44.1 | SAND, medium; trace large gravel; dark brown; red; semi-compact; dry. |
| 5 | 10 | HSA | | | 20.1 | SAND, medium; trace large gravel; dark brown; semi-compact; moist. |
| 10 | 12 | SS | 14-31-56-54 | 0.4 | 12.4 | SAND, medium; trace medium gravel; light brown; tan; semi-compact; wet. |
| 10 | 15 | HSA | | | 14.9 | SAND, fine to medium; some silt; brown; semi-compact; moist. |
| 15 | 17 | SS | 40-76-115 | 0.5 | 8.3 | SAND, fine to medium; some silt; brown; reddish; tan; compact; moist. |

**OWNER:** SEI

**WELL NO.:** MW-18S **PAGE** 2 **OF** 2 **PAGES**

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|---|---|---|---|---|---|---|
| 15 | 19 | HSA | | | 16.5 | Sand, fine to medium and silt; little weathered friable bedrock; compact; wet. |
| | | | | | | Auger refusal @ 19 ft. bg. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-19<br>**PAGE** 1 **OF** 2 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2” PVC<br>**SLOT NO.:** 0.010 **SETTING:** 10 to 20 ft. bg |
| **DATE COMPLETED:** August 14, 2006<br>**DRILLING COMPANY:** Soil Testing Inc. | **SAND PACK SIZE & TYPE:** Morie Grade Filtration Sand<br>**SETTING:** 8 to 20 ft. bg |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:** 2” PVC<br>**SETTING:** Grade to 10 ft. bg |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Patrick Welsh | **SEAL TYPE:** Bentonite<br>**SETTING:** 6 to 8 ft. bg; 20 to 21 ft. bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Concrete collar and road box casing | **DURATION:** **YIELD:** |

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 6-16-10-13 | 1.1 | 12.5 | SAND, medium; little silt; trace large gravel; dark brown; semi-compact; moist. |
| 0 | 5 | HSA | | | 11.5 | SAND, medium; little large cobbles; light brown; dry. |
| 5 | 7 | SS | 26-39-57-95 | 1.9 | 8.6 | SAND, fine to medium; little silt; trace medium to coarse gravel; dark brown; brown; semi-compact; dry. |
| 5 | 10 | HSA | | | 5.8 | SAND, coarse; little coarse gravel; light brown; semi-compact; dry. |
| 10 | 12 | SS | 22-25-58-74 | 1.0 | 1.6 | SILT; trace medium to coarse gravel; brown; compact; wet. |
| 10 | 15 | HSA | | | 1.1 | SAND, fine; little silt; trace medium to large gravel; light brown; semi-compact; moist. |
| 15 | 17 | SS | 39-75-100/5” | 1.8 | 6.4 | Sand, fine to medium and silt; trace medium to coarse gravel; dark brown; gray; compact; wet. |

**OWNER:** SEI

**WELL NO.:** MW-19 **PAGE** 2 **OF** 2 **PAGES**

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|---|---|---|---|---|---|---|
| 15 | 20 | HSA | | | 3.4 | Sand, fine to medium and silt; trace medium to coarse gravel; dark brown; compact; wet. |
| 20 | 21 | SS | 16-82-100/4” | 1.3 | 4.8 | Auger refusal @ 21 ft. bg. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-20<br>**PAGE** 1 **OF** 2 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2” PVC<br>**SLOT NO.:** 0.010 **SETTING:** 10 to 20 ft. bg |
| **DATE COMPLETED:** August 14, 2006<br>**DRILLING COMPANY:** Soil Testing Inc. | **SAND PACK SIZE & TYPE:** Morie Grade Filtration Sand<br>**SETTING:** 8 to 20 ft. bg |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:** 2” PVC<br>**SETTING:** Grade to 10 ft. bg |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Patrick Welsh | **SEAL TYPE:** Bentonite<br>**SETTING:** 6 to 8 ft. bg; 20 to 21 ft. bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Concrete collar and road box casing | **DURATION:** **YIELD:** |

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 14-12-5-6 | 0.8 | 10.9 | SILT; little clay; trace fine gravel; asphalt pieces; light brown; tan; semi-compact. |
| 0 | 5 | HSA | | | 0.6 | SAND, medium; trace coarse gravel; dark brown; semi-compact; dry. |
| 5 | 7 | SS | 25-25-23-36 | 1.7 | 3.1 | SAND, fine to medium; trace silt; trace fine gravel; light brown; tan; compact; dry. |
| 5 | 10 | HSA | | | 3.8 | SAND, medium; some medium to coarse gravel; dark brown; gray. |
| 10 | 12 | SS | 10-10-18-12 | 1.6 | 0 | Sand, fine and silt; trace clay; brown; light brown; compact; moist. |
| 10 | 15 | HSA | | | 0.6 | Sand, fine and silt; some fine to medium gravel; dark brown; dark gray; compact; moist. |
| 15 | 17 | SS | 14-20-26-76 | 1.0 | 0 | SAND, coarse; trace silt; brown; semi-compact; wet. |

**OWNER:** SEI

**WELL NO.:** MW-20 **PAGE** 2 **OF** 2 **PAGES**

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|---|---|---|---|---|---|---|
| 15 | 20 | HSA | | | 1.1 | Sand, fine and silt; trace medium gravel; dark brown; gray; semi-compact; moist. |
| 20 | 22 | SS | 74-100/2” | 1.2 | 0.6 | BEDROCK, weathered, friable, crushed; gray; moist. |
| | | | | | | Auger Refusal @ 22 ft. bg. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-21<br>**PAGE** 1 **OF** 2 **PAGES** |

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|---|---|
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2” PVC<br>**SLOT NO.:** 0.010 **SETTING:** 10 to 20 ft. bg |
| **DATE COMPLETED:** August 15, 2006<br>**DRILLING COMPANY:** Soil Testing Inc. | **SAND PACK SIZE & TYPE:** Morie Grade Filtration Sand<br>**SETTING:** Grade to 6 ft. bg; 8 to 20 ft. bg |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:** 2” PVC<br>**SETTING:** Grade to 10 ft. bg |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Patrick Welsh | **SEAL TYPE:** Bentonite<br>**SETTING:** 6 to 8 ft. bg; 20 to 21 ft. bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Concrete collar and road box casing | **DURATION:** **YIELD:** |
| **REMARKS:** | |
| **ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**<br>**REC = Recovery PPM = parts per million** | |

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 5-6-5-6 | 0.9 | 0 | SILT; trace clay; brown; compact; dry. |
| 2 | 4 | SS | 10-10-18-10 | 1.1 | 9.7 | SILT; trace fine sand; trace clay; trace fine gravel; brown; compact; dry. |
| 4 | 6 | SS | 2-8-34-42 | 1.6 | 11.9 | Sand, fine and silt; little fine to medium crushed gravel; brown; light brown; dry. |
| 6 | 8 | SS | 20-24-40-32 | 1.4 | 6.8 | 6.0-6.4 CLAY; brown; compact.<br>6.4-7.4 SAND, coarse; light brown; semi-compact. |
| 8 | 10 | SS | 29-40-51-72 | 0.9 | 11.4 | Sand, fine to coarse and silt; trace coarse gravel; brown; reddish brown; tan; semi-compact. |
| 10 | 12 | SS | 14-19-21-25 | 0 | | No Recovery. |
| 12 | 14 | SS | 48-50-45-72 | 1.0 | 2.3 | Sand, fine and silt; trace medium gravel; brown; dark brown; semi-compact; wet. |

**OWNER:** SEI

**WELL NO.:** MW-21 **PAGE** 2 **OF** 2 **PAGES**

| | | | | | | |
|---|---|---|---|---|---|---|
| 15 | 17 | SS | 22-28-52-67 | 1.8 | 0 | Sand, fine and silt; trace medium to coarse gravel; brown; light brown; semi-compact; wet. |
| 20 | 21 | SS | 65-100/4” | 0 | | No Recovery. |
| | | | | | | Auger Refusal @ 21 ft. bg. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-22<br>**PAGE** 1 **OF** 2 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2” PVC<br>**SLOT NO.:** 0.010 **SETTING:** 7 to 22 ft. bg |
| **DATE COMPLETED:** August 15, 2006 | **SAND PACK SIZE & TYPE:** Morie Grade Filtration Sand |
| **DRILLING COMPANY:** Soil Testing Inc. | **SETTING:** Grade to 3 ft. bg; 5 to 22 ft. bg |
|  | **CASING SIZE & TYPE:** 2” PVC |
| **DRILLING METHOD:** Hollow Stem Auger | **SETTING:** Grade to 7 ft. bg |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite |
| **OBSERVER:** Patrick Welsh | **SETTING:** 3 to 5 ft. bg; 22 to 23.5 ft. bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Concrete collar and road box casing | **DURATION:** **YIELD:** |

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) |  | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO |  |  |  |  |  |
| 0 | 2 | SS | 20-12-12-11 | 1.75 | 0 | SAND, fine to medium; trace silt; light brown; tan; semi-compact; dry; organics in top 0.3 ft. |
| 2 | 4 | SS | 13-12-8-7 | 1.5 | 0 | SILT; trace clay; dark brown; tan; compact; moist. |
| 4 | 6 | SS | 6-3-8-40 | 1.3 | 0 | Silt and clay; little coarse sand; tan; brown; semi-compact; moist. |
| 6 | 8 | SS | 55-60-45-30 | 1.5 | 15.3 | 6.0-6.5 Sand, fine to medium and silt; trace medium crushed angular gravel; dark brown; brown<br>6.5-7.0 ROCK, crushed; gray.<br>7.0-7.5 Sand, fine to medium and silt; brown; semi-compact. |
| 8 | 10 | SS | 38-42-26-26 | 1.4 | 100.8 | 8.0-8.7 Sand, fine and silt; brown; black; semi-compact.<br>8.7-9.4 SAND, fine to coarse; brown; tan; semi-compact. |
| 10 | 12 | SS | 13-18-15-26 | 1.45 | 13.2 | Sand, fine to medium and silt; little coarse gravel; dark brown; compact; moist. |

**OWNER:** SEI

**WELL NO.:** MW-22 **PAGE** 2 **OF** 2 **PAGES**

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|---|---|---|---|---|---|---|
| 12 | 14 | SS | | 1.3 | 68.4 | SILT; trace medium gravel; brown; compact; wet. |
| 15 | 17 | SS | 29-28-21-100 | 1.55 | 6.8 | Sand, fine to medium and silt; trace coarse gravel; brown; compact; moist. |
| 20 | 22 | SS | 21-24-36-79 | 1.2 | 25.2 | |
| | | | | | | Auger refusal @ 23.5 ft. bg. |
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**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**TRUMBULL, CONNECTICUT**

**OWNER:** SEI.

**WELL NO:** MW-23I

**PAGE** 1 **OF** 2 **PAGES**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2” PVC

**SLOT NO.:** 0.010 **SETTING:** 24 to 34 ft. bg

**DATE COMPLETED:** June 27, 2010

**DRILLING COMPANY:** Connecticut Test Borings, LLC
Oxford, CT

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 22 to 34 ft. bg

**CASING SIZE & TYPE:** 2” PVC

**SETTING:** Grade to 24 ft. bg

**DRILLING METHOD:** Hollow Stem Auger / Geoprobe

**SAMPLING METHOD:** Macrocore

**OBSERVER:** Patrick Welsh

**SEAL TYPE:** Bentonite Grout / Bentonite Chips

**SETTING:** Grout: 1 to 20 ft bg; Chips: 20 to 22 ft. bg

**REFERENCE POINT (RP):** N/A

**BACKFILL TYPE:** Bentonite Grout: 1 to 20 ft bg

**ELEVATION OF RP:** N/A

**STATIC WATER LEVEL:** ~ 10.5 ft. bg

**STICK-UP:** N/A

**DEVELOPMENT METHOD:** Submersible pump

**SURFACE COMPLETION:** Curve box; concrete lip; epoxy seal

**DURATION:** **YIELD:**

**REMARKS:** A thin layer of Bentonite chips were placed just below the screen and just above the grout (to help stabilize cement curvebox).

**ABBREVIATIONS: HD = Hand dig MC = Macrocore REC = Recovery PPM = parts per million ft bg = feet below grade**

| **DEPTH (FEET)** | | **SAMPLE TYPE** | **BLOW COUNT** | **REC. (FEET)** | **PID READING (PPM)** 10.6 / 11.7 | **DESCRIPTION** |
|---|---|---|---|---|---|---|
| **FROM** | **TO** | | | | | |
| 0 | 2 | HD | -- | -- | 0 / 0<br>0 / 0 | 0 - 0.5 Concrete (12” core)<br>0.5 – 2.0 SAND, fine to medium; some large sub-rounded gravel; trace silt; brown; semi-compact; dry. |
| 2 | 5 | MC | -- | 2.9 | 0 / 0<br>0.2 / 0<br>0 / 0<br>0 / 0 | 2.0-3.0 SAND, fine; trace silt; trace small sub-angular gravel; brown; semi-compact; dry.<br>3.0-3.2 Crushed small black pieces (possibly coal).<br>3.2-4.1 SAND, fine; brown; semi-compact; dry; black (possibly coal) dust on outside.<br>4.1-4.9 SAND, fine; some silt; brown; semi-compact; moist. |
| 5 | 10 | MC | -- | 3.8 | 0 / 0 | 5.0-8.8 Sand, fine and Silt; little large sub-rounded gravel; brown; compact; moist. |
| 10 | 15 | MC | -- | 4.8 | 0 / 0 | 10.0-14.8 SAND, fine; some silt; little small to medium sub-angular gravel; brown; very compact; moist from 10 to 11.2 ft bg; dry below. |

**OWNER:** SEI

**WELL NO.:** MW-23I **PAGE** 2 **OF** 2 **PAGES**

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|---|---|---|---|---|---|---|
| 15 | 20 | MC | -- | 4.8 | 0 / 0 | 15.0-19.8 SAND, fine; little silt; little medium to large sub-angular gravel; brown; compact; dry. |
| 20 | 24 | MC | | 4.0 | 0 / 0 | 20.0-24.0 SAND, fine; some silt; little medium to large angular to sub-angular gravel; brown; dark gray from 21.5 to 22.8; compact; moist; wet at 23 ft. bg. |
| | 24 | | | | | Macro core refusal. |
| 30 | 31 | MC | -- | 1.0 | 0 / 0 | 30.0-31.0 SAND, fine; some silt; little medium to large angular to sub-angular gravel; brown; dark gray from 21.5 to 22.8; compact; moist |
| | 34 | | | | | Hollow stem auger refusal. End of boring. |
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# GEOLOGIC LOG
## LEGGETTE, BRASHEARS & GRAHAM, INC.
## TRUMBULL, CONNECTICUT

**OWNER:** SEI

**WELL NO:** MW-24I

**PAGE** 1 **OF** 2 **PAGES**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2” PVC

**SLOT NO.:** 0.010 **SETTING:** 6 to 21 ft bg

**DATE COMPLETED:** July 18, 2010

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 5 to 21 ft bg

**DRILLING COMPANY:** Connecticut Test Borings, LLC
Oxford, CT

**CASING SIZE & TYPE:** 2” PVC

**SETTING:** Grade to 6 ft bg

**DRILLING METHOD:** Hollow Stem Auger / Geoprobe

**SAMPLING METHOD:** Macrocore

**SEAL TYPE:** Bentonite Grout / Bentonite Chips

**OBSERVER:** Patrick Welsh

**SETTING:** Grout: 1 to 3 ft bg; Chips: 3 to 5 ft bg

**REFERENCE POINT (RP):** N/A

**BACKFILL TYPE:** Bentonite Grout: 1 to 3 ft bg

**ELEVATION OF RP:** N/A

**STATIC WATER LEVEL:** ~ 7.5 ft bg

**STICK-UP:** N/A

**DEVELOPMENT METHOD:** Submersible pump

**SURFACE COMPLETION:** Curve box; concrete lip; epoxy seal

**DURATION:** **YIELD:**

**REMARKS:** A thin layer of Bentonite chips were placed just below the screen and just above the grout (to help stabilize cement curvebox). Concrete core = 6.5 inches thick.

**ABBREVIATIONS: HD = Hand dig MC = Macrocore REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) 10.6 / 11.7 | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 3 | HD | -- | -- | -- / -- | 0-0.5 Concrete, cored.<br>0.5-3.0 SAND, fine to medium; little small to large sub-rounded gravel; brown; semi-compact; dry. |
| 3 | 5 | MC | -- | 1.9 | 0 / 0<br>0 / 0 | 3.0-4.0 SAND, fine to medium; little silt; brown; semi-compact; moist.<br>4.0-4.9 Sand, fine and Silt; little small angular gravel; brown; compact; moist. |
| 5 | 10 | MC | -- | 4.9 | 0 / 0<br>0 / 0 | 5.0-8.5 SILT; trace fine sand; trace clay; trace small angular gravel; brown; compact; moist; wet from 6.8 to 8.5.<br>8.5-9.8 SAND, fine to medium; little small to medium sub-angualr gravel; brown; semi-compact; dry. |
| 10 | 15 | MC | -- | 4.8 | 6.2 / 0 | 10.0-14.8 SILT; trace fine sand; trace small angular gravel; brown; compact; moist. Patch of medium to coarse sand @ 11.8 ft. bg. |
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**OWNER:** SEI

**WELL NO.:** MW-24I **PAGE** 2 **OF** 2 **PAGES**

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|---|---|---|---|---|---|---|
| 15 | 20 | MC | -- | 4.8 | 0 / 0 | 15.0-19.8 SILT; trace fine sand; trace small angular to sub-angular gravel; brown; dark brown spot @ 18.0 ft. bg; compact; wet from 15.0 to 17.7 ft bg; dry elsewhere. |
| 20 | 25 | MC | | 4.9 | 0 / 0 | 20.0-24.9 SILT; trace fine sand; trace small to large weathered angular to sub-angular gravel (dark gray); brown; compact; moist. |
| 25 | 27 | MC | | 1.0 | 0 / 0 | 25.-26.0 SILT; trace fine sand; trace small to large weathered angular to sub-angular gravel (dark gray); brown; compact; moist. |
| | 27 | | | | | Macro core refusal. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-25I<br>**PAGE** 1 **OF** 2 **PAGES** |

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|---|---|
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2” PVC<br>**SLOT NO.:** 0.010 **SETTING:** 12 to 22 ft bg |
| **DATE COMPLETED:** July 25, 2010 | **SAND PACK SIZE & TYPE:** Filpro #1<br>**SETTING:** 10 to 22 ft bg |
| **DRILLING COMPANY:** Connecticut Test Borings, LLC<br>Oxford, CT | **CASING SIZE & TYPE:** 2” PVC<br>**SETTING:** Grade to 12 ft bg |
| **DRILLING METHOD:** Hollow Stem Auger / Geoprobe | |
| **SAMPLING METHOD:** Macrocore | **SEAL TYPE:** Bentonite Grout / Bentonite Chips |
| **OBSERVER:** Patrick Welsh | **SETTING:** Grout: 1 to 8 ft bg; Chips: 8 to 10 ft bg |
| **REFERENCE POINT (RP):** N/A | **BACKFILL TYPE:** Bentonite Grout: 1 to 8 ft bg |
| **ELEVATION OF RP:** N/A | **STATIC WATER LEVEL:** ~ 8.0 ft bg |
| **STICK-UP:** N/A | **DEVELOPMENT METHOD:** Submersible pump |
| **SURFACE COMPLETION:** Curve box; concrete lip; epoxy seal | **DURATION:** **YIELD:** |

**REMARKS:** A thin layer of Bentonite chips were placed just below the screen and just above the grout (to help stabilize cement curvebox). Concrete core = 6.75 inches thick.

**ABBREVIATIONS: HD = Hand dig MC = Macrocore REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) 10.6 / 11.7 | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 3 | HD | | -- | 0 / 0 | 0-0.5 Concrete<br>0.5-3.0 = SAND, fine to medium; trace silt from 2.5 to 3.0 ft bg; little small to large sub-rounded to sub-angular gravel; |
| 3 | 5 | MC | | 2.0 | 0 / 0 | 3.0-5.0 SAND, fine; some silt; trace small sub-angular gravel; brown; semi-compact; moist. |
| 5 | 10 | MC | | 4.2 | 0 / 0<br>0 / 0 | 5.0-8.0 SAND, fine; some silt; trace small sub-angular gravel; brown; semi-compact; wet.<br>8.0-9.2 Sand, fine and Silt; trace clay; trace small sub-angualr gravel; brown; compact; moist. |
| 10 | 15 | MC | | 4.8 | 0 / 0 | 10.0-14.8 Sand, fine and silt; trace clay; trace small sub-angualr gravel; brown; compact; wet. Pockets of crushed gray stone. |
| 15 | 20 | MC | | 4.8 | 0 / 0 | 15-19.8 SILT; some fine sand; little small to medium sub-angular to sub-rounded gravel; trace clay; brown; very compact; moist. |

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|---|---|---|---|---|---|---|
| 20 | 25 | MC | | 4.8 | 0 / 0 | 20.0-24.8 SILT; some clay; little small to medium sub-angular gravel; trace fine sand; brown; very compact; moist. |
| 25 | 27 | MC | | 2.0 | 0 / 0 | 25.0-27.0 SILT; some clay; little small to medium sub-angular gravel; trace fine sand; brown; very compact; moist. |
| | 27 | | | | | Macrocore refusal. |

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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** MW-26I<br>**PAGE** 1 **OF** 2 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2” PVC<br>**SLOT NO.:** 0.010 **SETTING:** 14 to 24 ft bg |
| **DATE COMPLETED:** August 15, 2010 | **SAND PACK SIZE & TYPE:** Filpro #1 |
| **DRILLING COMPANY:** Connecticut Test Borings, LLC<br>Oxford, CT | **SETTING:** 12 to 24 ft bg<br>**CASING SIZE & TYPE:** 2” PVC |
| **DRILLING METHOD:** Hollow Stem Auger / Geoprobe | **SETTING:** Grade to 14 ft bg |
| **SAMPLING METHOD:** Macrocore | **SEAL TYPE:** Bentonite Grout / Bentonite Chips |
| **OBSERVER:** Patrick Welsh | **SETTING:** Grout: 1 to 10 ft bg; Chips: 10 to 12 ft bg |
| **REFERENCE POINT (RP):** N/A | **BACKFILL TYPE:** Bentonite Grout: 1 to 10 ft bg |
| **ELEVATION OF RP:** N/A | **STATIC WATER LEVEL:** ~ 8.0 ft bg |
| **STICK-UP:** N/A | **DEVELOPMENT METHOD:** Submersible pump |
| **SURFACE COMPLETION:** Curve box; concrete lip; epoxy seal | **DURATION:** **YIELD:** |

**REMARKS:** A thin layer of Bentonite chips were placed just below the screen and just above the grout (to help stabilize cement curvebox). Concrete core = 6.5 inches thick.

**ABBREVIATIONS: HD = Hand dig MC = Macrocore REC = Recovery PPM = parts per million ft bg = feet below grade**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) 10.6 / 11.7 | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2.5 | HD | | -- | 0 / 0<br>0 / 0 | 0-0.5 Concrete, cored.<br>0.5-2.5 SAND, fine; little small to large sub-rounded to sub-angular gravel; trace cobbles; trace silt; brown, light brown; semi-compact; dry. |
| 2.5 | 5.0 | MC | | 2.5 | 0 / 0<br>0 / 0 | 2.5-3.8 SAND, fine; little silt; little small to medium sub-angular gravel; dark brown; semi-compact; dry.<br>3.8-5.0 SAND, fine; trace silt; trace medium sub-rounded gravel; brown; semi-compact; dry. |
| 5 | 10 | MC | | 3.8 | 0 / 0<br>0 / 0<br>0 / 0 | 5.0-7.0 SAND, fine; some silt; trace small sub-angular gravel; brown; compact; wet.<br>7.0-7.4 SAND, fine to medium; some medium to large sub-angular gravel; brown, gray; semi-compact; dry.<br>7.4-8.8 SILT; little clay; trace fine sand; brown, gray; semi-compact; wet. |

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|---|---|---|---|---|---|---|
| 10 | 15 | MC | | 4.8 | 0 / 0<br>0 / 0 | 10.0-13.2 Sand, fine and Silt; little small to medium sub-angular gravel; brown; compact; wet.<br>13.2-14.8 SILT; little clay; trace fine sand; brown, gray; very compact; dry. |
| 15 | 20 | MC | | 4.8 | 0 / 0 | 15.0-19.8 SILT; little clay; trace fine sand; brown, gray; very compact; dry. Dark patch from 17.7 to 18.6 ft bg. |
| 20 | 23 | MC | | 3.0 | 0 / 0<br>0 / 0 | 20.0-20.9 Sand, fine and Silt; little small to medium sub-angular gravel; brown; compact; dry.<br>20.9-23.0 SILT; little clay; trace fine sand; brown, gray; very compact; dry. |
| | 23 | | | | | Macrocore refusal; rock in the cutting shoe. |
| | 24 | | | | | Auger refusal. |

**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**SHELTON, CONNECTICUT**

**OWNER:** SEI

**BORING/WELL NO:** MW-27S

**PAGE** 1 **OF** **PAGE**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, CT

**SCREEN SIZE & TYPE:** 2-inch PVC

**SLOT NO.:** 0.010 **SETTING:** 5 to 25 ft bg

**DATE COMPLETED:** October 13, 2012

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 4 – 25 ft bg

**DRILLING COMPANY:** Connecticut Test Borings, LLC.
Seymour, CT

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** Grade to 5 ft bg

**DRILLING METHOD:** Hollow-Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite Chips/Bentonite Grout

**OBSERVER:** Patrick Welsh

**SETTING:** 2 to 4. ft bg / 1 to 2 ft bg

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:** Native

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:** ~ 6.25 ft bg

**STICK-UP:** --

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Roadbox with concrete collar

**DURATION:** **YIELD:**

**REMARKS:** For geologic information please see boring log of MW-27D.

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**SHELTON, CONNECTICUT** | **OWNER:** SEI<br>**BORING/WELL NO:** MW-27D<br>**PAGE** 1 **OF** **PAGE** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, CT | **SCREEN SIZE & TYPE:** 2-inch PVC<br>**SLOT NO.:** 0.010 **SETTING:** 22 to 42 ft bg |
| **DATE COMPLETED:** October 13, 2012 | **SAND PACK SIZE & TYPE:** Filpro #1<br>**SETTING:** 18 – 42 ft bg |
| **DRILLING COMPANY:** Connecticut Test Borings, LLC.<br>Seymour, CT | **CASING SIZE & TYPE:** 2-inch PVC<br>**SETTING:** Grade to 22 ft bg |
| **DRILLING METHOD:** Hollow-Stem Auger | |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite Chips/Bentonite Grout |
| **OBSERVER:** Patrick Welsh | **SETTING:** 15 to 18 ft bg / 1 to 15 ft bg |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** Grout |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** ~ 6.25 ft bg |
| **STICK-UP:** -- | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Roadbox with concrete collar | **DURATION:** **YIELD:** |

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | -- | -- | 0 | 0-5.0: SAND, fine to medium; trace silt; trace small to medium, sub-rounded to sub-angular ravel; dark brown; semi-compact; moist. |
| 5 | 7 | SS | 2-2-2-3 | 2.0 | 0 | 5-5.2: SAND, fine to medium; trace silt; trace small to medium, sub-rounded to sub-angular ravel; dark brown; semi-compact; moist.<br>5.2-7.0: CLAY; little silt; gray; compact; moist. |
| 10 | 12 | SS | 8-10-14-17 | 0.5 | 0 | 10-10.5: SAND, fine to coarse; trace small sub-rounded gravel; dark brown; semi-compact; wet. |
| 15 | 15.4 | SS | 50/4” | 0.4 | 0 | 15-15.4: SAND, fine; little small to medium sub-angular gravel; brown; compact; wet. Till material. |
| 20 | 20.3 | SS | 50/3” | 1.1 | 0 | 20-22.0: SAND, fine; little small to medium sub-angular gravel; brown; compact; wet. Till material. |

**OWNER:** SEI

**WELL NO.:** MW-27D **PAGE** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 25 | 25.5 | SS | 50/5” | 0.6 | 0 | 25-25.6: SAND, fine; little silt; small to large sub-angular gravel; brown; compact; wet. Till material. |
| 30 | 30.5 | SS | 50/5” | 0.6 | 0 | 30-30.6: SAND, fine; little silt; small to large sub-angular gravel; brown; compact; wet. Till material. |
| 35 | 35.4 | SS | 50/4” | 0.7 | 0 | 35-35.7: SAND, fine; little silt; small to large sub-angular gravel; brown; compact; wet. Till material. |
| 40 | 40.2 | SS | 50/1” | -- | -- | No Recovery. |
| | 42 | | | | | End of boring. |
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# GEOLOGIC LOG
# LEGGETTE, BRASHEARS & GRAHAM, INC.
## SHELTON, CONNECTICUT

**OWNER:** SEI

**BORING/WELL NO:** EW-1

**PAGE** 1 **OF** **PAGE**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, CT

**SCREEN SIZE & TYPE:** 2-inch PVC

**SLOT NO.:** 0.020 **SETTING:** 7 to 42 ft bg

**DATE COMPLETED:** September 29, 2012

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 7 – 42 ft bg

**DRILLING COMPANY:** Connecticut Test Borings, LLC.
Seymour, CT

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** Grade to 7 ft bg

**DRILLING METHOD:** Hollow-Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite Chips/Bentonite Grout

**OBSERVER:** Patrick Welsh

**SETTING:** 3 to 5 ft bg / 1 to 3 ft bg

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:** Native

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:** ~ 4 ft bg

**STICK-UP:** --

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Roadbox with concrete collar

**DURATION:** **YIELD:**

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | | | 0<br>0 | 0-0.6: Asphalt, crushed<br>0.2-5: SAND, fine to medium; little small to large sub-angular to sub-rounded gravel; trace silt; little large sub-angular gravel; gray, brown; semi-compact; dry. |
| 5 | 7 | SS | 1-10-6-7 | 1.2 | 0<br>0<br>0 | 5-5.2: SAND, fine; trace silt; trace small sub-angular gravel; brown; semi-compact; dry.<br>5.2-6.4: CLAY; little silt; gray; compact; dry.<br>6.4-6.6: SAND, fine; trace silt; trace small sub-angular gravel; brown; semi-compact; dry. |
| 10 | 12 | SS | 4-7-11-7 | 0.6 | 0 | 10-10.6: SAND, fine to medium; trace silt; little small to large sub-angular to sub-rounded gravel; brown; semi-compact; wet. |
| 15 | 17 | SS | 11-20-23-23 | 1.5 | 0 | 15-16.5: SAND, fine; little small sub-angular to sub-rounded gravel; little silt; dark brown; compact; wet. |

**OWNER:** SEI

**WELL NO.:** EW-1 **PAGE** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 20 | 22 | SS | 13-17-18-30 | 1.2 | 0 | 20-21.2: SAND, fine; little small sub-angular to sub-rounded gravel; little silt; dark brown; compact; wet. |
| 25 | 27 | SS | 6-14-10-12 | 1.0 | 0.1 | 25-26.0: SAND, fine; little small sub-angular to sub-rounded gravel; little silt; dark brown; compact; wet. |
| 30 | 32 | SS | 5-10-11-20 | 1.5 | 0 | 30-31.5: SAND, fine; little small sub-angular to sub-rounded gravel; little silt; dark brown; compact; wet. |
| 35 | 36.5 | SS | 14-34-50/5” | 1.0 | 0 | 35-36.0: SAND, fine; little small sub-angular to sub-rounded gravel; little silt; dark brown; compact; wet. |
| 40 | 40.9 | SS | 31-50/4” | 1.1 | 0 | 40-41.2: SAND, fine; little small sub-angular to sub-rounded gravel; little silt; dark brown; compact; wet. |
| | 42 | | | | | End of boring. |
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**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**SHELTON, CONNECTICUT**

**OWNER:** SEI

**BORING/WELL NO:** EW-2

**PAGE** 1 **OF** **PAGE**

**SITE LOCATION** Materials Research Corporation
542 Route 303
Orangetown, CT

**SCREEN SIZE & TYPE:** 2-inch PVC

**SLOT NO.:** 0.020 **SETTING:** 7 to 42 ft bg

**DATE COMPLETED:** September 30, 2012

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 7 – 42 ft bg

**DRILLING COMPANY:** Connecticut Test Borings, LLC.
Seymour, CT

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** Grade to 7 ft bg

**DRILLING METHOD:** Hollow-Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite Chips/Bentonite Grout

**OBSERVER:** Patrick Welsh

**SETTING:** 3 to 5 ft bg / 1 to 3 ft bg

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:** Native

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:**

**STICK-UP:** --

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Roadbox with concrete collar

**DURATION:** **YIELD:**

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | -- | -- | 0<br>0 | 0-0.6: Asphalt, crushed. Three Layers<br>0.6-1.5: SAND, medium; some large sub-angular to angular gravel; dark brown; semi-compact; dry.<br>1.5-5.0: SAND fine to medium; little small to medium sub-angular to sub-rounded gravel; brown; semi-compact; moist @ 4.0 ft bg. |
| 5 | 7 | SS | 6-12-8-8 | 0.5 | 0<br>0 | 5-5.3: SAND fine to medium; little small to medium sub-angular to sub-rounded gravel; brown; semi-compact; wet.<br>5.3-5.5: GRAVEL, crushed. |
| 10 | 12 | SS | 2-4-14-12 | 1.5 | 0<br>0 | 10-10.9: SAND, medium; trace large, sub-rounded gravel; brown; semi-compact; wet.<br>10.9-11.5: SAND, fine; some silt; little small to medium, sub-angular gravel; brown; compact; moist. Till material. |

**OWNER:** SEI

**WELL NO.:** EW-2 **PAGE** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 15 | 16.7 | SS | 17-38-43-50/2” | 1.3 | 0.1 | 15-16.3: SAND, fine; some silt; little small to medium, sub-angular gravel; brown; compact; moist. |
| 20 | 21.2 | SS | 14-41-50/2” | 1.2 | 0.1 | 20-21.2: SAND, fine; some silt; little small to medium, sub-angular gravel; brown; compact; moist. |
| 25 | 26.4 | SS | 16-35-50/4” | 1.1 | 0 | 25.0-25.2: GRAVEL, crushed.<br>25.2-26.1: SAND, fine; some silt; little small to medium, sub-angular gravel; brown; compact; wet. |
| 30 | 30.9 | SS | 37-50/4” | 0.9 | 0.2 | 30-30.9: SAND, fine; some silt; little small to medium, sub-angular gravel; brown; compact; wet. |
| 35 | 35.9 | SS | 43-50/4” | 1.7 | 0.1 | 35-36.0: SAND, fine; some silt; little small to medium, sub-angular gravel; brown; compact; wet. |
| 40 | 40.8 | SS | 54-50/2” | 1.2 | 0 | 40-41.2: SAND, fine; little small to medium sub-angular to sub-rounded gravel; trace silt brown; compact; wet. |
| | 42 | | | | | End of boring. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**SHELTON, CONNECTICUT** | **OWNER:** SEI<br>**BORING/WELL NO:** EW-3<br>**PAGE** 1 **OF** **PAGE** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, CT | **SCREEN SIZE & TYPE:** 2-inch PVC<br>**SLOT NO.:** 0.020 **SETTING:** 7 to 42 ft bg |
| **DATE COMPLETED:** September 22, 2012 | **SAND PACK SIZE & TYPE:** Filpro #1<br>**SETTING:** 7 – 42 ft bg |
| **DRILLING COMPANY:** Connecticut Test Borings, LLC.<br>Seymour, CT | **CASING SIZE & TYPE:** 2-inch PVC |
| **DRILLING METHOD:** Hollow-Stem Auger | **SETTING:** Grade to 7 ft bg |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite Chips/Bentonite Grout |
| **OBSERVER:** Patrick Welsh | **SETTING:** 3 to 5 ft bg / 2 to 3 ft bg |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** Native |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** ~ 1.5 ft bg |
| **STICK-UP:** -- | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Roadbox with concrete collar | **DURATION:** **YIELD:** |

**REMARKS:** Shallow water located in large angular gravel at surface may not be representative of the true water table elevation.

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | | | 0<br>0<br>0 | 0-0.2: Asphalt, crushed<br>0.2-3: Gravel, large, angular; little small to medium, angular cobbles; little fine sand; gray; semi-compact; wet @ 1.5 ft bg.<br>3.0-5.0: SAND, fine to medium; little large, sub-angular gravel; gray; semi-compact; wet. |
| 5 | 7 | SS | 15-11-6-5 | 1.2 | 0.2 | 5.0-5.4: SAND, fine to medium; trace small, sub-angular gravel; brown, gray; semi-compact; wet.<br>5.4-5.7: ROCK, crushed.<br>5.7-6.2: SILT; trace small to medium, sub-angular gravel; dark brown; compact; moist. |
| 10 | 12 | SS | 9-20-8-6 | 1.4 | 0.1 | 10-11.4: SILT; trace small to medium, sub-angular gravel; dark brown; compact; moist. |
| 15 | 17 | SS | 16-17-20-26 | 1.6 | 0.4 | 15-16.6: SAND, fine; little small to medium sub-angular to sub-rounded gravel; trace silt; brown; dry; compact. |

**OWNER:** SEI

**WELL NO.:** EW-3 **PAGE** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 20 | 22 | SS | 21-27-35-44 | 1.9 | 0.2 | 20-21.9: SAND, fine; little small to medium sub-angular to sub-rounded gravel; trace silt; brown; dry; compact. |
| 25 | 27 | SS | 34-43-44-56 | 1.4 | 0.2 | 25-26.4: SAND, fine; little small to large sub-angular to sub-rounded gravel; trace silt; brown; dry; compact. |
| 30 | 30.9 | SS | 36-100/4” | 0.9 | 0.3 | 30-30.9: SAND, fine; little small to medium sub-angular to sub-rounded gravel; trace silt; brown; dry; compact. |
| 35 | 36.3 | SS | 40-54-50/3” | 1.3 | 0.2 | 35-36.3: SAND, fine; little small to medium sub-angular to sub-rounded gravel; trace silt; brown; dry; compact. |
| 40 | 40.8 | SS | 32 – 50/2” | 0.8 | 0.2 | 40-40.8: SAND, fine; little small to medium sub-angular to sub-rounded gravel; trace silt; brown; dry; compact. |
| | 42 | | | | | End of boring. |

**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**SHELTON, CONNECTICUT**

**OWNER:** SEI

**BORING/WELL NO:** EW-4

**PAGE** 1 **OF** **PAGE**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, CT

**SCREEN SIZE & TYPE:** 2-inch PVC

**SLOT NO.:** 0.020 **SETTING:** 7 to 42 ft bg

**DATE COMPLETED:** September 23, 2012

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 7 – 42 ft bg

**DRILLING COMPANY:** Connecticut Test Borings, LLC.
Seymour, CT

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** Grade to 7 ft bg

**DRILLING METHOD:** Hollow-Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite Chips/Bentonite Grout

**OBSERVER:** Patrick Welsh

**SETTING:** 3 to 5 ft bg / 1 to 3 ft bg

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:** Native

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:** ~ 4 ft bg

**STICK-UP:** --

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Roadbox with concrete collar

**DURATION:** **YIELD:**

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | | | 0<br>0 | 0-0.2: Asphalt, crushed<br>0.2-5: SAND, medium to coarse; little large sub-angular gravel; gray, brown; semi-compact; dry. |
| 5 | 7 | SS | 1-1-3-3 | 1.3 | 0.2 | 5-6.3: CLAY; trace silt; gray; compact; wet. Small pieces of wire and organics found in clay. Crushed soda can found in cutting at 9 ft bg. |
| 10 | 12 | SS | 4-4-7-17 | 1.5 | 0.1 | 10-11.4: SAND, fine; trace silt; little small to medium sub-angular to sub-rounded gravel; brown; semi-compact; wet. |
| 15 | 16.2 | SS | 20-48-50/2” | 1.1 | 0.2 | 15-16.1: SAND, fine; little small to medium sub-angular to sub-rounded gravel; trace silt brown; compact; wet. |

**OWNER:** SEI

**WELL NO.:** EW-4 **PAGE** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 20 | 20.9 | SS | 23-50/4” | 0.8 | 0.2 | 20-20.8: SAND, fine; little small to medium sub-angular to sub-rounded gravel; trace silt brown; compact; wet. |
| 25 | 27 | SS | 57-50/5” | 0.8 | 0.3 | 25-25.8: SAND, fine; little small to medium sub-angular to sub-rounded gravel; trace silt brown; compact; wet. |
| 30 | 30.7 | SS | 42-50/2” | 0.9 | 0.2 | 30-30.9: SAND, fine; little small to medium sub-angular to sub-rounded gravel; trace silt brown; compact; wet. |
| 35 | 35.8 | SS | 39-50/3” | 1.0 | 0.1 | 35-36.0: SAND, fine; little small to medium sub-angular to sub-rounded gravel; trace silt brown; compact; wet. |
| 40 | 40.4 | SS | 50/5” | 1.2 | 0 | 40-41.2: SAND, fine; little small to medium sub-angular to sub-rounded gravel; trace silt brown; compact; wet. |
| | 42 | | | | | End of boring. |
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**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**SHELTON, CONNECTICUT**

**OWNER:** SEI

**BORING/WELL NO:** EW-5

**PAGE** 1 **OF** **PAGE**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2-inch PVC

**SLOT NO.:** 0.020 **SETTING:** 13 to 18 and 21 to 28 ft bg

**DATE COMPLETED:** December 13, 2013

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 12-18.5 and 20.5-28 ft bg

**DRILLING COMPANY:** Soil Testing, Inc.
Oxford, CT

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** Grade to 13 and 18 to 21 ft bg

**DRILLING METHOD:** Hollow-Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite Chips/Bentonite Grout

**OBSERVER:** Patrick Welsh

**SETTING:** 10 to 12 and 18.5 to 20.5 ft bg / 1.5 to 10 ft bg

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:** Native

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:** ~ 13 ft bg

**STICK-UP:** --

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Roadbox with concrete collar

**DURATION:** **YIELD:**

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | | -- | 0<br>0 | 0-0.4: Asphalt, crushed<br>0.4-5: SAND, fine; little small to large, sub-angular to angular gravel; trace silt; brown, dark brown, brown; compact; dry. |
| 5 | 10 | C | | -- | 0 | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); brown, dark brown; compact; dry. Large pockets up to several feet thick of large, sub-angular to angular gravel and cobbles. |
| 10 | 15 | C | | -- | 1.6 | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); brown, dark brown; compact; moist to wet. |
| 15 | 20 | C | | -- | 5.8 | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); brown, dark brown; compact; wet. |
| 20 | 25 | C | | -- | 19.6 | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); dark brown; compact; dry. |
| 28 | | | | | | Auger refusal. |

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|---|---|
| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**SHELTON, CONNECTICUT** | **OWNER:** SEI<br>**BORING/WELL NO:** EW-6<br>**PAGE** 1 **OF** **PAGE** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2-inch PVC<br>**SLOT NO.:** 0.020 **SETTING:** 13 to 18 and 21 to 28 ft bg |
| **DATE COMPLETED:** December 12, 2013 | **SAND PACK SIZE & TYPE:** Filpro #1<br>**SETTING:** 12-18.5 and 20.5-28 ft bg |
| **DRILLING COMPANY:** Soil Testing, Inc.<br>Oxford, CT | **CASING SIZE & TYPE:** 2-inch PVC<br>**SETTING:** Grade to 13 and 18 to 21 ft bg |
| **DRILLING METHOD:** Hollow-Stem Auger | |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite Chips/Bentonite Grout |
| **OBSERVER:** Patrick Welsh | **SETTING:** 10 to 12 and 18.5 to 20.5 ft bg / 1.5 to 10 ft bg |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** Native |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** ~ 13 ft bg |
| **STICK-UP:** -- | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Roadbox with concrete collar | **DURATION:** **YIELD:** |

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | | -- | 0 | Two layers of asphalt underlain by SAND, fine; some silt; little small to medium, sub-angular gravel (with pockets of large gravel); brown, dark brown; compact; dry. |
| 5 | 10 | C | | -- | 0 | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); brown, dark brown; compact; dry. Large pockets up to several feet thick of large, sub-angular to angular gravel and cobbles. |
| 10 | 15 | C | | -- | 0 | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); brown, dark brown; compact; moist to wet. |
| 15 | 20 | C | | -- | 0 | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); brown, dark brown; compact; wet. |
| 20 | 25 | C | | -- | 19.6 | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); dark brown; compact; wet. |
| 28 | | | | | | Auger refusal. |

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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**SHELTON, CONNECTICUT** | **OWNER:** SEI<br>**BORING/WELL NO:** EW-7<br>**PAGE** 1 **OF** **PAGE** |
| **SITE LOCATION** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2-inch PVC<br>**SLOT NO.:** 0.020 **SETTING:** 13 to 18 and 21 to 28 ft bg |
| **DATE COMPLETED:** December 13, 2013 | **SAND PACK SIZE & TYPE:** Filpro #1 |
| **DRILLING COMPANY:** Soil Testing, Inc.<br>Oxford, CT | **SETTING:** 12-18.5 and 20.5-28 ft bg |
| | **CASING SIZE & TYPE:** 2-inch PVC |
| **DRILLING METHOD:** Hollow-Stem Auger | **SETTING:** Grade to 13 and 18 to 21 ft bg |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite Chips/Bentonite Grout |
| **OBSERVER:** Patrick Welsh | **SETTING:** 10 to 12 and 18.5 to 20.5 ft bg / 1.5 to 10 ft bg |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** Native |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** ~ 13 ft bg |
| **STICK-UP:** -- | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Roadbox with concrete collar | **DURATION:** **YIELD:** |

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | | -- | 0 | Two layers of asphalt underlain by SAND, fine; some silt; little small to medium, sub-angular gravel (with pockets of large gravel); brown, dark brown; compact; dry. |
| 5 | 10 | C | | -- | 0 | SAND, fine; some silt; little small to medium, sub-angular gravel (with pockets of large gravel); brown, dark brown; compact; dry. |
| 10 | 15 | C | | -- | 8.1 | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); dark brown; compact; dry. |
| 15 | 20 | C | | -- | 17.2 | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); dark brown; compact; wet. |
| 20 | 25 | C | | -- | 42.6 | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); dark brown; compact; wet. |
| 28 | | | | | | Auger refusal. |

**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**SHELTON, CONNECTICUT**

**OWNER:** SEI

**BORING/WELL NO:** EW-8

**PAGE** 1 **OF** **PAGE**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**DATE COMPLETED:** December 16, 2013

**DRILLING COMPANY:** Soil Testing, Inc.
Oxford, CT

**DRILLING METHOD:** Hollow-Stem Auger

**SAMPLING METHOD:** Split Spoon

**OBSERVER:** Patrick Welsh

**REFERENCE POINT (RP):** Grade

**ELEVATION OF RP:** --

**STICK-UP:** --

**SURFACE COMPLETION:** Roadbox with concrete collar

**SCREEN SIZE & TYPE:** 2-inch PVC

**SLOT NO.:** 0.020 **SETTING:** 13 to 18 and 21 to 28 ft bg

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 12-18.5 and 20.5-28 ft bg

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** Grade to 13 and 18 to 21 ft bg

**SEAL TYPE:** Bentonite Chips/Bentonite Grout

**SETTING:** 10 to 12 and 18.5 to 20.5 ft bg / 1.5 to 10 ft bg

**BACKFILL TYPE:** Native

**STATIC WATER LEVEL:** ~ 13 ft bg

**DEVELOPMENT METHOD:**

**DURATION:** **YIELD:**

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | | -- | 0 | Two layers of asphalt underlain by SAND, fine; some silt; little small to medium, sub-angular gravel (with pockets of large gravel); brown, dark brown; compact; dry. |
| 5 | 10 | C | | -- | 0 | SAND, fine; some silt; little small to medium, sub-angular gravel (with pockets of large gravel); brown, dark brown; compact; dry. |
| 10 | 15 | C | | -- | | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); dark brown; compact; dry. |
| 15 | 20 | C | | -- | | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); dark brown; compact; wet. |
| 20 | 25 | C | | -- | | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); dark brown; compact; wet. |
| 28 | | | | | | Auger refusal. |

**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**SHELTON, CONNECTICUT**

**OWNER:** SEI

**BORING/WELL NO:** EW-9

**PAGE** 1 **OF** **PAGE**

**SITE LOCATION** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2-inch PVC

**SLOT NO.:** 0.020 **SETTING:** 13 to 18 and 21 to 28 ft bg

**DATE COMPLETED:** December 19, 2013

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 12-18.5 and 20.5-28 ft bg

**DRILLING COMPANY:** Soil Testing, Inc.
Oxford, CT

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** Grade to 13 and 18 to 21 ft bg

**DRILLING METHOD:** Hollow-Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite Chips/Bentonite Grout

**OBSERVER:** Patrick Welsh

**SETTING:** 10 to 12 and 18.5 to 20.5 ft bg / 1.5 to 10 ft bg

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:** Native

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:** ~ 13 ft bg

**STICK-UP:** --

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Roadbox with concrete collar

**DURATION:** **YIELD:**

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | | -- | 0 | Two layers of asphalt underlain by SAND, fine; some silt; little small to medium, sub-angular gravel (with pockets of large gravel); brown, dark brown; compact; dry. |
| 5 | 10 | C | | -- | 0 | SAND, fine; some silt; little small to medium, sub-angular gravel (with pockets of large gravel); brown, dark brown; compact; dry. |
| 10 | 15 | C | | -- | | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); dark brown; compact; dry. |
| 15 | 20 | C | | -- | | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); dark brown; compact; wet. |
| 20 | 25 | C | | -- | | SAND, fine; some silt; trace clay; trace small to medium, sub-angular gravel (with pockets of large gravel); dark brown; compact; wet. |
| 28 | | | | | | Auger refusal. |

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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**SHELTON, CONNECTICUT** | **OWNER:** SEI<br>**BORING/WELL NO:** EW-10<br>**PAGE** 1 **OF** **PAGE** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:** 2-inch PVC<br>**SLOT NO.:** 0.020 **SETTING:** 15-25 ft bg |
| **DATE COMPLETED:** December 16, 2013 | **SAND PACK SIZE & TYPE:** Filpro #1 |
| **DRILLING COMPANY:** Soil Testing, Inc.<br>Oxford, CT | **SETTING:** 13 - 15 ft bg<br>**CASING SIZE & TYPE:** 2-inch PVC |
| **DRILLING METHOD:** Hollow-Stem Auger | **SETTING:** Grade to 15 ft bg |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite Chips/Bentonite Grout |
| **OBSERVER:** Patrick Welsh | **SETTING:** 11 to 13 ft bg / 1.5 to 11 ft bg |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** Native |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** ~ 13 ft bg |
| **STICK-UP:** -- | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Roadbox with concrete collar | **DURATION:** **YIELD:** |

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) |  | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO |  |  |  |  |  |
| 0 | 5 | C |  |  | 0<br>0 | 0-0.4: Asphalt, crushed<br>0.4-5: SAND, fine; little small to medium sub-angular gravel; little silt; trace clay; brown, dark brown; semi-compact; dry. |
| 5 | 7 | SS | 25-50-50/4” | 1.2 | 0 | 5-6.2: SAND, fine; little small to medium sub-angular gravel; little silt; brown, dark brown; compact; dry. |
| 10 | 12 | SS | 16-19-28-27 | 0.8 | 0 | 10-10.8: SAND, fine to medium; little small to large, sub-angular to sub-rounded gravel; little silt; brown, dark brown; compact; dry. |
| 15 | 17 | SS | 34-30-28-31 | 1.0 | 0.5 | 15-16: SAND, fine to medium; little small to large, sub-angular gravel; trace silt; dark brown; semi-compact; wet. |
| 20 | 22 | SS | 29-40-/50/5” | 1.3 | 26.1 | 20-21.3: SAND, fine to medium; little small to large, sub-angular gravel; trace silt; dark brown; semi-compact; wet. |
| 25 | 27 | SS | 20-21-22-21 | 1.5 | 90.7 | 25.0-26.5: Mix of previous till (compact fine sand, silt, angular gravel) and weathered to more competent rock. |
| 25 |  |  |  |  |  | Auger refusal |

# GEOLOGIC LOG
## LEGGETTE, BRASHEARS & GRAHAM, INC.
## SHELTON, CONNECTICUT

**OWNER:** SEI

**BORING/WELL NO:** EW-11

**PAGE** 1 **OF** **PAGE**

**SITE LOCATION** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2-inch PVC

**SLOT NO.:** 0.020 **SETTING:** 13 to 18 and 21 to 28 ft bg

**DATE COMPLETED:** December 12, 2013

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 12-18.5 and 20.5-28 ft bg

**DRILLING COMPANY:** Soil Testing, Inc.
Oxford, CT

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** Grade to 13 and 18 to 21 ft bg

**DRILLING METHOD:** Hollow-Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite Chips/Bentonite Grout

**OBSERVER:** Patrick Welsh

**SETTING:** 10 to 12 and 18.5 to 20.5 ft bg / 1.5 to 10 ft bg

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:** Native

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:** ~ 13 ft bg

**STICK-UP:** --

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Roadbox with concrete collar

**DURATION:** **YIELD:**

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | | | 0<br>0 | 0-0.4: Asphalt, crushed<br>0.4-5: SAND, fine; little small to large, sub-angular to angular gravel; trace silt; brown, dark brown, brown; compact; dry. |
| 5 | 7 | SS | 22-13-18-20 | 1.6 | 0 | 5-6.6: SAND, fine; little small to large, sub-angular to angular gravel; trace silt; brown, dark brown, brown; compact; dry. |
| 10 | 12 | SS | 6-7-10-10 | 0.7 | 0 | 10-10.7: SAND, fine; little small to large, sub-angular to angular gravel; trace silt; brown, dark brown, brown; compact; dry. |
| 15 | 17 | SS | 12-22-26-20 | 0.7 | 0 | 15-15.7: SAND, fine to medium; little small to large, sub-angular gravel; trace silt; dark brown; semi-compact; wet. |
| 20 | 22 | SS | 33-26-50/5” | 0 | -- | No Recovery |
| 25 | 27 | SS | 47-50/3” | 0.9 | 215 | 25.0-25.9: SAND, fine to medium; little small to large, sub-angular gravel; trace silt; dark brown; semi-compact; wet. Pieces of decomposed, weathered bedrock throughout. |
| 28 | | | | | | Auger refusal |

**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**SHELTON, CONNECTICUT**

**OWNER:** SEI

**BORING/WELL NO:** EW-12

**PAGE** 1 **OF** **PAGE**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2-inch PVC

**SLOT NO.:** 0.020 **SETTING:** 13 to 18 and 21 to 28 ft bg

**DATE COMPLETED:** December 19, 2013

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 12-18.5 and 20.5-28 ft bg

**DRILLING COMPANY:** Soil Testing, Inc.
Oxford, CT

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** Grade to 13 and 18 to 21 ft bg

**DRILLING METHOD:** Hollow-Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite Chips/Bentonite Grout

**OBSERVER:** Patrick Welsh

**SETTING:** 10 to 12 and 18.5 to 20.5 ft bg / 1.5 to 10 ft bg

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:** Native

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:** ~ 13 ft bg

**STICK-UP:** --

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Roadbox with concrete collar

**DURATION:** **YIELD:**

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | | -- | 0<br>0 | 0-0.4: Asphalt, crushed<br>0.4-5: SAND, fine; little small to large, sub-angular to angular gravel; trace silt; brown, dark brown, brown; compact; dry. |
| 5 | 10 | C | | -- | 0 | SAND, fine; little small to medium, sub-angular gravel; trace silt; dark brown; compact; dry. |
| 10 | 15 | C | | -- | 0 | SAND, fine; little silt; trace small to medium, sub-angular gravel; dark brown; compact; dry. |
| 15 | 20 | C | | -- | 7.2 | SAND, fine; little silt; trace small to medium, sub-angular gravel; dark brown; compact; wet. |
| 20 | 25 | C | | -- | 15.0 | SAND, fine; little silt; trace small to medium, sub-angular to sub-rounded gravel; dark brown; compact; wet. |
| 25 | 27 | SS | 47-50/3” | 0.9 | 2149 | 25.0-25.9: SAND, fine; little small to large, sub-angular gravel; little silt; dark brown; compact; wet. Pieces of decomposed, weathered bedrock throughout. |
| 28 | | | | | | Auger refusal. |

**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**SHELTON, CONNECTICUT**

**OWNER:** SEI

**BORING/WELL NO:** EW-13

**PAGE** 1 **OF** 2 **PAGE**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2-inch PVC

**SLOT NO.:** 0.020 **SETTING:** 13 to 18 and 21 to 28 ft bg

**DATE COMPLETED:** June 20, 2013

**DRILLING COMPANY:** Soil Testing, Inc.
Oxford, CT

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 11 to 18.5 and 20.5 to 28 ft bg

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** Grade to 13 and 18 to 21 ft bg

**DRILLING METHOD:** Hollow-Stem Auger

**SAMPLING METHOD:** Split Spoon

**OBSERVER:** Tunde Komuves-Sandor

**SEAL TYPE:** Bentonite Chips/Bentonite Grout

**SETTING:** 9 to 11 ft bg and 18.5 to 20.5 ft bg

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:** Native

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:** ~ 13 ft bg

**STICK-UP:** --

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Roadbox with concrete collar

**DURATION:** **YIELD:**

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | NA | -- | --<br>0.0 | 0-0.4: Asphalt, crushed<br>0.4-5: SAND, fine; little medium to coarse; trace sub-angular to angular gravel; reddish brown; compact; dry; no odor. |
| 5 | 10 | C | NA | -- | 0.0 | 5-10: SAND, fine; little medium to coarse; trace silt; trace sub-angular to angular gravel; reddish brown; compact; dry; no odor. |
| 10 | 15 | C | NA | -- | 0.0 | 10-15: SAND, fine, trace medium to coarse; little silt; trace sub-angular to angular gravel; reddish brown; compact; moist; no odor. |
| 15 | 20 | C | NA | -- | 0.0 | 15-20: SAND, fine, trace medium to coarse; little silt; trace sub-angular to angular gravel; reddish brown; compact; moist; no odor. |
| 20 | 22 | SS | 100/3” | 0.4 | 0.0 | 20-20.4: Sand, fine and Gravel, small to large; some silt; brown; compact; wet; no odor. |
| 22 | 25 | C | NA | -- | 0.0 | 22-25: SAND, fine; little gravel small to large; trace silt; brown; compact; wet; no odor. |

**OWNER:** SEI

**BORING NO.:** EW-13 **PAGE** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 25 | 27 | SS | 59-100/3” | 0.75 | 3.0 | 25-25.75: Sand, fine and weathered rock, sub-angular to angular gravel; reddish brown; compact; wet; no odor. |
| 27 | 28 | C | -- | -- | -- | Sand, fine and weathered rock, sub-angular to angular gravel; reddish brown; compact; wet; no odor. |
| -- | 28 | -- | -- | -- | -- | End of Boring. |
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# GEOLOGIC LOG
LEGGETTE, BRASHEARS & GRAHAM, INC.
SHELTON, CONNECTICUT

**OWNER:** SEI

**BORING/WELL NO:** EW-14

**PAGE** 1 **OF** 2 **PAGE**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**DATE COMPLETED:** June 21, 2014

**DRILLING COMPANY:** Soil Testing, Inc.
Oxford, CT

**DRILLING METHOD:** Hollow-Stem Auger

**SAMPLING METHOD:** Split Spoon

**OBSERVER:** Patrick Welsh

**REFERENCE POINT (RP):** Grade

**ELEVATION OF RP:** --

**STICK-UP:** --

**SURFACE COMPLETION:** Roadbox with concrete collar

**SCREEN SIZE & TYPE:** 2-inch PVC

**SLOT NO.:** 0.020 **SETTING:** 18 to 28 ft bg

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 16 to 28 ft bg

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** Grade to 18 ft bg

**SEAL TYPE:** Bentonite Chips/Bentonite Grout

**SETTING:** 14 to 16 ft bg and 1.5 to 14 ft bg

**BACKFILL TYPE:** Native

**STATIC WATER LEVEL:**

**DEVELOPMENT METHOD:**

**DURATION:** **YIELD:**

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | NA | -- | 0-2.5: 0.5<br>2.5-5.0: 0.3 | 0-0.5: Asphalt, crushed<br>0.5-3.0: SAND, fine to medium; little small to large, sub-angular to sub-rounded gravel; trace silt; brown; semi-compact; dry. No odor.<br>3.0-5.0: SAND, fine; little silt; trace small, sub-angular gravel; brown; semi-compact; dry. |
| 5 | 10 | C | NA | -- | 5.0-7.5: 0.4<br>7.5-10: 0.8 | 5-10: SAND, fine; little silt; trace small, sub-angular gravel (large gravel from 7-10 ft bg); brown; semi-compact; dry. |
| 10 | 15 | C | NA | -- | 10-12.5: 0.5<br>12.5-15: 0.4 | 10-15: SAND, fine; little silt (some silt from 12 to 15 ft bg); little large, sub-angular to sub-rounded gravel; brown; cobbles; semi-compact; dry. |
| 15 | 20 | C | NA | -- | 15-17.5: 0.7<br>17.5-20: 1.3 | 15-17: Silt and fine sand; trace small to large, sub-rounded gravel; dark brown; semi-compact; moist. |
| 20 | 22 | SS | 75/5” | 0.4 | 74 | 20-20.4: SAND, fine; trace silt; dark brown; semi-compact; wet; rock in cutting shoe. |

**OWNER:** SEI

**BORING NO.:** EW-14 **PAGE** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 20 | 25 | C | NA | -- | 20-22.5: 0.7<br>22.5-25: 90.4 | 20.0-25.0: SAND, fine and layers of silt; little clay; dark brown, brown; compact; wet. |
| 25 | 27 | SS | 50/4" | 1.0 | 115 | 25.0-26.0: SAND, fine; trace silt; interbedded layers of decomposed rock (mica-schist); dark brown; compact; wet. Layers present since 19 ft bg increasing in frequency with depth. |
| 28 | | | | | | End of boring. |
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**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**SHELTON, CONNECTICUT**

