

Haley & Aldrich of New York  
200 Town Centre Drive  
Suite 2  
Rochester, NY 14623-4264

Tel: 585.359.9000  
Fax: 585.359.4650  
HaleyAldrich.com

**HALEY &  
ALDRICH**

6 October 2010  
File No. 28590-019

Lech M. Dolata  
Division of Environmental Remediation  
New York State Department of Environmental Conservation  
625 Broadway, 11<sup>th</sup> Floor  
Albany, NY 12233-7014

Subject: Tarrytown Former MGP Site  
Revised Site Management Plan  
Brownfield Cleanup Agreement No. C3600064

Dear Mr. Dolata:

As requested by Ferry Landings, LLC, this submittal responds to your 26 August 2010 letter which approved the August 2010 Tarrytown Site Management Plan (SMP) with one condition:

Section 2.4.2 Notifications, the last bullet; please add "This Notification will meet all the requirements stipulated under CFR 375-1.11 (d)(3)."

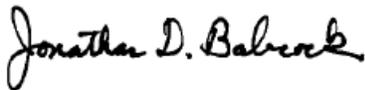
The requested change was made to the attached Tarrytown Former MGP Site Management Plan and the approval date was added to the SMP cover page.

The CD in the back of the report contains the entire report and its appendices in a single searchable electronic file in PDF format, as you requested. By copy of this letter, the SMP is being distributed to Consolidated Edison, Village of Tarrytown, New York State Department of Health, NYSDEC Region 3, and the public repository (Warner Library in Tarrytown, NY).

Please contact me if you require additional information.

Sincerely yours,

HALEY & ALDRICH OF NEW YORK



Jonathan D. Babcock, P.E.  
Project Manager

c C. Monheit, Ferry Landings, LLC

**Tarrytown Former MGP Site**  
WESTCHESTER COUNTY, NEW YORK

---

**Site Management Plan**

**NYSDEC Site Number: C360064**

**Prepared for:**

Ferry Landings, LLC  
485 West Putnam Avenue  
Greenwich, Connecticut 06830

**Prepared by:**

Haley & Aldrich of New York  
200 Town Centre Drive, Suite 2, Rochester, NY 14623  
585.359.9000

**Revisions to Final Approved Site Management Plan:**

Revision #	Submitted Date	Summary of Revision	DEC Approval Date
0	5/5/06	Original Approved SMP	5/12/06
	Updated 1/19/07	Update for Consistency with Environmental Easement	4/4/07
1	8/10/10	Comprehensive Reformatting per March 2010 NYSDEC Template and July 22, 2010 Comment Letter	8/26/10

---

**AUGUST 2010**

Revised 10 August 2010

**HALEY &  
ALDRICH**

**New York State Department of Environmental Conservation**  
**Division of Environmental Remediation**  
Remedial Bureau C, 11th Floor  
625 Broadway, Albany, New York 12233-7014  
Phone: (518) 402-9662 • Fax: (518) 402-9679  
Website: [www.dec.ny.gov](http://www.dec.ny.gov)



Alexander B. Grannis  
Commissioner

August 26, 2010

Mr. Carl Monheit  
Ferry Landings, LLC  
485 West Putnam Avenue  
Greenwich, CT 06830

Re: Tarrytown Former MGP Site, Site No. C360064  
Tarrytown, Westchester County, NY  
Agreement No. W3-1007-04-06  
Site Management Plan (SMP), August 2010

Dear Mr. Monheit:

We reviewed the revised Site Management Plan dated August 2010 (SMP, 2010) submitted to the New York State Department of Environmental Conservation (Department) under April 13, 2010 Order on Consent. Since our July 22, 2010 comments were satisfactorily addressed, the 2010 SMP is conditionally approved, subject to the following revision.

Section 2.4.2 Notifications, the last bullet; please add "This Notification will meet all the requirements stipulated under CFR 375-1.11(d)(3)."

Please distribute the revised SMP 2010 to all parties involved in this project, including the Repository, and provide the Department with an electronic copy compiled in a single PDF format file.

If you have any question regarding his letter, please contact me at (518) 402-9662.

Sincerely,

Lech Dolata.  
Project Manger  
Remedial Bureau C  
Division of Environmental Remediation

# TABLE OF CONTENTS

TABLE OF CONTENTS .....	I
1.0 INTRODUCTION AND DESCRIPTION OF REMEDIAL PROGRAM .....	1
2.0 ENGINEERING AND INSTITUTIONAL CONTROL PLAN.....	18
3.0 SITE MONITORING PLAN.....	35
4.0 OPERATION AND MAINTENANCE PLAN .....	44
5.0 INSPECTIONS, REPORTING AND CERTIFICATIONS.....	54

Revised 10 August 2010

## **LIST OF APPENDICES**

- APPENDIX A - Excavation Work Plan**
- APPENDIX B - Metes and Bounds**
- APPENDIX C - Environmental Easement**
- APPENDIX D - Health and Safety Plan and Community Air Monitoring Plan**
- APPENDIX E - Stormwater Pollution Control Plan**
- APPENDIX F - Groundwater Monitoring Plan with Well Installation Logs  
and Sampling Procedures**
- APPENDIX G - Quality Assurance Project Plan with Field Sampling Plan**
- APPENDIX H - Site Inspection Forms**
- APPENDIX I - Engineering Controls “As-Built” Drawings**
- APPENDIX J - Baseline Post-Remediation Groundwater Monitoring**
- APPENDIX K - Truck Routes**

## LIST OF TABLES

<b>Table No.</b>	<b>Title</b>
1	Soil Cleanup Objectives for the Site
2	Criteria for Re-use of On-Site Soil
3	Materials Disposed During Remediation at the Tarrytown Former MGP Site
4	Criteria for Imported Soil
5	Site Management Matrix
6	Monitoring / Inspection Schedule
7	Schedule for Monitoring / Inspection Reports
8	Emergency Contact Numbers
9	Operation and Maintenance Summary – DNAPL Recovery System
*	Copy of Table 2 from Appendix F

## LIST OF FIGURES

<b>Figure No.</b>	<b>Title</b>
1.1	Site Locus
1.2	Pre-Remediation Site Plan
1.3	Post-Remediation Site Plan
1.4	Site Plan 2009
1.5	Geologic Sections
1.6	Groundwater contour Map
1.7	Remedial Investigation Map
1.8	Remedial Action Record Drawing – Plan
1.9	Areas and Depths of Clean Soil Cover – January 2007
1.10	Monitoring Wells MW-12, MW-20, MW-21, MW-24, MW-29 Groundwater Monitoring Plan
2.1	Operations and Maintenance Plan
2.2	Northern DNAPL Section
2.3	Western DNAPL Section
2.4	Typical DNAPL Recovery Well

# SITE MANAGEMENT PLAN

## **1.0 INTRODUCTION AND DESCRIPTION OF REMEDIAL PROGRAM**

### **1.1 INTRODUCTION**

This document is required as an element of the remedial program at the Tarrytown Former Manufactured Gas Plant (MGP) Site (hereinafter referred to as the “Site”) under the New York State (NYS) Brownfield Cleanup Program (BCP) , administered by New York State Department of Environmental Conservation (NYSDEC). The site was remediated in accordance with Brownfield Cleanup Agreement (BCA) Index#, W3-1007-04-06, Site # C360069, which was executed on June 28, 2004.

This Site Management Plan supersedes the 2006 Site Management Plan, updated January 2007, previously approved by NYSDEC.

#### **1.1.1. General**

The Volunteers, Ferry Landings, LLC, Ferry Investments, LLC, and Consolidated Edison Company of New York, Inc. (ConEdison) entered into a BCA with the NYSDEC to remediate a 20-acre property located in the Village of Tarrytown, New York (See Figure 1.1). This BCA required the Volunteers to investigate and remediate contaminated media at the site. A figure showing the site location and boundaries of this 20-acre site is provided in Figure 1.2. The boundaries of the site are more fully described in the metes and bounds site description that is part of the Environmental Easement (See Appendices B and C).

The remedial work performed is described in the following documents:

1. “Tarrytown Former MGP Site, Revised Conceptual Remediation Plan,” prepared by Haley & Aldrich of New York, latest revision dated 22 July 2003.
2. “Tarrytown Former MGP Site, Holder and Tar Well Remedial Design Report,” prepared by Haley & Aldrich of New York, latest revision dated 29 September 2003.
3. “Tarrytown Former MGP Site, LNAPL Remedial Design Report,” prepared by Haley & Aldrich of New York, dated 18 December 2003.

4. “Tarrytown Former MGP Site, Northern DNAPL Barrier and Recovery Trench Remedial Design Report,” prepared by Haley & Aldrich of New York, latest revision dated 23 December 2003.
5. “Tarrytown Former MGP Site, Western DNAPL Barrier and Sediment Removal Wet Alternative Removal Remedial Design Report,” prepared by Haley & Aldrich of New York, dated 27 February 2004.

Within the rest of this Site Management Plan, the preceding documents will collectively be called the Remedial Action Work Plan (RAWP). After completion of the remedial work described in the RAWP, some contaminant residues were left in the subsurface at this site, which is hereafter referred to as “remaining contamination.” This Site Management Plan (SMP) was prepared to manage remaining contamination at the site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State.

This SMP was prepared by Haley & Aldrich of New York (Haley & Aldrich) on behalf of Ferry Landings, LLC in general accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, dated May 2010 (and/or its predecessor, publicly-issued Draft versions) and the guidelines provided by NYSDEC. This SMP addresses the means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) that are required by the Environmental Easement for the site.

### **1.1.2. Purpose**

The site contains contamination left after completion of the remedial action. Engineering Controls have been incorporated into the site remedy to control exposure to remaining contamination during the use of the site to be protective of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Westchester County Clerk, requires compliance with this SMP and all ECs and ICs placed on the site. The ICs place restrictions on site use, and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. This SMP specifies the methods necessary for compliance with the ECs and ICs required by the Environmental Easement for contamination that remains at the

site. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

This SMP provides a detailed description of the procedures required to manage remaining contamination at the site after completion of the Remedial Action, including: (1) implementation and management of the Engineering and Institutional Controls; (2) media monitoring; (3) operation and maintenance of the recovery systems; (4) performance of periodic inspections, certification of results, and submittal of Periodic Review Reports; and (5) defining criteria for termination of recovery system operations.

To address these needs, this SMP includes three 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 the recovery systems.

This plan also includes a description of Periodic Review Reports for the periodic submittal of data, information, recommendations, and certifications to NYSDEC.

NYSDEC emphasizes the following:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the environmental easement, which may be grounds for revocation of the Certificate of Completion (COC); and
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the above-referenced BCA for the site, and thereby may be subject to applicable penalties.

### **1.1.3. Revisions**

Revisions to this plan must be proposed in writing to the NYSDEC's project manager. Proposed revisions shall also be submitted to Ferry Landings, LLC and ConEdison. In accordance with the Environmental Easement for the site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

## **1.2 SITE BACKGROUND**

This section provides a description of the location, history, nature and extent of contamination, both before and after the remedy.

### **1.2.1 Site Location and Description**

The site is located on the east side of the Hudson River north of the Tappan Zee Bridge in the Village of Tarrytown, New York, as shown on Figure 1.1. The Pre-Remediation Site Plan is shown on Figure 1.2 and the Post-Remediation Site Plan is shown on Figure 1.3. Division and River Streets bound the site on the north, Railroad Avenue on the east, West Main Street on the south and the Hudson River on the west. The site encompasses approximately 20 acres, and was primarily used for industrial-commercial purposes prior to remediation. (Remediation was performed between June 2004 and January 2005). The main activities on the site were an asphalt batch plant in the northwest portion and a trucking terminal and maintenance facility in the southeast portion.

The central portion of the site included a former manufactured gas plant (MGP), reportedly operated between 1873 and 1938. The operational boundary and outlines of former structures of the MGP, derived from Sanborn™ maps, are shown on Figure 1.2. The MGP was last operated by the Westchester Lighting Company, which has been succeeded in ownership by Con Edison. The boundaries of the site are more fully described in Appendix B – Metes and Bounds.

### **1.2.2 Site History**

Information in this section was obtained primarily from “Site Investigation Report for the Tarrytown Site, ConEdison, Tarrytown, New York,” Parsons Engineering Science, 1997. Sanborn™ Fire Insurance maps indicate that between 1873 and 1940 portions of the site and surrounding areas were occupied by various industries including the MGP; lumber, porcelain tile, pottery and paint shops; brickyards; coal storage; meat processing plants; distilling and bottling companies; hotels; livery stables; and bulk oil storage facilities. The Sanborn maps also

Revised 10 August 2010

indicate that the shoreline of the Hudson River in the vicinity of the site has moved westward by as much as 680 feet since 1903, until reaching its present location in approximately 1924.

The Standard Oil Company owned and operated a bulk oil storage facility on a portion of the site. The storage tanks were no longer present on the 1970 Sanborn™ map. Anchor Motor Freight Corporation occupied the portion of the site which included the former MGP in approximately 1940 and operated a trucking terminal, including a 25,000 square foot maintenance building, at the site from approximately 1940 to 1996. Leaseway Transportation occupied the trucking terminal until shortly before remediation began.

To support the trucking operations, the Anchor facility contained a number of underground storage tank (UST) systems. Four 10,000-gallon USTs, two pump islands, and two wells for leak detection were located in the west-central portion of the site (Figure 1.2). Three of the USTs were reportedly installed in 1980 and were used to store diesel fuel. The other UST was reportedly installed in 1987 and was used to store gasoline. Five 8,000-gallon USTs were also located adjacent to the southwestern corner of the maintenance building. These were used to store antifreeze, gear oil, waste oil, motor oil, and hydraulic oil. These USTs were reportedly closed prior to 2000.

In the time just prior to remediation, an asphalt batch plant operated by County Asphalt was located in the northwest portion of the site, a concrete block building located in the north central portion of the site was used for offices, storage and vehicle maintenance by Westchester Industries, and the balance of the site was primarily used for staging vehicles for automobile dealerships and trucking companies.

By the end of 2009, remediation was completed, the asphalt plant was removed and seven new buildings were constructed on the site (see Figure 1-4). These included five multiple-unit condominium/townhouse buildings, the “Stone House,” which has retail space at street level and residential units above, and the “Club House,” which has meeting space and recreational space.

### **1.2.3 Geologic Conditions**

This section summarizes site geology and hydrogeology. Information in this section was obtained primarily from “Site Investigation Report for the Tarrytown Site, ConEdison, Tarrytown, New York,” Parsons Engineering Science, 1997. The shallow stratigraphy of the site can be divided into three geologic units: fill, silt with fine sand, and clayey silt. The subsurface

stratigraphy is illustrated on the geologic cross sections on Figure 1.5. The uppermost unit consists of fill. The fill varies in thickness from five feet in the eastern portion of the site to greater than nineteen feet in the western portion of the site. The fill consists of black, fine to coarse sand, silt, gravel, asphalt, bricks, wood, cinders, slag, ash and other construction-related debris. Heavy wood pilings were also observed in the fill. The fill is generally underlain by a tan, gray to green silt and fine grained sand with some interbeds of medium grained sand. The silt and fine sand unit ranges in thickness from ten feet in the eastern portion of the site to several feet thick in the western portion of the site. The lowermost unit consists of gray to greenish-gray, interbedded silt and clay. Bedrock was encountered at depths from 25 to 35 feet below the ground surface at the western limit of the site adjacent to the Hudson River.

The water table at the site generally ranges in depth from approximately three to seven feet below the ground surface. Groundwater levels at the site appear to be affected by tidal fluctuations in the Hudson River. Tidal fluctuations up to five feet have been measured in the river adjacent to the site. Historical groundwater data indicate that water levels at the site fluctuate by 0.5 to 2 feet. Groundwater elevation contours measured in 1997 are shown on Figure 1.6. These water levels were measured when the tide in the Hudson River was half way between low and high tide. The average groundwater flow direction is to the west and groundwater discharges to the Hudson River. Tidal fluctuations result in local reversals in flow direction along the edge of the river. The shallow aquifer is recharged by lateral groundwater flow from the east.

### **1.3 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS**

Remedial Investigations (RIs) were performed to characterize the nature and extent of contamination at the site. The results of the RIs are described in detail in the following reports:

1. "Site Investigation Report for the Tarrytown Site, ConEdison, Tarrytown, New York," Parsons Engineering Science, 1997.
2. "Supplemental Site Investigation Report for the Tarrytown Site, ConEdison, Tarrytown, New York," Parsons Engineering Science, 2000.
3. "Site Status Report, Penske Truck Leasing, Tarrytown, New York," Handex Group, Inc., 2000.

4. “Supplemental Site Investigation Report for the Tarrytown Site, ConEdison, Tarrytown, New York,” Parsons Engineering Science, 2002.
5. “Supplemental Site Investigation – Spring 2003, Tarrytown Former MGP Site, Tarrytown, New York,” Haley & Aldrich, 2003
6. “Pre-Design Investigation Report, Tarrytown Former MGP Site, Tarrytown, New York,” Haley & Aldrich, 2003.
7. “Supplemental Site Investigation, County Asphalt Plant, Tarrytown, New York,” Haley & Aldrich, 2006.

Figure 1.7 presents locations of the soil borings, groundwater monitoring wells, and soil vapor probes installed during the various remedial investigations.

### **1.3.1 General Results of the Remedial Investigations**

The following information describes in general the results of the RIs, organized according to four areas of the site:

- Holder and Tar Well Area,
- Light Non-Aqueous Phase Liquid (LNAPL) Area,
- Northern Dense Non-Aqueous Liquid (DNAPL) Area, and
- Western DNAPL and Sediment Removal Area.

Holder and Tar Well Area: Holders A, B, C, and D are shown on Figure 1.7. During site investigations, some flowing MGP DNAPL was present in Holders A, B, and C, but not in Holder D. Soils in the Tar Well Area, located south of Holder A were found to contain zones saturated with MGP DNAPL. Consequently, Holders A, B, C, and the Tar Well Area were proposed to be remediated via excavation of impacted materials.

LNAPL Area: Measurements in 1998 and 1999 by Handex Group, Inc. identified a zone of measurable free floating LNAPL (primarily diesel fuel) in a triangular area defined by MW-2, MW-3, and MW-6 (see Figure 1.7). Additionally, residual contamination due to historic LNAPL releases was evident between the triangular area of free-floating LNAPL and West Main Street (see Figure 1.7). April 2003 and July 2003 investigations confirmed previous data regarding

residual contamination in that area. No petroleum-related contamination was observed in the top four feet of soil in this area. Some odors, staining, and photo-ionization detector (PID) readings greater than 100 ppm were observed between four feet and eight feet depth.

The purpose of the remedial action in this area was to remove, to the extent practical, the floating free LNAPL and to remove and treat the contaminated soils in the smear zone between the high and low water table, in areas where they would be expected to potentially cause unacceptable concentrations of contaminants in soil vapor.

Northern DNAPL Area: The Northern DNAPL Area, as shown on Figure 1.6, is located underneath the existing County Asphalt office building, and is depicted to be about 500 ft long and 200 ft wide. The primary environmental concern in this area is soil affected by discrete zones containing MGP DNAPL (apparently derived from coal tar), as observed in soil borings SB-7, SB-10, SB-16, and SB-19 and in monitoring wells MW-11, MW-13, and MW-26. The subject zones are located between 12 and 15 ft below ground surface (bgs) on the west side of the building and between 9 and 13 ft bgs on the east side (See Figure 1.5). The proposed remediation consisted of two main components: a barrier and a recovery trench.

Western DNAPL and Sediment Removal Area: The Western DNAPL and Sediment Removal Area, as shown on Figure 1.7 is located approximately 450 feet north of the southern site property line. The Western DNAPL Area is depicted as having an east-to-west length of about 240 feet. The primary environmental concern in this area is soil found to contain DNAPL (presumably coal tar). These soils are located between 22 and 26 feet bgs. The zone was observed at the bottom of the fill, and exhibits very limited penetration of the natural soil layer (see Figure 1.5). In April 2003, borings SB-301, SB-302 and SB-303 were completed to better define the northern and southern limits of the DNAPL. The borings indicated that the width of the Western DNAPL Area, measured north to south, is less than 40 feet.

DNAPL-contaminated river sediment was identified west of the Western DNAPL Area. The contamination extended about 160 ft along the existing sea wall, and outward into the river by varying distances, up to about 120 ft. Sediment contaminated with DNAPL was identified in river borings RB-1, RB-3, RB-6 through RB-9, RB-11, RB-12, RB-15A, and RB-17 through RB-19. DNAPL contamination in the form of blebs and heavy sheens was also identified in river borings RB-2, RB-13, RB-23, and RB-24. The depth of the observed DNAPL ranges from one foot up to 8 feet below the top of sediment.

One purpose of the remedial action for the Western DNAPL and Sediment Removal Area was to prevent potential westward migration of DNAPL by installing a barrier and to implement DNAPL recovery up-gradient from the barrier. The other purpose of the remedial action was to remove contaminated sediments from the Hudson River.

### **1.3.2 Summary of Remedial Investigation Findings for Soil, Groundwater and Soil Vapor**

Below is a general summary of site conditions reported in the above-listed RI reports. Those reports should be consulted for more detailed information.

Soil: Most soil quality samples were taken in the fill soils. Soil quality reported in the RIs may be characterized as follows:

- Benzene, toluene, ethylbenzene, and xylenes (BTEX) were detected in the soil samples at total concentrations ranging from 0.002 mg/kg to 242 mg/kg.
- Semi-volatile organic compounds (SVOCs) detected in the soil samples consisted predominantly of polycyclic aromatic hydrocarbons (PAHs).
- Total PAH concentrations ranged from 0.374 mg/kg to 40,190 mg/kg.
- The distribution of BTEX and PAHs appears to be consistent with locations where LNAPL or DNAPL were visually observed in the soils.
- BTEX was not detected or detected at significantly lower concentrations in samples collected below the zones where LNAPL or DNAPL were observed.
- PAHs were detected at the low end of the overall range of concentrations in samples collected below the zones where LNAPL and DNAPL were observed.
- Highest BTEX and PAH concentrations were generally detected in the vicinity of the two former gas holders, the former tar well, and in the Northern DNAPL Area extending under the County Asphalt building.
- The presence of metals is likely related to the industrial nature of the area and the material used as fill (i.e. asphalt, cinders, slag, ash, and other construction debris).
  - Arsenic was detected at concentrations ranging from 0.76 mg/kg to 20.9 mg/kg.

- Lead was detected at concentrations ranging from 3.2 mg/kg to 1,760 mg/kg.
- Mercury was detected in approximately half of the soil samples at concentrations ranging from 0.08 mg/kg to 3.0 mg/kg.
- Zinc was detected at concentrations ranging from 26.5 mg/kg to 1,540 mg/kg.

Groundwater: Groundwater quality reported in the RIs may be characterized as follows:

- BTEX was detected in groundwater samples at total concentrations ranging from 8 to 1,409 ug/l.
- BTEX was also detected in groundwater from upgradient monitoring well MW-12 at a concentration of 10 ug/l.
- The distribution of BTEX in groundwater appears to be consistent with the distribution of LNAPL and DNAPL observed in the soils; higher BTEX concentrations were observed in groundwater samples from wells near LNAPL and DNAPL zones.
- SVOCs detected in the groundwater samples consisted predominantly of PAHs.
- Total PAH concentrations ranged from 18 ug/l to 1,204 ug/l. PAHs were also detected in groundwater from upgradient monitoring well MW -12 at a total concentration of 32 ug/l.
- PAHs in groundwater samples exhibited a similar distribution pattern to BTEX and appear to be consistent with the distribution of LNAPL and DNAPL observed in the soils.
- Metals were detected in groundwater samples as follows:
  - Arsenic was detected in four groundwater samples at concentrations ranging from 5.4 to 45.5 ug/l.
  - Lead was detected in all of the groundwater samples at concentrations ranging from 2.6 to 297 ug/l.
  - Mercury was detected in three groundwater samples at concentrations ranging from 0.14 to 1.0 ug/l.
  - Zinc was detected in all of the groundwater samples at concentrations ranging from 4.6 ug/l to 73 ug/l.

- Arsenic, lead and zinc were also detected in groundwater from upgradient monitoring well MW-12.

Soil Vapor: Soil vapor quality reported in the RIs may be characterized as follows:

- Benzene in 4 of 10 samples, ranging from 3.3 to 25,000 ug/m<sup>3</sup>
- Ethylbenzene in 3 of 10 samples, ranging from 2.5 to 5.4 ug/m<sup>3</sup>
- m, p-xylenes in 6 of 10 samples, ranging from 5.4 to 9 ug/m<sup>3</sup>
- o-xylenes in 2 of 10 samples, ranging from 1.7 to 2.1 ug/m<sup>3</sup>
- methyl-tert-butyl-ether in 5 of 10 samples ranging from 1.5 to 120 ug/m<sup>3</sup>

EPA soil vapor screening criteria for these compounds were only exceeded in one instance – benzene in soil vapor probe SV-4 was at a concentration of 25,000 ug/m<sup>3</sup>, exceeding the screening criterion of 130 ug/m<sup>3</sup>

Underground Storage Tanks: As indicated above, underground storage tanks shown on Figure 1.3 were closed prior to the remedial investigations.

#### **1.4 SUMMARY OF REMEDIAL ACTIONS**

The site was remediated in accordance with the NYSDEC-approved RAWP (refer to Section 1.1.1). The completed remediation is described in detail in the following documents:

1. “Final Engineering Report for Tarrytown Former MGP Site Tarrytown, New York,” Haley & Aldrich, 2005.
2. “Final Engineering Report Addendum for Tarrytown Former MGP Site Tarrytown, New York,” Haley & Aldrich, 2006.

The following is a summary of the Remedial Actions performed at the site:

1. Holder and Tar Well Area: The remediation consisted of removing the contents, walls and floor of three former MGP holders and excavation of contaminated soils adjacent to the holders, including an area believed to be associated with the former MGP tar wells. The excavation area is shown on Figure 1.8 (Chazen Engineering and Land Surveying Co. P.C. record drawing). Contaminated soil and debris was taken off site to a permitted facility for disposal and the excavations were backfilled with a combination of on-site and imported fill meeting quality standards established for the project. No further remediation is required for these features and therefore no operation or maintenance is needed under this SMP. Sub-slab vapor management systems that will be associated with future habitable structures in this area will require operation and maintenance and are covered by this SMP.
  
2. LNAPL Area: The remediation consisted of two parts, excavation of contaminated soil and installation of a recovery trench and skimmer system for residual floating petroleum product. The excavation area is shown on Figure 1-8. Contaminated soil was taken off site to a permitted facility for disposal and the excavation was backfilled with a combination of on-site and imported fill meeting quality standards established for the project. The LNAPL recovery system was operated through September 2007. The monitoring results through August 2007 supported a request for NYSDEC approval to discontinue operation and to dismantle the system. In response, the NYSDEC agreed with the recommendation to discontinue operation of the LNAPL recovery system in its letter dated 10 September 2007. The system was subsequently dismantled and is no longer operational.
  
3. Northern DNAPL Area: The locations of the Northern DNAPL barrier and recovery trench are shown on Figure 2-1. A cross section of the recovery trench is shown in Figure 2-2. The remediation consisted of installing a 360-foot long sheet pile barrier extending from about 3 feet below the ground surface, downward through the fill soils into the native clayey soils to a depth of about 22 feet below ground surface. The barrier

prevents westward migration of DNAPL contained in a two to three foot thick zone of saturated fill soils generally found on at the bottom of fill (9 to 15 feet below ground surface). The clayey soils impede further downward migration of the DNAPL. A 360-foot long DNAPL recovery trench, containing six DNAPL recovery wells, was constructed adjacent to the east face of the barrier.

The recovery trench allows removal of DNAPL if it builds up on the east side of the barrier. One area of contaminated soil at the south end of the barrier was excavated and taken off site for disposal. The excavation was backfilled with a combination of on-site and imported fill meeting quality standards established for the project. Operation and maintenance of the recovery trench is required and is covered in Section 4.0 of this SWP.

4. Western DNAPL and Sediment Removal Area: The locations of the Western DNAPL barrier and recovery trench are shown on Figure 2-1. A cross-section of the recovery trench is shown in Figure 2-3. The remediation was conceptually the same as for the Northern DNAPL Area. The remediation consisted of installing a 160-foot long sheet pile barrier extending from the river bottom at the face of the relieving platform down to bedrock. The barrier prevents westward migration of DNAPL contained in a two to three foot thick zone of saturated fill soils generally found on at the bottom of fill (22 to 26 feet below ground surface).

The containment of residual DNAPL was completed with the construction of a 4-foot thick, 20-foot wide underwater cap over the sediments found under the relieving platform. The underwater cap is located between the new sheet pile barrier, and the existing vertical timber wall at the eastern side of the relieving platform. The Western DNAPL recovery trench is 60-ft long, about 26 to 28 feet deep, and is situated about 65 feet inland from the new sheet pile barrier. It is situated within a zone of DNAPL fill soils that is two to three feet thick and about 40 feet wide located at the bottom of the fill on top of the native soils.

The Sediment Removal Area included the area beneath the relieving platform (about 160 feet by 20 feet by 4 feet deep) and an area of the river bottom running along the new sheet pile barrier and extending various distances out into the river, with a

maximum extent of about 120 ft. The Sediment Removal Area is shown on Figure 2-1. Sediment removal depths ranged from about three to eight feet. Operation and maintenance of the Western DNAPL recovery trench and cap is required and is covered under this Plan.

5. Excavation of Contaminated Soil and Sediment: Table 3 summarizes the quantities of soil, sediment excavated and taken off-site for treatment and/or disposal.
6. Construction of a Cover System: A clean soil cover was placed in areas that are not beneath structures, pavement, or other similar impervious surfaces. The clean soil cover is a minimum two feet thick and was placed over a demarcation layer, consisting of an orange geotextile.
7. Environmental Easement: The Environmental Easement, restricting land use and listing engineering and institutional controls to mitigate future exposure to contamination remaining at the site was executed on 4 April 2007 and recorded at the Westchester County Clerk's office on 24 April 2007 (see Appendix C).
8. Site Management Plan: The SMP was developed for long term management of remaining contamination as required by the Environmental Easement, which includes plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance and (4) reporting. The following engineering controls are described in the Environmental Easement and are presented in detail in Section 2.0 of this SMP:
  - Site cover,
  - Sub-slab soil vapor management systems for new buildings,
  - Northern DNAPL recovery system,
  - Western DNAPL recovery system,
  - LNAPL recovery system (now dismantled per NYSDEC 10 September 2007 letter),
  - Underwater cap, and
  - Groundwater monitoring wells.

The following institutional controls are described in the Environmental Easement and presented in detail in Section 2.0 of this SMP:

- Soil management, health and safety, and air monitoring requirements for future excavation beneath site cover,
- Requirements to maintain paving and other similar impervious cover components, and
- Prohibition for use of groundwater without treatment.

Remediation items 1 through 5 were completed at the site between June 2004 and January 2005. Remediation item 6 was completed in October 2006. Item 7, the Environmental Easement was recorded in April 2007 and Item 8, the Site Management Plan was most recently updated in January 2007 and was accepted by NYSDEC. This SMP supersedes the January 2007 SMP.

#### **1.4.1 Removal of Contaminated Materials from the Site**

While completing remediation items 1 through 4 listed above, the following were removed from the site for treatment and/or disposal:

- Soil (predominantly consisting of fill) with contamination constituents associated with LNAPL (presumably petroleum-related),
- Soil and sediment with contamination constituents associated with DNAPL (presumably coal tar-related),
- Liquid product, and
- Uncontaminated construction & demolition debris.