**OWNER:** SEI

**BORING/WELL NO:** EW-15

**PAGE** 1 **OF** 2 **PAGE**

**SITE LOCATION** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2-inch PVC

**SLOT NO.:** 0.020 **SETTING:** 18 to 28 ft bg

**DATE COMPLETED:** June 21, 2014

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 16 to 28 ft bg

**DRILLING COMPANY:** Soil Testing, Inc.
Oxford, CT

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** Grade to 18 ft bg

**DRILLING METHOD:** Hollow-Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite Chips/Bentonite Grout

**OBSERVER:** Patrick Welsh

**SETTING:** 14 to 16 ft bg and 1.5 to 14 ft bg

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:** Native

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:**

**STICK-UP:** --

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Roadbox with concrete collar

**DURATION:** **YIELD:**

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | NA | -- | 0-2.5: 1.3<br>2.5-5.0: 7.7 | 0-0.5: Asphalt, crushed<br>0.5-5.0: SAND, fine; trace silt; little small to large, sub-angular to sub-rounded gravel; brown; semi-compact; dry. |
| 5 | 10 | C | NA | -- | 5.0-7.5: 10.8<br>7.5-10: 9.8 | 5.0-8.0: SAND, fine; trace silt; little small to large, sub-angular to sub-rounded gravel; brown; compact; dry.<br>8.0-10: Sand, fine and silt (inter-bedded layers); trace clay; trace small to large, sub-angular to sub-rounded gravel; dark brown; compact; wet @ 9 ft bg. |
| 10 | 15 | C | NA | -- | 12.5-15: 21.1 | 10.0-15.0: Sand, fine and silt (inter-bedded layers); trace clay; trace small to large, sub-angular to sub-rounded gravel; dark brown; compact; wet. |
| 15 | 20 | C | NA | -- | 15-17.5: 11.3<br>17.5-20: 10.9 | 15.0-20.0: Sand, fine and silt (inter-bedded layers); trace clay; trace small to large, sub-angular to sub-rounded gravel; dark brown; compact; wet. |
| 20 | 22 | SS | 32 - 50/4” | 0.7 | 2.3 | 20-20.4: SAND, fine to medium; trace silt; weathered decomposed rock; brown; compact; wet. |

**OWNER:** SEI

**BORING NO.:** EW-15 **PAGE** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 20 | 25 | C | NA | -- | 20-22.5: 1.4 | 20.0-25.0: SAND, fine and layers of silt; trace clay; dark brown, brown; compact; wet. |
| 25 | 27 | SS | 50/4” | 1.0 | 115 | 25.0-26.0: SAND, fine and layers of silt; interbedded layers of decomposed rock (mica-schist); dark brown, compact; wet. |
| 28 | | | | | | End of boring. |
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**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**SHELTON, CONNECTICUT**

**OWNER:** SEI

**BORING/WELL NO:** EW-16

**PAGE** 1 **OF** 2 **PAGE**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2-inch PVC

**SLOT NO.:** 0.020 **SETTING:** 18 to 28 ft bg

**DATE COMPLETED:** June 28, 2014

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 16 to 28 ft bg

**DRILLING COMPANY:** Soil Testing, Inc.
Oxford, CT

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** Grade to 18 ft bg

**DRILLING METHOD:** Hollow-Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite Chips/Bentonite Grout

**OBSERVER:** Patrick Welsh

**SETTING:** 14 to 16 ft bg and 1.5 to 14 ft bg

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:** Native

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:**

**STICK-UP:** --

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Roadbox with concrete collar

**DURATION:** **YIELD:**

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | NA | -- | 1-2.5: 0.7<br>2.5-5.0: 0.5 | 0-0.3: Asphalt, crushed<br>0.3-1.0: GRAVEL, medium to large; little fine to medium sand; dark brown; semi-compact; dry.<br>1.0-5.0: SAND, fine to medium; little small to large, sub-angular to sub-rounded gravel; brown; semi-compact; dry. |
| 5 | 10 | C | NA | -- | 5.0-7.5: 0.5 | 5.0-7.5: SAND, fine to medium; little small to large, sub-angular to sub-rounded gravel; brown; semi-compact; dry.<br>7.5-10: SILT; some fine to medium sand; brown, dark brown; semi-compact; moist. |
| 10 | 15 | C | NA | -- | 12.5: 0.3 | 10.0-15.0: SILT; some fine to medium sand; brown, dark brown; semi-compact; moist. |
| 15 | 20 | C | NA | -- | 17.5: 0.3 | 15.0-20.0: SILT; some fine to medium sand; trace small, sub-angular gravel; brown, dark brown; semi-compact; moist. |
| 20 | 20.4 | SS | 75/5” | 0.4 | 0.5 | 20-20.4: SILT; some fine to medium sand; trace small, sub-angular gravel; brown, dark brown spots; semi-compact; moist. |

**OWNER:** SEI

**BORING NO.:** EW-16 **PAGE** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 20 | 25 | C | NA | -- | 22.5: 0.3 | 20.0-25.0: SILT; some fine to medium sand; trace small, sub-angular gravel; inter-bedded decomposed rock; brown, dark brown; semi-compact; moist. |
| 25 | 25.4 | SS | 75/4” | 1.0 | 115 | 25.0-26.0: SILT; some fine to medium sand; trace small, sub-angular gravel; inter-bedded decomposed rock; brown, dark brown; semi-compact; moist. |
| 28 | | | | | | End of boring. |
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## GEOLOGIC LOG
## LEGGETTE, BRASHEARS & GRAHAM, INC.
## SHELTON, CONNECTICUT

**OWNER:** SEI

**BORING/WELL NO:** EW-17

**PAGE** 1 **OF** 2 **PAGE**

**SITE LOCATION** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:** 2-inch PVC

**SLOT NO.:** 0.020 **SETTING:** 18 to 28 ft bg

**DATE COMPLETED:** June 28, 2014

**SAND PACK SIZE & TYPE:** Filpro #1

**SETTING:** 16 to 28 ft bg

**DRILLING COMPANY:** Soil Testing, Inc.
Oxford, CT

**CASING SIZE & TYPE:** 2-inch PVC

**SETTING:** Grade to 18 ft bg

**DRILLING METHOD:** Hollow-Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Bentonite Chips/Bentonite Grout

**OBSERVER:** Patrick Welsh

**SETTING:** 14 to 16 ft bg and 1.5 to 14 ft bg

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:** Native

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:**

**STICK-UP:** --

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Roadbox with concrete collar

**DURATION:** **YIELD:**

**REMARKS:**

**GPS COORDINATES**

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 5 | C | NA | -- | 0-2.5: 0.6<br>2.5-5.0: 0.8 | 0-0.3: Asphalt, crushed<br>0.3-1.0: GRAVEL, medium to large, sub-rounded; trace medium to coarse sand; dark brown; semi-compact; dry.<br>1.0-5.0: SAND, fine to medium; little small to large, sub-angular to sub-rounded gravel; brown; semi-compact; dry. |
| 5 | 10 | C | NA | -- | 5.0-7.5: 0.5 | 5.0-7.0: SAND, fine to medium; little small to large, sub-angular to sub-rounded gravel; brown; semi-compact; dry.<br>7.0-10: SILT; some fine to medium sand; trace small, sub-angular gravel; brown; semi-compact; moist. |
| 10 | 15 | C | NA | -- | 12.5: 0.9 | 10.0-15.0: SILT; some fine to medium sand; brown, dark brown; semi-compact; moist. |
| 15 | 20 | C | NA | -- | 17.5: 0.4 | 15.0-20.0: SILT; some fine to medium sand; trace small, sub-angular gravel; brown, dark brown; semi-compact; moist. |
| 20 | 20.8 | SS | 41 - 60/5” | 0.8 | 0.4 | 20-20.8: SAND, fine; some silt; trace small, sub-angular gravel; dark brown; compact; moist. |

**OWNER:** SEI

**BORING NO.:** EW-17 **PAGE** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 20 | 25 | C | NA | -- | 22.5: 0.4<br>24: 6.7 | 20.0-24.0: SAND, fine; some silt; trace small, sub-angular gravel; dark brown; compact; moist.<br>24.0-25.0: Silt and fine sand; brown; loose; wet. |
| 25 | 25.5 | SS | 75/5” | 0.5 | 3.6 | 25.0-26.0: SAND, fine (decomposed, weathered rock); gray, brown; semi-compact; wet. |
| 28 | | | | | | End of boring. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**SHELTON, CONNECTICUT** | **OWNER:** SEI<br>**BORING/WELL NO:** IW-1<br>**PAGE** 1 **OF** **PAGE** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, CT | **SCREEN SIZE & TYPE:** 4-inch PVC<br>**SLOT NO.:** 0.020 **SETTING:** 7 to 42 ft bg |
| **DATE COMPLETED:** October 20, 2012 | **SAND PACK SIZE & TYPE:** Filpro #1 |
| **DRILLING COMPANY:** Connecticut Test Borings, LLC.<br>Seymour, CT | **SETTING:** 7 – 42 ft bg<br>**CASING SIZE & TYPE:** 2-inch PVC |
| **DRILLING METHOD:** Hollow-Stem Auger | **SETTING:** Grade to 7 ft bg |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite Chips/Bentonite Grout |
| **OBSERVER:** Patrick Welsh | **SETTING:** 3 to 5 ft bg / 2 to 3 ft bg |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** Concrete |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** ~ 4 ft bg |
| **STICK-UP:** -- | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Roadbox with concrete collar | **DURATION:** **YIELD:** |
| **REMARKS:** | |
| **GPS COORDINATES** | |

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 5 | 7 | SS | 1-1-1-1 | 1.0 | 0 | 5-6.0: CLAY; little silt; dark brown, black; compact; moist. |
| 10 | 12 | SS | 4-5-8-7 | 1.0 | 0.3 | 10-10.6: SAND, medium to coarse; some small to medium, sub-angular gravel; brown; semi-compact; wet.<br>10.6-11.0: SAND, fine; trace silt; little medium to large sub-rounded gravel; brown; compact; wet. |
| 15 | 17 | SS | 8-16-22-43 | 2.0 | 0.1 | 15-17.0: SAND, fine; little silt; little small to large sub-angular gravel; brown; compact; wet. |
| 20 | 22 | SS | 15-21-28-29 | 1.1 | 0.2 | 20-22.0: SAND, fine; little silt; small to large sub-angular gravel; brown; compact; wet. |

**OWNER:** SEI

**WELL NO.:** IW-1 **PAGE** 2 **OF** 2 **PAGES**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 25 | 25.7 | SS | 24-50/2” | 0.7 | 0 | 25-25.8: SAND, fine; little silt; small to large sub-angular gravel; brown; compact; wet. |
| 30 | 30.3 | SS | 50/3” | 0.2 | 0 | 30-30.2: SAND, fine; little silt; small to large sub-angular gravel; brown; compact; wet. Till material. |
| 35 | 36.2 | SS | 43-55-50/2” | 1.1 | 0 | 35-36.0: SAND, fine; little small to medium sub-angular to sub-rounded gravel; trace silt; brown; compact; wet. |
| 40 | 40.2 | SS | 50/2” | 0.2 | 0 | 40-41.2: SAND, fine; little small to medium sub-angular to sub-rounded gravel; trace silt; brown; compact; wet. |
| | 42 | | | | | End of boring. |

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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>WELL NO.: H-1<br>PAGE: 1 OF 1 PAGE |
| SITE LOCATION: Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** July 9, 1999<br>**DRILLING COMPANY:** NA | **SAND PACK SIZE & TYPE:**<br>**SETTING:** |
| **DRILLING METHOD:** Hand Auger | **CASING SIZE & TYPE:**<br>**SETTING:** |
| **SAMPLING METHOD:** Grab<br>**OBSERVER:** Michael Manolakas | **SEAL TYPE:**<br>**SETTING:** |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** |
| **ELEVATION OF RP:** NA | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** | **DURATION:** **YIELD:** |

**REMARKS:** Hand Auger Point on northern side of building, near location of replaced corroded piping.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 0.25 | C | | | | GRAVEL, coarse; loose; grey; dry. |
| 0.25 | 1.5 | C | | | 0 | SAND, fine; some silt; little medium sand; little coarse gravel; compact; reddish brown; dry. |
| 1.5 | 4.5 | C | | | 0 | SAND, fine; some silt; little medium sand; little coarse gravel; compact; reddish brown; damp. |
| | 4.5 | | | | | End of boring. |
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## GEOLOGIC LOG

**LEGGETTE, BRASHEARS & GRAHAM, INC.**

**TRUMBULL, CONNECTICUT**

**OWNER:** SEI

WELL NO.: H-2

PAGE: 1 OF 1 PAGE

SITE LOCATION: Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:**

**SLOT NO.:** **SETTING:**

**DATE COMPLETED:** July 9, 1999

**DRILLING COMPANY:** NA

**SAND PACK SIZE & TYPE:**

**SETTING:**

**CASING SIZE & TYPE:**

**SETTING:**

**DRILLING METHOD:** Hand Auger

**SAMPLING METHOD:** Grab

**SEAL TYPE:**

**OBSERVER:** Michael Manolakas

**SETTING:**

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:**

**ELEVATION OF RP:** NA

**STATIC WATER LEVEL:**

**STICK-UP:**

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:**

**DURATION:** **YIELD:**

**REMARKS:** Hand Auger Point on northern side of building, near location of replaced corroded piping.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 0.25 | C | | | | GRAVEL, coarse; loose; grey; dry. |
| 0.25 | 2 | C | | | 0 | SAND, fine; some silt; little medium sand; little coarse gravel; compact; reddish brown; dry. |
| 2 | 4.5 | C | | | 0 | SAND, fine; some silt; little medium sand; little coarse gravel; compact; reddish brown; damp. |
| | 4.5 | | | | | End of boring. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>WELL NO.: TB-1<br>PAGE: 1 OF 1 PAGE |
| SITE LOCATION: Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** July 9, 1999<br>**DRILLING COMPANY:** Soiltesting Inc. | **SAND PACK SIZE & TYPE:**<br>**SETTING:** |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:**<br>**SETTING:** |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Michael Manolakas | **SEAL TYPE:**<br>**SETTING:** |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** |
| **ELEVATION OF RP:** NA | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** | **DURATION:** **YIELD:** |

**REMARKS:**

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = Recovery PPM = parts per million**

| DEPTH (FEET) |  | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO |  |  |  |  |  |
| 0 | 5 | C |  |  |  | Sand, fine and silt; little medium gravel; compact; reddish brown; dry. |
| 5 | 7 | SS | 13-50/5 | 0.6 | 1.5 | Sand, fine and silt; little medium gravel; compact; reddish brown; dry. |
|  | 7 |  |  |  |  | Refusal. |
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**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**TRUMBULL, CONNECTICUT**

**OWNER:** SEI

**WELL NO:** B-1

**PAGE** 1 **OF** 1 **PAGES**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:**

**SLOT NO.:** **SETTING:**

**DATE COMPLETED:** 10/30/01

**SAND PACK SIZE & TYPE:**

**DRILLING COMPANY:** Zebra Environmental

**SETTING:**

**CASING SIZE & TYPE:**

**DRILLING METHOD:** Geoprobe

**SETTING:**

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:**

**OBSERVER:** Andrew Linton

**SETTING:**

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:**

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:** 17.3 feet

**STICK-UP:**

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:**

**DURATION:** **YIELD:**

**REMARKS:** Two attempts were made to probe to 40 ft., one refusal occurred at 27 ft., and the second rejection at 37 ft.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million MC = Macrocore**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 9 | 11 | MC | | 2.0 | 0 | SILT; some fine. sand; little-trace small gravel; trace clay. Compact; reddish-brown; damp. |
| 19 | 21 | MC | | 1.75 | 0 | SILT; some-little clay; little-trace small gravel. Compact; reddish-brown; wet. |
| 29 | 31 | MC | | 2.0 | 0 | CLAY; little silt; little small and medium gravel. Brown; very compact; wet. |
| | 37 | | | | | Refusal. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B-2<br>**PAGE** 1 **OF PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** 10/30/01 | **SAND PACK SIZE & TYPE:** |
| **DRILLING COMPANY:** Zebra Environmental | **SETTING:**<br>**CASING SIZE & TYPE:** |
| **DRILLING METHOD:** Geoprobe | **SETTING:** |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** |
| **OBSERVER:** Andrew Linton | **SETTING:** |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** 18.0 |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** | **DURATION:** **YIELD:** |

**REMARKS:** Six attempts were made to probe to the desired 40 ft. depth, refusal occurred at 26.5 ft.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**

**REC = Recovery PPM = parts per million MC = Macrocore**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 9 | 11 | MC | | 1.55 | 0 | SILT; some fine, sand; little-trace clay. Compact; reddish brown; damp. |
| 19 | 21 | MC | | 1.30 | 0 | CLAY; little silt; little small gravel. Reddish brown-gray; wet. |
| | 26.5 | | | | | Refusal. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B-3<br>**PAGE** 1 **OF** **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** 10/31/01<br>**DRILLING COMPANY:** Zebra Environmental | **SAND PACK SIZE & TYPE:**<br>**SETTING:** |
| **DRILLING METHOD:** Geoprobe | **CASING SIZE & TYPE:**<br>**SETTING:** |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Andrew Linton | **SEAL TYPE:**<br>**SETTING:** |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** 18.0 feet |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** | **DURATION:** **YIELD:** |

**REMARKS:** Two attempts were made to probe to 40 feet.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million MC = Macrocore**

| **DEPTH (FEET)** | | **SAMPLE TYPE** | **BLOW COUNT** | **REC. (FEET)** | **PID READING (PPM)** | **DESCRIPTION** |
|---|---|---|---|---|---|---|
| **FROM** | **TO** | | | | | |
| 9 | 11 | MC | | 1.40 | 0 | SILT; some fine. sand; little small gravel; trace clay; trace medium sand; trace medium gravel. Compact; brown; damp. |
| 19 | 21 | MC | | 1.10 | 0 | CLAY; some silt; some small gravel. Compact; wet; brown. |
| 29 | 31 | MC | | 1.00 | 0 | CLAY; little silt; little small gravel. Compact; wet; brown. |
| 38 | 40 | MC | | 1.10 | 0 | CLAY; little silt; little-some small gravel. Very compact; wet; brown. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B-6<br>**PAGE** 1 **OF** 1 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** 11/7/01 | **SAND PACK SIZE & TYPE:** |
| **DRILLING COMPANY:** Zebra Environmental | **SETTING:** |
| | **CASING SIZE & TYPE:** |
| **DRILLING METHOD:** Geoprobe | **SETTING:** |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** |
| **OBSERVER:** Andrew Linton | **SETTING:** |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** | **DURATION:** **YIELD:** |

**REMARKS:** Three attempts were made to probe to a depth of 40 feet. Refusal occurred at 17 feet.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million MC = Macrocore**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 9 | 11 | MC | | 1.70 | 0 | SAND; fine; little silt; little small gravel; trace clay; trace medium gravel. Reddish-brown; dry; compact. |
| | 17 | | | | | Refusal. |
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## GEOLOGIC LOG

## LEGGETTE, BRASHEARS & GRAHAM, INC.

## TRUMBULL, CONNECTICUT

**OWNER:** SEI

**WELL NO:** B-7

**PAGE** 1 **OF** 1 **PAGES**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:**

**SLOT NO.:** **SETTING:**

**DATE COMPLETED:** 11/2/01

**SAND PACK SIZE & TYPE:**

**SETTING:**

**DRILLING COMPANY:** Zebra Environmental

**CASING SIZE & TYPE:**

**SETTING:**

**DRILLING METHOD:** Geoprobe

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:**

**SETTING:**

**OBSERVER:** Andrew Linton

**REFERENCE POINT (RP):** Grade

**BACKFILL TYPE:**

**ELEVATION OF RP:** --

**STATIC WATER LEVEL:**

**STICK-UP:**

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:**

**DURATION:** **YIELD:**

**REMARKS:** Five attempts were made to probe to 40 feet. Refusal occurred at 20 feet, a water sample was obtained at that depth, however a soil sample was not obtained because the LB could not reach that depth due to the tightness of the material.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**

**REC = Recovery PPM = parts per million MC = Macrocore**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 9 | 11 | MC | | 1.20 | 0 | SAND; fine. Some silt; little clay; little small gravel. Damp; compact; brown. |
| | 20 | | | | | Refusal. (A water sample was obtained from 20 feet, however a soil sample was not obtained due to the nature of the material) |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B-8<br>**PAGE** 1 **OF** 1 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** 11/1/01<br>**DRILLING COMPANY:** Zebra Environmental | **SAND PACK SIZE & TYPE:**<br>**SETTING:** |
| **DRILLING METHOD:** Geoprobe | **CASING SIZE & TYPE:**<br>**SETTING:** |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Andrew Linton | **SEAL TYPE:**<br>**SETTING:** |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** | **DURATION:** **YIELD:** |

**REMARKS:** Six attempts were made to probe to 40 feet, but refusal was encountered at 20 feet. Broke two soil samplers (LB's) on this location.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**

**REC = Recovery PPM = parts per million MC = Macrocore**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 9 | 11 | MC | | 1.20 | 0 | SILT; some clay; trace small gravel. Dry; brown; slightly compact. |
| 19 | 21 | MC | | | 0 | SILT; some clay; little small gravel. Wet; brown/red; very compact. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B-9<br>**PAGE** 1 **OF** 1 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** 11/8/01<br>**DRILLING COMPANY:** Zebra Environmental | **SAND PACK SIZE & TYPE:**<br>**SETTING:** |
| **DRILLING METHOD:** Geoprobe | **CASING SIZE & TYPE:**<br>**SETTING:** |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Andrew Linton | **SEAL TYPE:**<br>**SETTING:** |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** | **DURATION:** **YIELD:** |

**REMARKS:** Seven attempts were made to probe to a depth of 40 feet. Refusal occurred at 19 feet.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million MC = Macrocore**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 9 | 11 | MC | | 2.0 | 0 | SILT; little clay; little small gravel. Reddish-brown; compact; dry. |
| | 18 | | | | | Refusal. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B-13<br>**PAGE** 1 **OF** 1 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** 11/9/01 | **SAND PACK SIZE & TYPE:** |
| **DRILLING COMPANY:** Zebra Environmental | **SETTING:** |
| | **CASING SIZE & TYPE:** |
| **DRILLING METHOD:** Geoprobe | **SETTING:** |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** |
| **OBSERVER:** Andrew Linton | **SETTING:** |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** | **DURATION:** **YIELD:** |

**REMARKS:** Three attempts were made to probe to a depth of 40 feet. Refusal occurred at 23 feet.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**

**REC = Recovery PPM = parts per million MC = Macrocore**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 9 | 11 | MC | | 1.60 | 0 | SILT; little-some clay; little-trace small gravel. Reddish-brown; compact; dry. |
| 19 | 21 | MC | | 1.55 | 0 | SILT; some-little clay; trace small gravel. Reddish-brown; compact; wet. |
| | 23 | | | | | Refusal. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B-14<br>**PAGE** 1 **OF** 1 **PAGES** |

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| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** 11/6/01<br>**DRILLING COMPANY:** Zebra Environmental | **SAND PACK SIZE & TYPE:**<br>**SETTING:** |
| **DRILLING METHOD:** Geoprobe | **CASING SIZE & TYPE:**<br>**SETTING:** |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Andrew Linton | **SEAL TYPE:**<br>**SETTING:** |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** | **DURATION:** **YIELD:** |

**REMARKS:** Four attempts were made to probe to 40 feet. Refusal was encountered at 24 feet.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**

**REC = Recovery PPM = parts per million MC = Macrocore**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 9 | 11 | MC | | | 0 | SILT; little fine sand; little clay; trace small gravel. Reddish brown; slightly compact; damp. |
| 19 | 21 | MC | | | 0 | SILT; some clay; some-little small gravel. Reddish/brown; compact; wet. |
| | 24 | | | | | Refusal. (No water was encountered in this location) |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B-15<br>**PAGE** 1 **OF** 1 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** 11/5/01 | **SAND PACK SIZE & TYPE:** |
| **DRILLING COMPANY:** Zebra Environmental | **SETTING:** |
| | **CASING SIZE & TYPE:** |
| **DRILLING METHOD:** Geoprobe | **SETTING:** |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** |
| **OBSERVER:** Andrew Linton | **SETTING:** |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** | **DURATION:** **YIELD:** |

**REMARKS:** Three attempts were made to probe to 40 feet. Refusal occurred at 28 feet.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**

**REC = Recovery PPM = parts per million MC = Macrocore**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 9 | 11 | MC | | 1.00 | 0 | SAND; fine; some silt; little-trace clay; little small gravel. Brown; damp. |
| 19 | 21 | MC | | 1.10 | 0 | SILT; little clay; little small gravel. Reddish-brown; compact; damp. |
| 26 | 28 | MC | | | 0 | SAND; fine; some silt; trace small gravel. Wet; brown; compact. |
| | 28 | | | | | Refusal. |
| | | | | | | |
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## GEOLOGIC LOG
## LEGGETTE, BRASHEARS & GRAHAM, INC.
## TRUMBULL, CONNECTICUT

**OWNER:** SEI

**WELL NO:** B-16

**PAGE** 1 **OF** 1 **PAGES**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**DATE COMPLETED:** 11/6/01

**DRILLING COMPANY:** Zebra Environmental

**DRILLING METHOD:** Geoprobe

**SAMPLING METHOD:** Split Spoon

**OBSERVER:** Andrew Linton

**REFERENCE POINT (RP):** Grade

**ELEVATION OF RP:** --

**STICK-UP:**

**SURFACE COMPLETION:**

**SCREEN SIZE & TYPE:**

**SLOT NO.:** **SETTING:**

**SAND PACK SIZE & TYPE:**

**SETTING:**

**CASING SIZE & TYPE:**

**SETTING:**

**SEAL TYPE:**

**SETTING:**

**BACKFILL TYPE:**

**STATIC WATER LEVEL:**

**DEVELOPMENT METHOD:**

**DURATION:** **YIELD:**

**REMARKS:** Refusal was encountered at 22 feet on a very hard surface.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**

**REC = Recovery PPM = parts per million MC = Macrocore**

| **DEPTH (FEET)** | | **SAMPLE TYPE** | **BLOW COUNT** | **REC. (FEET)** | **PID READING (PPM)** | **DESCRIPTION** |
|---|---|---|---|---|---|---|
| **FROM** | **TO** | | | | | |
| 9 | 11 | MC | | | 0 | SILT; some-little clay; little-trace fine sand; trace small gravel. Damp; reddish-brown. |
| 19 | 21 | MC | | | 0 | SILT; some clay; little small gravel; trace medium gravel. Compact; wet; reddish-brown. |
| | 22 | | | | | Refusal. |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B-14<br>**PAGE** 1 **OF** 1 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** 11/6/01<br>**DRILLING COMPANY:** Zebra Environmental | **SAND PACK SIZE & TYPE:**<br>**SETTING:** |
| **DRILLING METHOD:** Geoprobe | **CASING SIZE & TYPE:**<br>**SETTING:** |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Andrew Linton | **SEAL TYPE:**<br>**SETTING:** |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** | **DURATION:** **YIELD:** |

**REMARKS:** Four attempts were made to probe to 40 feet. Refusal was encountered at 24 feet.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million MC = Macrocore**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 9 | 11 | MC | | | 0 | SILT; little fine sand; little clay; trace small gravel. Reddish brown; slightly compact; damp. |
| 19 | 21 | MC | | | 0 | SILT; some clay; some-little small gravel. Reddish/brown; compact; wet. |
| | 24 | | | | | Refusal. (No water was encountered in this location) |
| | | | | | | |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B-15<br>**PAGE** 1 **OF** 1 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** 11/5/01 | **SAND PACK SIZE & TYPE:** |
| **DRILLING COMPANY:** Zebra Environmental | **SETTING:** |
|  | **CASING SIZE & TYPE:** |
| **DRILLING METHOD:** Geoprobe | **SETTING:** |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** |
| **OBSERVER:** Andrew Linton | **SETTING:** |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** | **DURATION:** **YIELD:** |

**REMARKS:** Three attempts were made to probe to 40 feet. Refusal occurred at 28 feet.

**ABBREVIATIONS:** SS = split spoon W = wash C = cuttings G = grab ST = shelby tube
REC = Recovery PPM = parts per million MC = Macrocore

| DEPTH (FEET) |  | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO |  |  |  |  |  |
| 9 | 11 | MC |  | 1.00 | 0 | SAND; fine; some silt; little-trace clay; little small gravel. Brown; damp. |
| 19 | 21 | MC |  | 1.10 | 0 | SILT; little clay; little small gravel. Reddish-brown; compact; damp. |
| 26 | 28 | MC |  |  | 0 | SAND; fine; some silt; trace small gravel. Wet; brown; compact. |
|  | 28 |  |  |  |  | Refusal. |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
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# GEOLOGIC LOG
## LEGGETTE, BRASHEARS & GRAHAM, INC.
TRUMBULL, CONNECTICUT

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|---|---|
| | **OWNER:** SEI |
| | **WELL NO:** B-16 |
| | **PAGE** 1 **OF** 1 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** 11/6/01 | **SAND PACK SIZE & TYPE:** |
| **DRILLING COMPANY:** Zebra Environmental | **SETTING:** |
| | **CASING SIZE & TYPE:** |
| **DRILLING METHOD:** Geoprobe | **SETTING:** |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** |
| **OBSERVER:** Andrew Linton | **SETTING:** |
| **REFERENCE POINT (RP):** Grade | **BACKFILL TYPE:** |
| **ELEVATION OF RP:** -- | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** | **DURATION:** **YIELD:** |

**REMARKS:** Refusal was encountered at 22 feet on a very hard surface.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**

**REC = Recovery PPM = parts per million MC = Macrocore**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 9 | 11 | MC | | | 0 | SILT; some-little clay; little-trace fine sand; trace small gravel. Damp; reddish-brown. |
| 19 | 21 | MC | | | 0 | SILT; some clay; little small gravel; trace medium gravel. Compact; wet; reddish-brown. |
| | 22 | | | | | Refusal. |
| | | | | | | |
| | | | | | | |

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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B1-06<br>**PAGE** 1 **OF** 2 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** May 30, 2006<br>**DRILLING COMPANY:** Soil Testing Inc. | **SAND PACK SIZE & TYPE:**<br>**SETTING:** |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:**<br>**SETTING:** |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Patrick Welsh | **SEAL TYPE:** Bentonite<br>**SETTING:** 30’bg to 28’bg; 2’bg to grade |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Cuttings 28’bg to 2’bg |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Quikrete Blacktop Patch | **DURATION:** **YIELD:** |

**REMARKS:** Grade starts below 9” of Asphalt; water @ approximately 12’. Refusal at 30 feet below grade.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 9-3-3-3 | 1.4 | 2.0 | SILT; fine, moist, brown, trace clay |
| 2 | 4 | SS | 1-2-1-2 | 1.3 | 2.5 | SILT/CLAY mixture; fine, brown, moist, several pebbles: < 0.5” |
| 4 | 6 | SS | 17-26-17-11 | 1.8 | 1.0 | SAND; fine, brown, moist, with trace clay; contained top 0.8’; SILT/SAND; gray and light brown layers, pebbles 0.5”, in bottom 1.0’ |
| 6 | 8 | SS | 18-24-43-25 | 0.7 | 2.2 | SAND/SILT mix; brown to light brown, fine, small pebbles < 0.3” thick, dark-gray crushed rock bottom 0.15’ |
| 8 | 10 | SS | 29-29-25-40 | 1.5 | 2.4 | SAND/SILT mix; fine, light brown to brown, compact; gravel up to 1” thick |
| 10 | 12 | SS | 17-23-17-5 | 1.8 | 2.8 | SILT; fine, brown, trace sand, compact, wet, pebbles 0.5” - 1” thick |
| 12 | 14 | SS | 18-18-32-25 | 2 | 1.2 | SAND; fine, trace silt, dark brown, contained top 0.5’; CLAY; brown, moist, compact, trace cobble 0.5” thick, contained 0.5’ – 2’ |

**OWNER:** SEI

**WELL NO.:** B1-06 **PAGE** 2 **OF** 2 **PAGES**

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|---|---|---|---|---|---|---|
| 14 | 16 | SS | 16-18-36-28 | 1.8 | 3.8 | SILT; brown, fine, compact, trace sand, trace clay, trace pebbles; dark gray 2” layer @ 1.6’ |
| 16 | 18 | SS | 29-52-53-50 | 1.7 | 2.6 | SILT; brown to dark brown, compact, contained top 0.6’; SAND; brown, moist, fine, trace pebbles |
| 18 | 20 | SS | 22-23-32-30 | 1.4 | 6.0 | SILT/SAND mix; fine, brown, moist, pebbles <0.3”; SAND; coarse, wet, brown, contained to bottom 0.3’ |
| 20 | 22 | SS | 50/4 | 0.35 | 4.0 | SAND; coarse, very wet, dark brown |
| 22 | 24 | SS | 34-38-50-50/3 | 1.4 | 3.5 | SILT/SAND mix; fine, brown to dark brown, numerous pebbles 0.8’ - 1.2’; dark gray crushed rock 1.2’ - 1.4’ |
| 24 | 26 | SS | 50/4 | 0.3 | 0.7 | SAND; fine, compact, brown to dark brown, trace silt, small crushed stones |
| 26 | 28 | SS | - | 0 | N/A | No Recovery |
| 28 | 30 | SS | 50/5 | 0.5 | 1.7 | SAND; dark brown, crushed/decomposed sandstone, very wet, mainly crushed stone |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B2-06<br>**PAGE** 1 **OF** 2 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** June 1, 2006 | **SAND PACK SIZE & TYPE:** |
| **DRILLING COMPANY:** Soil Testing Inc. | **SETTING:** |
| | **CASING SIZE & TYPE:** |
| **DRILLING METHOD:** Hollow Stem Auger | **SETTING:** |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Bentonite |
| **OBSERVER:** Patrick Welsh | **SETTING:** 22’bg to 21’bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Grout 21’bg to grade |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Quikrete Blacktop Patch | **DURATION:** **YIELD:** |

**REMARKS:** Grade starts below 10” of Asphalt. Refusal at 22 feet below grade.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 10-11-8-11 | 0.3 | 1.4 | SAND; dark brown, wet, trace gravel |
| 2 | 4 | SS | 11-9-15-18 | 1.0 | 188 | SAND/SILT mix; dark brown, very compact, wet, pebbles 0.2” – 0.5” thick |
| 4 | 6 | SS | 16-22-51-38 | 1.2 | 392 | SILT; compact, brown, trace sand, trace clay; light to dark gray, crushed rock throughout |
| 6 | 8 | SS | 20-32-50-30 | 1.45 | 23.1 | SILT; brown, trace fine sand, small pebbles 0.3” – 0.8”thick; SAND; light brown to brown, compact, contained to top 0.4’ |
| 8 | 10 | SS | 6-6-8-8 | 1.4 | 37.5 | SILT/CLAY mix; moist, compact, brown , trace dark brown sand; pebbles <0.5” |
| 10 | 12 | SS | 9-15-19-19 | 1.4 | 27.3 | SILT; fine, brown, trace sand, trace clay, moist, pebbles 0.5” thick |
| 12 | 14 | SS | 25-29-31-28 | 2 | 22.9 | Top 0.5’: SILT; fine; moist, compact; Middle 0.5’ – 1.5’: SAND; coarse; light brown; Bottom 0.5’: SAND; fine, brown, moist; pebbles 0.3” – 0.9” |

**OWNER:** SEI

**WELL NO.:** B2-06 **PAGE** 2 **OF** 2 **PAGES**

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|---|---|---|---|---|---|---|
| 14 | 16 | SS | 16-19-39-22 | 1.5 | 9.5 | SILT; brown, fine, compact, wet, trace sand, trace clay, trace pebbles 0.5” – 1” |
| 16 | 18 | SS | 46-50/4 | 0.7 | 4.1 | SILT/SAND mix; brown , compact; crushed rock at bottom; wet on top |
| 18 | 20 | SS | 36-39-45-56 | 1.35 | 4.5 | SILT/SAND mix; fine, brown to reddish brown, very compact |
| 20 | 22 | SS | 50/2 | 0.15 | 2.8 | SILT/SAND mix; fine, brown, moist, compact |
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# GEOLOGIC LOG
LEGGETTE, BRASHEARS & GRAHAM, INC.
TRUMBULL, CONNECTICUT

**OWNER:** SEI

**WELL NO:** B3-06

**PAGE** 1 **OF** 2 **PAGES**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:**

**SLOT NO.:** **SETTING:**

**DATE COMPLETED:** June 1, 2006

**DRILLING COMPANY:** Soil Testing Inc.

**SAND PACK SIZE & TYPE:**

**SETTING:**

**CASING SIZE & TYPE:**

**SETTING:**

**DRILLING METHOD:** Hollow Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:**

**OBSERVER:** Patrick Welsh

**SETTING:**

**REFERENCE POINT (RP):**

**BACKFILL TYPE:** Grout 23’bg to grade

**ELEVATION OF RP:**

**STATIC WATER LEVEL:**

**STICK-UP:**

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Quikrete Blacktop Patch

**DURATION:** **YIELD:**

**REMARKS:** Grade starts below 10” of Asphalt. Refusal at 23 feet below grade.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 2-2-2-2 | 0.15 | 0 | SILT/SAND mix; dark brown, wet, trace gravel |
| 2 | 4 | SS | 3-3-3-4 | 0.35 | 0 | SILT; dark brown, very compact, trace sand, crushed gray stones |
| 4 | 6 | SS | 3-3-4-12 | 1.6 | 1.8 | SILT; brown to light brown, trace sand, pebbles 0.2” – 0.5” |
| 6 | 8 | SS | 25-20-15-20 | 1.8 | 138 | SILT; brown, trace sand, trace clay, stones 0.5” – 1.5” thick |
| 8 | 10 | SS | 11-17-12-11 | 2 | 38.1 | Top Foot: SAND; light brown, gray, trace silt; Bottom Foot: SILT; brown, trace tan sand and pebbles |
| 10 | 12 | SS | 4-5-7-12 | 1.5 | 52.2 | SILT/SAND mix; fine, brown to light brown, moist, dark gray pebbles <0.8” thick |
| 12 | 14 | SS | 14-7-12-9 | 2 | 6.2 | SILT/CLAY mix; moist, brown to light brown, trace fine sand, pebbles <0.5” thick |

**OWNER:** SEI

**WELL NO.:** B3-06 **PAGE** 2 **OF** 2 **PAGES**

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|---|---|---|---|---|---|---|
| 14 | 16 | SS | 14-17-26-44 | 1.35 | 6.0 | SILT; brown, fine, compact, moist, trace sand, pebbles <0.5” thick |
| 16 | 18 | SS | 50/1 | 0.8 | 3.4 | SILT/SAND mix; brown , compact |
| 18 | 20 | SS | 29-32-34-50/4 | 1.6 | 2.8 | SILT; fine, compact, trace clay, w/ dark brown sand layers |
| 20 | 22 | SS | 50/4 | 0.3 | 1.6 | SILT/SAND mix; fine, brown, compact |
| 22 | 23 | SS | 50/1 | 0.2 | 0 | SILT/SAND mix; brown to light brown. moist |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B4-06<br>**PAGE** 1 **OF** 2 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** June 2, 2006<br>**DRILLING COMPANY:** Soil Testing Inc. | **SAND PACK SIZE & TYPE:**<br>**SETTING:** |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:**<br>**SETTING:** |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Patrick Welsh | **SEAL TYPE:** Grout<br>**SETTING:** 21'bg to 20'bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Mix of Grout and Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Quikrete Blacktop Patch | **DURATION:** **YIELD:** |

**REMARKS:** Grade starts below 4” of Asphalt. Refusal at 21 feet below grade.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 14-22-31-32 | 0.55 | 11.1 | SAND; brown, wet, mainly crushed rocks 1” – 1.5” |
| 2 | 4 | SS | 16-22-21-14 | 0.5 | 6.8 | SILT/SAND mix; brown, moist, a few crushed stones |
| 4 | 6 | SS | 10-22-25-20 | 1.3 | 16.6 | SILT/SAND mix; brown , wet, stone 0.8” – 1.8” thick |
| 6 | 8 | SS | 26-23-20-19 | 1.6 | 13.8 | SILT; brown, trace sand, moist, compact, stones 0.5” – 1.8” thick |
| 8 | 10 | SS | 16-14-13-16 | 1.1 | 22.4 | SAND; brown, moist on top, trace silt, few stones 0.8” – 1.5” thick |
| 10 | 12 | SS | 11-9-10-10 | 0.95 | 3.8 | SAND; fine, brown to light brown, trace silt, moist, pebbles <0.5” thick |
| 12 | 14 | SS | 23-29-29-27 | 2 | 1.6 | SILT; wet, compact, brown to light brown, trace clay, pebbles <0.5” thick |

**OWNER:** SEI

**WELL NO.:** B4-06 **PAGE** 2 **OF** 2 **PAGES**

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|---|---|---|---|---|---|---|
| 14 | 16 | SS | 23-25-26-61 | 1.5 | 6.0 | SAND; brown to light brown, moist, trace silt, pockets of black sand, wet on top |
| 16 | 18 | SS | 50/2 | 0.3 | 0 | SILT/SAND mix; brown , very wet |
| 18 | 20 | SS | 75/5 | 0.55 | 0 | SAND; brown to dark brown, moist, compact, pebbles <0.2” thick |
| 20 | 22 | SS | 50/4 | 0.3 | 0 | Broken up sandstone, SAND; moist, dark brown to gray |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B5-06<br>**PAGE** 1 **OF** 2 **PAGES** |

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| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** June 5, 2006 | **SAND PACK SIZE & TYPE:**<br>**SETTING:** |
| **DRILLING COMPANY:** Soil Testing Inc. | **CASING SIZE & TYPE:** |
| **DRILLING METHOD:** Hollow Stem Auger | **SETTING:** |
| **SAMPLING METHOD:** Split Spoon | **SEAL TYPE:** Grout |
| **OBSERVER:** Patrick Welsh | **SETTING:** 21'bg to 20'bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Mix of Grout and Cuttings |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Quikrete Blacktop Patch | **DURATION:** **YIELD:** |

**REMARKS:** Grade starts below 4.5" of Asphalt. Refusal at 19.5 feet below grade.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 10-5-3-2 | 0.35 | 0 | Mainly Asphalt; with SAND; dark brown |
| 2 | 4 | SS | 4-5-6-10 | 1.2 | 0 | SAND; brown, compact, trace silt, pebbles <0.5", some asphalt |
| 4 | 6 | SS | 12-9-17-14 | 0.8 | 0 | SILT/SAND mix; brown , stones 0.8" – 1.8" thick, some asphalt |
| 6 | 8 | SS | 9-14-11-12 | 0.55 | 0 | SAND; coarse, brown to black to gray, many stones 0.8" – 1.8" thick |
| 8 | 10 | SS | 9-11-10-9 | 1.3 | 0 | SAND/SILT mix; brown, moist top, compact, stones 0.8" – 1.8" thick |
| 10 | 12 | SS | 3-8-12-6 | 1.25 | 0 | SILT/SAND mix; moist, brown, compact, stones 1" – 1.8" thick; crushed gray rock at bottom 0.3' |
| 12 | 14 | SS | 6-9-18-26 | 2 | 0 | SILT; wet, brown, trace sand, pebbles <0.5" thick |

**OWNER:** SEI

**WELL NO.:** B5-06 **PAGE** 2 **OF** 2 **PAGES**

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|---|---|---|---|---|---|---|
| 14 | 16 | SS | 21-17-73-22 | 1.55 | 0 | SILT/SAND mix; brown to light brown, wet, pebbles <0.5” thick |
| 16 | 18 | SS | 17-22-22-43 | 1.3 | 0 | SILT/SAND mix; brown to light brown, wet, compact, dark grey crushed sandstone in bottom 0.3’ |
| 18 | 20 | SS | 50/1 | 0.2 | 0 | SILT/SAND mix; brown, wet |
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| **GEOLOGIC LOG**<br>**LEGGETTE, BRASHEARS & GRAHAM, INC.**<br>**TRUMBULL, CONNECTICUT** | **OWNER:** SEI<br>**WELL NO:** B6-06<br>**PAGE** 1 **OF** 2 **PAGES** |
| **SITE LOCATION:** Materials Research Corporation<br>542 Route 303<br>Orangetown, New York | **SCREEN SIZE & TYPE:**<br>**SLOT NO.:** **SETTING:** |
| **DATE COMPLETED:** June 6, 2006<br>**DRILLING COMPANY:** Soil Testing Inc. | **SAND PACK SIZE & TYPE:**<br>**SETTING:** |
| **DRILLING METHOD:** Hollow Stem Auger | **CASING SIZE & TYPE:**<br>**SETTING:** |
| **SAMPLING METHOD:** Split Spoon<br>**OBSERVER:** Patrick Welsh | **SEAL TYPE:** Grout<br>**SETTING:** 20'bg to 20'bg |
| **REFERENCE POINT (RP):** | **BACKFILL TYPE:** Grout |
| **ELEVATION OF RP:** | **STATIC WATER LEVEL:** |
| **STICK-UP:** | **DEVELOPMENT METHOD:** |
| **SURFACE COMPLETION:** Quikrete Blacktop Patch | **DURATION:** **YIELD:** |

**REMARKS:** Grade starts below 5" of Asphalt. Refusal at 20 feet below grade.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 21-14-13-12 | 0.9 | 24.9 | Top 0.4': curshed rock/asphalt mix; Bottom 0.5': SILT/SAND mix; brown, pebbles <0.5" thick |
| 2 | 4 | SS | 11-14-13-16 | 1.0 | 20.8 | Top 0.2': dark gray, crushed rock; SILT/SAND mix; brown, compact, moist, pebbles <0.5" thick |
| 4 | 6 | SS | 16-18-19-14 | 0.5 | 185 | SILT; brown, very compact, wet, trace sand, large stones 0.5" – 1.5" thick |
| 6 | 8 | SS | 17-16-21-35 | 1.75 | 39.1 | Top 0.75': large, dark gray, crushed stones; Bottom: SILT/SAND mix; brown, very compact, wet, with grey stones |
| 8 | 10 | SS | 48-27-18-13 | 1.05 | 0 | Crushed gray rock mainly; SAND/SILT mix; brown, very compact |
| 10 | 12 | SS | 8-22-11-11 | 1.3 | 0 | SAND; fine, wet, brown, trace silt, compact, stones 0.8" – 1.2" thick |
| 12 | 14 | SS | 9-10-14-23 | 2 | 0 | Top 1': SAND; coarse, brown and gray; loose; wet; Bottom 1': SILT; moist, brown, compact |

**OWNER:** SEI

**WELL NO.:** B6-06 **PAGE** 2 **OF** 2 **PAGES**

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|---|---|---|---|---|---|---|
| 14 | 16 | SS | 34-35-36-41 | 1.55 | 1.8 | SILT; brown to reddish brown, moist, compact, large, gray stones 1" – 1.8" thick |
| 16 | 18 | SS | 50/3 | 1.2 | 0 | SILT/SAND mix; brown to dark gray, crushed gray sandstone at bottom |
| 18 | 20 | SS | 28-27-33-50/1 | 1.25 | 0 | Top: SILT; brown, wet, compact, trace grey sand; Bottom: crushed gray rock, wet, compact |
| 20 | 22 | SS | 50/0 | 0 | N/A | No recovery |
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**GEOLOGIC LOG**
**LEGGETTE, BRASHEARS & GRAHAM, INC.**
**TRUMBULL, CONNECTICUT**

**OWNER:** SEI

**WELL NO:** B7-06

**PAGE** 1 **OF** 2 **PAGES**

**SITE LOCATION:** Materials Research Corporation
542 Route 303
Orangetown, New York

**SCREEN SIZE & TYPE:**

**SLOT NO.:** **SETTING:**

**DATE COMPLETED:** June 6, 2006

**SAND PACK SIZE & TYPE:**

**SETTING:**

**DRILLING COMPANY:** Soil Testing Inc.

**CASING SIZE & TYPE:**

**SETTING:**

**DRILLING METHOD:** Hollow Stem Auger

**SAMPLING METHOD:** Split Spoon

**SEAL TYPE:** Grout

**OBSERVER:** Patrick Welsh

**SETTING:** 20’bg to grade

**REFERENCE POINT (RP):**

**BACKFILL TYPE:** Grout

**ELEVATION OF RP:**

**STATIC WATER LEVEL:**

**STICK-UP:**

**DEVELOPMENT METHOD:**

**SURFACE COMPLETION:** Quikrete Blacktop Patch

**DURATION:** **YIELD:**

**REMARKS:** Grade starts below 5” of Asphalt. Refusal at 20 feet below grade.

**ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube**
**REC = Recovery PPM = parts per million**

| DEPTH (FEET) | | SAMPLE TYPE | BLOW COUNT | REC. (FEET) | PID READING (PPM) | DESCRIPTION |
|---|---|---|---|---|---|---|
| FROM | TO | | | | | |
| 0 | 2 | SS | 8-5-4-3 | 1.15 | 1.1 | SILT; brown to dark brown, wet on bottom, trace clay, pebbles <0.5” thick |
| 2 | 4 | SS | 4-4-3-3 | 1.1 | 0.4 | SILT/SAND mix; wet, brown, few pebbles <0.5” thick |
| 4 | 6 | SS | 5-7-13-15 | 1.35 | 0.7 | SILT/SAND mix; brown, lots of light gray, crushed rock 1” – 1.5” thick |
| 6 | 8 | SS | 24-23-15-17 | 1.65 | 0.8 | SILT/SAND mix; compact, wet, brown, pockets of black sand and crushed rock |
| 8 | 10 | SS | 22-17-12-12 | 1.2 | 1.9 | SAND; brown, wet, trace silt, pebbles <0.5” thick; dark brown to black sand pockets |
| 10 | 12 | SS | 19-17-8-8 | 0.8 | 1.2 | SILT; moist, brown, trace sand, compact; 0.2’ patch of coarse tan sand |
| 12 | 14 | SS | 8-7-9-8 | 2 | 1.1 | SAND; brown to light brown, coarse, moist, trace silt, pebbles <0.5” thick |

**OWNER:** SEI

**WELL NO.:** B7-06 **PAGE** 2 **OF** 2 **PAGES**

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|---|---|---|---|---|---|---|
| 14 | 16 | SS | 9-17-22-24 | 1.15 | 2.2 | SILT/SAND mix; brown, moist, compact, large, gray stones 1” – 1.5” thick |
| 16 | 18 | SS | 21-18-28-39 | 2 | 5.3 | SILT/SAND mix; brown to dark brown, moist, compact, crushed gray stone 1” – 1.2” thick |
| 18 | 20 | SS | 50/4 | 0.33 | 1.2 | SAND; brown to dark gray, wet; crushed sandstone at bottom |
| 20 | 22 | SS | 9-50/2 | 0.4 | 22.5 | Crushed/Decomposed sandstone; dark gray to brown, trace coarse sand |
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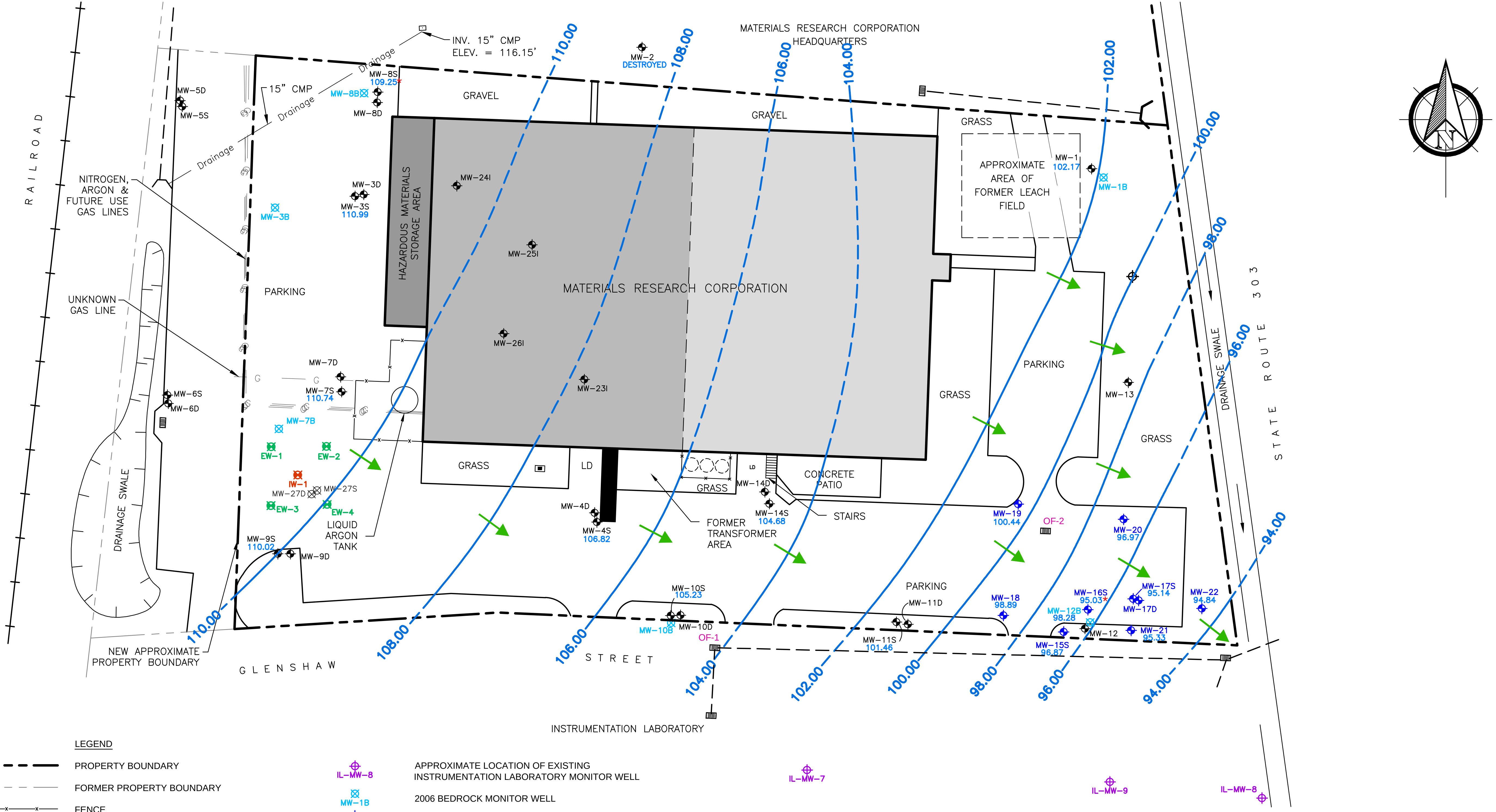
# APPENDIX IV

# 2012 – 2014 WATER TABLE AND POTENTIOMETRIC SURFACE CONTOUR MAPS



LEGEND

| | |
|---|---|
| ━ ━ ━ | PROPERTY BOUNDARY |
| — — — | FORMER PROPERTY BOUNDARY |
| —x—x— | FENCE |
| — — — | STORM-WATER PIPING |
| ▪ | STORM-WATER CATCH BASIN |
| ⊕ | SEWER DISCHARGE pH MONITOR |
| ▣ | TRANSFORMER |
| ■ | TRASH COMPACTOR |
| LD | LOADING DOCK |
| ▭ | CONSTRUCTED - 1961 |
| ▭ | CONSTRUCTED - 1969 |
| ▭ | CONSTRUCTED - 1980 |
| ⊕ IL–MW–8 | APPROXIMATE LOCATION OF EXISTING INSTRUMENTATION LABORATORY MONITOR WELL |
| ☒ MW–1B | 2006 BEDROCK MONITOR WELL |
| ⊕ MW–15S | 2006 OVERBURDEN MONITOR WELL |
| 96.87 | GROUNDWATER ELEVATION IN FEET |
| ⊕ MW–12 | MONITOR WELL LOCATION |
| ☒ MW–27 | PROPOSED MONITOR WELL LOCATION |
| OF–1 | OUTFALL |
| ☒ EW–1 | PROPOSED 2-INCH DIAMETER EXTRACTION WELL LOCATION |
| ☒ IW–1 | PROPOSED 6-INCH DIAMETER INJECTION WELL LOCATION |
| 94.00 —— | GROUNDWATER ELEVATION CONTOUR IN FEET (DASHED WHERE INFERRED) |
| → | GROUNDWATER FLOW DIRECTION |

* ANOMALOUS GROUNDWATER ELEVATION, NOT USED TO GENERATE GROUNDWATER ELEVATION CONTOURS

NOTE:
WELL LOCATIONS ARE APPROXIMATE.

0 50
SCALE IN FEET

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## SHALLOW GROUNDWATER ELEVATION CONTOUR MAP
## NOVEMBER 14, 2012

| DATE | REVISED |
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PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
4 Research Drive
Suite 301
Shelton, Connecticut 06484
(203) 929-8555

| DRAWN: | RAC | CHECKED: | KD | DATE: | 11/03/14 | FIGURE: | D–1 |
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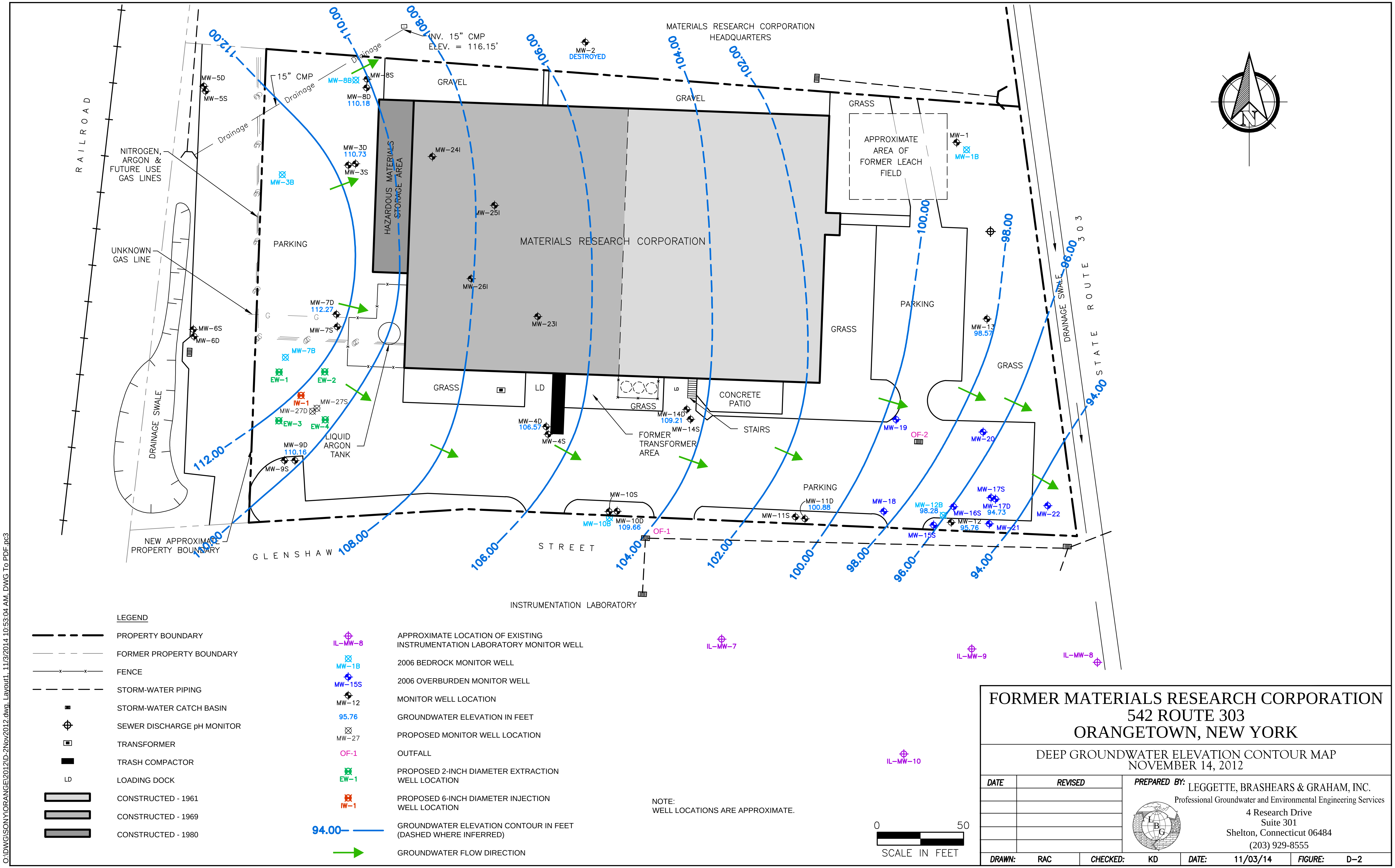

LEGEND

| | |
|---|---|
| ▬ ▪ ▬ | PROPERTY BOUNDARY |
| — — — | FORMER PROPERTY BOUNDARY |
| —x—x— | FENCE |
| — — — | STORM-WATER PIPING |
| ▪ | STORM-WATER CATCH BASIN |
| ⊕ | SEWER DISCHARGE pH MONITOR |
| ▣ | TRANSFORMER |
| ■ | TRASH COMPACTOR |
| LD | LOADING DOCK |
| ▭ | CONSTRUCTED - 1961 |
| ▭ | CONSTRUCTED - 1969 |
| ▭ | CONSTRUCTED - 1980 |

| | |
|---|---|
| IL-MW-8 | APPROXIMATE LOCATION OF EXISTING INSTRUMENTATION LABORATORY MONITOR WELL |
| MW-1B | 2006 BEDROCK MONITOR WELL |
| MW-15S | 2006 OVERBURDEN MONITOR WELL |
| MW-12 | MONITOR WELL LOCATION |
| 95.76 | GROUNDWATER ELEVATION IN FEET |
| MW-27 | PROPOSED MONITOR WELL LOCATION |
| OF-1 | OUTFALL |
| EW-1 | PROPOSED 2-INCH DIAMETER EXTRACTION WELL LOCATION |
| IW-1 | PROPOSED 6-INCH DIAMETER INJECTION WELL LOCATION |
| 94.00— | GROUNDWATER ELEVATION CONTOUR IN FEET (DASHED WHERE INFERRED) |
| → | GROUNDWATER FLOW DIRECTION |

NOTE:
WELL LOCATIONS ARE APPROXIMATE.

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## DEEP GROUNDWATER ELEVATION CONTOUR MAP
## NOVEMBER 14, 2012

| DATE | REVISED |
|---|---|
| | |

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Professional Groundwater and Environmental Engineering Services
4 Research Drive
Suite 301
Shelton, Connecticut 06484
(203) 929-8555

| DRAWN: | RAC | CHECKED: | KD | DATE: | 11/03/14 | FIGURE: | D-2 |
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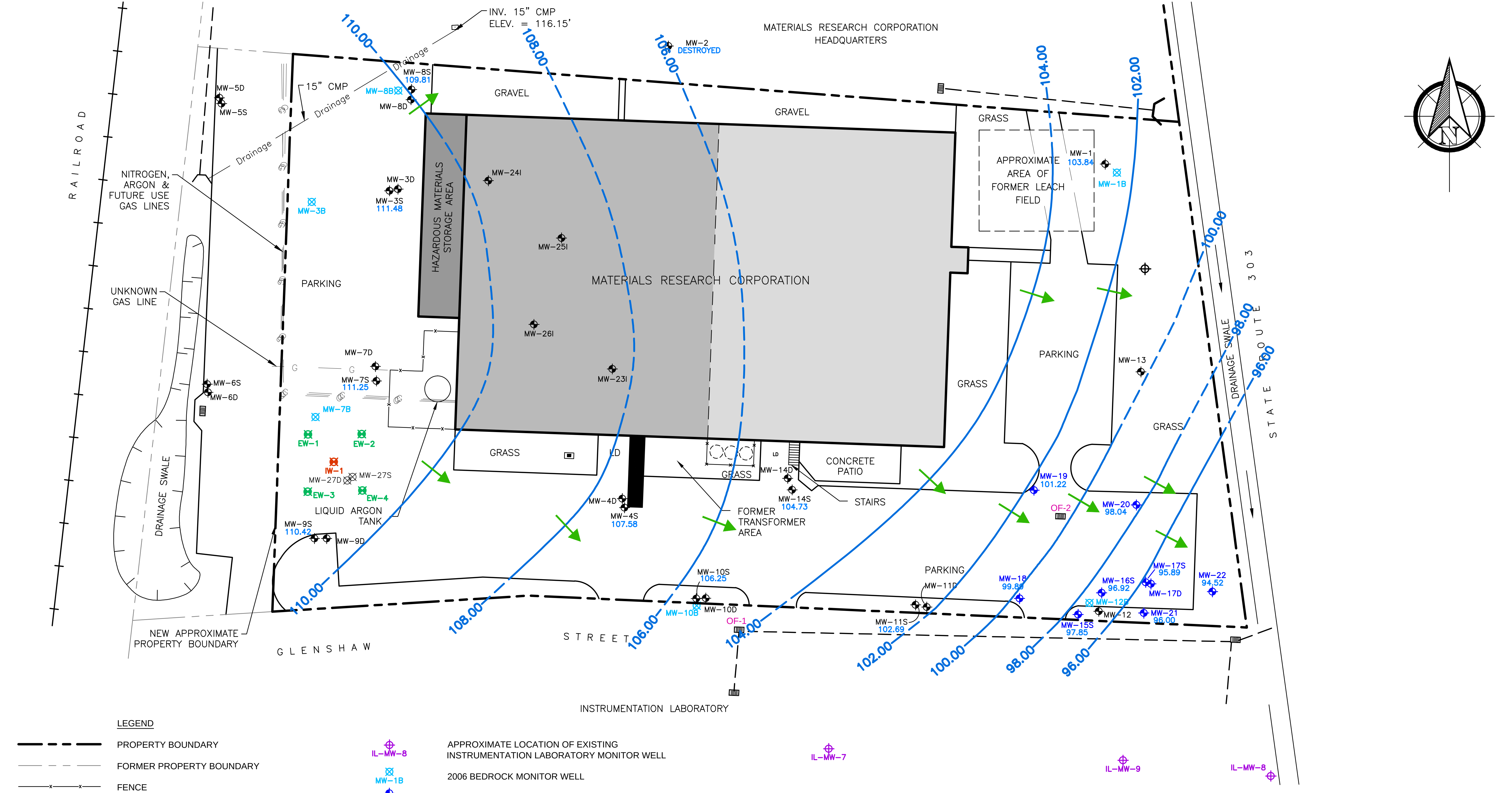

LEGEND

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|---|---|
| ▬ ▬ ▬ | PROPERTY BOUNDARY |
| — — — | FORMER PROPERTY BOUNDARY |
| —x—x— | FENCE |
| — — — | STORM-WATER PIPING |
| ▪ | STORM-WATER CATCH BASIN |
| ⊕ | SEWER DISCHARGE pH MONITOR |
| ▣ | TRANSFORMER |
| ▬ | TRASH COMPACTOR |
| LD | LOADING DOCK |
| ▭ | CONSTRUCTED - 1961 |
| ▭ | CONSTRUCTED - 1969 |
| ▭ | CONSTRUCTED - 1980 |

| | |
|---|---|
| IL-MW-8 | APPROXIMATE LOCATION OF EXISTING INSTRUMENTATION LABORATORY MONITOR WELL |
| MW-1B | 2006 BEDROCK MONITOR WELL |
| MW-15S | 2006 OVERBURDEN MONITOR WELL |
| 97.85 | GROUNDWATER ELEVATION IN FEET |
| MW-12 | MONITOR WELL LOCATION |
| MW-27 | PROPOSED MONITOR WELL LOCATION |
| OF-1 | OUTFALL |
| EW-1 | PROPOSED 2-INCH DIAMETER EXTRACTION WELL LOCATION |
| IW-1 | PROPOSED 6-INCH DIAMETER INJECTION WELL LOCATION |
| 96.00— | GROUNDWATER ELEVATION CONTOUR IN FEET (DASHED WHERE INFERRED) |
| → | GROUNDWATER FLOW DIRECTION |

NOTE:
WELL LOCATIONS ARE APPROXIMATE.

0 50
SCALE IN FEET

# FORMER MATERIALS RESEARCH CORPORATION
542 ROUTE 303
ORANGETOWN, NEW YORK

## SHALLOW GROUNDWATER ELEVATION CONTOUR MAP
JANUARY 9, 2013

| DATE | REVISED |
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Professional Groundwater and Environmental Engineering Services
4 Research Drive
Suite 301
Shelton, Connecticut 06484
(203) 929-8555

| DRAWN: | RAC | CHECKED: | KD | DATE: | 11/03/14 | FIGURE: | D-3 |
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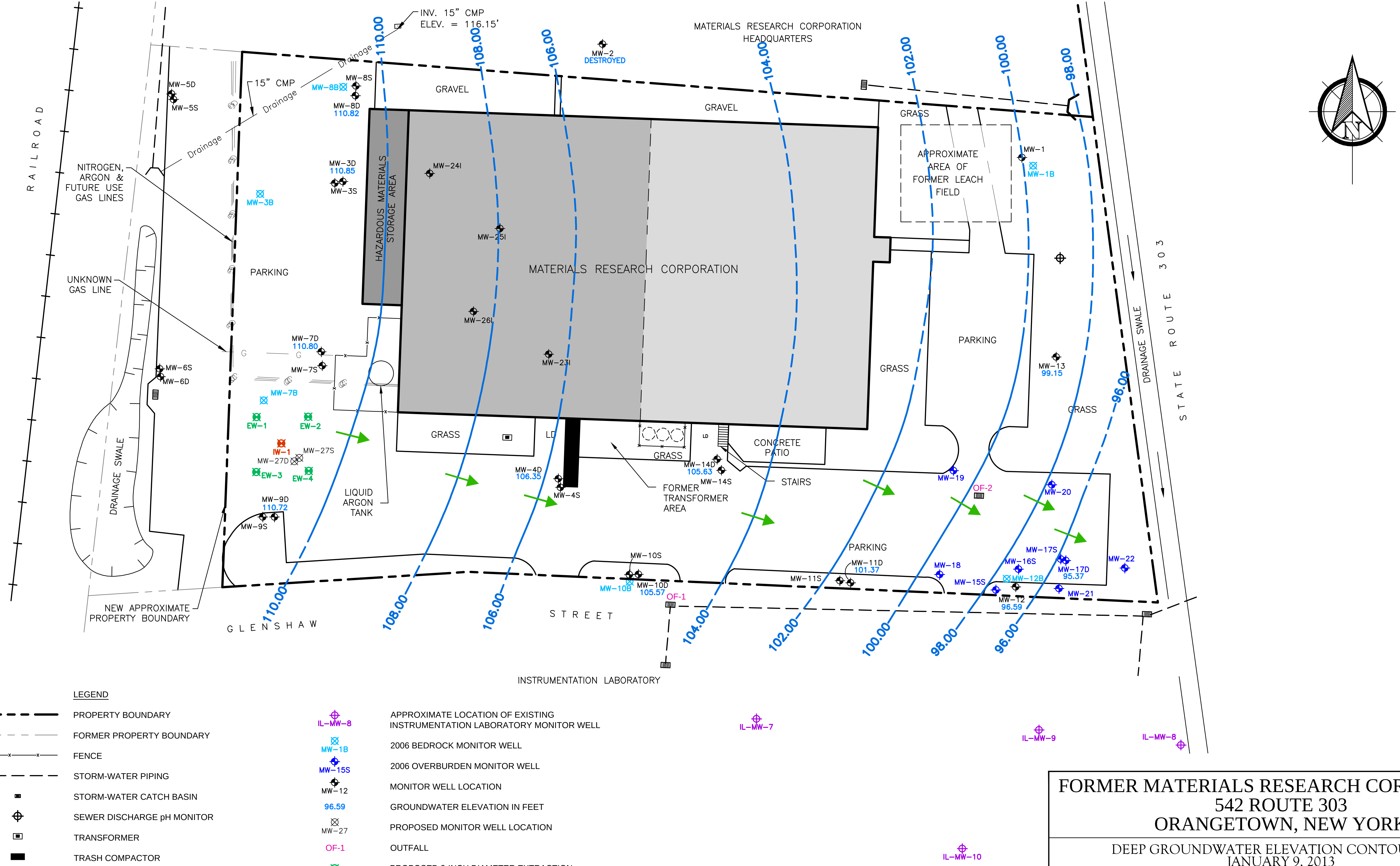

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LEGEND

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|---|---|
| — — · — — | PROPERTY BOUNDARY |
| — — — — | FORMER PROPERTY BOUNDARY |
| ——x——x—— | FENCE |
| — — — — | STORM-WATER PIPING |
| ▪ | STORM-WATER CATCH BASIN |
| ⊕ | SEWER DISCHARGE pH MONITOR |
| ⊡ | TRANSFORMER |
| ▬ | TRASH COMPACTOR |
| LD | LOADING DOCK |
| ▭ | CONSTRUCTED - 1961 |
| ▭ | CONSTRUCTED - 1969 |
| ▭ | CONSTRUCTED - 1980 |

| | |
|---|---|
| IL-MW-8 | APPROXIMATE LOCATION OF EXISTING INSTRUMENTATION LABORATORY MONITOR WELL |
| MW-1B | 2006 BEDROCK MONITOR WELL |
| MW-15S | 2006 OVERBURDEN MONITOR WELL |
| MW-12 | MONITOR WELL LOCATION |
| 96.59 | GROUNDWATER ELEVATION IN FEET |
| MW-27 | PROPOSED MONITOR WELL LOCATION |
| OF-1 | OUTFALL |
| EW-1 | PROPOSED 2-INCH DIAMETER EXTRACTION WELL LOCATION |
| IW-1 | PROPOSED 6-INCH DIAMETER INJECTION WELL LOCATION |
| 96.00— | GROUNDWATER ELEVATION CONTOUR IN FEET (DASHED WHERE INFERRED) |
| → | GROUNDWATER FLOW DIRECTION |

NOTE:
WELL LOCATIONS ARE APPROXIMATE.

0 50
SCALE IN FEET

# FORMER MATERIALS RESEARCH CORPORATION
542 ROUTE 303
ORANGETOWN, NEW YORK

## DEEP GROUNDWATER ELEVATION CONTOUR MAP
JANUARY 9, 2013

| DATE | REVISED |
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PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
4 Research Drive
Suite 301
Shelton, Connecticut 06484
(203) 929-8555

| DRAWN: | RAC | CHECKED: | KD | DATE: | 11/03/14 | FIGURE: | D-4 |
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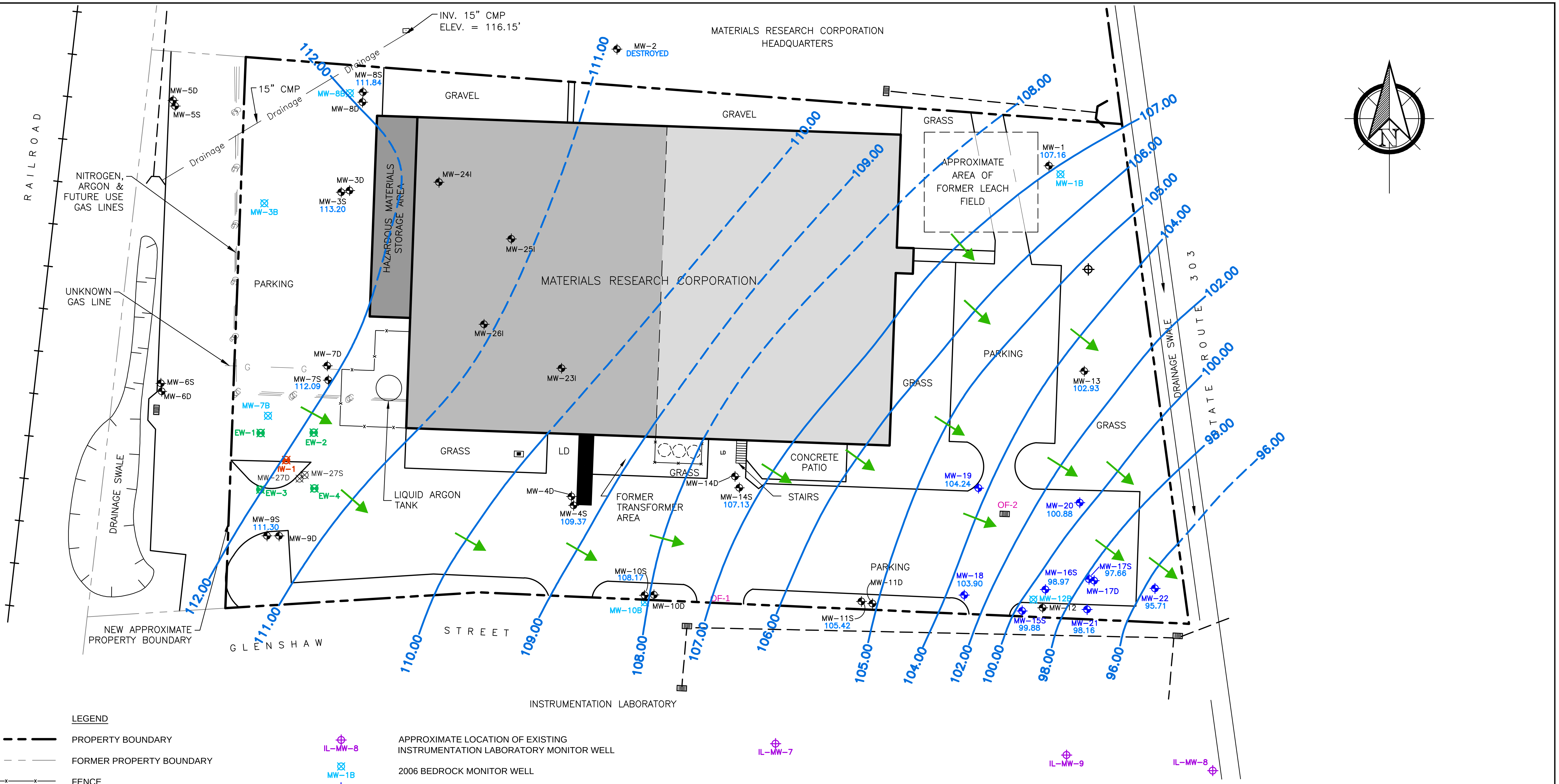

LEGEND

| | |
|---|---|
| ▬ ▬ ▬ | PROPERTY BOUNDARY |
| — — — | FORMER PROPERTY BOUNDARY |
| —x—x— | FENCE |
| — — — | STORM-WATER PIPING |
| ▪ | STORM-WATER CATCH BASIN |
| ⊕ | SEWER DISCHARGE pH MONITOR |
| ▣ | TRANSFORMER |
| ▬ | TRASH COMPACTOR |
| LD | LOADING DOCK |
| ▭ | CONSTRUCTED - 1961 |
| ▭ | CONSTRUCTED - 1969 |
| ▭ | CONSTRUCTED - 1980 |
| ⊕ IL-MW-8 | APPROXIMATE LOCATION OF EXISTING INSTRUMENTATION LABORATORY MONITOR WELL |
| ⊠ MW-1B | 2006 BEDROCK MONITOR WELL |
| ⊕ MW-15S | 2006 OVERBURDEN MONITOR WELL |
| 99.88 | GROUNDWATER ELEVATION IN FEET |
| ⊕ MW-12 | MONITOR WELL LOCATION |
| ⊠ MW-27 | PROPOSED MONITOR WELL LOCATION |
| OF-1 | OUTFALL |
| ⊠ EW-1 | PROPOSED 2-INCH DIAMETER EXTRACTION WELL LOCATION |
| ⊠ IW-1 | PROPOSED 6-INCH DIAMETER INJECTION WELL LOCATION |
| 96.00 — | GROUNDWATER ELEVATION CONTOUR IN FEET (DASHED WHERE INFERRED) |
| → | GROUNDWATER FLOW DIRECTION |

NOTE:
WELL LOCATIONS ARE APPROXIMATE.

0 50
SCALE IN FEET

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## SHALLOW GROUNDWATER ELEVATION CONTOUR MAP
## APRIL 19, 2014

| DATE | REVISED |
|---|---|
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PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
4 Research Drive
Suite 301
Shelton, Connecticut 06484
(203) 929-8555

| DRAWN: | RAC | CHECKED: | KD | DATE: | 11/05/14 | FIGURE: | D-5 |
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LEGEND

▬ ▬ ▬ PROPERTY BOUNDARY

96.00 ▬ ▬ GROUNDWATER ELEVATION CONTOUR IN FEET
(DASHED WHERE INFERRED)

→ GROUNDWATER FLOW DIRECTION

0 150
SCALE IN FEET

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## SHALLOW GROUNDWATER ELEVATION CONTOUR MAP
## APRIL 19, 2014

| DATE | REVISED |
|---|---|
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PREPARED BY: **LEGGETTE, BRASHEARS & GRAHAM, INC.**
**Professional Groundwater and Environmental Engineering Services**
4 Research Drive
Suite 204
Shelton, Connecticut 06484
(203) 929-8555

| DRAWN: | RAC | CHECKED: | KD | DATE: | 09/17/15 | FIGURE: | D-5A |
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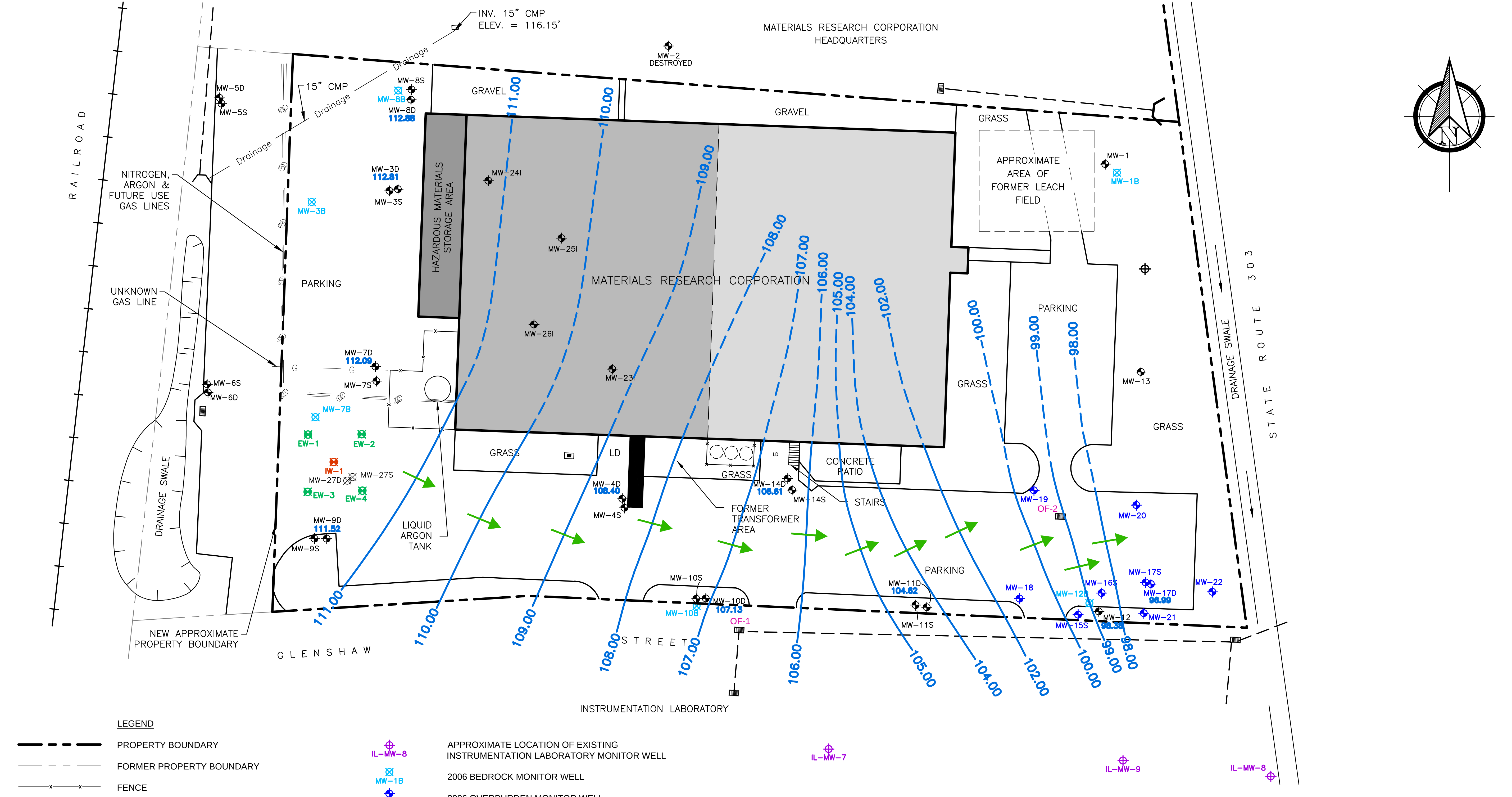

LEGEND

| | |
|---|---|
| — — · — — | PROPERTY BOUNDARY |
| — — — — | FORMER PROPERTY BOUNDARY |
| ——x——x—— | FENCE |
| — — — — | STORM-WATER PIPING |
| ▪ | STORM-WATER CATCH BASIN |
| ⊕ | SEWER DISCHARGE pH MONITOR |
| ▣ | TRANSFORMER |
| ■ | TRASH COMPACTOR |
| LD | LOADING DOCK |
| ▭ | CONSTRUCTED - 1961 |
| ▭ | CONSTRUCTED - 1969 |
| ▭ | CONSTRUCTED - 1980 |
| IL-MW-8 | APPROXIMATE LOCATION OF EXISTING INSTRUMENTATION LABORATORY MONITOR WELL |
| MW-1B | 2006 BEDROCK MONITOR WELL |
| MW-15S | 2006 OVERBURDEN MONITOR WELL |
| MW-11D | MONITOR WELL LOCATION |
| 104.62 | GROUNDWATER ELEVATION IN FEET |
| MW-27 | PROPOSED MONITOR WELL LOCATION |
| OF-1 | OUTFALL |
| EW-1 | PROPOSED 2-INCH DIAMETER EXTRACTION WELL LOCATION |
| IW-1 | PROPOSED 6-INCH DIAMETER INJECTION WELL LOCATION |
| 98.00 —— | GROUNDWATER ELEVATION CONTOUR IN FEET (DASHED WHERE INFERRED) |
| → | GROUNDWATER FLOW DIRECTION |

NOTE:
WELL LOCATIONS ARE APPROXIMATE.

0 50
SCALE IN FEET

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## DEEP GROUNDWATER ELEVATION CONTOUR MAP
## APRIL 19, 2014

| DATE | REVISED |
|---|---|
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PREPARED BY: LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
4 Research Drive
Suite 301
Shelton, Connecticut 06484
(203) 929-8555

DRAWN: RAC | CHECKED: KD | DATE: 11/05/14 | FIGURE: D-6

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# APPENDIX V

# SOIL VOC QUALITY SUMMARY TABLE

# APPENDIX V

# FORMER MATERIALS RESEARCH CORPORATION
## 542 ROUTE 303
## ORANGETOWN, NEW YORK

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## Summary of Detected Volatile Organic Compounds in Soils[1/]

| Sample ID | Sample Date | Depth (ft bg) | PCE (mg/kg) | TCE (mg/kg) | 1,2 DCE (mg/kg) | 1,1 DCA (mg/kg) | 1,1,2,2 TCA (mg/kg) | 1,1,1 TCA (mg/kg) | 1,1 DCE (mg/kg) | 1,4-DCB (mg/kg) | CF (mg/kg) | CE (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Exterior Borings** | | | | | | | | | | | | |
| B-1 | 10/29/01 | 10 | 0.004J | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| | | 20 | 0.003J | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| | | 30 | 0.003J | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| B-2 | 10/30/01 | 10 | 0.004J | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| | | 20 | 0.003J | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| B-3 | 10/30/01 | 10 | 0.003J | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| | | 20 | 0.003J | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.01 |
| | | 30 | 0.003J | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| | | 40 | 0.003J | 0.003J | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| B-6 | 11/07/01 | 10 | 0.006 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.01 |
| B-6 (Duplicate) | 11/07/01 | 10 | 0.006 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.01 |
| B-7 | 11/02/01 | 10 | 0.003J | 0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| B-8 | 10/31/01 | 10 | 0.003J | 0.022 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.01 |
| | 11/01/01 | 20 | 0.017 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| B-9 | 11/08/01 | 10 | 0.006B | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| B-9 (Duplicate) | 11/08/01 | 10 | 0.008B | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| B-9 (Triplicate) | 11/08/01 | 10 | 0.007B | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| B-13 | 11/08/01 | 10 | 0.006B | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| | 11/09/01 | 20 | 0.006B | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| B-14 | 11/05/01 | 10 | 0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| | 11/06/01 | 20 | 0.005 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.01 |
| B-15 | 11/02/01 | 10 | 0.003J | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| | | 20 | 0.003J | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| | | 28 | 0.006 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.01 |
| B-16 | 11/06/01 | 10 | 0.006 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.01 |

# APPENDIX V

# FORMER MATERIALS RESEARCH CORPORATION
542 ROUTE 303
ORANGETOWN, NEW YORK

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## Summary of Detected Volatile Organic Compounds in Soils[1/]

| Sample ID | Sample Date | Depth (ft bg) | PCE (mg/kg) | TCE (mg/kg) | 1,2 DCE (mg/kg) | 1,1 DCA (mg/kg) | 1,1,2,2 TCA (mg/kg) | 1,1,1 TCA (mg/kg) | 1,1 DCE (mg/kg) | 1,4-DCB (mg/kg) | CF (mg/kg) | CE (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-16 (continued) | 11/06/01 | 20 | 0.006 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.001 | ND<0.01 |
| MW-1 | 07/09/99 | 10 to 11 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-3 | 07/09/99 | 3 to 5 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-3D | 04/02/02 | 5 to 7 | ND<0.005 | 0.003J | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-3D (duplicate) | 04/02/02 | 5 to 7 | ND<0.005 | 0.002J | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-4 | 07/09/99 | 1 to 3 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-4D | 03/26/02 | 5 to 7 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
|  |  | 10 to 12 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-7D | 04/02/02 | 10 to 12 | ND<0.005 | 0.036 | 0.010 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-8D | 04/04/02 | 0 to 2 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-8D (duplicate) | 04/04/02 | 0 to 2 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-8D (triplicate) | 04/04/02 | 0 to 2 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-9D | 04/01/02 | 10 to 12 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-10D | 03/28/02 | 5 to 7 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-10D | 03/28/02 | 10 to 12 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-11D | 03/27/02 | 10 to 12 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-12 | 03/26/02 | 10 to 12 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-13D | 03/27/02 | 15 to 17 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-14D | 03/29/02 | 5 to 7 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| MW-14D | 03/29/02 | 10 to 12 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| S-1 | 4/02/02 | 0 to 0.25 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| S-2 | 4/02/02 | 0 to 0.25 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| S-3 | 4/02/02 | 0 to 0.25 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| S-4 | 4/02/02 | 0 to 0.25 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| S-5 | 4/02/02 | 0 to 0.25 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| S-6 | 4/02/02 | 0 to 0.25 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |
| S-7 | 4/02/02 | 0 to 0.25 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.05 |

# APPENDIX V

## FORMER MATERIALS RESEARCH CORPORATION
## 542 ROUTE 303
## ORANGETOWN, NEW YORK

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### Summary of Detected Volatile Organic Compounds in Soils[1/]

| Sample ID | Sample Date | Depth (ft bg) | PCE (mg/kg) | TCE (mg/kg) | 1,2 DCE (mg/kg) | 1,1 DCA (mg/kg) | 1,1,2,2 TCA (mg/kg) | 1,1,1 TCA (mg/kg) | 1,1 DCE (mg/kg) | 1,4-DCB (mg/kg) | CF (mg/kg) | CE (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B1-06 | 5/30/06 | 0 to 2 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | 0.001 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 2 to 4 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 4 to 6 | 0.006 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 6 to 8 | 0.007 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 8 to 10 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 10 to 12 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 12 to 14 | ND<0.01 | 0.002 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 14 to 16 | ND<0.01 | 0.001 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 16 to 18 | ND<0.005 | 0.004 J | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 |
| | | 18 to 20 | ND<0.01 | 0.002 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 20 to 22 | 0.004 J | **0.60** | 0.001 J (cis) | ND<0.025 | ND<0.025 | 0.002 J | ND<0.025 | 0.001 J | 0.004 J | ND<0.025 |
| | | 22 to 24 | ND<0.01 | 0.003 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 24 to 26 | 0.055 | 0.210 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 28 to 30 | 0.001 J | 0.018 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| B2-06 | 6/1/06 | 0 to 2 | 0.044 J | ND<005 | ND<005 | ND<005 | ND<005 | ND<005 | ND<005 | ND<005 | ND<005 | ND<005 |
| | | 2 to 4 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 4 to 6 | 0.002 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 6 to 8 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 8 to 10 | 0.001 J | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 |
| | | 10 to 12 | 0.004 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 12 to 14 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 14 to 16 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 16 to 18 | 0.002 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 18 to 20 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 20 to 22 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| B3-06 | 6/1/06 | 0 to 2 | 0.003 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 2 to 4 | 0.017 J | ND<0.025 | ND<0.025 | ND<0.025 | ND<0.025 | ND<0.025 | ND<0.025 | ND<0.025 | ND<0.025 | ND<0.025 |
| | | 4 to 6 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 6 to 8 | 0.003 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 8 to 10 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 10 to 12 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |

# APPENDIX V

## FORMER MATERIALS RESEARCH CORPORATION
## 542 ROUTE 303
## ORANGETOWN, NEW YORK

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### Summary of Detected Volatile Organic Compounds in Soils[1/]

| Sample ID | Sample Date | Depth (ft bg) | PCE (mg/kg) | TCE (mg/kg) | 1,2 DCE (mg/kg) | 1,1 DCA (mg/kg) | 1,1,2,2 TCA (mg/kg) | 1,1,1 TCA (mg/kg) | 1,1 DCE (mg/kg) | 1,4-DCB (mg/kg) | CF (mg/kg) | CE (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B3-06 (continued) | 6/1/06 | 12 to 14 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 14 to 16 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 16 to 18 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 18 to 20 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 20 to 22 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 22 to 23 | ND<0.01 | 0.012 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| B4-06 | 6/2/06 | 0 to 2 | 0.003 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 2 to 4 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | 0.005 J |
| | | 4 to 6 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | 0.004 J |
| | | 6 to 8 | 0.004 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | 0.002 J |
| | | 8 to 10 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | 0.004 J |
| | | 10 to 12 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 12 to 14 | ND<0.01 | 0.003 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | 0.003 J |
| | | 14 to 16 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | 0.004 J |
| | | 16 to 18 | ND<0.01 | 0.008 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | 0.003 J |
| | | 18 to 20 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | 0.004 J |
| | | 20 to 21 | 0.002 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | 0.003 J |
| B5-06 | 6/5/06 | 0 to 2 | 0.004 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 2 to 4 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 4 to 6 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 6 to 8 | 0.003 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 8 to 10 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 10 to 12 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 12 to 14 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 |
| | | 14 to 16 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 16 to 18 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 18 to 19.5 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| B6-06 | 6/6/06 | 0 to 2 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 2 to 4 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 4 to 6 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 6 to 8 | ND<0.01 | 0.003 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |

# APPENDIX V

## FORMER MATERIALS RESEARCH CORPORATION
## 542 ROUTE 303
## ORANGETOWN, NEW YORK

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### Summary of Detected Volatile Organic Compounds in Soils[1/]

| Sample ID | Sample Date | Depth (ft bg) | PCE (mg/kg) | TCE (mg/kg) | 1,2 DCE (mg/kg) | 1,1 DCA (mg/kg) | 1,1,2,2 TCA (mg/kg) | 1,1,1 TCA (mg/kg) | 1,1 DCE (mg/kg) | 1,4-DCB (mg/kg) | CF (mg/kg) | CE (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B6-06<br>(continued) | 6/6/06 | 8 to 10 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 10 to 12 | ND<0.01 | 0.003 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 12 to 14 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 14 to 16 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | 0.004 J |
| | | 16 to 18 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 18 to 20 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | 0.004 J |
| B7-06 | 6/6/06 | 0 to 2 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 2 to 4 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 4 to 6 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 6 to 8 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 8 to 10 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 10 to 12 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 12 to 14 | ND<0.01 | 0.002 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 14 to 16 | ND<0.01 | 0.012 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 16 to 18 | ND<0.01 | 0.002 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 18 to 20 | ND<0.01 | ND<10 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 20 to 22 | ND<0.01 | ND<10 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| MW-16S | 6/5/06 | 0 to 2 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 | ND<0.005 |
| | | 2 to 4 | 0.004 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 4 to 6 | 0.002 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 6 to 8 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 8 to 10 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 10 to 12 | 0.002 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 12 to 14 | 0.002 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 14 to 16 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 16 to 18 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 18 to 20 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 20 to 22 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 22 to 23.5 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| MW-17D[2] | 5/31/06 | 2 to 4 | 0.005 J | 0.001 J | 0.002J (cis) | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 4 to 6 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |

# APPENDIX V

# FORMER MATERIALS RESEARCH CORPORATION
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## ORANGETOWN, NEW YORK

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### Summary of Detected Volatile Organic Compounds in Soils[1/]

| Sample ID | Sample Date | Depth (ft bg) | PCE (mg/kg) | TCE (mg/kg) | 1,2 DCE (mg/kg) | 1,1 DCA (mg/kg) | 1,1,2,2 TCA (mg/kg) | 1,1,1 TCA (mg/kg) | 1,1 DCE (mg/kg) | 1,4-DCB (mg/kg) | CF (mg/kg) | CE (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-17D[2]<br>(continued) | 5/31/06 | 6 to 8 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 8 to 10 | 0.005 J | 0.022 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 10 to 12 | 0.003 J | 0.007 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 12 to 14 | 0.002 J | 0.003 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 14 to 16 | ND<0.01 | 0.006 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 16 to 18 | ND<0.01 | 0.055 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 18 to 20 | ND<0.01 | 0.007 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 20 to 22 | 0.005 J | 0.013 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 22 to 24 | ND<0.01 | 0.019 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 24 to 26 | ND<0.01 | 0.002 J | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 26 to 28 | 0.011 | 0.024 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| | | 28 to 30 | 0.012 | 0.320 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| MW-21 | 8/15/06 | 8 to 10 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| MW-22 | 8/15/06 | 8 to 10 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 | ND<0.01 |
| EW-11 | 12/12/13 | 25 to 27 | 0.076 | **160** | 0.013 (cis) | ND<0.0056 | ND<0.0056 | 0.054 | 0.02 | ND<0.0056 | 0.0059 | ND<0.0056 |
| EW-12 | 12/19/13 | 25 to 27 | 0.038 E | **8.6** | 0.0042J (cis) | 0.014 | ND<0.0047 | 0.095 | 0.074 | ND<0.0047 | 0.11 | ND<0.0047 |
| EW-15 | 6/21/14 | 25 to 26.5 | 0.0094 | **7.0** | ND>0.0026 | ND<0.0026 | ND<0.0026 | 0.022 | ND<0.0026 | ND<0.0026 | ND<0.0026 | ND<0.0026 |
| **Interior Borings** | | | | | | | | | | | | |
| MW-23I | 6/26/10 | 2 to 4 | ND<0.30 | **730** | 530 (cis)<br>29 (trans) | 1.90 J | ND<.0.33 | 2.20 J | 3.90 | NA | ND<0.21 | ND<0.45 |
| | | 4 to 4.9 | ND<.00062 | 0.027 | 0.040(cis) | ND<.00082 | ND<.00068 | ND<0.0011 | ND<0.0016 | NA | ND<.00043 | ND<.00091 |
| | | 5 to 7 | ND<.00063 | ND<.00069 | ND<0.0012 | ND<.00083 | ND<.00069 | ND<0.0011 | ND<0.0016 | NA | ND<.00044 | ND<.00092 |
| | | 7 to 8.8 | ND<.00084 | ND<.00093 | ND<0.0011 | ND<0.0011 | ND<.00093 | ND<0.0015 | ND<0.0022 | NA | ND<.00058 | ND<0.0012 |
| | | 10 to 12 | ND<.00062 | 0.0061 | 0.0051J(cis) | ND<.00083 | ND<.00068 | ND<0.0011 | ND<0.0016 | NA | ND<.00043 | ND<.00091 |
| | | 22 to 24 | ND<.00064 | 0.004 | 0.0028J(cis) | ND<.00085 | ND<.0007 | ND<0.0012 | ND<0.0016 | NA | ND<.00044 | ND<.00094 |
| | | 30 to 31 | ND<.00066 | 0.005J | 0.0013J(cis) | ND<.00087 | ND<.00072 | ND<0.0012 | ND<0.0017 | NA | ND<.00045 | ND<.00096 |
| MW-24I | 7/18/10 | 3 to 5 | ND<.00061 | 0.00067 | ND<0.0011 | ND<.00081 | ND<.00067 | ND<0.0011 | ND<0.0016 | NA | ND<.00042 | ND<.00090 |

# APPENDIX V

## FORMER MATERIALS RESEARCH CORPORATION
## 542 ROUTE 303
## ORANGETOWN, NEW YORK

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### Summary of Detected Volatile Organic Compounds in Soils[1/]

| Sample ID | Sample Date | Depth (ft bg) | PCE (mg/kg) | TCE (mg/kg) | 1,2 DCE (mg/kg) | 1,1 DCA (mg/kg) | 1,1,2,2 TCA (mg/kg) | 1,1,1 TCA (mg/kg) | 1,1 DCE (mg/kg) | 1,4-DCB (mg/kg) | CF (mg/kg) | CE (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-24I (continued) | 7/18/10 | 11 to 13 | ND<.00060 | 0.0009J | ND<0.0011 | ND<.00060 | ND<.00065 | ND<0.0011 | ND<0.0015 | NA | ND<.00041 | ND<.00087 |
| | | 19 to 21 | ND<.00060 | ND<.00065 | ND<0.0011 | ND<.00079 | ND<.00065 | ND<0.0011 | ND<0.0015 | NA | ND<.00041 | ND<.00087 |
| | | 25 to 27 | ND<.00061 | ND<.00067 | ND<0.0011 | ND<.00081 | ND<.00067 | ND<0.0011 | ND<0.0016 | NA | ND<.00042 | ND<.00090 |
| MW-25I | 7/25/10 | 2 to 2.5 | ND<.00059 | 0.0024J | ND<0.0011 | ND<.00079 | ND<.00065 | 0.0092 | 0.0092 | NA | ND<.00041 | 0.00098J |
| | | 7 to 9 | ND<.00058 | ND<.00063 | ND<0.0011 | ND<.00076 | ND<.00063 | ND<0.0011 | ND<0.0015 | NA | ND<.00040 | ND<.00084 |
| | | 16 to 18 | ND<.00058 | ND<.00064 | ND<0.0011 | ND<.00078 | ND<.00064 | ND<0.0011 | ND<0.0015 | NA | ND<.00040 | ND<.00085 |
| | | 26 to 27 | ND<.00058 | ND<.00064 | ND<0.0011 | ND<.00077 | ND<.00064 | ND<0.0011 | ND<0.0015 | NA | ND<.00040 | ND<.00085 |
| MW-26I | 8/15/10 | 0.5 to 1.0 | ND<.00060 | ND<.00065 | ND<0.0011 | ND<.00079 | ND<.00065 | ND<0.0011 | ND<0.0015 | NA | ND<.00041 | ND<.00087 |
| | | 2.0 to 2.5 | ND<.00063 | ND<.00069 | 0.041(cis)<br>0.0016J(trans) | ND<.00084 | ND<.00069 | ND<0.0012 | ND<0.0016 | NA | ND<.00044 | ND<.00092 |
| | | 2.5 to 4.0 | ND<.00064 | 0.0032J | 0.140(cis)<br>0.0045J (trans) | ND<.00085 | ND<.00070 | ND<0.0012 | ND<0.0016 | NA | ND<.00044 | ND<.00093 |
| | | 4.0 to 5.0 | ND<.00064 | ND<.00071 | 0.0047J (cis) | ND<.00086 | ND<.00067 | ND<0.0012 | ND<0.0016 | NA | ND<.00045 | ND<.00094 |
| | | 7.0 to 8.8 | ND<.00058 | ND<.00063 | ND<0.0011 | ND<.00076 | ND<.00063 | ND<0.0011 | ND<0.0015 | NA | ND<.00040 | ND<.00084 |
| | | 14 to 16 | ND<.00057 | 0.0014J | ND<0.0011 | ND<.00076 | ND<.00063 | ND<0.0010 | ND<0.0015 | | ND<.00040 | ND<.00084 |
| | | 16-18 | ND<.00062 | 0.0037J | 0.0015J(cis) | ND<.00083 | ND<.00068 | ND<0.0011 | ND<0.0016 | NA | ND<.00043 | ND<.00091 |
| | | 18 to 20 | ND<.00062 | 0.0039J | ND<0.0011 | ND<.00083 | ND<.00068 | ND<0.0011 | ND<0.0016 | | ND<.00043 | ND<.00091 |
| | | 22 to 23 | ND<.00057 | 0.0026J | ND<0.0011 | ND<.00076 | ND<.00063 | ND<0.001 | ND<0.0015 | NA | ND<.00040 | ND<.00084 |
| Part 375 Restricted Use SCO Industrial | | | 300 | **400** | 1,000 | 480 | 0.60[3/] | 1,000 | 1,000 | 250 | 700 | 1.90[3/] |
| Protection of Groundwater SCO[4/] | | | 1.3 | **0.47** | 0.25(cis)<br>0.19(trans) | 0.27 | 0.60 | 0.68 | 0.33 | 1.8 | 0.37 | 1.90 |

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### Summary of Detected Volatile Organic Compounds in Soils[1/]

| | | | |
|---|---|---|---|
| ND | Below laboratory detection limits/2010 ND below Method Detection Limit | DCE | Dichloroethylene |
| PCE | Tetrachloroethylene | DCA | Dichloroethane |
| DCB | Dichlorobenzene | TCE | Trichloroethylene |
| CE | Chloroethane | TCA | Trichloroethane |
| NA | Not Analyzed | CF | Chloroform |

| | |
|---|---|
| Note: | Bold Indicates Criteria Exceedance<br>Carbon Tetrachloride was detected at concentrations of 0.21 mg/kg and 0.044 mg/kg in EW-11 (25-27 ft bg) and EW-15 (25-26.5 ft bg), respectively. The Part 375 Industrial Restricted Use SCO for Carbon Tetrachloride is 44 mg/kg. |
| J | Indicates an estimated value. Detected below the Reporting Limit but greater than or equal to the Method Detection Limit; therefore, the result is an estimated concentration. |
| B | Analyte found in the associated analysis batch blank. |
| E | The concentration indicated for this analyte is an estimated value above the calibration range of the instrument, therefore, the value is considered an estimate. |
| ft bg | Feet below grade |

[1/] All concentrations in milligrams per kilogram (mg/kg).
[2/] MW-17D mislabeled as MW-14D on laboratory sheets.
[3/] NYSDEC TAGM Recommended Soil Clean-Up Objective.
[4/] Only applicable to soil samples collected below the water table.

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# APPENDIX VI

# GROUNDWATER VOC QUALITY SUMMARY TABLE

# APPENDIX VI

# FORMER MATERIALS RESEARCH CORPORATION
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ORANGETOWN, NEW YORK

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## Summary of Volatile Organic Compounds Results for All Groundwater Samples[1/]

| Sample Location | Depth of Sample | Date Sampled | Trichloro-ethylene | 1,1,1- Trichloro-ethane | Tetrachloro-ethylene | 1,1-Dichloro-ethylene | 1,1-Dichloro-ethane | 1,2-Dichloroethane | cis-1,2-Dichloro-ethylene | trans-1,2-Dichloro-ethylene | Chloroform | Vinyl Chloride | Carbon Tetra-chloride | MTBE | Toluene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-1 | 20 | 10/29/2001 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| B-1 | 30 | 10/30/2001 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| B-2 | 20 | 10/30/2001 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| B-3 | 20 | 10/30/2001 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| B-3 | 30 | 10/31/2001 | ND<2 | ND<2 | ND<2 | ND<2 | ND<2 | ND<2 | ND<2 | ND<1 | ND<1 | ND<20 | ND<1 | -- | -- |
| B-3 | 40 | 10/31/2001 | 2 | ND<2 | ND<2 | ND<2 | ND<2 | ND<2 | ND<2 | ND<2 | ND<1 | ND<20 | ND<1 | -- | -- |
| B-7 | 20 | 11/2/2001 | 58 | 9 | ND<1 | 12 | **7** | ND<1 | 6 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| B-8 | 20 | 11/1/2001 | **180** | 9 | ND<1 | 9 | **14** | ND<1 | **160** | 1 | ND<1 | **12** | ND<1 | -- | -- |
| B-13 | 20 | 11/9/2001 | 5 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | **9** | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| B-15 | 28 | 11/5/2001 | 10 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | **10** | ND<1 | ND<1 | ND<1 | ND<1 | -- | -- |
| MW-1 | -- | 7/13/1999 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | -- | -- |
|  | 14.5 | 4/13/2007 | 2J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW-1B | 56 | 4/14/2007 | 6 | ND<5 | ND<5 | 2J | ND<5 | ND<5 | 2J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
|  | 100 | 4/14/2007 | 3J | ND<5 | ND<5 | 2J | ND<5 | ND<5 | 2J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW-2 | -- | 7/13/1999 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | -- | -- |
|  | -- | 9/10/1999 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<2 | ND<1 | -- | -- |
|  | 19 | 4/19/2002 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | -- | -- |
|  | 12 | 5/11/2004 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 |
|  | 15 | 4/13/2007 | 2J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW-3S | -- | 7/13/1999 | 28 | 30 | ND<1 | 19 | **14** | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | -- | -- |
|  | -- | 9/10/1999 | 16 | 15 | ND<1 | 11 | **5.1** | ND<1 | ND<1 | ND<1 | ND<1 | ND<2 | ND<1 | -- | -- |
|  | 14 | 5/13/2004 | 33 | 4 | ND<1 | 5 | **14** | ND<1 | 6 | ND<1 | ND<1 | ND<1 | ND<1 | 2 | ND<1 |
|  | 14 | 4/14/2007 | 24 | 8 | ND<5 | 5 | **12** | ND<5 | 5 | ND<5 | ND<5 | **3J** | ND<5 | -- | -- |
|  | 15 | 8/30/2010 | 41 | 4.9J | ND<0.52 | 6.3 | **15** | ND<0.65 | **9.8** | ND<0.65 | ND<0.36 | **2.6J** | ND<1 | -- | -- |
|  | 15 | 3/18/2013 | 5.8 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 1.3J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW-3D | 37.5 | 4/19/2002 | 30 | 48 | ND<1 | **75** | **22** | ND<1 | ND<1 | ND<1 | 2 | ND<10 | ND<1 | -- | -- |
|  | 37 | 5/13/2004 | 69 | **64** | ND<1 | **130** | **55** | ND<1 | 1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 |
|  | 36 | 4/14/2007 | 45 | 27 | ND<5 | 45 | **13** | ND<5 | 1J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
|  | 40 | 8/30/2010 | 1.2J | ND<0.95 | ND<0.52 | ND<1.3 | ND<0.69 | ND<0.65 | ND<0.96 | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
|  | 37 | 3/18/2013 | 16 | 5 | ND<5 | 12 | 4.4J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW-3B | 148 | 4/12/2007 | ND<5 | 2J | 4J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
|  | -- | 7/13/1999 | **290** | 2.5 | ND<1 | 22 | **11** | ND<1 | **400** | ND<1 | ND<1 | **130** | ND<1 | -- | -- |
| MW-4S | -- | 9/10/1999 | **270** | 2.2 | ND<1 | 19 | **7.5** | ND<1 | **320** | ND<1 | ND<1 | **89** | ND<1 | -- | -- |
|  | 8 | 5/12/2004 | 25 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | **19** | ND<1 | ND<1 | ND<1 | ND<1 | **130** | ND<1 |
|  | 12 | 4/14/2007 | 15 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 2J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
|  | 16.5 | 8/29/2010 | 5.4 | ND<0.95 | ND<0.52 | ND<1.3 | ND<0.69 | ND<0.65 | 3.4J | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
|  | 12 | 11/5/2010 | 6.3 | ND<0.95 | ND<0.52 | ND<1.3 | ND<0.69 | ND<0.65 | 3.1J | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
|  | 10 | 11/16/2012 | 4.8J | ND<5 | ND<5 | ND<5 | ND<5 | **3J** | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
|  | 10 | 1/9/2013 | 53 | ND<5 | ND<5 | ND<5 | ND<5 | **19** | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
|  | 11 | 2/19/2013 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
|  | 10 | 3/18/2013 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |

## APPENDIX VI

## FORMER MATERIALS RESEARCH CORPORATION
## 542 ROUTE 303
## ORANGETOWN, NEW YORK

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### Summary of Volatile Organic Compounds Results for All Groundwater Samples[1/]

| Sample Location | Depth of Sample | Date Sampled | Trichloro-ethylene | 1,1,1- Trichloro-ethane | Tetrachloro-ethylene | 1,1-Dichloro-ethylene | 1,1-Dichloro-ethane | 1,2-Dichloroethane | cis-1,2-Dichloro-ethylene | trans-1,2-Dichloro-ethylene | Chloroform | Vinyl Chloride | Carbon Tetra-chloride | MTBE | Toluene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-4D | 30.5 | 4/19/2002 | **330** | 5 | ND<5 | 17 | **6** | ND<5 | **250** | **5** | 3J | **55** | ND<1 | -- | -- |
| | 30 | 5/12/2004 | **190** | ND<1 | ND<1 | 6 | 3 | ND<1 | **110** | 4 | ND<1 | **7** | ND<1 | **63** | ND<1 |
| | 30 | 4/14/2007 | 38 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | **16** | ND<5 | ND<5 | ND<0.97 | ND<5 | -- | -- |
| | 24 | 8/29/2010 | 67 | ND<0.95 | ND<0.52 | ND<1.3 | ND<0.69 | ND<0.65 | **22** | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
| | 30 | 11/5/2010 | 81 | ND<0.95 | ND<0.52 | ND<1.3 | ND<0.69 | ND<0.65 | **21** | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
| | 25 | 11/16/2012 | 51 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | **20** | ND<5 | ND<5 | 0.9J | ND<5 | -- | |
| | 20 | 1/9/2013 | 2.4J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 1.9J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 30 | 2/19/2013 | 43 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | **16** | ND<5 | ND<5 | 1.0J | ND<5 | -- | -- |
| | 30 | 3/18/2013 | 41 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | **17** | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW-7S | 12.5 | 4/19/2002 | 110 | 40 | ND<1 | 12 | **5** | ND<1 | **48** | ND<1 | ND<1 | **44** | ND<1 | -- | -- |
| | 12.5 | 5/12/2004 | **3,500** | 3 | ND<1 | 24 | **5** | ND<1 | **470** | **5** | ND<1 | **110** | ND<1 | ND<1 | ND<1 |
| | 12.5 | 4/14/2007 | **1,500** | ND<50 | ND<50 | ND<50 | ND<50 | ND<50 | **210** | ND<50 | ND<50 | **21J** | ND<50 | -- | -- |
| | 12.5 | 1/6/2009 | 110 | ND<5 | ND<5 | 5 | 1J | ND<5 | **120** | 1 | ND<5 | **10** | ND<5 | ND<5 | ND<5 |
| | 12.5 | 8/30/2010 | **1,300** | ND<9.5 | ND<5.2 | ND<13 | ND<6.9 | ND<6.5 | **400** | ND<6.5 | ND<3.6 | **37J** | ND<10 | -- | -- |
| | 12.5 | 11/5/2010 | **160** | ND<0.95 | ND<0.52 | 6.1 | 1.3J | ND<0.65 | **130** | 1.4J | ND<0.36 | **14** | ND<1 | -- | -- |
| | 15 | 11/16/2012 | 63 | ND<5 | ND<5 | 3.7J | 1.4J | ND<5 | **84** | 1J | ND<5 | **16** | ND<5 | -- | -- |
| | 13 | 1/9/2013 | 28 | ND<5 | ND<5 | 1.5J | ND<5 | ND<5 | **36** | ND<5 | ND<5 | **4.7J** | ND<5 | -- | -- |
| | 17 | 2/19/2013 | 23/22 | ND<5 | ND<5 | 1.5J/1.4J | ND<5/ND<5 | ND<5/ ND<5 | **22/22** | ND<5/ ND<5 | ND<5/ ND<5 | **3.5J/3.4J** | ND<5/ ND<5 | -- | -- |
| | 13 | 3/18/2013 | 35 | 0.86J | ND<5 | 1.6J | 1.1J | ND<5 | **33** | ND<5 | ND<5 | **5.3** | ND<5 | -- | -- |
| MW-7D | 33 | 4/19/2002 | **850** | ND<25 | ND<25 | **98** | **68** | ND<25 | **2,900** | **36** | ND<25 | **730** | ND<25 | -- | -- |
| | 33 | 5/12/2004 | **550** | ND<1 | ND<1 | **150** | **85** | ND<1 | **2,300** | **38** | ND<1 | ND<1 | ND<1 | **570** | **5** |
| | 33 | 4/14/2007 | 4J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 4J | ND<5 | ND<5 | ND<5 | 1J | -- | -- |
| | 33 | 1/6/2009 | 51 | ND<5 | ND<5 | 5 | 2J | ND<5 | **47** | 1J | 1J | **3J** | ND<5 | ND<5 | ND<5 |
| | 35 | 8/30/2010 | 8.9 | ND<0.95 | ND<0.52 | ND<1.3 | ND<0.69 | ND<0.65 | **10** | ND<0.65 | ND<0.36 | 1.5J | ND<1 | -- | -- |
| | 33 | 11/5/2010 | **510** | ND<0.95 | ND<0.52 | 62 | **19** | ND<0.65 | **510** | **15** | ND<0.36 | **74** | ND<1 | -- | -- |
| | 30 | 11/16/2012 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 25 | 1/9/2013 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 30 | 2/19/2013 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 33 | 3/18/2013 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW-7B | 115 | 4/12/2007 | 5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 155 | 4/12/2007 | 4J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW-8S | 15 | 5/11/2004 | 7 | 2 | ND<1 | ND<1 | ND<1 | ND<1 | 3 | ND<1 | ND<1 | ND<1 | ND<1 | 9B | ND<1 |
| | 12 | 4/14/2007 | 3J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 15 | 8/30/2010 | 6.5 | 1.0J | ND<0.52 | ND<1.3 | ND<0.69 | ND<0.65 | ND<0.96 | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
| MW-8D | 38 | 4/19/2002 | ND<1 | 3 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| | 33 | 5/11/2004 | ND<1 | 2 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | 9B | ND<1 |
| | 38 | 4/14/2007 | 7 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 40 | 8/30/2010 | ND<0.57 | ND<0.95 | ND<0.52 | ND<1.3 | ND<0.69 | ND<0.65 | ND<0.96 | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
| MW-8B | 120 | 4/13/2007 | 2J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 160 | 4/13/2007 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW-9S | 12.5 | 4/19/2002 | 20 | 6 | ND<1 | 8 | 4 | ND<1 | 4 | ND<1 | ND<1 | 1J | ND<1 | -- | -- |
| | 12.5 | 5/11/2004 | 56 | 14 | ND<1 | 9 | **7** | ND<1 | **15** | ND<1 | ND<1 | **5** | ND<1 | ND<1 | ND<1 |
| | 15 | 4/13/2007 | 20 | 5 | ND<5 | 5 | 4J | ND<5 | **7** | ND<5 | ND<5 | **3J** | ND<5 | -- | -- |
| | 15 | 8/30/2010 | 29 | 3.1J | ND<0.52 | 6.7 | 4.8J | ND<0.65 | **13** | ND<0.65 | ND<0.36 | **3.2J** | ND<1 | -- | -- |
| | 13 | 11/5/2010 | 23 | 1.8J | ND<0.52 | 6.2 | 4.3J | ND<0.65 | **13** | ND<0.65 | ND<0.36 | **2.5J** | ND<1 | -- | -- |
| | 15 | 11/16/2012 | 13 | 1.2J | ND<5 | 7.1 | 3.8J | ND<5 | **13** | ND<5 | ND<5 | 1.5J | ND<5 | -- | -- |
| | 17 | 1/9/2013 | 13 | 1.2J | ND<5 | 5.1 | 2.6J | ND<5 | 6.5 | ND<5 | ND<5 | 0.87J | ND<5 | -- | -- |
| | 17 | 2/19/2013 | 20 | 3.0J | ND<5 | 11 | 3.5J | ND<5 | **9.9** | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 13 | 3/18/2013 | 29/30 | 3.9J/4.2J | ND<5/ ND<5 | 15/15 | 4.1J/4.3J | ND<5/ ND<5 | **15/17** | ND<5/ ND<5 | ND<5/ ND<5 | 1.2J/1.2J | ND<5/ ND<5 | -- | -- |