The soil cleanup objectives, as presented in the NYSDEC-approved RAWP used for this site are given in Table 1. The criteria for re-use of soil on-site (beneath site cover) are given in Table 2, and as follows:

- Less than 500 ppm for total PAH compounds,
- Less than 10 ppm for total BTEX compounds, and
- No visual evidence of LNAPL and/or DNAPL-saturated media.

The materials and quantities of materials removed from the site are presented in Table 3. The locations of material removed and subsequently backfilled are shown on Figure 1.8. Further details regarding removal of contaminated materials from the site are given in the 2005 Final Engineering Report and 2006 Final Engineering Report Addendum listed above.

#### **1.4.2 Site-Related Treatment Systems**

An LNAPL recovery system was operated between December 2004 and September 2007, and has since been dismantled, as approved by NYSDEC in its 10 September 2007 letter. No other long-term treatment systems were required or installed as part of the site remedy.

#### **1.4.3 Remaining Contamination**

This section provides a summary of contamination remaining at the site to assist anyone performing future excavations at the site in anticipating the environmental conditions they may encounter. Remaining soil contamination at the site can be broadly categorized as fill-related, LNAPL-related, and DNAPL related. A description of the locations of these categories of residual contamination follows.

The extents of fill, which is encountered practically everywhere on site, are described in Sections 1.2.2 and 1.2.3 of this SMP, and depicted in section on Figure 1-5.

Practically-recoverable floating LNAPL has been removed from the site, however, residual LNAPL-related soil contamination may be encountered at the depth of the water table, including the seasonal and tidal variability in water table elevation (refer to Section 1.2.3 and Figure 1-6 of this SMP for water table information). Due to the presence of floating LNAPL prior to remediation, residual LNAPL-related soil contamination has a higher probability of occurring in the triangular area defined by MW-2, MW-3, and MW-6 compared to elsewhere on site (see Figure 1.7).

DNAPL-related contaminated soil was removed from the Holder and Tar Well Area to limits of excavation where less than 1,000 ppm total PAH and less than 10 ppm total BTEX were exhibited; the limits of the removal are shown on Figure 1.8. DNAPL remains on site at locations and depths described in Section 1.3.1, and shown on Figures 1.5 and 1.6 of this SMP. Zones of soil containing DNAPL range in depth from approximately 9 to 26 feet bgs. The zones are generally from about one to three feet thick. There is an area characterized by lenses of soil containing DNAPL shown on Figure 1.6; the lenses were encountered at depths between 6 and 14 feet bgs.

Constituents of soil contamination described in Section 1.3.2 of this SMP may be expected to be encountered within the fill at this site. In the above-described areas of residual LNAPL-related and DNAPL-related contamination of the fill, total PAH concentrations may be expected to exceed 500 ppm and total BTEX concentrations may be expected to exceed 10 ppm (the criteria for re-use of on-site soil or fill). Experience to date has shown, in general, that the top four feet of fill on site is typical of urban fill and does not exceed 500 ppm total PAH or 10 ppm total BTEX. This is also generally true of the fill below four feet depth at locations where there is no observed LNAPL- or DNAPL-related soil contamination.

Residually contaminated soil (fill) is located beneath the site cover. Two feet of clean soil cover was placed over an orange geotextile demarcation layer in the areas shown on Figure 1-9. In certain areas shown on the figure, the clean soil cover is more than two feet thick. Areas where the site cover consists of asphalt or concrete and where buildings (all of which comprise acceptable final cover) are located are also shown on Figure 1.9. Site fill would be encountered if the cover in any part of these areas is removed; there is no demarcation layer beneath these areas;

Some groundwater and soil vapor samples from the site exhibited contamination as described in Section 1.3.2. Removal of contaminated soil was expected, in part, to mitigate ongoing groundwater and soil vapor quality concerns. In addition, Engineering and Institutional Controls have been adopted to manage exposure to residual contamination in groundwater, soil vapor, and soil at the site; they are described in Section 2.0 of this SMP.

## **2.0 ENGINEERING AND INSTITUTIONAL CONTROL PLAN**

### **2.1 INTRODUCTION**

#### **2.1.1 General**

Since residually contaminated soil, groundwater, and soil vapor exists beneath the site, Engineering Controls and Institutional Controls (EC/ICs) are required to protect human health and the environment. This Engineering and Institutional Control Plan describes the procedures for the implementation and management of the EC/ICs at the site. The EC/IC Plan is one component of the SMP and is subject to revision by the parties to the Brownfield Cleanup Agreement.

#### **2.1.2 Purpose**

This plan provides:

- A description of the EC/ICs on the site;
- The basic implementation and intended role of each EC/IC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the features to be evaluated during each required inspection and periodic review; and
- A description of plans and procedures to be followed for implementation of EC/ICs, such as the implementation of the Excavation Work Plan for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site.

## **2.2 ENGINEERING CONTROLS**

### **2.2.1 Engineering Control Systems**

The following subsections list the Engineering Controls at the site, as set forth in the Environmental Easement. For a more detailed description of each system and for required operation and maintenance procedures, refer to Sections 3.0 and 4.0 of this SMP

#### 2.2.1.1 Cover

Exposure to residual contamination in soil or fill at the site is prevented by a cover system placed over the site. In areas not proposed for future building construction or impervious covering, residually contaminated soils on the site that meet criteria for re-use of on-site soil (Table 2), must be covered by a demarcation layer consisting of an orange, 4 oz/sy geotextile or equivalent material suitable as a demarcation layer, and that demarcation layer must be overlain by at least 2 feet of clean fill cover material. This barrier must be maintained as per this SMP. If the property is used for commercial or industrial purposes, the clean soil cover may be a minimum of one foot thick, as approved by NYSDEC, consistent with the Brownfield Clean-up Program enabling legislation.

The Excavation Work Plan (EWP) that appears in Appendix A outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed. Refer to Section 2.3.1 of this SMP for additional explanation of the EWP. Procedures for the inspection and maintenance of site cover are provided in the Monitoring Plan and Operation and Maintenance Plan included in Sections 3.0 and 4.0 of this SMP.

#### 2.2.1.2 Soil Vapor Management System

As a minimum, a passive Soil Vapor Management System (SVMS) must be installed in every new building erected within the site. Newly constructed buildings within the site shall also be subjected to a Soil Vapor Intrusion (SVI) Investigation, conducted in accordance with the applicable guidance in effect at the time of the investigation. If the results of this SVI

investigation demonstrate ineffectiveness of the passive SVMS, an appropriate active Soil Vapor Management System shall be designed, constructed and maintained.

Descriptions of the pre-construction SVI Investigation procedures, as well as procedures for post-construction confirmation testing, evaluation for potential future exposures, and indoor air quality verification testing may be found in Section 2.3.2 of this SMP. Procedures for the inspection and maintenance of the SVMS are provided in the Monitoring Plan and Operation and Maintenance Plan included in Sections 3.0 and 4.0 of this SMP.

#### 2.2.1.3 Northern DNAPL Recovery System

This SMP requires the operation and maintenance of the Northern DNAPL Recovery System as depicted on Figures 2-1, 2-2, and 2-4 and as set forth in the Operation, Maintenance, and Monitoring Plan (Section 5 of this SMP).

#### 2.2.1.4 Western DNAPL Recovery System

This SMP requires the operation and maintenance of the Western DNAPL Recovery System as depicted on Figures 2-1, 2-3, and 2-4 and as set forth in the Monitoring Plan and Operation and Maintenance Plan included in Sections 3.0 and 4.0 of this SMP.

#### 2.2.1.5 Underwater Cap

This SMP requires the maintenance of the Underwater Cap System in the Sediment Excavation Area as depicted on Figure 2-1 and as set forth in the Monitoring Plan and Operation and Maintenance Plan included in Sections 3.0 and 4.0 of this SMP.

#### 2.2.1.6 Groundwater Monitoring Wells

This SMP requires the monitoring of the Groundwater Monitoring Wells as depicted on Figure 1-10 and as set forth in the Groundwater Monitoring Plan (which is Appendix F to this SMP). Maintain the Groundwater Monitoring Wells as set forth in Section 4.0 of this SMP.

### 2.2.1.7 LNAPL Recovery System

An LNAPL recovery system was operated between December 2004 and September 2007, and has since been dismantled, as approved by NYSDEC in its 10 September 2007 letter. There is no continuing monitoring, operation, or maintenance of that system.

### **2.2.2 Criteria for Completion of Remediation/Termination of Remedial Systems**

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document and the framework for determining when remedial processes are complete is provided in Sections 6.4 and 6.5 of NYSDEC DER-10.

At the Site, there are two DNAPL recovery systems and no treatment systems: and guidance for determining when DNAPL recovery may be discontinued is provided within this SMP. Extraction of DNAPL from the Northern and/or Western DNAPL recovery systems may be discontinued when the quantity of recovered DNAPL from recovery wells becomes sufficiently small as to render further recovery impractical. A report with the data supporting the conclusion that the system operation may be discontinued will be submitted to NYSDEC for review and approval. After NYSDEC approval, the DNAPL recovery and observation wells will be abandoned: road boxes, protective casings, bollards, etc will be removed, the well casings will be cut below grade and will be filled with grout, and the ground surface restored to match site conditions.

In general, groundwater monitoring activities to assess natural attenuation will continue, as determined by the NYSDEC, until residual groundwater concentrations are found to be consistently below NYSDEC standards or have become asymptotic at an acceptable level over an extended period. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, additional source removal, treatment and/or control measures will be evaluated.

At the Site, guidance for determining when groundwater monitoring may be discontinued is provided within this SMP. As presented in Section 1.3.2 of this SMP, groundwater quality the distribution of BTEX and PAHs in groundwater appears to be consistent with the distribution of

LNAPL and DNAPL observed in the soils; higher BTEX and PAH concentrations were observed in groundwater samples from wells near LNAPL and DNAPL zones. Even though these general observations were made, there was no defined groundwater contaminant plume identified at the site. In terms of site hydrogeology, groundwater at the site discharges to the Hudson River, which abuts the western site boundary.

In light of the hydrogeologic considerations and lack of defined groundwater plume, guidance applicable to the specific site conditions is found in NYSDEC DER-10. Section 6.5(d)(2)(i)(1) addresses conditions needed to discontinue groundwater monitoring as follows: No further monitoring may be required if it has been satisfactorily demonstrated that the contaminant plume is discharging into a body of water with sufficient assimilative capacity to ensure that there is no contravention of surface water standards, threat to fish and wildlife resources or no threat to human health and the environment.

Data would be supportive for discontinuing groundwater monitoring at the site, for example, if constituents are all within groundwater quality standards or if a substantial decrease of contaminant concentration has occurred that is conclusively demonstrative of attenuation processes within the groundwater.

### **2.3 INSTITUTIONAL CONTROLS**

A series of Institutional Controls is required to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; and, (3) limit the use and development of the site to restricted residential, restricted commercial or restricted industrial uses. Adherence to these Institutional Controls on the site is required by the Environmental Easement and will be implemented under this Site Management Plan. Table 5 presents a site management matrix which summarizes the engineering and institutional controls described in this SMP.

### **2.3.1 Environmental Easement**

The following subsections present the specific Institutional Controls listed in the Environmental Easement.

#### 2.3.1.1 Soil Management

Any proposed soil excavation on the site below the 2 foot cover or below the demarcation layer requires prior notification to the NYSDEC in accordance with this SMP. Excavated soil must be managed, characterized, and properly disposed in accordance with this SMP and applicable regulations and/or guidance. Section 2.3.3 of this SMP presents the parameters of the Excavation Work Plan that addresses this Institutional Control.

#### 2.3.1.2 Maintain Site Cover

The integrity of the impervious surfaces on the site must be maintained. Any portion of the impervious (e.g. asphalt, concrete, building slab, or similar material) surface damaged and/or removed from the site must be immediately replaced in kind or must be substituted with a demarcation layer and clean soil cover in accordance with paragraph 2.2.1.1 of this SMP. Site cover may be temporarily disturbed for new construction, maintenance or repair of underground utilities, etc. The site cover must be replaced at the conclusion of those activities.

#### 2.3.1.3 Use of Groundwater

The use of untreated groundwater for any purpose is not permitted.

### **2.3.2 Institutional Controls**

Institutional Controls may be modified, added or deleted from this list as warranted by site-specific conditions. Institutional Controls identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. Compliance with the Environmental Easement and this SMP includes the following:

- The Engineering Controls must be operated and maintained as specified in this SMP;
- The Engineering Controls on the site must be inspected at a frequency and in a manner defined in the SMP;
- Groundwater monitoring must be performed as defined in this SMP;
- Data and information pertinent to Site Management must be reported at the frequency and in a manner defined in this SMP;
- The property may only be used for restricted residential, restricted commercial, or restricted industrial use provided that the long-term Engineering and Institutional Controls included in this SMP are employed.
- The property may not be used for a higher level of use, such as unrestricted use without additional remediation and amendment of the Environmental Easement, as approved by the NYSDEC;
- Future activities on the property that will disturb residual contaminated material must be conducted in accordance with this SMP;
- Vegetable gardens and farming on the property are prohibited;
- The site owner or remedial party will submit to NYSDEC, Ferry Landings, LLC, and ConEdison 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 and will be made by an expert that the NYSDEC finds acceptable.

### **2.3.3 Excavation Work Plan**

The site has been remediated for restricted residential, restricted commercial, or restricted industrial use. Any future intrusive work that will penetrate the soil cover or cap, or encounter or disturb the remaining contamination, including any modifications or repairs to the existing cover system will be performed in compliance with the Excavation Work Plan (EWP) that is attached as Appendix A to this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) prepared for the site. A sample HASP and CMP is attached as Appendix D to this SMP that has been accepted by NYSDEC for the activities covered within the HASP. *Every contractor must create and use the contractor's own site-specific Health and Safety Plan. For the subject site, the contractor's site-specific HASP must, at minimum, comply with 40 CFR 1910.120.* Based on future changes to State and federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP will be updated and re-submitted with the notification provided in Section A-1 of the EWP. Any intrusive construction work will be performed in compliance with the EWP, the contractor's HASP and CAMP, and will be described in the periodic inspection and certification reports submitted under the Site Management Reporting Plan (See Section 5.0 of this SMP).

In areas where the marker layer is placed, excavation above the marker layer does not require notification of NYSDEC. If excavation below the demarcation barrier is planned, then NYSDEC will be notified. Soil that is excavated (such as for foundations, utilities, etc.) must be managed, characterized, and, if necessary, properly disposed in accordance with NYSDEC regulations and directives. Soil meeting the criteria given in Table 2 may be re-used on site below the clean soil cover. The criteria for soil being imported to the site are given in Table 4.

### **2.3.4 Soil Vapor Management Systems**

This section describes the soil vapor management options to be utilized at the site and the soil gas sampling program required to determine the type of system to be used.

#### 2.3.4.1 Soil Vapor Intrusion Investigation

Prior to design and construction of new buildings at the site, the building footprint areas need to be sampled for potentially contaminated soil vapor. The data will be evaluated by the NYSDEC and by NYS Department of Health to determine the appropriate type of soil vapor management system.

The soil vapor sampling program will consist of using temporary probes to extract soil vapor samples from the vadose zone. The samples shall be at a frequency of one per 50,000 square-feet of building footprint, and shall not be less than two samples for any single building. Buildings with footprint areas less than 10,000 square-feet will require only one sample.

At each location direct-push methods will advance a vapor sample probe to 4 to 5-feet depth below-ground-surface (bgs). If the water table is higher than 5 feet, then the soil probe should be advanced to less than one foot of the water table. The probe will be connected to a sample port by new, dedicated flexible tubing, and the boring finished with a bentonite seal and cap for the probe. The seal will prevent ambient air short-circuiting.

For soil vapor sampling under this program, a tracer gas shall be used at least once at a shallow sample to ensure that adequate sampling techniques are being applied. If it has been verified that the tracer gas is not infiltrating the sample, and identical protocols are used for each sample location, the tracer gas test can be suspended.

Sampling will be performed by evacuating each borehole briefly to purge stagnant vapor, then a lab-supplied Summa canister will be connected and set to fill at a rate no greater than 0.1 liters/minute for one hour. Analyses will be performed according to the U.S. Environmental Protection Agency (EPA) Method TO-15. Analytes will include the base list and extended list for MGP sites contained in NYSDEC guidance, however since chlorinated volatile organic compounds (VOCs) have not been an issue at this site, the set of chlorinated VOCs on the guidance target analyte list will not be analyzed. A New York State ELAP laboratory will perform the analyses.

SVI sampling results, evaluations, and follow-up actions will also be summarized in the next Periodic Review Report.

#### 2.3.4.2 Description of Conceptual Systems

Vapor management systems will be selected in conjunction with the review of the soil vapor data by the NYSDEC and NYSDOH, and in consideration of their recommendations. Soil vapor management may be provided by a passive or an active vapor management system.

A vapor barrier system is required for either a passive or an active vapor management system. The vapor barrier system consists of an impermeable vapor barrier of 20 mil polyethylene sheeting that inhibits migration of vapors into the foundation slab. A geotextile material will be placed both above and below the sheeting for protection of the barrier. Use of a polyethylene barrier is only appropriate if the foundation is a slab-on-grade type.

Implementation of a polyethylene vapor barrier is not feasible if the foundation utilizes caissons or piers due to the difficulty of providing adequate seals around the caisson/ pier intrusions. In such cases, Liquid Boot™, or similar flexible vapor barrier could be utilized.

The passive vapor management system consists of the vapor barrier system placed over a crushed stone sub-base with a network of piping (or sumps) to ventilate the sub-slab area. Crushed stone, or equivalent, should be placed above and below the piping network, and will act as a higher permeability zone through which the gases can migrate to the exhaust piping. The active soil vapor management system is the same as the passive soil management system, with the addition of a blower to induce air flow from the air intake pipes and to create a negative air pressure beneath the building foundation.

The selection of soil vapor management system will depend on several factors:

- Results of the soil vapor intrusion investigation,
- Location of the proposed structure on the site,
- Proposed use for the structure (residential, commercial, industrial),
- Building design features (such as foundation, floor slab, HVAC system, etc.), and
- Consideration of applicable standards, guidance and criteria.

At minimum all new occupied structures on site shall be constructed with a passive soil vapor management system.

### 2.3.4.3 Post-Construction Confirmation Testing

This section describes confirmation testing to be performed upon completing the installation of a building vapor management system. It also describes the testing required for evaluation of the potential for future exposures, after new buildings have been constructed.

Once a vapor management system has been installed, its effectiveness and proper installation must be confirmed. This confirmation testing will be done on either passive or active soil vapor management systems. Confirmation testing of passive soil vapor management systems will require utilization of a temporary fan installation to induce low pressure beneath the floor slab.

- Confirmation testing will include:
- Testing for leaks (through concrete cracks, floor joints, and at floor penetrations) using smoke tubes, or equivalent method. Any identified leaks should be sealed so that smoke can no longer flow through the opening.
- Testing for back drafting of natural draft combustion appliances, such as furnaces, clothes dryers, and water heaters. If back drafting is found, the condition must be corrected. Back draft testing may be eliminated based on site specific conditions, such as for second-floor living spaces, where such testing would not be applicable with respect to potential exposure to soil vapor.
- Testing that a pressure change is induced in the sub-slab area. For active vapor management systems, the installed fans should be turned on. For passive vapor management systems, a temporary fan needs to be installed and utilized. Holes shall be drilled in the slab at a sufficient number of locations to demonstrate that a vacuum is being created beneath the entire slab. This may be done using smoke tubes or digital micro-manometer. After the confirmation testing is complete the test holes shall be sealed.
- Confirmation of adequate operation of the warning device for active soil vapor management systems.
- Post-mitigation air sampling, as described in Section 2.3.4.5.

All confirmation testing activities must be documented and reported to the NYSDEC and NYSDOH.

#### 2.3.4.4 Post-Construction Evaluation of the Potential for Future Exposures

After new buildings have been constructed, evaluation of the potential for future exposures will be performed by taking soil vapor samples at sampling points located on a grid pattern. The grid will include the proposed building footprint and beyond, because an active vapor management system in a new building could draw vapors from areas outside the building footprint.

The grid pattern will include one sample location within the building footprint and one sample location each at the north, east, south and west sides of the building. The grid locations will be selected to include any known sources of volatile chemicals. Soil vapor samples not taken from beneath an existing building shall be taken approximately five (5) feet below ground surface, or approximately one foot above the water table, whichever is least deep. For a grid location in an area of known contamination, an additional sample shall be taken at the approximate depth of foundation footings to determine the vertical extent of contamination around the source.

The procedure to be followed for the soil vapor testing used to evaluate the potential for future exposures, after new buildings have been constructed is the same as described in Section

#### 2.3.4.5 Verification Air Sampling

Within the first year of operation of vapor management systems for site buildings, verification air sampling shall be performed indoors. Sampling shall be performed in the building space for which the floor is in contact with the soil. If there is a choice, sampling will be done from rooms to be occupied rather than from rooms which will not normally be occupied (for example, sampling would be done in an office space, rather than a storage room).

The samples shall be at a frequency of one per 50,000 square-feet of building footprint, and shall not be less than two samples for any single building. Buildings with footprint areas less than 10,000 square-feet will require only one sample.

Sampling will be performed using a Summa canister with flow regulator set to fill at a rate no greater than 0.1 liters/minute, for one hour. Analyses will be performed according to the U.S. Environmental Protection Agency (EPA) Method TO-15. Analytes will include EPA target compound list volatile organic compounds (VOCs), however since chlorinated VOCs have not been an issue at this site, the set of chlorinated VOCs on the analyte list will not be analyzed. A New York State ELAP laboratory will perform the analyses.

Results of the sampling will be submitted to NYSDEC and NYSDOH for evaluation. The air quality will be compared to the standards, criteria and guidance (SCG) applicable to the site and building usage. If either NYSDEC or NYSDOH determines that the air quality does not satisfy the SCG, then additional sampling or implementation of additional engineering controls for soil vapor will be completed. Following any corrective actions, verification sampling will need to be repeated, until it is determined that the air quality satisfies the SCG.

## **2.4 INSPECTIONS AND NOTIFICATIONS**

### **2.4.1 Inspections**

Inspections of the remedial components installed at the site will be conducted at the frequency specified in the SMP Monitoring Plan schedule. A comprehensive site-wide inspection will be conducted annually, regardless of the frequency of the Periodic Review Report.

The inspections will determine and document the following:

- Whether Engineering Controls continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria;
- Sampling and analysis of appropriate media during monitoring events;
- If site records are complete and up to date; and
- Changes, or needed changes, to the remedial or monitoring system;

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (Section 3.0). The reporting requirements are outlined in the Periodic Review Reporting section of this plan (Section 5.0).

If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the EC/ICs implemented at the site by a qualified environmental professional as determined by NYSDEC.

#### **2.4.2 Notifications**

Notifications will be submitted by the property owner to the NYSDEC, Ferry Landings, LLC, and ConEdison as needed for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the Brownfield Cleanup Agreement (BCA), 6NYCRR Part 375, and/or Environmental Conservation Law.
- 7-day advance notice of any proposed ground-intrusive activities pursuant to the Excavation Work Plan.
- Notice within 48-hours of any damage or defect to the foundations structures that reduces or has the potential to reduce the effectiveness of other Engineering Controls and likewise any action to be taken to mitigate the damage or defect.
- Verbal notice by noon of the following day of any emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of Engineering Controls in place at the site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action shall be submitted to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs.
- Any change in the ownership of the site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC, Ferry Landings, LLC and ConEdison will be notified in writing of the proposed change. This will include a certification that the prospective purchaser has been provided with a copy of the BCA and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing. This notification will meet all the requirements stipulated under CFR 375-1.11(d)(3).

## **2.5 CONTINGENCY PLAN**

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions.

### **2.5.1 Emergency Telephone Numbers**

In the event of any environmentally related situation or unplanned occurrence requiring emergency response, the Owner or Owner's representative(s) should contact the appropriate party from the contact list in Table 8. For emergencies, appropriate emergency response personnel should be contacted. The emergency contact list must be maintained in an easily accessible location at the site.

### **2.5.2 Map and Directions to Nearest Health Facility**

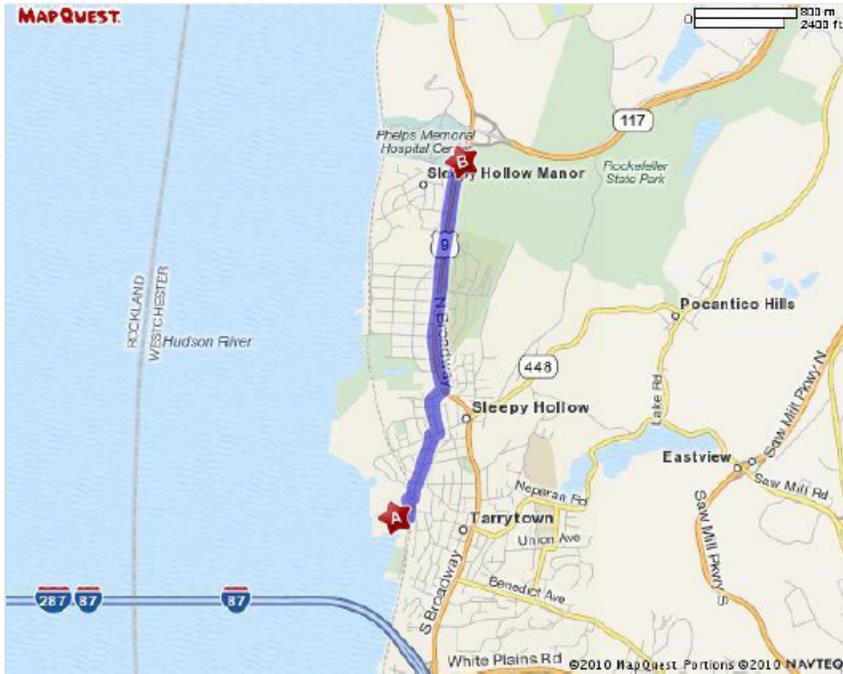
Site Location:	189 West Main Street, Tarrytown, NY
Nearest Hospital Name:	Phelps Memorial Hospital (see attached map)
Hospital Location:	701 North Broadway, Tarrytown, New York
Hospital Telephone:	914.366.3000

Directions to the Hospital:

1. Start out going EAST on W MAIN ST toward GREEN ST.
2. Turn LEFT onto RAILROAD AVE.
3. Turn RIGHT onto DEPOT PLZ / DEPOT PLAZA ST.
4. Turn LEFT to stay on DEPOT PLZ / DEPOT PLAZA ST.
5. Turn SLIGHT LEFT onto CORTLANDT ST.
6. Turn RIGHT onto BEEKMAN AVE.
7. Turn LEFT onto POCANTICO ST.
8. Turn LEFT onto US-9 / N BROADWAY.
9. 701 N BROADWAY is on the LEFT.

Total Distance:                    2.3 Miles  
Total Estimated Time:            7 Minutes

Map Showing Route from the site to the Hospital:



All rights reserved. Use subject to License/Copyright. | [Map Legend](#)

**2.5.3 Response Procedures**

As appropriate, the fire department and other emergency response group will be notified immediately by telephone of the emergency. The emergency telephone number list is found on Table 8, and is presented below:

Medical, Fire, and Police:	911
	(800) 272-4480
One Call Center: (Call Before You Dig)	(3 day notice required for utility mark out)
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362

\* Note: Contact numbers are subject to change and should be updated as necessary

The site is accessible by truck via I-87 and NYS Route 9. (See maps in Appendix K).

## **3.0 SITE MONITORING PLAN**

### **3.1 INTRODUCTION**

#### **3.1.1 General**

The Monitoring Plan describes the measures for evaluating the performance and effectiveness of the remedy to reduce or mitigate contamination at the site, the soil cover system, and the affected site media identified below. Monitoring of other Engineering Controls is described in Chapter 4, Operation, Monitoring and Maintenance Plan. This Monitoring Plan may only be revised with the approval of NYSDEC.

#### **3.1.2 Purpose and Schedule**

This Monitoring Plan describes the methods to be used for:

- Sampling and analysis of the appropriate media. The only medium that requires periodic sampling at the site is groundwater;
  - Assessing compliance with applicable NYSDEC standards, criteria and guidance, particularly ambient groundwater standards and Part 375 Soil Cleanup Objectives (SCOs) for soil;
  - Assessing achievement of the remedial performance criteria.
  - Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment; and
  - Preparing the necessary reports for the various monitoring activities.
- To adequately address these issues, this Monitoring Plan provides information on:
- Sampling locations, protocol, and frequency;
  - Information on all designed monitoring systems (e.g., well logs);
  - Analytical sampling program requirements;
  - Reporting requirements;
  - Quality Assurance/Quality Control (QA/QC) requirements;

- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and
- Annual inspection and periodic certification.

Monitoring of the performance of the remedy and overall reduction in contamination on-site will be conducted annually until otherwise approved by NYSDEC. Trends in contaminant levels in groundwater in the affected areas will be evaluated to determine if the remedy continues to be effective in achieving remedial goals. Monitoring frequency is provided in Table 6 and outlined in detail in Sections 3.2 and 3.3 below.

## **3.2 SITE COVER MONITORING**

Note that cover system monitoring is presented along with media monitoring in this SMP, separately from the other engineering controls because it is a passive component of the site remedies. This SMP includes monitoring/inspection for both the site cover system in the upland area of the site and the cap installed in the underwater area of the site

### **3.2.1 Site Cover Monitoring**

A clean (as defined below) soil cover has been provided to prevent direct contact with the soils remaining in place at the site. As described in the 2006 Final Engineering Report Addendum, a demarcation layer and two feet thick clean soil cover were placed at the completion of the remedial activities. As shown on Figure 1-8, as of January 2007, the site cover also included asphalt, concrete, and buildings.

The soil cover system will be visually inspected on an annual basis as part of the inspection described in Section 3.4 of this SMP to ensure efficacy of this measure. The visual inspection will note observed breaches in paved areas and/or removal of clean soil cover, should they exist. The inspection will consider the status of any work performed under the provisions of the Excavation Work Plan, particularly with respect to replacement of disturbed site cover.

### **3.2.2 Underwater Cap Monitoring**

The cover systems at the Site include an underwater cap, located beneath the relieving platform, adjacent to the 160 foot long sheet pile barrier. It is 160 feet long and 20 feet wide, and covers the river bottom beneath the relieving platform. The cap consists of a 12-inch thick layer of soil-Bentonite mixture, placed at the base of the excavation, followed by 12 inches of NYSDOT medium stone fill, then 24 inches of ¾-inch gravel.

Observations will be conducted for the submerged cap under the relieving platform via diver inspections. Diver inspections will be scheduled one year and five years after the Certificate of Completion, with the frequency of subsequent inspections to be determined based on the results of the inspections.

The divers will use visual observation and rigid probes to assess the condition of the cap system. They will check for possible displacement of gravel cover and/or medium stone fill, note possible displacement of steel sheeting, if it is exposed.

Diver inspection reports shall be stored in a secure place, so they may be accessed by the property owners, system maintenance personnel, and the NYSDEC. The inspection reports need to be available to the individual or organization that prepares the annual report.

## **3.3 MEDIA MONITORING PROGRAM**

### **3.3.1 Groundwater Monitoring**

Groundwater monitoring will be performed on a periodic basis to assess the performance of the remedy. The objective of the Site groundwater monitoring is to determine if the quality meets NYS groundwater standards, assessing achievement of the remedial performance criteria and evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment. The NYSDEC-approved Groundwater Monitoring Plan (GMP) is included as Appendix F to this SMP. The list of sampling and analytical parameters is given in Table 2 of Appendix F – for convenience a copy appears after Table 9 in the Tables section of this SMP.

- The network of five monitoring wells has been installed to monitor both up-gradient and down-gradient groundwater conditions at the site. The network of on-site wells has been designed based on selection rationale described within the Groundwater Monitoring Plan in Appendix F. Additional information pertinent to the groundwater monitoring network follows:
- A figure showing the monitoring well array is provided within the Groundwater Monitoring Plan in Appendix F (Figure 2);
- Geologic conditions are summarized in Section 1.2.3 of this SMP (including geologic cross-section provided as Figure 1.4);
- Baseline water levels and flow pattern are summarized in Section 1.2.3 of this SMP and on Figure 1-5;
- Baseline post-remedial groundwater quality conditions as summarized in Section 1.3 and in Table 8 of this;
- The list of wells to be sampled and analytes to be tested are provided in the Groundwater Monitoring Plan in Appendix F (Tables 1 and 2).
- Monitoring well construction details are provided in the Groundwater Monitoring Plan in Appendix F (included as Appendix A to the GMP);

The sampling frequency is annual and may be modified with the approval NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by NYSDEC. Baseline post-remediation groundwater quality analytical results are presented in Appendix J.

Deliverables for the groundwater monitoring program are specified below.

#### 3.3.1.1 Sampling Protocol

All monitoring well sampling activities will be recorded in a field book and on groundwater sampling forms (copies of the sampling forms are presented within the Groundwater Monitoring Plan in Appendix F). Other observations (e.g., well integrity, etc.) will be noted on the well sampling log. The well sampling log will serve as the inspection form for the groundwater monitoring well network.

Sampling protocols for the monitoring events will be consistent with the investigation phase of the project and will include a description of:

- Well water level measurement;
- Well purging;
- Sampling methodology;
- Analytical methodology:
  - Lab certification;
  - Analytical methods;
  - Analytes.

This information is presented within the Groundwater Monitoring Plan (Appendix F to this SMP).

#### 3.3.1.2 Monitoring Well Repairs, Replacement and Decommissioning

If biofouling or silt accumulation occurs in the monitoring wells, the wells will be physically agitated/surged and redeveloped using the procedures documented in the Groundwater Monitoring Plan in Appendix F). Additionally, monitoring wells will be properly decommissioned and replaced, if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on the annual assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of monitoring wells for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent periodic report. Well decommissioning without replacement will be done only with the prior approval of NYSDEC. Well abandonment will be performed in accordance with NYSDEC's "Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be reinstalled in the nearest available location, unless otherwise approved by the NYSDEC.

### **3.3.2 DNAPL Monitoring**

There are two DNAPL recovery trenches at the site. The Western DNAPL recovery trench is 60 feet long, about 26 to 28 feet deep and contains two recovery wells. The Northern DNAPL recovery trench is 360 feet long, about 17 to 20 feet deep and contains six recovery wells. Each trench has one observation well at each end. Both recovery trenches are located upgradient from permanent barriers installed to contain residual DNAPL in its current location, at least nine feet below the ground surface.

A summary of the Operation and Maintenance procedures for the DNAPL systems is provided in Section 4 of this SMP. Operation includes measurement of water and DNAPL levels (using an interface probe) in all observation and recovery wells. These measurements will be collected on a periodic basis as summarized in Section 4 in this SMP. Procedures for measurements are included in Section 4 and integral to the operations and maintenance of these systems

All observations must be kept on logs and the logs stored in a secure place, so they may be accessed by the property owners, system maintenance personnel, and the NYSDEC. See Appendix H for DNAPL Monitoring Forms. The logs need to be available to the individual or organization that prepares the annual report.

### **3.4 SITE-WIDE INSPECTION**

Site-wide inspections will be performed on a regular schedule at a minimum of once a year. Site-wide inspections will also be performed if warranted by severe events (wind, flooding, explosions, etc.) that may affect Engineering Controls or monitoring devices. During these inspections, an inspection form will be completed (Appendix H). The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of the inspection;
- The kind of site management activities being conducted such as work being conducted under provisions of the Excavation Work Plan, media sampling, etc.

- Compliance with permits and schedules included in this SMP; and
- Confirm that site records are up to date.

### 3.5 MONITORING QUALITY ASSURANCE/QUALITY CONTROL

All sampling and analyses will be performed in accordance with the requirements of the Quality Assurance Project Plan (QAPP) with Field Sampling Plan (FSP) prepared for the site (Appendix G). Main Components of the QAPP include:

- QA/QC Objectives for Data Measurement;
- Sampling Program:
  - Sample containers will be properly washed, decontaminated, and appropriate preservative will be added (if applicable) prior to their use by the analytical laboratory. Containers with preservative will be tagged as such.
  - Sample holding times will be in accordance with the NYSDEC ASP requirements.
  - Field QC samples (e.g., trip blanks, coded field duplicates, and matrix spike/matrix spike duplicates) will be collected as necessary.
- Sample Tracking and Custody;
- Calibration Procedures:
  - All field analytical equipment will be calibrated immediately prior to each day's use. Calibration procedures will conform to manufacturer's standard instructions.
  - The laboratory will follow the calibration procedures and schedules as specified in USEPA SW-846 and subsequent updates that apply to the instruments used for the analytical methods.

- Analytical Procedures;
- Preparation of a Data Usability Summary Report (DUSR), which will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain of custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method.
- Internal QC and Checks;
- QA Performance and System Audits;
- Preventative Maintenance Procedures and Schedules;
- Corrective Action Measures.

### **3.6 MONITORING REPORTING REQUIREMENTS**

Forms and any other information generated during regular monitoring events and inspections will be kept in a secure place, so they may be accessed by the property owners, system maintenance personnel, and the NYSDEC. The logs, forms, inspection reports, etc. need to be available to the individual or organization that prepares the annual report. All forms, and other relevant reporting formats used during the monitoring/inspection events, will be (1) subject to approval by NYSDEC within this SMP and (2) submitted at the time of the Periodic Review Report, as specified in the Reporting Plan of this SMP.

Monitoring results will be reported to NYSDEC on a periodic basis in the Periodic Review Report. As indicated on Table 7, during the first five years following completion of remediation, the Periodic Review Report will be issued annually to the NYSDEC. The report will include, at a minimum:

- Date of event(s);
- Personnel conducting sampling;
- Description of the activities performed;
- Type of samples collected;
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);

- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled;
- Any observations, conclusions, or recommendations; and
- An assessment as to whether groundwater conditions have changed since the last reporting event.

Data will be reported in hard copy or digital format as determined by NYSDEC. A summary of the monitoring program deliverables are summarized in Table 7.

## **4.0 OPERATION AND MAINTENANCE PLAN**

### **4.1 INTRODUCTION**

The site remedy does not rely on any mechanical systems, such as active sub-slab depressurization systems, groundwater treatment, or air sparge/soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not included in this SMP. However, overview information on non-mechanical Engineering Controls (i.e. cover systems, DNAPL recovery and soil vapor management) is provided. A copy of this Operation and Maintenance Plan, along with the complete SMP, will be kept at the site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of the SMP.

### **4.2 ENGINEERING CONTROL SYSTEM OPERATION AND MAINTENANCE**

#### **4.2.1 DNAPL Recovery Systems Descriptions**

There are two DNAPL recovery systems at the site. Each system consists of a sheet pile barrier and a recovery trench, as shown on Figure 2-1. These systems went into operation in June 2005. The Northern DNAPL barrier consists of a 360-foot long sheet pile wall extending from about 3 feet below the ground surface, downward through the fill soils into the native clayey soils to a depth of about 22 feet below ground surface. The barrier prevents westward migration of DNAPL contained in a two to three foot thick zone of saturated fill soils generally found on at the bottom of fill (9 to 15 feet below ground surface), as shown on Figure 1-4. The clayey soils impede further downward migration of the DNAPL. The Northern DNAPL recovery trench is located adjacent to the east face of the barrier; it is 360 feet long, about 17 to 20 feet deep and contains six recovery wells, as shown on Figure 2-2. The trench has one observation well at each end. The recovery trench allows removal of DNAPL if it builds up on the east side of the barrier.

The Western DNAPL barrier consists of a 160-foot long sheet pile wall extending from the river bottom at the face of the relieving platform down to bedrock. The barrier prevents westward migration of DNAPL contained in a two to three foot thick zone of saturated fill soils

generally found on at the bottom of fill (22 to 26 feet below ground surface), as shown on Figure 1-5. Clayey soils at the bottom of the fill impede further downward migration of the DNAPL.

The Western DNAPL recovery trench is 60 feet long, about 26 to 28 feet deep and contains two recovery wells and has one observation well at each end. Due to the presence of the relieving platform, the Western DNAPL recovery trench is located approximately XX feet east of the sheet pile barrier, on the land side of the relieving platform. The trench provides a zone of high permeability that, when DNAPL is extracted from the trench, provides a hydrogeologic “sink.” DNAPL may move into the recovery trench from all sides. The recovery trench allows removal of DNAPL, mitigating potential build-up on the east side of the barrier.

The recovery wells and observation wells are all constructed of 8-inch diameter PVC, as shown by the typical recovery well detail on Figure 2-4. The wells were initially “stick-up” wells having a steel protective casing with locking cap. During construction for site development, the steel protective casings were removed and replaced by “flush-mount” road boxes.

#### 4.2.1.1 DNAPL Recovery System Operation

The plan for system operation involves two phases: start-up and long term operation. The start up phase began after system installation and is continued for the first year. The long term phase began in June 2006, after one complete year of operation. Operational tasks are described in the following section.

A summary of the Operation and Maintenance procedures for the DNAPL recovery systems is given in Table 9. Operation includes measurement of water and DNAPL levels (using an interface probe) in all observation and recovery wells. Observations in the long term will be at a frequency established during the start-up period. Observation results will determine the frequency of DNAPL removal.

In the Northern DNAPL area, the rate of DNAPL accumulation is expected to be less than in the Western DNAPL area (past recovery attempts prior to the subsurface barrier and collection system, were made on this DNAPL and no recovery was achieved). Additionally, the rate of accumulation immediately following installation of the recovery trenches may be greater than at the end of the start-up phase, due to mobilization of DNAPL caused by vibrations or other disturbances during construction. The rate of DNAPL recovery in the recovery wells

should be monitored. The removal frequency will be adjusted accordingly. By the end of the start-up phase, the frequency of required DNAPL extraction should be established, as summarized in Table 8. As of June 2010, observation and recovery was being performed on a monthly basis, however frequency is subject to change, as discussed herein.

#### 4.2.1.2 DNAPL Recovery System Operation and Maintenance

DNAPL must be removed from the recovery trenches on a periodic basis, using vacuum trucks, removable submersible pumps, or other comparable means. As a guideline, if the thickness of DNAPL in the recovery wells exceeds 1.5 feet, removal should be scheduled and performed. Recovered DNAPL should be placed in Department of Transportation (DOT) approved containers and then transported to permitted facilities for recycling, treatment, or disposal. See Appendix H for DNAPL Extraction Forms.

All observations must be kept on logs (refer to section 4.4 of this SMP) and the logs stored in a secure place, so they may be accessed by the property owners, system maintenance personnel, and the NYSDEC. The logs need to be available to the individual or organization that prepares the annual report.

If more than 0.1 foot DNAPL thickness is observed in an observation well, then the product must be removed from the observation wells and the recovery wells at that trench and the wells must be measured again. If the DNAPL thickness is 0.1 foot or greater in an observation well at the second measurement (i.e. the accumulation is equal to or more than 0.1 foot per week), then a plan for increased monitoring to determine if the presence of DNAPL is transient or it is indicative of DNAPL migrating around the recovery trench. If the accumulation is at a lower rate, then measurement frequency should revert to that prior to measuring DNAPL in the observation well.

The management of the recovery wells must be monitored and adjusted as necessary during the long-term operation period. Extraction of DNAPL should be discontinued if the evidence demonstrates that further measurable quantities can not be removed.

#### 4.2.1.3 DNAPL Recovery System Non-Routine Maintenance

A DNAPL Recovery System Operations Summary is given in Table 9. Inspection of the recovery wells will include a visual inspection of the well surface completion and will be undertaken at least once a year during either a) one of the DNAPL recovery events, or b) the annual site inspection. Any required repairs will be completed to ensure access for the recovery system.

### **4.2.2 Sub-slab Vapor Management Systems**

At minimum all new occupied structures on site shall be constructed with a passive sub-slab soil vapor management system. This system will include a sub-slab vapor barrier, sub-slab gravel, a perforated pipe system within the sub-slab gravel and a riser pipe to convey vapor from beneath the slab (if any) to an exhaust pipe on the roof.

There are currently no active vapor management systems on the site. This section describes the soil vapor management options to be utilized in the future at the site and the generally accepted operation and maintenance procedures for similar systems.

#### 4.2.2.1 Sub-slab Vapor Management System Description

Vapor management systems beneath newly constructed buildings will be selected based on review of soil vapor sampling data, based on NYSDEC and NYSDOH guidance, and in consideration of agency review of sampling data and agency recommendations. Soil vapor management may be provided by a passive or an active vapor management system.

A vapor barrier system is required for either a passive or an active vapor management system. The vapor barrier system consists of an impermeable vapor barrier of 20 mil polyethylene sheeting, or equivalent, which inhibits migration of vapors into the foundation slab.

The passive vapor management system consists of the vapor barrier system placed over a crushed stone sub-base (or equivalent) with a network of perforated piping to ventilate the sub-slab area. Crushed stone should be placed above and below the piping network, and will act as a higher permeability zone through which gases can migrate to the exhaust piping. The active soil vapor management system is the same as the passive soil management system, with the addition

of a blower or fan to induce air flow from the sub-slab pipes and to create a negative air pressure beneath the building foundation.

#### 4.2.2.2 Sub-slab Vapor Management System Operation and Maintenance

The operation and maintenance requirements presented in this section were developed to be consistent with guidance presented in the NYS Department of Health “Soil Vapor Intrusion Guidance Document.” Minimum requirements for operations and maintenance activities associated with passive and active vapor management systems are provided in the following text. Also included is a discussion of non-routine maintenance. Much of the information applies to active vapor management systems; passive vapor management systems do not have blowers, fans, warning devices, etc., so those O&M items do not apply for passive systems.

Both routine and non-routine operation and maintenance activities must be documented using the appropriate inspection log (refer to section 4.4 of this SMP). Maintenance check lists or logs shall be stored securely on-site, so they may be accessed by the property owners, system maintenance personnel, the NYSDEC, and the NYSDOH. The checklists and/or logs need to be available to the individual or organization that prepares the annual report.

Routine maintenance shall commence within 18 months after the system becomes operational, and shall occur every 12 months thereafter. Based upon a demonstration of the system's reliability, a petition to alter the frequency may be submitted for the State's review. The frequency may only be altered after receiving approval from the State.

Operation and maintenance of a passive vapor management system consists of annual inspection of:

- the above ground piping to confirm that it is free from obstructions (nests, leaf debris, etc) and that no air intakes have been located nearby, and
- identification and repair of noted system deficiencies.

Operation of an active vapor management system is generally continuous, and as such requires monitoring, but no other operational procedures.

Maintenance of an active vapor management system shall include annual checks to confirm that the fans are operating. During the inspection, the possible collection of water in the

system should be checked by listening for a gurgling noise. If the noise is present the fan should be disconnected, any water in the fan housing or piping should be removed, and the fan should be re-installed and put back in service. Fan life is generally between three and five years, and fans should be replaced as needed. The above-ground piping in an active vapor management system should be inspected annually to confirm that it is free from obstructions (nests, leaf debris, etc).

As necessary, preventative maintenance (e.g., replacing vent fans), repairs and/or adjustments must be made to the system to ensure its continued effectiveness at mitigating exposures related to soil vapor intrusion. The need for preventative maintenance will depend upon the life expectancy and warranty for the specific part (fan life is generally between three and five years), as well as visual observations over time. The need for repairs and/or adjustments will depend upon the observation of system operation compared to that obtained when system operations were initiated.

Maintenance logs shall be kept on a suitable form (refer to section 4.4 of this SMP) and stored in a secure place, so they may be accessed by the property owners, system maintenance personnel, and the NYSDEC. The logs need to be available to the individual or organization that prepares the annual report

In the event an active vapor management system (i.e., fans) are needed to meet the objectives in Section 4.2.2.1 above, then the SMP will be amended to include information on these systems such as:

- Manufacturer's recommendations;
- Manual(s);
- Routine maintenance activities and schedules; and
- Inspection scope and schedule.

#### 4.2.2.3 Sub-slab Vapor Management System Non-Routine Maintenance

Non-routine maintenance is also required during the long-term operation of a vapor management system. Examples of such situations include the following:

- The need to replace the fan,

- The building's owners or occupants report that the warning device indicates the vapor management system is not operating properly,
- The vapor management system becomes damaged, or
- The building has undergone renovations that may reduce the effectiveness of the vapor management system.

Activities conducted during non-routine maintenance will vary depending upon which of these situations was the reason for the maintenance. In general, non-routine maintenance activities may include examining the building for structural or HVAC system changes, or other changes that may affect the performance of the vapor management system (e.g., new combustion appliances or deterioration of the concrete slab). The non-routine maintenance may also include examining the operation of the warning device and the vent fan, or the extent of sub-slab depressurization. Repairs or adjustments should be made to the system as appropriate.

If significant changes are made to the system or when the system's performance is unacceptable, the system may need to be redesigned and restarted. Such a redesign may require system testing activities; the extent of testing activities required will primarily depend upon the reason for the changes being made.

### **4.2.3 Cover System and Underwater Cap**

This SMP includes a site cover system in the upland area of the site and a cap installed in the underwater area of the site, both of which are passive non-mechanical Engineering Controls. Drawings of the site cover system are provided in Appendix I.

#### 4.2.3.1 System Descriptions

The minimum required site cover system includes a demarcation layer and clean soil cover in the areas of the site not covered by structures, pavement, or previously placed clean soil cover. The clean soil cover will be a minimum two feet thick and will be placed over a demarcation layer, consisting of an orange 4 oz/sy geotextile, or equivalent material suitable as a demarcation (marker) layer. If the property is used for commercial or industrial purposes, the

clean soil cover may be a minimum of one foot thick, as approved by NYSDEC, consistent with the Brownfield Clean-up Program enabling legislation.

The criteria for establishing that imported backfill is acceptable for use as clean soil cover at the Site are presented in 6 NYCRR Part 375, Table 375-6.8(a): Unrestricted Use Soil Cleanup Objectives. The criteria for establishing that imported backfill is acceptable for use beneath the site cover are the “Restricted-Residential” soil cleanup objectives presented in 6 NYCRR Part 375, Table 375-6.8(b): Restricted Use Soil Cleanup Objectives.

The underwater cap is located beneath the relieving platform, adjacent to the 160 foot long sheet pile barrier, as shown on Figure 2-1. It is 160 feet long and 20 feet wide, and covers the river bottom beneath the relieving platform. The cap system was constructed after four feet of contaminated sediments were removed from beneath the relieving platform. The cap consists of a 12-inch thick layer of soil-bentonite mixture, placed at the base of the excavation, followed by 12 inches of NYSDOT medium stone fill, then 24 inches of ¾-inch gravel, as shown on Figure 4-1. The cap spans the distance from the new steel sheet pile barrier and the existing timber retaining wall at the east edge of the relieving platform.

#### 4.2.3.2 Maintenance

Based on the passive non-mechanical nature of the site cover and underwater cap there will be no routine operation and maintenance; however inspection and repairs of these systems will be undertaken, as described, and in accordance with schedules in Section 3.4 of this SMP.

### **4.3 ENGINEERING CONTROL SYSTEM PERFORMANCE MONITORING**

Based on the passive non-mechanical nature of the above-described systems there will be no additional system performance monitoring, but inspection and repairs of these systems will be undertaken, as described, and in accordance with schedules in Section 3.4 of this SMP.

### **4.3.1 General Equipment Monitoring**

A visual inspection of these systems will be conducted during the monitoring events and annual inspections. A list of topics to be reviewed is provided in the Site-wide Inspection Checklist, presented in Appendix H.

### **4.3.2 Sampling Event Protocols**

Any required sampling associated with the vapor management will be undertaken in accordance with procedures described in Section 2.3.4 of this SMP.

## **4.4 MAINTENANCE AND PERFORMANCE MONITORING REPORTING REQUIREMENTS**

Forms and any other information generated related to maintenance or monitoring events and inspections will be kept in a secure place, so they may be accessed by the property owners, system maintenance personnel, and the NYSDEC. The logs, forms or inspection reports need to be available to the individual or organization that prepares the annual report. Information will be submitted as part of the Periodic Review Report, as specified in the Section 5 of this SMP.

Checklists or forms (see Appendices F and H) will be completed during each maintenance or monitoring event, as appropriate. Checklists/forms will include, but not be limited to the following information:

- Date;
- Name, company, and position of person(s) conducting maintenance activities;
- Maintenance activities conducted;
- Any deficiencies noted;
- Any modifications or repairs to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,

- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

## **5.0 INSPECTIONS, REPORTING AND CERTIFICATIONS**

### **5.1 SITE INSPECTIONS**

#### **5.1.1 Inspection Frequency**

All inspections will be conducted at the frequency specified in the schedules provided in Section 3 Monitoring Plan and Section 4 Operation and Maintenance Plan of this SMP. At a minimum, a site-wide inspection will be conducted annually. Inspections of remedial components will also be conducted when a breakdown of any treatment system component has occurred or whenever a severe condition has taken place, such as an erosion or flooding event that may affect the ECs.

#### **5.1.2 Inspection Forms, Sampling Data, and Maintenance Reports**

Inspections and monitoring events will be recorded on the appropriate forms for their respective system which are contained in Appendices F and H. Additionally, a general site-wide inspection form will be completed during the site-wide inspection (see Appendix H). These forms are subject to revision, as needed.

Applicable inspection forms and other records, including the media sampling data and system maintenance reports, generated for the site during the reporting period will be provided in electronic format in the Periodic Review Report.

#### **5.1.3 Evaluation of Records and Reporting**

The results of the inspection and site monitoring data will be evaluated as part of the EC/IC certification to confirm that the:

- EC/ICs are in place, are performing properly, and remain effective;
- The Monitoring Plan is being implemented;
- Operation and maintenance activities are being conducted properly; and, based on the above items,

- The site remedy continues to be protective of public health and the environment and is performing as designed in the RAWP and FER.

## 5.2 CERTIFICATION OF ENGINEERING AND INSTITUTIONAL CONTROLS

After the last inspection of the reporting period, a Professional Engineer licensed to practice in New York State will prepare the following certification:

For each institutional or engineering control identified for the site, I certify that all of the following statements are true:

- The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;
- The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;
- Nothing has occurred that would impair the ability of the control to protect the public health and environment;
- Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;
- Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;
- Use of the site is compliant with the environmental easement;
- The engineering control systems are performing as designed and are effective;
- To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and
- The information presented in this report is accurate and complete.
- I certify that the information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class “A” misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of

[business address], am certifying as [Owner or Owner's Designated Site Representative] I have been authorized and designated by all site owners to sign this certification for the site.

The foregoing signed certification will be provided on annual basis and will be included in the Periodic Review Report described below. If, for some reason, the certification cannot be made (such as a deficient engineering control), then a Corrective Measures Plan must be prepared (see Section 5.4 ).

### **5.3 PERIODIC REVIEW REPORT**

A Periodic Review Report will be submitted to the Department annually, beginning eighteen months after the Certificate of Completion is issued. In the event that the site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the site described in Appendix B (Metes and Bounds). The report will be prepared in accordance with NYSDEC DER-10 and submitted within 45 days of the end of each certification period. Media sampling results will also incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site;
- Results of the required annual site inspections and severe condition inspections, if applicable;
- All applicable inspection forms and other records generated for the site during the reporting period in electronic format;
- A summary of any discharge monitoring data and/or information generated during the reporting period with comments and conclusions;
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor), which include a listing of the compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends;

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted electronically in a NYSDEC-approved format;
- A site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the site-specific RAWP, ROD or Decision Document;
  - The operation and the effectiveness of all all treatment units or systems, including identification of any needed repairs or modifications;
  - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring Plan for the media being monitored;
  - Recommendations regarding any necessary changes to the remedy and/or Monitoring Plan; and
  - The overall performance and effectiveness of the remedy.

The Periodic Review Report will be submitted, in hard-copy format, to the NYSDEC Central Office and Regional Office in which the site is located, and in electronic format to NYSDEC Central Office, Regional Office and the NYSDOH Bureau of Environmental Exposure Investigation.

#### **5.4 CORRECTIVE MEASURES PLAN**

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control, a corrective measures plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until it is approved by the NYSDEC.

**TABLE 1**  
**SOIL CLEANUP OBJECTIVES FOR THE SITE**  
**TARRYTOWN FORMER MGP SITE**  
**TARRYTOWN, NEW YORK**

Site Area	Total PAH mg/kg	Total BTEX mg/kg
Holder and Tar Well Area (DNAPL Contamination)	1000	10
Balance of Site (LNAPL Contamination)	500	10

**TABLE 2**  
CRITERIA FOR RE-USE OF ON-SITE SOIL  
TARRYTOWN FORMER MGP SITE  
TARRYTOWN, NEW YORK

Total PAH mg/kg	Total BTEX mg/kg
500	10

No visual evidence of LNAPL and/or DNAPL saturated media

**TABLE 3**  
**MATERIALS DISPOSED DURING REMEDIATION AT THE TARRYTOWN FORMER MGP SITE**  
**TARRYTOWN FORMER MGP SITE**  
**TARRYTOWN, NEW YORK**

<b>Waste Type</b>	<b>Disposal Facility</b>	<b>Quantity</b>	<b>Units</b>
LNAPL Impacted Soil	ESMI	3,037	Tons
DNAPL Impacted Soil	ESMI	10,042	Tons
DNAPL Impacted Soil/Sediment	Casie ProTank	10,740	Tons
Construction Debris	ESMI	1,286	Tons
Liquid Products	Casie ProTank	605	Gallons

**TABLE 4**  
**CRITERIA FOR IMPORTED SOIL TO BE USED AS CLEAN COVER SOIL**  
**TARRYTOWN FORMER MGP SITE**  
**TARRYTOWN, NEW YORK**

<b>Purpose/Location</b>	<b>Criteria</b>
Clean soil cover above demarcation layer	Use Unrestricted, Residential, or Restricted Residential Soil Cleanup Objectives from 6 NYCRR Part 375
Fill and/or backfill below demarcation layer, pavement or buildings	Use Unrestricted, Residential, or Restricted Residential Soil Cleanup Objectives from 6 NYCRR Part 375
Applicable to all locations	Refer to DER-10 Section 5.4(e) Refer to 6 NYCRR Part 375-6.7(d)
Notable excerpts from the referenced Part 375 and DER-10 sections	<p>Excerpts are provided for general information only. The full text of Part 375 and DER-10 shall be consulted regarding criteria for quality of imported fill.</p> <p><b>EXCERPTS FROM DER-10</b></p> <p>1. Documentation of the source of fill must be provided to DER for approval of the source of the material before it is used on the site. See DER-10 for documentation requirements.</p> <p>2. Soil imported to a site for use in a soil cap, soil cover or as backfill will:</p> <ul style="list-style-type: none"> <li>• be free of extraneous debris or solid waste; and</li> <li>• be recognizable soil or other unregulated material as set forth in 6 NYCRR Part 360 and materials for which DEC has issued a beneficial use determination</li> </ul> <p>3. The following material may be imported, without chemical testing, to be used as backfill beneath pavement, buildings or as part of the final site cover, provided that it contains less than 10% by weight material which would pass through a size 80 sieve and consists of:</p> <ul style="list-style-type: none"> <li>• gravel, rock or stone, consisting of virgin material from a permitted mine or quarry; or</li> <li>• recycled concrete or brick from a DEC registered construction and demolition debris processing facility if the material conforms to the requirements of Section 304 of the New York State Department of Transportation <i>Standard Specifications Construction and Materials Volume 1</i> (2002).</li> </ul> <p><b>EXCERPTS FROM 6 NYCRR Part 375 6.7(d)</b></p> <p>1. Soil brought to the site for use as a soil cover or backfill must:</p> <ul style="list-style-type: none"> <li>• for residential, restricted-residential, and commercial use sites use the lower of the protection of groundwater or the protection of public health soil cleanup objectives, for the identified use of the site as set forth in Table 375-6.8(b);</li> <li>• for industrial use sites, use the lower of the protection of groundwater or the protection of public health soil cleanup objectives for commercial use as set forth in Table 375-6.8(b);</li> </ul> <p>2. The Department may issue a site specific exemption for one or more of the requirements set forth in paragraph (1) above, based upon site specific conditions, including but not limited to, the following:</p> <ul style="list-style-type: none"> <li>• use and redevelopment of the site;</li> <li>• depth of placement of the backfill material;</li> <li>• depth of placement of the backfill material relative to groundwater;</li> <li>• volume of backfill material;</li> <li>• potential for odor from the backfill material; and/or</li> <li>• presence of historic fill in the vicinity of the site.</li> </ul>

**TABLE 5**  
**SITE MANAGEMENT MATRIX**  
**TARRYTOWN FORMER MGP SITE**  
**TARRYTOWN, NEW YORK**

Site Management Items	Residential Use	Commercial / Industrial Use
Groundwater use allowable only with treatment	Yes	Yes
Provide soil meeting imported clean backfill requirements on unpaved (pervious) areas	2 feet thick	1 foot thick
Provide demarcation layer beneath clean soil layer	Yes	Yes
Excavation above the demarcation layer unrestricted	Yes	Yes
Excavation greater than clean soil thickness	Notify NYSDEC	Notify NYSDEC
Structures	Permitted	Permitted
Underground Utility Construction	See Excavation Work Plan	
Underground Utility Maintenance	See Excavation Work Plan	
Soil Vapor Investigation	Required for new building construction	
Soil Vapor Management System	Passive, at minimum - See Site Management Plan	

**TABLE 6**  
**MONITORING/INSPECTION SCHEDULE**  
**TARRYTOWN FORMER MGP SITE**  
**TARRYTOWN, NEW YORK**

<b>Monitoring Program</b>	<b>Frequency*</b>	<b>Matrix/Type</b>	<b>Analysis</b>
Soil Cover System	Annual	Inspection	Not Applicable
Underwater Cap System	Periodic (initially two and five years following remediation completion)	Inspection	Not Applicable
Groundwater Sampling	Annual	Groundwater	BTEX, PAHs, Attenuation Parameters in accordance with Groundwater Monitoring Plan (See Table 2 in Appendix F – A copy is provided in this SMP after Table 9)
DNAPL Recovery Trench	Periodic (see Section 4 of this SMP Operation and Maintenance)	Depth/Elevation Measurements	Not Applicable

**TABLE 7**  
**SCHEDULE OF MONITORING/INSPECTION REPORTS**  
**TARRYTOWN FORMER MGP SITE**  
**TARRYTOWN, NEW YORK**

Task	Reporting Frequency*
Soil Cover System	Annual
Underwater Cap System	During year inspection takes place
Groundwater Sampling	Annual
DNAPL Recovery Systems	Annual

\* The frequency of events will be conducted as specified until otherwise approved by NYSDEC

**TABLE 8**  
**EMERGENCY CONTACT NUMBERS**  
**TARRYTOWN FORMER MGP SITE**  
**TARRYTOWN, NEW YORK**

Medical, Fire, and Police:	911
One Call Center: (Call Before You Dig)	(800) 272-4480 (3 day notice required for utility mark-out)
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
NYSDEC Spills Hotline:	(800) 457-7362