## APPENDIX VI

## FORMER MATERIALS RESEARCH CORPORATION
## 542 ROUTE 303
## ORANGETOWN, NEW YORK

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### Summary of Volatile Organic Compounds Results for All Groundwater Samples[1/]

| Sample Location | Depth of Sample | Date Sampled | Trichloro-ethylene | 1,1,1- Trichloro-ethane | Tetrachloro-ethylene | 1,1-Dichloro-ethylene | 1,1-Dichloro-ethane | 1,2-Dichloroethane | cis-1,2-Dichloro-ethylene | trans-1,2-Dichloro-ethylene | Chloroform | Vinyl Chloride | Carbon Tetra-chloride | MTBE | Toluene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-9D | 30 | 4/19/2002 | **900** | 11 | ND<1 | **180** | **100** | ND<1 | **240** | ND<1 | ND<1 | **29** | ND<1 | -- | -- |
| | 30 | 5/11/2004 | 72 | 7 | ND<1 | 22 | **8** | ND<1 | **34** | ND<1 | ND<1 | **3** | ND<1 | ND<1 | ND<1 |
| | 36 | 4/14/2007 | **200** | 5 | ND<5 | 15 | ND<5 | **5** | **26** | ND<5 | ND<5 | **5** | 4J | -- | -- |
| | 31 | 8/30/2010 | 60 | 5.3 | ND<0.52 | 35 | **36** | ND<0.65 | **130** | ND<0.65 | ND<0.36 | **27** | ND<1 | -- | -- |
| | 36 | 11/5/2010 | 120 | 21 | ND<0.52 | **150** | **82** | ND<0.65 | **470** | 4.9J | ND<0.36 | **97** | ND<1 | -- | -- |
| | 30 | 11/16/2012 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 30 | 1/9/2013 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 0.82J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 30 | 2/19/2013 | 5.8 | ND<5 | ND<5 | 2.1J | 1.6J | ND<5 | 6.2 | ND<5 | ND<5 | **6.2** | ND<5 | -- | -- |
| | 36 | 3/18/2013 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW-10S | 19 | 4/19/2002 | 11 | ND<1 | ND<1 | 3 | **25** | ND<1 | **83** | ND<1 | ND<1 | **58** | ND<1 | -- | -- |
| | 19 | 5/11/2004 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 |
| | 12 | 4/13/2007 | 8 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 12 | 8/30/2010 | 2.9J | ND<0.95 | ND<0.52 | ND<1.3 | ND<0.69 | ND<0.65 | 2.0J | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
| | 15 | 11/16/2012 | 5.7 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 17 | 1/9/2013 | 1.1J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 17 | 2/19/2013 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 13 | 3/18/2013 | ND5/0.86J | ND<5/ND<5 | ND<5/ND<5 | ND<5/ND<5 | ND<5/ND<5 | ND<5/ND<5 | ND<5/ND<5 | ND<5/ND<5 | ND<5/ND<5 | ND<5/ND<5 | ND<5/ND<5 | -- | -- |
| MW-10D | 30 | 4/19/2002 | 100 | ND<1 | ND<1 | 11 | **31** | ND<1 | **180** | ND<1 | ND<1 | **84** | ND<1 | -- | -- |
| | 30 | 5/11/2004 | 80 | ND<1 | ND<1 | 9 | **14** | ND<1 | **130** | 1 | ND<1 | **41** | ND<1 | 1 | ND<1 |
| | 30.5 | 4/13/2007 | 48 | ND<5 | ND<5 | 4J | **6** | ND<5 | **56** | ND<5 | ND<5 | **12** | ND<5 | -- | -- |
| | 30.5 | 8/30/2010 | 42 | ND<0.95 | ND<0.52 | 2.5J | 1.9J | ND<0.65 | **35** | ND<0.65 | ND<0.36 | **3.3J** | ND<1 | -- | -- |
| | 32.5 | 11/16/2012 | 38 | ND<5 | ND<5 | 1.1J | ND<5 | ND<5 | **27** | ND<5 | ND<5 | 1.2J | ND<5 | -- | -- |
| | 33 | 1/10/2013 | 34 | ND<5 | ND<5 | 1.6J | 1.0J | ND<5 | **28** | ND<5 | ND<5 | 1.6J | ND<5 | -- | -- |
| | 30 | 2/19/2013 | 31 | ND<5 | ND<5 | 1.6J | 1.0J | ND<5 | **25** | ND<5 | ND<5 | **2.0J** | ND<5 | -- | -- |
| | 30 | 3/18/2013 | 27 | ND<5 | ND<5 | 1.2J | 1.0J | ND<5 | **24** | ND<5 | ND<5 | 1.1J | ND<5 | -- | -- |
| MW-10B | 97 | 4/13/2007 | **270** | 16 | ND<25 | **70** | **30** | ND<25 | **190** | ND<25 | ND<25 | ND<25 | ND<25 | -- | -- |
| | 127 | 4/13/2007 | 37 | 3 | ND<5 | 13 | **5** | ND<5 | **29** | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 100 | 2/1/2018 | 60 | ND<2.5 | ND<2.5 | 14 | **3.8J** | ND<2.5 | **27** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- | -- |
| MW-11S | 19 | 4/19/2002 | 65 | ND<1 | ND<1 | ND<1 | 2 | ND<1 | **45** | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| | 19 | 5/13/2004 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 |
| | 12.5 | 4/14/2007 | 4J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 12.5 | 8/30/2010 | 18 | ND<0.95 | ND<0.52 | ND<1.3 | ND<0.69 | ND<0.65 | **8.1** | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
| | 15 | 11/16/2012 | 15 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | **7.1** | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 15 | 1/9/2013 | 2.8J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 1.3J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 17 | 2/19/2013 | 0.98J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW-11D | 19 | 4/19/2002 | 92 | ND<1 | ND<1 | ND<1 | 3 | ND<1 | **90** | ND<1 | ND<1 | **3J** | ND<1 | -- | -- |
| | 19 | 5/13/2004 | 57 | ND<1 | ND<1 | ND<1 | 1 | ND<1 | **31** | ND<1 | ND<1 | **2** | ND<1 | ND<1 | 2 |
| | 12.5 | 4/14/2007 | 23 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | **14** | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 15 | 8/30/2010 | 46 | ND<0.95 | 2.1J | ND<1.3 | 0.86J | ND<0.65 | **21** | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
| | 15 | 11/16/2012 | 47 | ND<5 | 1.8J | ND<5 | ND<5 | ND<5 | **19** | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 15 | 1/9/2013 | 2.6J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 17 | 2/19/2013 | 32 | ND<5 | 1.2J | ND<5 | ND<5 | ND<5 | **15** | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW-12 | 23 | 4/19/2002 | **21,000** | ND<500 | **3,700** | ND<500 | ND<500 | ND<500 | ND<500 | ND<500 | ND<500 | ND<500 | ND<500 | -- | -- |
| | 23 | 5/13/2004 | 71 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | **12** | ND<1 | ND<1 | 1 | ND<1 | 4 | ND<1 |
| | 22 | 4/14/2007 | 3J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 1J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 22 | 1/6/2009 | 77 | 1J | ND<5 | ND<5 | ND<5 | ND<5 | **20** | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 |
| | 22 | 2/20/2009 | 18 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | 5.3 | ND<1 | ND<1 | ND<1 | ND<1 | 0.4J | 4 |
| | 22 | 4/21/2009 | 78 | ND<5 | ND<5 | ND<1 | ND<1 | ND<1 | 6 | ND<1 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 |
| | 24 | 11/26/2013 | 24 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | **32** | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 25 | 11/25/2014 | 6.2 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | 4J | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- | -- |
| | 25 | 12/22/2014 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- | -- |

# APPENDIX VI

# FORMER MATERIALS RESEARCH CORPORATION
542 ROUTE 303
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## Summary of Volatile Organic Compounds Results for All Groundwater Samples[1/]

| Sample Location | Depth of Sample | Date Sampled | Trichloro-ethylene | 1,1,1- Trichloro-ethane | Tetrachloro-ethylene | 1,1-Dichloro-ethylene | 1,1-Dichloro-ethane | 1,2-Dichloroethane | cis-1,2-Dichloro-ethylene | trans-1,2-Dichloro-ethylene | Chloroform | Vinyl Chloride | Carbon Tetra-chloride | MTBE | Toluene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-12B | 55 | 4/14/2007 | 5 | ND<5 | ND<5 | 1J | ND<5 | ND<5 | 2J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 85 | 4/14/2007 | 5 | ND<5 | ND<5 | 2J | ND<5 | ND<5 | 2J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 111 | 4/14/2007 | 5 | ND<5 | ND<5 | 2J | ND<5 | ND<5 | 2J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 90 | 2/1/2018 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- |
| MW-13 | 25 | 4/19/2002 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| | 25 | 5/13/2004 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 |
| MW-13 Duplicate | 25 | 4/19/2002 | 1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| MW-13 Triplicate | 25 | 4/19/2002 | 1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| MW-14S | 12 | 5/12/2004 | 12 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | **9** | ND<1 | 2 | ND<1 | ND<1 | ND<1 | ND<1 |
| | 12 | 4/14/2007 | 5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 2J | ND<5 | 5 | ND<5 | ND<5 | -- | -- |
| | 12 | 8/29/2010 | 4.5J | ND<0.95 | ND<0.52 | ND<1.3 | ND<0.69 | ND<0.65 | ND<0.96 | ND<0.65 | **17** | ND<0.97 | ND<1 | -- | -- |
| | 12 | 11/5/2010 | 4.9J | ND<0.95 | ND<0.52 | ND<1.3 | ND<0.69 | ND<0.65 | 1.9J | ND<0.65 | **18** | ND<0.97 | ND<1 | -- | -- |
| MW-14D | 30 | 4/19/2002 | **200** | 21 | ND<2 | 21 | 4 | ND<2 | **200** | ND<2 | ND<2 | ND<20 | ND<2 | -- | -- |
| | 30 | 5/12/2004 | **150** | 17 | ND<1 | 27 | 2 | ND<1 | **140** | ND<1 | 6 | **3** | ND<1 | ND<1 | ND<1 |
| | 30 | 4/14/2007 | 83 | 8 | ND<5 | 1J | 1J | ND<5 | **88** | ND<5 | **14** | ND<5 | ND<5 | -- | -- |
| | 30 | 8/29/2010 | 75 | 3.0J | ND<0.52 | 9.9 | ND<0.69 | ND<0.65 | **44** | ND<0.65 | **14** | ND<0.97 | ND<1 | -- | -- |
| | 30 | 11/5/2010 | 100 | 3.2J | ND<0.52 | 11 | ND<0.69 | ND<0.65 | **50** | ND<0.65 | **19** | ND<0.97 | ND<1 | -- | -- |
| MW-15S | 15 | 4/14/2007 | 2J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 15 | 1/6/2009 | 2 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 2 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 |
| | 15 | 2/20/2009 | 1.3 | ND<0.5 | ND<0.5 | ND<0.5 | ND<0.5 | ND<0.5 | 1.2 | ND<0.5 | ND<0.5 | ND<0.5 | ND<0.5 | ND<0.5 | 0.9 |
| | 15 | 4/21/2009 | 2J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 1J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 |
| | 17 | 11/26/2013 | 1.1J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 2.3J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 18 | 11/25/2014 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- | -- |
| MW-16S | 15 | 4/14/2007 | 96 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | **9** | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 15 | 1/6/2009 | 120 | ND<5 | ND<5 | 1J | ND<5 | ND<5 | **9** | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 |
| | 15 | 2/20/2009 | 110 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | 4 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **5.9** |
| | 15 | 4/21/2009 | **160** | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 6 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 |
| | 15 | 11/5/2010 | **200** | 1.7J | 2.4J | 1.3J | ND<0.69 | ND<0.65 | **15** | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | ND<0.38 | ND<0.23 |
| | 17 | 11/26/2013 | 51 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | **9.3** | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 18 | 11/25/2014 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- | -- |
| MW-17S | 15.5 | 4/14/2007 | 51 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 4J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 15.5 | 1/6/2009 | **630** | ND<25 | **8J** | ND<25 | ND<25 | ND<25 | **23J** | ND<25 | ND<25 | ND<25 | ND<25 | ND<25 | ND<25 |
| | 15.5 | 2/20/2009 | **700** | 5.4J | 7.7J | ND<12 | ND<12 | ND<12 | **8.5J** | ND<12 | ND<12 | ND<12 | **10J** | ND<12 | **23** |
| | 15.5 | 4/21/2009 | **340** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | 5J | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 |
| | 15.5 | 11/5/2010 | **2,000** | 35 | **36** | 2.5J | ND<0.69 | ND<0.65 | **85** | ND<0.65 | 3.3J | ND<0.97 | **51** | ND<0.38 | ND<0.23 |
| | 17 | 11/26/2013 | **5,300** | ND<500 | ND<500 | ND<500 | ND<500 | ND<500 | **260J** | ND<500 | ND<500 | ND<500 | ND<500 | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 18 | 11/24/2014 | ND<2.5 | **120** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **13** | ND<2.5 | **260** | -- | -- |
| | 18 | 12/22/2014 | ND<2.5 | **72** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **8.6** | ND<2.5 | **130** | -- | -- |
| | 16.5 | 2/19/2016 | 18 | **57E** | ND>2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **3.7J** | ND<2.5 | **140E** | -- | -- |

## APPENDIX VI

## FORMER MATERIALS RESEARCH CORPORATION
## 542 ROUTE 303
## ORANGETOWN, NEW YORK

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### Summary of Volatile Organic Compounds Results for All Groundwater Samples[1/]

| Sample Location | Depth of Sample | Date Sampled | Trichloro-ethylene | 1,1,1- Trichloro-ethane | Tetrachloro-ethylene | 1,1-Dichloro-ethylene | 1,1-Dichloro-ethane | 1,2-Dichloroethane | cis-1,2-Dichloro-ethylene | trans-1,2-Dichloro-ethylene | Chloroform | Vinyl Chloride | Carbon Tetra-chloride | MTBE | Toluene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-17D | 25.5 | 4/14/2007 | **55,000** | ND<5 | ND<5 | **160** | ND<5 | **3J** | ND<5 | 2J | **13** | **2J** | ND<5 | -- | -- |
| | 25.5 | 1/6/2009 | **48,000** | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | **1,300** | ND<2,500 | ND<2,500 |
| | 25.5 | 2/2/2009 | **56,000** | ND<2,500 | **570J** | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | **1,400J** | ND<2,500 | ND<2,500 |
| | 25.5 | 2/12/2009 | **53,000** | ND<2,500 | **700J** | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | **1,400J** | ND<2,500 | ND<2,500 |
| | 25.5 | 2/20/2009 | **54,000** | ND<1,000 | **560J** | ND<1,000 | ND<1,000 | ND<1,000 | ND<1,000 | ND<1,000 | ND<1,000 | ND<1,000 | **1,500** | ND<1,000 | **730J** |
| | 25.5 | 4/21/2009 | **45,000** | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | ND<2,500 | **940J** | ND<2,500 | ND<2,500 |
| | 25.5 | 11/5/2010 | **17,000** | ND<190 | ND<100 | ND<270 | ND<140 | ND<130 | ND<190 | ND<130 | ND<72 | ND<190 | **400J** | ND<76 | ND<46 |
| | 25 | 11/26/2013 | **13,000** | ND<1,000 | ND<1,000 | ND<1,000 | ND<1,000 | ND<1,000 | **160J** | ND<1,000 | ND<1,000 | ND<1,000 | **400J** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 27 | 11/24/2014 | ND<2.5 | **110** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **12** | ND<2.5 | **340** | -- | -- |
| | 25 | 12/22/2014 | ND<2.5 | **89** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **8.8** | ND<2.5 | **190** | -- | -- |
| | 25.5 | 2/19/2016 | ND<12 | **710** | ND<12 | ND<12 | ND<12 | ND<12 | ND<12 | ND<12 | **44** | ND<12 | **280** | -- | -- |
| MW-18 | 13 | 4/14/2007 | 1J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 2J | ND<5 | ND<5 | -- | -- |
| | 13 | 11/15/2010 | 9.6 | ND<0.95 | ND<0.52 | ND<1.3 | ND<0.69 | ND<0.65 | **7.4** | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | ND<0.38 | ND<0.23 |
| MW-19 | 15 | 4/11/2007 | 6 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 4J | ND<5 | ND<5 | -- | -- |
| | 15 | 7/18/2014 | 3.9J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | **22** | ND<5 | ND<5 | -- | -- |
| MW-20 | 15 | 4/11/2007 | 15 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 17 | 11/26/2013 | **300** | ND<50 | **11J** | ND<50 | ND<50 | ND<50 | ND<50 | ND<50 | ND<50 | ND<50 | **53** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 15 | 11/25/2014 | 5.9 | 4.8J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 4.6J | ND<5 | **37** | -- | -- |
| | 15 | 12/23/2014 | ND<2.5 | ND<2.5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 3.7J | ND<5 | 4.3J | -- | -- |
| MW-21 | 15 | 4/14/2007 | 3J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 15 | 1/6/2009 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 |
| | 15 | 2/20/2009 | ND<0.5 | ND<0.5 | ND<0.5 | ND<0.5 | ND<0.5 | ND<0.5 | ND<0.5 | ND<0.5 | ND<0.5 | ND<0.5 | ND<0.5 | ND<0.5 | 0.7 |
| | 15 | 4/21/2009 | 3J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 |
| | 17 | 11/26/2013 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 18 | 11/25/2014 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- | -- |
| | Duplicate | 11/25/2014 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- | -- |
| | 16 | 12/22/2014 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- | -- |
| | Duplicate | 12/22/2014 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- | -- |
| MW-22 | 18 | 4/11/2007 | **1,200** | 40 | **19** | 3J | ND<5 | ND<5 | **13** | ND<5 | **7** | ND<5 | **17** | -- | -- |
| | 18 | 1/6/2009 | **2,100** | 27J | **29J** | ND<50 | ND<50 | ND<50 | **20J** | ND<50 | ND<50 | ND<50 | **36J** | ND<50 | ND<50 |
| | 18 | 2/20/2009 | ND<100 | 47J | **71J** | ND<100 | ND<100 | ND<100 | ND<100 | ND<100 | ND<100 | ND<100 | **110** | ND<100 | **7,000** |
| | 18 | 4/21/2009 | **4,000** | 28J | ND<130 | ND<130 | ND<130 | ND<130 | ND<130 | ND<130 | ND<130 | ND<130 | **53J** | ND<130 | ND<130 |
| | 18 | 11/5/2010 | **220** | 2.8J | **10** | ND<1.3 | ND<0.69 | ND<0.69 | 4.7J | ND<0.65 | **12** | ND<0.97 | 4.7J | ND<0.38 | ND<0.23 |
| | 19 | 11/26/2013 | 30 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | **21** | ND<5 | **17** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 16 | 11/25/2014 | 3J | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **11** | ND<2.5 | 3.3J | -- | -- |
| | 18 | 12/22/2014 | **420** | 5.6 | **11** | ND<2.5 | ND<2.5 | ND<2.5 | 4.2J | ND<2.5 | **8.4** | ND<2.5 | **18** | -- | -- |
| MW-23I | 15 | 8/29/2010 | 13 | 4.9J | ND<0.52 | 8 | 1.2J | ND<0.65 | **7.2** | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
| | 29 | 11/7/2010 | 24 | 6.3 | ND<0.52 | 12 | 1.0J | ND<0.65 | **7.6** | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
| MW-24I | 16 | 8/29/2010 | 3.6J | 4.7J | ND<0.52 | 1.4J | ND<0.69 | ND<0.65 | ND<0.96 | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
| | 14 | 11/7/2010 | 4.8J | 4.5J | ND<0.52 | 1.7J | ND<0.69 | ND<0.65 | ND<0.96 | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
| MW-25I | 15 | 8/29/2010 | 0.91J | 6.7 | ND<0.52 | 6.6 | ND<0.69 | ND<0.65 | ND<0.96 | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
| | 17 | 11/7/2010 | 1.2J | 7.4 | ND<0.52 | 9.2 | ND<0.69 | ND<0.65 | ND<0.96 | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
| MW-26I | 22 | 8/29/2010 | 30 | ND<0.95 | ND<0.52 | ND<1.3 | 0.95J | ND<0.65 | **18** | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |
| | 19 | 11/7/2010 | 69 | ND<0.95 | ND<0.52 | 1.5J | 1.4J | ND<0.65 | **40** | ND<0.65 | ND<0.36 | ND<0.97 | ND<1 | -- | -- |

# APPENDIX VI

## FORMER MATERIALS RESEARCH CORPORATION
## 542 ROUTE 303
## ORANGETOWN, NEW YORK

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### Summary of Volatile Organic Compounds Results for All Groundwater Samples[1/]

| Sample Location | Depth of Sample | Date Sampled | Trichloro-ethylene | 1,1,1- Trichloro-ethane | Tetrachloro-ethylene | 1,1-Dichloro-ethylene | 1,1-Dichloro-ethane | 1,2-Dichloroethane | cis-1,2-Dichloro-ethylene | trans-1,2-Dichloro-ethylene | Chloroform | Vinyl Chloride | Carbon Tetra-chloride | MTBE | Toluene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-27S | 20 | 11/16/2012 | 35 | 1.8J | ND<5 | 6.6 | **6.1** | ND<5 | **59** | ND<5 | ND<5 | **7.5** | ND<5 | -- | -- |
| | 18 | 1/10/2013 | ND<5 | 2.4J | ND<5 | ND<5 | 4.0J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 15 | 2/20/2013 | ND<5 | ND<5 | **18** | ND<5 | **100** | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 15 | 3/18/2013 | 2.7J | 1.4J | ND<5 | ND<5 | 2.3J | ND<5 | 2.1J | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW27D | 30 | 11/16/2012 | **1,000** | 31 | ND<5 | **120J** | **160** | ND<5 | **890** | **14** | ND<5 | **160** | ND<5 | -- | -- |
| | 32 | 1/10/2013 | ND<5 | 22 | ND<5 | ND<5 | **100** | ND<5 | ND<5 | ND<5 | 0.85J | ND<5 | ND<5 | -- | -- |
| | 35 | 2/20/2013 | ND<5 | 5.1 | ND<5 | ND<5 | **12** | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 30 | 3/18/2013 | ND<5 | 31 | ND<5 | ND<5 | **140** | ND<5 | ND<5 | ND<5 | 0.89J | ND<5 | ND<5 | -- | -- |
| EW-1 | 30 | 11/16/2012 | 25 | ND<5 | ND<5 | 6.5 | **7.3** | ND<5 | **19** | ND<5 | ND<5 | 1.7J | ND<5 | -- | -- |
| | 35 | 1/10/2013 | **150** | 6.7 | ND<5 | 33 | **18** | ND<5 | **93** | 1.1J | ND<5 | **4.8J** | ND<5 | -- | -- |
| | 35 | 2/20/2013 | **340** | 17 | ND<5 | **86** | **41** | ND<5 | **290** | 2.5J | ND<5 | **17** | ND<5 | -- | -- |
| | 35 | 3/18/2013 | **1,100** | 29 | ND<5 | **170** | **72** | ND<5 | **650** | **5.4** | ND<5 | **37** | ND<5 | -- | -- |
| EW-2 | 35 | 11/16/2012 | 7.8/7.2 | ND<5/ND<5 | ND<5/ND<5 | 2.1J/1.7J | 3.3J/1.6J | ND<5/ND<5 | **59/40** | ND<5/ND<5 | ND<5/ND<5 | **7.5/5.7** | ND<5/ND<5 | -- | -- |
| | 35 | 1/10/2013 | 11 | ND<5 | ND<5 | 1.6J | 1.9J | ND<5 | **35** | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 30 | 2/20/2013 | 15 | ND<5 | ND<5 | 2.3J | 2.3J | ND<5 | **39** | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 35 | 3/18/2013 | 14 | ND<5 | ND<5 | 1.9J | 2.2J | ND<5 | **46** | ND<5 | ND<5 | **5.1** | ND<5 | -- | -- |
| EW-3 | 30 | 11/16/2012 | **470** | **66** | ND<5 | **210** | **89** | ND<5 | **130** | 2.3J | ND<5 | **18** | ND<5 | -- | -- |
| | 35 | 1/10/2013 | ND<5 | 41 | ND<5 | ND<5 | **58** | ND<5 | ND<5 | ND<5 | 0.89J | ND<5 | ND<5 | -- | -- |
| | 35 | 2/20/2013 | 1.4J | 42 | ND<5 | ND<5 | **51** | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 30 | 3/18/2013 | 7.7 | 50 | ND<5 | ND<5 | **68** | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| EW-4 | 30 | 11/16/2012 | **470** | 5.8 | ND<5 | 65 | **39** | ND<5 | **550** | 4.9J | ND<5 | **63** | ND<5 | -- | -- |
| | 35 | 1/10/2013 | ND<5 | 5.2 | ND<5 | ND<5 | **21** | ND<5 | ND<5 | ND<5 | 1.7J | ND<5 | ND<5 | -- | -- |
| | 35 | 2/20/2013 | ND<5 | 6.3 | ND<5 | ND<5 | **13** | ND<5 | ND<5 | ND<5 | 0.87J | ND<5 | ND<5 | -- | -- |
| | 30 | 3/18/2013 | ND<5 | 9.4 | ND<5 | ND<5 | **24** | ND<5 | ND<5 | ND<5 | 1.0J | ND<5 | ND<5 | -- | -- |
| EW-5 | 26 | 2/7/2014 | **1,700** | 16 | **29** | 2.7J | ND<5 | ND<5 | **71** | ND<5 | 3.4J | ND<5 | **20** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 25 | 11/24/2014 | ND<2.5 | 14 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **22** | -- | -- |
| | 25 | 12/22/2014 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- | -- |
| EW-6 | 25 | 2/7/2014 | **28,000** | **370** | **570** | 49 | **5.4** | ND<5 | **360** | 1.0J | **53** | ND<5 | **860** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 25 | 11/25/2014 | ND<2.5 | **500** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **23** | ND<2.5 | **1,400** | -- | -- |
| | 25 | 12/22/2014 | ND<25 | **390** | ND<25 | ND<25 | ND<25 | ND<25 | ND<25 | ND<2.5 | ND<25 | ND<25 | **1,200** | -- | -- |
| | 25 | 2/19/2016 | 47 | **96E** | 6.8 | ND<2.5 | ND<2.5 | ND<2.5 | 2.6J | ND<2.5 | 4.6J | ND<2.5 | **110E** | | |
| EW-7 | 25 | 2/7/2014 | **28,000** | **300** | **530** | **89** | 2.1 J | ND<5 | **200** | ND<5 | **32** | ND<5 | **1,100** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 25 | 11/25/2014 | ND<2.5 | **150** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **13** | ND<2.5 | **400** | -- | -- |
| | 21 | 12/23/2014 | ND<2.5 | **120** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **7.9** | ND<2.5 | **270** | -- | -- |
| | 24.5 | 2/19/2016 | 41 | **51E** | 24 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **7.4** | ND<2.5 | **150E** | | |
| EW-8 | 26 | 2/7/2014 | **12,000** | **160** | **280** | 15 | 2.1J | ND<5 | **160** | ND<5 | **37** | ND<5 | **420** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 25 | 11/25/2014 | **9,500** | **84** | **190** | 9.3 | ND<2.5 | ND<2.5 | **120** | ND<2.5 | **15** | ND<2.5 | **350** | -- | -- |
| | 24 | 12/22/2014 | **6,200** | ND<250 | ND<250 | ND<250 | ND<250 | ND<250 | ND<250 | ND<2.5 | ND<250 | ND<2.5 | **330J** | -- | -- |
| EW-9 | 26 | 2/7/2014 | **28,000B** | **370** | **710** | 40 | **6.2** | ND<5 | **330** | 1.2J | **63** | ND<5 | **1,400** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 26 | 11/24/2014 | ND<2.5 | **160** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **9.6** | ND<2.5 | **390** | -- | -- |
| | 21 | 12/23/2014 | ND<2.5 | **260** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **12** | ND<2.5 | **570** | -- | -- |
| | 25 | 2/19/2016 | **18,000** | **450J,E** | **430J** | ND<250 | ND<250 | ND<250 | **620** | ND<250 | ND<250 | ND<250 | **1,200E** | | |

## APPENDIX VI

## FORMER MATERIALS RESEARCH CORPORATION
## 542 ROUTE 303
## ORANGETOWN, NEW YORK

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### Summary of Volatile Organic Compounds Results for All Groundwater Samples[1/]

| Sample Location | Depth of Sample | Date Sampled | Trichloro-ethylene | 1,1,1- Trichloro-ethane | Tetrachloro-ethylene | 1,1-Dichloro-ethylene | 1,1-Dichloro-ethane | 1,2-Dichloroethane | cis-1,2-Dichloro-ethylene | trans-1,2-Dichloro-ethylene | Chloroform | Vinyl Chloride | Carbon Tetra-chloride | MTBE | Toluene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EW-10 | 21 | 2/7/2014 | **19,000B** | **230** | **340** | **88** | 4.3J | ND<5 | **140** | ND<5 | **62** | ND<5 | **770** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 22 | 11/24/2014 | ND<2.5 | 33 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | 6.3 | ND<2.5 | **80** | -- | -- |
| | 22 | 12/22/2014 | 2.9J | 35 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | 4.6J | ND<2.5 | **95** | -- | -- |
| | 24.5 | 2/19/2016 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | 17 | ND<2.5 | **420** | | |
| EW-11 | 24 | 2/7/2014 | **9,500B** | **140** | **110** | 29 | 1.8J | ND<5 | **54** | ND<5 | **35** | ND<5 | **160** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 26 | 11/25/2014 | 8.4 | **90** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **7.2** | ND<2.5 | **170** | -- | -- |
| | 25 | 12/22/2014 | ND<2.5 | **93** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | 6 | ND<2.5 | **150** | -- | -- |
| | 24.5 | 2/19/2016 | ND<2.5 | **130E** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | 5.5 | ND<2.5 | **180J** | | |
| EW-12 | 26 | 2/7/2014 | **7,800B** | **1,000** | **290** | **150** | **16** | **93** | **24** | ND<5 | **43** | ND<5 | **790** | -- | -- |
| | Duplicate | 2/7/2014 | **25,000B** | **940** | **270** | **160** | **16** | **98** | **25** | ND<5 | **44** | ND<5 | **710** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 25 | 11/25/2014 | ND<2.5 | **380** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **9.9** | ND<2.5 | **260** | -- | -- |
| | 25 | 12/22/2014 | ND<5 | **300** | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | **7.7J** | ND<2.5 | **260** | -- | -- |
| | 25 | 2/19/2016 | ND<2.5 | **560** | ND<2.5 | ND<2.5 | 3.6J,E | ND<2.5 | ND<2.5 | ND<2.5 | **23** | ND<2.5 | **490** | | |
| | Duplicate | 2/19/2016 | ND<2.5 | **540** | ND<2.5 | ND<2.5 | 3.7J,E | ND<2.5 | ND<2.5 | ND<2.5 | **24** | ND<2.5 | **470** | | |
| EW-13 | 25 | 7/18/2014 | **1,900** | 38 | **88** | 2.7J | ND<5 | ND<5 | 3.5J | ND<5 | **14** | ND<5 | **250** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 25 | 11/24/2014 | ND<2.5 | **380** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **20** | ND<2.5 | **1,400** | -- | -- |
| | 21 | 12/23/2014 | 29 | **260** | **26** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **20** | ND<2.5 | **1,500** | -- | -- |
| EW-14 | 25 | 7/18/2014 | **2,000** | 28 | **9.6** | 7.4 | 2.0J | ND<5 | 4.5J | ND<5 | 2.4J | ND<5 | **13** | -- | -- |
| | Duplicate | 7/18/2014 | **1,600** | 28 | **9.8** | 7 | 1.9J | ND<5 | 3.9J | ND<5 | 2.1J | ND<5 | **13** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 25 | 11/24/2014 | ND<2.5 | **1,400** | ND<2.5 | ND<2.5 | 3.2 J | ND<2.5 | ND<2.5 | ND<2.5 | **14** | ND<2.5 | **600** | -- | -- |
| | 25 | 12/22/2014 | ND<25 | **1,300** | ND<25 | ND<25 | ND<25 | ND<25 | ND<25 | ND<25 | ND<25 | ND<25 | **820** | -- | -- |
| | 25 | 2/19/2016 | **3,100** | **1,100** | **43** | 24E | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **8.8** | ND<2.5 | **510** | | |
| EW-15 | 25 | 7/18/2014 | **1,800** | 37 | **17** | 2.4J | 2.1J | ND<5 | 6.3 | ND<5 | **12** | ND<5 | **36** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 25 | 11/24/2014 | ND<2.5 | **2,700** | **42** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **19** | ND<2.5 | **4,200** | -- | -- |
| | 25 | 12/22/2014 | ND<250 | **2,900** | ND<250 | ND<250 | ND<250 | ND<250 | ND<250 | ND<250 | ND<250 | ND<250 | **7,700** | -- | -- |
| | 25 | 2/19/2016 | **190E** | **1,600** | **12** | **110E** | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **13** | ND<2.5 | ND<2.5 | -- | -- |
| EW-16 | 25 | 7/18/2014 | **180** | 4.9J | 1.2J | ND<5 | ND<5 | ND<5 | **9.6** | ND<5 | 4.2J | ND<5 | 0.88J | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 25 | 11/24/2014 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- | |
| EW-17 | 25 | 7/18/2014 | 20 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | 5.9 | ND<5 | 1.6J | ND<5 | ND<5 | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 25 | 11/24/2014 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | 4.5 J | ND<2.5 | ND<2.5 | -- | -- |
| **Offsite Monitoring Wells - Upgradient** | | | | | | | | | | | | | | | |
| MW-5S | -- | 9/10/1999 | ND<1 | 7 | ND<1 | ND<1 | 1.3 | ND<1 | ND<1 | ND<1 | ND<1 | ND<2 | ND<1 | -- | -- |
| | -- | 11/19/2001 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| | 15 | 4/19/2002 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| | 15 | 5/11/2004 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 |
| | 15 | 11/16/2012 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 16 | 1/9/2013 | ND<5 | ND<5 | ND<5 | ND<5 | 0.83J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 17 | 2/20/2013 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |

## APPENDIX VI

## FORMER MATERIALS RESEARCH CORPORATION
## 542 ROUTE 303
## ORANGETOWN, NEW YORK

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### Summary of Volatile Organic Compounds Results for All Groundwater Samples[1/]

| Sample Location | Depth of Sample | Date Sampled | Trichloro-ethylene | 1,1,1- Trichloro-ethane | Tetrachloro-ethylene | 1,1-Dichloro-ethylene | 1,1-Dichloro-ethane | 1,2-Dichloroethane | cis-1,2-Dichloro-ethylene | trans-1,2-Dichloro-ethylene | Chloroform | Vinyl Chloride | Carbon Tetra-chloride | MTBE | Toluene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-5D | -- | 9/10/1999 | ND<1 | 2.6 | 3.6 | ND<1 | ND<1 | ND<1 | ND<1 | 3.6 | ND<1 | ND<2 | ND<1 | -- | -- |
| | -- | 11/19/2001 | ND<1 | 1 | ND<1 | 1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| | 35 | 4/19/2002 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| | 35 | 5/11/2004 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 |
| | 30 | 11/21/2012 | ND<5 | 0.93J | 1.1J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 30 | 1/9/2013 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 35 | 2/20/2013 | ND<5 | ND<5 | 1.7J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW-6S | -- | 9/10/1999 | 5 | 1.5 | 3.9 | ND<1 | ND<1 | ND<1 | ND<1 | 3.9 | ND<1 | ND<2 | ND<1 | -- | -- |
| | -- | 11/19/2001 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| | 15 | 4/19/2002 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| | 15 | 5/11/2004 | 1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 |
| | 15 | 11/21/2012 | 2.9J | ND<5 | 3.6J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 15 | 1/9/2013 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| MW-6D | -- | 9/10/1999 | 9.5 | 2.1 | **7.9** | 1.4 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<2 | ND<1 | -- | -- |
| | -- | 11/19/2001 | 72 | 37 | 1 | 32 | 2 | ND<1 | 3 | ND<1 | ND<1 | ND<10 | ND<1 | -- | -- |
| | 35 | 4/19/2002 | **140** | **62** | ND<1 | **66** | **5** | ND<1 | **7** | ND<1 | ND<1 | ND<1 | ND<1 | -- | -- |
| | 35 | 5/11/2004 | 12 | 1 | ND<1 | 2 | ND<1 | ND<1 | 1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 | ND<1 |
| | 30 | 11/21/2012 | 5.5 | ND<5 | 3.61 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 35 | 1/9/2013 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| **Offsite Monitoring Wells - Downgradient** | | | | | | | | | | | | | | | |
| IL-MW-7 | 10 | 4/11/2007 | 2J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| IL-MW-8 | 16 | 4/11/2007 | **950** | 7 | 3J | 24 | **6** | ND<5 | **43** | ND<5 | ND<5 | ND<5 | **10** | -- | -- |
| | 16 | 2/7/2014 | **320** | ND<25 | ND<25 | 7.0J | ND<25 | ND<25 | **21** | ND<25 | ND<25 | ND<25 | **5.4** | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 16 | 11/13/2014 | ND<2.5 | 3.8J | ND<2.5 | ND<2.5 | 3J | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | **9.9** | -- | -- |
| | 16 | 12/18/2014 | 23 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- | -- |

## APPENDIX VI

## FORMER MATERIALS RESEARCH CORPORATION
542 ROUTE 303
ORANGETOWN, NEW YORK

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### Summary of Volatile Organic Compounds Results for All Groundwater Samples[1/]

| Sample Location | Depth of Sample | Date Sampled | Trichloro-ethylene | 1,1,1- Trichloro-ethane | Tetrachloro-ethylene | 1,1-Dichloro-ethylene | 1,1-Dichloro-ethane | 1,2-Dichloroethane | cis-1,2-Dichloro-ethylene | trans-1,2-Dichloro-ethylene | Chloroform | Vinyl Chloride | Carbon Tetra-chloride | MTBE | Toluene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IL-MW-9 | 12 | 4/11/2007 | 3J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | 14 | 2/7/2014 | 4.8J | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| | Insitu Groundwater Remediation Injection of Sodium Permanganate | | | | | | | | | | | | | | |
| | 12 | 11/13/2014 | 16 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- | -- |
| | 12 | 12/18/2014 | 7.2 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | ND<2.5 | -- | -- |
| IL-MW-10 | 12 | 4/11/2007 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | ND<5 | -- | -- |
| Site Background Concentration | | | **140** | **62** | **7.9** | **66** | **5** | **0.6** | **7** | **5** | **7** | **2** | **5** | **10** | **5** |
| NYSDEC TOGS Guidance Values | | | **5** | **5** | **5** | **5** | **5** | **0.6** | **5** | **5** | **7** | **2** | **5** | **10** | **5** |

| | |
|---|---|
| [1/] | all concentrations reported in micrograms per liter (parts per billion) |
| MTBE | Methyl Tert-Butyl Ether |
| B | Detected in laboratory blank. |
| J | Estimated value. Result detected below the reporting limit but greater than or equal to the method detection limit; therefore; the result is an estimated concentration. |
| -- | Constituent not tested |
| NYSDEC TOGS | New York Department of Environmental Conservation Technical and Operational Guidance Series |
| ND<1 | Not detected above noted concentrations; Non-detects for 2010 results reflect laboratory minimum detection level |
| ft bg | Feet below grade |
| Note: | Monitor wells MW-1, MW-2 and MW-4 were dry, and access was not obtained to MW-3 during November 2001 sampling event. |

Bromomethane was detected in IL-MW-7 at a concentration of 1J on 4/11/07.

Bromodichloromethane was detected in MW-17D at concentration of 1J on 4/11/07.

Benzene was detected in MW-12 and MW-15S at a concentration of 0.4J on 2/20/09.

Xylenes were detected in MW-12, MW-16S, MW-17S and MW-21 at concentrations of 1.9J, 1.8J, 7.4J and 0.2J, respectively on 2/20/09.

Freon 112 was detected in EW-10 at a concentration of 12 and 2.6J in EW-5 at on 2/7/14.

Freon 113 was detected on 2/7/2014 in EW-10 at 12; on 11/24/2014 in MW-17S, MW-17D, EW-6, EW-7, EW-12, EW-13, EW-14 and EW-15 at 6.8, 7.2, 13, 6.7, 5.5, 8.9, 18 and 42, respectively; on 2/19/2016 in MW-17D, EW-10, EW-12, EW-14 and EW-15 at 37, 13, 15, 13 and 25, respectively.

1,2,3 Trichlorobenzene was detected in EW-10 at a concentration of 4.2 on 12/22/2014.

# APPENDIX VII

# SOIL-VAPOR VOC QUALITY SUMMARY TABLE

# APPENDIX VII

## MATERIALS RESEARCH CORPORATION
## 542 ROUTE 303
## ORANGETOWN, ROCKLAND COUNTY, NEW YORK

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### Summary of Soil-Vapor Laboratory Results Collected On December 29, 2003

| | SV-1 (ppbv) | SV-2 (ppbv) | SV-3 (ppbv) | SV-4 (ppbv) | SV-5 (ppbv) | SV-6 (ppbv) | SV-7 (ppbv) | SV-8 (ppbv) | SV-9 (ppbv) | AA-1 (ppbv) |
|---|---|---|---|---|---|---|---|---|---|---|
| Tetrachloroethylene | ND<178 | 1,400J | ND<14.8 | ND<1.85 | ND<38.5 | ND<90.8 | ND<6.79 | ND<67.4 | ND<200 | ND<0.34 |
| Trichloroethylene | 350 | 1,000J | 35 | 3.6 | ND<38.5 | 230 | 460 | 400 | ND>200 | ND<0.34 |
| 1,1,1-Trichloroethane | ND<178 | ND<1770 | ND<14.8 | ND<1.85 | ND<38.5 | 8,000 | 230 | 190 | 480 | ND<0.34 |
| 1,1-Dichloroethane | ND<178 | ND<1770 | ND<14.8 | ND<1.85 | ND<38.5 | 240 | ND<6.79 | 260 | 630 | ND<0.34 |
| 1,1-Dichloroethylene | ND<178 | ND<1770 | ND<14.8 | ND<1.85 | ND<38.5 | ND<90.8 | 76 | 73 | 1,500 | ND<0.34 |
| cis-1,2-Dichloroethylene | 2,900 | 32,000 | 76 | 24 | ND<38.5 | 99 | 230 | 1,300 | 12,000 | ND<0.34 |
| trans-1,2-Dichloroethylene | ND<178 | ND<1770 | ND<14.8 | ND<1.85 | ND<38.5 | ND<90.8 | 25 | 70 | 460 | ND<0.34 |
| Methylene Chloride | 670B | 8,200B | 180B | 2.7B | 77B | 160B | 9B | 120B | 550B | 0.9B |
| Acetone | 770 | 6,700 | 740 | 5 | 660 | 400 | 130 | 1,400 | 3,400 | 6.4 |
| Freon-113 | 100J | 1,300J | ND<14.8 | ND<1.85 | ND<38.5 | ND<90.8 | ND<6.79 | ND<67.4 | ND<200 | ND<0.34 |
| Isopropanol | 620 | 5,200 | 80 | 5.1 | 680 | 540 | 220 | 4,800 | 3,200 | 2.6 |
| Benzene | ND<178 | ND<1770 | ND<14.8 | ND<1.85 | ND<38.5 | ND<90.8 | 5J | ND<67.4 | 2,500 | 0.9 |
| Ethylbenzene | ND<178 | ND<1770 | 910 | ND<1.85 | ND<38.5 | ND<90.8 | 6.7 | ND<67.4 | ND<200 | 0.4 |
| Toluene | 400 | 3,000 | 310 | 3.3 | 350 | 91 | 58 | 77 | 390 | 2.3 |
| Total Xylene | ND<178 | ND<1770 | 1,560 | ND<1.85 | ND<38.5 | ND<90.8 | 14.2 | ND<67.4 | ND<200 | 1 |
| 1,2,4-Trimethylbenzene | ND<178 | ND<1770 | ND<14.8 | ND<1.85 | ND<38.5 | ND<90.8 | ND<6.79 | ND<67.4 | ND<200 | 1 |
| 1,3,5-Trimethylbenzene | ND<178 | ND<1770 | ND<14.8 | ND<1.85 | ND<38.5 | ND<90.8 | ND<6.79 | ND<67.4 | ND<200 | 0.4 |
| 4-Ethyltoluene | ND<178 | ND<1770 | ND<14.8 | ND<1.85 | ND<38.5 | ND<90.8 | ND<6.79 | ND<67.4 | ND<200 | 0.5 |
| 1,4-Dichlorobenzene | 470 | 4,100 | ND<14.8 | ND<1.85 | 36J | ND<90.8 | ND<6.79 | 34J | 340 | ND<0.34 |
| n-Hexane | 200 | 2,200 | ND<14.8 | ND<1.85 | ND<38.5 | ND<90.8 | ND<6.79 | ND<67.4 | 180J | 0.7 |
| Chloroform | ND<178 | ND<1770 | 17 | ND<1.85 | ND<38.5 | ND<90.8 | 6.3J | ND<67.4 | ND<200 | ND<0.34 |
| Methyl isobutyl ketone | ND<178 | ND<1770 | ND<14.8 | ND<1.85 | ND<38.5 | ND<90.8 | 75 | ND<67.4 | ND<200 | ND<0.34 |

| | |
|---|---|
| ppbv | Parts per billion per volume |
| ND | Not detected |
| J | Compound was detected at concentration below the practical minimum detection limit |
| B | Compound was detected in the method blank |

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# APPENDIX VIII

# PROPOSED REMEDIAL ALTERNATIVES COSTS

## APPENDIX VIII
## FORMER MATERIALS RESEARCH CORP.
## 542 ROUTE 303
## ORANGETOWN, NEW YORK

### ALTERNATIVE 1 - NO ACTION COST ESTIMATE

| Description | Unit Cost | Unit | Quantity | Cost |
|---|---|---|---|---|
| **CAPITAL COSTS** | | | | |
| Institutional Controls | $20,000 | LS | 1 | $20,000 |
| | | | Capital Costs Total | $20,000 |
| | | | Contingency (15%) | $3,000 |
| | | | Estimated Capital Cost Total | **$23,000** |
| **Annual Costs** | | | | |
| O&M of Institutional Controls | $1,000 | yr | 1 | $1,000 |
| Groundwater Monitoring w/ Letter Summary Report | $18,500 | yr | 1 | $18,500 |
| | | | Annual Costs | $19,500 |
| Present Worth of Annual Costs Assuming 30 Years of Monitoring | | | | **$585,000** |
| **TOTAL COST FOR ALTERNATIVE 1 - NO ACTION** | | | | **$608,000** |

Cost estimate does not include any costs associated with permitting, reporting, BCP management or NYSDEC/NYSDPH/Praxair oversight

Cost estimate assumes 30 wells sampled annually.

Cost assumes $3,500 for annual groundwater monitoring summary report.

# APPENDIX VIII
# FORMER MATERIALS RESEARCH CORP.
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## ALTERNATIVE 2 - BIOREMEDIATION COST ESTIMATE [1/]

| Description | Unit Cost | Unit | Quantity | Cost |
|---|---|---|---|---|
| **CAPITAL COSTS** | | | | |
| 1. Installation of Injection/Extraction Wells | $164,500 | LS | 1 | $164,500 |
| 2. Disposal - Soil and Water Generated During Drilling Activities | $32,500 | LS | 1 | $32,500 |
| 3. Baseline Sampling | $24,000 | LS | 1 | $24,000 |
| 4. Carbon Amendment Injection [2/] | $118,500 | LS | 2 [3/] | $237,000 |
| 5. Micro-Organism Injection [2/] | $105,500 | LS | 2 [3/] | $211,000 |
| 6. Post Treatment Sampling - 1st Year | $54,000 | LS | 1 | $54,000 |
| | | | Total Capital Costs | $723,000 |
| | | | Contingency (15%) | $108,450 |
| | | | Estimated Capital Cost Total | **$831,450** |
| **Annual Costs** | | | | |
| Groundwater Monitoring w/ Letter Summary Report [4/] | $43,500 | yr | 1 | $43,500 |
| Present Worth of Annual Costs Assuming 5 Years of Monitoring | | | | **$217,500** |
| Present Worth of Annual Costs Assuming 6 Years of Monitoring | | | | **$261,000** |
| **TOTAL COST FOR ALTERNATIVE 2 - BIOREMEDIATION [5/]** | | | **$1,048,950** | **$1,092,450** |

1/ Cost estimate does not include any costs associated with permitting, reporting, BCP management or NYSDEC/NYSDPH/Praxair oversight.

2/ Cost assumes 45,000 gallons of non-hazardous wastewater disposal fees generated from injection/extraction activities.

3/ Cost assumes up to two applications of remediation treatment. Capital cost for one application remediation treatment approximately $573,850.

4/ Cost assumes $3,500 for annual groundwater monitoring summary report.

5/ Assumes 5 to 6 years of semi-annual post-treatment groundwater monitoring of maximum 32 wells (includes 24 onsite and 8 upgradient wells).

# APPENDIX VIII
# FORMER MATERIALS RESEARCH CORP.
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## ALTERNATIVE 3 - BIOSUPPLEMENT COST ESTIMATE [1/]

| Description | Unit Cost | Unit | Quantity | Cost |
|---|---|---|---|---|
| **CAPITAL COSTS** | | | | |
| 1. Installation of Injection/Extraction Wells | $165,500 | LS | 1 | $165,500 |
| 2. Disposal - Soil and Water Generated During Drilling Activities | $32,500 | LS | 1 | $32,500 |
| 3. Baseline Sampling | $26,500 | LS | 1 | $26,500 |
| 4. Biosupplement Injection [2/] | $196,000 | LS | 2 [3/] | $392,000 |
| 5. Post Treatment Sampling - 1st Year | $80,000 | LS | 1 | $80,000 |
| | | | Total Capital Costs | **$696,500** |
| | | | Contingency (15%) | $104,475 |
| | | | Estimated Capital Cost Total | **$800,975** |
| **Annual Costs** | | | | |
| Groundwater Monitoring w/ Letter Summary Report [4/] | $45,000 | yr | 1 | $45,000 |
| | Present Worth of Annual Costs Assuming 4 Years of Monitoring | | | **$180,000** |
| | Present Worth of Annual Costs Assuming 5 Years of Monitoring | | | **$225,000** |
| | **TOTAL COST FOR ALTERNATIVE 3 - BIOSUPPLEMENT [5/]** | | **$980,975** | **$1,025,975** |

1/ Cost estimate does not include any costs associated with permitting, reporting, BCP management or NYSDEC/NYSDPH/Praxair oversight

2/ Cost assumes 45,000 gallons of non-hazardous wastewater disposal fees generated from injection/extraction activities.

3/ Cost assumes two applications of remediation treatment. Capital cost for one application of remediation treatment (including pilot test) is approximatley $575,575.

4/ Cost assumes $3,500 for annual groundwater monitoring summary report.

5/ Assumes 4 to 5 years of semi-annual post-treatment groundwater monitoring of maximum 32 wells (includes 24 onsite and 8 upgradient wells).

# APPENDIX VIII
# FORMER MATERIALS RESEARCH CORP.
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## ALTERNATIVE 4 - SODIUM PERMANGANATE COST ESTIMATE [1]

| Description | Unit Cost | Unit | Quantity | Cost |
|---|---|---|---|---|
| **CAPITAL COSTS** | | | | |
| 1. Installation of Injection/Extraction Wells | $164,500 | LS | 1 | $164,500 |
| 2. Disposal - Soil and Water Generated During Drilling Activities | $32,500 | LS | 1 | $32,500 |
| 3. Baseline Sampling | $13,500 | LS | 1 | $13,500 |
| 4. Sodium Permanganate Injection [2] | $176,500 | LS | 1.5 [3] | $264,750 |
| 5. Post Treatment Monitoring - 1st Year | $28,500 | LS | 1 | $28,500 |
| | | | Total Capital Costs | **$503,750** |
| | | | Contingency (15%) | $75,560 |
| | | | Estimated Capital Cost Total | **$579,310** |
| **Annual Costs** | | | | |
| Groundwater Monitoring w/ Letter Summary Report [4] | $24,000 | yr | 1 | $24,000 |
| | Present Worth of Annual Costs Assuming 2 Years of Monitoring | | | **$48,000** |
| | Present Worth of Annual Costs Assuming 3 Years of Monitoring | | | **$72,000** |
| | **TOTAL COST FOR ALTERNATIVE 4 - SODIUM PERMANGANATE** [5] | | **$627,310** | **$651,310** |

1/ Cost estimate does not include any costs associated with permitting, reporting, BCP management or NYSDEC/NYSDPH/Praxair oversight

2/ Cost assumes 45,000 gallons of non-hazardous wastewater disposal fees generated from injection/extraction activities.

3/ Cost assumes 1.5 applications of remediation treatment. Capital cost for one application remediation treatment approximately $477,825.

4/ Cost assumes $3,500 for annual groundwater monitoring summary report.

5/ Assumes 2 to 3 years of semi-annual post-treatment groundwater monitoring of maximum 32 wells (includes 24 onsite and 8 upgradient wells).

## APPENDIX VIII
## FORMER MATERIALS RESEARCH CORP.
## 542 ROUTE 303
## ORANGETOWN, NEW YORK

### ALTERNATIVE 5 - EXCAVATION TO UNRESTRICTED-USE SCOs WITH OFFSITE SOIL DISPOSAL

| **Description** | **Quantity** | **Unit** | **Unit Costs** | **Line Item Costs** |
|---|---|---|---|---|
| **Construction Capital Cost** | | | | |
| 1. SITE PREPARATION | | | | |
| Mobilization/Demobilization | 1 | LS | $ 270,000 | $ 270,000 |
| Temporary Facilities and Utilities | 20,000 | FT2 | $ 75 | $ 1,500,000 |
| Temporary Waste Staging Pad | 1 | LS | $ 25,000 | $ 25,000 |
| Decontamination Pad | 1 | LS | $ 5,000 | $ 5,000 |
| 2. TEMPORARY CONTROLS | | | | |
| Soil and Erosion and Sedimentation Controls | | | | |
| Stabilized Construction Entrances | 2 | EACH | $ 2,500 | $ 5,000 |
| Silt Fencing/Haybales | 1250 | LF | $ 2 | $ 2,500 |
| Community Air Monitoring | | | | |
| Set Up and Baseline Monitoring | 1 | LS | $ 5,000 | $ 5,000 |
| Monitoring and Reporting During Construction | 36 | MONTH | $ 9,000 | $ 324,000 |
| Dust Control | 36 | MONTH | $ 7,000 | $ 252,000 |
| Security | 36 | MONTH | $ 8,000 | $ 288,000 |
| 3. DEMOLITION | | | | |
| Building Slab Demolition (demolish in place; 6-inch thick) | 20000 | FT2 | $ 10 | $ 200,000 |
| Building Slab Demolition (remove, crush; 6-inch thick) | 375 | CY | $ 55 | $ 20,625 |
| 4 - 6 inch Asphalt Road Demolition | 6150 | SY | $ 20 | $ 123,000 |
| 4. DEWATERING | 1 | LS | $ 1,000,000 | $ 1,000,000 |
| 5. EXCAVATION | | | | |
| Building Interior | 30000 | CY | $ 50 | $ 1,500,000 |
| Exterior | 81,500 | CY | $ 25 | $ 2,037,500 |
| 6. TRANSPORTATION AND DISPOSAL | | | | |
| VOC-impacted Soil | 167250 | TON | $ 120 | $ 20,070,000 |
| 7. BACKFILL | | | | |
| Building | 30000 | CY | $ 30 | $ 900,000 |
| Exterior | 81,500 | CY | $ 30 | $ 2,445,000 |
| 8. RESTORATION | | | | |
| Building | 20000 | FT2 | $ 20 | $ 400,000 |
| Asphalt | 6150 | SY | $ 5 | $ 27,675 |
| SUBTOTAL CONSTRUCTION CAPITAL COST: | | | | $ 31,400,300 |
| CONTINGENCY (20% of construction capital cost) | 20 | % | $ 6,280,060 | $ 6,280,060 |
| **TOTAL CONSTRUCTION CAPITAL COST** | | | | **$ 37,680,360** |

# APPENDIX VIII
# FORMER MATERIALS RESEARCH CORP.
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## ALTERNATIVE 5 - EXCAVATION TO UNRESTRICTED-USE SCOs WITH OFFSITE SOIL DISPOSAL

| **Description** | **Quantity** | **Unit** | **Unit Costs** | **Line Item Costs** |
|---|---|---|---|---|
| **Engineering, Permitting, and Documentation Capital Cost** | | | | |
| 9. PRE-CONSTRUCTION ENGINEERING AND PERMITTING | | | | |
| Pre-Design Investigatior | 1 | LS | $ 50,000 | $ 50,000 |
| Remedial Design (Drawing, Plans) | 1 | LS | $ 250,000 | $ 250,000 |
| Permitting | 1 | LS | $ 15,000 | $ 15,000 |
| Bid Support | 1 | LS | $ 10,000 | $ 10,000 |
| 10. CONSTRUCTION OBSERVATION AND DOCUMENTATION | | | | |
| Submittals and Pre-Construction Planning | 1 | LS | $ 25,000 | |
| On-Site Cor Stabilized Construction Entrances | 36 | MONTH | $ 25,000 | $ 900,000 |
| Engineering Silt Fencing/Haybales | 36 | MONTH | $ 10,000 | $ 360,000 |
| 11. POST-CONSTRUCTION ENGINEERING AND PERMITTING | | | | |
| Institutional Controls | 1 | LS | $ 20,000 | $ 20,000 |
| Construction Completion Report | 1 | LS | $ 25,000 | $ 25,000 |
| SUBTOTAL ENGINEERING, PERMITTING AND DOCUMENTATION CAPITAL COST: | | | | $ 1,630,000 |
| 12. CONTINGENCY (20 percent of engineering and permitting capital cost) | 20 | % | $ 326,000.0 | $ 326,000 |
| **TOTAL ENGINEERING, PERMITTING AND DOCUMENTATION CAPITAL COST:** | | | | **$ 1,956,000** |
| 13. ANNUAL O& M COSTS | | | | |
| O&M of Institutional Controls | Not Required | | | $0 |
| 14. CONTINGENCY (20 percent) | 0 | % | | $0 |
| | | | | $0 |
| **TOTAL CONSTRUCTION CAPITAL COST** | | | | **$ 37,680,360** |
| **TOTAL ENGINEERING, PERMITTING AND DOCUMENTATION CAPITAL COST:** | | | | **$ 1,956,000** |
| **TOTAL COST FOR ALTERNATIVE 5 - EXCAVATION TO UNRESTRICTED-USE SCOs WITH OFFSITE DISPOSAL** | | | | **$39,636,360** |

Cost estimate does not include any costs associated with permitting, reporting, BCP management or NYSDEC/NYSDPH/Praxair oversigh
Cost assumes no annual O&M required

# APPENDIX IX

# ORANGETOWN LAND ZONING MAP

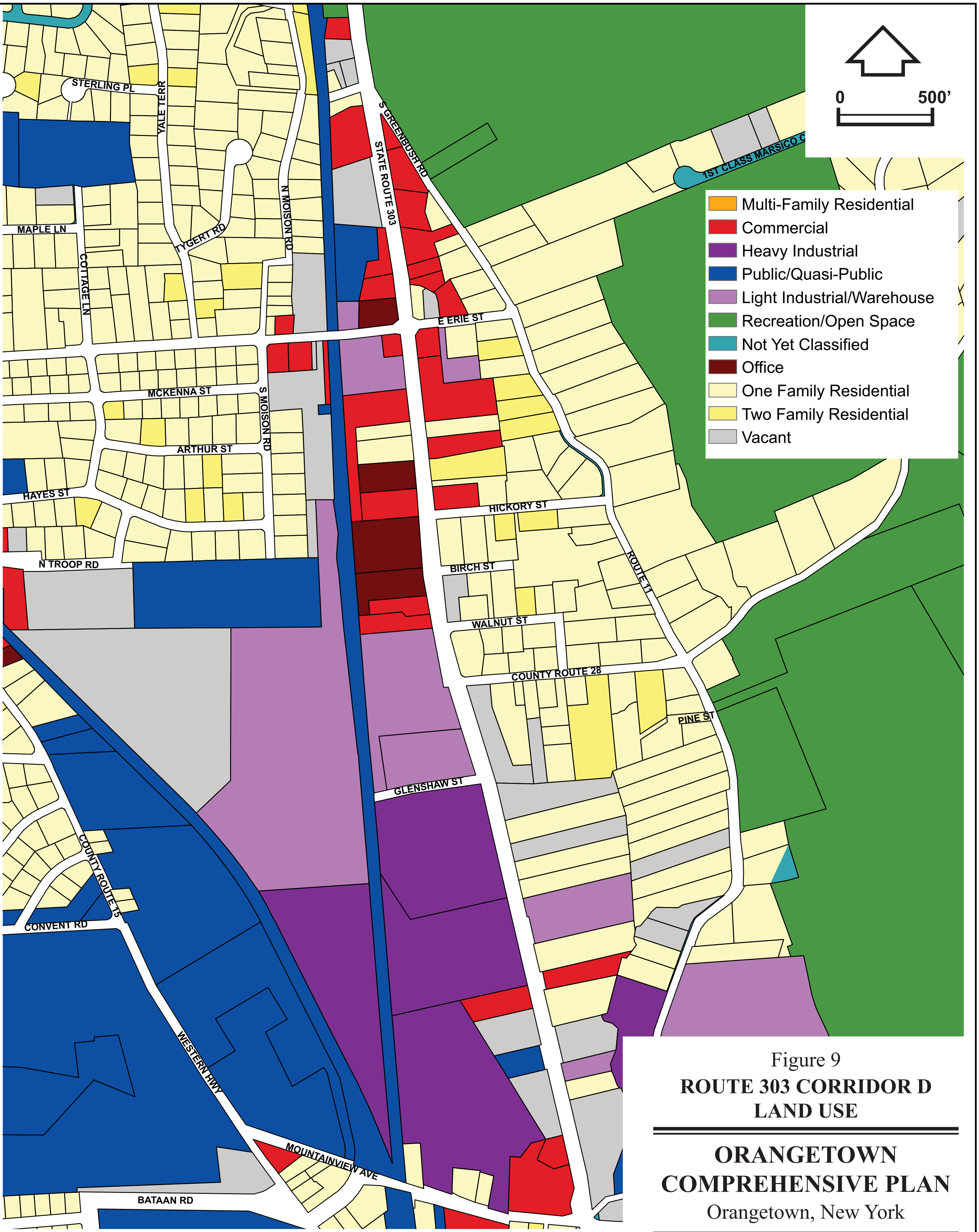


Figure 9

**ROUTE 303 CORRIDOR D LAND USE**

## ORANGETOWN COMPREHENSIVE PLAN

Orangetown, New York

*VHB Saccardi & Schiff*

SOURCE: Rockland County GIS, 2008

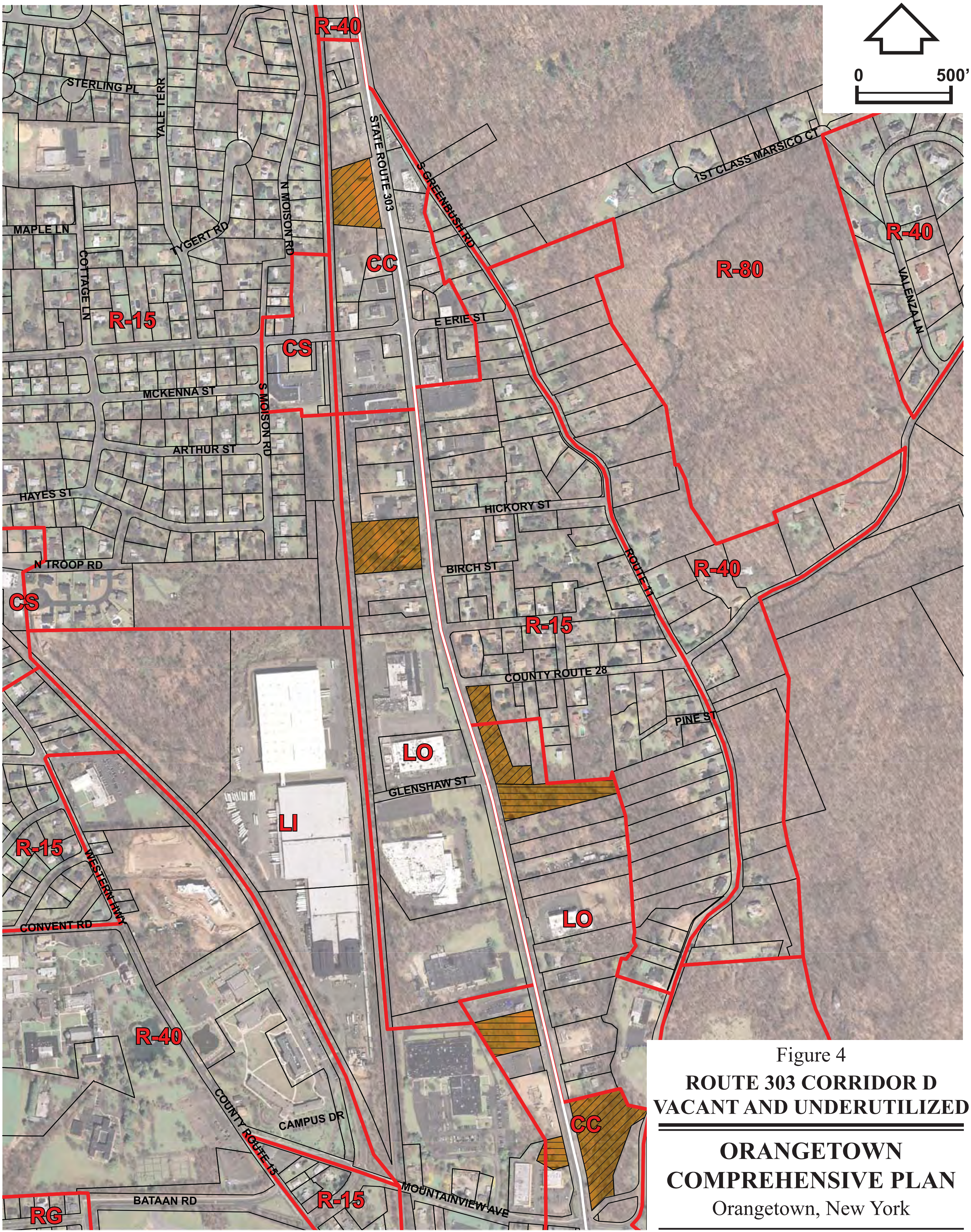


Figure 4

## ROUTE 303 CORRIDOR D VACANT AND UNDERUTILIZED

## ORANGETOWN COMPREHENSIVE PLAN

Orangetown, New York

▨ Vacant and Underutilized Land

SOURCE: Rockland County GIS, 2008

VHB Saccardi & Schiff

# APPENDIX X

# LIQUID SODIUM PERMANGANATE CALCULATIONS

CARUS®

CARUS REMEDIATION TECHNOLOGIES

*In Situ* Chemical Oxidation (ISCO) *In Situ* Bioremediation (BIO) *In Situ* Biogeochemical Stabilization (ISBS)

# RemOx® S and L ISCO Reagents Estimation Spreadsheet

Input data into boxes with blue font.

| | Estimates | Units |
|---|---|---|
| **Treatment Area Volume** | | |
| Length | 115 | ft |
| Width | 60 | ft |
| Area | 6900 | sq ft |
| Thickness | 33 | ft |
| Total Volume | 8433 | cu yd |
| | | |
| **Soil Characteristics/Analysis** | | |
| Porosity | 20 | % |
| Total Plume Pore Volume | 340663 | gal |
| Avg Contaminant Conc | 1 | ppm |
| Mass of Contaminant | 2.84 | lb |
| PNOD | 1 | g/kg |
| Effective PNOD | 20 | % |
| Effective PNOD Calculated | 0.2 | |
| PNOD Oxidant Demand | 5009.4 | lb |
| Avg Stoichiometric Demand | 2.4 | lb/lb |
| Contaminant Oxidant Demand | 6.82 | lb |
| Theoretical Oxidant Demand | 5016.22 | lb |
| Confidence Factor | 2.5 | |
| Calculated Oxidant Demand | 12540.55776 | |
| | | |
| **Injection Volumes for RemOx S** | | |
| RemOx S Injection Concentration | | % |
| Total Volume of Injection Fluid | #DIV/0! | gal |
| Pore Volume Replaced | #DIV/0! | % |

**Amount of RemOx S ISCO Reagent Estimated** **12,541 pounds** **K**

| | | |
|---|---|---|
| **Injection Volumes for RemOx L** | | |
| RemOx L Injection Concentration | 20.0% | % |
| Calculated Specific Gravity | 1.183246 | g/ml |
| Total Volume of Injection Fluid | 5,702 | gal |
| Pore Volume Replaced | 0.02 | % |

**Amount of RemOx L ISCO Reagent Estimated** **28,154 pounds** **Na**
**2,463 gallons**

CARUS REMEDIATION TECHNOLOGIES

*In Situ* Chemical Oxidation (ISCO) *In Situ* Bioremediation (BIO) *In Situ* Biogeochemical Stabilization (ISBS)

# RemOx® S and L ISCO Reagents Estimation Spreadsheet

Input data into boxes with blue font.

| | Estimates | Units |
|---|---|---|
| **Treatment Area Volume** | | |
| Length | 115 | ft |
| Width | 60 | ft |
| Area | 6900 | sq ft |
| Thickness | 33 | ft |
| Total Volume | 8433 | cu yd |
| | | |
| **Soil Characteristics/Analysis** | | |
| Porosity | 20 | % |
| Total Plume Pore Volume | 340663 | gal |
| Avg Contaminant Conc | 1 | ppm |
| Mass of Contaminant | 2.84 | lb |
| PNOD | 1 | g/kg |
| Effective PNOD | 20 | % |
| Effective PNOD Calculated | 0.2 | |
| PNOD Oxidant Demand | 5009.4 | lb |
| Avg Stoichiometric Demand | 2.4 | lb/lb |
| Contaminant Oxidant Demand | 6.82 | lb |
| Theoretical Oxidant Demand | 5016.22 | lb |
| Confidence Factor | 2.5 | |
| Calculated Oxidant Demand | 12540.55776 | |
| | | |
| **Injection Volumes for RemOx S** | | |
| RemOx S Injection Concentration | | % |
| Total Volume of Injection Fluid | #DIV/0! | gal |
| Pore Volume Replaced | #DIV/0! | % |

**Amount of RemOx S ISCO Reagent Estimated** 12,541 pounds K

| | | |
|---|---|---|
| **Injection Volumes for RemOx L** | | |
| RemOx L Injection Concentration | 10.0% | % |
| Calculated Specific Gravity | 1.091623 | g/ml |
| Total Volume of Injection Fluid | 12,362 | gal |
| Pore Volume Replaced | 0.04 | % |

**Amount of RemOx L ISCO Reagent Estimated** 28,154 pounds Na

2,463 gallons

CARUS®

CARUS REMEDIATION TECHNOLOGIES

*In Situ* Chemical Oxidation (ISCO) *In Situ* Bioremediation (BIO) *In Situ* Biogeochemical Stabilization (ISBS)

# RemOx® S and L ISCO Reagents Estimation Spreadsheet

Input data into boxes with blue font.

| | Estimates | Units |
|---|---|---|
| **Treatment Area Volume** | | |
| Length | **15** | ft |
| Width | **35** | ft |
| Area | 525 | sq ft |
| Thickness | **33** | ft |
| Total Volume | 642 | cu yd |
| **Soil Characteristics/Analysis** | | |
| Porosity | **20** | % |
| Total Plume Pore Volume | 25920 | gal |
| Avg Contaminant Conc | **1** | ppm |
| Mass of Contaminant | 0.22 | lb |
| PNOD | **1** | g/kg |
| Effective PNOD | **20** | % |
| Effective PNOD Calculated | 0.2 | |
| PNOD Oxidant Demand | 381.15 | lb |
| Avg Stoichiometric Demand | **2.4** | lb/lb |
| Contaminant Oxidant Demand | 0.52 | lb |
| Theoretical Oxidant Demand | 381.67 | lb |
| Confidence Factor | **2.5** | |
| Calculated Oxidant Demand | 954.1728733 | |
| **Injection Volumes for RemOx S** | | |
| RemOx S Injection Concentration | | % |
| Total Volume of Injection Fluid | #DIV/0! | gal |
| Pore Volume Replaced | #DIV/0! | % |

| | | |
|---|---|---|
| **Amount of RemOx S ISCO Reagent Estimated** | **954 pounds** | **K** |

| | | |
|---|---|---|
| **Injection Volumes for RemOx L** | | |
| RemOx L Injection Concentration | **5.0%** | % |
| Calculated Specific Gravity | 1.0458115 | g/ml |
| Total Volume of Injection Fluid | 1,964 | gal |
| Pore Volume Replaced | 0.08 | % |

| | | |
|---|---|---|
| **Amount of RemOx L ISCO Reagent Estimated** | **2,142 pounds**<br>**187 gallons** | **Na** |

CARUS REMEDIATION TECHNOLOGIES

*In Situ* Chemical Oxidation (ISCO) *In Situ* Bioremediation (BIO) *In Situ* Biogeochemical Stabilization (ISBS)

# RemOx® S and L ISCO Reagents Estimation Spreadsheet

Input data into boxes with blue font.

| | Estimates | Units |
|---|---|---|
| **Treatment Area Volume** | | |
| Length | **30** | ft |
| Width | **35** | ft |
| Area | 1050 | sq ft |
| Thickness | **33** | ft |
| Total Volume | 1283 | cu yd |
| | | |
| **Soil Characteristics/Analysis** | | |
| Porosity | **20** | % |
| Total Plume Pore Volume | 51840 | gal |
| Avg Contaminant Conc | **1** | ppm |
| Mass of Contaminant | 0.43 | lb |
| PNOD | **1** | g/kg |
| Effective PNOD | **20** | % |
| Effective PNOD Calculated | 0.2 | |
| PNOD Oxidant Demand | 762.3 | lb |
| Avg Stoichiometric Demand | **2.4** | lb/lb |
| Contaminant Oxidant Demand | 1.04 | lb |
| Theoretical Oxidant Demand | 763.34 | lb |
| Confidence Factor | **2.5** | |
| Calculated Oxidant Demand | 1908.345747 | |
| | | |
| **Injection Volumes for RemOx S** | | |
| RemOx S Injection Concentration | | % |
| Total Volume of Injection Fluid | #DIV/0! | gal |
| Pore Volume Replaced | #DIV/0! | % |

**Amount of RemOx S ISCO Reagent Estimated** **1,908 pounds** **K**

| | | |
|---|---|---|
| **Injection Volumes for RemOx L** | | |
| RemOx L Injection Concentration | **10.0%** | % |
| Calculated Specific Gravity | 1.091623 | g/ml |
| Total Volume of Injection Fluid | 1,881 | gal |
| Pore Volume Replaced | 0.04 | % |

**Amount of RemOx L ISCO Reagent Estimated** **4,284 pounds** **Na**
**375 gallons**

CARUS REMEDIATION TECHNOLOGIES

*In Situ* Chemical Oxidation (ISCO) *In Situ* Bioremediation (BIO) *In Situ* Biogeochemical Stabilization (ISBS)

# RemOx® S and L ISCO Reagents Estimation Spreadsheet

Input data into boxes with blue font.

| | Estimates | Units |
|---|---|---|
| **Treatment Area Volume** | | |
| Length | 15 | ft |
| Width | 60 | ft |
| Area | 900 | sq ft |
| Thickness | 33 | ft |
| Total Volume | 1100 | cu yd |
| | | |
| **Soil Characteristics/Analysis** | | |
| Porosity | 20 | % |
| Total Plume Pore Volume | 44434 | gal |
| Avg Contaminant Conc | 1 | ppm |
| Mass of Contaminant | 0.37 | lb |
| PNOD | 1 | g/kg |
| Effective PNOD | 20 | % |
| Effective PNOD Calculated | 0.2 | |
| PNOD Oxidant Demand | 653.4 | lb |
| Avg Stoichiometric Demand | 2.4 | lb/lb |
| Contaminant Oxidant Demand | 0.89 | lb |
| Theoretical Oxidant Demand | 654.29 | lb |
| Confidence Factor | 2.5 | |
| Calculated Oxidant Demand | 1635.724926 | |
| | | |
| **Injection Volumes for RemOx S** | | |
| RemOx S Injection Concentration | | % |
| Total Volume of Injection Fluid | #DIV/0! | gal |
| Pore Volume Replaced | #DIV/0! | % |

| | | |
|---|---|---|
| **Amount of RemOx S ISCO Reagent Estimated** | **1,636 pounds** | **K** |

| | | |
|---|---|---|
| **Injection Volumes for RemOx L** | | |
| RemOx L Injection Concentration | 10.0% | % |
| Calculated Specific Gravity | 1.091623 | g/ml |
| Total Volume of Injection Fluid | 1,612 | gal |
| Pore Volume Replaced | 0.04 | % |

| | | |
|---|---|---|
| **Amount of RemOx L ISCO Reagent Estimated** | **3,672 pounds**<br>**321 gallons** | **Na** |

CARUS®

CARUS REMEDIATION TECHNOLOGIES

*In Situ* Chemical Oxidation (ISCO)   *In Situ* Bioremediation (BIO)   *In Situ* Biogeochemical Stabilization (ISBS)

# RemOx® S and L ISCO Reagents Estimation Spreadsheet

**Input data into boxes with blue font.**

| | Estimates | Units |
|---|---|---|
| **Treatment Area Volume** | | |
| Length | **55** | ft |
| Width | **35** | ft |
| Area | 1925 | sq ft |
| Thickness | **33** | ft |
| Total Volume | 2353 | cu yd |
| | | |
| **Soil Characteristics/Analysis** | | |
| Porosity | **20** | % |
| Total Plume Pore Volume | 95040 | gal |
| Avg Contaminant Conc | **1** | ppm |
| Mass of Contaminant | 0.79 | lb |
| PNOD | **1** | g/kg |
| Effective PNOD | **20** | % |
| Effective PNOD Calculated | 0.2 | |
| PNOD Oxidant Demand | 1397.55 | lb |
| Avg Stoichiometric Demand | **2.4** | lb/lb |
| Contaminant Oxidant Demand | 1.90 | lb |
| Theoretical Oxidant Demand | 1399.45 | lb |
| Confidence Factor | **2.5** | |
| Calculated Oxidant Demand | 3498.633869 | |
| | | |
| **Injection Volumes for RemOx S** | | |
| RemOx S Injection Concentration | | % |
| Total Volume of Injection Fluid | #DIV/0! | gal |
| Pore Volume Replaced | #DIV/0! | % |

**Amount of RemOx S ISCO Reagent Estimated** **3,499 pounds** **K**

| | | |
|---|---|---|
| **Injection Volumes for RemOx L** | | |
| RemOx L Injection Concentration | **20.0%** | % |
| Calculated Specific Gravity | 1.183246 | g/ml |
| Total Volume of Injection Fluid | 1,591 | gal |
| Pore Volume Replaced | 0.02 | % |

**Amount of RemOx L ISCO Reagent Estimated** **7,854 pounds** **Na**
**687 gallons**

CARUS REMEDIATION TECHNOLOGIES

*In Situ* Chemical Oxidation (ISCO) *In Situ* Bioremediation (BIO) *In Situ* Biogeochemical Stabilization (ISBS)

# RemOx® S and L ISCO Reagents Estimation Spreadsheet

Input data into boxes with blue font.

| | Estimates | Units |
|---|---|---|
| **Treatment Area Volume** | | |
| Length | 100 | ft |
| Width | 20 | ft |
| Area | 2000 | sq ft |
| Thickness | 33 | ft |
| Total Volume | 2444 | cu yd |
| | | |
| **Soil Characteristics/Analysis** | | |
| Porosity | 20 | % |
| Total Plume Pore Volume | 98743 | gal |
| Avg Contaminant Conc | 1 | ppm |
| Mass of Contaminant | 0.82 | lb |
| PNOD | 1 | g/kg |
| Effective PNOD | 20 | % |
| Effective PNOD Calculated | 0.2 | |
| PNOD Oxidant Demand | 1452 | lb |
| Avg Stoichiometric Demand | 2.4 | lb/lb |
| Contaminant Oxidant Demand | 1.98 | lb |
| Theoretical Oxidant Demand | 1453.98 | lb |
| Confidence Factor | 2.5 | |
| Calculated Oxidant Demand | 3634.944279 | |
| | | |
| **Injection Volumes for RemOx S** | | |
| RemOx S Injection Concentration | | % |
| Total Volume of Injection Fluid | #DIV/0! | gal |
| Pore Volume Replaced | #DIV/0! | % |

**Amount of RemOx S ISCO Reagent Estimated** **3,635 pounds** **K**

| | | |
|---|---|---|
| **Injection Volumes for RemOx L** | | |
| RemOx L Injection Concentration | 20.0% | % |
| Calculated Specific Gravity | 1.183246 | g/ml |
| Total Volume of Injection Fluid | 1,653 | gal |
| Pore Volume Replaced | 0.02 | % |

**Amount of RemOx L ISCO Reagent Estimated** **8,160 pounds** **Na**
**714 gallons**

# APPENDIX XI

# HEALTH AND SAFETY PLAN

## 1.0 HEALTH AND SAFETY PLAN

The Health and Safety Plan (HASP) that follows is intended to provide a basic framework for the safe conduct of the Remedial Action conducted at the Materials Research Corporation (MRC) site in Orangetown, New York. The HASP includes a generalized Community Air Monitoring Plan (CAMP). The procedures provided herein are intended as a guide for all Leggette, Brashears & Graham, Inc. (LBG) and subcontractor employees who will be involved in the completion of the Remedial Action. The subcontractor responsible for the handling activities of the sodium permanganate will provide a site-specific HASP for their employees regarding safe handling procedures. Response procedures to potential spills are described in the Stormwater Pollution Prevention Plan included as Appendix XIII of this RAWP.

The soil and groundwater on the former MRC site has been investigated and the site's health and safety hazards are well known. The primary areas of concern for worker health and safety are the normal work hazards associated with drilling operations and the presence of volatile organic compounds (VOCs) in the soil and groundwater. While to date, VOCs have not been identified in the site soils and are not anticipated to be encountered during this Remedial Action program, procedures for handling VOC-impacted soils are included in this HASP, in the event that the work plan is altered during the Remedial Action program. Historically, the VOCs which occur at the highest concentrations in both media are vinyl chloride (VC), 1,1-dichloroethene (DCE), cis 1,2-dichloroethene (cis 1,2-DCE), trans 1,2-dichloroethene (trans 1,2-DCE), 1,1-dichloroethane (DCA), 1,1,1-trichloroethane (TCA), trichloroethene (TCE) and tetrachloroethene (PCE). Of these, PCE, TCE and VC are the substances which are of greatest concern, being considered by the National Institute for Occupational Safety and Health (NIOSH) to be known or suspected carcinogens. The 10-hour permissible exposure limits for these VOCs are 25, 50 and 1 ppm (part per million), respectively. It is anticipated that the drilling and groundwater sampling activities associated with the Remedial Action program will be conducted in Level D. However, the handling of the chemical oxidant proposed for the Remedial Action will be conducted in modified Level C personal protection.

The primary objective of the HASP is to establish work safety guidelines, requirements and procedures before field activities begin. The following information was prepared specifically for field operations by personnel to enforce and adhere to the established rules as specified in the HASP. The approved HASP will be provided to all personnel to aid in accomplishing the following objectives:

- monitoring the effectiveness of the HASP as it is conducted in the field by conducting field operation audits;
- following-up on any necessary corrective actions;
- interacting with Sony Electronics Inc., subcontractor or NYSDEC field representatives regarding modifications of health and safety actions; and
- stopping work should work-site conditions warrant such action.

All personnel will have had health and safety training in accordance with OSHA Interim Final Standard 29 CFR 1910.120, or as may be amended.

## 1.1 Organization and Responsibilities

The organization and responsibilities for implementing safe site-investigation procedures, and specifically for the requirements contained in this manual, are described in this section.

### 1.1.1 Project Manager

The LBG Project Manager, Karen Destefanis, will be responsible for the overall implementation and monitoring of the health and safety program by:

- ensuring appropriate protective equipment is available and properly used by all LBG personnel, in accordance with the HASP;
- ensuring LBG personnel health and safety awareness by providing them with proper training and familiarity with procedures and contingency plans;
- ensuring all personnel are apprised of potential hazards associated with the site conditions and operations;
- supervising and monitoring the safety performance of all LBG personnel to ensure their work practices are conducted in accordance with the HASP;

- correcting any work practices or conditions that would expose personnel to possible injury or hazardous condition;
- communications with the onsite Health and Safety Officer (HSO);
- promptly initiating emergency alerts; and
- communicating with the client and/or regulatory agency representatives.

Non-LBG personnel on the site will be responsible for providing appropriate protective equipment, training and supervision to maintain an adequate level of protection which is consistent with the LBG HASP. Copies of the LBG HASP will be made available to others as necessary prior to entrance on to the site.

### 1.1.2 Onsite Health and Safety Officer

The onsite HSO, who will be onsite during the initiation of the Remedial Action activities, will be an LBG Hydrogeologist, who will also supervise the field program. In addition to the duties described in the Scope of Work, the LBG Hydrogeologist, will be accountable for the direct supervision of personnel from the subcontractors and other LBG personnel with regard to:

- health and safety program compliance;
- maintaining a high level of health and safety consciousness among employees at the work site;
- reporting accidents within LBG jurisdiction and undertaking corrective action;
- contacting Call-Before-You-Dig services to obtain appropriate mark outs; and
- coordinating with Sony Electronics Inc. and/or MRC personnel to clear drilling sites of obstructions, hazards and utilities.

### 1.1.3 Field Personnel

All field personnel will report directly to the onsite HSO, and will be required to:

- be familiar with, and conform to, provisions of the HASP;
- ensure that they are well informed of potential hazards at the work site and exercise informed consent in their work;
- report any accidents or hazardous conditions to the onsite HSO; and

- have complete familiarity with their job requirements and the health and safety procedures involved.

Prior to the start of field activities, a meeting will be held to discuss the potential hazards at the site, with a review of the required protective clothing and procedures to be observed at this site. As needed, daily meetings will be held to discuss any changes in the hazards.

## 1.2 On and Offsite Exposure Assessment

Because the subject property and surrounding area are served by public water, there is no anticipated exposure from the halogenated VOCs that have been identified onsite, through consumption to any of the onsite or surrounding population. There is a potential for onsite contact with VOCs during injection/extraction activities or during groundwater sampling. As previously stated, the subcontractor responsible for the handling activities of the sodium permanganate will provide a site-specific HASP regarding safe handling procedures. The only other potential exposure pathway is through inhalation. Previous investigations have shown that the unconsolidated materials encountered in the unsaturated zone at the MRC property primarily consists of dense/compact fine sand and silt. These dense materials do not readily allow volatilization. This is likely related to the general poor interconnection between the pore spaces of the materials. With this type of condition, inhalation of vapors is not anticipated to be a potential exposure pathway. Based on multiple subsurface investigations conducted throughout the property, this assumption is valid.

### 1.2.1 Air Monitoring Plan

The following monitoring plan evaluates exposure for onsite personnel within the work zone (Section 1.5). As described below, the only potential exposure pathway outside the work zone is through inhalation and direct contact during groundwater sampling activities. Air monitoring will be performed during the following activities: ground invasive work; well development, groundwater sampling and during the ISCO groundwater injection/extraction activities; and any other activities which may release VOCs into the atmosphere.

The generic CAMP includes continuous monitoring for all ground intrusive activities (which would include the installation of soil borings or monitor wells) and periodic monitoring for VOCs during non-intrusive activities (collection of groundwater samples, ISCO injection/extraction activities). The specific VOC and particulate monitoring include:

- Monitoring frequency
- Response Levels; and
- Actions.

The monitoring frequency and procedures will be in accordance with the generic CAMP included in Appendix I.

### 1.2.2 Hazard Evaluation

The possible presence of VOCs in the groundwater and/or soil comprises the focus of personal health review. As previously stated, the subcontractor responsible for the handling activities of the sodium permanganate will provide a site-specific HASP for their employees regarding safe handling procedures. The protection of personnel from exposure to these substances by inhalation, oral ingestion, dermal absorption or eye contact is included as a primary purpose of this plan. As discussed above, VOC-impacted soil is not anticipated to be encountered during the Remedial Action program, unless the Scope of Work is altered because of observed field conditions.

The primary COCs consist of PCE, TCE, 1,1,1-TCA, cis 1,2-DCE, trans 1,2-DCE, DCE, DCA and VC. The National Institute for Occupational Safety and Health (NIOSH) and Occupational Safety and Health Administration (OSHA) exposure limits for the COCs are provided in table 1. The physical properties of the COCs and sodium permanganate are also provided in the table.

The onsite HSO is responsible for determining the level of personal protection equipment required. The HSO will conduct a preliminary evaluation to confirm personal protective equipment requirements once the site has been entered. When work-site conditions warrant, the onsite HSO will modify the level of protection to be utilized. The existence of a situation more hazardous than anticipated will result in the suspension of work until the Project Manager and client representative have been notified and appropriate instructions have been provided to the field team.

### 1.2.3 Monitoring Requirements

A photoionization detector (PID) will be used to monitor ambient air quality at the proposed boring locations. Records of these data will be maintained by the onsite HSO. During drilling operations, air quality will be monitored at each boring location, especially near the top of the boreholes as samples are collected. Work operations which involve handling of hazardous substances, will include periodic (minimum of 15-minute intervals) contaminant monitoring using the PID. In addition, field monitoring will be conducted when work is initiated at different portions of the site. When deemed necessary or desirable by the onsite HSO, area monitoring will be used in potentially hazardous zones. Area monitoring will be conducted as plans and conditions dictate, and in accordance with the HASP and CAMP and with the goal of accident and hazardous condition prevention in mind.

For the compounds previously identified to be most prevalent, the lowest 10-hour exposure limit is 1 ppm for VC. The compound which is expected to be present in the highest concentration in sampled media is derivatives of 1,2-dichloroethene, which have a 10-hour exposure limit of 200 ppm. PCE and TCE, which have a 10-hour exposure limit of 25 ppm, could also be present at low concentrations.

### 1.3 Levels of Protection

The level of protection anticipated to be used while completing the drilling activities is Level D. The level of protection anticipated to be used while handling the sodium permanganate during the injection/extraction activities is a modified Level C. Only protective equipment deemed suitable by the onsite HSO for use at the work site will be worn. Any changes in protection levels shall be documented by the onsite HSO. Field personnel should exercise informed judgment on protective equipment requirements at active work sites or at work sites that have been repeatedly entered or occupied without apparent harm. In any case where doubt exists, the safest course of action must be taken. The protective equipment that may be used by field personnel is listed below.

### 1.3.1 Level D

- hard hat;
- safety glasses, shatterproof prescription glasses or chemical splash goggles (when working with liquids);
- boots/shoes, leather or chemical-resistant, steel toe and shank;
- protective hearing devices (i.e. ear plugs or ear muffs) during drilling;
- coveralls; and
- chemical-resistant gloves.

At a minimum, protective headgear, including protective hearing devices, eye wear and footwear will be worn at all times by personnel working around the drilling equipment. When work-site conditions dictate, protective gloves and chemical-resistant boots shall be required for those personnel handling contaminated soils or water or sodium permanganate.

Should levels of organic vapor greater than 10 ppm above background levels be detected by the PID in the work area, work will stop and all personnel will leave the work area. A level of 10 ppm was chosen by the Project Manager and the HSO, because it provides a large safety margin until the conservative 10-hour exposure limit is reached. If a PID reading of greater than 5 ppm persists, an evaluation will be made to determine the cause of the elevated readings with the use of colorimetric tubes. Based on the results of the analysis, the onsite HSO, in consultation with the Project Manager, will determine the advisability of continuing work in Level B or C protective equipment.

### 1.3.2 Level C

- hard hat;
- safety glasses, shatterproof prescription glasses or chemical splash goggles (when working with liquids);
- boots, leather, steel toe and shank;
- outer boots, chemical-resistant;
- hearing protection during drilling
- chemical-resistant gloves (Solvex);

- Tyvek or Saranex suit; and
- Air-purifying full face respirator with organic vapor cartridge and dust and mist filter.

Level C protection will be considered for PID readings of 25 to 100 ppm above background if substances other than TCE are causing the elevated readings. A concentration of 100 ppm was chosen for the upper level because the respirator cartridges will provide at least four hours of protection (50 times the permissible exposure limits) at that level from the chemicals associated with the site (other than TCE), based on breakthrough times supplied by the manufacturer.

Respirators for all personnel will be available with both particulate and organic vapor protection cartridges. The onsite HSO will direct when the protective clothing and respirators will be utilized based on the conditions encountered at the work site.

### 1.3.3 Modified Level C –Sodium Permanagate Injection/Extraction Work

- hard hat;
- safety glasses, shatterproof prescription glasses or chemical splash goggles and full face shield;
- boots, leather, steel toe and shank;
- outer boots, chemical-resistant;
- chemical-resistant gloves;
- chemical-resistant Tyvek or Saranex suit; and if necessary
- NIOSH-MSHS-approved mist respirator.

The modified Level C protection will be used at all times during the handling and transferring of the sodium permanganate (injection activities) to avoid eye and skin exposure. Because of the type of work anticipated for this project (i.e. permanganate being transferred directly from a mixing tote to the injection well and the mixing activities), misting is not expected to be a health and safety issue. However, if the handling activities have the potential to result in misting of the permanganate solution, then a mist respirator must be donned by all in the work area to prevent irritation of the respiratory tract.

### 1.3.4 Levels A and B

Level A or B PPE is not anticipated during the conduct of site work. Any recommendation of the HSO to upgrade to Level A or B PPE will be cause to stop work and prepare an alternate work plan. Sustained chemical-specific PID readings in the breathing zone will prompt the HSO to halt work activities and re-evaluate the relevant work plans with the Project Manager.

### 1.4 Safe Work Practices and Hygiene

In addition to the use of protective equipment, other procedures will be followed to minimize risk:

- all consumptive activities, including eating, drinking or smoking are prohibited in the work zone during the drilling, injection/extraction, sampling and decontamination activities;
- hands will be washed before eating, drinking or smoking in the non-work zone area;
- emergency eye washes will be located near the work site during the entire Remedial Actioning program;
- an emergency shower area will be located near the work area during the permanganate injection/extraction activities;
- absorbent spill supplies to address a minor spill shall be supplied by the sub-contractor;
- an adequate source of potable water for emergency use will be available at the drilling sites (two liters per person per day); and
- an adequately stocked first-aid kit will be maintained at the work site at all times during operational hours.

### 1.4.1 Heat Stress

In order to avoid heat stress, several preventative measures will be observed:

- Workers will drink a 16-ounce glass of water prior to work (in the morning and after lunch). Water will be contained in a cooler, maintained at a temperature below 60$^o$F. Workers will be encouraged to drink approximately every 20 minutes during days of extreme heat.

- Workers will be encouraged to wear long cotton underwear under the heat-retaining protective clothing required by Level C.
- In extreme hot weather, field activities will be conducted in the early mornings and late afternoons.
- Rest breaks in cool or shaded areas will be enforced as needed.
- Toilet facilities will be made available to site workers at the Praxair facility.
- Good hygiene practices will be encouraged, stressing the importance of allowing the clothing to dry during rest periods. Anyone who notices skin problems should receive medical attention immediately.
- If there are support personnel available outside the work zone, they should observe the workers in the exclusion zone to monitor signs of stress, frequency of breaks, etc.

A copy of a heat stress chart is included in Appendix II.

### 1.4.2 Cold Stress and Exposure

In order to avoid cold stress, several preventative measures will be observed;

- work will not take place when the temperature falls below -20°F. (The wind chill factor should be a major consideration);
- clothing should be worn in layers, so that personnel can adapt to changing conditions and various levels of physical stress;
- if possible, breaks should be taken in a heated vehicle or building, but care should be taken to remove outer clothing during the break;
- have on hand extra inner clothing in case perspiration builds up;
- keep insulated containers of warm liquids available for breaks outside of the exclusion zone;
- be aware of the signs of frostbite and take immediate remedial measures; and
- take extra precautions around areas subject to ice buildup, such as sanding slippery surfaces.

A copy of wind chill factors is included in Appendix II.

## 1.5 Work Area

The remediation project will have three different work zones identified as the ‘exclusion zone (EZ)’, the ‘contamination reduction zone (CRZ)’ and the ‘support zone (SZ)’. The exclusion zone is where the Remedial Action program will take place in the appropriate safety equipment. The contamination reduction zone (CRZ) is where the decontamination of personnel and equipment will take place. The support zone is the outer limit zone where equipment is stored and protective clothing is not required. To prevent unauthorized personnel from entering areas where active operations are being performed, orange cones will be set up to delineate the work area (includes the EZ and CRZ) and the exclusion zone will be delineated with temporary orange fencing or yellow tape during the Remedial Action program (including drilling, groundwater sampling and permanganate injection/extraction activities).

The work area will normally be entered in Level D protection. However, individual work areas may require higher levels of protection based on air-monitoring results during the various activities. If this becomes the case, separate work zones will be established based on the level of protection required.

Field personnel are instructed to leave the area if monitoring shows readings above the permissible exposure limits. Before conducting field work in respirators, the Project Manager and client representative will be contacted. A determination will be made by the onsite HSO and Project Manager if work is to continue with respirators. Factors which may influence this decision include the level of observed or suspected hazards, period of time required to complete activity, and weather conditions.

If it is necessary to upgrade personal protection from Level D or C then site control measures need to be implemented. This control will help prevent transporting contaminants offsite and minimize exposures to onsite personnel. Site maps will be available which show special work zones if Level C conditions exist.

The buddy system will be observed in the exclusion and contamination reduction zones. Non-essential employees will remain at the support zone which will be delineated by a rope, safety/caution tape or barrier. No one will be permitted beyond that point unless authorized, certified and has read and signed the HASP. Theses zones will be set up with the support zone being furthest upwind.

All sodium permanganate handling activities will be performed in a manner to minimize health and safety risks. Sodium permanganate is a strong oxidant (igniting dry organic materials) and reacts violently with reducing agents (potentially causing an explosion that can propel the oxidant). Only subcontractors that are trained with the handling of sodium permanganate and it's associated risks shall be contracted for the remediation work. The area where the injection equipment and field personnel will be working will be cordoned off during all oxidant transfer, mixing and injection activities. All permanganate handling activities will be performed using the buddy system to provide immediate assistance in the case of an emergency. Prior to opening the sodium permanganate tote and transferring to a mixing tote, all project site personnel will be notified and all nonessential personnel will vacate the handling area (exclusion zone). As previously described, personnel handling the sodium permanganate will don the modified Level C personal protective equipment.

## 1.6 Contaminant Reduction Zone

Decontamination will occur in the contaminant reduction zone (CRZ). The type of decontamination procedures used will be based on the level of protection required. Decontamination of Level D protective wear will consist of brushing heavily soiled boots to remove soils (if applicable), rinsing gloves and safety glasses (and over boots, if worn) with water, and removing and storing coveralls in plastic bags before leaving the work area, if heavily soiled or suspected of having been in contact with site contaminants. The CRZ will be delineated in the field prior to commencement or work. Personnel handling the sodium permanganate will follow the subcontractor's site-specific HASP decontamination procedures.

## 1.7 Confined Spaces

Confined spaces are those which, by design or circumstance, present difficulties for entry and exit, or which may serve to reduce ventilation or concentrated vapors. These could include well pits, trenches, tanks, vaults, sewers, etc. There are no anticipated confined spaces based on the Scope of Work.

## 1.8 Contingency Plan For Emergencies

In the event of a safety or health emergency, appropriate corrective measures must immediately be taken to assist those who have been injured or exposed and to protect others from hazard. The onsite HSO will be notified of the incident immediately. If necessary, first aid will be rendered.

Onsite personnel will report any accident to the onsite HSO and an accident report form filled out. The HSO will be responsible for contacting Michael Manolakas the LBG Principal in charge.

Leggette, Brashears & Graham, Inc.
(203) 929-8555
Principal-in-Charge . . . . Michael Manolakas
Project Manager . . . . . . .Karen Destefanis
911 Police Headquarters
(845) 349-3700
Nyack Hospital-Emergency Room
160 North Midland Avenue
(845) 348-2000

### 1.8.1 Directions to Hospital

Travel north on Route 303 to Route NY-59 E (approximately 2.5 miles). Travel approximately 1.3 miles on NY-59 E. Continue onto Main Street approximately 0.1 mile. Turn left onto North Midland Avenue for approximately 0.3 mile. Nyack Hospital will be on your left. See the enclosed figure for mapped directions from the site to the Nyack Hospital.

### 1.9 Training

All site workers, including site managers, will provide documentation to the onsite HSO that the field personnel have been trained in the proper use of protective clothing and equipment in accordance with 29 CFR Part 1910, including:

- purpose of wearing respirators;
- how the respirator works;

- limitations;
- fit testing;
- maintenance; and
- conditions of use.

All LBG personnel, client representatives, regulatory personnel and field personnel shall be made aware of the particular hazardous substances which could be encountered during this project.

## 1.10 Medical Surveillance

The HSO will insure that each site worker involved in environmental sampling participates in an ongoing medical surveillance program, which includes baseline and annual follow-up exams.

# TABLE

# TABLE 1
# Former Materials Research Corp.
# 542 Route 303
# Orangetown, New York

**NIOSH/OSHA Exposure Limit for Compounds Likely to be Encountered**

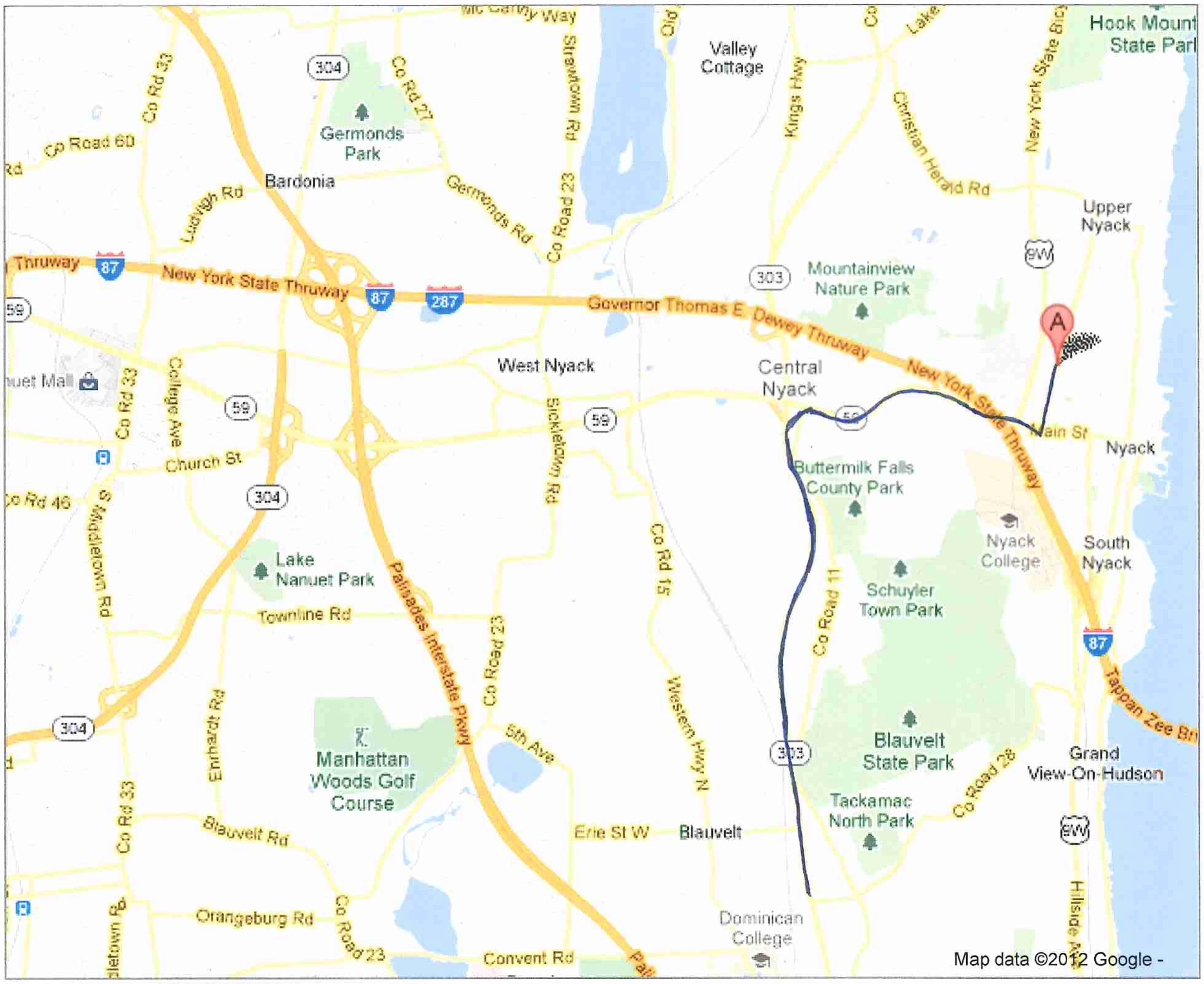
**During the Pilot Test**

| **Compound** | **NIOSH REL** | | | **OSHA PEL** | | | **IDLH** | **UEL** | **LEL** | **Vapor Pressure** | **Ionization Potential** | **Target Organs** | **Potential Health Effects** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **TWA** | **STEL** | **Ceiling** | **TWA** | **STEL** | **Ceiling** | | | | | | | |
| 1,2 Dichloroethylene | 200 ppm | NL | 790 $mg/m^3$ | 200 ppm | NL | 790 $mg/m^3$ | 1000 ppm | 12.80% | 5.60% | 180-265 mm | 9.65 eV | Eyes, respiratory system, central nervous system | Irritation to eyes; respiratory system, CNS and depression. |
| 1,1 Dichloroethene | CA | CA | CA | NL | NL | NL | ND | 15.50% | 6.50% | 500 mm | 10 eV | Eyes, respiratory system, central nervous system | Irritation to eyes; respiratory system, CNS and depression. |
| 1,1 Dichloroethane | 100 | NL | NL | 100 | NL | NL | 3000 | 11.40% | 5.40% | 182 mm | 11.06 eV | Eyes, respiratory system, central | Irritation to eyes; respiratory system, CNS and |
| Tetrachloroethylene | CA | CA | CA | 100 ppm | 200 ppm | 300 ppm | 150 ppm | NA | NA | 14 mm | 9.32 eV | Respiratory system, skin, eyes, central nervous system, liver, kidney | Irritated eyes, nose, throat, nausea, flush face, neck, dizziness, liver damage, etc. |
| 1,1,1 Trichloroethane | NL | NL | 350 ppm (15 min) | 350 ppm | NL | NL | 700 ppm | 12.50% | 7.50% | 100 mm | 11.0 eV | Central nervous system, kidney, liver, skin | Irritation of eyes, nose, throat; kidney and brain damage |
| Trichloroethylene | CA | CA | CA | 10 ppm | 25 ppm | 200 ppm (300 ppm for 5 min max) | CA 1000 ppm | 10.50% | 8% | 58 mm | 9.45 eV | Central nervous system, liver, skin, eyes, heart | Central nervous system: depression, decreased alertness, headache, sleepiness, loss of consciousness, irritation to eyes, skin, head. |
| Vinyl Chloride | CA | CA | CA | 1 ppm | NL | 5 ppm | CA | 30% | 3.60% | 3.3 atm | 9.99 eV | Liver, central nervous system, blood respiratory system, lymphatic system | Lassitude, abdominal pain, GI bleeding, enlarged liver, pallor of extremities |
| Sodium Permanganate | NL | NL | NL | .2 $mg/m^3$ | NL | 5 mg/m3 | NL | NA | NA | 760 mm | NL | eyes, respiratory system, liver, kidney | Eye damage, possible respiratory disorder, nausea, vomiting, liver and kidney damage, irritation to skin |

| | |
|---|---|
| TWA | Time weighted average |
| LEL | Lower explosion limit |
| UEL | Upper Explosion Limit |
| STEL | Short Tem Exposure Limit |
| IDLH | Immediately dangerous to life or health |
| OSHA | Occupational Safety and Health Administration |
| NIOSH | National Institute for Occupational Safety and Health |
| CA | NIOSH Potential Occupational Carcinogen/Minimize exposure |
| PEL | Permissible Exposure Criteria |
| REL | Recommended Exposure Limits |
| NL | Not Listed |
| NA | Not Applicable |

# MAP

To see all the details that are visible on the screen, use the "Print" link next to the map.



**Directions to Nyack Hospital**
160 N Midland Ave, Nyack, NY 10960
**4.2 mi** – about **11 mins**

542 New York 303, Orangeburg, NY 10962

| | |
|---|---|
| 1. Head **east** on **Glenshaw St** toward **NY-303 S** | go 308 ft<br>total 308 ft |
| 2. Turn left onto **NY-303 N**<br>About 6 mins | go 2.5 mi<br>total 2.5 mi |
| 3. Slight right toward **NY-59 E** | go 0.2 mi<br>total 2.7 mi |
| 4. Continue straight onto **NY-59 E**<br>About 2 mins | go 1.1 mi<br>total 3.8 mi |
| 5. Continue onto **Main St**<br>About 1 min | go 0.1 mi<br>total 3.9 mi |
| 6. Turn left onto **N Midland Ave**<br>Destination will be on the left<br>About 1 min | go 0.3 mi<br>total 4.2 mi |

**Nyack Hospital**
160 N Midland Ave, Nyack, NY 10960

# APPENDIX I

# Former Materials Research Corporation
# 542 Route 303
# Orangetown, New York
# Generic Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP), as described by the New York State Department of Health, 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. The intent of the CAMP 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 resulting from investigative and remedial activities. Air monitoring will be performed during the following activities: ground invasive work; well development, groundwater sampling and during the ISCO groundwater extraction activities; and any other activities which may release VOCs into the atmosphere. The monitoring plan will be in accordance with the generic CAMP, as outlined in Appendix 1A of the Final DER-10 Technical Guidance for Site Investigation and Remediation.

The generic CAMP includes continuous monitoring for all ground intrusive activities (which would include the installation of soil borings or monitor wells) and periodic monitoring for VOCs during non-intrusive activities (collection of groundwater samples, ISCO injection/extraction activities). Particulate monitoring will not be conducted during non-intrusive activities unless fugitive dust migration is observed during work activities.

The specific VOC and particulate monitoring requirements include:

- Monitoring frequency
- Response Levels; and
- Actions.

For VOC Monitoring, VOCs will be monitored at the downwind perimeter of the immediate work area (exclusion zone) on a continuous basis. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring will be performed using equipment that is capable of calculating 15-minute running average concentrations. The equipment will be calibrated at least daily for the contaminants of concern or for an appropriate surrogate.

For VOCs:

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

2. If the total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels greater than 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. Work activities can resume provided the total organic vapor level 200 feet downwind of the work area/exclusion zone or half the distance to the nearest residential or commercial structure, whichever is less, but in no case less than 20 feet, is below 5 ppm over background for the 15-minure average.

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

4. All 15-minute readings will be recorded and be available for NYSDEC and NYSDOH personnel to review. Instantaneous readings will also be recorded.

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

For particulates:

1. 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 of 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.

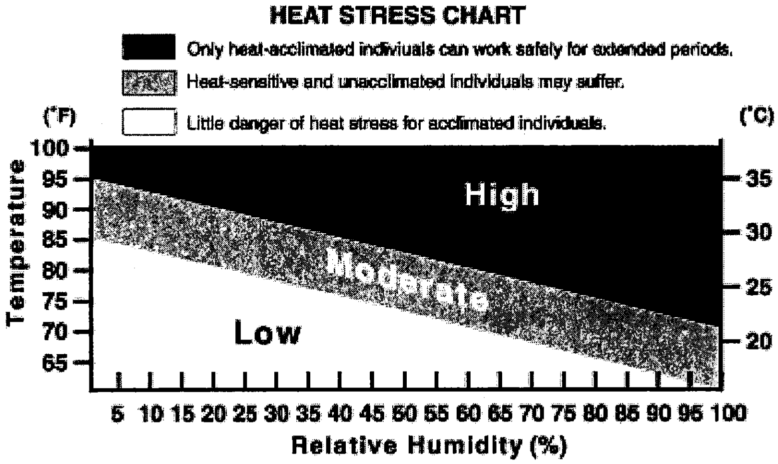
2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 (mcg/$m^3$) above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentrations to within 150 (mcg/$m^3$) of the upwind level and is preventing visible dust migration.

3. All readings must be recorded and available for NYSDEC and ROC and County Health personnel to review.

The location of sampling stations will vary based on wind direction and will be determined daily by the onsite supervisor (HSO, project manager, etc.). The location of sampling stations for each day’s activities will be recorded in the Daily Report.

H:\SONY\Orangetown\2015\RAWP\Appendix XI\Generic community Air Monitoring.docx

# APPENDIX II


HEAT STRESS CHART
Only heat-acclimated indiviuals can work safely for extended periods.
Heat-sensitive and unacclimated individuals may suffer.
Little danger of heat stress for acclimated individuals.
(°F)
(°C)
Temperature
100
95
90
85
80
75
70
65
35
30
25
20
High
Moderate
Low
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Relative Humidity (%)

# FORMER MATERIALS RESEARCH CORPORATION
542 ROUTE 303
ORANGETOWN, NEW YORK

## Wind Chill Factors

| | Apparent Temperature (Wind Chill) as a Function of Wind Speed and Actual Temperature * in $^{o}$F | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Wind speed (mph)** | **16** | **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **-1** |
| 4 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | -1 |
| 5 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | ` | 0 | -1 | -2 | -4 | -5 | -6 |
| 6 | 9 | 8 | 7 | 6 | 5 | 3 | 2 | 1 | 0 | -1 | -2 | -3 | -4 | -5 | -6 | -8 | -9 | -10 |
| 7 | 6 | 5 | 4 | 3 | 1 | 0 | -1 | -2 | -3 | -4 | -5 | -7 | -8 | -9 | -10 | -11 | -12 | -13 |
| 8 | 3 | 2 | 1 | 0 | -1 | -3 | -4 | -5 | -6 | -7 | -8 | -10 | -11 | -12 | -13 | -14 | -15 | -17 |
| 9 | 1 | 0 | -2 | -3 | -4 | -5 | -6 | -8 | -9 | -10 | -11 | -12 | -14 | -15 | -16 | -17 | -18 | -20 |
| 10 | -1 | -3 | -4 | -5 | -6 | -7 | -9 | -10 | -11 | -12 | -14 | -15 | -16 | -17 | -18 | -20 | -21 | -22 |
| 11 | -3 | -5 | -6 | -7 | -8 | -10 | -11 | -12 | -13 | -15 | -16 | -17 | -18 | -20 | -21 | -22 | -23 | -25 |
| 12 | -5 | -6 | -8 | -9 | -10 | -12 | -13 | -14 | -15 | -17 | -18 | -19 | -20 | -22 | -23 | -24 | -26 | -27 |
| 13 | -7 | -8 | -9 | -11 | -12 | -13 | -15 | -16 | -17 | -19 | -20 | -21 | -22 | -24 | -25 | -26 | -28 | -29 |
| 14 | -8 | -10 | -11 | -12 | -14 | -15 | -16 | -18 | -19 | -20 | -22 | -23 | -24 | -26 | -27 | -28 | -30 | -31 |
| 15 | -10 | -11 | -13 | -14 | -15 | -17 | -18 | -19 | -21 | -22 | -23 | -25 | -26 | -27 | -29 | -30 | -31 | -33 |
| 16 | -11 | -13 | -14 | -15 | -17 | -18 | -19 | -21 | -22 | -24 | -25 | -26 | -28 | -29 | -30 | -32 | -33 | -34 |
| 17 | -13 | -14 | -15 | -17 | -18 | -19 | -21 | -22 | -24 | -25 | -26 | -28 | -29 | -30 | -32 | -33 | -35 | -36 |
| | | | | | | | | | | | | | | | | | | |

**FORMER MATERIALS RESEARCH CORPORATION**
**542 ROUTE 303**
**ORANGETOWN, NEW YORK**

## Wind Chill Factors

| | Apparent Temperature (Wind Chill) as a Function of Wind Speed and Actual Temperature * in °F | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Wind speed (mph)** | **16** | **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **-1** |
| 18 | -14 | -15 | -17 | -18 | -19 | -21 | -22 | -24 | -25 | -26 | -28 | -29 | -30 | -32 | -33 | -35 | -36 | -37 |
| 19 | -15 | -16 | -18 | -19 | -21 | -22 | -23 | -25 | -26 | -28 | -29 | -30 | -32 | -33 | -35 | -36 | -37 | -39 |
| 20 | -16 | -17 | -19 | -20 | -22 | -23 | -24 | -26 | -27 | -29 | -30 | -32 | -33 | -34 | -36 | -37 | -39 | -40 |
| 21 | -17 | -18 | -20 | -21 | -23 | -24 | -26 | -27 | -28 | -30 | -31 | -33 | -34 | -36 | -37 | -38 | -40 | -41 |
| 22 | -18 | -19 | -21 | -22 | -24 | -25 | -27 | -28 | -29 | -31 | -32 | -34 | -35 | -37 | -38 | -40 | -41 | -42 |
| 23 | -19 | -20 | -22 | -23 | -25 | -26 | -28 | -29 | -30 | -32 | -33 | -35 | -36 | -38 | -39 | -41 | -42 | -44 |
| 24 | -20 | -21 | -23 | -24 | -25 | -27 | -28 | -30 | -31 | -33 | -34 | -36 | -37 | -39 | -40 | -42 | -43 | -45 |
| 25 | -20 | -22 | -23 | -25 | -26 | -28 | -29 | -31 | -32 | -34 | -35 | -37 | -38 | -40 | -41 | -43 | -44 | -46 |
| 26 | -21 | -23 | -24 | -26 | -27 | -29 | -30 | -32 | -33 | -35 | -36 | -37 | -39 | -40 | -42 | -43 | -45 | -46 |
| 27 | -22 | -23 | -25 | -26 | -28 | -29 | -31 | -32 | -34 | -35 | -37 | -38 | -40 | -41 | -43 | -44 | -46 | -47 |
| 28 | -22 | -24 | -25 | -27 | -28 | -30 | -31 | -33 | -35 | -36 | -38 | -39 | -41 | -42 | -44 | -45 | -47 | -48 |
| 29 | -23 | -25 | -26 | -28 | -29 | -31 | -32 | -34 | -35 | -37 | -38 | -40 | -41 | -43 | -44 | -46 | -47 | -49 |
| 30 | -24 | -25 | -27 | -28 | -30 | -31 | -33 | -34 | -36 | -37 | -39 | -40 | -42 | -43 | -45 | -46 | -48 | -50 |
| 31 | -24 | -26 | -27 | -29 | -30 | -32 | -33 | -35 | -36 | -38 | -39 | -41 | -43 | -44 | -46 | -47 | -49 | -50 |
| 32 | -25 | -26 | -28 | -29 | -31 | -32 | -34 | -35 | -37 | -39 | -40 | -42 | -43 | -45 | -46 | -48 | -49 | -51 |
| 33 | -25 | -27 | -28 | -30 | -31 | -33 | -34 | -36 | -38 | -39 | -41 | -42 | -44 | -45 | -47 | -48 | -50 | -51 |

**FORMER MATERIALS RESEARCH CORPORATION**
**542 ROUTE 303**
**ORANGETOWN, NEW YORK**

## Wind Chill Factors

| | **Apparent Temperature (Wind Chill) as a Function of Wind Speed and Actual Temperature * in °F** | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Wind speed (mph)** | **16** | **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **-1** |
| 34 | -26 | -27 | -29 | -30 | -32 | -33 | -35 | -36 | -38 | -40 | -41 | -43 | -44 | -46 | -47 | -49 | -50 | -52 |
| 35 | -26 | -28 | -29 | -31 | -32 | -34 | -35 | -37 | -38 | -40 | -42 | -43 | -45 | -46 | -48 | -49 | -51 | -52 |
| 36 | -26 | -28 | -30 | -31 | -33 | -34 | -36 | -37 | -39 | -40 | -42 | -44 | -45 | -47 | -48 | -50 | -51 | -53 |
| 37 | -27 | -28 | -30 | -31 | -33 | -35 | -36 | -38 | -39 | -41 | -42 | -44 | -46 | -47 | -49 | -50 | -52 | -53 |
| 38 | -27 | -29 | -30 | -32 | -33 | -35 | -37 | -38 | -40 | -41 | -43 | -44 | -46 | -48 | -49 | -51 | -52 | -54 |
| 39 | -27 | -29 | -31 | -32 | -34 | -35 | -37 | -38 | -40 | -42 | -43 | -45 | -46 | -48 | -49 | -51 | -53 | -54 |
| 40 | -28 | -29 | -31 | -32 | -34 | -36 | -37 | -39 | -40 | -42 | -43 | -45 | -47 | -48 | -50 | -51 | -53 | -55 |

* Courtesy of the National Weather Service

# APPENDIX XII

# SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN

# QUALITY ASSURANCE/QUALITY CONTROL PLAN
# FORMER MATERIAL RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## 1.0 INTRODUCTION

The Quality Assurance Project Plan (QAPP) that follows is site-specific and has been prepared for the activities to be completed during the proposed Remedial Action activities and any additional site characterization/remedial action investigations. The QAPP has been developed following general guidelines of the United States Environmental Protection Agency (EPA) "Quality Assurance Guidance for Conducting Brownfields Site Assessments" (OWSER Directive No. 9230.0-83P).

The objective of the QAPP is to provide sufficiently thorough and concise descriptions of the measures to be applied during the investigation such that the data generated will be of a known and acceptable level of precision and accuracy. The QAPP sets forth specific procedures to be used during sampling of relevant environmental matrices and analyses of data.

Sampling methods, sample preservation requirements, sample handling times, decontamination procedures for field equipment, frequency if for field blanks, field duplicates and trip blanks will conform to the NYSDEC Analytical Services Protocol (ASP).

## 2.0 MEASUREMENT DATA ACQUISITION

### 2.1 Sampling Design

The proposed sampling program includes:

- Collection of groundwater samples from monitor wells.
- Potential collection of soil samples based on field observations.

### 2.1.1 Groundwater Sampling

All groundwater samples will be collected using the low-stress purging and sampling technique. The methodology for this technique is outlined in the January 19, 2010 USEPA Region I, "Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells". In general, this procedure consists of removing groundwater from a well at an extremely low flow rate (e.g., 0.1 to 0.4 L/m [liters per minute]) using a bladder pump, centrifugal pump or peristaltic pump. For wells set in low permeable materials, an even lower flow rate than 0.1 L/m may be required. A sample is collected once stabilization has been achieved for the following parameters and variances for three consecutive readings: turbidity (10 percent for values greater than 1 NTU, DO (10 percent), specific conductance (3 percent), temperature (3 percent), pH (0.1 units) and ORP (10 millivolts). These parameters are measured using a multi-parameter water-quality instrument equipped with a flow through cell. Groundwater samples collected for analysis will be placed in properly labeled laboratory-supplied containers and stored in a chilled cooler until delivery to the laboratory. The standard operating procedure (SOP) and an example of the standard low-flow log are included in Appendix I.

### 2.1.2 Drilling of Soil Borings and Collection of Soil

Soil borings, to be completed as an injection/extraction or monitor well, will be drilled throughout the western portion of the Site using hollow stem auger. Select borings will be subject to collection of soil samples using a 2-foot, 2-inch outer diameter split-spoon sampling device. Split spoons will be decontaminated before and between each use. Decontamination procedures include brushing with an Alconox wash and rinsing with deionized water.

Soil samples collected for analysis will be placed in properly labeled laboratory-supplied containers and stored in a chilled cooler until delivery to the laboratory. Geologic logs will be completed for each boring and soils will be described in accordance with ASTM D2487 and ASTM D2488. All geologic logging of soil samples collected for analysis will follow the SOP included in Appendix II.

## 2.2 Sampling and Analytical Method Requirements

The groundwater and soil samples collected will be analyzed utilizing several methodologies. Analysis may include:

- Halogenated Volatile Organic Compounds (VOCs) by EPA Method 8260.
- Methane, ethene and ethane.
- Total Metals including arsenic, barium, cadmium, chromium, hexavalent chromium, copper and lead, and

- Inorganic compounds including chloride and sulfate.

Quality Assurance and Quality Control (QA/QC) samples will include duplicate, matrix spike, matrix spike duplicates and trip blanks. All samples for laboratory analysis will be submitted to York Analytical Laboratories (York) located in Stratford, Connecticut, or other NYSDOH-approved laboratory.

### 2.3 Field and Equipment Calibration and Corrective Action

Preventative maintenance of field equipment is required in order to ensure the collection of valid field measurements. As part of the calibration procedures, field equipment is tested during the calibration process. These processes ensure only equipment in the proper working order is utilized during the Remedial Action activities.

The photoionization detector (PID) and multi-parameter water quality instrument with flow through cell used during the Remedial Action sample collection will be calibrated at a minimum on a daily basis. Additional calibration will be completed on an as needed basis. Calibration will be completed pursuant to operating manuals.

### 2.4 Sample Handling and Custody Requirement

The following documentation procedures will be used during sampling and analyses to provide Chain-of-Custody control during transfer of samples from collection through analyses. Record keeping documentation will include use of the following:

- field log book (bound with numbered pages) to document sampling activities in the field;
- labels to identify individual samples; and
- Chain-of-Custody record sheet to document analyses to be completed.