\* Note: Contact numbers subject to change and should be updated as necessary

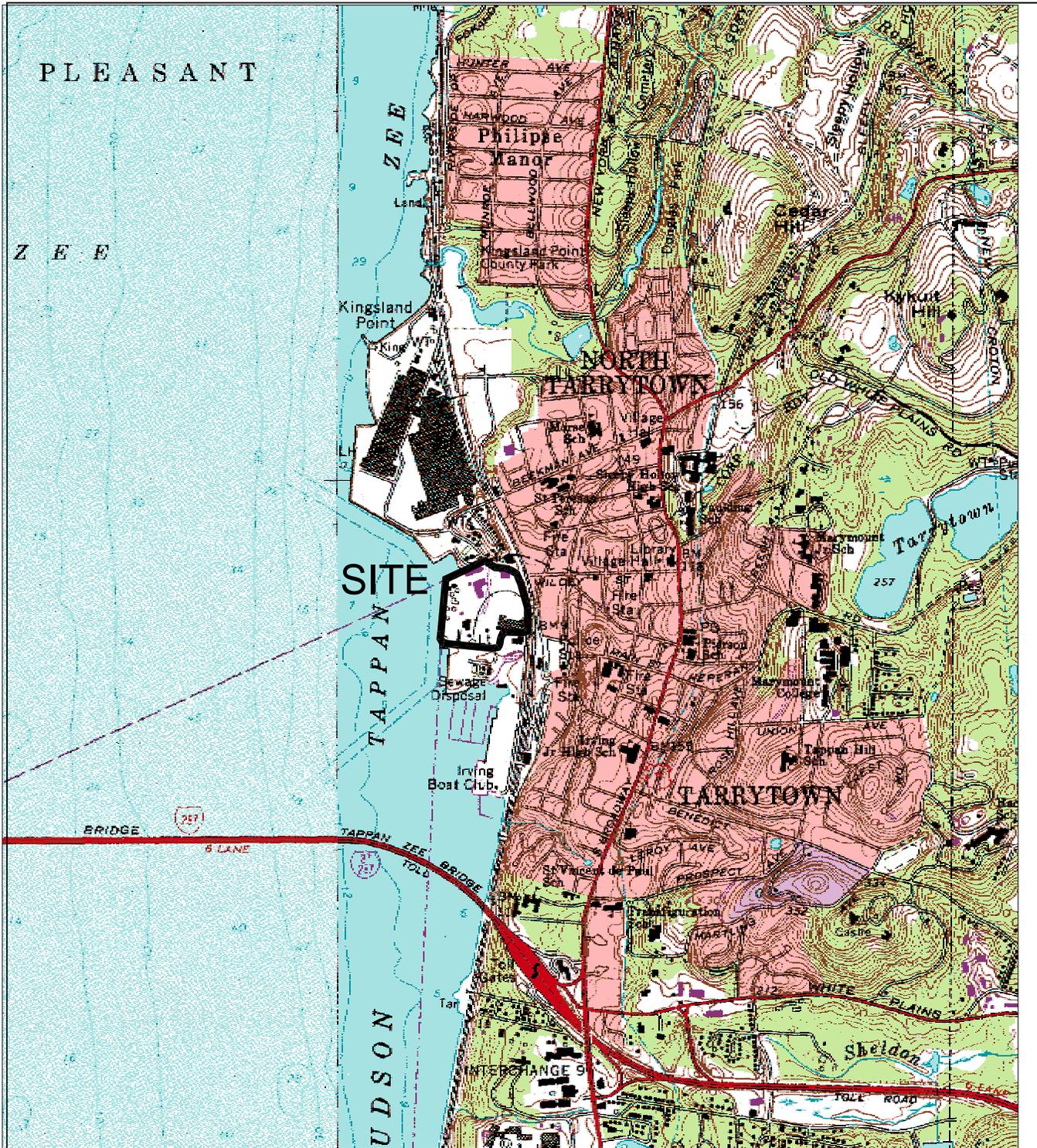
**TABLE 9**  
**OPERATION AND MAINTENANCE SUMMARY-DNAPL RECOVERY SYSTEM**  
**TARRYTOWN FORMER MGP SITE**  
**TARRYTOWN, NEW YORK**

Activity	Time after Construction Approved by NYSDEC	
	Start-up	Long Term
	0-12 Months	After 12 Months
Measure water levels and DNAPL thickness in recovery wells and observation wells	At least Monthly – more frequently if warranted by Start-up Phase observations	Frequency established in Near Term phase, and adjusted annually thereafter
Extract DNAPL	After every measurement round, if present in thickness greater than 0.5 feet	Frequency established in Start-up phase, and adjusted annually thereafter
Inspect Well/Surface Completion Condition	Once	Annually
Adjust Frequency of Measurement and Extraction	At end of time period	Annually, if warranted

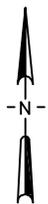
Tarrytown Former MGP Site  
 Site Management Plan Appendix F - Table 2

**Table 2 - Sampling Parameters and Recommended Analytical Methods**

Analyte	Analytical Method
<b>BTEX</b>	
Benzene	8021B
Toluene	8021B
Ethlybenzene	8021B
o- Xylene	8021B
p&m- Xylene	8021B
<b>Polyaromatic Hydrocarbons (PAH)</b>	
Acenaphthene	8270C
Acenaphthylene	8270C
Anthracene	8270C
Benz(a)anthracene	8270C
Benzo(a)pyrene	8270C
Benzo(b)fluoranthene	8270C
Benzo(ghi)fluoranthene	8270C
Chysene	8270C
Dibenz(a,h)anthracene	8270C
Fluoranthene	8270C
Fluorene	8270C
Indeno(1,2,3-cd)pyrene	8270C
Napthalene	8270C
Phenanthrene	8270C
Pyrene	8270C
<b>Attenuation Indicators</b>	
<b>FIELD PARAMETERS</b>	
Dissolved Oxygen	Field Probe
Oxygen-Reduction Potential	Field Probe
pH	Field Probe
Specific Conductance	Field Probe
Temperature	Field Probe
Ferrous Iron (Fe <sup>+2</sup> )	Field Probe
Carbon Dioxide	Field Probe
Alkalinity	Field Probe
Turbidity	Field Probe
<b>LABORATORY PARAMETERS</b>	
Biochemical Oxygen Demand	5210B
Chemical Oxygen Demand	5520C,5520D
Dissolved Organic Carbon	415.1
Total Organic Carbon	9060
Sulfate	375.4
Sulfide	376.1,376.2
Nitrate	353.2
Nitrite	353.2
Total Iron	6010
Manganese	6010



Z:\PROJECTS\28559\0000 RA WORK PLAN\DRAWINGS\28559\000-002A LOCUSDWG.DWG



QUADRANGLE LOCATION: WHITE PLAINS, N.Y.

**HALEY & ALDRICH**

TARRYTOWN FORMER MGP SITE  
 TARRYTOWN, NEW YORK  
 FERRY LANDINGS, LLC  
 NYSDEC SITE NO. C360064

SITE LOCUS

SCALE: AS SHOWN  
 JUNE 2010

FIGURE 1-1



Z:\PROJECTS\28590013 FINAL COVER AND DEC COMPLETION\28590-013-FIGURE 2\_F.DWG



**BASE MAP LEGEND:**

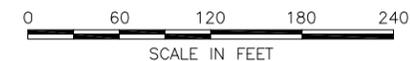
- NO PHYSICAL BOUNDS
- ADJACENT PROPERTY LINE
- PATENT & GRANT LINES
- DEED PARCEL & TAX LINE
- TAX PARCEL LINE
- X — X — EXISTING FENCE
- ○ — ○ — EXISTING STONE WALL
- ○ — ○ — EXISTING TREE LINE
- OHW — EXISTING OVERHEAD WIRES
- W — EXISTING UNDERGROUND WATER LINE
- G — EXISTING UNDERGROUND GAS LINE
- 8" SAN — EXISTING UNDERGROUND SEWER LINE
- 15" RCP — EXISTING UNDERGROUND STORM LINE
- HYD — EXISTING HYDRANT
- SMH — EXISTING SANITARY SEWER MANHOLE
- CB — EXISTING CATCH BASIN
- DMH — EXISTING STORM SEWER MANHOLE
- UP — EXISTING UTILITY POLE
- WV — EXISTING WATER VALVE
- GV — EXISTING GAS VALVE
- WSO — EXISTING WATER SHUT OFF
- ☆ — EXISTING LIGHT POLE
- S — EXISTING SIGN
- LP — LIGHT POLE
- MW-28 — MONITORING WELL LOCATION
- X — DNF "DID NOT FIND" (SEE NOTE 3)

**NOTES:**

1. BASE PLAN ILLUSTRATING EXISTING SITE STRUCTURES AND FEATURES DERIVED FROM THE CHAZEN COMPANIES' DRAWING ENTITLED "ALTA/ACSM LAND TITLE SURVEY LANDS OF FERRY INVESTMENTS, LLC" DATED 12/02/02. DATE OF SURVEY WAS 12/08/98.
2. HOLDER AND TAR WELLS, LNAPL, NDAPL, AND WDAPL LIMITS OF EXCAVATION ADAPTED FROM CHAZEN ENGINEERING & LAND SURVEYING CO., P.C., DRAWING ENTITLED "AS-BUILT SURVEYING GAS HOLDERS & TAR WELL, LNAPL, DNAPL & WDAPL REMEDIATION AREAS", DAED 1/07/05.
3. MONITORING WELL MW-05 WAS DESTROYED. ALL THE OTHER WELLS NOT LOCATED WERE COVERED WITH THE ASPHALT PLANT STOCKPILES OR EQUIPMENT.
4. MONITORING WELLS MW-10, MW-2, AND MW-28 ABANDONED DURING REMEDIATION
5. BOUNDARIES OF CLEAN SOIL COVER AND NEW ASPHALT ARE APPROXIMATE ONLY, BASED ON TAPE MEASUREMENTS FROM KNOWN PHYSICAL FEATURES.

**LEGEND:**

- SITE BOUNDARY
- AREA WITH MINIMUM FOUR FEET CLEAN SOIL COVER
- ▨ AREA WITH MINIMUM TWO FEET CLEAN SOIL COVER
- ▧ AREA WITH ASPHALT / PAVEMENT PLACED IN 2006
- AREA WITH EXISTING PAVEMENT OR STRUCTURES



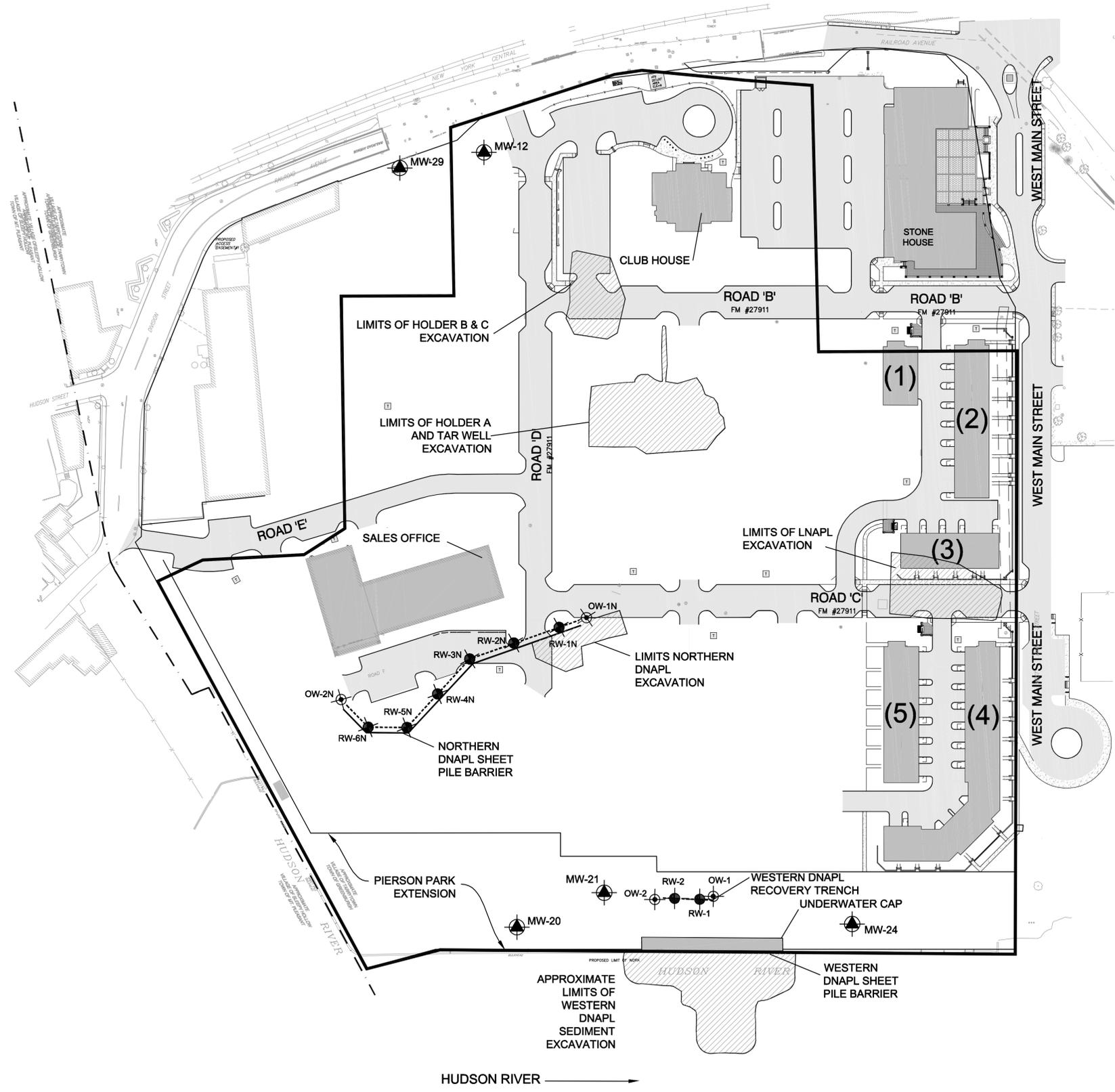
**HALEY & ALDRICH** TARRYTOWN FORMER MGP SITE  
TARRYTOWN, NEW YORK  
FERRY LANDINGS, LLC  
NYSDEC SITE NO. C360064

**POST-REMEDIATION  
SITE PLAN**

SCALE: AS SHOWN  
JUNE 2010

**FIGURE 1-3**

Z:\PROJECTS\28590\017 SITE DEVELOPMENT SERVICES\CAD\CHAZEN SITE PLAN 2009\28590-017-002B 2009 SITE PLAN.DWG

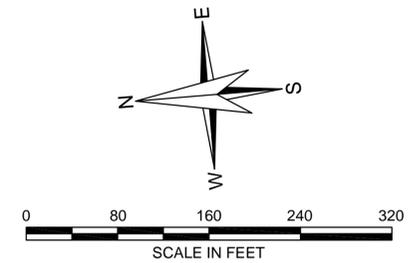


LEGEND:

-  GROUNDWATER MONITORING WELL
-  DNAPL RECOVERY WELL
-  DNAPL OBSERVATION WELL
-  APPROXIMATE AREA ENCOMPASSED BY THE BROWNFIELD CLEAN-UP AGREEMENT #C360064
-  ROADS AND PARKING AREAS
-  (5) BUILDING NUMBER

NOTES:

1. BASEMAP BASED ON CAD DRAWING ENTITLED "PH1\_10399-08\_PHASE.DWG" DATED 1 JULY 2009 FROM CHAZEN COMPANIES OF GLENN FALLS, NEW YORK

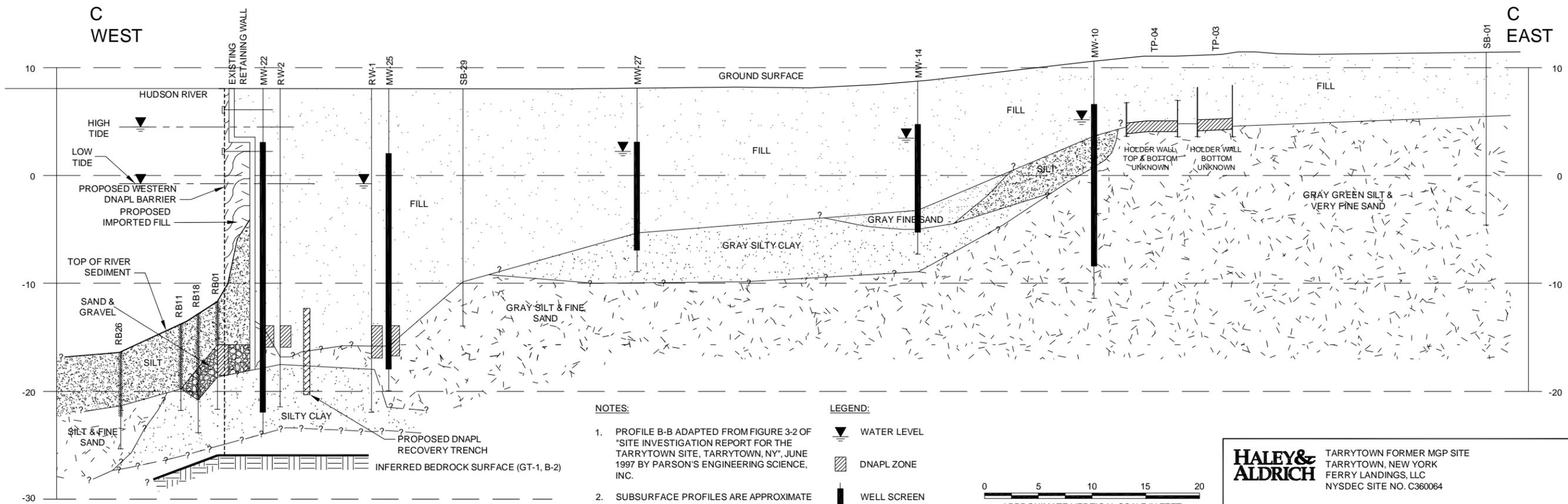
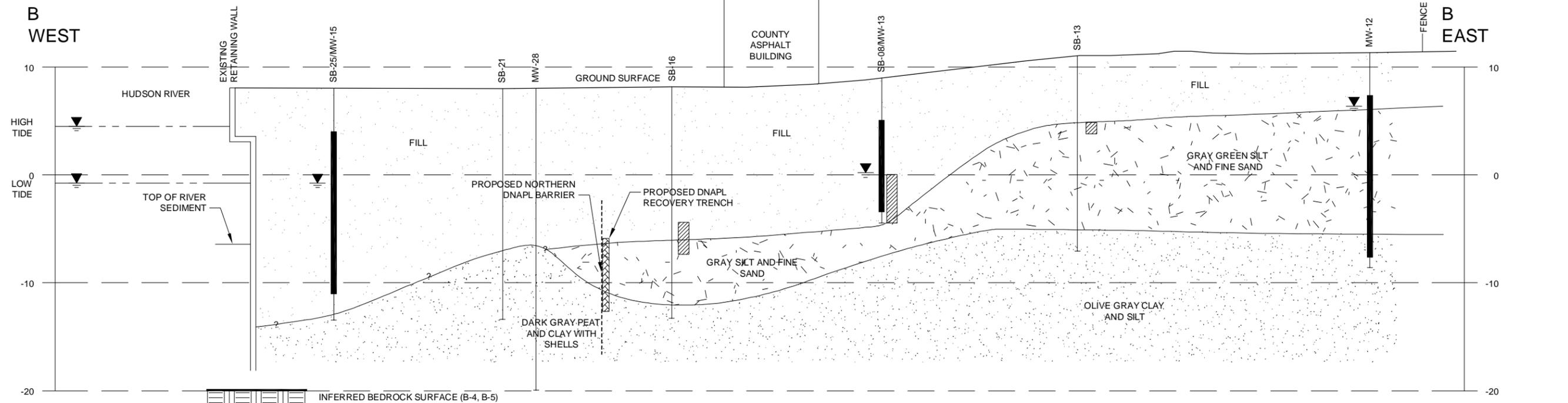


**HALEY & ALDRICH** TARRYTOWN FORMER MGP SITE  
 TARRYTOWN, NEW YORK  
 FERRY LANDINGS, LLC  
 NYSDEC SITE NO. C360064

SITE PLAN 2009

SCALE: AS SHOWN  
 JUNE 2010

FIGURE 1-4



- NOTES:**
1. PROFILE B-B ADAPTED FROM FIGURE 3-2 OF "SITE INVESTIGATION REPORT FOR THE TARRYTOWN SITE, TARRYTOWN, NY", JUNE 1997 BY PARSON'S ENGINEERING SCIENCE, INC.
  2. SUBSURFACE PROFILES ARE APPROXIMATE ONLY, AND ARE INTENDED TO PROVIDE A GENERAL ILLUSTRATION OF SITE CONDITIONS.
  3. LATERAL DIMENSIONS OF HOLDERS BASED ON SANBORN (TM) MAPS. DEPTH BASED ON ADJACENT HOLDER WHERE HOLDER BOTTOM WAS FOUND.

**LEGEND:**

- WATER LEVEL
- DNAPL ZONE
- WELL SCREEN
- RECOVERY TRENCH
- SHEEN & BLEBS IN RIVER SEDIMENT

0 5 10 15 20  
APPROXIMATE VERTICAL SCALE IN FEET

0 50 100 150 200  
APPROXIMATE HORIZONTAL SCALE IN FEET

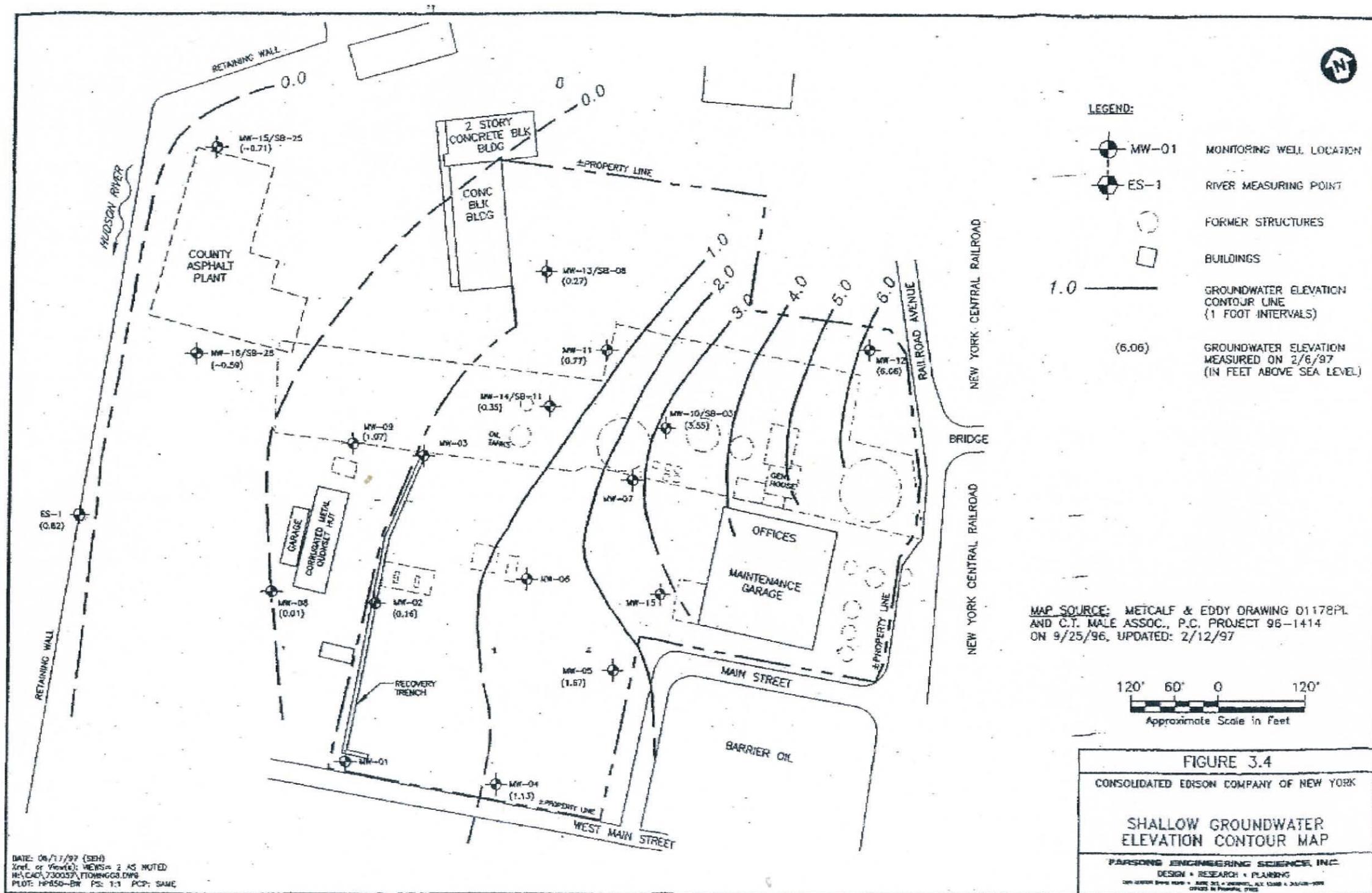
**HALEY & ALDRICH** TARRYTOWN FORMER MGP SITE  
TARRYTOWN, NEW YORK  
FERRY LANDINGS, LLC  
NYSDEC SITE NO. C360064

**GEOLOGIC SECTIONS**

SCALE: AS SHOWN  
JUNE 2010

**FIGURE 1-5**

Z:\PROJECTS\28590\000 RA WORK PLAN\DRAWINGS\CONCEPT\PLAN\PROFILE REV1.DWG



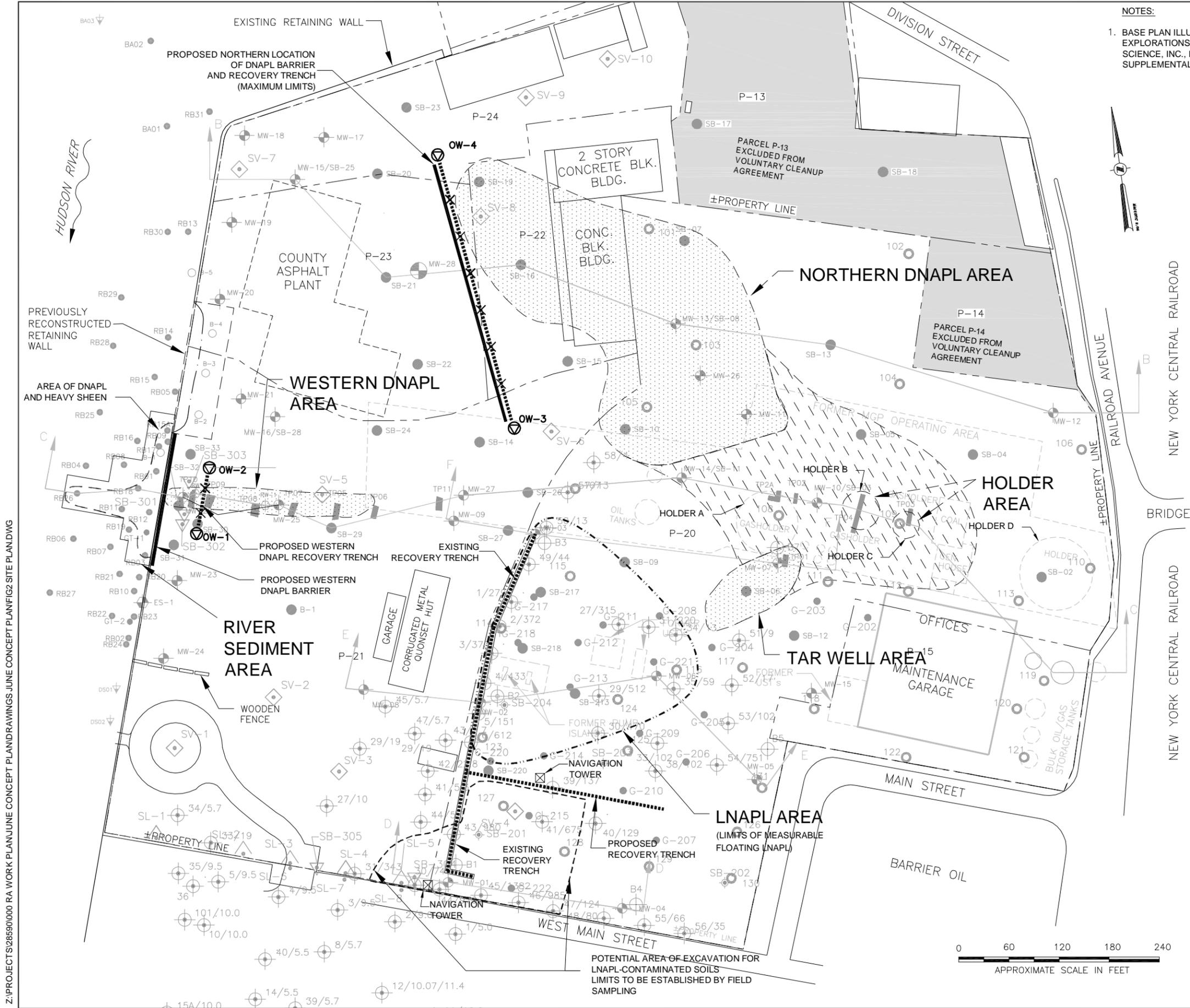
Z:\PROJECTS\28590\000 RA WORK PLAN\DRAWINGS\28590-000-002B.GW.CNTR.DWG

**HALEY & ALDRICH** TARRYTOWN FORMER MGP SITE  
 TARRYTOWN, NEW YORK  
 FERRY LANDINGS, LLC  
 NYSDEC SITE NO. C360064

GROUNDWATER CONTOUR MAP

SCALE: AS SHOWN  
 JUNE 2010

FIGURE 1-6



**NOTES:**

1. BASE PLAN ILLUSTRATING EXISTING SITE STRUCTURES, FEATURES, EXISTING EXPLORATIONS AND EXTENT OF IMPACTED AREAS DERIVED FROM PARSONS ENGINEERING SCIENCE, INC., FIGURE 3-1 ENTITLED "TOTAL BTEX CONCENTRATIONS IN SOIL SAMPLES, SUPPLEMENTAL INVESTIGATION TARRYTOWN SITE" DATED 28 SEPTEMBER 2000.

**LEGEND:**

- MW-28 PROPOSED MONITORING WELL
- SV-1 PROPOSED SOIL VAPOR PROBE
- SB-301 PROPOSED BORING TO CHECK DNAPL LIMITS - 28'
- SL-4 PROPOSED SLAM BAR SOIL VAPOR SAMPLE LOCATION
- MW-01 MONITORING WELL LOCATIONS
- SB-01 SOIL BORING LOCATIONS
- RB06 RIVER BORING LOCATION
- GT-2 GEOTECHNICAL BORING LOCATION
- ES-1 RIVER MEASURING POINT
- TP03 TEST PIT LOCATIONS
- G-207 GEOPROBE BORINGS CONDUCTED BY RETEC IN OCTOBER 1996
- SB-202 SOIL BORINGS CONDUCTED BY RETEC IN OCTOBER 1996
- B-2 GEOTECHNICAL BORINGS CONDUCTED BY COUNTY ASPHALT IN MARCH 1998
- FORMER STRUCTURES
- BUILDINGS
- LNAPL AREA - LIMITS OF MEASURABLE FLOATING LNAPL
- PROPOSED RECOVERY WELL LOCATION
- PROPOSED DNAPL OBSERVATION WELL
- ZONES SATURATED WITH MGP DNAPL
- LENSES SATURATED WITH MGP DNAPL
- 58/4 APPROX. LOCATIONS OF SOIL GAS SAMPLES PERFORMED BY METCALF & EDDY, DATED DECEMBER 1990. 58/4=SAMPLE#/PID RESULTS IN PPM.
- B5 APPROX. LOCATIONS OF SOIL SAMPLE BORINGS PERFORMED BY METCALF & EDDY, DATED DECEMBER 1990. B5=PROBE NO.
- 120 APPROX. LOCATIONS OF SOIL PROBES PERFORMED BY METCALF & EDDY, DATED DECEMBER 1994. 120=PROBE NO.