### 2.4.1 Field Log Book

Measurement data will be generated in many field activities. These data include, but are not limited to, the following:

i) documenting time and weather conditions;
ii) observation of sample appearance and other conditions;
iii) water-quality field parameters for the low stress, low flow purging method.

The general QA objective for measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the use of standardized procedures. In the field, the sampler will record the following information in the field log book for each sample collected:

- sample number (all samples will have a unique identification)
- sample matrix;
- name of sampler;
- sample source;
- time and date;
- pertinent data (e.g., location, sample interval);
- analysis to be conducted;
- sampling method (e.g., low flow stress purging sampling or bailer)
- description of each sample (turbidity, color, smell, etc.);
- number of sample bottles collected; and
- pertinent weather data.

Each field log book page will be signed by the sampler. A unique sample numbering system will be used to identify each collected sample. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. Field record keeping will follow standard operating procedures identified in Appendix III. All analytical results will be entered into an electronic database.

### 2.4.2 Chain-of-Custody Records

Chain-of-Custody forms will be completed for all samples collected during the investigation to document the transfer of sample containers. A typical sample of the Chain-of-Custody form and the standard operating procedures are included in Appendix IV.

If the cooler will not be within LBG control when delivered to the laboratory, custody seals (provided by the laboratory) will be placed around each cooler and the cooler will then be sealed with packing tape. All samples will be refrigerated at $4^0$C ($\pm 2^0$ C) using wet ice and delivered to the laboratory within 48 hours of collection. All samples will be delivered to the laboratory by laboratory personnel, or by LBG field personnel. All samples will be maintained at $4^0$C (±$2^0$ C) by the laboratory.

The Chain-of-Custody record, completed at the time of sampling, will contain, but not be limited to, the sample number, date and time of sampling, and the name of the sampler. The Chain-of-Custody document will be signed, timed, and dated by the sampler when transferring the samples.

Each sample cooler being delivered to the laboratory will contain a Chain-of-Custody form. The Chain-of-Custody form will consist of the original and possibly a carbon copy. The shipper will maintain a copy while the other will be enclosed in a waterproof envelope within the cooler with the samples. The sample number of each sample shipped will be recorded on the sheet. The cooler will then be sealed properly for shipment. The laboratory, upon receiving the samples, will complete the Chain-of-Custody form. The laboratory will maintain one copy for their records. One copy will be returned to LBG upon receipt of the samples by the laboratory. One copy will be returned to LBG with the data deliverables package.

If not delivered by LBG personnel, upon receipt of the cooler at the laboratory, the shipping cooler and the custody seal will be inspected by the designated sample custodian. The condition of the cooler and the custody seal will be noted on the Chain-of-Custody record sheet by the sample custodian. The sample custodian will record the temperature of one sample (or temperature blank) from each cooler and the temperature will be noted on the Chain of Custody. If the shipping cooler seal is intact, the sample containers will be accepted for analyses. The sample custodian will document the date and time of receipt of the container (on the Chain-of-Custody), and sign the form.

If damage or discrepancies are noticed (including sample temperature exceedances), they will be recorded in the remarks column of the record sheet, dated and signed. Any damage or discrepancies will be reported to the laboratory supervisor who will inform the lab manager and QA Officer before the samples are processed.

### 2.5 Analytical Sensitivity and Project Criteria

The fundamental QA objective with respect to the accuracy, precision and sensitivity of analytical data is to achieve the QC acceptance criteria of each analytical protocol. The purpose of the analytical work completed during the Remedial Action activities is for the chemical characterization of site ground water before and following *in situ* chemical oxidation (ISCO) treatment.

The targeted quantitation limits for the Remedial Action will be in accordance with the analytical methods specified. The specified methods are capable of achieving detection limits at or below the applicable NYSDEC Technical and Operational Guidance Series (TOGS) numerical criteria.

The method accuracy for samples will be determined by spiking selected samples (Matrix Spikes) with all spiking compounds specified in the analytical methods. Accuracy will be reported as the percent recovery of the spiking compound(s) and will be compared with the criteria given in the appropriate methods.

The method(s) precision (reproducibility between duplicate analyses) will be determined from the duplicate analysis of matrix spike samples for organic parameters.

Sampling and analytical precision will be determined from the collection and analysis of field duplicate samples.

## 2.6 Field Quality Control Requirements

To assess the quality of data resulting from the field sampling program, field duplicate samples, field blanks and samples for matrix spike analysis will be collected (where appropriate) and submitted for laboratory analysis. Field QA/QC samples that will be provided by LBG to the analytical laboratory will be identified as:

- Field duplicate samples will be collected at a frequency of one per 20 Remedial Action/investigative samples.
- Field (rinse) blank samples will be collected at a frequency of one per 20 Remedial Action/investigative samples.
- Triple sample volume will be supplied to the laboratory by LBG in order to perform matrix spike and matrix duplicate analyses at a frequency of one per 20 Remedial Action/investigative samples.

Field (rinse, equipment) blanks will be analyzed to check procedural contamination from sampling device cleaning procedures, and ambient conditions at the site. Field duplicate samples will be analyzed to assess sampling and analytical reproducibility. Spike and duplicate samples will be analyzed to evaluate analytical accuracy and precision.

## 2.7 Laboratory Quality Control Requirements

Laboratory equipment testing, maintenance and inspections are completed by both outside contractors and in-house certified technicians. The testing, inspection and maintenance is completed pursuant to EPA methodologies and equipment specifications. Standard operating procedures for the testing and inspections are maintained at the laboratories.

Laboratory equipment will be calibrated by trained laboratory technicians or outside contractors pursuant to equipment operating manuals and EPA analytical methodologies. In addition, the frequency of the calibrations will be completed pursuant to EPA methodologies.

Corrective action procedures in the laboratory are normally initiated by the analytical laboratory personnel (and their supervisors) directly involved with the analysis of the samples and by implementing of the procedures presented in this QAPP. Quality Control (QC) records for daily instrument calibration, replicate analyses, and surrogate analysis are utilized to indicate the necessity for corrective action. Control records shall be established for each procedure indicating upper and lower limit ranges. At the point when control records indicate a determination is outside the warning ranges, investigation into the cause will be initiated.

The laboratory analyst shall verify that all quality control procedures are followed and that the results of the analysis of quality control samples are within the allowable acceptance criteria. This requires that the analyst assess the correctness of all the following items as appropriate:

- sample holding times;
- sample preparation procedure;
- initial calibration;
- calibration verification;
- method blank result;
- duplicate analysis;
- laboratory control standard;
- fortified sample result; and
- practical quantitative limits.

If the assessment reveals that any of the QC acceptance criteria are not met, the analyst must immediately assess the analytical system to correct the problem. The analyst will notify the Laboratory Manager and Laboratory Quality Assurance (QA) Manager of the problem and, if possible, identify potential causes and corrective action. Copies of the form summarizing these actions are provided to the Laboratory Manager and Laboratory QA Manager.

Data generated concurrently with an out-of-control system shall be evaluated for usability in light of the nature of the deficiency. If the deficiency does not impair the usability of the results, data is reported and the deficiency is noted in the case narrative. Where sample results are impaired, the Laboratory QA Manager is notified and appropriate corrective action (e.g., re-analyses) is taken.

The routine analytical corrective action procedures within the laboratory are documented and may result in the re-analysis of samples or recalibration of analytical instrumentation. Routine corrective action shall take place as necessary and does not require the approval of the Project QA Manager. However, should significant events occur such as simple breakage or loss, exceeding sample holding times, extensive instrumentation downtime, or changes or additions to sample cleanup for removal of interferences, the laboratory shall report these to the Project Manager immediately.

## 2.8 Data Management & Documentation

### 2.8.1 Field Documents and Records

A bound field book and/or pre-printed forms will be used to log data. Copies of the field book entries, field maps used to locate sample locations and any additional field forms will be copied and provided to the Project Manager for review and will be stored in the project file. Field logs, boring logs and groundwater sample logs will be provided to the Project Manager for review at the completion of the field work. These records will be stored in the project file and will be appended to the investigation report.

A Chain-of-Custody (COC) form will accompany the samples at all times. A copy of the Chain-of-Custody will be kept in the project file and the original will accompany the samples delivered to the laboratory.

### 2.8.2 Laboratory Documents and Records

The laboratory will assign each sample or group of samples a unique laboratory identification number. The laboratory Sample Custodian will record the client name, sample number, and date of receipt in the laboratory Sample Control Log Book. The sample temperature will be measured by the lab upon receipt of the samples and will be recorded on the Chain-of-Custody. Samples removed from storage for analysis will also be documented in the laboratory Sample Control Log Book.

The laboratory will be responsible for maintaining analytical log books and laboratory data as well as a sample inventory for submittal to LBG on an “as required” basis. Raw laboratory data produced from the analysis of samples will be maintained by the laboratory in case further evaluation of the data is requested. LBG will designate on the Chain-of-Custody which samples are to be held at the laboratory for an extended period of time to allow for further analysis pending the results of the initial analysis requested. The laboratory will provide routine data packages that will include the following:

- Sample results, including sample preparation and analysis dates, percent solids for soil/sediment, units, and reporting levels;
- Case narrative explaining qualified data, observations, method deviations;
- Matrix spike/matrix spike duplicate or lab control/lab control duplicates results and acceptance limits;
- Surrogate recoveries, if applicable; and,
- Method blank results.

### 2.8.3 Post-Laboratory Data Manipulation

Upon receipt of the laboratory data package, LBG will conduct a Data Quality Assessment (DQA) and Data Usability Evaluation (DUE). The DQA will include a completeness check and review of consistency with this QAPP, including evaluation of precision and accuracy and any QC non-conformances identified by the laboratory in the case narrative of the data package. Limitations on use of the data and/or rejected data will be identified in the Final Engineer Report (FER).

The sample results will be summarized in a table along with the applicable remediation standards. The summary table will be generated using Microsoft excel or access, and will be checked for transcription errors. Copies of the laboratory data packages will be provided in the

FER. Electronic copies of the laboratory data packages will also be maintained in the project file.

Software that is routinely used for data reduction, reporting and data manipulation include, Excel (Microsoft), Access (Microsoft), Grapher (Golden Software), AutoCAD, Surfer, and ARC GIS (ESRI).

# 3.0 ASSESSMENT AND OVERSIGHT

## 3.1 Assessment and Response Actions

### 3.1.1 Field Data

Problems are often encountered that require corrective action in order to conform to the QAPP requirements. The entire project team will become familiar with the QAPP and copies will be available at the project site during site activities for reference.

The LBG Program Geologist will be on site during all investigation activities. The Program Geologist is responsible for ensuring that methods and procedures used for collection of environmental samples conform to the QAPP and SOPs. Each of the field staff will be equipped with a portable telephone for use in seeking direction from the LBG Project Manager or QA Officer as needed. The Program Geologist will report any problems encountered or deviation from the QAPP to the LBG Project Manager or QA Officer and will document the deviations in the field logbook. The Program Geologist will send copies of the field data collection forms and logbook to the LBG Project Manager or QA Officer on a daily basis during the field investigation for evaluation of conformance with the QAPP, SOPs, and a completeness check. Minor adjustments to the sampling design may proceed with notification given to the project QA Officer and documentation in the field logbook.

Field data collection forms, (i.e. boring logs, groundwater-sample logs, field-logbook notes), will be reviewed by the LBG QA Officer for completeness. The LBG QA Officer will evaluate the data reported in the field data forms during the DQA/DQE process and will report any findings that may limit use of the data or qualification of the data set in the FER.

The LBG Project Manager or QA Officer will inspect field activities on the first or second day of the field investigation to observe progress and conformance with the QAPP. Oversight and documentation of subcontractor activities in the field will be performed by the LBG Program Geologist. If a significant problem is encountered, i.e. impact to field staff or public safety, or requires significant deviation from the QAPP, the Program Geologist will immediately notify the LBG QA Officer and/or LBG Project Manager who will implement corrective action. The LBG Project Manager will notify the NYSDEC before continuing with any field work.

### 3.2 Project Reports

The LBG Project Manager will provide monthly status reports to the NYSDEC and NYS DOH. The monthly status report will describe the field work conducted, field observations, geologic/well logs, and evaluation of data quality with respect to the project-specific cleanup criteria. A summary data table and relevant cleanup criteria/standards will be provided with results exceeding criteria highlighted. The monthly status report may include maps depicting sample locations, sample identification numbers, pertinent site and surrounding area details, groundwater contours and flow direction, and contaminant distribution across the site to the extent allowed by the data collected.

The FER will include an evaluation of the data. Copies of all laboratory-data reports, field forms, pertinent photographs, and documentation of any required agency notifications made as a result of the Remedial Action will be appended to the report.

The FER will be submitted to the NYSDEC and NYS DOH in electronic format on a CD with proper indexing.

## 4.0 DATA EVALUATION

### 2.1 Field-Data Evaluation

Field data will be evaluated by the LBG QC Officer or LBG Project Manager as the data is generated by the field staff. This data includes the soil-boring logs, well-completion details, field-screening results, groundwater-elevation survey, groundwater-sampling logs, and sample-custody forms. The data will be used to document the effectiveness of the ISCO treatment. Soil-boring logs, well-completion details and laboratory data will be tabulated for inclusion in the investigation report. Trends, anomalies, and correlation between field data and laboratory data will be evaluated and presented in the FER.

## 4.2 Laboratory Data Evaluation

The laboratory analytical results will be reviewed by the LBG QA Officer or Project Manager, with assistance from a LBG Hydrogeologist who is trained in data validation principles, to determine that the data reports have met the requirements of the QAPP. Chain-of-Custody forms will be reviewed to determine that appropriate sample preservatives were used and sample holding times were met. A completeness review will be performed to ensure that results for all of the requested analyses, including field QC samples, have been received and reporting levels were achieved.

Laboratory data will be compared to standards and criteria established in the RAWP. As such, a QA/QC evaluation will be performed as the data is received from the laboratory to determine if the data is of sufficient quality in relation to the project-specific DQOs. The QA/QC evaluation will reveal whether bias in the results or QC nonconformances affect the usability of the data for its intended purpose.

The DQA process will include a review of the laboratory QC samples including the lab method blanks, surrogate recoveries, spiked samples, replicates and calibration samples, sample dilutions, detection limits and any issues identified in the case narrative.

Laboratory QC samples, including the laboratory blank (instrument blank) and laboratory control sample will be evaluated. The laboratory blank results will be evaluated to determine if contamination may have been introduced into the sample from the laboratory instrumentation. The laboratory control sample will be evaluated to assess the accuracy of the reported sample results.

Field QC samples, including trip blanks for VOC-sample analysis will always be collected for analysis when samples are to be analyzed for VOCs. Results from these samples will be reviewed by the LBG QA Officer to determine whether sample containers may have become contaminated during transportation and storage.

The relative percent difference between duplicate samples will be evaluated to ensure the accuracy and reproducibility of the data and sampling methodology are within acceptable limits. The field blank will be used to assess potential contamination contributed from sampling location conditions, transport, handling, and storage of the samples. Equipment rinsate-blank results will be obtained when sampling equipment is decontaminated and re-used in the field to determine if decontamination procedures were adequate.

## 4.3 Data Usability and Project Evaluation

Data usability assessment is the process of evaluating data to determine its suitability for decision making with respect to the DQOs. The sample results will be tabulated in a summary table together with the applicable clean-up criteria evaluation. The data-summary table will be checked for transcription errors and appropriate units.

Any limitations on the use of the data, i.e. sensitivity, precision, and accuracy, will be discussed in the context of project findings and conclusions. Particular attention will be focused on whether reporting limits (RLs) for contaminants of concern are at or near the cleanup action levels established in the RAWP. Duplicate results, when available, will be used to evaluate the heterogeneity of the sample matrix, which may impact the usability of low-level results that are at or near the cleanup-action levels.

The usability of samples with elevated RLs that occur as a result of sample dilution during analysis will be evaluated. When elevated RLs occur as a result of sample dilution, the LBG QA Officer or Project Manager will contact the laboratory to determine the reason for the dilution and whether re-analysis should be performed to salvage the data. Groundwater-sample logs from low-flow sampling will be evaluated to determine if elevated turbidity may contribute to elevated contaminant concentrations reported by the laboratory when the result is at or near the cleanup-action levels or RL.

Observations made from the data including trends, anomalies, or data gaps will be documented in the FER, in addition to any limitations on the use of the data.

## 4.4 Project File

Evidentiary files for the entire project shall be inventoried and maintained by LBG and shall consist of the following:

i) project related plans;
ii) project log books;
iii) field data records;
iv) sample identification documents;
v) Chain of Custody records;
vi) report notes, calculations, etc.;
vii) lab data, etc.;

viii) references, copies of pertinent literature;
ix) miscellaneous - photos, maps, drawings, etc.; and
x) copies of all final reports pertaining to the project.

The evidentiary file materials shall be the responsibility of the project manager with respect to maintenance and document removal. Records will be maintained until the Certificate of Completion is issued by the NYSDEC.

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# APPENDIX I

## 1.0 Objective

The objective of this guideline is to provide general reference information on the field methods to be used for the collection of groundwater samples from monitoring wells. Through the use of these methods as the default, standardized approach, and in conjunction with other site-specific methods and procedures in the site-specific Sampling Plan, the goal is to encourage the collection of representative and reproducible groundwater samples. These methods emphasize the need to minimize hydraulic stress by using low purging rates to limit water-level drawdown and monitoring field parameters to determine when sample collection may begin.

This guideline is adapted from U.S. Environmental Protection Agency (EPA) Region I and II guidance documents. The EPA guidance documents may be more limited in their application (e.g., wells greater than 1.5 inches in diameter, wells where the water level is above the top of the screen), but these methods still represent a reasonable set of practices to best achieve the goal of collecting representative groundwater samples.

## 2.0 Equipment and Supplies

The following items are suggested for the proper administration of low-flow groundwater sample collection:

### 2.1 *Documents*

- Field logbook
- Sampling Plan
- Site map with monitoring well locations marked out
- Quality Assurance Plan
- Health & Safety Plan
- Monitoring well construction data
- Field data from last sampling event
- Monitoring instruments operation, maintenance and calibration manuals
- Instrument calibration standards
- Field Instrument Calibration Logs
- Blank Low-Flow Sampling Logs and
- Blank Chain-of-Custody Forms

2.2 *Protective Equipment (As directed by the Health and Safety Plan)*

- Hard hat
- Steel-toed boots
- Safety glasses
- Reflective vest
- Gloves, usually nitrile
- Rain gear or cold-weather gear as necessary

2.3 *Sampling Equipment and Gear*

- Groundwater extraction device: peristaltic, bladder or submersible pump as directed by the Sampling Plan
- Tygon pump-head tubing and polyethylene, Teflon or Teflon-lined polyethylene as in-well tubing as dictated by the Sampling Plan and tubing connectors, as appropriate – note that, when sampling for analysis of volatile organic compounds (VOCS), it is recommended that the pump-head tubing and the in-well tubing are of the same inside diameter
- Electronic tape (e-tape), oil-water interface probe or chalk, water finding paste and tape measure as directed by the Sampling Plan
- Volumetric container (such as a graduated cylinder) and watch for measuring pumping rate
- 5-gallon graduated bucket used to measure total water purged from the monitoring well
- External power source such as a battery or generator
- A multi-parameter, water-quality probe with flow-through cell (Horiba or YSI) capable of pH, specific conductance, dissolved oxygen, oxidation-reduction potential and temperature measurements
- A separate turbidity meter
- A “T” connector with a valve to be connected between the pump tubing and the flow-through cell
- Decontamination supplies: Alconox, distilled/deionized water, bleach solution etc., buckets, brushes
- Sample bottles-size and type required, plus extras for blanks, duplicate samples, matrix-spike and spike duplicate samples, as appropriate, and in case of breakage or contamination, along with labels
- Clean cooler with ice, Chain-of-Custody Forms and trip blank

2.4 *General Supplies*

- Keys for site and well access
- Clipboard and waterproof pen, ball point pen, felt-tip marker (indelible ink, such as a ‘Sharpie’)
- Calculator for determining parameter stabilization
- Flashlight and extra batteries

- Toolbox
- Camera

## 3.0 Documentation

### 3.1 *Field Log*

Personal logs should be kept current during the administration of field activities. Field notes will include:

- project name, client name and site address
- weather and site conditions
- pertinent site activity information (e.g., boring or well number, water-level measurements, total depth of wells, etc.)
- time of arrival and departure from the site

### 3.2 *Instrument Calibration Log (if required by the Sampling Plan)*

An Instrument Calibration Log shall accompany the field notes and Low-Flow Sampling Log and serve as a record of instrument calibration. A copy of the Instrument Calibration Log is included at the end of this SOP.

### 3.3 *Low-Flow Sampling Log*

A Low-Flow Sampling Log will be written for each monitoring well scheduled to be sampled and will include the following:

- sample date and total number of wells scheduled to be sampled
- client name, project location and sampler's name
- equipment/instrument identification (pump and monitoring equipment) manufacturer and model number
- well identification number, well diameter, total well depth, depth to water and time of measurement
- well screen setting, tubing intake setting, description of well condition
- water-quality monitoring parameters (pH, conductivity, turbidity, dissolved oxygen, temperature and oxidation/reduction potential (ORP)), depth to water, evacuation rate and time of measurements
- record of stabilization of parameters
- total volume of water purged
- sample time

A copy of the Low-Flow Sampling Log is included at the end of this SOP.

## 4.0 Calibration of Field Instruments

Prior to the sampling event and mobilization to the site, check all instruments to ensure they were decontaminated following the last use and that all sensors are in working condition. Check to make sure that spare batteries of appropriate size, calibration and maintenance manuals are included in the travel case.

Once on the site, calibrate the field instruments per manufacturer instructions and document the calibration on the Instrument Calibration Log.

If weather and/or site conditions change greatly during the sampling event or if any of the water-quality probes do not appear to be functioning properly, check the calibration in measurement mode and recalibrate if necessary. Document all calibration checks and associated recalibration on the Instrument Calibration Log.

At the end of the day, check and document the calibration in measurement mode. If directed by the Sampling Plan, a copy of the instrument calibration log is to be included with the Low-Flow Sampling Log in the project file.

## 5.0 Onsite Procedure

5.1 The well sampling sequence should consider the available water-quality information. Generally the well sampling sequence should progress from the least to the most contaminated wells, unless directed otherwise.

5.2 Calibrate the water-quality probe prior to the initiation of well sampling.

5.3 Open the well and obtain a water-level measurement. Use the well log to determine the mid point of the most-permeable zone in the screened interval; that will be the setting for the tubing intake. In the absence of that information, identify the mid-point of the effective screen length. Note: It is best not to measure the total depth of the well the same day that the well will be sampled as this can dramatically increase the turbidity. If it is not possible to measure the total depth the day before the sampling event, the total depth of the well should be measured after the groundwater sample is collected.

5.4 All sampling, monitoring equipment and supplies will be placed on plastic sheeting. Lower the tubing into the well, setting the tubing intake at the previously calculated intake depth. Attach the well tubing to the peristaltic pump-head tubing. When using a submersible pump, slowly introduce the pump so as not to disturb sediment accumulated in the well. When directed by the Sampling Plan, connect a 'T' connector with a valve on the pump-discharge tubing (prior to the flow-through cell). When a turbidity measurement is required, the valve can be opened and a sample collected in a vessel and turbidity measured with a free-standing turbidity meter, rather than through the flow-through-cell.

5.5 Begin pumping. Water should be pumped from the well starting at a low rate, which can be increased until discharge occurs. At the initiation of pumping, a brief spike of turbid water might discharge from the tubing. It is best to purge this initial spike of turbid water for about 5 minutes prior to attaching the tubing to the flow-through cell. The depth of intake and purge rate should be consistent at a given well between sampling rounds, if possible.

5.6 Following the initial tubing purge, connect the Tygon tubing to the bottom intake of the flow-through cell. Once the tubing is connected to the cell, place the cell on an elevated surface (e.g. bucket, table, etc.) and attach another section of Tygon tubing so that the purge water drains into a purge bucket.

5.7 The pumping rate will depend on the formation characteristics and the effectiveness of the well development, but rates between 100 and 200 milliliters per minute (ml/min) are common. Adjust the pump speed to *minimize water-level drawdown, with the goal being to keep drawdown to less than 0.3 feet*. It may be necessary to drop the pumping rate below 100 ml/min to maintain a water-level drawdown of 0.3 feet or less or if the purge water is high in turbidity. If the water-level drawdown exceeds 0.3 feet but remains stable, continue purging, however, the volume of water purged must exceed the volume displaced from the well (and sand pack) prior to sample collection. If water-level stabilization does not occur, consult the Sampling Plan or the project manager for alternative procedures. The pumping rate should be monitored through volumetric timing at approximate 5-minute intervals and recorded. An electric tape should be used to make depth to water readings at approximate 5-minute intervals along with the purge-rate measurements.

5.8 Turn on the water-quality meter and begin taking indicator-parameter readings every 5 minutes or greater, as appropriate, based on the flow rate and the size of the flow-through cell. Readings must be sufficiently spaced to allow turnover of the contents of the flow-through cell between readings. Keep the purge rate stable (at the rate at which water-level stabilization occurred).

5.9 Record the indicator parameters (pH, specific conductance, dissolved oxygen, ORP, temperature and turbidity) along with the depth to water and evacuation rate on a Low-Flow Sampling Log. A copy of a Low-Flow Sampling Log is attached to this document.

5.10 Between indicator-parameters readings, the stabilization percentages should be calculated and recorded on the bottom section of the Low-Flow Sampling Log. The allowable parameter variation for pH is +/- 0.1. The allowable parameter variation percentage for conductivity is +/- 3%. The allowable parameter variation percentage for turbidity is +/- 10% for values greater than 5 NTUs. The allowable parameter variation percentage for dissolved oxygen is +/- 10% for values greater than 0.5 mg/L. The allowable parameter variation percentage for temperature is +/- 3%. The allowable parameter variation percentage for ORP is +/- 10 millivolts. Parameter stabilization is achieved when three consecutive readings of the indicator parameters at 5-minute or greater intervals meet the recommended stabilization criteria.

5.11 Once the indicator parameters have stabilized, disconnected the Tygon from the intake of the flow-through cell and fill the appropriate sample bottles. Do not increase the pumping rate. Note: Never collect a sample from the discharge of the flow-through cell because it could lead to cross contamination. During sampling, the pump tubing must remain filled with water to avoid aeration. If a sample is being collected for dissolved metals, filter the water using an in-line filter before placing sample in the preserved bottle. Fill out the required information (well ID, sample date and time, preservative, site location, sampler’s initials, and analysis required) on the sample labels. Place bottles in a cooler with ice and secure.

5.12 After the sample is collected, remove the tubing from the well and measure the total depth of the well if it has not been measured yet. Put the cap and cover securely back on the well. Note and record any well-condition issues.

5.13 Place disposable materials in a trash bag.

5.14 Record the total volume of water purged on the Low-Flow Sampling Log and dispose of the purge water in an appropriate manner.

5.15 When required by the Sampling Plan, collect a field/equipment blank (typically for submersible, not peristaltic pumps) by pumping deionized water through an unused section of tubing.

5.16 Check the calibration of the field instruments in measurement mode anytime the readings appear suspect (e.g., negative DO, apparent drift, etc.) and at the end of the day and document on the Instrument Calibration Log.

## 6.0 Decontamination

Decontaminate sampling equipment prior to use in the first well, then following each well and at the end of the day. Decontaminate equipment that will be used in multiple wells (i.e. electric tape, steel tape) with Alconox and deionized water or as directed in the Sampling Plan. Rinse the flow-through cell and probes in deionized water.

## 7.0 Sample Delivery

Complete the Chain-of-Custody Form for the samples and deliver the iced samples to the pre-selected laboratory. Relinquish the samples to the lab by signing and dating the appropriate section of the Chain-of-Custody Form. If samples are not being delivered or picked up on the day of sampling, ensure that the samples are maintained at an adequate temperature by icing or placing in a refrigerator dedicated for the storage of groundwater samples. If leaving samples in an LBG refrigerator, relinquish the samples to the refrigerator.

## 8.0 Precautions

- Sample tubing and flow-through cell must be completely filled with water, no air bubbles.
- Avoid the use of tubing constrictors to control discharge rates, as this will cause pressure differentials and possible VOC loss.
- When the water level is above the top of the screen prior to purging, avoid lowering the water level below the top of the screen during the purging and sampling process.
- If one or more field parameters have not stabilized after 10 consecutive readings, if water-level stabilization is not achieved or if there is excessive drawdown of groundwater, consult the Sampling Plan and/or contact the project manager for alternate sampling procedures. Any alternate procedures are to be documented on the Low-Flow Sampling Log.
- In order to prevent heating of the tubing and field instruments or possible off-gassing of VOCs, keep all equipment out of direct sunlight. If necessary, use an umbrella, tent or other device to shade the sampling equipment.
- Tubing exiting the monitoring well should be kept as short as possible.
- Keep calibration liquids at the same approximate temperature as the expected temperature of the groundwater to be sampled.

- Keep monitoring equipment and sampling bottles away from truck/vehicle or generator exhaust.

## 9.0 References

EPA, Region I, Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells, EQASOP-GW 001, January 19, 2010

EPA, Region I, Standard Operating Procedure Calibration of Field Instruments, EQASOP-FieldCalibrat, January 19, 2010

EPA, Region II Low Stress Groundwater Sampling Protocol, GW Sampling SOP, March 16, 1998

K:\References\SOPs\Low-Flow Low-Stress Groundwater Sample Collection 3-2A.doc

# APPENDIX II

## 1.0 Objective

To provide a method for the preliminary investigation of subsurface volatile organic compound contamination.

## 2.0 Applicability

Soil-vapor analysis is commonly used to characterize unsaturated zone contamination by volatile organic compounds. Soil-vapor data are useful in determining the areal and vertical location and extent of contamination. Common target compounds are volatile petroleum constituents (BTEX) and chlorinated solvents (e.g., TCA, TCE and PCE).

## 3.0 Definitions

Soil vapor -- the gas phase of a volatile contaminant within the interstitial pores of the soil/rock matrix.

## 4.0 Equipment

The following general equipment is recommended for soil vapor screening:

- PID/FID (e.g., Thermo Environmental Model OVM 580B, HNU 101, MiniRae, etc.)
- sample jars with lids (approximately 500 mL or state required minimum)
- aluminum foil
- zip-lock plastic bags

## 5.0 Procedure

1. Transfer a representative portion of the soil sample into the sample jar, or plastic zip-lock bag, and fill it approximately halfway.
2. If using a jar, seal it with a piece of aluminum foil. If using a plastic zip-lock bag, seal the opening.
3. Store the sample for approximately 20 minutes in a warm area or until sufficiently volatilized.
4. In order to take a measurement, push the intake probe of the PID instrument through the foil, or plastic bag, taking care not to allow soil or water to enter the intake.
3. Record the highest reading, which usually occurs within 5 seconds of puncturing the
4. aluminum foil or plastic bag. Allow meter to return to the background reading before the next measurement is made.

## 6.0 Documentation

Record all measurements in log.

## 1.0 Objective

The objective of this guideline is to provide methods and to describe the sequence of operations and equipment necessary to perform penetration tests and to take representative subsurface soil samples with split barrel or piston-type samplers during field activities. The methods are based on ASTM D1586-67 (1974), Method for Penetration Test and Split Barrel Sampling of Soils, and ASTM D1587-74, Thin-Walled Tube Sampling of Soils.

## 2.0 Applicability

The methods are applicable to penetration testing and soil sampling at hazardous substance sites. Since the testing and sampling are usually performed by subcontractors, the methods will govern their operations.

## 3.0 Definitions

Clay -- Fine-grained soil or portion of soil that can be made to exhibit plasticity within a range of water content and that exhibits considerable strength when air-dried.

Gravel -- Rounded or semirounded particles of rock that will pass a 3-in. U.S. standard sieve and be retained on a No. 4 U.S. standard sieve.

Rock -- Natural solid mineral matter occurring in large masses or fragments.

Sand -- Particles of rock that will pass a No. 4 sieve and be retained on a No. 200 sieve.

Silt -- Material passing the No. 200 U.S. standard sieve that is nonplastic to slightly plastic and that exhibits little or no strength when air-dried.

Soil -- Sediments or other unconsolidated accumulations of solid particles that are produced by the physical and chemical disintegration of rocks and that may contain organic matter.

Stone -- Crushed or naturally angular particles of rock that will pass a 3-in. sieve and be retained on a No. 4 U.S. standard sieve.

Undisturbed sample -- A soil sample that has been obtained by methods in which every precaution has been taken to minimize disturbance to the sample.

Water table -- The surface in an unconfined zone of saturation where ground-water pressure is equal to atmospheric pressure.

## 4.0 Responsibilities

The Project Manager or field team leader is responsible for implementation of the appropriate soil sampling procedure. The site geologist is responsible for directly overseeing the sampling procedure, for classifying soils and for directing the packing and sealing of soil samples. The site sampler or shipper is responsible for initiating, maintaining, and transferring chain of custody.

## 5.0 Equipment

The following equipment usually provided by the drilling subcontractor is needed for subsurface soil sampling and test boring:

- drilling equipment.
- split barrel (split spoon) samplers, OD 2 in., ID 1-3/8 in., 27 in. long (open); see ASTM D1586-67 (1974) for details
- thin walled tubes, (Shelby), OD 2 to 5 in., 36 to 54 in. long. See ASTM D1587 for details.
- drive weight assembly, 140-lb weight, driving head and guide permitting free fall of 30 in.
- accessory equipment, including labels, paraffin, stove, and sample jars (glass jars, 3-1/2 in. high, 2 in. ID)

It is the responsibility of the field team leader to make sure all appropriate equipment including drilling contractor's equipment and materials are present at the site prior to initiation of drilling.

## 6.0 Methods

### 6.1 *Subsurface Soil Sampling*

The following method is to be used for subsurface soil sampling:

1. Clear out the hole to sampling depth using equipment that will ensure that the material to be sampled is not disturbed by the operation. In saturated sands and silts, withdraw the drill bit slowly to prevent loosening of the soil around the hole and maintain the water level in the hole at or above ground-water level.
2. In no case shall a bottom-discharge bit be permitted. (Side-discharge bits are permissible.) The process of jetting through an open-tube sampler and then sampling when the desired depth is reached shall not be permitted. Where casing is used, it may not be driven below sampling elevation.

Record any loss of circulation or excess pressure in drilling fluid during advancing of holes.

3. With the sampler resting on the bottom of the hole, drive the 2 in. OD split barrel sampler with blows from the 140-lb hammer falling 30 in. until either 18 in. have been penetrated or 100 blows have been applied. This process is referred to as the Standard Penetration Test.
4. Repeat this operation at depth intervals not greater than 5 feet in homogeneous strata.
5. If required for the project, record the number of blows required to complete each 6 inches of penetration or fraction thereof. The first 6 inches is considered to be a seating drive. The number of blows required for the second and third 6 inches of penetration is termed the penetration resistance, N. If the sampler is driven less than 18 inches, the penetration resistance is that for the last 1 foot of penetration. (If less than 1 foot is penetrated, the logs shall state the number of blows and the fraction of 1 foot penetrated.)
6. Bring the sampler to the surface and open. Describe carefully typical samples of soils recovered as to composition, structure, consistency, color, condition and obvious contamination; then put into jars without packing. Seal the jars with wax or hermetically seal them, to prevent evaporation of the soil moisture. Affix labels to the jar, or make notations on the covers (or both) including job designation, boring number, sample number, depth penetration record, and length of recovery. Protect samples against extreme temperature changes. Complete chain-of-custody forms.

### 6.2 *Test Boring*

When it is desired to take undisturbed samples of soil, thin-walled seamless tube samples (Shelby tubes) will be used. The following method applies:

1. Clean out the hole to the sampling depth using whatever method is preferred that will ensure that the material to be sampled is not disturbed. In saturated sands and silts, withdraw the drill bit slowly to prevent loosening of the soil around the hole and maintain the water level in the hole at or above ground-water level.
2. The use of bottom discharge bits shall not be allowed, but any side discharge bit is permitted. The procedure of jetting through an open-tube sampler to clean out the hole shall not be allowed.
3. Prior to inserting the tube sampler in the hole, check to ensure that the sampler head contains a check valve. The check valve is necessary to keep water in the rods from pushing the sample out of the tube sampler during sample withdrawal.
4. With the sampling tube resting on the bottom of the hole and the water level in the boring at the ground-water level or above, push the tube into the soil by a continuous and rapid motion, without impact or twisting. In no case shall the tube be pushed further than the length provided for the soil sample. Allow about 3 inches in the tube for cuttings and sludge. After pushing the tube, the sample

should sit 5 to 15 minutes prior to removal. Immediately before removal, the sample must be sheared by rotating the rods with a pipe wrench a minimum of two revolutions.

5. Thin-walled undisturbed tube samples are somewhat restricted in their usage, depending primarily upon the consistency of the soil to be sampled. Often very loose and/or wet samples cannot be retrieved by the samplers and soils with a consistency in excess of medium stiff cannot be penetrated by the sampler. There are devices which are used in conjunction with the tube samplers which permit obtaining soil samples which could not be obtained by the tube sampler alone. Using these devices normally increases sampling costs and therefore their use should be weighed against the increased cost and the need for an undisturbed sample. In any case, if a sample cannot be obtained with a tube sampler, an attempt should be made with a split barrel sampler at the same depth, so that at least a sample can be obtained for classification purposes.
6. Repeat the sampling procedures described above at intervals not greater than 5 feet in homogeneous strata.
7. Upon removal of the sampler tube, measure the length of sample in the tube and also the length penetrated. Remove disturbed material in the upper end of the tube before applying wax and measure the length of sample again. After removing at least 1 in. of solid from the lower end, and after inserting an impervious disk, seal both ends of the tube with wax applied in a way that will prevent the wax from entering the sample. Newspaper or other types of filler must be placed in voids at either end of the sampler prior to sealing with wax. Place plastic caps on the ends of the sampler, tape them into place and then dip the ends in wax to seal them.
8. Affix labels to the tubes giving job designation, sample location, boring number, sample number, depth, penetration, and recovery length. Mark the same information on the tube with indelible ink and mark the location of the top of the sample. Complete chain-of-custody forms.
9. Do not allow tubes to freeze, and store in a cool place out of the sun at all times. Ship samples protected with suitable resilient packing material to reduce shock, vibration, and disturbance.
10. Using soil removed from the ends of the tube, make a careful description, giving composition, conditions, color, and, if possible, structure and consistency.

## 7.0 Documentation

The data obtained in borings is to be recorded in a field logbook and should include the following:

1. Name and location of job
2. Date of boring (start, finish)
3. Boring number and coordinate, if available
4. Surface elevation, if available

5. Sample number and depth
6. Method of advancing sampler; penetration and recovery lengths
7. Type and size of sampler
8. Description of soil
9. Thickness of layer
10. Depth to water surface, to loss of water, and to artesian head; time at which reading was made
11. Type and make of machine
12. Size of casing, depth of cased hole
13. Number of blows per 6 in.
14. Names of crewmen
15. Miscellaneous remarks

In addition, a log is to be filled in for each borehole. An example log form is attached and should be used unless specific project needs require otherwise. Deviation is permitted following approval by quality assurance personnel.

K:\References\SOPs\Subsurface Soil Sampling and Test Boring 4-3.docx

## 1.0 Objective

- To observe and document site-specific geologic conditions.
- To provide a detailed, systematic, and sequential record of the progress of drilling a well or borehole.
- To obtain technically sound and defensible field data by maintaining acceptable log forms and adhering to established procedures.

## 2.0 Gear

- waterproof felt-tip pen or ballpoint pen
- aluminum clipboard or job box
- geologic log forms
- 12-foot tape measure
- grain-size distribution chart
- monitoring equipment and digital camera, as required by project work plan

## 3.0 Documentation Procedure

Enter the following basic information on the heading of each log sheet:

- site owner's name
- project name, job code and site address
- boring or well number
- location (approximate in relation to identifiable landmarks)
- name of drilling contractor
- drilling method and equipment
- sampling method
- water level at end of drilling (static)
- start and finish (time and date)
- name of logger

### *3.1 Soil Description*

Describe the material encountered in a concise and consistent manner and stress major constituents and characteristics. The chart at the end of section 3.0 may be used for determining grain sizes. The format should conform to the Wentworth system as follows:

| **Number of Material Types** | **Percentage(s)** | **Linking Word** | **Example** |
|---|---|---|---|
| one | 100 - medium to fine sand | NA | SAND, medium to fine, brown, dry. 12" recovery. |
| two | 35 to 50 - gravel | and | Sand, medium, and fine rounded gravel; brown. 8" recovery. |
| two | 20 to 35 - fine sand | some | SAND, medium; some fine; brown. 20" recovery. |
| two | 10 to 20 - clay | little | SAND, medium; little clay; brown. 12" recovery. |
| three | equal percentage each | NA | Sand, medium; fine rounded gravel; silt; brown. 14" recovery. |
| two | 1 to 10 - silt | trace | SAND, medium; trace of silt; brown. 12" recovery. |

- The principal material should be the first word of each statement, in capital letters, followed by size description, color and any other modifiers, separated by commas. Amount of recovery in inches is noted last.
- If present, secondary constituents should be listed after the principal material.
- Secondary materials are listed with the modifiers BEFORE the noun. If there is no principal (dominant) material within the sample matrix, no capitals are used.
- Any material which constitutes less than 35 percent of a sample is separated by a semicolon. If there are three equally dominant materials, each should be separated by a semicolon. If no other noun is indicated, it is assumed that the rest of the entry refers to the previously-described material.

More complex examples are shown below.

| **Number of Material Types** | **Percentage(s)** | **Color** | **Example** |
|---|---|---|---|
| four | 45 - medium sand<br>25 - fine sand<br>25 - silt<br>5 - clay | brown | SAND, medium; some fine; some silt; trace of clay; brown. 10" recovery. |
| four | 30 - coarse sand<br>30 - very fine sand<br>30 - silt and clay<br>10 - coarse rounded gravel | multicolored (homogenous through-out sample) | Sand, coarse; very fine sand; silt and clay; trace of coarse rounded gravel; multicolored. 10" recovery. |
| three | 45 - medium brown sand<br>35 - reddish brown silt<br>20 - yellow clay | color distinctive for each material | SAND, medium, brown; some 1/4" layers of reddish brown silt; occasional 1/8" thick layer of yellow clay. 12" recovery. |

- If gravel is present it should be specified as to whether the gravel appears rounded, subangular or angular.
- If the sample is one color throughout, it should be noted after the grain size descriptions and before any special observations such as odor or moisture content, separated by a semicolon.
- If each material is a distinct color, each should be noted after the grain size description of the principal material and separated by a comma or prior to the secondary materials.

### *4.2 Logging Details*

- When sampling is by split spoon, any material larger than coarse gravel must be logged on the basis of rotation, wash or cutting samples or based on the geologists and drillers experience. Drilling will usually become noisy and/or rough when boulders or cobbles are encountered. Log split spoon and add; occasional cobble or boulder.
- Layered samples can be described by giving the thickness and location of the layers.
  Example: SAND, medium, with several 1/4 to 2-inch thick layers of silt in bottom 6 inches of spoon; brown. 12" recovery.

- If a significant formation change is noted within the spoon, the sample description should be divided into tenths of a foot segments.

| From (ft) | To (ft) | Material Type |
|---|---|---|
| 4 | 4.5 | CLAY, gray. |
| 4.5 | 5 | SAND, fine to very fine, brown, dry. |
| 5 | 6 | SAND, medium, gray, saturated. |

- The degree of moisture observed within each logged interval should be documented on the log. Adjectives such as dry, moist and wet/saturated should be added to the end of each geologic description to document the observed moisture content. The exact depth of saturation should be specifically noted.
- The relative degree of compaction should also be noted at the end of each geologic description using the terms loose, semi-compact or compact.
- Strictly geologic terms (aphanitic, metaquartzitic) should be avoided unless such descriptions are significant to a particular job. Careful observations regarding the water-bearing and/or pollutant transporting characteristics of a formation are much more important to the client.
- Since much of our recent work has dealt with contaminant hydrogeology, it is essential to note any unusual substances, odors, colors or drilling or sampling peculiarities which may be encountered. This notation should be made after the strictly geologic portion of the log, separated by a period, and before the recovery
- Indicate why the hole was terminated, and for what reason (i.e., refusal (bedrock?), refusal or end of borehole), in the last log entry.
- Measure and record the length of soil recovered from the borehole.
- When using a split-spoon sampler, record the number of blows required for a specified borehole length interval.
- Include a description of any tests run in the borehole; placement and construction details of wells and any other equipment; abandonment records and notes on readings obtained by air monitoring.
- Copy and turn geologic logs into typing.
- File the original logs in the project file.

### GRAIN SIZE CHART

| **Wentworth grade scale US Geological Survey logs** | **Grain Size (inches)** | **Grain Size (millimeters)** |
|---|---|---|
| Boulders | 10.08 | 256 |
| Cobbles | 2.52 | 64 |
| Gravel - very coarse | 1.260 | 32 |
| Gravel - coarse | 0.630 | 16 |
| Gravel - medium | 0.315 | 8 |
| Gravel - fine | 0.157 | 4 |
| Gravel - very fine | 0.079 | 2 |
| Sand - very coarse | 0.039 | 1 |
| Sand - coarse | 0.010 | 0.5 |
| Sand - medium | 0.0098 | 0.25 |
| Sand - fine | 0.0049 | 0.125 |
| Sand - very fine | 0.0025 | 0.63 |
| Silt | 0.00015 | 0.004 |
| Clay | - | - |

### 5.0 Safety

- perform all activities at a minimum Health and Safety Level D; the Site Safety Plan supersedes this instruction
- read the Site Safety Plan prior to start-up and update as necessary; post on site (i.e., dashboard).
- restrict site access to authorized personnel

# APPENDIX III

## 1.0 Objective

These general guidelines provide a method for effective field administrative procedures. The main objective in their use is to obtain the following:

- offsite quality control via proper communication and record keeping
- data for billing of equipment and expenses

This document may also be used as a basic checklist.

## 2.0 Gear

The following general items are suggested for the proper administration of many field activities:

### 2.1 *Documents*

- field logbook
- site base map with activity locations marked-out
- forms necessary for task (e.g. geologic log, low-flow sampling log, instrument calibration sheet, depth-to-water sheet, sample history sheet, chain of custody etc.)
- pencils, waterproof felt-tip pen, ball point pen, markers
- covered clipboard or job box

These lists are not inclusive. Please refer to individual SOP documents for specific items, including analytical equipment, sampling protocol, decontamination equipment, documentation, etc.

## 3.0 Field Log

Personal logs should be kept current during the administration of all field activities. Field logs/notes should be kept in a bound waterproof notebook (field book) and photocopies are to be submitted to the project manager in a timely fashion at the completion of field activities.

- Write your name and date range on the cover of the field book with a waterproof pen.
- Attach your business card to the first page (incase you misplace your field book, the finder will know who to return it to and where).
- Number your pages starting with “1” (lower right and lower left hand corners).
- Create a table of contents on the first page, this page should include the title of each project, date and page number.

- Write the date and project identifier (and address) on top of each page.
- Record time of arrival and departure from the site in your notes.
- Record weather conditions during the field work, if weather conditions change record (e.g. thunderstorm, hale etc.) the change.
- Record topic, time and person involved in any project related communications weather in person or over the phone.
- Record any issues that may arise during the scheduled field assignment.
- If you were not able to record an occurrence for some reason write it down as soon as you can (e.g. you took a call from a contractor or client on your cell phone while collecting a sample, driving to/from site/lab etc.) and indicate approximate time.
- Depending on the type of field work being completed (excavation, installing monitoring wells etc.) a quick sketch including field measurements of distances may be very helpful later. Make sure to state the words “Not to Scale” on each sketch. If samples were collected indicate the location on the sketch.
- Record mileage on the daily activities on a vehicle log (for company vehicles) or your field book for personal vehicle.
- If overseeing a subcontractor include subcontractor arrival and departure times, names of personnel on site, equipment, material and amounts used.
- If the task is groundwater sampling record the depth to water and total depths in your field book.
- If the task is the installation of wells record start and finish times for each well location.
- Neatness and clear, legible writing is imperative (do not use cursive as it is harder to read and does not photocopy well)
- NEVER use a pencil in your field book, use a pen if you must delete an entry cross it out with a single line and date and initial it.
- NEVER leave blanks on a page, if you want to start another date/site on a new page you must put a line through the empty pace and date and initial it.
- NEVER take field notes on a “rough” sheet of paper and transcribe them into your field book at a later time. Such a practice defeats the entire purpose of taking accurate field notes in the first place and **it is also unethical.**

When taking field notes please remember that someone else will be reading them, possibly at a much later time, make your notes readable, succinct and as complete as possible. Someone may need to use your field notes to recreate what occurred at a site at a later point in time.

It is often helpful to tape a copy of the phone sheet into the end of your field book or any phone numbers, site lock codes, reference tables, formulas you may often need.

Remember your field book is a legal document and it is the property of LBG.

## 4.0 Forms

The forms you may need to use while completing field assignments/tasks is not a replacement for good field notes, they are used to compliment your field notes and record data. Some forms you may need in the field are:

- Site assessment forms and/or questionnaires (Phase I site visits)
- Operation and Maintenance forms (treatment systems)
- Low-Flow Sampling Log (groundwater sampling)
- Instrument Calibration Log (groundwater sampling)
- Geologic Log (soil sampling, well installation, drilling)
- Sample History Sheet (VOC sampling in soil)
- Pumping Test Forms (pumping tests)
- Survey Sheet (monitor well survey)
- Well Data Sheet (recovery well rehabilitation)
- Chain-of-Custody (any sampling activity)

Complete the forms in their entirety, do not leave anything blank if a particular portion of the form does not apply to your site or task indicate NA. Keep all forms together and turn in to the project manager with a photocopy of your field notes as soon as the work is completed. Keep the forms neat and legible (do not doodle on them), forms are included in reporting activities as part of the documentation of the field work.

K:\References\SOPs\Field Record Keeping 1-1A.doc

# APPENDIX IV

## 1.0 Objective

To specify the requirements for completing and transferring controlled chain-of-custody (COC) records which accompany all samples from location to location.

## 2.0 Applicability

The guidelines here are applicable to COC control for samples collected during site activities, but do not take precedence over the specific requirements of project plans for chain of custody.

## 3.0 Data Entry Procedure

A COC form, as seen in Appendix A., should be filled-in upon completion of a sample collection. Enter the following information with a black ball point pen (not "Flair" type, unless permanent ink is used).

- our company name
- project name or identifier
- project name: site name and location
- samplers: sampler's signature
- station number: enter the sample number for each sample in the shipment, this number appears on the sampling identification label.
- date: enter a six-digit number indicating the day, month, and year of sample collection, for example, 040896
- time: enter a four-digit number indicating the military time of collection, for example, 1354
- sample type: indicate type, for example, composite or grab, soil, water, sludge, etc.
- station location: describe the location where the sample was collected
- number of containers: for each sample number, enter the number of sample bottles that are contained in the shipment, container types and preservation
- remarks: enter any appropriate remarks

## 5.0 Transferring Custody of Samples to Shipping Agent

Samplers will transfer custody of samples to shipper as follows:

- sign, date, and enter time of COC report under "Relinquished by"
- make certain that shipper signs the "Received by"
- enter name of carrier under next "Relinquished by" category
- receiving laboratory will sign "Received for Laboratory by" on lower line and enter date and time

## 4.0 Transferring Custody from Shipping Agent to Common Carrier

Instructions for shipper transferring custody of samples to a common carrier are given below.

- sign, date, and enter time under "Relinquished by" entry
- enter name of carrier (e.g., UPS, Federal Express) under "Received by"
- enter bill-of-lading or Federal Express air bill number under "Remarks"
- place the original of the COC form in the appropriate sample shipping package and retain a copy with field records
- complete other carrier-required shipping papers
- insure samples as needed

Common carriers will usually not accept responsibility for handling COC forms; this necessitates packing the record in the sample package.

## 6.0 Transferring Custody from Sampler Directly to Carrier

To transfer custody of samples from the sampler directly to a carrier, proceed as above, except eliminate the shipper's signature.

## 7.0 Additional Information

If samples are to be split with the site owner, or with another interested party, a separate COC form must be completed for each of these custodians.

Record COC and other sampling information in the field logbook or Daily Activity Log Sheet.

## 8.0 Preserving Anonymity of Sites

It may be advisable to take actions to prevent the laboratory performing analysis from knowing the identity of the sites involved. In this case, the following would apply:

- complete COC as outlined above
- record all sampling information in the field logbook, including the numbers of the chain of custody forms used
- transfer the information to a second set of forms, excluding the site name and the station location data that is traceable to the site
- transfer the names of sampling personnel in block print only (they should not appear as signatures)
- complete the appropriate "Relinquished by" blank as well as the shipping information or "Received for

Laboratory by" blank

- make a notation in the remarks column of both the old and new forms that ties the two sets together, for example: "COC form 087235 transferred to chain of custody form 098236", and record this information in the logbook
- the original COC forms and copies of the new chain of custody forms must be placed in the project files

K:\References\SOPs\Chain of Custody 1-5.docx

# APPENDIX XIII

# STORMWATER POLLUTION PREVENTION PLAN

# STORMWATER POLLUTION PREVENTION PLAN
# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK
# BCP NUMBER C344070

## 1.0 INTRODUCTION

The following Stormwater Pollution Prevention Plan (SWPPP) was completed for the Former Materials Research Corporation property (Site) located at 542 Route 303, Orangetown, New York, by Leggette, Brashears & Graham, Inc. (LBG). This SWPPP is being included as an attachment to the Remedial Investigation Work Plan (RAWP) for the Site, which outlines activities to be performed at the Site in conjunction with the approved remedial actions.

The Site is located in an industrial/commercial area at the intersection of Route 303 and Glenshaw Street in Orangetown, Rockland County, New York. The Site consists of a one story industrial building. The footprint of the building is approximately 43,000 $ft^2$ (square feet). The MRC facility purifies metals and forms metal targets used in sputtering machines that manufacture chips for electronic equipment.

The vicinity of the property consists of industrial, commercial and limited residential properties. The Site is bordered on the: north by Praxair Electronics headquarters building and parking lot; south by Glenshaw Street; east by Route 303; and, west by railroad tracks and the undeveloped railroad right-of-way. The Sparkill Creek is located approximately 700 feet east of the Site.

The Site has been (and continues to be) used to purify metals and forms metal targets used in sputtering machines that manufacture chips for electronic equipment since 1961.

## 1.1 Goals of the SWPPP

The goals of the SWPPP are:

- to prevent pollution of surface waters that could result in toxicity to aquatic organisms, impair ecosystems or create risk to human health; and
- to prevent floating oil, scum or similar non-natural substances arising from investigation activities from entering surface waters.

A copy of the approved SWPPP, including related drawings, will be kept at the Site at all times for inspection by the New York State Department of Environmental Conservation (NYSDEC). Revisions to the approved plan (if required) will be submitted to the NYSDEC for approval.

## 2.0 SCOPE AND PLAN OBJECTIVES OF SWPPP

This SWPPP covers all requirements as specified by the NYSDEC for management of storm-water discharges. The SWPPP outlines soil erosion and sediment control measures to be taken during the subsurface investigation ground invasive activities in areas exposed to the elements that could cause sediment or cause contaminants such as contaminated soil, volatile organic compounds (VOCs) or petroleum products to transport to the Sparkill Creek or surrounding storm-water catch-basins. A further objective of the SWPPP is to minimize the quantity of accumulated storm-water on and surrounding the Site, so as to allow open borings and other site activities to remain dry and active. This SWPPP includes plans for controlling erosion and sediment transport as a result of Remedial Action activities on and surrounding the Site. Temporary erosion and sediment control measures such as dikes, silt fences, turbidity curtains (booms), diversion ditches, and inlet protection shall be identified and employed on and surrounding the Site as described in this plan or the RAWP. These structural measures and other Best Management Practices (BMP) that may be necessary to achieve the plan's objectives are included in this SWPPP.

Contaminated materials, primarily halogenated VOCs are known to be present in the groundwater beneath the Site. The SWPPP will focus on mitigating the release of contaminants generated during drilling activities and the storage and handling management practices of sodium permanganate that will be used as part of an in-situ chemical oxidation (ISCO) remediation at the Site. The soil erosion and contaminant control measures described herein are designed based on the following principles:

1. Minimize exposure of bare soil;
2. Prevent soil from leaving the area where ground invasive activities (drilling) are being performed through the use of silt fences, permeable berms, inlet protection (catch basin mat), as necessary;
3. Prevent sodium permanganate from leaving the Remedial Action area through the use of catch basin mats for nearby storm-water catch basins, spill kits, Universal absorbent pads, pigs and booms, Speedi-Dri, bentonite and sodium thiosulfate (neutralizer); and
4. Divert run-on water away from disturbed areas.

### 2.1 General Responsibilities

LBG representatives will be responsible for ensuring daily activities are conducted in a way that is consistent with this SWPPP. Specifically, all activities involving solid, liquid or hazardous waste handling, or outdoor movement of subsurface materials is to conduct work activities in such a way that:

- no drums or roll-off containers are left anywhere outside unless they are properly stored with the tops securely fastened;
- work areas on and surrounding the Site are kept neat and picked up on a regular basis;
- no change-outs of vehicle or equipment fluids (crankcase, transmission, hydraulic systems, radiator, oil) are conducted outdoors; and,
- no liquid coating materials, fuels, oils, paints, solvents or similar substances are poured onto the ground or into catch basins, sumps, down spouts or drains.

## 2.2 Pollution Prevention Team

The pollution prevention team for the Site has one administrator and several members from the LBG Shelton, CT office. Prior to starting any work associated with the RAWP, all personnel active at the work site will review this SWPPP and will sign the Storm-Water Pollution Prevention Plan Terms and Conditions Certification form which is included in Appendix I. The primary personnel presently assigned to the team and the activities for which they are responsible, are listed below:

| **Name** | **Company** | **Responsibility** |
|---|---|---|
| Michael Manolakas | LBG, Inc. | Overall Project Oversight |
| Mark Goldberg | LBG, Inc. | Review and Approval of Work Plans<br>Certification of Work Performed |
| Karen Destefanis | LBG, Inc. | Project Oversight, Agency Communication |
| Patrick Welsh/Lucas Williamson | LBG, Inc. | Field Supervision |
| Contractor | TBD | Drilling and ISCO Activities<br>Installation of SWPP Measures |

## 3.0 HYDROLOGY AND HYDRAULICS

The areas where the proposed drilling and ISCO injection/extraction activities are to be completed at the Site include the western side of the Site. The Site location, along with the nearby Sparkill Creek are shown on figure 1 and the proposed exterior Remedial Action areas along with the locations of the storm-water catch-basins surrounding the Site are shown on figure 2.

All work to be performed as part of Remedial Action activities will be performed on the western exterior portion of the property. Features along this portion of the property include an asphalt driveway, a paved parking area (with landscaping) to the south, outdoor storage containers to the north and two loading docks that are used daily located along the south side of the facility.

The slope of grade affects the amount of runoff and rate of runoff. With all other things being equal, a site with steep slopes will produce more runoff and transport it at a faster rate than a site with little to no slopes. Base on Site conditions, the Remedial Action area is relatively level grade. Releases and storm-water runoff in the vicinity of the loading docks would flow into the storm-water catch basin located off the southeast corner of the building and into the town storm sewer system along Glenshaw Street and Route 303 or in to a storm-water catch basin located on Glenshaw Street approximately 220 feet southeast of the ISCO treatment area. There is a small drainage swale located to the west-southwest of the ISCO treatment area, beyond the property boundary. This swale contains natural vegetation with trees and underbrush and empties into a natural depression adjacent to the railroad right-of-way, southwest of the ISCO treatment area. There is a storm-water catch basin located northwest of the proposed treatment area that diverts storm water to the drainage swale (figure 2).

The Site's stormwater drainage systems discharge south and east to Glenshaw Street where it is conveyed east to the stormwater drainage system along Route 303. There are no stormwater catch basins in the immediate vicinity of the proposed ISCO treatment area.

The type of soil on a site also affects the amount and rate of runoff generated. The soil type determines the amount and rate at which water can be absorbed into the ground. The more water which infiltrates into the soil, the greater the reduction in runoff volume and rate will be. The Natural Resources Conservation Service (NRCS) categorizes soils into one of four hydrologic soils group: type A, B, C, D. Type A soils are the most permeable and Type D soils are the least.

The surface cover on a site refers to what is on the surface of a site; whether it is lawn, asphalt, brush, etc. Surface cover affects the rate and volume of runoff just like slope and soil type.

Certain covers allow for a greater opportunity for water to be absorbed into the ground. Based on the fact that the majority of the Site is covered with impermeable asphalt and concrete, it will not allow for any water to be absorbed into the ground. Almost all the rain that falls on asphalt or other impermeable covers will be converted to runoff. As such, the primary goal of preventing the contamination of the runoff will be by containing onsite drilled soils and potential sodium permanganate spills.

The majority of the surface covers on and surrounding the Site consists of impervious areas including existing buildings, and the adjoining streets and sidewalks. The soil type underlying the Site was determined using the historical subsurface investigations prepared by LBG. The historical subsurface investigations characterize onsite and offsite subsurface conditions interpreted from borings. According to data obtained from these investigations, the soil beneath the Site consists of layers of Fill and Native Soil and are defined as follows:

Fill: fine to medium sand, little small to large sub-angular gravel, clay, and trace organics in the clay;

Native Soil: fine sand, little to some silt with little small to medium subangular to subrounded gravel, brown.

Based on the fact that the soil borings will be advanced to depths below grade, and soil cuttings would be containerized during the drilling activities, storm-water sheet flow to drainage areas downgradient from the Site will not be impacted by activities at the Site.

## 4.0 PLAN IMPLEMENTATION

The general sequence of activities for the SWPPP will be dictated by the implementation of the RAWP activities and are as follows:

- Subsurface clearance activities;
- Mobilization—delivery of drilling equipment, delivery of ISCO injection/extraction equipment following completion of well installation and well development activities;
- Drilling and soil storing (within 55-gallon drums or roll-off containers);
- Well construction activities, including restoration of grade surface (concrete); and,
- ISCO injection/extraction activities.

If feasible, drilling and ISCO activities will be scheduled to correspond with anticipated time periods where precipitation is not forecast. It is anticipated that the drilling activities will have the most potential impact on erosion. Sediment and erosion control practices will be consistent with currently acceptable practices, including the containment of soil cuttings as they are generated and the placement of permeable berms to mitigate sedimentation transport; and the use of absorbent booms or catch basin mats, where applicable, to prevent the flow of contaminated liquids from entering storm sewer pathways. All runoff control barriers will be spot checked daily. Areas of bare soil exposed by drilling activities will be minimized. All soil erosion and sediment control measures will be installed prior to any major soil disturbances, or in their proper sequence, and maintained until permanent protection is established (i.e. – the well construction is completed and the surface seal has been restored). Any changes to the approved SWPPP will require the submission of a revised SWPPP to the NYSDEC. The revised plans must meet all current soil erosion and sediment control standards.

## 4.1 Good Housekeeping

During drilling and ISCO injection/extraction activities, the Contractor will establish and maintain good housekeeping Best Management Practices (BMP) for the site. These will include the following:

- When not in use, all equipment will be stored in designated equipment staging areas.
- No vehicle fueling will be conducted onsite.
- All fuel will be stored in approved storage containers.
- No vehicle maintenance such as oil changes, lubrication, and other maintenance tasks will be conducted onsite.
- All vehicle washing and general maintenance activities that could produce contaminants will be conducted within a containment area or asphalt-covered area.
- All cleaning materials, lubricants, fuel, and other materials will be stored in original containers as much as possible, or will be stored in other approved containers when necessary.
- All spills will be promptly cleaned up.

## 4.2 Drilling Activities

### 4.2.1 Site Sediment Controls

The following control devices will be available (if necessary), constructed as indicated below and will meet the requirements of the contract documents and the New York Standards and Specifications for Sediment Control:

- Remedial Action Entrance: The Site presently has three access points for vehicular traffic, at the southern end of Glenshaw Street. The Glenshaw Street entrances are paved asphalt and concrete. Glenshaw Street entrances that will be used will be monitored daily. Any dirt and/or mud deposited on public roadways from a source at the Site will be removed and cleaned up.

- Sedimentation Barriers: Although their use is not anticipated, pre-manufactured silt fences will be used as needed sedimentation barriers and will be installed in areas where the potential of soil runoff and erosion may occur. If needed, silt fences will be installed in areas where siltation is a problem, and will be maintained until surface restoration is completed. These silt fences will be embedded to prevent water from running under them. Silt fences will be spot checked daily and maintained in satisfactory condition for the duration of the project.
- Soil Boring/Well Head Coverage: Following the completion of the work day, any open soil boring/well head will be covered over with a polyethylene sheet barrier or tarp and/or a 55 gallon drum to prevent the open borehole from filling up with storm-water.
- Inlet Protection: No catch basins and/or storm drains are present immediately adjacent to the proposed drilling area at the Site.
- 55 Gallon Drums/Roll-Off Soil Containers: All soil cuttings generated during drilling will be stored in 55-gallon drums or roll-off containers and any roll-off staying onsite overnight will be covered with tarps or polyethylene sheeting. All 55-gallon drums will be covered and secured at the end of each work day.
- Additional Measures: Immediately upon recognizing any unforeseen circumstances that may pose the potential for accelerated erosion or sedimentation, LBG will ensure that the Contractor uses appropriate best management practices to eliminate the potential for accelerated erosion and sedimentation. The Contractor, where necessary, will supplement the above control devices with hay bales and erosion control matting.
- Removal: Removal of the erosion and sediment controls will be accomplished as the items are no longer needed.

Once in place, the LBG Program Geologist will be responsible for daily inspections of all erosion and sediment control measures and spot checking structural control measures. Any items found noncompliant with this plan will either be repaired or replaced immediately.

The LBG Program Geologist has the authority to stop work until these repairs are completed. The LBG Program Geologist will also maintain list of deficiencies found, and the corrective action(s) taken in the daily field log required under the RAWP.

### 4.2.2 Contaminated Runoff Controls

If during the course of the Remedial Action ground invasive contaminated runoff is observed flowing away from the work zone, action will be taken to prevent it from leaving the work area. These actions will consist of:

- Boom Barriers: If required, a sorbent boom will be laid out to contain contaminants in the work area and prevent it from flowing offsite.
- Soil Boring/Well Head Coverage: Following the completion of the work day, any open soil boring/well head will be covered over with a polyethylene barrier or tarp to prevent the excavation from filling up with storm-water.
- 55 Gallon Drums/Roll-Off Soil Containers: All soil cuttings will be stored in 55-gallon drums or roll-off containers and any roll-off staying onsite overnight will be covered with tarps or poly. All 55-gallon drums will be covered and secured at the end of each work day.

### 4.3 ISCO Activities

The potential for failure of equipment utilized during the proposed ISCO Remedial Action is described below, including such items as unloading equipment, tank overflow, rupture, leakage, or any other equipment known to be a source of a discharge. The ISCO delivery procedures and Spill Contingency Plan are included as Appendix II and III, respectively.

### 4.3.1 Sodium Permanganate Mixing Area

The sodium permanganate will be delivered to the Contractor responsible for handling the sodium permanganate during the Remedial Action injection and extraction activities. The injection activities will require mixing the sodium permanganate with water. This water source is Praxair’s outdoor tap. Three containers will be used in the mixing process; a tote containing a 40 percent sodium permanganate solution; and two empty totes that will be used to combine and mix the sodium permanganate with clean water prior to the injection activities.

All totes will be stored on the Contractor’s rack/box truck. The totes will be place in a self-contained, secondary containment structure (spill containment/spill guard). This structure will be capable of containing a minimum of 1,000 gallons. This exceeds the amount of liquid that will be stored in the totes on the Contractor’s rack/box truck. The sodium permanganate tote supplied by the manufacturer will initially contain approximately 260 gallons of 40 percent sodium permanganate. For a 10 percent solution approximately 50 gallons of the 40 percent sodium permanganate will be added to two empty totes and each mixed with 210 gallons of water. The maximum quantity of sodium permanganate solution stored in the secondary containment is 680 gallons (two full totes containing 260 gallons of the 10 percent solution and one tote containing the remaining 160 gallons of the 40 percent sodium permanganate). For a 20 percent solution approximately 110 gallons of the 40 percent sodium permanganate will be transferred to the two separate totes, each filled with approximately 150 gallons of clean water. The remaining 40 gallons of 40 percent sodium permanganate will be mixed with 55 gallons of water in the tote. Therefore, the maximum quantity of sodium permanganate and sodium permanganate injection solution being stored on the rack/box truck will not exceed 615 gallons. A 1,000 gallon secondary containment will have adequate holding capacity of the 40 percent sodium permanganate and the 10 to 20 percent sodium permanganate solution, in the unlikely event of failure of all three totes.

During the mixing activities, the volume of sodium permanganate that will be added to the mixing tote will be measured through the use of a flow meter and totalizer. The use of the totalizer will minimize the possibility of overfilling.

Throughout the mixing activities, there will be a 4,000-gallon vacuum truck on site that can be used for an Emergency Response to pump out the tote if there is a leak or spill.

### 4.3.2 Injection Well Overflow

The sodium permanganate solution will be delivered to the injection well through flexible vinyl or chemical-resistant hose directly from the mixing tank. A drop tube will be attached to the hose and placed directly into the well. The sodium permanganate solution will gravity feed into the injection well and the delivery will be terminated by closing the ball valve attached to the hose once the permanganate solution has been delivered into the injection well. The delivery will also be visually observed to prevent overfill. In the unlikely event that overfill occurs, only a small quantity (less than or equal to 1 gallon) is assumed to be released before the situation is corrected. This amount is based on the slow transfer of the sodium permanganate solution from the mixing tote to the injection well via gravity feed. Spilled permanganate solution from any potential overflow would be immediately removed using the standby 4,000-gallon vacuum truck or Universal pads, pigs and/or booms (compatible with sodium permanganate), all which will be available to contain and isolate any potential spill. If necessary, damning/diking materials will include speedi-dri, booms, pads and bentonite.

During the injection activities a spill mat will be placed over the stormwater drain located next to the drainage swale (approximately 35 feet west of the property edge) if it is topographically lower than the injection area.

Prior to the injection activities, a sodium permanganate-compatible boom will be placed downslope of the injection well to prevent overland flow of any potential release during the transfer from the mixing tote to the injection well. Throughout the injection activities, there will be a 4,000-gallon vacuum truck on site that can be used for an Emergency Response to capture any overflow or spill. In addition, sodium thiosulfate will be onsite to neutralize any significant release, if needed.

### 4.3.3 Tote Rupture

The sodium permanganate tote has a total storage capacity of 260 gallons combined with two mixing totes which have a total combined storage capacity of 550 gallons. The total maximum quantity of sodium permanganate and sodium permanganate solution (diluted with water) that potentially could be spilled is 680 gallons (10 percent solution) and 615 gallons (20 percent solution). This quantity of sodium permanganate could be spilled only if all three tanks were completely full and ruptured simultaneously, an extremely unlikely event. In the event of individual tank rupture, the maximum quantity of sodium permanganate or sodium permanganate solution that could be released is 260 gallons. The 1,000-gallon secondary containment will be able to accommodate the maximum tote rupture. Therefore, any spills from tote ruptures are expected to be contained within the passive secondary containment structure.

### 4.3.4 Tote Leakage

An undetected leak has the potential of draining the entire tote contents. A visual inspection of the totes will be conducted to document any spills, leaks, corrosion or damage and address any issues. Sodium permanganate inventory will be monitored daily to document any loss. Any leakage from any tote will be contained within the passive secondary containment structure.

### 4.3.5 Faulty Ancillary Equipment

Hoses and associated fittings have the potential to leak or rupture during the injection operations. During the injection activities, the Contractor’s rack/box truck holding the totes will be situated as close to the injection well as possible to minimize the hose lengths between the mixing tote and the injection well.

A minor spill or leak (i.e., less than 1 gallon) from the hose connected to the mixing tote would be expected to puddle on the ground below the rack/box truck, which will be located adjacent to the injection well. Trained Contractor personnel will respond to the minor leak from the hose with available spill supplies. This includes a 4,000-gallon vacuum truck, absorbent materials including Universal pads, pigs and booms (compatible with sodium permanganate). If necessary, damning/diking materials including speedi-dri, booms, pads and bentonite will be used to contain and isolate any potential spill. In addition, sodium thiosulfate will be onsite to neutralize any significant release.

### 4.4 Discharge Prevention, Spill Control and Countermeasures

To prevent spills during the mixing and injection transfers, the injection activities will be scheduled during daylight hours during a period of clear weather. HAZWOPER-trained Contractor employees will monitor the permanganate transfer activities (including mixing and injecting) until the action is completed. The following discharge prevention and spill control and countermeasures are listed below.

<u>ISCO Activities:</u>

- 1,000 gallon self-contained secondary containment tote;
- 4,000 gallon vacuum truck;
- 4-5 poly open top drums
- 1 catch basin mat for a nearby storm-water catch basin; and
- spill kit
    - Universal absorbent pads
    - Universal absorbent pigs
    - absorbent booms
    - Speedi-Dri
    - Bentonite
    - Sodium thiosulfate (neutralizer)
    - goggles
    - nitrile gloves

### 4.5 Disposal Methods

If a discharge of sodium permanganate were to occur, spill control and countermeasures would be implemented as outlined in Appendix III. Recovered materials, waste booms, waste absorbent material, and other waste impacted with sodium permanganate will be managed as either hazardous waste or regulated non-hazardous waste. Regulated waste is manifested and will be transported offsite by the Contractor to a certified disposal facility according to applicable Resource Conservation and Recovery Act (RCRA) regulations.

## 5.0 CONTACT LIST, EMERGENCY PROCEDURES AND SUPPORTING DOCUMENTATION

An Emergency Contact List, which has the names and telephone numbers of persons to be contacted in an emergency will be included at the front of this Plan. This contact list shall be photocopied and made readily available during the injection activities. However, if any person notices that a spill has occurred, then at a minimum that person shall immediately notify the LBG Supervisor or the Contractor's personnel about the condition.

In the event of a spill, the Emergency Procedures that is included in Appendix IV will be followed. The Emergency Procedures will be available during all sodium permanganate injection activities. The Emergency Contact List will be maintained in the same location as the emergency procedures.

The Contractor will be responsible to immediately institute and expediently complete all actions necessary to remedy the effects of any release.

The NRC shall be contacted in the event a discharge of sodium permanganate reaches surface water or stormwater catch basins. It is assumed that if a discharge reaches a stormwater catch basin, then it will reach a surface-water body. The following information shall be provided to the NRC:

- name, organization and telephone number;
- name and address of the party responsible for the incident;
- date and time of the incident;
- location of the incident;
- source and cause of the discharge;
- types of material(s) discharged;
- quantity of materials discharged;
- danger or threat posed by the discharge;
- number and types of injuries (if any);
- weather conditions at the incident location; and
- other information to help emergency personnel respond to the incident.

In the event of a spill, a written description of the spill event will be documented. Information to be included includes:

- date and time of spill;
- estimates of the total quantity discharged;
- the source of the discharge;
- a description of all affected media (soil, ground water, surface water, air);
- the cause of the discharge;
- any damages or injuries caused by the discharge;
- corrective action taken;
- plans for preventing recurrence;
- if evacuation was required; and,
- if any spill response contractors or other organizations (i.e. fire department) were notified.

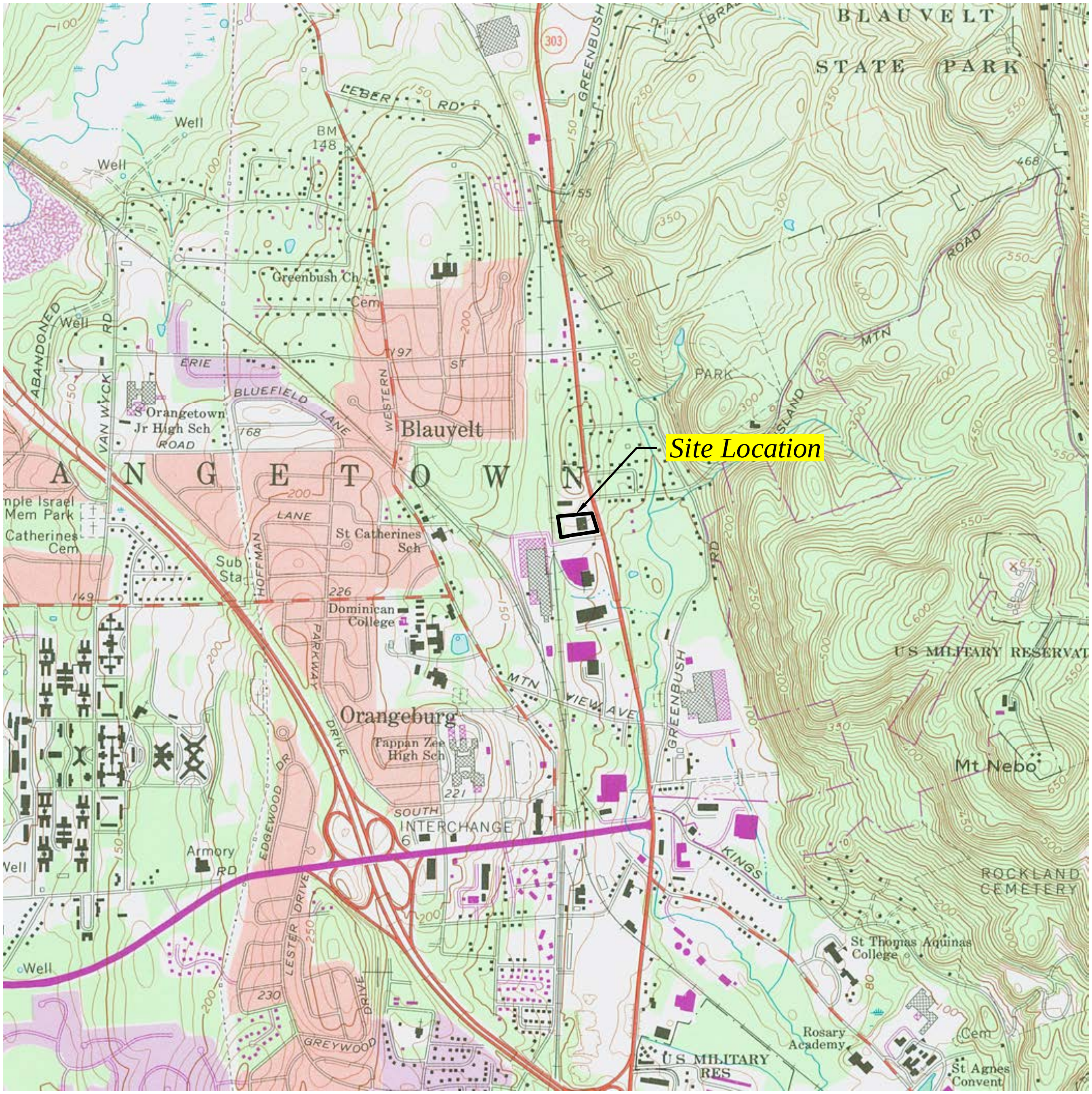
## 6.0 FINAL RESTORATION

Following the completion of the Remedial Action activities, all areas where ground invasive activities had been performed will be restored. Site restoration will include the repair of any site areas damaged or disturbed during the completion of drilling activities and cleaning of all work areas to remove all materials and waste. All cap materials (i.e. asphalt and concrete) will be restored to, at a minimum, their previous construction specifications.

# EMERGENCY CONTACT LIST

| | |
|---|---|
| 1. Facility Personnel: | |
| Praxair Facility Manager | (845) 398-8484 (office) |
| 2. Leggette, Brashears & Graham, Inc. | (203) 929-8555 |
| 3. NYSDEC – Spill Reporting (notify with any size spill) | 1-800-457-7362 |
| 4. ISCO – Spill Response Contractor | TBD |
| 5. National Response Center (notify if release enters surface water or storm-water catch basins) | 1-800-424-8802 |
| 6. Orangetown Police Department | 911 (Emergency)<br>(845) 349-3700 (other) |
| 7. Orangetown Fire Marshal | 911 (Emergency)<br>(845) (other) |
| 8. Nyack Hospital | (845) 348-2000 (Emergency Services) |
| 9. EPA – Region 1 Administrator | (888) 372-7341 (Customer Call Center) |

# FIGURES



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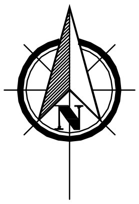

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## SITE MAP

| DATE | REVISED |
|---|---|
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| | |
| | |
| | |
| | |

**PREPARED BY:**

LBG ENGINEERING SERVICES, P.C.
Professional Environmental and Civil Engineers
4 Research Drive
Suite 204
Shelton, Connecticut 06484
(203) 929-8555

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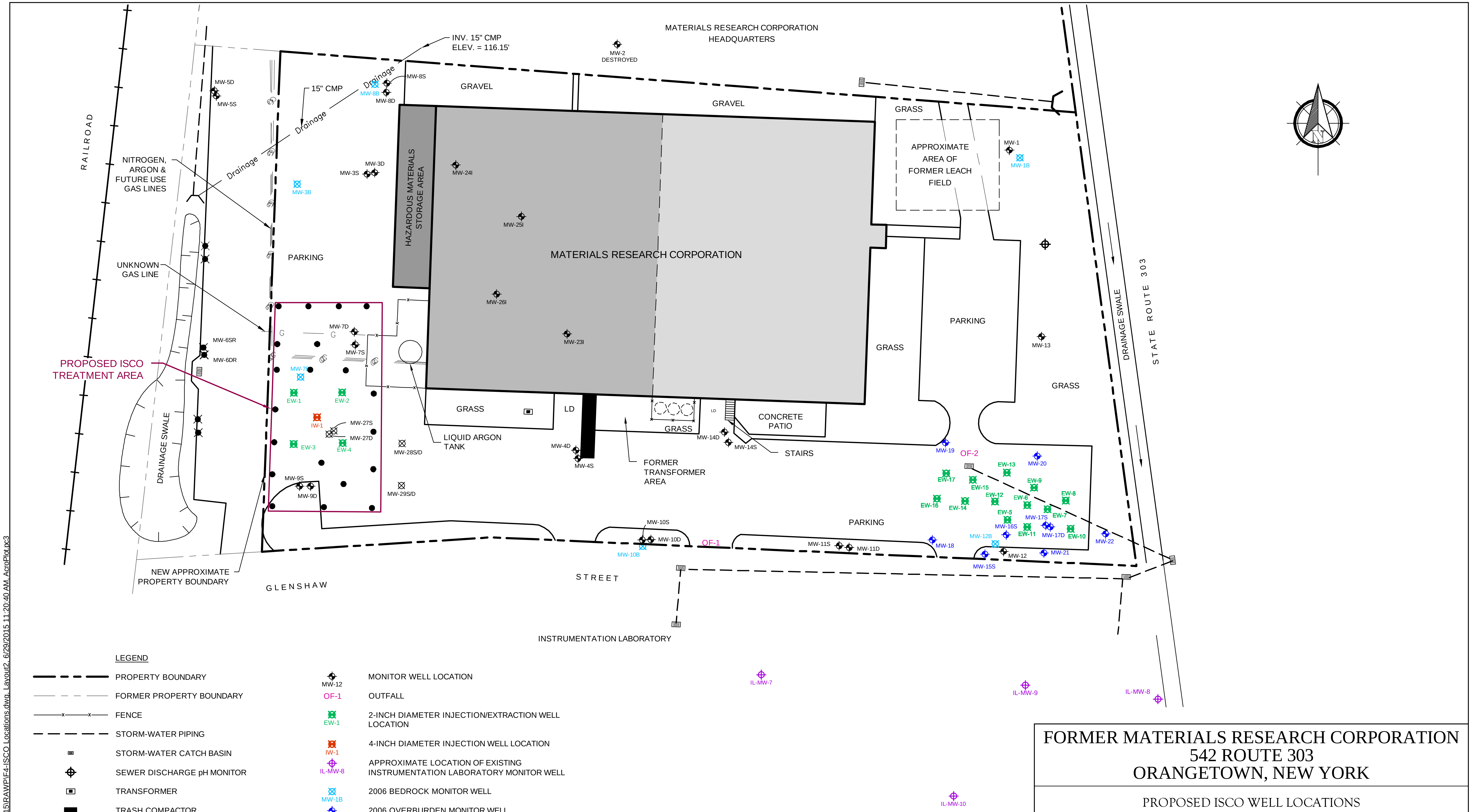

LEGEND

PROPERTY BOUNDARY

FORMER PROPERTY BOUNDARY

FENCE

STORM-WATER PIPING

STORM-WATER CATCH BASIN

SEWER DISCHARGE pH MONITOR

TRANSFORMER

TRASH COMPACTOR

LD LOADING DOCK

CONSTRUCTED - 1961

CONSTRUCTED - 1969

CONSTRUCTED - 1980

MW-12 MONITOR WELL LOCATION

OF-1 OUTFALL

EW-1 2-INCH DIAMETER INJECTION/EXTRACTION WELL LOCATION

IW-1 4-INCH DIAMETER INJECTION WELL LOCATION

IL-MW-8 APPROXIMATE LOCATION OF EXISTING INSTRUMENTATION LABORATORY MONITOR WELL

MW-1B 2006 BEDROCK MONITOR WELL

MW-15S 2006 OVERBURDEN MONITOR WELL

MW-28 PROPOSED MONITOR WELL CLUSTER LOCATION

● PROPOSED 2-INCH DIAMETER INJECTION/EXTRACTION WELL LOCATION

PROPOSED OFFSITE MONITOR WELL LOCATION

NOTE: WELL LOCATIONS ARE APPROXIMATE.

0 50
SCALE IN FEET

# FORMER MATERIALS RESEARCH CORPORATION
# 542 ROUTE 303
# ORANGETOWN, NEW YORK

## PROPOSED ISCO WELL LOCATIONS

| DATE | REVISED |
|---|---|
| | |
| | |
| | |
| | |
| | |

PREPARED BY: LBG ENGINEERING SERVICES, P.C.
Professional Environmental and Civil Engineers
4 Research Drive
Suite 204
Shelton, Connecticut 06484
(203) 929-8555

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# APPENDIX I

# STORMWATER POLLUTION PREVENTION PLAN TERMS AND CONDITIONS CERTIFICATION

## FORMER MATERIALS RESEARCH CORPORATION
## 542 ROUTE 303
## ORANGETOWN, ROCKLAND COUNTY, NEW YORK

## NYSDEC BCP SITE NO. C344070

# STORM-WATER POLLUTION PREVENTION PLAN TERMS AND CONDITIONS CERTIFICATION

I hereby certify that I understand and agree to comply with the terms and conditions of the Storm-Water Pollution Prevention Plan (SWPPP) and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the *owner or operator* must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System (SPDES) general permit for storm-water discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water-quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal civil and/or administrative proceedings.

| **Name** | **Signature** | **Date** |
|---|---|---|
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H:\SONY\Orangetown\2015\RAWP\Appendix XIII\Appendix I SWPPP terms and conditions certification frm 7-31-13.doc

# APPENDIX II

# ISCO DELIVERY PROCEDURES

# ISCO DELIVERY PROCEDURES

Note: Steps 1-11 are to be conducted by the spill response contractor (to be determined) personnel. ISCO delivery operations will not occur during inclement weather.

1. Extinguish all smoking materials.

2. Report to the LBG supervisor or a designated alternate to obtain the necessary authorization to proceed.

3. Obtain approval from the Facility Manager to conduct the ISCO delivery.

4. Park the rack/box truck with truck delivery connections adjacent to or close to the injection well.

5. Set the parking brake and place wheel chocks on the wheels.

6. Check the ball valve on the delivery hose attached to the mixing tote to make sure it is in the closed position. Place a mat over the catch basin located 35 feet west of the property edge if it is topographically lower than the injection area as a precautionary measure.

7. Measure clean water in the mixing tank. Using the flow meter and transfer pump, transfer the appropriate quantity of sodium permanganate into the mixing tote.

8. Remove the flow meter and transfer pump from the mixing tote.

9. Position a drop tube at the end of the delivery hose. Inspect the valves or hose (as applicable) for damage.

10. Position the drop tube in the injection well and open the ball valve to begin delivery of sodium permanganate solution to injection well.

11. If a leak is detected from any point along the mixing tote or hose, cease filling operations, close the inlet and outlet valves and correct the leak if it is safe to do so. Report any spills or leaks to the onsite LBG supervisor. Report the leak to the Facility Manager and follow the Emergency Procedures.

12. The spill response contractor personnel will closely monitor ISCO delivery operations and product level in the mixing tote and level in the injection well.

13. Once the injection well is filled to the proper level, as determined by the onsite LBG supervisor, cease delivery operations by closing hose valves.

14. Once level of sodium permanganate in the injection well has subsided, repeat steps 9-13 until the prescribed amount of mixture has been delivered to the injection well.

15. Relocate the rack/box truck with truck delivery connections adjacent to or close to the next injection well and repeat steps 1 -14.

16. Add clean water to mixing tote and purge hose line with clean water to remove any residual sodium permanganate solution. Disconnect hose and replace plug in tote.

17. Verify that sodium permanganate is not leaking from the tote.

18. Remove the catch basin mats and boom.

H:\SONY\Orangetown\2015\RAWP\Appendix XIII\Appendix II ISCO delivery procedures.doc

# APPENDIX III

# SPILL CONTINGENCY PLAN

# SPILL CONTINGENCY PLAN

In the event of a spill, the following plan will be followed.

> The spill response contractor shall be the primary responder to spills during the ISCO activities. The spill response contractor will be licensed and will be onsite throughout the injection/extraction activities.
>
> In the event of an emergency, the Orangetown Fire and Police Departments shall be notified and will respond with the necessary resources and take over incident command if emergency conditions such as a fire or explosion occur at the Site. Police shall direct traffic as needed.

Establishment of notification procedures for the purpose of early detection and timely notification of a discharge including:

(1) The identification of critical water use areas to facilitate the reporting of and response to discharges:

If a significant spill occurs at the site that escapes secondary containment, then it could enter the stormwater catch basins located west or south of the ISCO injection area or on Glenshaw Street and enter the town stormwater system. If a spill adversely impacts any water body, then the proper agencies on the Emergency Contact List shall be notified.

(2) A current list of names, telephone numbers and addresses of the responsible persons and alternates on call to receive notification of a discharge, as well as names and telephone numbers and addresses of the organizations and agencies to be notified when an discharge is discovered:

The Emergency Contact List identifies the necessary agencies and organizations to contact in the event an emergency and their contact information.

(3) Provisions for access to a reliable communication system for timely notification of a discharge:

Phones and internet access are available at the Site to reach any party on the Emergency Contact List.

(4) An established pre-arranged procedure for requesting assistance during a major disaster or when the situation exceeds the response capability of the state, local or regional authority:

The procedures for requesting assistance during a major disaster (i.e. an emergency that requires evacuation or a significant spill) are described in Appendix IV.

Provisions to assure that full resource capability is known and can be committed during a discharge situation including:

(1) The identification and inventory of applicable equipment, materials and supplies, which are available locally and regionally:

The spill response contractor will be a licensed spill response contractor that has the personnel and supplies to immediately respond to minor and significant spills and will have the necessary resources available to clean up a spill in a timely manner. Spills of less than 1 gallon will be contained using sorbent materials, catch basin mats, booms and other PPE supplies. Spills greater than 1 gallon will be contained using the 4,000 gallon vacuum truck.

(2) An estimate of the equipment, materials and supplies which would be required to remove the maximum discharge to be anticipated:

The maximum discharge of sodium permanganate from a most probable spill scenario is anticipated to be approximately 5 gallons (this should not be confused with the worst-case spill scenario quantity of 680 gallons of 10 percent permanganate solution). Some of the equipment that may be required to respond to a most probable spill includes the following: a vacuum truck, drums, booms, sorbent materials, sodium thiosulfate (neutralizer) and temporary (flow) barriers.

The maximum discharge quantity from the totes for a worst-case spill scenario would be 680 gallons, which is the maximum quantity of the two full totes containing 260 gallons of 10 percent solution and one tote containing the remaining 160 gallons of 40 percent solution. The equipment mentioned above, specifically the 4,000 gallon vacuum truck will be available throughout the ISCO activities.

Provisions for well-defined and specific actions to be taken after discovery and notification of a discharge including:

(1) Specification of a discharge response operating team consisting of trained, prepared and available operating personnel.

The spill response contractor will provide a team of trained employees to immediately respond to minor and major spills as defined in this SPCC Plan. The employees have OSHA “First Responder Operations Level” training.

(2) Pre-designation of a properly qualified discharge response coordinator who is charged with the responsibility, and delegated commensurate authority, for directing and coordinating response operations and who knows how to request assistance from federal authorities operating under existing national and regional contingency plans:

The spill response contractor will coordinate spill response activities and notify the appropriate authorities to respond to a spill.

(3) Provisions for varying degrees of response effort depending on the severity of the discharge:

The Emergency Procedures provides for varying degrees of response effort depending on the severity of the discharge.

(4) Specification of the order of priority in which the various water uses are to be protected where more than one water use may be adversely affected as a result of a discharge and where response operations may not be adequate to protect all uses:

Protection of surface water bodies (this includes the storm-water catch basins) would be the highest priority. Since one storm-water catch basin is located 35 feet west of the property boundary, this catch basin is not likely to be impacted by a spill from the Site.

# APPENDIX IV

# EMERGENCY PROCEDURES

# EMERGENCY PROCEDURES

In the event of a spill, the spill response contractor will have the necessary resources to respond quickly to a spill and will have the necessary resources to remediate a spill according to applicable local, state and federal regulations. The spill control and emergency response procedures for the site are presented below.

1. Identify the source of the spill and type of fluid involved (diluted or undiluted sodium permanganate).
2. Close valves or de-energize pumps to stop the flow of sodium permanganate to minimize the size of the spill.
3. If the spill is from leaking hoses located outside of secondary containment the boom will be moved to a location to contain the spill and placing mats over nearby storm-water catch basins.
4. Report the spill to the Facility Manager as soon as possible.
5. Get additional help, if necessary. The LBG onsite supervisor will determine if additional clean-up help is required.
6. Use personal protective equipment and safety supplies (goggles, gloves, boots, caution tape, safety cones, etc…) as needed.
7. Isolate and contain the spill (if minor) using caution tape, booms, safety cones and absorbent materials.
8. Verify that the entire spill has been contained.
9. If the spill is minor, clean-up the spill with spill kit supplies. If the spill is significant, then clean-up the spill with the 4,000 gallon vacuum truck. Dilute or neutralize the sodium permanganate with water and/or sodium thiosulfate prior to using the vacuum truck.
10. Place used clean-up supplies in open top poly drums. Do not throw away used clean-up supplies in the trash.
11. Document the release.
12. Replace any spill supplies or equipment that was used in the response and clean-up.
13. The spill response contractor will coordinate for proper off-site disposal of spilled material or used clean-up supplies.

Prepare a report of the spill incident which includes the date, time, location, material spilled, quantity, source, clean-up methods, injuries sustained (if applicable) and damage estimate.

# APPENDIX XIV

# COMMUNITY PARTICIPATION PLAN

**New York State Department of Environmental Conservation**

# Brownfield Cleanup Program
## Site # C344070

# Citizen Participation Plan
**for**
# FORMER MATERIALS RESEARCH CORPORATION

542 Route 303
Orangetown
Rockland County, New York

May 2010

# CONTENTS

* * * * *

**Note:** The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the brownfield site's remedial process.

Applicant: **Sony Electronics, Inc. (“Applicant”)**
Site Name: **Former Materials Research Corporation (“site”)**
Site Address: **542 Route 303, Orangetown**
Site County: **Rockland County**
Site Number: **#C344070**

## 1. What is New York’s Brownfield Cleanup Program?

New York’s Brownfield Cleanup Program (BCP) is designed to encourage the private sector to investigate, remediate (clean up) and redevelop brownfields. A brownfield is any real property where redevelopment or reuse may be complicated by the presence or potential presence of a contaminant. A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal and financial burdens on a community. If the brownfield is not addressed, it can reduce property values in the area and affect economic development of nearby properties.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC) which oversees Applicants that conduct brownfield site remedial activities.[1] An Applicant is a person whose request to participate in the BCP has been accepted by NYSDEC. The BCP contains investigation and remediation requirements, ensuring that cleanups protect public health and the environment. When NYSDEC certifies that these requirements have been met, the property can be reused or redeveloped for the intended use.

For more information about the BCP, go online at: **www.dec.state.ny.us/website/der/bcp**.

## 2. Citizen Participation Plan Overview

This Citizen Participation (CP) Plan provides members of the affected and interested public with information about how NYSDEC will inform and involve them during the investigation and remediation of the site identified above. The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

Appendix A contains a map identifying the location of the site.

### *Project Contacts*

Appendix B identifies NYSDEC project contact(s) to whom the public should address questions or request information about the site’s remedial program. The public’s suggestions about this CP Plan and the CP program for the site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

---

[1] “Remedial activities”, “remedial action”, and “remediation” are defined as all activities or actions undertaken to eliminate, remove, treat, abate, control, manage, or monitor contaminants at or coming from a brownfield site.

### *Document Repositories*

The locations of the site's document repositories also are identified in Appendix B. The document repositories provide convenient access to important project documents for public review and comment.

### *Site Contact List*

Appendix C contains the brownfield site contact list. This list has been developed to keep the community informed about, and involved in, the site's investigation and remediation process. The brownfield site contact list will be used periodically to distribute fact sheets that provide updates about the status of the project. These will include notifications of upcoming remedial activities at the site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.

The brownfield site contact list includes, at a minimum:

- chief executive officer and official(s) principally involved with relevant zoning and planning matters the county, city, town and village in which the site is located;
- residents, owners, and occupants of the site and properties adjacent to the site;
- the public water supplier which services the area in which the site is located;
- any person who has requested to be placed on the site contact list;
- the administrator of any school or day care facility located on or near the site for purposes of posting and/or dissemination of information at the facility;

Where the site or adjacent real property contains multiple dwelling units, the Applicant will work with NYSDEC to develop an alternative method for providing such notice in lieu of mailing to each individual. For example, the owner of such a property that contains multiple dwellings may be requested to prominently display fact sheets and notices required to be developed during the site's remedial process. This procedure would substitute for the mailing of such notices and fact sheets, especially at locations where renters, tenants and other residents may number in the hundreds or thousands, making the mailing of such notices impractical.

The brownfield site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in Appendix B. Other additions to the brownfield site contact list may be made on a site-specific basis at the discretion of the NYSDEC project manager, in consultation with other NYSDEC staff as appropriate.

### *CP Activities*

Appendix D identifies the CP activities, at a minimum, that have been and will be conducted during the site's remedial program. The flowchart in Appendix E shows how these CP activities integrate with the site remedial process. The public is informed about these CP activities through fact sheets and notices developed at significant points in the site's remedial process.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a brownfield site, and the nature and progress of efforts to investigate and remediate a brownfield site.

- **Public forums, comment periods and contact with project managers** provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a brownfield site's investigation and remediation.

The public is encouraged to contact project staff at any time during the site's remedial process with questions, comments, or requests for information about the remedial program.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 6. or in the nature and scope of remedial activities. Modifications may include additions to the brownfield site contact list and changes in planned citizen participation activities.

## 3. Site Information

### *Site Description*

The former Materials Research Corporation (MRC) is a 2.72 acre property at 542 Route 303 in Orangetown, Rockland County, New York. The property is surrounded by a mix of residential, commercial and industrial properties, as well as a railroad right-of-way. To the north of the property is the Praxair Surface Technologies (Praxair) headquarters building; to the south is Instrumentation Laboratory; to the east of the site is vacant and residential property; and west of the site is identified as the Interstate Distribution Center which contains commercial and industrial businesses. The area is zoned for residential, commercial and laboratory/industrial uses. A Site Map is shown on figure 1 in Appendix A.

### *Site History*

The MRC facility purifies metals and forms metal targets used in sputtering machines that manufacture chips for electronic equipment. The sputtering process creates a metallic coat onto a silicon disk. In 1999, Praxair purchased the property from MRC and their (Praxair's) current operations at the site are essentially unchanged since MRC began manufacturing metal targets at the facility in 1961.

Environmental investigations conducted at the property document impact to groundwater by halogenated volatile organic compounds (VOCs). The results of a groundwater and soil-vapor investigations identified the potential of a VOC source area located beneath the southwestern portion of the building. Degradation of the potential source material (trichloroethylene ("TCE")) is occurring at this portion of the property. Generally low concentrations of VOCs are identified downgradient of the source area. The investigations indicate that the VOC plume attributed to this release is primarily contained on site and concentrations have significantly diminished since the first round of groundwater samples were collected in 1999.

A second area containing VOC-impacted groundwater was identified near the southeastern portion of the site. Extensive investigations were completed at this portion of the property to determine if the source of the VOCs in this second area is related to an onsite source. The results of the soil investigation identified no VOC constituents above NYSDEC TAGM recommended soil clean-up objectives. None of the unsaturated soil samples contained VOCs indicative of a source area. An evaluation of the chemical gradient within groundwater demonstrates no connection with the suspect VOC source area beneath the building. The source of the TCE and tetrachloroethylene ("PCE") contamination in the southeastern portion of the site is believed to be associated with an offsite source. Suspect offsite sources include an offsite storm drainage system that was reportedly impacted by halogenated VOCs in 1981 and, in addition, documented releases on the western abutting hydraulically upgradient property. An alternative possibility is that there was a spill in this location that may contribute to these conditions, although the testing to date has not identified a spill in this area.

### *Environmental History*

Leggette, Brashears & Graham, Inc. (LBG), the Applicant's environmental consultant has performed environmental investigations at the site dating back to 1997. In September 2001, Sony entered into the NYSDEC Voluntary Cleanup Program to perform environmental investigations of the subject property (#V00317-3). A summary of the investigations that have been conducted are summarized below.

- **Environmental Site Assessment (September 1997)**. This investigation included conducting a site inspection, a review of readily available reports, searches of Federal, State and local regulatory databases for the site and surrounding properties, and inquiries to the local Building Inspector, Sewer Department, Environmental Department and Fire Inspector concerning the subject property. The purpose of this report was to identify potential areas of environmental concern based on the historic use of the site and to document any observation made at the time of the inspection. Potential areas of concern that were identified during the investigation included the former septic system; two active loading docks; a failed drainage pipe along the north side of the building; the topographically low area on the property (swale) and the former transformer area.

- **Phase II Investigation (November 1999)**. This investigation included collecting soil samples from soil borings that were drilled in areas of potential concern identified during the 1997 Environmental Site Assessment as well as the hazardous waste storage area; collecting surficial soil samples in the vicinity of a pad-mounted transformer; and collecting groundwater samples from eight shallow overburden monitor wells that were installed on the site property as part of the investigation. In addition, an extensive review of environmental files for MRC and the surrounding properties maintained at the Rockland County Health Department was conducted as part of this investigation. Based on the investigation, there were no detections of VOCs in any of the soil samples that were collected. Halogenated VOCs were detected in groundwater from several monitor wells that were sampled, however, the source(s) of the VOCs was not identified during the investigation.

- **Phase II Subsurface Investigation (November 2002).** This investigation included drilling 56 soil borings, collecting 44 soil samples, installing 16 additional shallow overburden monitor wells and collecting 35 groundwater samples. Based on the investigation, no sources of VOCs were identified in the unsaturated soils. The groundwater flow direction above bedrock was determined to flow from the northwest to the southeast. Documented offsite releases of halogenated VOCs were determined to be entering the property. During this investigation, a potential VOC source area was identified beneath the western portion of the building. A second area with VOC impacts to groundwater was identified near the southeastern portion of the site. However, it was not determined if the source of this second area of VOC impacts to groundwater was located on the property.

- **Soil Vapor Investigation (May 2004).** A soil vapor investigation was conducted under the western half of the MRC building. The soil vapor sample results confirmed that a possible source area of PCE and 1,1,1-Trichloroethane ("TCA") were located beneath the southwestern portion of the building. As a result, a sub-slab depressurization system was constructed in January 2005 and has been operating on a continuous basis since installation to prevent any vapors from entering the building.

- **Supplemental Investigation (April 2008).** A supplemental investigation was performed to identify a potential source or sources of the VOCs that were documented in the groundwater beneath the southeastern portion of the property and, specifically, to determine if the interior floor-drainage system and the exterior SPDES outfalls were potential sources of the VOCs. In addition, an evaluation of the bedrock groundwater quality was conducted during this investigation. This supplemental investigation included drilling 16 test borings, collecting 107 soil samples, installing 9 overburden wells and 6 bedrock wells, collecting groundwater samples from 38 onsite and offsite monitor wells, inspecting the floor drain system and SPDES outfalls. Based on the laboratory results, there was no source of VOCs identified by the soil samples collected in the southeastern portion of the property. Sources for the groundwater contamination along this portion of the property remain unknown but may be related to an offsite storm drainage system that reportedly had been impacted by halogenated VOCs in 1981. The groundwater sample results indicated that overall the concentrations of VOCs in the overburden groundwater had improved over time with the exception of the groundwater quality in the southeastern portion of the property, which were above criteria. In addition, low concentrations of VOCs were detected in the bedrock wells. Groundwater sampled from the shallow bedrock (50 to 100 feet below grade) from two bedrock wells contained VOCs at concentrations above criteria. The floor-drainage system inspection indicated that all drains were capped or sealed with the exception of those which discharge non-contact cooling water outside of the building. Water and sediment samples collected from two SPDES outfalls (where the non-contact cooling water is discharged) contained several halogenated VOCs at trace concentrations. The source of the VOCs is unknown since reportedly only non-contact cooling water is discharged through these outfall locations and the current owners of the site report no PCE or TCE use in the facility and the applicant never used PCE or TCE during their occupation of the MRC building.

## 4. Remedial Process

**Note:** See Appendix E for a flowchart of the Brownfield site remedial process.

*Application*

The Applicant has applied for and been accepted into New York's Brownfield Cleanup Program as a Participant. Pursuant to the Program, the Participant is obligated to fully characterize the nature and extent of contamination onsite, as well as the nature and extent of contamination that has migrated from the site. The Participant also must conduct a "qualitative exposure assessment," which is a characterization of the actual or potential exposures of people, fish and wildlife to contaminants on the site and to contamination that has migrated from the site.

The Applicant in its Application proposes that the site will be used for industrial purposes.

The Applicant will conduct those remedial activities at the site, with oversight provided by NYSDEC, that are necessary and appropriate for the continued use of the site for industrial purposes. The Brownfield Cleanup Agreement executed by NYSDEC and the Applicant sets forth the responsibilities of each party in conducting a remedial program at the site.

*Investigation*

The Applicant proposes to conduct a targeted remedial investigation (RI) beneath the western portion of the site building. This investigation will be performed with NYSDEC oversight. The Applicant has developed a remedial investigation workplan, which is subject to public comment as noted in Appendix D. The goals of the investigation are as follows:

1) Define the nature and extent of contamination in soil, groundwater and any other impacted media;

2) Identify the source(s) of the contamination;

3) Assess the impact of the contamination on public health and/or the environment; and

4) Provide information to support the development of a Remedial Work Plan to address the contamination, or to support a conclusion that the contamination does not require remediation.

The Applicant will prepare an RI Report after it completes the RI. This report will summarize the results of the RI and will include the Applicant's recommendation of whether remediation is needed to address site-related contamination. The RI Report is subject to review and approval by NYSDEC. Before the RI Report is approved, a fact sheet that describes the RI Report will be sent to the site's contact list.
NYSDEC will determine if the site poses a significant threat to public health and/or the environment. If NYSDEC determines that the site is a "significant threat," a qualifying

community group may apply for a Technical Assistance Grant (TAG). The purpose of a TAG is to provide funds to the qualifying community group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the site and the development/implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the site, and that its members' health, economic well-being or enjoyment of the environment may be affected by a release or threatened release of contamination at the eligible site.

For more information about the TAG Program and the availability of TAGs, go online at: **www.dec.state.ny.us/website/der/guidance/tag/**.

### *Remedy Selection*

After NYSDEC approves the RI Report, the Applicant will be able to develop a Remedial Work Plan if remediation is required.  The Remedial Work Plan describes how the Applicant would address the contamination related to the site.

The public will have the opportunity to review and comment on the draft Remedial Work Plan. The site contact list will be sent a fact sheet that describes the draft Remedial Work Plan and announces a 45-day public comment period. NYSDEC will factor this input into its decision to approve, reject or modify the draft Remedial Work Plan.

A public meeting may be held by NYSDEC about the proposed Remedial Work Plan if requested by the affected community and if significant substantive issues are raised about the draft Remedial Work Plan.  Please note that, in order to request a public meeting, the health, economic well-being or enjoyment of the environment of those requesting the public meeting must be threatened or potentially threatened by the site. In addition, the request for the public meeting should be made within the first 30 days of the 45-day public comment period for the draft Remedial Work Plan.  A public meeting also may be held at the discretion of the NYSDEC project manager in consultation with other NYSDEC staff as appropriate.

### *Construction*

Approval of the Remedial Work Plan by NYSDEC will allow the Applicant to design and construct the alternative selected to remediate the site.  The site contact list will receive notification before the start of site remediation.  When the Applicant completes remedial activities, it will prepare a final engineering report that certifies that remediation requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the remediation is protective of public health and the environment for the intended use of the site.  The site contact list will receive a fact sheet that announces the completion of remedial activities and the review of the final engineering report.

*Certificate of Completion and Site Management*

Once NYSDEC approves the final engineering report, it will issue to the Applicant a Certificate of Completion. This Certificate states that remediation goals have been achieved, and relieves the Applicant from future remedial liability, subject to statutory conditions. The Certificate also includes a description of any institutional and engineering controls or monitoring required by the approved remedial work plan. If the Applicant uses institutional controls or engineering controls to achieve remedial objectives, the site contact list will receive a fact sheet that discusses such controls.

An institutional control is a non-physical restriction on use of the brownfield site, such as a deed restriction that would prevent or restrict certain uses of the remediated property. An institutional control may be used when the remedial action leaves some contamination that makes the site suitable for some, but not all uses.

An engineering control is a physical barrier or method to manage contamination, such as a cap or vapor barrier.

Site management will be conducted by the Applicant as required. NYSDEC will provide appropriate oversight. Site management involves the institutional and engineering controls required for the brownfield site. Examples include: operation of a water treatment plant, maintenance of a cap or cover, and monitoring of groundwater quality.

## 5. Citizen Participation Activities

CP activities that have already occurred and are planned during the investigation and remediation of the site under the BCP are identified in Appendix D: Identification of Citizen Participation Activities. These activities also are identified in the flowchart of the BCP process in Appendix E. NYSDEC will ensure that these CP activities are conducted, with appropriate assistance from the Applicant.

All CP activities are conducted to provide the public with significant information about site findings and planned remedial activities, and some activities announce comment periods and request public input about important draft documents such as the Remedial Work Plan.

All written materials developed for the public will be reviewed and approved by NYSDEC for clarity and accuracy before they are distributed. Notices and fact sheets can be combined at the discretion, and with the approval of, NYSDEC.

## 6. Major Issues of Public Concern

This section of the CP Plan identifies major issues of public concern, if any, that relate to the site. Additional major issues of public concern may be identified during the site’s remedial process.

Based on previous investigations performed on the Site, VOCs were reported to be present in the subsurface (groundwater and soil vapor). The contamination beneath the building is likely to be the result of historical activities on the Site and/or surrounding properties. As such, delineation of the zone of contamination under the building is to be conducted to determine the contaminant concentrations in the soils and groundwater beneath the building. All subsequent investigations or remediation efforts will be determined based upon the location and concentrations of contamination under the building.

The likelihood of human exposure on the Site is low (i.e. human exposure to the contamination at the site is considered to be unlikely). The current workplace activities at the Site do not include the use of the contaminants. The physical location of the contamination is in the groundwater, and possibly the soil, beneath the Site. The Site and the area surrounding the Site is paved and/or covered with buildings, preventing any contact with potentially impacted soils. As such, the likelihood of people being exposed through ingestion and/or dermal contact is minimal. An active sub-surface depressurization system under the building ensures that there are no soil vapors entering the building. Exposure to groundwater is not expected because the building is served by public water.

All workers involved in environmental investigative and remediation activities will follow the standard operating procedures outlined in the Health and Safety Plan developed specifically for the Site to minimize possible exposure.

For the general public surrounding the Site, the possible environmentally-mediated exposure route is through the air. Because the area is served by public water and groundwater is inaccessible, exposure to groundwater is unlikely and not expected. The possibility of being exposed to the inhalation hazard presents itself in the form of soil gas intrusion through the basements of buildings surrounding the Site and through the migration of particulates from the Site during ground invasive activities. The particulates will be monitored and controlled during any investigative and remediation activities with the procedures outlined in an approved Community Air Monitoring Plan. Currently the soil vapor depressurization system serving the building prevents soil vapor from migrating from under the building, thereby containing the vapors and preventing human exposure. Due to the distances that neighboring structures are from any potential contamination source beneath the building, combined with the large percentage of paved areas and structures throughout the area, offsite vapor intrusion is unlikely. However, if soil gas sampling indicates high VOC concentrations along the perimeter of the Site, the survey radius may be expanded to rule out exposure to offsite structures.

# Appendix A – Site Location Map

# Appendix B – Project Contacts and Document Repositories

## Project Contacts

For information about the site's remedial program, the public may contact any of the following project staff:

### New York State Department of Environmental Conservation (NYSDEC):

Mr. James Candiloro, P.E
Project Manager
NYSDEC
Division of Environmental Remediation
625 Broadway, 11th floor
Albany, NY 12233-7014
Telephone: (518) 402-9564
e-mail address: jxcandil@gw.dec.state.ny.us

Mr. Michael Knipfing
Citizen Participation Specialist
NYSDEC
21 South Putt Corners Road
New Paltz, NY 12561
Telephone: (845) 256-3145

### New York State Department of Health (NYSDOH):

Project Manager – Fay Navratil
NYSDOH
Bureau of Environmental Exposure Investigation
Flanigan Square
547 River Street
Troy, NY 12180-2216
Telephone: (518) 402-7860 or
(800) 458-1158

## Document Repositories

The document repositories identified below have been established to provide the public with convenient access to important project documents:

Orangeburg Library
20 South Greenbush Road
Orangeburg, NY
Attn: Director William Langham
Phone: (845) 359-2244
Hours: Mon-Thur 10 am to 9 pm
Fri – Sat 10 am to 5 pm
Sunday 1 pm to 5 pm
E-mail: org@rcls.org

NYSDEC Region 3 Office
21 South Putt Corners Road
New Paltz, NY
Attn: Mr. Michael Knipfing
Phone: (845) 256-3145
Hours: Mon – Fri 9am to 4 pm
(By appointment)

# Appendix C – Brownfield Site Contact List

## Government Officials

## Town of Orangetown

Paul Whalen - Supervisor
26 Orangeburg Road
Orangeburg, New York 10962

EMAIL: supervisor@orangetown.com

### Office of Building, Zoning, Planning Administration and Enforcement

John Giardiello, P.E., C.P.E.S.C., C.P.S.W.Q., C.P.C.A.- Director
20 Greenbush Road
Orangeburg, NY 10962

EMAIL: OBZPAE@orangetown.com

## Rockland County

**Rockland County Executive**
C. Scott Vanderhoef
County Executive Office
Allison-Parris County Office Building
11 New Hempstead Rd
New City, NY 10956

### Commissioner of Planning and Public Transportation

Salvatore Corallo – Commissioner

Rockland County Department of Planning
Dr. Robert Yeager Health Center, Building T
Pomona, NY  10970
Email: rcplan@co.rockland.ny.us

## New York Department of Environmental Conservation

Sal Ervolina
NYSDEC
625 Broadway
Albany, NY 12233
sxervoli@gw.dec.state.ny.us

Willie Janeway
NYSDEC Regional Director
21 South Putt Corners Road
New Paltz, NY  12561
wcjanewa@gw.dec.state.ny.us

Wendy Rosenbach
NYSDEC Public Affairs Officer
21 South Putt Corners Road
New Paltz, NY  12561
warosenb@gw.dec.state.ny.us

Michael J. Knipfing
NYSDEC
21 South Putt Corners Road
New Paltz, NY  12561
mjknipfi@gw.dec.state.ny.us

Ed Moore
NYSDEC
21 South Putt Corners Road
New Paltz, NY  12561
elmoore@gw.dec.state.ny.us

Alec Ciesluk
NYSDEC
21 South Putt Corners Road
New Paltz, NY  12561
afcieslu@gw.dec.state.ny.us

Michael Lesser
NYSDEC
625 Broadway
Albany, NY  12233-5500
mjlesser@gw.dec.state.ny.us

James Candiloro
NYSDEC
625 Broadway
Albany, NY 12233
jxcandil@gw.dec.state.ny.us

Rosalie Rusinko
NYSDEC
100 Hillside Ave, Ste1W
White Plains, NY 10603
rkrusink@gw.dec.state.ny.us

## New York State Department of Health

Fay Navratil
NYSDOH
547 River St.
Troy, NY 12180-2216
fsn01@health.state.ny.us

Mark Van Valkenburg
NYSDOH
547 River Street
Troy, NY 12180-2216
mev05@health.state.ny.us

Gary Litwin
NYSDOH
547 River Street
Troy, NY 12180
gal09@health.state.ny.us

## Property Owners Within One Quarter Mile

RESIDENT
522 ROUTE 303
ORANGEBURG, NY 10962

PRAXAIR SURFACE TECHNOLOGIES
542 ROUTE 303
ORANGEBURG, NY 10962

INSTRUMENTATION LABORATORY CO
526 ROUTE 303
ORANGEBURG, NY 10962

PACKAGING SYSTEMS CORP
524 ROUTE 303
ORANGEBURG, NY 10962

MARZEEPLEX ASSOCIATES
523 ROUTE 303
ORANGEBURG, NY 10962

RESIDENT
525 ROUTE 303
ORANGEBURG, NY 10962

JARCO REALTY CO INC
527 ROUTE 303
ORANGEBURG, NY 10962

JARCO REALTY CO
529 ROUTE 303
ORANGEBURG, NY 10962

RESIDENT
531 ROUTE 303
ORANGEBURG, NY 10962

RESIDENT
533 ROUTE 303
ORANGEBURG, NY 10962

RESIDENT
535 ROUTE 303
ORANGEBURG, NY 10962

RESIDENT
537 ROUTE 303
ORANGEBURG, NY 10962

RESIDENT
539 ROUTE 303
ORANGEBURG, NY 10962

RESIDENT
242 S GREENBUSH RD
ORANGEBURG, NY 10962

RESIDENT
240 S GREENBUSH RD
ORANGEBURG, NY 10962

RESIDENT
238 S GREENBUSH RD
ORANGEBURG, NY 10962

RESIDENT
236 S GREENBUSH RD
ORANGEBURG, NY 10962

RESIDENT
234 S GREENBUSH RD
ORANGEBURG, NY 10962

RESIDENT
232 S GREENBUSH RD
ORANGEBURG, NY 10962

RESIDENT
228 S GREENBUSH RD
ORANGEBURG, NY 10962

RESIDENT
230 S GREENBUSH RD
ORANGEBURG, NY 10962

RESIDENT
244 S GREENBUSH RD
ORANGEBURG, NY 10913

RESIDENT
1 PINE ST
ORANGEBURG, NY 10962

RESIDENT
246 S GREENBUSH RD
ORANGEBURG, NY 10962

RESIDENT
250 S GREENBUSH RD
ORANGEBURG, NY 10962

RESIDENT
20 SPRUCE ST
ORANGEBURG, NY 10962

RESIDENT
18 SPRUCE ST
ORANGEBURG, NY 10962

RESIDENT
3 PINE ST
ORANGEBURG, NY 10962

RESIDENT
16 SPRUCE ST
ORANGEBURG, NY 10962

RESIDENT
14 SPRUCE ST
ORANGEBURG, NY 10962

RESIDENT
10 SPRUCE ST
ORANGEBURG, NY 10962

RESIDENT
12A SPRUCE ST
ORANGEBURG, NY 10962

RESIDENT
12B SPRUCE ST
ORANGEBURG, NY 10962

RESIDENT
12C SPRUCE ST
ORANGEBURG, NY 10962

RESIDENT
8A SPRUCE ST
ORANGEBURG, NY 10962

RESIDENT
8 SPRUCE ST
ORANGEBURG, NY 10962

RESIDENT
6 SPRUCE ST
ORANGEBURG, NY 10962

RESIDENT
4 SPRUCE ST
ORANGEBURG, NY 10962

RESIDENT
541 ROUTE 303
ORANGEBURG, NY 10962

U&A CONSTRUCTION CORP
560 ROUTE 303
ORANGEBURG, NY 10962

ALUF REAL PROPERTY INC
57 N TROOP RD
BLAUVELT, NY 10913

ALUF REAL PROPERTY INC
5-7 GLENSHAW ST
ORANGEBURG, NY 10962

ALUF REAL PROPERTY INC
2 GLENSHAW ST
ORANGEBURG, NY 10962

ALUF REAL PROPERTY
3 GLENSHAW ST
ORANGEBURG, NY 10962

DYNAREX CORP.
10 GLENSHAW ST
ORANGEBURG, NY 10962

COUNTY OF ROCKLAND INDUSTRIAL DEVELOPMENT AGENCY
507 WESTERN HWY
BLAUVELT, NY 10913

RESIDENT
567 ROUTE 303
BLAUVELT, NY 10913

RESIDENT
68 HICKORY ST
BLAUVELT, NY 10913

RESIDENT
57 HICKORY ST
BLAUVELT, NY 10913

RESIDENT
55 HICKORY ST
BLAUVELT, NY 10913

RESIDENT
51 HICKORY ST
BLAUVELT, NY 10913

RESIDENT
45 HICKORY ST
BLAUVELT, NY 10913

RESIDENT
551 ROUTE 303
BLAUVELT, NY 10913

RESIDENT
55 WALNUT ST
BLAUVELT, NY 10913

RESIDENT
57 WALNUT ST
BLAUVELT, NY 10913

RESIDENT
65 WALNUT ST
BLAUVELT, NY 10913

RESIDENT
75 WALNUT ST
BLAUVELT, NY 10913

RESIDENT
79 WALNUT ST
BLAUVELT, NY 10913

RESIDENT
89 WALNUT ST
BLAUVELT, NY 10913

RESIDENT
264 S GREENBUSH RD
BLAUVELT, NY 10913

RESIDENT
16 HILLSIDE AV
BLAUVELT, NY 10913

RESIDENT
15 HILLSIDE AV
BLAUVELT, NY 10913

RESIDENT
66 WALNUT ST
BLAUVELT, NY 10913

RESIDENT
62 WALNUT ST
BLAUVELT, NY 10913

RESIDENT
46 SPRUCE ST
BLAUVELT, NY 10913

RESIDENT
56 SPRUCE ST
BLAUVELT, NY 10913

RESIDENT
66 SPRUCE ST
BLAUVELT, NY 10913

RESIDENT
76 SPRUCE ST
BLAUVELT, NY 10913

RESIDENT
86 SPRUCE ST
BLAUVELT, NY 10913

RESIDENT
106 SPRUCE ST
BLAUVELT, NY 10913

RESIDENT
118 SPRUCE ST
BLAUVELT, NY 10913

RESIDENT
262 S GREENBUSH RD
BLAUVELT, NY 10913

RESIDENT
270 S GREENBUSH RD
BLAUVELT, NY 10913

RESIDENT
278 S GREENBUSH RD
BLAUVELT, NY 10913

RESIDENT
282 S GREENBUSH RD
BLAUVELT, NY 10913

RESIDENT
286 S GREENBUSH RD
BLAUVELT, NY 10913

RESIDENT
81 HICKORY ST
BLAUVELT, NY 10913

RESIDENT
92 S MOISON RD
BLAUVELT, NY 10913

RESIDENT
68 S MOISON RD
BLAUVELT, NY 10913

RESIDENT
564 ROUTE 303
BLAUVELT, NY 10913

RESIDENT
566 ROUTE 303
BLAUVELT, NY 10913

INTEGRATED WIRELESS ALLIANCELLC
568 ROUTE 303
BLAUVELT, NY 10913

RESIDENT
570 ROUTE 303
BLAUVELT, NY 10913

RESIDENT
572 ROUTE 303
BLAUVELT, NY 10913

WESTSHORE PLAZA LLC
580 ROUTE 303
BLAUVELT, NY 10913

UNITED WATER NEW YORK INC
61 N TROOP RD
BLAUVELT, NY 10913

ERIE LACKAWANNA RAILROAD COCONSOLIDATED RAIL CORP
SPARKILL, NY 10976

RESIDENT
314 S GREENBUSH RD
BLAUVELT, NY 10913

## Local Media Contacts

City Editor
**Orangeburg News**
**http://www.topix.com/city/orangeburg-ny**

City Editor
**Rockland Journal News**
200 N Route 303
1625 West Nyack, 10994 (NY)
**http://www.lohud.com/**