Z:\PROJECTS\28590000 RA WORK PLAN\UNE CONCEPT PLAN\FIG2 SITE PLAN.DWG



TARRYTOWN FORMER MGP SITE  
TARRYTOWN, NEW YORK  
FERRY LANDINGS, LLC  
NYSDEC SITE NO. C360064

**REMEDIAL INVESTIGATION AND CONCEPTUAL REMEDIATION PLAN**

SCALE: AS SHOWN  
JUNE 2010

**FIGURE 1-7**

SEE DRAWING AS-BUILT SURVEY GAS  
HOLDERS & TAR WELL, LNAPL, NDNAPL &  
WDNAPL REMEDIATION AREAS, DRAWING  
SP1, 1/7/05, BY CHAZEN ENGINEERING &  
LAND SURVEYING CO., P.C.  
REFER TO APPENDIX I

Z:\PROJECTS\28590\008 RESP TO FER COMMENTS\DRAWINGS\LOCUS.DWG

**HALEY &  
ALDRICH**

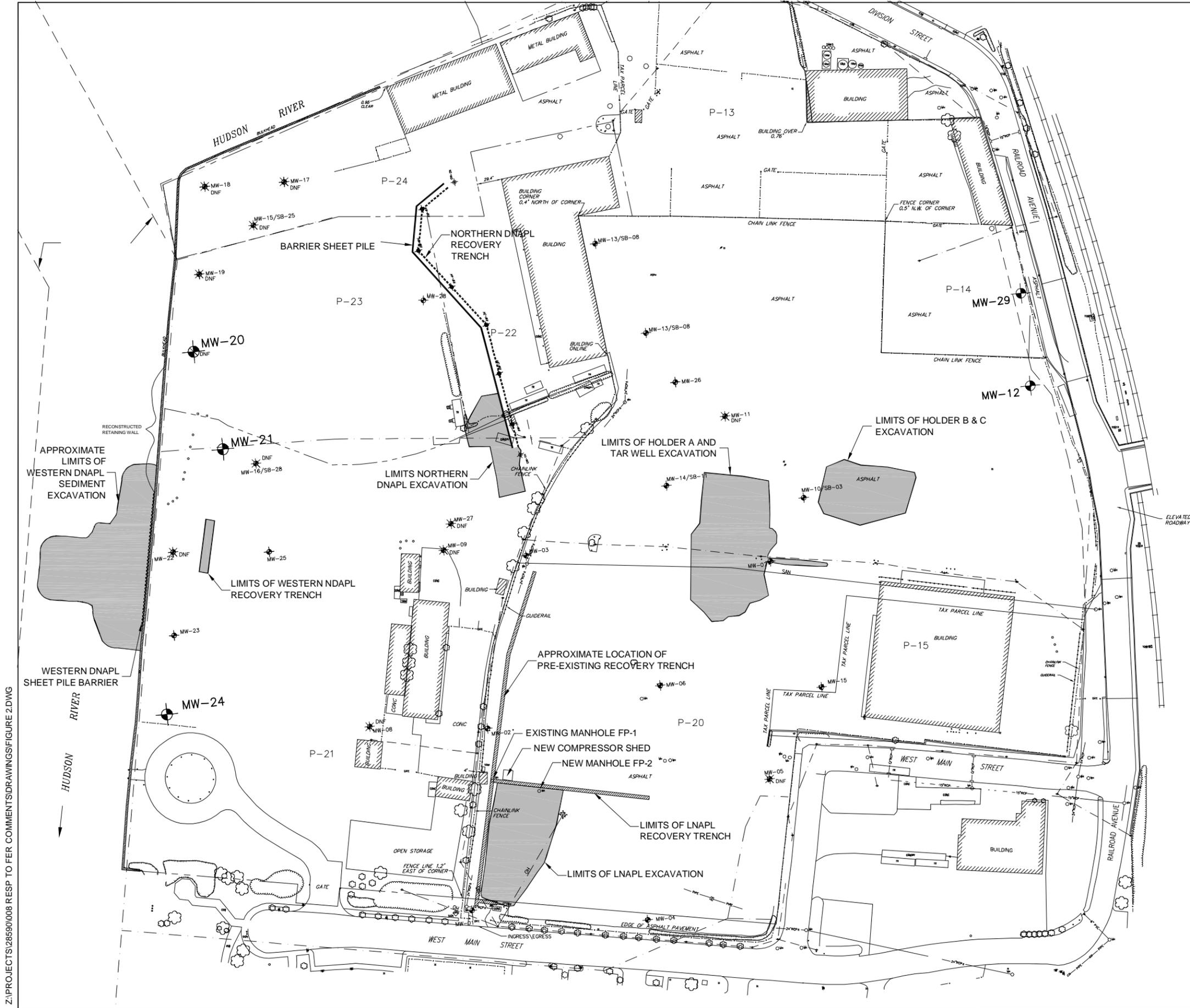
TARRYTOWN FORMER MGP SITE  
TARRYTOWN, NEW YORK  
FERRY LANDINGS, LLC  
NYSDEC SITE NO. C360064

REMEDIAL ACTION RECORD  
DRAWING - PLAN

SCALE: AS SHOWN  
JUNE 2010

FIGURE 1-8





**BASE MAP LEGEND:**

---	NO PHYSICAL BOUNDS
- - - -	ADJACENT PROPERTY LINE
- - - -	PATENT & GRANT LINES
- - - -	DEED PARCEL & TAX LINE
- - - -	TAX PARCEL LINE
- X - X -	EXISTING FENCE
○ ○ ○ ○ ○	EXISTING STONE WALL
○ ○ ○ ○ ○	EXISTING TREE LINE
— OHW —	EXISTING OVERHEAD WIRES
— W —	EXISTING UNDERGROUND WATER LINE
— G —	EXISTING UNDERGROUND GAS LINE
— 8" SAN —	EXISTING UNDERGROUND SEWER LINE
— 15" RCP —	EXISTING UNDERGROUND STORM LINE
HYD	EXISTING HYDRANT
○ SMH	EXISTING SANITARY SEWER MANHOLE
□ CB	EXISTING CATCH BASIN
○ DMH	EXISTING STORM SEWER MANHOLE
○ UP	EXISTING UTILITY POLE
○ WV	EXISTING WATER VALVE
○ GV	EXISTING GAS VALVE
○ SP	EXISTING WATER SHUT OFF
☆	EXISTING LIGHT POLE
+	EXISTING SIGN
⊕	LIGHT POLE
⊕ MW-28	MONITORING WELL LOCATION
⊕ DNF	"DID NOT FIND" (SEE NOTE 3)

- NOTES:**
1. BASE PLAN ILLUSTRATING EXISTING SITE STRUCTURES AND FEATURES DERIVED FROM THE CHAZEN COMPANIES' DRAWING ENTITLED "ALTA/ACSM LAND TITLE SURVEY LANDS OF FERRY INVESTMENTS, LLC" DATED 12/02/02. DATE OF SURVEY WAS 12/08/98.
  2. HOLDER AND TAR WELLS, LNAPL, NDAPL, AND WDAPL LIMITS OF EXCAVATION ADAPTED FROM CHAZEN ENGINEERING & LAND SURVEYING CO., P.C., DRAWING ENTITLED "AS-BUILT SURVEYING GAS HOLDERS & TAR WELL, LNAPL, DNAPL & WDAPL REMEDIATION AREAS", DAED 1/07/05.
  3. MONITORING WELL MW-05 WAS DESTROYED. ALL THE OTHER WELLS NOT LOCATED WERE COVERED WITH THE ASPHALT PLANT STOCKPILES OR EQUIPMENT.
  4. MONITORING WELLS MW-10, MW-2, AND MW-28 ABANDONED DURING REMEDIATION



**HALEY & ALDRICH** TARRYTOWN FORMER MGP SITE  
 TARRYTOWN, NEW YORK  
 FERRY LANDINGS, LLC  
 NYSDEC SITE NO. C360064

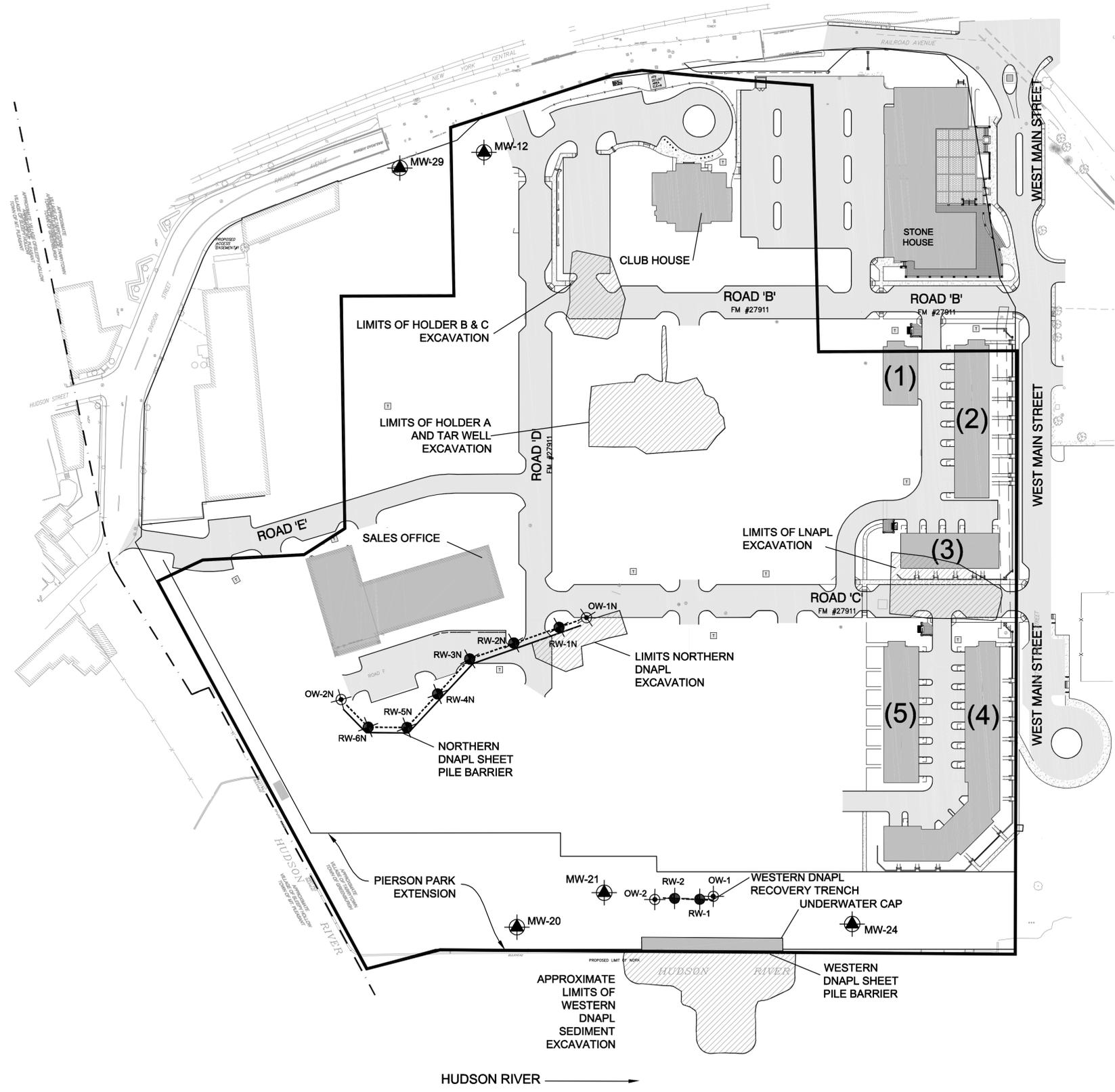
**MONITORING WELLS  
 MW-12, MW-20, MW-21, MW-24, MW-29  
 GROUNDWATER MONITORING PLAN**

SCALE: AS SHOWN  
 JUNE 2010

**FIGURE 1-10**

Z:\PROJECTS\28590\008 RESP TO FER COMMENTS\DRAWINGS\FIGURE 2.DWG

Z:\PROJECTS\28590\017 SITE DEVELOPMENT SERVICES\CAD\CHAZEN SITE PLAN 2009\28590-017-002B 2009 SITE PLAN.DWG

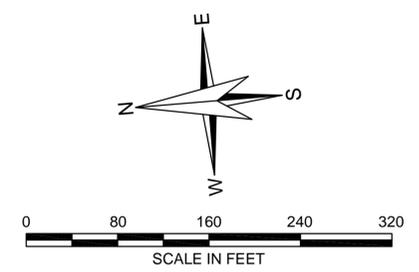


LEGEND:

-  GROUNDWATER MONITORING WELL
-  DNAPL RECOVERY WELL
-  DNAPL OBSERVATION WELL
-  APPROXIMATE AREA ENCLOSED BY THE BROWNFIELD CLEAN-UP AGREEMENT #C360064
-  ROADS AND PARKING AREAS
-  (5) BUILDING NUMBER

NOTES:

1. BASEMAP BASED ON CAD DRAWING ENTITLED "PH1\_10399-08\_PHASE.DWG" DATED 1 JULY 2009 FROM CHAZEN COMPANIES OF GLENN FALLS, NEW YORK



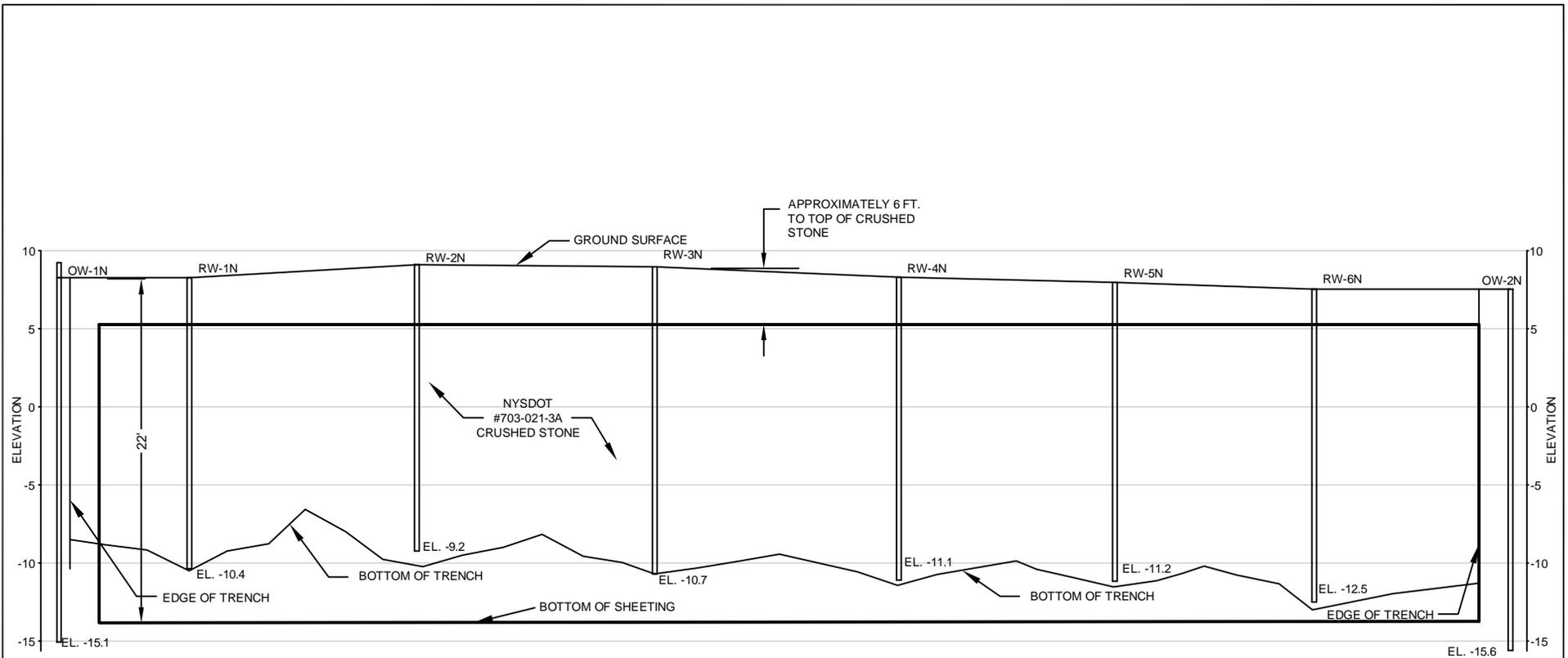
**HALEY & ALDRICH**

TARRYTOWN FORMER MGP SITE  
TARRYTOWN, NEW YORK  
FERRY LANDINGS, LLC  
NYSDEC SITE NO. C360064

OPERATION, MAINTENANCE, AND MONITORING PLAN

SCALE: AS SHOWN  
JUNE 2010

FIGURE 2-1

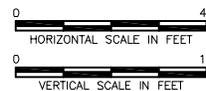


**NOTES: SOURCES OF DATA**

1. D.A. COLLINS ENVIRONMENTAL SERVICES, SUBMITTAL "WDNAPL DEGRADABLE SLURRY COLLECTION TRENCH, AS-BUILT PROFILES AND QC DOCUMENTS", DATED 12 JULY 2004. ADJUSTED BASED ON AS MEASURED WELL DEPTHS.

2. HALEY & ALDRICH, DEPTH OF WELL MEASUREMENTS PERFORMED BETWEEN 9 JULY 2004 TO 12 JANUARY 2005.

3. THE CHAZEN COMPANIES, "AS-BUILT SURVEY GAS HOLDERS & TAR WELL, LNAPL, NDAPL & WDNAPL REMEDIATION AREAS" DRAWING DATED 24 MARCH 2005.



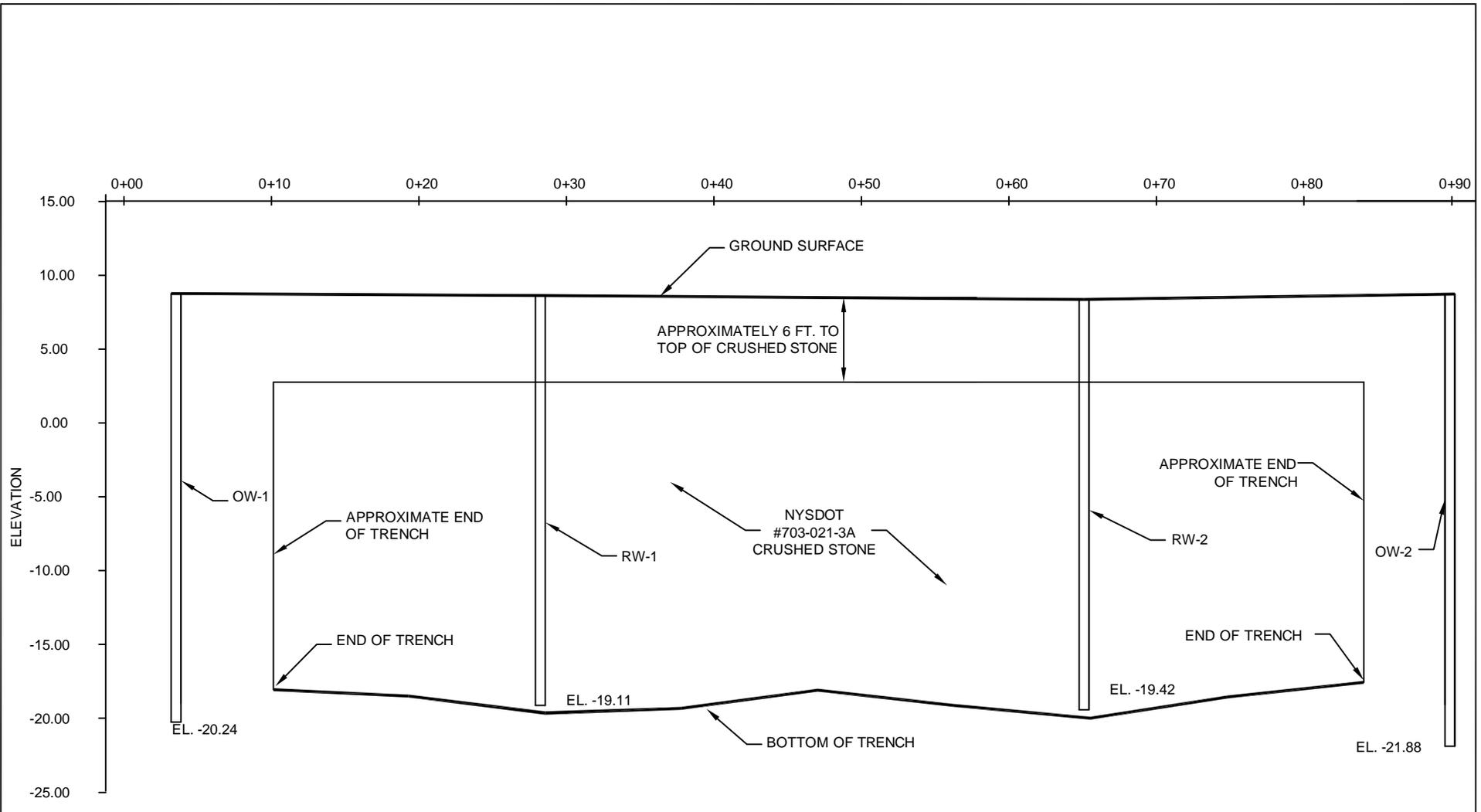
**HALEY & ALDRICH**

TARRYTOWN FORMER MGP SITE  
TARRYTOWN, NEW YORK  
FERRY LANDINGS, LLC  
NYSDEC SITE NO. C360064

**NORTHERN DNAPL  
RECOVERY TRENCH**

SCALE: AS SHOWN  
JUNE 2010

**FIGURE 2-2**



**NOTES: SOURCES OF DATA**

1. D.A. COLLINS ENVIRONMENTAL SERVICES, SUBMITTAL "WDNAPL DEGRADABLE SLURRY COLLECTION TRENCH, AS-BUILT PROFILES AND QC DOCUMENTS", DATED 10 JANUARY 2005.
2. HALEY & ALDRICH, DEPTH OF WELL MEASUREMENTS PERFORMED ON 12 JANUARY 2005.
3. THE CHAZEN COMPANIES, "AS-BUILT SURVEY GAS HOLDERS & TAR WELL, LNAPL, NDAPL & WDNAPL REMEDIATION AREAS" DRAWING DATED 24 MARCH 2005.



**HALEY & ALDRICH**

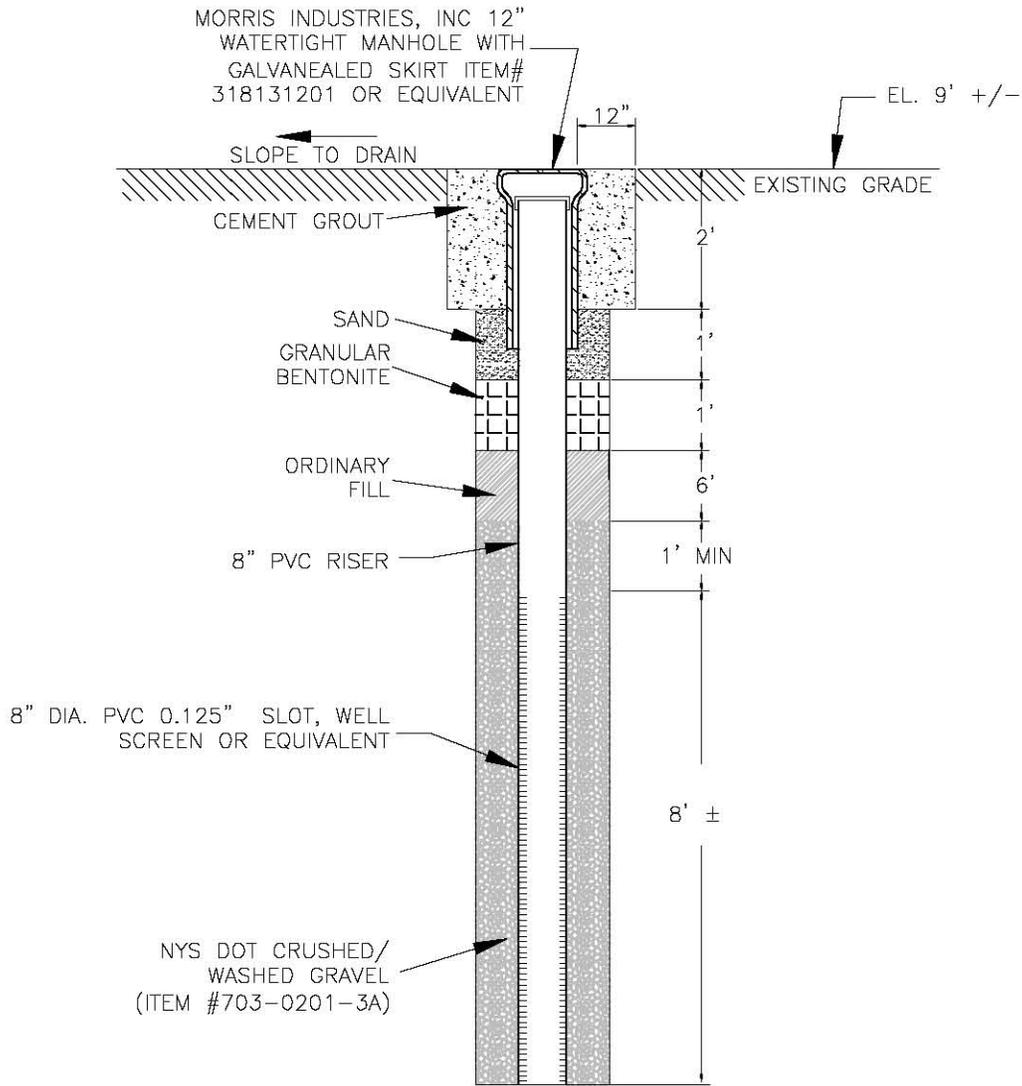
TARRYTOWN FORMER MGP SITE  
 TARRYTOWN, NEW YORK  
 FERRY LANDINGS, LLC  
 NYSDEC SITE NO. C360064

**WESTERN DNAPL  
 RECOVERY TRENCH**

SCALE: AS SHOWN  
 JUNE 2010

**FIGURE 2-3**

Z:\PROJECTS\28590\002 PREDESIGN PHASE \NORTHERN DNAPL BARRIER AND COLLECTION TRENCH\DRAWINGS\3-DETAILS.DWG



DNAPL OBSERVATION AND RECOVERY WELL

DETAIL

SCALE: NONE

**HALEY &  
ALDRICH**

TARRYTOWN FORMER MGP SITE  
TARRYTOWN, NEW YORK  
FERRY LANDINGS, LLC  
NYSDEC SITE NO. C360064

DNAPL OBSERVATION AND  
RECOVERY WELL DETAIL

SCALE: NOT TO SCALE  
JUNE 2010

FIGURE 2-4

**APPENDIX A**

**Excavation Work Plan**

**TARRYTOWN FORMER MGP SITE FINAL ENGINEERING REPORT  
SITE MANAGEMENT PLAN  
TARRYTOWN, NEW YORK**

**APPENDIX A: EXCAVATION WORK PLAN**

**by**

**Haley & Aldrich of New York  
Rochester, New York**

**for**

**Ferry Landings, LLC  
Tarrytown, New York**

**File No. 28590-010  
Revised June 2010**

## **1. PURPOSE AND SCOPE**

**This Excavation Work Plan was prepared to be used by owners and contractors that may need to perform excavations at the Ferry Landings site, shown on Figure 1. The Work Plan presents procedures to be followed for protection of worker health and safety and to protect human health and the environment. The Work Plan is applicable to those areas located beneath existing impervious surfaces and beneath demarcation layers (which are generally situated at two feet below ground surface in areas of the site not covered by buildings, pavement or other impervious surfaces). This Work Plan does not apply to excavations in soils placed above a demarcation layer.**

**This work plan describes the required agency notifications, health and safety requirements (including air monitoring), soil characterization requirements, soil management procedures and documentation requirements.**

**For convenience, a checklist of procedures to be followed prior to, during, and after completion of the excavation project is provided at the end of this Work Plan.**

## **2. PRE-EXCAVATION ACTIVITIES**

**Certain pre-excitation activities are required as part of this Excavation Work Plan. The Work Plan is applicable to all areas of the site and to any party making excavations at the site.**

### **2.1 Applicable Areas**

**This excavation plan is applicable to all areas of the site where excavation depths will extend below an existing demarcation layer, or penetrate impervious surfaces where no demarcation layer has been placed. Figure 1 provides a site plan showing the site boundary and the areas where demarcation layers have been installed, as of April 2006.**

### **2.2 Pre-Excavation Activities and Notifications**

#### **2.2.1 Data Check**

**Prior to performing the planned excavation, it is recommended that site records are checked to determine how much of the excavation will be in areas already containing clean fill and how much will be beneath demarcation layers or beneath impervious surfaces. Site records are available from the site owner and from New York State Department of Conservation.**

#### **2.2.2 Agency Notification**

**Prepare written notification to the New York State Department of Environmental Conservation, Division of Environmental Remediation, 625 Broadway, Albany, NY 12233-7014, to Ferry Landings, LLC and to ConEdison. Notification must be 7 calendar days prior to the start of work. The notification must include:**

- § A description of the work to be performed,**
- § Expected dates for performing the work,**
- § A statement that the Tarrytown Former MGP Site Excavation Work Plan will be followed during the course of the work,**
- § A statement that a Health & Safety Plan for the work has been prepared and will be followed according to OSHA regulation 29 CFR 1910.120,**
- § A statement that Air Monitoring will be performed in conformance with the Excavation Work Plan.**
- § In the event that the work is associated with new building construction, the following additional information must be provided:**
  - Identification of the building under construction.**
  - Identification of the cover area being disturbed. Disturbance of the site cover will be limited to the building footprint and an adjacent area outside the footprint not larger than is reasonably needed for building construction.**
  - A description of the measures to be taken to control the limits of cover disturbance adjacent to the building, consistent with the site cover requirements of the SMP.**
  - A forecast for duration of building construction and schedule for replacing the cover system at the end of building construction.**

#### **2.2.3 Obtain Permits**

**Obtain any permits or approvals needed from the Village of Tarrytown, Westchester County or other regulatory agencies for the work to be performed.**

#### **2.2.4 Imported Backfill Quality Verification**

Obtain testing data for all sources of imported backfill to demonstrate compliance with the quality criteria given in the Site Management Plan. The criteria for establishing that imported backfill is acceptable for use at the site are presented in Table 1.

#### **2.2.5 Underground Utility Clearance and Notification**

An investigation of potential underground utilities and facilities shall be performed prior to excavation. Agencies such as the Underground Facilities Protection Organization (UFPO) at 800-962-7962 (Dig Safely New York) and others as may be required to properly to mark out existing utilities facilities shall be contacted. Both public and private utilities and facilities must be identified.

#### **2.2.6 Pre-excavation Soil Sampling**

It is advised that pre-excavation soil sampling be performed (see Section 4) to obtain understanding regarding the nature and extent of soil quality that may be encountered. A determination of whether or not a demarcation layer was installed in the work area can be made based on pre-excavation sampling. If no pre-excavation sampling is performed, then it must be assumed that all excavated materials must be managed according to this Excavation Work Plan. The pre-excavation sampling must be performed according to the applicable Health & Safety and Air Monitoring requirements outlined in the following sections.