City Editor
Hudson Valley Business Journal
86 E. Main St
Wappingers Falls , NY 12590
City Editor
Our Town Media Inc.
P.O. Box 329
Ramsey, NJ 07446

City Editor
El Clarin
48 Broadway
Haverstraw, NY 10927

City Editor
OurTown/ Courier/ Independent
36 Ridge
Pearl River, NY 10965

City Editor
Rockland Review
26 Snake Hill Rd.
West Nyack,  NY 10994

City Editor
Rockland County Times
119 Main St.
Nanuet, NY 10954

City Editor, The Jewish Tribune
Executive Office
78 Randall Avenue
Rockville Center, NY 11570

City Editor
The Record
150 River Street
Hackensack, NJ 07601

WNYK
Nyack College
Nyack, NY 10960

News Director
WRKL
1551 Route 202
Pomona, NY 10970

News Director
Cablevision
235 W. Nyack Road
W. Nyack, NY 10994

News Director, MediaOne
N. Rockland High School
Hammond Road
Theills, NY 10984

News Director
WRNN TV
800 Westchester Ave., Ste S-640
Rye Brook, NY 10573

Lisa Phillips, Bureau Chief
WAMC
318 Central Ave
Albany, NY 12206-2522

Hank Gross
Mid-Hudson News Service
42 Marcy Lane
Middletown, NY 10941

News Director
WRCR
75 West Rt. 59, Suite. 2126
Nanuet, NY 10954

## Public Water Supply

United Water Company
55 Old Mill Road
West Nyack, NY  10994

## Any Person Requesting to be Placed on the Contact List

Jon S. Potaki
Instrumentation Laboratory
526 Route 303
Orangeburg, NY 10962

Donald J. Wanamaker
Environmental Management, Ltd.
56 West Gate Road
Suffern, NY 10901

## Community, Civic, Religious and Other Educational Institutions

**Dominican College**
470 Western Highway
Orangeburg, NY  10962
Sr. Mary Eileen O'Brien, O.P.

**Saint Catharine's School**
517 Western Highway
Blauvelt, NY 10913
Sharon Goodman
**http://www.saintcatharines.org/index.htm**

**Church of the Lord**
13 Mountain View Ave
Orangeburg, NY
10962-1208
Chan Yun Joo

## Environmental Groups

Scenic Hudson
1 Civic Center Plaza
Poughkeepsie, NY 12601

Greenway Conservancy
Capitol Building
Capitol Station, Rm 254
Albany, NY 12224

The Nature Conservancy
Eastern NY Chapter
265 Chestnut Ridge Road
Mt. Kisco, NY 10549

Karl Coplan, Esq.
Pace/Riverkeeper
78 N. Broadway
White Plains, NY 10603

Environmental Citizens Coalition
33 Central Ave.
Albany, NY 12210

Laura Haight
NYPIRG
107 Washington Ave.
Albany, NY 12210

Rockland County EMC
50 Sanatarium Road
Building P
Pomona, NY 10970

Rockland County Conservation Association
P.O. Box 213
Pomona, NY 10970

Larry Larson
Natural Resource Conservation Service
225 Dolson Avenue, Suite 103
Middletown, NY 10940

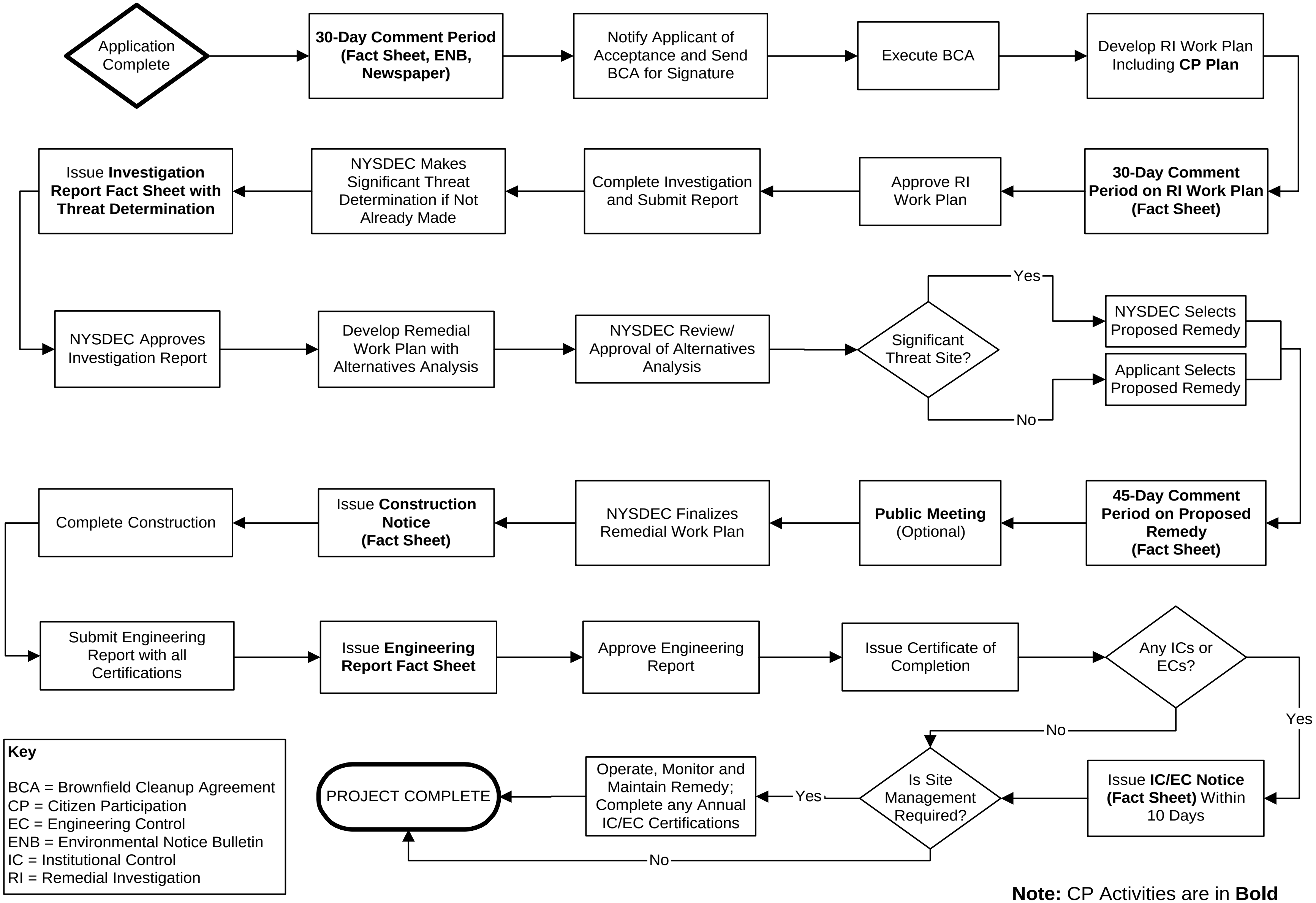
Cornell Cooperative Extension Service
c/o 10 Patriot Hills Drive
Stony Point, NY 10980

Sierra Club
Atlantic Chapter
353 Hamilton St
Albany, NY 12210-1709

# Appendix D – Identification of Citizen Participation Activities

| Required Citizen Participation (CP) Activities | CP Activities) Occur at this Point |
|---|---|
| **Application Process:** | |
| • Prepare brownfield site contact list (BSCL)<br>• Establish document repositories | At time of preparation of application to participate in BCP. |
| • Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day comment period | When NYSDEC determines that BCP application is complete. The 30-day comment period begins on date of publication of notice in ENB. End date of comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice and notice to the BSCL should be provided to the public at the same time. |
| **After Execution of Brownfield Site Cleanup Agreement:** | |
| • Prepare citizen participation (CP) plan | Draft CP Plan must be submitted within 20 days of entering Brownfield Site Cleanup Agreement. CP Plan must be approved by NYSDEC before distribution. |
| **After Remedial Investigation (RI) Work Plan Received:** | |
| • Mail fact sheet to BSCL about proposed RI activities and announcing 30-day public comment period on draft RI Work Plan | Before NYSDEC approves RI Work Plan. If RI Work Plan is submitted with application, comment periods will be combined and public notice will include fact sheet. 30-day comment period begins/ends as per dates identified in fact sheet. |
| **After RI Completion:** | |
| • Mail fact sheet to BSCL describing results of RI | Before NYSDEC approves RI Report. |
| **After Remedial Work Plan (RWP) Received:** | |
| • Mail fact sheet to BSCL about proposed RWP and announcing 45-day comment period<br>• Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager in consultation with other NYSDEC staff as appropriate) | Before NYSDEC approves RWP. 45-day comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day comment period. |
| **After Approval of RWP:** | |
| • Mail fact sheet to BSCL summarizing upcoming remedial construction | Before the start of remedial construction. |
| **After Remedial Action Completed:** | |
| • Mail fact sheet to BSCL announcing that remedial construction has been completed<br>• Mail fact sheet to BSCL announcing issuance of Certificate of Completion (COC) | At the time NYSDEC approves Final Engineering Report. These two fact sheets should be combined when possible if there is not a delay in issuance of the COC. |

# Appendix E – Brownfield Cleanup Program Process



**Note:** CP Activities are in **Bold**

# APPENDIX XV

# RESUMES

# Mark M. Goldberg, PE

Mark Goldberg is a Senior Environmental Engineer with a wide range of experience in managing small- to large-scale projects in the environmental engineering field. Mr. Goldberg's project experience includes managing budgets, managing the engineering design and remediation of petroleum-impacted sites, interfacing with clients and vendors, preparing design specifications and proposals, performing engineering calculations, construction administration duties, and oversight of subcontractors. Mr. Goldberg has completed Phase I, Phase II, and Phase III site investigations, as well as feasibility studies and landfill investigations. Mr. Goldberg's responsibilities have included the day-to-day operations and maintenance for a pump-and-treat remediation system at a superfund site. Mr. Goldberg has developed Spill Prevention, Control and Countermeasures (SPCC) Plans, stormwater pollution prevention plans (SWPPP), Emergency Response Plans (ERP), Work Plans and Community Participation Plans for Brownfield sites. In addition, he is a Connecticut licensed asbestos project designer, asbestos management planner, and asbestos inspector.

## EDUCATION

M.S. Environmental Engineering, 1999, Northeastern University, Boston, Massachusetts

B.S. Mechanical Engineering, 1990, University of Massachusetts, Amherst, Massachusetts

## REGISTRATION

Registered Professional Engineer in Connecticut and New York

Licensed Asbestos Project Designer in Connecticut

## TECHNICAL SOCIETIES

National Society of Professional Engineers (NSPE), Past-President of CT Chapter

Environmental Professionals Organization of Connecticut (EPOC), Associate Member

2000-2001 Licensed Site Professionals Association (LSPA), Associate Member (Massachusetts)

## CONTINUING EDUCATION

Project Management Training
Health & Safety Training
Quality Assurance/Quality Control (QA/QC) Training
Asbestos Project Designer Refresher Training
Asbestos Management Planner/Inspector Refresher Training
Pumping System Design Seminar
Indoor Environmental Quality Seminar
Statistical Design of Experiments Seminar
OSHA (HAZWOPER) 8 hour refresher training
Assessing and Remediating Petroleum Contaminated Sites Course
Business Accounting Course
Optical Analysis of fine-fibered materials Seminar
EPOC Remediation Standard Regulations (RSR) Seminar
Programmable Logic Control (PLC) Seminar
Lotus Notes Seminar
SAPP Accounting Software Seminar
Engineering Ethics Seminar
Bioremediation and Thermal Remediation Seminar
SPCC Seminar
LEED Seminar
Ethics Seminar

## SUMMARY OF PROFESSIONAL EXPERIENCE

**2003 to present:**
Senior Environmental Engineer with Leggette, Brashears, and Graham, Inc., Shelton and Trumbull, Connecticut

**2000 to 2003:**
Project Manager/Environmental Engineer with Clough, Harbour, & Assoicates, LLP,
Rocky Hill, Connecticut

**1999 to 2000:**
Environmental Engineer with Handex, Inc., Marlborough, Massachusetts

**1990 to 1998:**
Product Development Engineer with Veratec (Int'l Paper), Walpole, Massachusetts

## SPECIFIC EXPERIENCE IN SOIL AND GROUNDWATER CONTAMINATION

### Sag Harbor, New York

Senior Environmental Engineer conducting day-to-day operation and maintenance activities for a full-scale pump-and-treat (FSP&T) remediation system that is managed under the Environmental Protection Agency (EPA) "Superfund" Program. The FSP&T system includes nine recovery wells, a pre-treatment filtration section to remove iron, and a packed tower air stripper to remove volatile organic compounds.

Routine operation and maintenance activities include troubleshooting pump and treat system equipment and processes, managing a schedule of needed maintenance activities for the site, and ordering required supplies and equipment to ensure that the system operates smoothly. Oversight includes training field technicians and hydrogeologists to perform routine sampling and maintenance activities.

Responsibilities also include preparing monthly status reports, work plans, Resource Conservation and Recovery Act (RCRA) reports, annual summary reports, hazardous waste documents, and specifications, drawings to modify and/or improve system performance.

### West Hartford, Connecticut

Project Engineer responsible for remediation design engineering for a gasoline service station to address petroleum-impacted soil and ground water. Following site characterization, the preferred remediation technology being implemented for this site is a combination of selective excavation and multi-phase extraction (MPE) of ground water and soil vapor.

### Norwalk, Connecticut

Project Manager responsible for conducting a Phase II Site Investigation at an automotive paint shop to characterize soil, soil vapor and groundwater at the site to determine if follow-up remedial action is required according to applicable CT DEP remediation standard regulations (RSRs). A report was prepared for the client summarizing LBG's findings and recommendations.

### Norwalk, Connecticut

Project Manager responsible for a former gasoline service station site that is under a CT DEP Stipulation for Judgment to complete subsurface environmental investigations and develop a remedial action plan to treat the petroleum-impacted ground water at the site according to applicable CT DEP RSRs.

### Yonkers, New York

Project Manager to provide expertise and guidance for a manufacturing facility to become compliant with environmental regulations including a Risk Management Plan (RMP) (40 CFR Part 68), Spill Prevention Control and Countermeasures (SPCC) plan (40 CFR 112), Petroleum Bulk Storage (Westchester County Sanitation Code), Stormwater Pollution Prevention (SWPP) Plan (40 CFR 122), air emissions program (6 NYCRR Chapter III and the Westchester County Sanitation Code), wastewater discharge program (Westchester County Sanitation Code), hazardous waste management (RCRA). Provided guidance and assistance during an EPA audit of the RMP for the Site.

## SPECIFIC EXPERIENCE IN SOIL AND GROUNDWATER CONTAMINATION (continued)

**Stamford, Connecticut**
Project Manager providing a professional engineering opinion letter to the client for stormwater runoff from the road impacting a residential property. The letter included recommendations to manage stormwater runoff from the road to the residential property.

**Danbury, Connecticut**
Project Engineer responsible for remediation design engineering for a gasoline service station to address petroleum-impacted soil and groundwater. Following site characterization, the preferred remediation technology being implemented for this site is a combination of selective excavation and multi-phase extraction (MPE) of ground water and soil vapor.

**Danbury, Connecticut**
Environmental Engineer providing a feasibility study to determine the preferred remedial approach to treat an industrial site with contaminants consisting of chlorinated volatile organic compounds and heavy metals. The feasibility study included an evaluation of technical constraints, site conditions, regulatory conditions, cost, estimated time to completion and the probability of a successful completion of the project to achieve closure. Prepared a Connecticut Department of Public Health (CTDPH) asbestos alternative work practice (AWP) so subsurface environmental investigations can be completed inside the building.

**Shelton, Connecticut**
Project Manager responsible for preparing Stormwater Pollution Prevention Plan (SWPPP), Spill Prevention and Control Measures (SPCC) plan and stormwater permitting for a manufacturing facility.

**Cortlandt, New York**
Project Manager responsible for Phase II stormwater management of the Town of Cortlandt. This includes identifying, characterizing and sampling stormwater outfalls and sub-watershed boundaries according to applicable State Pollutant Discharge Elimination System (SPDES) permit requirements. Surface water modeling software (Hydrocad) was used to establish “time of concentration” and “first flush” parameters for each sub-watershed to establish a preferred time for sampling each stormwater outfall.

**Shelton, Connecticut**
Project Manager responsible for a runoff evaluation for the Cranberry Pond Watershed (CPW) as it pertained to proposed development activities for a portion of the CPW. Specifically the evaluation compared estimated runoff in Cranberry Pond/Bog for the pre - and post - development of the site. A letter report was prepared for the Town of Stratford Conservation Commission summarizing LBG’s findings and recommendations.

**Fairfield, Connecticut**
Project Manager responsible for environmental compliance for a small industrial company. This included preparation of an SPCC, an SWPPP and an air emissions application package to the CTDEP. The work also included evaluating and providing recommendations for RCRA hazardous waste management and municipal building/zoning requirements.

## SPECIFIC EXPERIENCE IN SOIL AND GROUNDWATER CONTAMINATION (continued)

**Crotonville, New York**

Project Manager responsible for preparing an SPCC Plan and a Westchester County petroleum bulk storage application package for a company training center to comply with applicable regulatory requirements.

**Bridgeport, Connecticut**

Project Manager responsible for preparing an SPCC Plan, SWPPP and Emergency Response Plan (ERP) for a former manufacturing facility to be compliant with applicable local, state and federal regulations.

**Franklin, Connecticut**

Project Engineer responsible for preparing an SPCC Plan and associated engineering recommendations for an oil terminal to become compliant with the SPCC regulations.

**Bantam, Connecticut**

Project Engineer responsible for preparing an SPCC Plan and associated engineering recommendations for an oil terminal to become compliant with the SPCC regulations.

**Norwalk, Connecticut**

Project Manager responsible for preparing an SPCC Plan and associated engineering recommendations for an electric sub-station, water treatment plant and properties used for storage of transformers to become compliant with the SPCC regulations.

**Fitzwilliam, New Hampshire**

Project Manager for the site assessment of an existing fire-fighting training facility that has groundwater contamination impacting several drinking water wells. An initial investigation was performed to determine the location of the source area and a follow-up investigation is being undertaken to further delineate the source area for contamination.

As project manager, interaction with state regulatory officials and the client were a regular part of the duties for this job. Other responsibilities included managing the budget and ensuring accurate and correct invoices were sent to the client, oversight of drilling subcontractors and Quality Assurance/Quality Control QA/QC of laboratory data.

A site investigation report was prepared that included a history of the site, the location of the probable source of contamination, a summary of drilling activities and laboratory results, conclusions of the study and recommendations for follow-up activities which included potential remedial solutions for clean-up of the source area at the site. All site investigation activities and documents conformed to existing New Hampshire Department of Environmental Services regulations and statutes.

**Wolcott, Connecticut**

Project Manager responsible for conducting stormwater sampling for the Town of Wolcott so they can be compliant with the CTDEP MS4 storm-water permit.

## SPECIFIC EXPERIENCE IN SOIL AND GROUNDWATER CONTAMINATION (continued)

**Killingworth, Connecticut**

Project Manager for the environmental site assessment of a former poultry farm. The Town of Killingworth intends to build an athletic complex on this site and wants to insure that there are no environmental liabilities associated with the property prior to construction. Project management activities for this site included budget management, performing field activities, preparing a final environmental report including conclusions and recommendations for future environmental work, interaction with the client, and oversight of drilling subcontractors. All work performed for this project conformed to Connecticut Department of Environmental Protection (CT DEP) the June 12, 2000 Site Characterization Guidance Document, the Connecticut Transfer Act (Sections 22a-134 through 22a-134e), and the Remediation Standard Regulations (RSR) (Sections 22a-133k-1 through 22a-133k-3).

**Hartford, Connecticut**

Project Manager for on-call engineering services with the Connecticut Department of Public Works (CT DPW). Project Management duties included proposal preparation for projects, budget management, preparation of design specifications, concept plans, inspection and compliance reports, performing construction administration duties, oversight of subcontractors, preparation of presentations for project meetings, and conducting periodic status meetings for the project.

Reports, design specifications, and field activities conformed to all applicable Environmental Protection Agency (EPA) (40 CFR 763) Connecticut Department of Health (CT DPH) (19a-332a, 19a-333, 20-440), and Occupational, Safety and Health Administration (OSHA) (29 CFR 1910 and 1926) regulations and protocols.

**Holyoke, Massachusetts**

Project Manager for an Environmental Site Assessment for an automotive repair shop conforming to Massachusetts Contingency Plan (MCP) 40 CMR 310.0000 regulations. During initial investigation activities, non-aqueous phase liquid (NAPL) was detected above applicable MCP reporting conditions. An Immediate Response Action (IRA) Plan was submitted to the Massachusetts Department of Environmental Protection (MA DEP) and subsequent IRA activities were conducted at the site. Through historical investigations and the results of field activities, it was determined that the source was originating from an off-site location. A report was submitted which included a Downgradient Property Status Opinion (DPSO), a summary of IRA activities and an MCP Phase I in conformance with all applicable MCP regulations.

**Southington, Connecticut**

Environmental Engineer performing operation and maintenance activities at the “SRS” state superfund site. This is a remediation system that uses a number of processes to clean the contaminated groundwater at the site. Processes include a rapid mix tank, flocculation tank, sand filter, UV Oxidation lamps, and activated carbon (water phase and vapor phase carbon). As the environmental engineer, prepared weekly, monthly, and quarterly discharge monitoring reports for the CT DEP and the client. In addition, assisted with process troubleshooting problems.

## SPECIFIC EXPERIENCE IN SOIL AND GROUNDWATER CONTAMINATION (continued)

**Killingly, Connecticut**

Project Manager responsible for the environmental investigation for a future Walmart distribution center. The project activities included a subsurface investigation of the soils, a site inspection and a historical review of environmental information in the vicinity of the site.

# Michael Manolakas, LEP, CPG

Michael Manolakas' 20 years of experience includes completion of numerous Phase I through Phase III environmental site investigations, delineation and full characterization of contaminated soils and groundwater, feasibility studies, remedial system design, remedial cost estimates, water treatment system design, and remediation of soils and groundwater. His remedial experience includes in-situ abiotic and biotic treatments, in-situ stabilization, soil-vapor extraction, air sparge, pump and treat, excavation, product removal, and encapsulation. He currently manages sites undergoing investigations and remediation as part of RCRA Corrective Action, CT Transfer Act, CT and NY Voluntary Remediation/Clean-Up/Brownfield Programs and under CT Consent Order. He is experience also includes investigation and remediation of releases in accordance with 40 CFR 761 (TSCA).

Michael's experience includes performing comprehensive environmental liability assessments at industrial facilities, preparing detailed lifecycle construction/remediation project cost estimates, preparing feasibility studies as well as project management, construction contract administration, preparation of project manuals, bidding documents, specifications, and management of remedial investigations. Additional experience includes assisting clients in administering construction bidding process and evaluating bids. Michael also has corporate experience in determining potential environmental financial liability related to the acquisition, leasing or sale of properties and businesses.

Michal has also developed, constructed and analyzed many 2-D and 3-D groundwater flow and solute transport models in hydrogeologic evaluations involving both ground-water supply and groundwater remediation. Michael has used finite element models to delineate well capture zones, determine optimal remedial designs, and estimate the impact pumping may have on surface-water bodies, salt-water interface and wetlands. He has also used databases and programming to streamline management and interpretation of environmental data, and evaluate well field performance, efficiency and determine safe yields for well fields. Michael utilizes GIS modeling and database to increase efficiency and effectiveness in managing projects.

Michael's field experience includes design of pumping and monitor wells and supervising the installation of monitor wells; design and management in constant-rate pumping tests and analysis of data; sampling of surface and groundwater, use of an organic vapor meter to evaluate and delineate volatile organic compound impact; and geophysical investigation using electromagnetic and borehole geophysical logging methods.

## EDUCATION

B.S. in Geological Sciences, 1994, The Ohio State University, Columbus, Ohio

## REGISTRATIONS

Licensed Environmental Professional in Connecticut

Certified Professional Geologist by the American Institute of Professional Geologists

## TECHNICAL SOCIETIES

American Institute of Professional Geologists (AIPG)

Environmental Professionals Organization of Connecticut (EPOC)

## SUMMARY OF PROFESSIONAL EXPERIENCE

**2013 to present:**
Senior Vice President with Leggette, Brashears & Graham, Inc., Shelton, Connecticut

**2009 through 2012:**
Vice President with Leggette, Brashears & Graham, Inc., Shelton, Connecticut

**2006 through 2008:**
Senior Associate with Leggette, Brashears & Graham, Inc., Shelton, Connecticut

**2002 through 2005:**
Associate with Leggette, Brashears & Graham, Inc., Trumbull, Connecticut

**1998 through 2001:**
Senior Hydrogeologist at Leggette, Brashears & Graham, Inc., Trumbull, Connecticut

**1997:**
Hydrogeologist II at Leggette, Brashears & Graham, Inc., Trumbull, Connecticut

**1994 to 1996:**
Hydrogeologist at Leggette, Brashears & Graham, Inc., Wilton and Trumbull, Connecticut

**1993:**
Volunteer at the Ohio Environmental Protection Agency, Columbus, Ohio

**1992:**
Intern at Ford Motor Company, Batavia, Ohio.

## SPECIFIC EXPERIENCE IN ENVIRONMENTAL SITE INVESTIGATION AND REMEDIATION

**Bridgeport, Connecticut**

Project management of investigations and remediation of a 76.5 acre former industrial site. This RCRA TSD facility included an approximate 1.5 million square foot manufacturing building, an inactive industrial landfill, 55 former USTs and two former metal hydroxide sludge beds. Investigations included the drilling of over ~1500 soil borings, installation of ~300 monitoring wells and ~350 soil-vapor point, collection of ~200 sediment samples, electromagnetic geophysics, ground penetrating radar, down-hole geophysics, aquifer test, groundwater flow modeling, collection and analyses of numerous soil and groundwater samples for various constituents of concern (COCs). COCs included PCBs, VOCs, SVOCs, metals, and pesticides. Remedial actions have included the removal and offsite disposal of thousands of tons of PCB remediation waste in accordance with 40 CFR 761, in-situ stabilization of over 3,000 tons of characteristically hazardous waste and disposal of this waste containing PCBs and non-aqueous phase liquids as PCB remediation waste, closure of multiple greater than 90-day RCRA waste storage areas, and remediation of four areas containing light non-aqueous phase liquids (LNAPL). Remediation also included the screening and removal of solid waste from 40,000 cubic yards of landfilled materials. Remediation of this site is ongoing.

**East Haven, Connecticut**

Characterization and remediation of PCB bulk product waste and PCB remediation waste at water-supply sedimentation basin in accordance with the self-implementing option for cleanup and disposal of PCB remediation waste (40 CFR 761.61(a)). The investigation and remediation were completed with the corporation of the CTDEEP and EPA Region 1 Administrator.

**Hamden, Connecticut**

Project management of investigation and remediation of an approximately 19-acre industrial waste landfill site located on residential and public school parcels. Tasks included development of chronological historical filling activities, a detailed investigation work plan, oversight of offsite investigations, implementation of extensive onsite soil and groundwater investigation, and remedial options and costs. Thus far, the field investigations have included the drilling of 70 soil borings, excavation of 8 test pits, collection and analysis of 105 soil samples, installation of 24 monitor wells and collection and analysis of 32 groundwater samples. In addition, tasks included monitor of communications, attend and report on CTDEEP, EPA and other primary responsible party public meetings and review of technical submittals of government agencies and primary responsible parties. Remediation underway include the removal of PCB “hot spot” to be disposed as PCB remediation waste in accordance with 40 CFR 761.

**Fairfield, Connecticut**

Contracted for approximately four months to work at a large international conglomerate corporation. Tasks included review of over one hundred environmental site assessments and remedial closure reports to determine potential environmental risks with respect to acquiring, leasing or selling properties or businesses, and working with environmental health and safety managers to reduce risks associated with these types of transactions. Property and businesses reviewed were located throughout the world and ranged from leasing of office space to acquisition of $500 million corporations. Review of larger acquisitions often included development of work plans and determination of potential environmental liability.

## SPECIFIC EXPERIENCE IN ENVIRONMENTAL SITE INVESTIGATION AND REMEDIATION (continued)

**Danbury, Connecticut**
Identified offsite source of contamination through environmental file review and review of regional hydrogeologic setting. Designed and coordinated installation of potable water treatment system. Coordinated repairs of onsite well and distribution system to the satisfaction of the Connecticut Department of Public Health.

**Manhattan, New York**
Completed Phase I environmental site assessment for signature property assessed at approximately $250 million.

**Chester, Connecticut**
Project management of a RCRA ground-water quality assessment for a plume from metal hydroxide seepage lagoons. The project involved quarterly sampling and evaluation. Developed and implemented CTDEP approved work plan for closure investigation of waste lagoons. Receipt of CTDEP clean closure approval for former waste lagoons. Tasks also included characterization and monitoring of halogenated volatile organic plume and assessment of remedial performance. Remedial operations consisted of both a multi-phase extraction and pump and treat system.

**Norwalk, Connecticut**
Research and identification of inexpensive new technology (jet cavitation) for treatment of contaminated groundwater. Technology is proposed to be used in conjunction with a pump and treat system to remove halogenated volatile organic compounds from bedrock and overburden aquifers.

**Winsted, Connecticut**
Project management of investigations and remediation at a former thread manufacturing facility. Tasks included identification and characterization of 22 potential release areas, and successful remediation of all identified release areas.

**Sag Harbor, New York**
Full characterization of halogenated VOC plume. Tasks included response to technical comments concerning hydrogeology, chemical transport, remedial effectiveness and SPDES discharge technical requirements.

**Detroit, Michigan**
Acted as the onsite supervisor for environmental investigations and remediation activities at three automotive plants. Tasks included operation and maintenance of phytoremediation berm, supervising closure of hazardous waste storage areas, excavation of petroleum, VOC and metal impacted soils and supervision of site investigations.

**Portland, Connecticut**
Supervision and development of monitor wells and evaluation of soil volatile organic levels.

**Stratford, Connecticut**
Supervision of test borings and monitor well installation, while sampling for PCB's and asbestos, to determine soil and groundwater quality.

## SPECIFIC EXPERIENCE IN ENVIRONMENTAL SITE INVESTIGATION AND REMEDIATION (continued)

**Illinois, New Jersey, New Hampshire, Pennsylvania, Rhode Island and Vermont**
Conducted several Phase I environmental site assessments for use of property transfer.

**Farmington, Connecticut**
Completion and submittal of the Environmental Condition Assessment Form and Form III to the CTDEP to satisfy requirements of the Connecticut Property Transfer Program.

**Yonkers, New York**
Supervision and development of monitor wells on periphery of landfill. Entailed collection of groundwater and surface water samples.

**Thomaston, Connecticut**
Characterization of MTBE and BTEX plume in the groundwater.

**Patterson, New York**
Project management of Phase II investigations. Project included sampling of groundwater, soils and paint and the evaluation of the laboratory results.

**Glastonbury, Connecticut**
Project management of subsurface investigation to determine the impact to the soil and groundwater from a former tannery operation. The project included the installation of monitor wells, sampling and evaluation.

**Cheshire, Connecticut**
Annual and quarterly reporting on efficiency and optimization of soil-vapor extraction (SVE) and sparge system (IAS) operation. SVE/IAS system orients hydraulic gradient so that halogenated solvents remain in localized area.

**Dutchess County, New York**
Completed numerous requirements of the hydrogeologic reporting section of the 6 NYCRR Part 360 Solid Waste Management Facilities rules and regulations for a proposed C&D landfill as a closure plan for a mining operation.

**Stratford, Connecticut**
Project management of subsurface investigation to determine the impact from former site operations to the soil and groundwater. Project included drilling of test borings, sampling, environmental database review and evaluation. Completion of final remediation report and submittal of Form II Connecticut Property Transfer form.

**Orangetown, New York**
Project management of subsurface investigation to determine the impact of former site operations to the soil and groundwater. Development and implementation of final work plan to investigate the site under the NYSDEC voluntary remediation program.

**Cromwell, Connecticut**
Project management of bioremediation system, and monitoring program for petroleum release. Tasks also included fulfilling CTDEP reporting requirements.

## SPECIFIC EXPERIENCE IN ENVIRONMENTAL SITE INVESTIGATION AND REMEDIATION (continued)

**Hamden, Connecticut**

Project management of characterization, removal and disposal of mercury-impacted soils.

**Wallingford, Connecticut**

Project management of characterizing pesticide soil and groundwater contamination with respect to the Connecticut Remediation Standard Regulations. Identified concentrations of contaminant in soils posing a potential health threat for various uses of the property.

**Connecticut and New York**

Conducted numerous Phase I and Phase II environmental site assessments for use in a property transfer and financing.

**North Haven, Connecticut**

Supervised steam cleaning of impacted industrial sumps. Investigation and delineation of impacted soils and wetlands.

## SPECIFIC EXPERIENCE IN GROUNDWATER SUPPLY

**Suffolk County, New York**

Completed detailed salt-water and iron investigation as they responded to pumpage of eleven pumping wells in the Montauk Area. The study included pumpage recommendations intended to maximize potable water while limiting seasonal and long-term chloride and iron impacts. The study also provided alternative management approaches for rehabilitating impacted well fields and maximizing existing well fields.

**New Haven County, Connecticut**

Analysis and evaluation of groundwater levels, stream flows, precipitation and wetland conditions to determine the impact of groundwater withdrawals on the aquifers and surface-water systems in four well fields.

**Southington, Connecticut**

Conducted pumping and induced infiltration tests of municipal water supply wells.

**Town of Wappinger Falls, New York**

Conducted several geophysical investigations. Analyzed pump test to determine aquifer parameters and stream infiltration rates. Calculated optimal placement of an additional production well.

**New Haven County, Connecticut**

Evaluation of pumping test data and development of water table maps.

**Suffolk County, New York**

Conducted numerous geophysical investigations. Investigations required determination of optimal screen setting and size for design of production wells.

**Dutchess County, New York**

Completed numerous requirements of the hydrogeologic reporting section of the 6 NYCRR Part 360 Solid Waste Management Facilities rules and regulations for a proposed C&D landfill as a closure plan for a mining operation.

**Suffolk County, New York**

Development of numerous groundwater flow and salt-water intrusion models for locations in Suffolk County to determine optimal well field withdrawal rates in order to avoid potential adverse impacts to the Upper Glacial Aquifer, Magothy Aquifers and surrounding wetlands. Specifically, the models were utilized to determine pumping rates that would avoid salt-water upcoming or lateral encroachment or dewater of wetlands. Projects included management and analysis of pumping tests, design of monitoring well networks and response to concerns of the NYSDEC.

**Southold, New York**

Hydrogeologic assessment for proposed well field. Evaluated potential impacts from salt water upcoming. Project included a 72-hour pump test, collection of samples and evaluation.

**Carlin, Nevada**

Calibration of ground-water flow model (MODFLOW) to evaluate optimal use of pumpage for dewatering of gold mine.

## SPECIFIC EXPERIENCE IN GROUNDWATER SUPPLY (continued)

**New Haven County, Connecticut**

Modification and calibration of groundwater flow model (MODFLOW) to determine the zone of influence during drought conditions for four existing well fields. The modification involved updating three separate 2-dimensional models to 3-dimensional models to better evaluate the effects of the surface-water bodies.

**Town of Thomaston, Connecticut**

Use of groundwater flow model (MODFLOW) and particle tracking program (PATH3D) to determine most efficient and economical remedial design for the characterized MTBE and BTEX plume in the groundwater.

**Sag Harbor, New York**

Modification and calibration of groundwater flow model (MODFLOW), particle tracking program (PATH3D) and solute transport program (MT3D) to determine, optimal remedial design for historical DNAPL Plume.

**Town of Wappinger Falls, New York**

Use of 2-dimensional groundwater flow model (Capzone) and particle tracking program (GWPATH) to determine safe and maximum yield of well field. Model output helped determine capture zone and optimum discharge rate of future production well.

**Litchfield County, Connecticut**

Development and calibration of groundwater flow model (MODFLOW) to determine the zone of influence during drought conditions for four existing well fields. Use of particle tracking program (PATH3D) to determine area of contribution for existing well field.

**Westchester County, New York**

Development and calibration of groundwater flow model (MODFLOW) to determine extent of mounding from proposed septic discharge.

## SPECIFIC EXPERIENCE IN GROUNDWATER MODELING

**Fairfield County, Connecticut**
Development and calibration of groundwater flow model (MODFLOW) to determine the zone of influence during average conditions of existing well fields. Use of particle tracking software (PATH3D) for determination of area of contribution. Model was used to evaluate safe yield for southern well field with respect to salt water intrusion.

**Orange County, New York**
Development and calibration of several groundwater flow models (MODFLOW) to determine zone of influence in drought conditions of existing well fields. Use of particle tracking software (PATH3D) for determination of area of contribution for travel times.

**Carlin, Nevada**
Calibration of groundwater flow model (MODFLOW) to evaluate optimal use of pumpage for dewatering of gold mine.

**New Haven County, Connecticut**
Modification and calibration of groundwater flow model (MODFLOW) to determine the zone of influence during drought conditions for four existing well fields. The modification involved updating three separate 2-dimensional models to 3-dimensional models to better evaluate the effects of the surface-water bodies.

**Thomaston, Connecticut**
Use of groundwater flow model (MODFLOW) and particle tracking program (PATH3D) to determine most efficient and economical remedial design for the characterized MTBE and BTEX plume.

**Suffolk County, New York**
Development of numerous (more than 20) groundwater flow (MODFLOW), particle tracking (PATH3d and MODPATH) and salt-water intrusion (SHARP) models for locations in Suffolk County which were utilized to determine optimal well field withdrawal rates to avoid potential adverse impacts to the Upper Glacial Aquifer, Magothy Aquifers and surrounding wetlands. Specifically, the models were utilized to determine pumping rates that would avoid salt-water upcoming or lateral encroachment or dewater of wetlands.

**Sag Harbor, New York**
Modification and calibration of groundwater flow model (MODFLOW), particle tracking program (PATH3D) and solute transport program (MT3D) to determine optimal remedial design for historical DNAPL plume. Through modeling determined contaminant removal times and optimum pumping locations and rates for focused source/contaminant removal actions.

**Wappinger Falls, New York**
Use of 2-dimensional groundwater flow model (Capzone) and particle tracking program (GWPATH) to determine safe and maximum yield of well field. Model output helped determine capture zone and optimum discharge rate of future production well.

## SPECIFIC EXPERIENCE IN GROUNDWATER MODELING (continued)

**Litchfield County, Connecticut**

Development and calibration of groundwater flow model (MODFLOW) to determine the zone of influence during drought conditions for four existing well fields. Use of particle tracking program (PATH3D) to determine area of contribution for existing well field.

**Westchester County, New York**

Development and calibration of groundwater flow model (MODFLOW) to determine extent of mounding from proposed septic discharge.

## BIBLIOGRAPHY

“Stabilization of Characteristically Hazardous Volatile Organic Compounds and Metals Using Rice Hull Ash and Lime Kiln Dust” Battelle Eighth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, May 2012.

“Effectiveness of a Metal Stabilizer when Treating Hazardous Waste with Modified Fenton’s Reagent and Sodium Persulfate: A Laboratory Treatability Study” Battelle Seventh International Conference on Remediation of Chlorinated and Recalcitrant Compounds, May 2010.

“Investigation of Site Specific Mobility and Leaching Characteristics of Dieldrin in Soils”, Battelle Fourth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, May 2004.

“Achieving Compliance through Development of Alternative Soil Criteria”, Monitor, Spring 2004

“Guidance for EPA Technical Impracticability of Ground Water Restoration” LBG Short Notes, Spring 1999

“Aquifer Mapping Integral to Well Field Protection Efforts”, Land and Water, July/August 1998.

“The Use of Computer Models in Well Field Protection delineations”, CE News, April 1999.

# Karen B. Destefanis

Karen Destefanis' hydrogeologic experience includes drilling supervision, design and installation of monitor, supply and recovery wells; supervision of pumping tests including constant-rate, step, residual drawdown, recovery and slug tests; analytical review of pumping and recovery test data; development of golf course water supplies; salt water intrusion analysis; groundwater, soil and sediment sampling; stream and pond monitoring for contamination migration; geophysical investigations using ground penetrating radar, electromagnetic and borehole geophysical logging methods; fracture-trace analyses utilizing aerial photographs for determining optimal well location; supervision of chemical and mechanical redevelopment of supply and monitor wells; site assessments for property transfers; supervision of underground storage tank removal. Karen's contamination experience includes investigation of sites regulated by CERCLA, RCRA and Connecticut's Remediation Standard Regulations. Her experience also includes oversight and project management responsibilities; development of site wide remedial alternatives and area specific releases; lead field geologist for Superfund site remedial investigation/feasibility study.

## EDUCATION

M.S. in Geology (Hydrogeology), University of Connecticut, Storrs, Connecticut, 1997

B.A. in Geology, Franklin and Marshall College, Lancaster, Pennsylvania, 1987

## REGISTRATION

Certified Professional Geologist by the American Institute of Professional Geologists

## TECHNICAL SOCIETIES

American Institute of Professional Geologists

Association of Ground-Water Scientists and Engineers (National Ground Water Association)

The Environmental Professionals' Organization of Connecticut

Society of Women Environmental Professionals

## PUBLIC SERVICE ACTIVITY

Norwalk Conservation Commission, Norwalk, Connecticut, Chair, 2004 to 2006

Norwalk Conservation Commission, Norwalk, Connecticut, Vice Chair, 2003-2004

Norwalk Conservation Commission, Norwalk, Connecticut, 1999 to present

Norwalk Harbor Management Commissioner, Norwalk, Connecticut, 1996-1998

Norwalk Water Quality Committee Member, Norwalk, Connecticut, 1997-1998

## SUMMARY OF PROFESSIONAL EXPERIENCE

**2000 to present:**
Associate with Leggette, Brashears & Graham, Inc., Trumbull and Shelton, Connecticut

**1993 to 1999:**
Senior Hydrogeologist at Leggette, Brashears & Graham, Inc., Wilton and Trumbull, Connecticut

**1987 to 1992:**
Hydrogeologist at Leggette, Brashears & Graham, Inc., Wilton, Connecticut

**July - Nov. 1987:**
Geologist at Roy F. Weston, Inc.

**1986 to 1987:**
Laboratory Assistant with Department of Geology at Franklin and Marshall College

**1986 (summer):**
Geologic Technician with U.S. Army Corps of Engineers

## SPECIFIC EXPERIENCE IN GROUNDWATER SUPPLY

**North Castle, New York**
Testing and evaluation of potential replacement production well for Town water district. Coordination with Town and subcontractors, well design and well-yield test specifications.

**Cross River, New York**
Develop additional water supply to supplement existing system that was impacted by offsite petroleum contamination. Included well location, drilling, testing and preparation of NYSDEC Water Taking Permit.

**North Brookfield, Connecticut**
Supervised the installation of five monitor wells for a groundwater supply development. Project duties included logging the wells, screen size selection and well-yield testing.

**Patterson, New York**
Conducted a hydrogeologic assessment of the site to determine groundwater development potential. Included drilling supervision and well logging, pumping-test supervision and offsite well monitoring, long-term well yield analysis and water-quality sampling.

**Woodbury, Connecticut**
Drilling supervision of exploratory borings to define sand and gravel extent for the construction of a proposed pond.

**Rockland County, New York**
Conducted a comprehensive review of the status of 61 existing wells in Rockland County. The investigation included analyses and evaluation of the wells and operating equipment. Research of the production history and present condition of each well led to recommendations to obtain optimum performance. Pumping tests including continuous and variable-rate step tests were conducted when insufficient data or discrepancies were noted.

**Carmel, New York**
Participated in a water-supply investigation of vacant land proposed for development. Responsibilities included offsite well monitoring.

**Roxbury, Connecticut**
Conducted a Phase I site assessment of property proposed for development. Investigation included fracture-trace analysis utilizing aerial photographs; groundwater supply versus demand analysis; and nitrate dilution analysis.

**Rhinebeck, New York**
Conducted a Phase I site investigation of a 1,300-acre property proposed for commercial and residential development. Investigation included fracture-trace analysis utilizing aerial photographs; groundwater supply versus demand analysis; and nitrate diluhon analysis.

**Clinton, Connecticut**
Investigation for developing a septic system on 3-acre property. Investigation included supervision of installation of eight monitoring wells, short constant-rate pumping and recovery tests, and evaluation of water-table.

## SPECIFIC EXPERIENCE IN GROUNDWATER SUPPLY (continued)

**Cheshire, Connecticut**
Annual well testing of public water-supply wells by performing drawdown and recovery pumping tests. Analytical review of data to determine well and pump efficiency and performance. Supervision of well redevelopment utilizing mechanical and chemical techniques.

**Wilton, Connecticut**
Supervision of pumping test to determine offsite interference on private water-supply wells.

**Laurel, New York**
Supervision of monitor well installation for potential production well supply.

**Somers, New York**
Conducted pumping test for back-up water supply to meet NYSDOH requirements.

**Weston, Connecticut**
Conducted a pumping test to determine offsite interference on private water-supply wells and river.

**Gardiner's Bay, New York**
Develop additional water supply for golf course.

**Sagaponack, New York**
Develop potable, irrigation and fire-protection supply for private estate.

## SPECIFIC EXPERIENCE IN GROUNDWATER CONTAMINATION

**Bridgeport, Connecticut**
Coordinate quarterly/semi-annual groundwater monitoring at City landfill (RCRA, solid-waste). As project manager, completed associated quarterly and annual reports. Reviewed consent order to determine compliance status.

**Norwalk, Connecticut**
Coordinate Phase II and Phase III investigation of former manufacturing site. Oversaw site soil remediation and responsible for reporting. Coordinate quarterly groundwater monitoring at the site for closure purposes.

**Stamford, Connecticut**
Coordinate Phase II and Phase III investigations for multi-parcel industrial facility for potential land sale. Project included developing work plan, indoor and outdoor subsurface drilling, groundwater monitoring, data evaluation and reporting.

**Sag Harbor, New York**
Conducted a remedial investigation of a CERCLA site. Activities included conducting electromagnetic geophysical surveys, installing monitor well clusters, conducting borehole geophysical logs and slug tests, groundwater sampling, soil sampling, stream and bay sampling, data evaluation, determining vertical and horizontal extent of contamination, determining potential discharge contamination in local bay, reviewing historical aerial photographs, reporting.

**Orangeburg, New York**
Coordination of subsurface investigation for delineation of chlorinated solvent groundwater contamination. Data evaluation and reporting.

**Port Chester, New York**
Supervision of underground storage tank removal and supervision of monitoring well installation to determine if unsaturated soils and groundwater were contaminated.

**Brookfield, Connecticut**
Phase I and II site assessments for property transfer of petroleum-contaminated property. Included soil and groundwater investigation record search at both state and local levels.

**Woodbridge, Connecticut**
Quarterly sampling to monitor groundwater quality near an active landfill.

**Plainville, Connecticut**
Supervision of an unsaturated soil investigation and monitoring of groundwater quality. Monitoring of a hydrocarbon recovery system. Duties included supervision of drilling exploratory borings for onsite wells. Conducted pumping tests and groundwater sampling.

**Mount Vernon, New York**
Supervision of well installation at hydrocarbon-contaminated site to determine groundwater flow and contamination extent.

## SPECIFIC EXPERIENCE IN GROUNDWATER CONTAMINATION (continued)

**Cromwell, Connecticut**

Phase I and II site investigation of manufacturing facility with elevated chromium and chlorinated solvent concentrations. Investigation included indoor/outdoor well installation supervision, well development, permeability testing, groundwater, surface-water and soil sampling.

**Morristown, Tennessee**

Phase I investigation of site contaminated by chlorinated solvents. Vertical and horizontal extent of contamination was determined by drilling test borings in conjunction with comprehensive soil sampling.

**Waterbury, Connecticut**

Phase I site assessment for property transfer at manufacturing facility. Assessment included installation of monitor wells and comprehensive soil sampling.

**New Canaan, Connecticut**

Conducted a Phase I environmental investigation at an active ash landfill. Study included installation of shallow wells, groundwater and surface-water sampling and review of existing water-quality data.

**North Branford, Connecticut**

Phase II site assessment for property transfer. Included supervision of underground storage tank removal, soil sampling and well installation.

# Melanie Sheperd

Melanie Sheperd has over eight years of experience in conducting Phase I, II and III Environmental Site Assessments, including completing all facets of field investigations. These investigations include a variety of drilling, well completion, soil and water sampling, environmental screening tasks associated with impacted soil and groundwater and remediation system monitoring and maintenance. Melanie's experience includes investigations of sites regulated by RCRA, Connecticut's Remediation Standard Regulations and other state regulations. Her experience also includes the management of staff and subcontractors, communication with clients and associated town and state representatives, project data compilation and reporting. Melanie is also trained in all aspects of health and safety precautions related to both environmental and geotechnical projects.

## EDUCATION

B.S. in Geology and Geophysics, 2000, University of Connecticut, Storrs, Connecticut

## CERTIFICATION AND TRAINING

OSHA 40-hour training, 2008 refresher

Troxler Nuclear Density Gauge, 2000

CT DEP Remediation Standard Regulations, 2006

## SUMMARY OF PROFESSIONAL EXPERIENCE

**2008 to present:**
Senior Hydrogeologist at Leggette, Brashears & Graham, Inc., Shelton, Connecticut

**2006 to 2007:**
Hydrogeologist II at Leggette, Brashears & Graham, Inc., Shelton, Connecticut

**2005 to 2006:**
Environmental Geologist at Haley & Aldrich, Inc., Hartford, Connecticut

**2000 to 2005:**
Field Geologist at Haley & Aldrich, Inc., Hartford, Connecticut

## SPECIFIC EXPERIENCE IN ENVIRONMENTAL SITE INVESTIGATION, REMEDIATION AND SITE DEVELOPMENT

**Stamford, Connecticut**

Completed a Phase I and II environmental site assessment and investigation at an approximate 60-acre property which led to remediation. Site responsibilities included oversight and management of subcontractors completing test boring and well installation for Phase II investigation. Additional responsibilities included field reporting, data tabulation and reporting.

**Ossining, New York**

Completed Phase I environmental site assessment necessary for property sale. Project included environmental database review, evaluation and reporting.

**Stratford, Connecticut**

Completed Phase I environmental site assessment which led to remediation, necessary for property transfer and financing. Project included environmental database review and evaluation, supervision of remediation activities and reporting.

**Bridgeport, Connecticut**

Monitored field activities for an extensive Phase III Investigation at an approximate 77-acre property including oversight of subcontractors completing test borings, test pits and monitoring well installations. Additional responsibilities included soil vapor survey, field reporting, data compilation and assistance in completing reports.

**Hartford, Connecticut**

Conducted Phase II Environmental Site Investigation at a Brownfield site to delineate a BTEX contaminant plume. Site responsibilities included oversight and management of subcontractors and delineation of ground-water plume through field sampling. Completed compilation and correlation of site characterization report and on-going semi-annual groundwater monitoring reports.

**Nassau, Bahamas**

Completed Phase II Environmental Site Investigation to characterize and delineate contamination at several parcels for future building concerns. Conducted groundwater sampling plan which included monitoring of free-phase product. Provided local Bahamian drillers with techniques for split spoon sample collection and installed monitoring wells to maintain project schedule. Data compilation included knowledge of Florida water quality standards for comparison purposes.

**Torrington, Connecticut**

Monitored an extensive test boring and monitoring well program for a Phase III investigation of a former golf shaft manufacturing plant. Additional responsibilities included slug testing, groundwater sampling, field reporting, data tabulation and assistance in completing reports.

**Georgetown, Connecticut**

Monitored test boring plan to characterize subsurface soil conditions for future construction and site development of a former wire/fencing manufacturing factory. Site responsibilities included oversight and management of subcontractors.

## SPECIFIC EXPERIENCE IN ENVIRONMENTAL SITE INVESTIGATION, REMEDIATION AND SITE DEVELOPMENT (continued)

**New Haven, Connecticut**
Monitored and observed daily activities of several earthwork contractors for completion of a high school field house. Supervised installation of approximately 700 pressure injected footings and determined their final depth based upon soil density. Continuously monitored effects of footing installation using Blastmate seismic recording devices; monitored excavation of unsuitable soils; monitored compaction of soils and tested compacted soils with a nuclear density gauge; completed daily reports with extensive maps of daily activities and kept constant communication with various site foreman and construction managers.

**Adams, Massachusetts**
Completed a multi-phase geotechnical test boring program which included Shelby tube sampling and NX rock core drilling for additional development of a college campus. Monitored drilling contractors using all-terrain drilling rigs, which were required to complete the boring depth requirements for the varying terrain and topography of the site. Additional responsibilities included rock outcrop mapping and soil sieve analyses.

**Waterbury, Connecticut**
Completed a quarterly groundwater sampling and regularly monitored/maintained a soil-vapor extraction (SVE) system required for remediation of soils impacted with volatile organic compounds.

**Groton, Connecticut**
Monitored test boring program for future construction and site development. Site responsibilities included monitoring of all soil and bedrock drilling. Field responsibilities included identifying bedrock; determining size and angle of rock fractures and rock quality designation which aided in planning for blasting and retaining wall construction.

**New Haven, Connecticut**
Supervised numerous boring contractors conducting an extensive test boring program for future construction of highway bridges, ramps and roads. Monitored all drilling activities and completed geologic logs in accordance with the Connecticut Department of Transportation soil description standards.

**Hamden, Connecticut**
Monitored extensive test boring and monitoring well program for both Phase II and III investigations. High profile project required widespread quality control/quality assurance and diligence of subcontractors. Additional responsibilities included groundwater sampling, field reporting, data compilation and assistance in completing reports.

**Stamford, Connecticut**
Monitored subsurface exploration in support of remediation and foundation design for a large multi-level department store and parking garage. Conducted subcontractor oversight of construction activities which included remedial excavation and preparation of structural footings to support a multi-story building. Additional work included supervising offsite soil disposal, characterization of excavated soil to facilitate offsite disposal or onsite reuse, and daily field reports.

## SPECIFIC EXPERIENCE IN ENVIRONMENTAL SITE INVESTIGATION, REMEDIATION AND SITE DEVELOPMENT (continued)

**Connecticut**

Completed numerous test boring and monitoring well programs for over 13 schools – both public and private located in New Haven, Darien, Greenwich, Hartford, Litchfield, Storrs and Hamden Connecticut.

**New Haven, Connecticut**

Completed Phase II and III Investigation which led to remediation and site development. Monitored field work activities including geoprobe drilling, hollow stem auger drilling and monitoring well installation; completed groundwater sampling; observed removal of numerous underground storage tanks and completed closure sampling. Coordinated with subcontractors and co-workers daily to monitor excavation areas and soil sample collection required for off-site disposal. Completed data compilation and tabulation required for site remediation.

**Waterbury, Connecticut**

Completed oversight work for several earthwork contractors including monitoring building demolition; underground storage tank removal and soil remediation; site work preparation for footing installation and field reporting of daily contractor activities. Completed test boring plan for future development of site which led to construction of multi-story building and parking garage.

**Tolland County, Connecticut**

Worked with several staff members to complete an extensive groundwater sampling plan required to monitor contaminant migration from a former landfill.

# Lucas Williamson

Lucas Williamson's experience includes the investigation and remediation of soil and groundwater contamination. Relatable field experience includes supervision of remedial contractors, supervision of bedrock and overburden drilling programs (hollow-stem auger, direct push method), monitoring well installation and development, and sampling of various environmental media including soil, groundwater, surface and storm-water.

Mr. Williamson also has experience with projects involving groundwater supply and management. Specific field experiences include assistance with aquifer testing, stream gaging, well development, piezometer installation, and water level monitoring.

Mr. Williamson has also assisted with the preparation of various reports including Phase I Environmental Site Assessments and Remedial Action Plans. He has used geographic information systems (GIS) to aid in the analysis of various sampling programs. In addition, he has experience studying and applying soil moisture and heat transport principles within the shallow subsurface using distributed temperature sensing via fiber-optic cables.

## EDUCATION

M.S. in Hydrogeology, 2012, University of Nevada, Reno, Nevada

B.S. in Environmental Science-Natural Resources, 2009, University of Connecticut, Storrs, Connecticut

## CERTIFICATION AND TRAINING

Health and Safety Operations at Hazardous Waste Sites (HAZWOPER), 29 CFR 1910.120(e)(3), 40 hours; with annual 8-hour refreshers.

DOT Hazardous Materials Transportation, 49 CFR 172.704(a)(1)(3)

DOT Security Awareness Training, 49 CFR 172.704(a)(4)

## SUMMARY OF PROFESSIONAL EXPERIENCE

**2015 to present:**
Hydrogeologist II at Leggette, Brashears & Graham, Inc., Shelton, Connecticut

**2012 to 2014:**
Hydrogeologist I at Leggette, Brashears & Graham, Inc., Shelton, Connecticut

**2010 to 2012**
Research Assistant, University of Nevada, Reno, Nevada

**2009 to 2010**
Teaching Assistant (Groundwater Hydrology), University of Nevada, Reno, Nevada

**May 2007 to August 2007**
Field Technician, Public Archaeology Survey Team Inc., Storrs, Connecticut

## SPECIFIC EXPERIENCE IN ENVIRONMENTAL SITE INVESTIGATION AND REMEDIATION

**Branford, Connecticut**

Conducted logging of soil cores and soil sampling to characterize potential ash layer at a contaminated site in Branford. Responsible for waste stream profiling and coordination with subcontractor for waste disposal.

**Bridgeport, Connecticut**

Conducted subcontractor oversight of direct push soil borings and monitoring well installations, including associated geologic logging and soil/groundwater sampling. Oversight of various remedial projects including the excavation and removal of light non-aqueous phase liquid (LNAPL) impacted soil and groundwater, excavation and offsite disposal of contaminated soil including TSCA-regulated PCBs, removal of piping, removal of concrete slab, and removal of solid waste from a former landfill.

**Danbury, Connecticut**

Assisted with LNAPL extraction from monitoring wells at an abandoned manufacturing facility of coaxial connectors. Oversight of impacted soil relocation and subsequent soil sampling for designation of an environmental land use restriction (ELUR) at a new car dealership.

**Derby, Connecticut**

Conducted Phase I environmental site assessment and subsequent field work for Phase II environmental subsurface investigation at a former landscaping center prior to property transaction.

**East Hartford, Connecticut**

Oversight of well abandonment of 30 monitoring wells at an industrial site and neighboring golf course.

**Hamden, Connecticut**

Onsite health and safety officer and oversight of remedial excavation for removal of soils containing PCBs and solid waste.

**Low-flow/Low-Stress Groundwater Sampling**

Responsible for groundwater sampling using the low-flow/low-stress sampling method at various sites within Connecticut and New York.

**Trumbull, Connecticut**

Conducted field component of Phase II site assessment of municipal property. This included oversight of ground-penetrating radar, direct push drilling and associated soil screening, logging and soil sampling, installation of temporary monitoring wells and groundwater sampling.

**Waterbury, Connecticut**

Responsible for updating a Phase I environmental site assessment for two adjacent lots in Waterbury.

## SPECIFIC EXPERIENCE IN ENVIRONMENTAL SITE INVESTIGATION AND REMEDIATION continued

**Wilton, Connecticut**

Oversight of polluted fill excavations and direct push drilling for delineation of impacted fill at an industrial site in Wilton. Responsible for geologic logging of borings, screening with a PID, and soil sampling.

**Woodbridge, Connecticut**

Conducted sampling of suspect hazardous materials at an abandoned cabin on public water supply land.  Oversight of cabin deconstruction and disposal.

## SPECIFIC EXPERIENCE IN GROUNDWATER MANAGEMENT AND SUPPLY

**East Fishkill, New York**

Installed and checked pressure transducers in onsite and offsite wells to monitor water levels during pumping test.

**Hamden, Connecticut**

Conducted recovery tests at two production wells within a well field for evaluation of well performance. Also collected water samples for Biological Activity and Reaction Test (BART).

**Harriman, New York**

Collected groundwater and surface water samples throughout town for assessment of sodium and chloride levels.

**Monroe, New York**

Installed and monitored staff gages in a reservoir and surrounding streams. Conducted stream gaging and measurement of culvert flows as part of assessment of pumping impact on local water balance.

**North Salem, New York**

Responsible for long term, water level monitoring surrounding a potential housing complex.