#### **2.2.7 Health & Safety Plan**

Past investigations of the subject site have shown that contaminated soil may potentially be encountered during subsurface exploration, utility installation, and construction activities that disturb soil, rock, and fill materials. These particularly include materials that could be associated with the fill contained within the subject site. Generally, materials that are subject to health and safety planning include:

- § Volatile Organic Compounds (VOCs) - These include petroleum and or MGP constituents.
- § Semi-Volatile Organic Compounds (SVOCs) - These are primarily residual MGP constituents and residuals of petroleum fuel oils.

Health and safety planning should also give consideration to other construction related issues, such as, but not limited to, trenching safety (as is required under OSHA regulations 29 CFR 1910.1926), or other construction-related OSHA regulations.

A written Health & Safety Plan (conforming to 29 CFR 1910.120) shall be developed for construction activities based on sample analytical results, information specific to the parcel being developed, specific construction tasks to be performed, and the potential for exposure for site workers and uncontrolled public access areas where potential for exposure may exist. The HASP must provide for healthy and safe conduct of site tasks by on-site personnel and the public.

At minimum the HASP shall include:

- § Pre-work Health and Safety Briefing Documentation
- § Worker Training Requirements (consistent with requirements under OSHA 29 CFR 1910).

- § **Project information: Location of project, organizations performing the work, site owner contact information, excavation contractor contact information**
- § **Site Description**
- § **Scope of Work**
- § **Hazard Assessment (Chemical and Physical)**
- § **Protective Measures (Personal Protective Equipment, Work Zone Safety)**
- § **Air Monitoring Plan and Equipment**
- § **Decontamination Procedures**
- § **Contingency Plan (for emergencies)**

### **2.2.8 Air Monitoring Plan**

**The following Air Monitoring Plan (AMP) shall be implemented at the Site.**

**Continuous air monitoring for VOCs is required for all ground intrusive activities. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.**

**Periodic air monitoring for VOCs shall be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring well. “Periodic” monitoring during sample collections might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or disturbing soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of uncontrolled public access areas where potential for exposure may exist, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or soil sampling in an open excavation or adjacent to a school or residence.**

#### **VOC Monitoring, Response Levels, and Actions**

**VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) at 15 minute intervals and in the immediate work area (i.e., during soil or groundwater sampling) when necessary. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using a photo-ionization detector (PID) or flame-ionization detector (FID) with data logging and alarm capabilities to measure volatile organic vapors including MGP-related constituents known or suspected to be present. The equipment must be calibrated at least daily in accordance with manufacturer requirements with an appropriate calibration gas.**

- § **All readings must be recorded on the Record of Field Monitoring Log form and with a data logger and be available for State (DEC and DOH) personnel to review.**
- § **If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for longer than 15 minutes, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.**
- § **If total organic vapor levels at the downwind perimeter of the work area or exclusion**

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

- § If the organic vapor level is above 25 ppm at the perimeter of the work area as indicated by the equipment alarm, activities must be shut down pending evaluation and implementation of additional corrective actions to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less (but in no case less than 20 feet) is below 5 ppm over background.

#### **Particulate Monitoring, Response Levels, and Actions**

Particulate monitoring during the handling of waste or contaminated soil or when activities on site generate fugitive dust from exposed waste or contaminated soils must follow guidance in NYSDEC TAGM #4031. If dust is observed leaving the work site, work must be suspended, and dust suppression techniques, such as water application will be employed. After the dust suppression technique is implemented, if no dust is observed, work may continue. If fugitive dust continues to be generated, particulate monitoring equipment must be utilized to monitor and qualify conditions.

### **3. EXCAVATION WORK PROCEDURES**

**Site excavations shall be conducted according to the following procedures:**

- a. Implement the measures required by the HASP and CAMP.**
- b. If applicable, conduct pre-excavation soil sampling (see Section 4).**
- c. Perform excavation and stockpiling of excavated soil.**
  - 1. Soil excavated from above the demarcation layer shall be stockpiled separately and may be re-used on site without further characterization.**
  - 2. Soil excavated from beneath the demarcation layer or from areas having no demarcation layer shall be stockpiled for purposes of characterization.**
  - 3. Stockpiles shall be placed on minimum 10 mil plastic sheeting or on sound pavement.**
  - 4. Stockpiles shall be covered at the end of each work day and only uncovered when in active use.**
  - 5. Stockpiles shall be surrounded with a perimeter berm, staked silt fence or staked hay bales to manage sediment-laden runoff and to minimize run-on from outside the stockpiles.**
  - 6. Stockpiles shall be segregated using visual and olfactory observations, screening with field instruments, such as a PID, and/or pre-excavation testing.**
- d. Testing shall be performed to determine if the stockpiled material may be re-used on site or needs to be disposed off site.**
  - 1. Testing may be a combination of pre-excavation soil characterization and testing of stockpile samples.**
  - 2. Testing frequency shall satisfy the guidelines in Section 4.**
  - 3. At least one test per 500 cubic yards of material shall be performed.**
- e. Excavated soil may be used for on site backfill, beneath a demarcation layer if it satisfies the following criteria:**
  - 1. Less than 500 ppm for total PAHs (polycyclic aromatic hydrocarbons),**
  - 2. Less than 10 ppm for total BTEX compounds (benzene, toluene, ethylene, xylene),**
  - 3. No visual evidence of LNAPL and/or DNAPL-saturated media.**
- f. Manage construction water as outlined in Section 4.**
- g. Debris from excavations that is unsuitable for site backfill (wood, wire, metal, large pieces of masonry, etc) must be taken off site and disposed at a permitted facility.**
- h. Backfill shall be performed according to the project specifications; utilizing on-site and/or off-site materials satisfying the requirements of this Excavation Work Plan.**
- i. A demarcation layer (orange 4 oz/sy fabric shall be placed during backfill operations as follows:**

- 1. For utility trenches, the demarcation layer shall be placed, at minimum, two feet below final grade and the backfill above the demarcation layer shall meet the quality requirements for imported backfill.**
- 2. For green space, the demarcation layer shall be placed roughly horizontally, a minimum 2ft below the final grade.**
- 3. For paved areas, or other impervious surfaces, no demarcation layer is needed.**
- 4. Beneath buildings, no demarcation layer is needed.**

**j. Perform project completion and site clean-up tasks.**

**k. Record documents of the project shall be prepared and provided to the property owner. They shall include:**

- 1. Drawings showing the limits of excavation, location of demarcation, and type of backfill used**
- 2. Soil and water testing reports.**
- 3. Manifests and/or Bills of Lading documenting the destination of soil and other debris that was disposed off-site.**
- 4. Dates the work was performed.**

**l. Notify NYSDEC and site owner in writing that the excavation project was completed. The written notification shall include copies of all manifests or bills of lading for materials that were sent off site for disposal.**

## **4. SOIL CHARACTERIZATION AND MANAGEMENT**

**This section of the work plan describes soil characterization, excavated soil management, and soil re-use and disposal requirements.**

### **4.1 Soil Characterization**

#### **4.1.1 Sample Parameters**

**Conventional subsurface exploration methods consisting of test pits, test borings, or other methods may be used for sampling soil materials. The intent of such explorations is to view materials that may be excavated during construction for observable signs of soil quality as described in Section 3e.**

**The overall intent of sampling is to obtain a sufficient number of samples to be representative of the total mass of material that is expected to be excavated during construction. If laboratory analyses show the samples to satisfy the criteria for use as backfill (see Section 2.2.5), then the material excavated should be manageable on-site, if desired.**

**Test pit or test trench type explorations should not be advanced deeper than anticipated construction excavation, nor should they be placed in areas within the footprint of the proposed structures where intended to provide future structural support. Backfill of excavated test pits and/or test trenches should be performed with a free-draining granular fill compacted sufficiently to ensure a bearing strength equal to or greater than the native conditions.**

#### **4.1.2 Sampling Frequency**

##### **4.1.2.1 Pre-Construction**

**In order to generate samples that are representative of the overall soil mass that will be excavated, regular sampling along foundation elements is recommended. All samples will be "grab" samples. Grab samples are obtained from a specific location and are representative of the conditions at that location.**

**Footers - In general, sampling is recommended at a frequency of one grab sample per 200 linear-feet of foundation footer (for slab-on-grade type construction). For typical footer excavation of 4 to 5 feet in depth, and 4 to 5 feet width, this represents one sample per approximately 200 in-place cubic yards.**

**Column Supports - If column footers, grade beams, or other structural supports are intended for the proposed building footprint, and these elements will require excavation, sampling is also recommended on a regularly spaced basis. Spacing between samples at column support should not exceed 200 ft in any direction.**

**Underground Utility Trenches - Sampling frequency for underground utility trenches in excess of four feet deep is recommended at a frequency of one grab sample per 200 linear-feet.**

**Sample Integrity - The number of samples, sampling schedule, and intended analyses should be coordinated with a qualified environmental laboratory such that appropriate sample containers, preservation methods, shipping, and holding times may be adhered**

to. At a minimum all grab samples should be tested per EPA 8260 (VOCs), 8270 (SVOCs) and 6010 (metals).

#### **4.1.2.2 During Construction**

Sampling of excavated soil materials during construction should be performed if either of the following conditions exists:

- § No pre-construction planning or sampling was performed.
- § If conditions encountered during actual construction are significantly different than those observed during pre-construction exploration.

The recommended frequency of sampling during construction (if not otherwise done before construction) should follow the guidelines of sample frequency described previously for pre-construction.

#### **4.1.3 Soil Parameters for Imported Backfill**

Any additional fill material brought to the site for filling and grading purposes shall be from an acceptable borrow source, free of industrial and/or other potential sources of chemical contamination. Analytical testing of backfill materials imported to the site shall consist of EPA 8260 (VOCs), 8270 (SVOCs) and 6010 (metals) (metals), 8081A/82 and 8141A (pesticides and PCBs), and 8151A (herbicides). Testing shall be performed by a laboratory certified under the NYS Department of Health Environmental Laboratory Approval Program (see <http://www.wadsworth.org/labcert/elap/comm.html> for a list of certified laboratories). The results of chemical analysis of the borrow soil must be provided to NYSDEC for review and acceptance. The quality criteria for acceptance are provided in Table 1.

### **4.2 Management of Excavated Material**

#### **4.2.1 Site Management**

The area of excavation shall be marked to prevent access by unauthorized personnel or vehicles. A decontamination station for workers and for vehicles shall be established, so that people or equipment are clean before leaving the site. Appropriate construction safety measures shall be employed and the HASP and CAMP shall be implemented.

#### **4.2.2 On-Site Soil Management**

As indicated above, excavated soil meeting specified quality criteria for on-site backfill may be re-used as fill on site. The soil must exhibit total BTEX concentrations of less than 10 ppm and total polycyclic aromatic hydrocarbon (PAH) concentrations of less than 500 ppm.

Appropriate measures to consider in materials management should include a possible need to temporarily stockpile excavated soil and measures to prevent its commingling with other materials. Measures to consider for such control include:

- § Stockpile locations away from storm sewers, downwind property boundaries, and drainage courses.
- § Placement of stockpiles on impervious material (plastic) with perimeter berms.

**§ Covering stockpiles or exposed waste areas to prevent migration by wind-blown dust or storm water runoff until final placement and final cover is established.**

#### **4.2.3 Off-Site Soil Management**

**Rock, debris (such as timber, concrete, brick, metal, etc), and excess soil from the excavation project may need to be sent off-site. Any off-site placement or disposal shall comply with applicable laws, regulations and permits. The NYSDEC shall be notified in advance of shipping contaminated soil materials off site. As indicated previously, soil spoils exceeding the quality criteria for backfill must be taken off site to a permitted disposal facility.**

#### **4.3 Excavation Dewatering**

**Construction design and planning should consider existing data regarding groundwater quality and depths to allow for proper management of groundwater flow into excavations during construction, if de-watering is necessary for construction purposes. Groundwater entering excavations may exceed surface or groundwater quality standards and may need treatment prior to discharge. In general, shallow excavations (less than four feet) would not be expected to encounter the stabilized average water table. For excavations below the water table, treatment of the excavation dewatering water must be performed prior to discharge, unless testing demonstrates that the water quality meets surface water quality standards.**

## **5. PROJECT COMPLETION**

### **5.1.1 Demarcation Layer and Cleanup**

**A demarcation layer consisting of an orange 4 oz/sy fabric, or equivalent, shall be placed horizontally across excavations made beneath green space and in utility trenches, at a minimum two feet depth below final grade. Soil placed above the demarcation layer shall meet the quality criteria for imported backfill. A demarcation layer is not required under buildings, pavement or other impervious surfaces. Prior to demobilization, the work area shall be cleaned, equipment decontaminated (as needed) and wastes disposed appropriately.**

### **5.1.2 Agency Notification and Record Documents**

**At project completion, the NYSDEC and the site owner shall be notified in writing that the work is complete. The written notification shall include copies of all manifests or bills of lading for materials that were sent off site for disposal. In addition, record documents of the project shall be prepared and provided to the property owner. They shall include:**

- § Drawings showing the limits of excavation, location of demarcation, and type of backfill used,**
- § Soil and water testing reports,**
- § Manifests and/or Bills of Lading documenting the destination of soil and other debris that was disposed off-site,**
- § Dates the work was performed.**

**These record documents will be used by the owner for the annual certification report to NYSDEC, as indicated in the Site Management Plan.**

## **6. PROJECT CHECKLIST**

### **Pre-Excavation**

- £ Data Check – check site records to determine extent of excavation where the Work Plan applies**
- £ Agency Notification – Notify NYSDEC seven days in advance of excavation**
- £ Obtain Permits – Obtain any required permits**
- £ Imported Backfill Quality Verification – obtain chemical testing of backfill materials to be imported**
- £ Underground Utility Clearance & Notification – Identify public and private underground utilities and facilities**
- £ Health & Safety Plan – Prepare HASP meeting requirements of 29 CFR 1910.120**
- £ Air Monitoring Plan – Prepare AMP per requirements of this Work Plan**

### **Excavation**

- £ Implement the HASP and AMP**
- £ Conduct pre-excavation soil sampling (if desired)**
- £ Excavate and stockpile excavated soil – observe stockpiling requirements in Work Plan**
- £ Test excavated soil for re-use or off-site disposal**
- £ Manage construction water**
- £ Dispose of excavation debris at permitted off-site location**
- £ Perform site backfill per project specifications and Work Plan**
- £ Install demarcation layer per Work Plan**
- £ Perform project completion and site clean up tasks**

### **Post-Excavation**

- £ Prepare Record Documents – per Work Plan**
- £ Submit Record Documents to NYSDEC and property owner**

**Table 1. Criteria for Use of Imported Soil**

Purpose/Location	Criteria
Clean soil cover above demarcation layer	Use Unrestricted, Residential, or Restricted Residential Soil Cleanup Objectives from 6 NYCRR Part 375
Fill and/or backfill below demarcation layer, pavement or buildings	Use Unrestricted, Residential, or Restricted Residential Soil Cleanup Objectives from 6 NYCRR Part 375
Applicable to all locations	Refer to DER-10 Section 5.4(e) Refer to 6 NYCRR Part 375-6.7(d)
<p>Notable excerpts from the referenced Part 375 and DER-10 sections</p>	<p>Excerpts are provided for general information only. The full text of Part 375 and DER-10 shall be consulted regarding criteria for quality of imported fill.</p> <p><b>EXCERPTS FROM DER-10</b></p> <p>1. Documentation of the source of fill must be provided to DER for approval of the source of the material before it is used on the site. See DER-10 for documentation requirements.</p> <p>2. Soil imported to a site for use in a soil cap, soil cover or as backfill will:</p> <ul style="list-style-type: none"> <li>• be free of extraneous debris or solid waste; and</li> <li>• be recognizable soil or other unregulated material as set forth in 6 NYCRR Part 360 and materials for which DEC has issued a beneficial use determination</li> </ul> <p>3. The following material may be imported, without chemical testing, to be used as backfill beneath pavement, buildings or as part of the final site cover, provided that it contains less than 10% by weight material which would pass through a size 80 sieve and consists of:</p> <ul style="list-style-type: none"> <li>• gravel, rock or stone, consisting of virgin material from a permitted mine or quarry; or</li> <li>• recycled concrete or brick from a DEC registered construction and demolition debris processing facility if the material conforms to the requirements of Section 304 of the New York State Department of Transportation <i>Standard Specifications Construction and Materials Volume 1</i> (2002).</li> </ul> <p><b>EXCERPTS FROM 6 NYCRR Part 375 6.7(d)</b></p> <p>1. Soil brought to the site for use as a soil cover or backfill must:</p> <ul style="list-style-type: none"> <li>• for residential, restricted-residential, and commercial use sites use the lower of the protection of groundwater or the protection of public health soil cleanup objectives, for the identified use of the site as set forth in Table 375-6.8(b);</li> <li>• for industrial use sites, use the lower of the protection of groundwater or the protection of public health soil cleanup objectives for commercial use as set forth in Table 375-6.8(b);</li> </ul> <p>2. The Department may issue a site specific exemption for one or more of the requirements set forth in paragraph (1) above, based upon site specific conditions, including but not limited to, the following:</p> <ul style="list-style-type: none"> <li>• use and redevelopment of the site;</li> <li>• depth of placement of the backfill material;</li> <li>• depth of placement of the backfill material relative to groundwater;</li> <li>• volume of backfill material;</li> <li>• potential for odor from the backfill material; and/or</li> <li>• presence of historic fill in the vicinity of the site.</li> </ul>

G:\Projects\28590\017 Site Development Services\2010 Rev SMP\APPENDICES\App A Excavation Work Plan\2010-0610-Final Excavation Work Plan.doc

**APPENDIX B**

**Metes and Bounds**

## SCHEDULE B

---

All that plot piece or parcel of land situate and being in the Village of Tarrytown, Town of Greenburgh, County of Westchester and State of New York, bounded and described as follows:

BEGINNING at a point on the westerly side of Railroad Avenue said point being the northeasterly corner of the herein described parcel and the southeasterly corner of lands now or formerly Westchester Industries, Inc as described in Liber 7115 of deeds at page 633, thence along the westerly side of Railroad Avenue southeasterly on a curve to the right of radius 608.00 feet an arc length of 39.79 feet having a chord bearing S 38°04'58" E 39.78 feet, S 14°25'40" E 89.28 feet, S 10°47'30" E 28.28 feet, S 11°30'40" E 56.31 feet, S 2°13'30" E 68.43 feet, S 27°07'20" W 42.94 feet, S2°06'00" W 143.13 feet and S 16°35'00" W 27.19 to the intersection of the northerly side of West Main Street with the westerly side of Railroad Avenue, said point being the southeasterly corner of the herein described parcel and the southeasterly corner of lands now or formerly Ferry Investments, LLC described in Control #410460110; thence along the northerly and westerly side of West Main Street, N 85°12'30" W 120.88 feet, N 84°31'20" W 98.24 feet, N 87°10'20" W 113.23 feet, S 6°08'20" W 224.58 feet, N 85°14'40" W 523.17 feet, S 6°08'20" W 22.35 feet, N 85°14'40" W 50.01 feet, N 6°08'20" E 22.35 feet, and N 85°14'40" W 205.31 feet to the southwesterly corner of the herein described parcel and a point on the easterly bank of the Hudson River, thence along same N 4°45'20" E 727.34 feet, and N 10°32'20" W 93.12 feet to the northwesterly corner of the herein described parcel, thence along the southerly bank of the Hudson River and lands now or formerly Ferry Landings, LLC described in Control #430240001, N 66°17'50" E 416.57, N 67°56'29" E 113.57 feet, N 79°55'39" E 18.12 feet, N 87°36'58" E 19.04 feet, S 20°01'52" E 59.02 feet, S 01°39'30" E 95.89 feet, S 21°49'03" W 12.29 feet, S 11°56'47" E 90.48 feet, N 89°52'20" E 47.28 feet, S 88°41'00" E 189.13 feet and S 88°11'25" E 66.03 feet to a point; thence along lands now or formerly of Westchester Industries, Inc. described in Liber 7115 of deeds at page 633, S 1°48'35" W 156.64 feet and S 88°11'25" E 196.49 to the point or place of beginning.

CONTAINING 20.30 ACRES OF LAND

**NOTES:**

1. THIS SURVEY IS BASED UPON THE RECORDS OF THE STATE ENGINEER'S OFFICE AND THE RECORDS OF THE STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION. THE SURVEYOR HAS CONDUCTED A VISUAL INSPECTION OF THE PROPERTY AND HAS FOUND THAT THE RECORDS ACCURATELY REPRESENT THE ACTUAL SITUATION ON THE GROUND. THE SURVEYOR HAS NOT CONDUCTED A FIELD SURVEY OF THE PROPERTY AND HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY. THE SURVEYOR HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY. THE SURVEYOR HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY.

**FIELD SURVEY NOTES:**

2. THE SURVEYOR HAS CONDUCTED A VISUAL INSPECTION OF THE PROPERTY AND HAS FOUND THAT THE RECORDS ACCURATELY REPRESENT THE ACTUAL SITUATION ON THE GROUND. THE SURVEYOR HAS NOT CONDUCTED A FIELD SURVEY OF THE PROPERTY AND HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY. THE SURVEYOR HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY.

**ADDITIONAL NOTES:**

3. THE SURVEYOR HAS CONDUCTED A VISUAL INSPECTION OF THE PROPERTY AND HAS FOUND THAT THE RECORDS ACCURATELY REPRESENT THE ACTUAL SITUATION ON THE GROUND. THE SURVEYOR HAS NOT CONDUCTED A FIELD SURVEY OF THE PROPERTY AND HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY. THE SURVEYOR HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY.

**PROPERTY INFORMATION:**

4. THE SURVEYOR HAS CONDUCTED A VISUAL INSPECTION OF THE PROPERTY AND HAS FOUND THAT THE RECORDS ACCURATELY REPRESENT THE ACTUAL SITUATION ON THE GROUND. THE SURVEYOR HAS NOT CONDUCTED A FIELD SURVEY OF THE PROPERTY AND HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY. THE SURVEYOR HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY.

NO.	DESCRIPTION	DATE
1	...	...
2	...	...
3	...	...
4	...	...
5	...	...
6	...	...
7	...	...
8	...	...
9	...	...
10	...	...

**PROPOSED SURVEY CONSTRUCTION ENVIRONMENTAL STATEMENT**

5. THE SURVEYOR HAS CONDUCTED A VISUAL INSPECTION OF THE PROPERTY AND HAS FOUND THAT THE RECORDS ACCURATELY REPRESENT THE ACTUAL SITUATION ON THE GROUND. THE SURVEYOR HAS NOT CONDUCTED A FIELD SURVEY OF THE PROPERTY AND HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY. THE SURVEYOR HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY.

**CONTRIBUTORS:**

6. THE SURVEYOR HAS CONDUCTED A VISUAL INSPECTION OF THE PROPERTY AND HAS FOUND THAT THE RECORDS ACCURATELY REPRESENT THE ACTUAL SITUATION ON THE GROUND. THE SURVEYOR HAS NOT CONDUCTED A FIELD SURVEY OF THE PROPERTY AND HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY. THE SURVEYOR HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY.

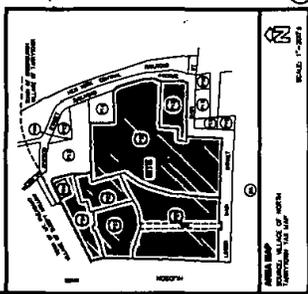
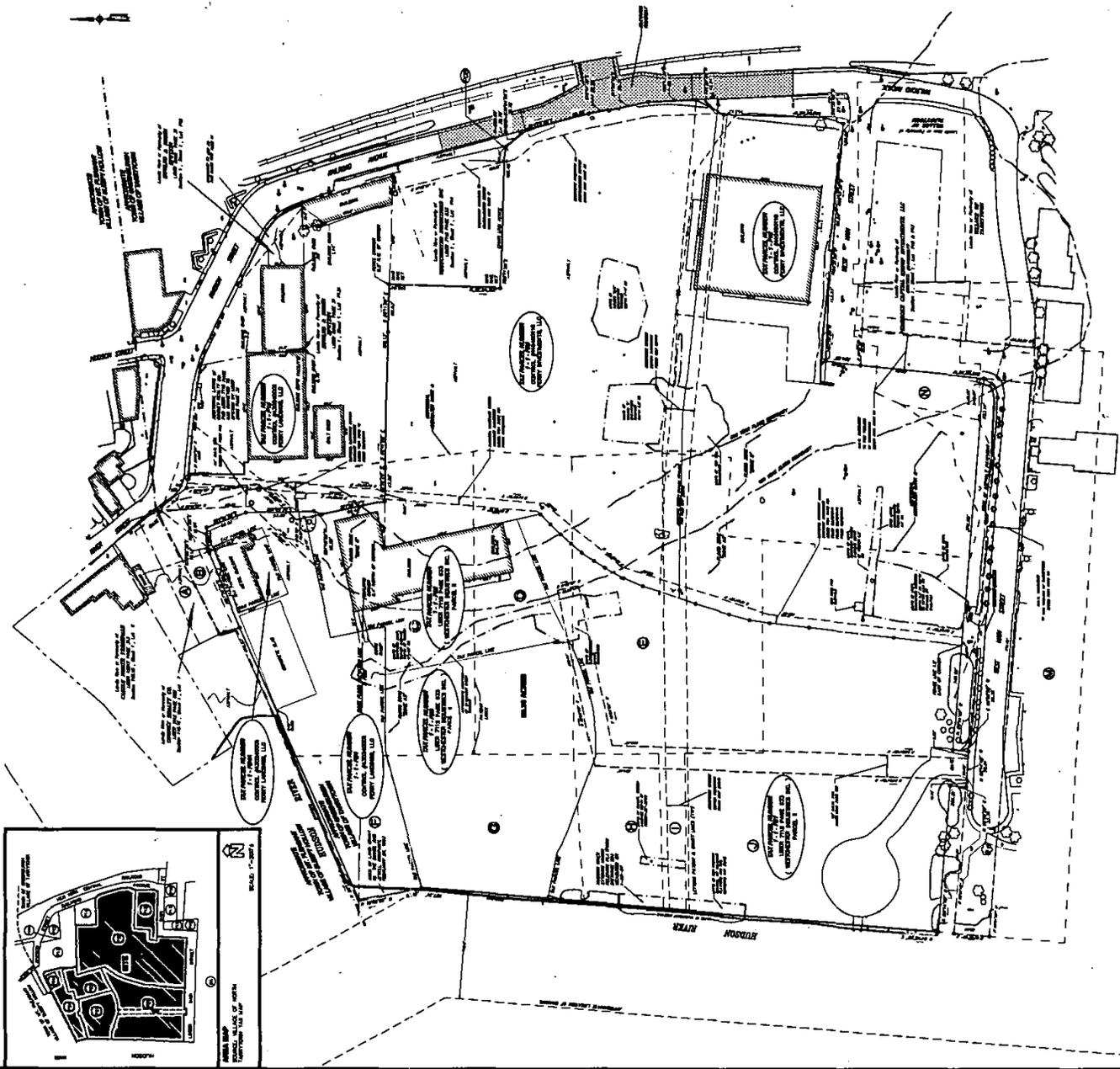
7. THE SURVEYOR HAS CONDUCTED A VISUAL INSPECTION OF THE PROPERTY AND HAS FOUND THAT THE RECORDS ACCURATELY REPRESENT THE ACTUAL SITUATION ON THE GROUND. THE SURVEYOR HAS NOT CONDUCTED A FIELD SURVEY OF THE PROPERTY AND HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY. THE SURVEYOR HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY.

8. THE SURVEYOR HAS CONDUCTED A VISUAL INSPECTION OF THE PROPERTY AND HAS FOUND THAT THE RECORDS ACCURATELY REPRESENT THE ACTUAL SITUATION ON THE GROUND. THE SURVEYOR HAS NOT CONDUCTED A FIELD SURVEY OF THE PROPERTY AND HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY. THE SURVEYOR HAS NOT OBTAINED ANY MEASUREMENTS FROM THE PROPERTY.

- 1. ...
- 2. ...
- 3. ...
- 4. ...
- 5. ...
- 6. ...
- 7. ...
- 8. ...
- 9. ...
- 10. ...
- 11. ...
- 12. ...
- 13. ...
- 14. ...
- 15. ...
- 16. ...
- 17. ...
- 18. ...
- 19. ...
- 20. ...

**LEGEND:**

- 1. ...
- 2. ...
- 3. ...
- 4. ...
- 5. ...
- 6. ...
- 7. ...
- 8. ...
- 9. ...
- 10. ...
- 11. ...
- 12. ...
- 13. ...
- 14. ...
- 15. ...
- 16. ...
- 17. ...
- 18. ...
- 19. ...
- 20. ...



STATE OF NEW YORK  
 DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
 DIVISION OF LAND SURVEYING  
 LAND SURVEYING CO., P.C.  
 100 WEST STREET  
 ALBANY, NEW YORK 12242  
 TEL: 518/462-3100  
 FAX: 518/462-3101  
 WWW: WWW.DLS.STATE.NY.US

THE CHRYSLER COMPANY  
 100 WEST STREET  
 ALBANY, NEW YORK 12242  
 TEL: 518/462-3100  
 FAX: 518/462-3101  
 WWW: WWW.DLS.STATE.NY.US

STATE OF NEW YORK  
 DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
 DIVISION OF LAND SURVEYING  
 LAND SURVEYING CO., P.C.  
 100 WEST STREET  
 ALBANY, NEW YORK 12242  
 TEL: 518/462-3100  
 FAX: 518/462-3101  
 WWW: WWW.DLS.STATE.NY.US

**APPENDIX C**

**Environmental Easement**

Haley & Aldrich of New York  
200 Town Centre Dr. -  
Suite 2  
Rochester, NY 14623-4264  
Tel: 585.359.9000  
Fax: 585.359.4650  
HaleyAldrich.com



20 April 2007  
File No. 28590-014

New York State Department of Environmental Conservation  
Division of Environmental Remediation  
Remedial Bureau C, 11th Floor  
625 Broadway  
Albany, NY 12233-7014

Attention: Lech Dolata  
Project Manager

Subject: Tarrytown Former MGP Site  
Environmental Easement Filed in the Westchester County Clerk's Office  
Agreement No, C360064

Dear Mr. Dolata:

This letter is written to certify that the Environmental Easement on the tax parcels listed below within the Town of Greenburgh, Village of Tarrytown was filed with the Westchester County Clerk. The executed Environmental Easement (20 pages) was filed on 16 April 2007; see copy of the Westchester County Clerk Recording Sheet stamped at the bottom as received by the Clerk's office. The master survey (Drawing SP-1) and survey maps for each of the seven parcels were filed on 16 April 2007, see copy of receipt which lists the document number for each drawing, attached. A copy of the affidavit of filing for the Environmental Easement is attached. The Westchester County Clerk Control number for the Environmental Easement is 471060359.

- |                                |                                 |
|--------------------------------|---------------------------------|
| ■ Section 1, Sheet 1, Lot P-15 | ■ Section 1, Sheet 1, Lot P-23  |
| ■ Section 1, Sheet 1, Lot P-20 | ■ Section 1, Sheet 1, Lot P-24  |
| ■ Section 1, Sheet 1, Lot P-21 | ■ Section 1, Sheet 1, Lot P-24A |
| ■ Section 1, Sheet 1, Lot P-22 |                                 |

This letter is also written to certify that the Village of Tarrytown and Town of Greenburgh were notified that the Environmental Easement was filed. Copies of the letters written to the Village of Tarrytown and Town of Greenburgh are attached.

Should you have any questions regarding this matter, please contact Carl Monheit at Ferry Landings, LLC or myself.

New York State Department of Environmental Conservation  
20 April 2007  
Page 2

Sincerely yours,  
HALEY & ALDRICH OF NEW YORK



Jonathan D. Babcock, P.E.  
Project Manager

\\ROC\common\Projects\28590\014 2007 Support for Project Approvals and Development\Environmenta Easement\2007-0419-JDB-Dolata Ltr-F.doc

# WESTCHESTER COUNTY CLERK RECORDING SHEET

110 Dr. Martin Luther King, Jr. Boulevard

White Plains, NY 10601

THIS FORM MUST BE COMPLETED AND SUBMITTED WITH EACH DOCUMENT

This page is part of the instrument; the County Clerk will rely on the information provided on this page for purposes of indexing this document.  
To the best of the submitter's knowledge the information contained on this Recording Sheet is consistent with the information contained in the attached document.

**SUBMITTER INFORMATION:**

Title Number: LN7C-0922-W-06

Company: Liberty Title Agency, LLC  
 Address: 885 Second Ave, 17th Floor  
 City: New York State: NY Zip: 10017 Telephone: (212) 324-9200  
 Attention: Soo Mi Young

Document type: <u>Environmental Easement</u> # of pages - <u>20</u>	Mortgage Amount On page ___ of document \$ _____ OR Consideration/Conveyance Amt. \$ <u>00.00</u>	Dwelling Type: For Mortgage Only On page ___ of document <input type="checkbox"/> 1 to 2 family <input type="checkbox"/> 1 to 6 family <input type="checkbox"/> Not 1 to 6 family
1st party name(s) (i.e. grantor/mortgagor) On page <u>1</u> of document <u>Tarrytown Waterfront, LLC</u> <input checked="" type="checkbox"/> Business Entity <u>Ferry Investments LLC</u> <input checked="" type="checkbox"/> <u>Westchester Industries, Inc</u> <input type="checkbox"/>	Check if submitted: <input type="checkbox"/> RP-5217 - <input type="checkbox"/> \$75 <input type="checkbox"/> \$165 <input checked="" type="checkbox"/> TP-584 - Type of property conveyed [1 through 8] <u>8</u> <input type="checkbox"/> TP-584.1 <input type="checkbox"/> IT-2663	
2nd party name(s) (i.e. grantee/mortgagee) On page <u>1</u> of document <u>The People of the State of New York</u> <input type="checkbox"/> Business Entity	TAXES PAID: Mortgage Tax \$ _____ Reference # _____ Transfer Tax \$ <u>0.00 - Exempt</u> Reference # _____ Mansion Tax \$ _____ Reference # _____ RECORDING FEES PAID: Amount \$ _____ Reference # or Check # _____	
Tax designation (Section, Block & Lot) On page <u>1</u> of document <u>Sec 1 Block 1 Lots: P15 P20 P21 P22 P23 P24 P25</u>	MORTGAGE TAX AFFIDAVITS SUBMITTED: <input type="checkbox"/> 252 <input type="checkbox"/> 255 <input type="checkbox"/> 280 Other: _____ <input type="checkbox"/> 253 <input type="checkbox"/> 260 <input type="checkbox"/> 339-ec _____	
City(ies) of Town(s) for Property Description On page <u>1</u> of document <u>Village of Tarrytown</u> <u>Town of Greenburgh</u>	Cross Reference(s): On page ___ of document _____ _____	
Property Description - If required, check the one contained within the document. On page <u>12</u> of document <input checked="" type="checkbox"/> Metes & bounds <input type="checkbox"/> Lot number on map filed in the Office of the County Clerk <input type="checkbox"/> Refer to deed recorded in the Office of the County Clerk	Record and Return To: <del>Liberty Title Agency, LLC</del> <del>885 2nd Ave, 17th Fl</del> <del>New York, NY 10017</del> <del>Joe Carter</del> <del>485 West Putnam Ave</del> <del>Greenwich, CT 06830</del>	

07 APR 16 PM 1:46  
RECEIVED

WESTCHESTER COUNTY CLERK

DIV. OF LAND RECORDS  
WESTCHESTER COUNTY

DATE: 04/16/2007

8@ \$14.00 = \$112.00  
8@ \$10.00 = \$80.00

TOTAL: \$192.00  
=====

16 ITM - CT (Cash)

RJB6 - 1:45:26 PM

THANK YOU!

**27934** - P-23

**27935** - P-24

**27936** - P-24A

**27937** P-22

**27938** P-21

**27939** P-20

**27940** P-15

**27941** - SP1  
(P24, P24A, P24, P23)  
P15, P20

APR 16 2007

DEC Environmental Easement  
LTNYC-0922-W-06

**LIBERTY TITLE AFFIDAVIT OF RECORDING**

State of New York            }  
  }ss  
County of Westchester        }

I, Terence P. Guerriere, was a recording clerk for Liberty Title Agency, LLC ("Liberty Title") on April 16, 2007 in connection with file number LTNYC-092<sup>2</sup><sub>1</sub>-W-06 (the "Report").

1) On April 16, 2007 I personally delivered the following original Environmental Easement and associated documents to the Clerk of Westchester County for recording:

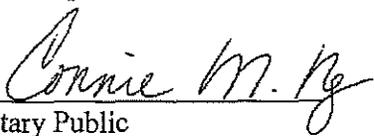
Environmental Easement dated April 4, 2007 from Tarrytown Waterfront LLC, Ferry Landings LLC, Ferry Investments LLC, and Westchester Industries, Inc., as Grantor and The People of the State of New York acting through the Commissioner of the Department of Environmental Conservation, as Grantee.

2) The recording information for the Environmental Easement has not yet been received from the Clerk of Westchester County.

I make this affidavit knowing that that the parties to the current transaction referenced in Liberty Title's file number LTNYC-0922-W-06 will rely on the truth of the statements herein made. This affidavit is incorporated and made a part of the Owner's policy to be issued in conjunction with File number LTNYC-0922-W-06.

  
\_\_\_\_\_  
Terence P. Guerriere

Sworn to before me this 20<sup>th</sup>  
day of April, 2007

  
\_\_\_\_\_  
Notary Public

CONNIE M. NG  
NOTARY PUBLIC, STATE OF NEW YORK  
NO. 01NG4977346  
QUALIFIED IN NEW YORK COUNTY  
COMMISSION EXPIRES FEBRUARY 4, 2011

April 18, 2007



Via Certified Mail – Return Receipt Requested  
7062050000059061428

Ms. Carol A. Booth  
Village Clerk  
Village of Tarrytown  
21 Wildey Street  
Tarrytown, NY 10591

Re: Easement granted to the New York State Department of Environmental  
Conservation - Filed for Recording in the Westchester County Clerk's Office

Dear Ms. Booth:

This letter is written to notify you that an Environmental Easement on the following tax parcels within the Town of Greenburgh, Village of Tarrytown has been granted to the New York State Department of Environmental Conservation on portions of the following tax lots:

- Section 1, Sheet 1, Lot P-15
- Section 1, Sheet 1, Lot P-20
- Section 1, Sheet 1, Lot P-21
- Section 1, Sheet 1, Lot P-22
- Section 1, Sheet 1, Lot P-23
- Section 1, Sheet 1, Lot P-24
- Section 1, Sheet 1, Lot P-24A

The Environmental Easement was filed for recording with the Westchester County Clerk on Monday, April 16, 2007. A copy of the easement is enclosed herewith.

Should you have any questions regarding this matter, please feel free to contact me.

Very truly yours,

David A. Singer

cc: Jeffrey Shumejda, Esq.

April 18, 2007



Via Certified Mail -- Return Receipt Requested  
7062050000059061411

Ms. Alfreda Williams  
Town Clerk  
Town of Greenburgh  
177 Hillside Avenue  
Greenburgh, NY 10607

Re: Easement granted to the New York State Department of Environmental  
Conservation - Filed for Recording in the Westchester County Clerk's Office

Dear Ms. Williams:

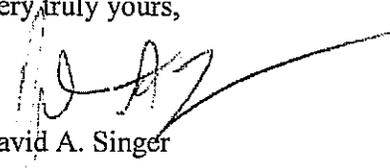
This letter is written to notify you that an Environmental Easement on the following tax parcels within the Town of Greenburgh, Village of Tarrytown has been granted to the New York State Department of Environmental Conservation on portions of the following tax lots:

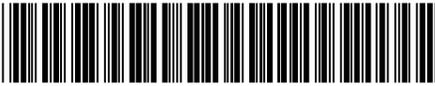
- Section 1, Sheet 1, Lot P-15
- Section 1, Sheet 1, Lot P-20
- Section 1, Sheet 1, Lot P-21
- Section 1, Sheet 1, Lot P-22
- Section 1, Sheet 1, Lot P-23
- Section 1, Sheet 1, Lot P-24
- Section 1, Sheet 1, Lot P-24A

The Environmental Easement was filed for recording with the Westchester County Clerk on Monday, April 16, 2007. A copy of the easement is enclosed herewith.

Should you have any questions regarding this matter, please feel free to contact me.

Very truly yours,

  
David A. Singer



\*471060359EAS1\*

Control Number  
**471060359**

Instrument Type  
**EAS**



**WESTCHESTER COUNTY RECORDING AND ENDORSEMENT PAGE  
(THIS PAGE FORMS PART OF THE INSTRUMENT)  
\*\*\* DO NOT REMOVE \*\*\***

**THE FOLLOWING INSTRUMENT WAS ENDORSED FOR THE RECORD AS FOLLOWS:**

**TYPE OF INSTRUMENT: EAS - EASEMENT  
FEE PAGES: 22                      TOTAL PAGES: 22**

**RECORDING FEES**

STATUTORY CHARGE	\$6.00
RECORDING CHARGE	\$66.00
RECORD MGT. FUND	\$19.00
RP 5217	\$0.00
TP-584	\$5.00
CROSS REFERENCE	\$0.00
MISCELLANEOUS	\$0.00
<b>TOTAL FEES PAID</b>	<b>\$96.00</b>

**MORTGAGE TAXES**

MORTGAGE DATE	
MORTGAGE AMOUNT	\$0.00
EXEMPT	
COUNTY TAX	\$0.00
YONKERS TAX	\$0.00
BASIC	\$0.00
ADDITIONAL	\$0.00
MTA	\$0.00
SPECIAL	\$0.00
<b>TOTAL PAID</b>	<b>\$0.00</b>

**TRANSFER TAXES**

CONSIDERATION	\$0.00
TAX PAID	\$0.00
TRANSFER TAX #	14066

**SERIAL NUMBER:  
DWELLING:**

**RECORDING DATE: 4/24/2007  
TIME: 10:29:00**

**THE PROPERTY IS SITUATED IN  
WESTCHESTER COUNTY, NEW YORK IN THE:  
TOWN OF GREENBURGH**

WITNESS MY HAND AND OFFICIAL SEAL

**TIMOTHY C. IDONI  
WESTCHESTER COUNTY CLERK**

**Record & Return to:  
LIBERTY TITLE  
885 2ND AVE  
17TH FLOOR  
NEW YORK, NY 10017**

Liberty Title  
885 2nd Ave 17th Flwr.  
New York, NY 10017.

21

## ENVIRONMENTAL EASEMENT

THIS INDENTURE made this 4<sup>th</sup> day of April, 2007, between Tarrytown Waterfront LLC, a Delaware limited liability company, Ferry Landings LLC, a Delaware limited liability company, Ferry Investments LLC, a Connecticut limited liability company, and Westchester Industries, Inc., all of the foregoing having an office at 485 West Putnam Avenue, Greenwich, Connecticut 06830 (collectively, the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("brownfield sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of environmental easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and of ensuring the potential restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that environmental easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a brownfield site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located in the Village of Tarrytown, Town of Greenburgh, Westchester County, New York, known and designated on the tax map of the Town of Greenburgh, Village of Tarrytown as Tax Lots P15, P20, P21, P22, P23, P24, P24A (Section 1, Sheet 1 on the Town of Greenburgh Tax Map), being the same as that property conveyed to Grantor by deeds and recorded in the Land Records of the Westchester County Clerk as listed in Schedule A attached hereto and made part hereof, comprised of approximately 20.6 acres, and hereinafter more fully described in Schedule B, containing a master metes and bounds description and survey, dated February 19, 2007, captioned, "#129 Main Street, ALTA/ACSM Land Title Survey Prepared For New York State Department Of Environmental Conservation, and seven individual metes and bounds descriptions and surveys, dated October 21, 2005, captioned, "Ferry Landings, Survey Map Showing Development Zones, Clean Soil Areas and Engineering Controls, Parcels P-15, P-20, P21,

P22, P23, P24, P-24A, by Chazen Engineering and Land Surveying CO., P.C., attached hereto and made a part hereof (the "Controlled Property"); and

WHEREAS, the Commissioner does hereby acknowledge that the Department accepts this Environmental Easement in order to ensure the protection of human health and the environment and to achieve the requirements for remediation established at this Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the covenants and mutual promises contained herein and the terms and conditions of Brownfield Cleanup Index Number W3-1007-04-06, Grantor grants, conveys and releases to Grantee a permanent Environmental Easement pursuant to Article 71, Title 36 of the ECL in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the potential restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The following controls apply to the use of the Controlled Property, run with the land are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees, and any person using the Controlled Property:

A. The Controlled Property may be used for "restricted residential use" as defined in the May 5, 2005 Site Management Plan. As updated January 19, 2007, shown in Schedule C attached hereto and made a part hereof, and by any subsequent site management plan approved by the Department (the "Approved Site Management Plan"), as long as the following long-term institutional and engineering controls remain in place and are employed as set forth in the Approved Site Management Plan.

#### Engineering Controls

(i) In areas not proposed for future building construction or impervious covering, residually contaminated soils on the Controlled Property that meet backfill criteria as stipulated in Section 2.2.5 of the Approved Site Management Plan, must be covered by a demarcation layer consisting of an orange, non-woven 4 oz/sy geotextile or its equivalent and must be overlain by at least 2 feet of clean fill cover material. This barrier must be maintained as per the Approved Site Management Plan; and

(ii) As a minimum, a passive Soil Vapor Management System (SVMS) must be installed in every new building erected within the Controlled Property. Newly constructed buildings within the Controlled Property shall also be subjected to a Soil Vapor Intrusion (SVI)

Investigation, conducted in accordance with the applicable guidance in effect at the time of the investigation. If the results of this SVI investigation demonstrate ineffectiveness of the passive SVMS, an appropriate active Soil Vapor Management System shall be designed, constructed and maintained.

(iii) Operate and maintain the Northern DNAPL Recovery System as depicted on Figure 2 and as set forth in Section 2 of the Operation, Maintenance, and Monitoring Plan (which is Appendix A to the Approved Site Management Plan).

(iv) Operate and Maintain LNAPL Recovery System as depicted on Figure 2 and as set forth in Section 3 of the Operation, Maintenance, and Monitoring Plan (which is Appendix A to the Approved Site Management Plan).

(v) Operate and Maintain Western DNAPL Recovery System as depicted on Figure 2 and as set forth in Section 2 of the Operation, Maintenance, and Monitoring Plan (which is Appendix A to the Approved Site Management Plan).

(vi) Maintain the Underwater Cap System in the Sediment Excavation Area as depicted on Figure 2 and as set forth in Section 4 of the Operation, Maintenance, and Monitoring Plan (which is Appendix A to the Approved Site Management Plan).

(vii) Monitor and maintain the Groundwater Monitoring Wells as depicted on Figure 2 and as set forth in the Groundwater Monitoring Plan (which is Appendix C to the Operations Maintenance, and Monitoring Plan). The Operation, Maintenance and Monitoring Plan is Appendix A to the Approved Site Management Plan.

#### Institutional Controls

(viii) Any proposed soil excavation on the Controlled Property below the 2 foot cover or below the demarcation layer requires prior notification to the NYSDEC in accordance with the Approved Site Management Plan. Excavated soil must be managed, characterized, and properly disposed in accordance with the Approved Site Management Plan and applicable regulations and/or guidance.

(ix) The integrity of the impervious surfaces on the Controlled Property must be maintained at all times. Any portion of the impervious surface damaged and/or removed from the Controlled Property must be immediately replaced in kind or must be substituted with a demarcation layer and clean soil cover in accordance with paragraph 2.2.5 of the Approved Site Management Plan.

(x) The use of untreated groundwater for any purpose is not permitted.

B. The Controlled Property may not be used for a higher level of use such as unrestricted residential uses and the above-stated controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. Grantor covenants and agrees that until such time as the Environmental Easement

is extinguished in accordance with the requirements of Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

---

**This property is subject to an environmental easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law.**

---

D. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

E. Grantor covenants and agrees that it shall annually, or such time as NYSDEC may allow, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury that the controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls employed at the Controlled Property were approved by the NYSDEC, and that nothing has occurred that would impair the ability of such control to protect the public health and environment or constitute a violation or failure to comply with any Site Management Plan for such controls and giving access to such Controlled Property to evaluate continued maintenance of such controls.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Controlled Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer the underlying fee interest to the Controlled Property by operation of law, by deed, or by indenture, subject and subordinate to this Environmental Easement.

5. Enforcement.

A. This environmental easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Controlled Property, any lessees, and any person using the Controlled Property. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this environmental easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden;

it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person intentionally violates this environmental easement, the Grantee may revoke the Certificate of Completion provided under ECL Article 27, Title 14, or the Satisfactory Completion of Project provided under ECL Article 56, Title 5 with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach. Grantor shall then have a reasonable amount of time from receipt of such notice to cure. At the expiration of said second period, Grantee may commence any proceedings and take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement in accordance with applicable law to require compliance with the terms of this Environmental Easement.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar its enforcement rights in the event of a subsequent breach of or noncompliance with any of the terms of this Environmental easement.

6. Notice. Whenever notice to the State (other than the annual certification) or approval from the State is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing its County tax map number or the Liber and Page or computerized system tracking/ identification number and address correspondence to:

Division of Environmental Enforcement  
Office of General Counsel  
New York State Department of Environmental Conservation  
625 Broadway  
Albany New York 12233-5500

Such correspondence shall be delivered by hand, or by registered mail or by Certified mail and return receipt requested or by nationally recognized overnight delivery carriers. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Controlled Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. This environmental easement may be amended only by an amendment executed by the Commissioner of the New York State Department of Environmental

Conservation and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This environmental easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

**[SIGNATURES ON FOLLOWING PAGE]**

---

---

---

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

**Tarrytown Waterfront LLC**

By: TW Waterfront Holdings LLC

By:   
\_\_\_\_\_  
Joseph Cotter, President

Date: March 30, 2007

**Ferry Landings LLC**

By:   
\_\_\_\_\_  
Joseph Cotter, President

Date: March 30, 2007

**Westchester Industries, Inc.**

By:   
\_\_\_\_\_  
Joseph Cotter, President

Date: March 30, 2007

**Ferry Investments LLC**

By:   
\_\_\_\_\_  
Joseph Cotter, President

Date: March 30, 2007

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE  
PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the  
Department of Environmental Conservation

By:

4/4/07



\_\_\_\_\_  
Carl Johnson, Acting Executive Deputy  
Commissioner

**[Acknowledgements on Following Page]**

---

---

---

GRANTORS' ACKNOWLEDGMENT

Tarrytown Waterfront LLC

STATE OF NEW YORK )
) ss:
COUNTY OF WESSTCHESTER )

On the 30th day of March, in the year 2007, before me, the undersigned, personally appeared Joseph Cotter, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

[Handwritten signature]
Notary Public - State of New York

DAVID A. SINGER
Notary Public State of New York
No. 02SI6057925
Qualified in Westchester County
Commission Expires April 30, 2007

Ferry Landings LLC

STATE OF NEW YORK )
) ss:
COUNTY OF WESTCHESTER )

On the 30th day of March, in the year 2007, before me, the undersigned, personally appeared Joseph Cotter, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

[Handwritten signature]
Notary Public - State of New York

DAVID A. SINGER
Notary Public State of New York
No. 02SI6057925
Qualified in Westchester County
Commission Expires April 30, 2007

Westchester Industries, Inc.

STATE OF NEW YORK )
) ss:
COUNTY OF WESTCHESTER )

On the 30th day of March, in the year 2007, before me, the undersigned, personally appeared Joseph Cotter, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and



SCHEDULE A

A. Title vested in Tarrytown Waterfront LLC in accordance with the following:

(i) Deed made by Westchester Industries, Inc., dated February 8, 2007 Control Number pending in the Westchester County Clerk's office;

(ii) Deed made by Ferry Investments LLC dated February 8, 2007 Control Number pending in the Westchester County Clerk's office;

(iii) Deed made by Ferry Landings LLC dated February 8, 2007 Control Number pending in the Westchester County Clerk's office.

B. Title vested in Westchester Industries, Inc. in accordance with the following:

(i) Deed made by Tarrytown Rail & Water Terminal, Inc., dated March 1, 1973 recorded March 27, 1973 in Liber 7115 page 663

C. Title vested in Ferry Landings LLC in accordance with the following:

(i) Deed made by Cooney Realty Co., dated November 1, 2002 recorded March 27, 2003 under Control Number 430240001.

D. Title Vested in Ferry Investments LLC (f/k/a Pembroke Acquisitions LLC) in accordance with the following:

(i) Deed made by Penske Logistics Support Services, Inc. and successor by merger to Anchor Motor Freight, Inc., dated December 27, 2000 recorded February 22, 2001 under Control Number 410460110.

---

---

## SCHEDULE B

---

All that plot piece or parcel of land situate and being in the Village of Tarrytown, Town of Greenburgh, County of Westchester and State of New York, bounded and described as follows:

BEGINNING at a point on the westerly side of Railroad Avenue said point being the northeasterly corner of the herein described parcel and the southeasterly corner of lands now or formerly Westchester Industries, Inc as described in Liber 7115 of deeds at page 633, thence along the westerly side of Railroad Avenue southeasterly on a curve to the right of radius 608.00 feet an arc length of 39.79 feet having a chord bearing S 38°04'58" E 39.78 feet, S 14°25'40" E 89.28 feet, S 10°47'30" E 28.28 feet, S 11°30'40" E 56.31 feet, S 2°13'30" E 68.43 feet, S 27°07'20" W 42.94 feet, S2°06'00" W 143.13 feet and S 16°35'00" W 27.19 to the intersection of the northerly side of West Main Street with the westerly side of Railroad Avenue, said point being the southeasterly corner of the herein described parcel and the southeasterly corner of lands now or formerly Ferry Investments, LLC described in Control #410460110; thence along the northerly and westerly side of West Main Street, N 85°12'30" W 120.88 feet, N 84°31'20" W 98.24 feet, N 87°10'20" W 113.23 feet, S 6°08'20" W 224.58 feet, N 85°14'40" W 523.17 feet, S 6°08'20" W 22.35 feet, N 85°14'40" W 50.01 feet, N 6°08'20" E 22.35 feet, and N 85°14'40" W 205.31 feet to the southwesterly corner of the herein described parcel and a point on the easterly bank of the Hudson River, thence along same N 4°45'20" E 727.34 feet, and N 10°32'20" W 93.12 feet to the northwesterly corner of the herein described parcel, thence along the southerly bank of the Hudson River and lands now or formerly Ferry Landings, LLC described in Control #430240001, N 66°17'50" E 416.57, N 67°56'29" E 113.57 feet, N 79°55'39" E 18.12 feet, N 87°36'58" E 19.04 feet, S 20°01'52" E 59.02 feet, S 01°39'30" E 95.89 feet, S 21°49'03" W 12.29 feet, S 11°56'47" E 90.48 feet, N 89°52'20" E 47.28 feet, S 88°41'00" E 189.13 feet and S 88°11'25" E 66.03 feet to a point; thence along lands now or formerly of Westchester Industries, Inc. described in Liber 7115 of deeds at page 633, S 1°48'35" W 156.64 feet and S 88°11'25" E 196.49 to the point or place of beginning.

CONTAINING 20.30 ACRES OF LAND

















# WESTCHESTER COUNTY CLERK RECORDING SHEET

110 Dr. Martin Luther King, Jr. Boulevard      White Plains, NY 10601

----- THIS FORM MUST BE COMPLETED AND SUBMITTED WITH EACH DOCUMENT -----

This page is part of the instrument; the County Clerk will rely on the information provided on this page for purposes of indexing this document.  
To the best of the submitter's knowledge the information contained on this Recording Sheet is consistent with the information contained in the attached document.

**SUBMITTER INFORMATION:** Title Number: LYNYC-0922-W-06

Company: Liberty Title Agency, LLC

Address: 885 Second Ave, 17th Floor

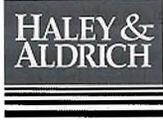
City: New York State: NY Zip: 10017 Telephone: (212) 324-9200

Attention: Soo Mi Young

Document type: <u>Environmental Easement</u>	# of pages - <u>20</u>	Mortgage Amount On page ___ of document \$ _____	Dwelling Type: For Mortgage Only On page ___ of document <input type="checkbox"/> 1 to 2 family <input type="checkbox"/> 1 to 6 family <input type="checkbox"/> Not 1 to 6 family
1st party name(s) (i.e. grantor/mortgagor) On page <u>1</u> of document		Mortgage Amount On page ___ of document \$ _____ <b>OR</b> Consideration/Conveyance Amt: \$ <u>00.00</u>	Dwelling Type: For Mortgage Only On page ___ of document <input type="checkbox"/> 1 to 2 family <input type="checkbox"/> 1 to 6 family <input type="checkbox"/> Not 1 to 6 family
Business Entity <u>Tarrytown Waterfront, LLC</u> <input checked="" type="checkbox"/> <u>Ferry Investments LLC</u> <input checked="" type="checkbox"/> <u>Westchester Industries, Inc</u> <input type="checkbox"/>			
2nd party name(s) (i.e. grantee/mortgagee) On page <u>1</u> of document		Check if submitted: <input type="checkbox"/> RP-5217 - <input type="checkbox"/> \$75 <input type="checkbox"/> \$165 <input checked="" type="checkbox"/> TP-584 - Type of property conveyed [1 through 8] <u>8</u> <input type="checkbox"/> TP-584.1 <input type="checkbox"/> IT-2663	
Business Entity <u>The People of the State of New York</u> <input type="checkbox"/>		TAXES PAID:	
		Amount      Reference # Or Check #	
		Mortgage Tax \$ _____	
		Transfer Tax \$ <u>00.00 - Exempt</u>	
		Mansion Tax \$ _____	
		RECORDING FEES PAID:	
		Amount      Reference # or Check #	
		\$ _____	
Tax designation (Section, Block & Lot) On page <u>1</u> of document <u>Sec 1 Block 11 Lots P15 P20 P21 P22 P23 P24 P25</u>		MORTGAGE TAX AFFIDAVITS SUBMITTED: <input type="checkbox"/> 252 <input type="checkbox"/> 255 <input type="checkbox"/> 280 Other: _____ <input type="checkbox"/> 253 <input type="checkbox"/> 260 <input type="checkbox"/> 339-ee _____	
City(ies) of Town(s) for Property Description On page <u>1</u> of document <u>Village of Tarrytown</u> <u>Town of Greenburgh</u>		Cross Reference(s):      On page ___ of document	
Property Description -- If required, check the one contained within the document. On page <u>12</u> of document <input checked="" type="checkbox"/> Metes & bounds <input type="checkbox"/> Lot number on map filed in the Office of the County Clerk <input type="checkbox"/> Refer to deed recorded in the Office of the County Clerk		Record and Return To: <u>Liberty Title Agency, LLC</u> <u>885 2nd Ave, 17th Fl</u> <u>New York, NY 10017</u> <u>Joe Cutler</u> <u>485 West Putnam Ave</u> <u>Greenwich, CT 06830</u>	

**APPENDIX D**

**Health and Safety Plan and  
Community Air Monitoring Plan**



**ALERT**

*This Health and Safety Plan (HASP) is provided for information only. Note that the standard procedures attached to this HASP are copyrighted. Every contractor must create and use the contractor's own site-specific Health and Safety Plan. For the subject site, the contractor's site-specific HASP must, at minimum, comply with 40 CFR 1910.120.*

**HALEY & ALDRICH OF NEW YORK  
SITE-SPECIFIC HEALTH & SAFETY PLAN  
AND  
COMMUNITY AIR MONITORING PLAN**

for

**Construction Monitoring, Contaminated Soil Management  
& Environmental Monitoring**

Ferry Landings, LLC  
Tarrytown Property Development  
Former Consolidated Edison Manufactured Gas Plant  
Tarrytown, New York

Project/File No. 28590-017

Prepared by: Brock E. Barry, P.E.

Revised by: Ethan Lee

*Revised by: Michael Beikirch*

Date: June 2003

Revised: January 2008

*Revised 2/7/08*

APPROVALS: The following signatures constitute approval of this Health & Safety Plan. Deviations from this Plan are not permitted without prior approval from the undersigned.

*Michael G. Beikirch*  
\_\_\_\_\_  
Michael G. Beikirch - Local H&S Coordinator

*2-7-08*  
\_\_\_\_\_  
Date

*Jonathan D. Babcock*  
\_\_\_\_\_  
Jonathan D. Babcock - Site/Project Manager

*2-14-08*  
\_\_\_\_\_  
Date

**PRE-WORK HEALTH & SAFETY BRIEFING**

I have attended a briefing on this Health & Safety Plan prior to the start of on-site work and declare that I understand and agree to follow the provisions and procedures set forth herein while working on this site.

**PRINTED NAME**

**SIGNATURE**

**DATE**

_____	_____	
_____	_____	
_____	_____	
_____	_____	
_____	_____	
_____	_____	
_____	_____	
_____	_____	
_____	_____	
_____	_____	

**NOTE:** This Site Health and Safety Plan provides only site-specific descriptions and work procedures. General safety and health compliance programs in support of this site plan, including safe work, training, medical monitoring, and record-keeping practices, are described in the Haley & Aldrich Corporate Health and Safety Program Manual and are hereby made part of this plan by reference. The manual is available to all employees and to outside parties by request.

## 1.0 PROJECT INFORMATION

<b>Name of Project:</b> Former Consolidated Edison Manufactured Gas Plants, Tarrytown Property Redevelopment	<b>Haley &amp; Aldrich File No.:</b> 28590-017
<b>Location:</b> One River Street, Tarrytown, New York	
<b>Client/Site Contact:</b> Ferry Landings, LLC, Carl Monheit	<b>Contact Phone No.:</b> 203.661.0055 or 203.912.7571
<b>Haley &amp; Aldrich Project Manager:</b> Jonathan D. Babcock	<b>PM Phone No.:</b> 585.321.4213 or 585.370.9792

## SCOPE OF WORK

This Site-Specific Health and Safety Plan addresses the health and safety practices and procedures that will be employed by all Haley & Aldrich employees participating in the site redevelopment of the former Consolidated Edison Company Manufactured Gas Plant facility. This plan is based on an assessment of the site-specific health and safety risks available to Haley & Aldrich during construction monitoring, contaminated soil management, and environmental monitoring. The scope of work includes monitoring contractor activities, soil removal, soil sampling for characterization, backfill with clean soil, community air monitoring, and soil vapor sampling. Additional activities include groundwater monitoring, periodic extraction of DNAPL from recovery wells, and observation of underwater inspections.

**Subcontractor(s)** to be involved in on-site activities:

Name	Work Activity
EnviroWaste	Pumping of contaminated water and recovery wells
ETRE Associates, Ltd.	Soil excavation, obstruction removal, and utility installation
Dynamic Compaction Company, Inc.	Dynamic Compaction
Seaway Diving and Salvage Co. Inc.	Underwater Cap Inspection

**Projected Start Date:** June 1, 2007

**Projected Completion Date:** December 31, 2009

**Estimated Number of Days to Complete Field Work:** 2 years

**2.0 SITE DESCRIPTION**

Check one of the following:

<b>Site classification:</b>	<input checked="" type="checkbox"/> Industrial	<input checked="" type="checkbox"/> Commercial	Other:
-----------------------------	--	--	--------

**2.1 General Description:**

The site is located at 129 West Main Street in Tarrytown, New York approximately 100 yards from the east bank of the Hudson River. The site is currently partially active and consists of several parcels of land that cover approximately 19 acres. Several buildings are located on the site. The remainder of the site is covered by asphalt pavement and is completely surrounded by a chain-link fence.

The site is located in an industrial/commercial area of Tarrytown approximately one-half mile south of the former General Motors plant. The site is bordered on the north by commercial properties, on the east by Railroad Avenue and the New York Central Railroad, on the south by West Main Street, and on the west by the Hudson River. The nearby roads are active roads with regular traffic.

**Site Status** (mark all that apply):

<input type="checkbox"/>	Active	<input type="checkbox"/>	Inactive
<input checked="" type="checkbox"/>	Partially Active	<input type="checkbox"/>	Other:

**Site history information sources** used; check all that apply:

<input checked="" type="checkbox"/>	City Directories	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	Geological References	<input type="checkbox"/>	State Files
<input checked="" type="checkbox"/>	Previous report by HALEY & ALDRICH	<input type="checkbox"/>	Water Quality Maps
<input checked="" type="checkbox"/>	Previous report by others	<input type="checkbox"/>	Inquiries

Is a **site plan** or sketch available? Y  N  If yes, attach a copy to this plan. See Figure 1.

Indicate any **unusual features** at the site (power lines, variable terrain, etc.):  
 Hudson River

**2.2 Work Areas**

List/identify each specific work area(s) on the job site and indicate its location(s) on the site plan:

1. Construction monitoring, soil stockpile sampling, soil vapor installation and sampling, and groundwater sampling will be performed across the entire site.
2. The decontamination area will be designated either on an area of existing pavement or on an area where a plastic liner has been placed.

<b>3.0 PROJECT TASK BREAKDOWN</b>
-----------------------------------

List and describe each distinct work task below:

Task No.	Task Description	Employee(s)	Work Date(s) or Duration
1	Construction monitoring of excavation, utility installation, site grading, dynamic compaction contractors, and compaction testing using a nuclear density gauge.	Haley & Aldrich staff to be identified	2 years
2	Sampling of soil stockpiles created during isolation trench excavations.	Haley & Aldrich staff to be identified	2 years
3	Installation and sampling of soil vapor points.	Haley & Aldrich staff to be identified	2 years
4	A subcontractor will perform underwater inspections of the gravel cover and sheet pile exposure for the pier system. Haley & Aldrich staff will provide oversight and monitoring of the diving activity as it is being performed by the contractor. Haley & Aldrich staff will remain on the ground more than six feet away from the Hudson River in order to monitor the audio and video feed from the divers.	Haley & Aldrich staff to be identified	1 day per year
5	Groundwater sampling.	Haley & Aldrich staff to be identified	2 days per year

**4.0 HAZARD ASSESSMENT**

**4.1 Chemical Hazards**

Is **chemical analysis data** available? Y x N\_\_ (If yes, a data summary should be attached)

–See table below.

Does chemical analysis data indicate that the site is contaminated? Y x N \_\_

Potential **physical state** of the hazardous materials at the site (mark all that apply):

x	Gas/Vapor		Sludge
x	Liquid	x	Solid/Particulate

Anticipated/actual **class of compounds** (mark all that apply):

	Asbestos	x	Inorganics
x	BTEX		Pesticides
	Chlorinated Solvents	x	Petroleum products
x	Heavy Metals	x	Other: Coal Tar, PAHs

**Impacted environments** (indicate all media in which contamination is expected):

x	Air	x	Groundwater
x	Soil		Sediment
	Surface water		Other:

**Estimated concentrations/medium** of major chemicals expected to be encountered by onsite personnel:

Work Activity	Media	Chemical	Anticipated Concentration
Task No. 1,2,3	A	VOCs Particulates	ND to 300 ppm (estimated) unknown
Task No. 1,2,3	SO	PAHs BTEX Metals Inorganics Coal Tar	ND to 620 ppm (estimated) ND to 150 ppm (estimated) ND to 2100 ppm (estimated) ND to 1100 ppm (estimated) unknown
Task Nos. 5	GW	PAHs BTEX Metals Inorganics Coal Tar	ND to 1200 ppm (estimated) ND to 1400 ppm (estimated) ND to 750 ppm (estimated) ND to 700 ppm (estimated) unknown

(Media key: A = Air; GW = Groundwater; SW = Surface Water; SO = Soil; SE = Sediment)

**Other site (safety) concerns** related to the chemicals present on this site: N/A

**4.2 Physical Hazards**

Is any site work area(s) to be entered for this project considered a confined space? Y    N    X     
 If yes, indicate which area(s) and why:

**ALL CONFINED SPACE ENTRIES REQUIRE SPECIAL PROCEDURES, PERMITS AND TRAINING AND MUST BE APPROVED BY THE CORPORATE HEALTH & SAFETY MANAGER**

**Physical Hazard Checklist**

Indicate all hazards that may be present for each task. If any of these potential hazards are checked, it is the project manager’s responsibility to determine how to eliminate/minimize the hazard to protect onsite personnel. Note: Task numbers refer to those identified in Section 3.

Hazards	Task 1	Task 2	Task 3	Task 4	Task 5
Underground utilities	√	√	√		
Overhead utilities	√				
Excavations greater than 4’ depth	√	√			
Open excavation fall hazards	√	√	√		√
Heavy equipment	√	√			
Drilling hazards					
Noise (above 85 dBA)	√				
Traffic concerns					
Extreme weather conditions	√	√	√	√	√
Rough terrain for drilling equipment					
Buried drums	√				
Heavy lifting (more than 50 lbs)					
High risk fire hazard					
Poisonous insects or plants					
Water hazards				√	
Use of a boat					
Lockout/Tagout requirements					
Other: See Note 2 below	√				

**Describe any special precautions to be taken with respect to the hazards checked above:**

1. Due to the hazards associated with work in and around excavations, Haley & Aldrich personnel will adhere to the Haley & Aldrich excavation and trenching safety procedures contained in OP-1001 (attached).
2. Haley & Aldrich personnel using the nuclear density gauge must be certified in New York State for use of the gauge. The gauge user(s) must comply with the conditions of the New York State Department of Health Radioactive Materials License (attached).

**5.0 PROTECTIVE MEASURES**

**5.1 Personal Protective Equipment Requirements**

Work will begin in Level D or Modified Level D (without respirator protection), including hard hat, steel-toe safety boots, safety glasses, protective gloves, and eye and ear protection. Tyveks may be appropriate. Avoid direct dermal contact with soils.

The site work will be conducted in areas where limited vehicle traffic is expected. The work area shall be protected by the placement of vehicles and orange safety cones. Traffic Safety vests shall be worn at all times. As the Site is located in a residential area, on-site personnel will be cognizant of pedestrian traffic safety issues.

**PPE Checklist**

Required PPE	Task 1	Task 2	Task 3	Task 4	Task 5
Hard hat	√	√	√	√	√
Safety glasses w/side shields	√	√	√	√	√
Steel-toe footwear	√	√	√	√	√
Hearing protection (plugs, muffs)	√	√			
Tyvek™ coveralls		√*	√*		
PE-coated Tyvek™ coveralls					
Boots, chemical resistant		√**			
Boot covers, disposable					
Leather work gloves					
Inner gloves		√	√		√
Outer gloves		√			
Tape all wrist/ankle interfaces					
Half-face respirator					
Full-face respirator					
Organic vapor cartridges					
Acid gas cartridges					
Other cartridges:					
P-100 (HEPA) filters					
Face shield					
Other: Traffic Safety Vests	√	√	√	√	√
Other: Personal Flotation Device				√	
Other: 100-ft Ring Buoy				√	
<b>Level of protection required [C or D]:</b>	<b>D*</b>	<b>D*</b>	<b>D*</b>	<b>D*</b>	<b>D*</b>

\*If free product or contaminated soil that is overly damp is encountered, employees who may come in contact with the material will be required to wear modified Level D PPE with PE Tyvek.

\*\*Or disposable boot covers.

The project PPE requirements may also be upgraded from level D to level C based on the Site Safety Officer's (HALEY & ALDRICH representative on-site) determination to upgrade from "D" to "C." This

is accomplished by determining the presence of airborne contaminants. This will be determined based on air monitoring results as indicated in Section 6.0 of this HASP.

**5.2 Personal Hygiene Safeguards**

Follow decontamination procedures identified in the section below.  
 Wash hands before eating any food.  
 Do not eat food in the exclusion zone.  
 No smoking in or around work area.

**5.3 Site Safety Equipment**

Check all items that are required to be on site:

	Fire extinguisher	x	First aid kit		Flashlight
	Air horn/Signaling device	x	Cellular phone		Duct tape
	Ladder	x	Barricade tape		Drum dolly
x	Personal flotation devices	x	Safety cones		Harness/Lanyard
	Other, specify:				

**5.4 Site Security & Work Area Controls**

Access to each contaminated work area will be controlled during on-site activities as follows:

Visual control of general access of contaminated work zones (exclusion zone) or decontamination station. Areas are to be delineated by cones and/or barricade tape. HALEY & ALDRICH employees are expected to maintain the area in conjunction with the contractors. No unauthorized personnel or general public to be allowed access to active work areas. Access to individual drilling sites cannot be controlled during non-work hours. Those who desire access to the site must have authorization and a current 40 hour and/or 8 hour Hazwoper certification.

Can **site access** be controlled by a perimeter fence or similar means? Y x N \_\_\_\_\_

If not, how will the site/work area be controlled during non-work hours to prevent access by unauthorized persons?

Whenever possible boring/drilling/excavating work will be completed prior to the end of each work day and the equipment will be demobilized. If in the event work at a specific location is not completed, the area will be marked-off by safety cones and barricade tape.

**6.0 MONITORING PLAN AND EQUIPMENT**

Is **air/exposure monitoring** required at this work site for personal protection? Y x N \_\_\_\_  
 Screening of soils will be performed during drilling operations as well.

Is **perimeter monitoring** required for community protection? Y X N \_\_\_\_ (see Section 9.0)

**Monitoring/Screening equipment** required to be on site:

x	<b>Photo Ionization Detector (PID)</b>	x	<b>10.2eV</b>		11.7eV		Combustible Gas Indicator (CGI) (LEL)	
x	Organic vapor monitor (FID)						Multiple Gas Detector - LEL/O <sub>2</sub> /H <sub>2</sub> S/CO	
	Photovac Micro Tip, 10.6eV						x	Dust/Aerosol/Fiber count monitor
	Photovac GC						x	Colorimetric tubes; Specify: Benzene
	Other:							

**Standard action levels and required responses** for readings obtained with a multiple gas detector or an individual monitoring instrument are listed below. Do not deviate from these guidelines unless granted specific approval from the Corporate Health and Safety Manager.

Instrument	Normal	Operating levels	Action levels – required responses
Oxygen Meter	20.9%	Between 19.5-23.5%	Below 19.5 %: leave area, requires supplied air Above 23.5%: leave area, fire hazard
CGI	0%	Less than 10%	Greater than 10%: fire/explosion hazard; cease work
Hydrogen Sulfide	0%	Less than 10 ppm.	Greater than 15 ppm (or 10 ppm for 8 hrs) requires supplied air respirator (SAR)
Carbon Monoxide	0%	Less than 25 ppm	Greater than 200 ppm for 1 hour or 25 ppm for 8 hrs requires SAR

**Description of Monitoring Requirements** (include frequency and location by Task):

Monitoring Plan for Task Number(s):	1,2,3,5	Frequency:		times per	<b>As needed for personnel</b>
-------------------------------------	---------	------------	--	-----------	--------------------------------

Monitor breathing zone of work areas as needed with PID instrument. If sustained readings in breathing zone of 10 ppm or greater above background are encountered and sustained for 5 minutes or longer, allow vapors to dissipate between samples and implement appropriate engineering controls, or don the appropriate PPE to limit potential for exposure.

Monitoring Plan for Task Number(s):	1	Frequency:		times per	<b>Continuous for community</b>
-------------------------------------	---	------------	--	-----------	---------------------------------

- Notes:
1. Exposure Guidelines for common contaminants are listed in **Table 1 (attached)**.
  2. Requirements for PPE upgrades based on monitoring are in **Table 2 (attached)**.
  3. Record monitoring data and PPE upgrades on **Record of Field Monitoring form (attached)**; maintain with project files.

**7.0 DECONTAMINATION**

**7.1 Personnel Decontamination**

Are **decontamination procedures** required for personnel working on site? Y x N \_\_\_

If yes, describe steps:

Personnel decontamination activities will be conducted during all site activities to reduce the potential for contamination of personnel and/or transmission of contaminants off-site.

1. Remove disposable PPE in the following order: respirator (if worn), tyvek, disposable boots and gloves. Containerize all waste material, such as Tyvek suits, organic vapor cartridges, and gloves in trash bags for disposal upon exiting contaminated work zone.

**Location of decontamination station:** Decontamination will be performed at the work areas described in Section 2.2 Work Areas.

**Disposal of PPE:** Disposable PPE will be disposed of as solid waste on-site in a dumpster, bin, or other client-approved receptacle.

**7.2 Tools & Equipment Decontamination**

Check all **equipment and materials needed for decontamination** of tools and other equipment:

	Acetone	x	Distilled water		Poly sheeting
x	Alconox soap	x	Drums for water	x	Steam cleaner
x	Brushes		Hexane	x	Tap water
x	Disposal bags		Methanol		Washtubs
x	Other, specify: Buckets				

Outline the **equipment decontamination procedures** for this project:

Should decontamination of equipment be required, utilize standard decontamination procedures (clean with soapy water, rinse with tap water followed by a distilled water rinse):

1. Brush off and containerize loose soils from sampling tools.
2. Soapy wash, tap water and distilled water rinse.
3. Containerize all investigation derived waste (IDW) including excess soils and PPE.
4. Equipment decontamination will be performed on equipment prior to site demobilization. The decontamination area will be designated either on an area of existing pavement or on an area where a plastic liner has been placed. Decontamination water will be collected for testing and subsequent disposal.

**Disposal methods for contaminated decontamination materials** (e.g., wash water, rags, brushes, poly sheeting) will consist of:

- Soil – drummed and disposed of as IDW.
- Decontamination water – drummed as IDW (see above).

Misc. materials - Uncontaminated gloves, rags, paper towels, ziplock bags, or any other material used during sampling or groundwater monitoring should be disposed of in trash bags and brought to a dumpster and disposed of on-site in client approved receptacles.

**8.0 CONTINGENCY PLAN**

**EMERGENCY RESPONSE RESOURCES**

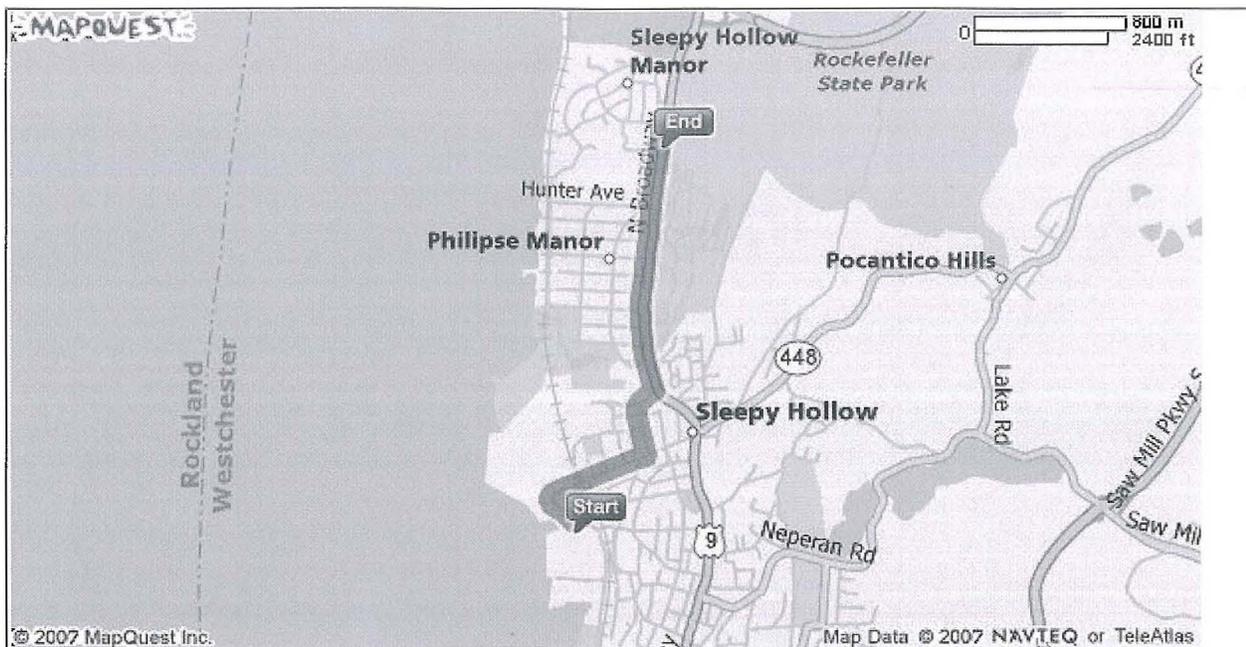
<p><b>Nearest Hospital:</b>                  (see attached map) Address:                   Phone Number:</p>	<p>Phelps Memorial Hospital (see attached map)                  701 North Broadway                  Tarrytown, New York                  914.366.3000</p>
<p><b>Emergency Response Number:</b></p>	<p><b>911</b></p>
<p>Local Emergency Response Number (if not on 911 system):</p>	<p>See above</p>
<p>Other Ambulance, Fire, Police, or Environmental Emergency Resources:</p>	<p>Tarrytown Village Police/Fire Department: 914.631.5544                  National Spill Response Center: 800.424.8802</p>
<p>Haley &amp; Aldrich Project Manager:                  Phone Number:                  Emergency Phone Number:</p>	<p>Jonathan D. Babcock                  585.321.4213                  585.370.9792</p>
<p>Alternate Haley &amp; Aldrich Contact:                  Phone Number:                  Emergency Phone Number:</p>	<p>or</p> <p>Vincent B. Dick                  585.321.4207                  Cell: 585.734.6838</p>
<p>Client Contact/Project Manager:                  Phone Number:                  Emergency Phone Number:</p>	<p>Carl Monheit                  203.661.0055                  none</p>
<p>Utility Emergencies:</p>	<p>Electric: 911      UFPO: 800.962.7962                  Gas: 911                  Water: 911</p>

**Evacuation alarms** and/or emergency information will be communicated among personnel on site by the following means:   x   Verbal communication. If communication will be by other means, describe:

**Emergency services will be summoned:**   x   Via on-site phone. If contact will be by other means, describe:

The on-site phone is generally each field team member’s individual cell phone.

The **site evacuation plan** is as follows: In case of an emergency, a designated meeting area will be assigned based on field conditions at the time of the emergency.



★ Phelps Memorial Hospital, 701 North Broadway, Tarrytown, New York

**Directions:**

Exit site and turn left (east) onto Main Street. Take Main Street to U.S. Route 9. Take left onto Route 9 (north) through North Tarrytown. Proceed to light after passing cemetery on right. Make left into hospital entrance at light. Will not be able to see hospital from Route 9, but sign at entrance.

Approximately 15 minutes travel time.

**9.0 COMMUNITY AIR MONITORING PLAN**

THE COMMUNITY AIR MONITORING PLAN INCLUDES, BY REFERENCE, THE ATTACHED NEW YORK STATE DEPARTMENT OF HEALTH (NYSDOH) GENERIC COMMUNITY AIR MONITORING PLAN.

G:\Projects\28590\017 Site Development Services\Project Management\2008 HASP\Health & Safety 02Jun03 Rev Jan 08.doc

**TABLE 1  
HAZARD MONITORING**

(CIRCLE CONTAMINANTS OF CONCERN, WRITE ADDITIONAL CONTAMINANTS AND EXPOSURE ON LAST PAGE)

CONTAMINANTS OF CONCERN	ROUTES OF EXPOSURE	IDLH	PEL	TLV 500 Cv 750	PID (IP eV)	FID	ODOR THRES- HOLD	IRRITATION THRESHOLD	ODOR DESCRIPTION
Acetone	R, I, C	2500	1000	500 Cv 750	9.69	60	13	--	Chem, sweet, pungent
Ammonia	R, A, I, C	300	50	25 Cv 35	--	--	0.5-2	10	Pungent suffocating odor
<b>Benzene</b>	<b>R,A,I,C</b>	<b>Ca</b>	<b>1</b>	<b>Sk 0.5</b>	<b>9.25</b>	<b>150</b>	<b>4.68</b>	<b>--</b>	<b>Solvent</b>
Carbon tetrachloride (Tetrachlormethane)	R,A,I,C	Ca	2 Cv25 200: 5 min peak	Sk 5 Cv 10	11.47**	10	50	--	Sweet, pungent
Chlorobenzene	R,I,C	1000	75	10	9.07	200	0.68	--	Almond like
Chloroform	R,I,C	Ca	2	10	11.42**	65	50	--	Sweet
Cyanides (CN salts)	R,A,I,C	50 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>	Sk Cv 5 mg/m <sup>3</sup>	--	--	--	--	Faint almond odor
o-Dichlorobenzene	R,A,I,C	200	Cv 50	25 Cv 50	9.06	50	0.3	E 20-30	Pleasant, aromatic
p-Dichlorobenzene	R,I,C	150	Cv 75	10	8.94	--	0.18	E 80-160	Distinct, aromatic mothball-like
Dichlorodifluoromethane (Freon 12)	R,C	1500	1000	1000	11.97**	15	--	--	--
1,1-Dichloroethane	R,I,C	3000	100	100	--	80	200	--	Distinct
1,2-Dichloroethane	R,I,A,C	Ca	Cv 100 50	10	11.12**	80	88	--	Chloroform
1,1-Dichloroethylene (Vinylidene chloride, 1,1- DCE)	R,I	Ca	--	5 Cv 20	*	40	190	--	--
1,2-Dichloroethylene	R,I,C	1000	200	200	9.65	50	0.85	--	Ether-like acrid
Ethanol	R,A,I,C	--	1000	1000 Cv 125	10.48**	25	10	--	Sweet
<b>Ethylbenzene</b>	<b>R,I,C</b>	<b>800</b>	<b>100</b>	<b>100</b>	<b>8.76</b>	<b>100</b>	<b>2.3</b>	<b>E 200</b>	<b>Aromatic</b>
Ethylene Glycol vapor	R,A,I,C	--	100 mg/m <sup>3</sup>	-	--	--	--	--	--
Formaldehyde	I,C	Ca	0.75	Cv 0.3	10.88**	--	0.83	--	Hay
<b>Gasoline</b>	<b>R,I,C</b>	<b>Ca</b>	<b>--</b>	<b>300</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>E 0.5</b>	<b>Petroleum</b>
Hexane, n-isomer	R,I,C	--	500	50	10.18	70	130	E.T 1400-1500	Mild, gasoline-like
Hydrogen Cyanide (as CN)	R,A,I,C	50	10	Sk Cv-4.7	**	--	0.58	--	Bitter almond
Hydrogen peroxide	R,I,C	75	1	1	11**	--	--	--	Shar[
Methanol	R,I,C	25000	Sk 200	Sk 200	10.84**	12	1000	--	Sweet
MEK peroxide	R,I,C	--	Cv 0.7	Cv 0.2	--	--	--	--	--
Methyl Chloroform (1,1,1- TCA)	R,I,C	700	350	350	**	105	20-100	--	Chloroform-like
Methylene Chloride (Dichloromethane, Methylene dichloride)	R,I,C	Ca	25	50	11.35**	100	25-50	E 5000	Ether-like
Methyl Mercaptan	R,C	150	Cv 10	0.5	9.44	--	--	--	Garlic, Rotten Cabbage
MIBK (Hexone)	R,I,C	500	100	50 Cv 75	--	--	--	--	Pleasant
<b>Naptha (coal tar)</b>	<b>R,I,C</b>	<b>1000</b>	<b>100</b>	<b>400</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>Aromatic</b>
Naphthalene	R,A,I,C	250	10	10	8.14	--	0.3	E 15	Mothball-like
<b>Octane</b>	<b>R,I,C</b>	<b>750</b>	<b>500</b>	<b>300 Cv 375</b>	<b>9.9</b>	<b>80</b>	<b>48</b>	<b>--</b>	<b>Gasoline-like</b>
Pentachlorophenol	R,A,I,C	Ca 2.5 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup> Sk	Sk 0.5 mg/m <sup>3</sup>	--	--	--	--	Pungent when hot
Phenol	R,A,I,C	250	Sk 5	Sk 5	8.5	--	0.04	E.N.T. 68	Medicinal

**TABLE 1  
HAZARD MONITORING**

(CIRCLE CONTAMINANTS OF CONCERN, WRITE ADDITIONAL CONTAMINANTS AND EXPOSURE ON LAST PAGE)

CONTAMINANTS OF CONCERN	ROUTES OF EXPOSURE	IDLH	PEL	TLV	PID (IP eV)	FID	ODOR THRESHOLD	IRRITATION THRESHOLD	ODOR DESCRIPTION
Propane	R,C	2100	1000	2500	10.95**	80	1600	--	Natural gas odor
Stoddard Solvent (Mineral Spirits)	R,CI,I	20000 mg/m <sup>3</sup>	500	100	*	--	1	E 400	Kerosene-like
1,1,2,2-Tetrachloroethane	R,A,I,C	Ca (100)	Sk 5	1	11.1**	100	1.5	--	--
Tetrachloroethylene (Perchloroethylene)	R,I,C	Ca	100	25	9.32	70	4.68	N.T513-690	Ether, chloroform-like
<b>Toluene</b>	<b>R,A,I,C</b>	<b>500</b>	<b>200</b>	<b>50</b>	<b>8.82</b>	<b>110</b>	<b>2.14</b>	<b>E300-400</b>	<b>Mothball-like</b>
Trichloroethylene	R,I,C	Ca (1000)	100	50	9.47	70	21.4	--	Solventy, chloroform-like
Turpentine	R,A,I,C	800	100	100	--	--	200	E.N 200	Pine-like
Vinyl Chloride	R	Ca	1	2	9.995	--	3000	--	Ethereal
<b>Xylenes</b>	<b>R,A,I,C</b>	<b>1000</b>	<b>100</b>	<b>100</b>	<b>8.56/8.44</b>	<b>111/116</b>	<b>1.1</b>	<b>E.N.T. 200</b>	<b>Aromatic</b>
<b>DUSTS, MISTS AND MISCELLANEOUS COMPOUNDS</b>									
Asbestos	R	Ca	0.1 fibr/cc	Species dependent	--	--	--	--	--
PCBs-42% Chlorine	R,A,I,C	Ca	1 mg/m <sup>3</sup> Sk	1 mg/m <sup>3</sup> Sk	--	--	--	--	Mild, hydrocarbon
PCBs-54% Chlorine	R,A,I,C	Ca	0.5 mg/m <sup>3</sup> Sk	0.5 mg/m <sup>3</sup> Sk	--	--	--	--	Mild, hydrocarbon
Styrene	R,I,C	700	100	20	8.47	85	0.047	E 200-400	Rubber, solvent
<u>Aluminum- metal dust- total</u>	<u>R,I,C</u>	<u>==</u>	<u>15 mg/m<sup>3</sup></u>	<u>10 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>-soluble salts</u>	<u>R,I,C</u>	<u>==</u>	<u>2 mg/m<sup>3</sup></u>	<u>2 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>Arsenic- inorganic</u>	<u>R,A,I,C</u>	<u>Ca</u>	<u>0.01 mg/m<sup>3</sup></u>	<u>0.2 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>Barium: soluble compounds</u>	<u>R,I,C</u>	<u>250 mg/m<sup>3</sup></u>	<u>0.5 mg/m<sup>3</sup></u>	<u>0.5 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>Cadmium dusts</u>	<u>R,I</u>	<u>Ca</u>	<u>0.005 mg/m<sup>3</sup></u>	<u>0.01 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>Chromium: Species Dependent (Hexavalent)</u>	<u>R,I,A,C</u>	<u>25 mg/m<sup>3</sup></u>	<u>Spec Dep hex- (.5mg/m<sup>3</sup>)</u>	<u>Spec Dep</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>Copper - dust &amp; mist</u>	<u>R,I,C</u>	<u>==</u>	<u>1 mg/m<sup>3</sup></u>	<u>1 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>Lead - arsenate</u>	<u>R,I,C</u>	<u>Ca</u>	<u>0.05 mg/m<sup>3</sup></u>	<u>0.15 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>- inorg. dust &amp; fume</u>	<u>R,I,C</u>	<u>==</u>	<u>0.5 mg/m<sup>3</sup></u>	<u>0.15 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>- chromate</u>	<u>R,I,C</u>	<u>==</u>	<u>==</u>	<u>0.05 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>Manganese &amp; compounds</u>	<u>R,I</u>	<u>500 mg/m<sup>3</sup></u>	<u>Cv-5 mg/m<sup>3</sup></u>	<u>0.2 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>Mercury &amp; inorg. comp.</u>	<u>R,A,C</u>	<u>10 mg/m<sup>3</sup></u>	<u>Cv0.1 mg/m<sup>3</sup></u>	<u>0.1 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>- (organo) alkyl comp.</u>	<u>R,A,I,C</u>	<u>2 mg/m<sup>3</sup></u>	<u>0.01 mg/m<sup>3</sup></u>	<u>0.1 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>Nickel - metal, insoluble</u>	<u>R,I,C</u>	<u>Ca</u>	<u>1 mg/m<sup>3</sup></u>	<u>1 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>- soluble comp.</u>	<u>R,I,C</u>	<u>Ca</u>	<u>0.1 mg/m<sup>3</sup></u>	<u>0.1 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>Nuisance Dust</u>			<u>5mg/m<sup>3</sup>(Resp)</u> <u>15mg/m<sup>3</sup>(total)</u>						
Portland cement	R,I,C	--	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>	--	--	--	--	--
<u>Selenium compounds</u>	<u>R,A,I,C</u>	<u>100 mg/m<sup>3</sup></u>	<u>0.2 mg/m<sup>3</sup></u>	<u>0.2 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>Silver - metal</u>	<u>R,I,C</u>	<u>==</u>	<u>0.01 mg/m<sup>3</sup></u>	<u>0.1 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>- soluble comp.</u>	<u>R,I,C</u>	<u>==</u>	<u>==</u>	<u>0.1 mg/m<sup>3</sup></u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>
<u>Thallium, soluble</u>	<u>R,A,I,C</u>	<u>20 mg/m<sup>3</sup></u>	<u>0.1 mg/m<sup>3</sup> Sk</u>	<u>0.1 mg/m<sup>3</sup> Sk</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>	<u>==</u>

**TABLE 1  
HAZARD MONITORING**

(CIRCLE CONTAMINANTS OF CONCERN, WRITE ADDITIONAL CONTAMINANTS AND EXPOSURE ON LAST PAGE)

CONTAMINANTS OF CONCERN	ROUTES OF EXPOSURE	IDLH	PEL	TLV	PID (IP eV)	FID	ODOR THRES-HOLD	IRRITATION THRESHOLD	ODOR DESCRIPTION
<u>Tin, metal &amp; inorganic</u>	<u>R,C</u>	<u>400 mg/m<sup>3</sup></u>	<u>2 mg/m<sup>3</sup></u>	<u>2</u>	==	==	==	==	==
<u>Comp. except oxides</u>									
<u>Tin, organic compounds</u>	<u>R,A,I,C</u>	<u>200 mg/m<sup>3</sup></u>	<u>0.1 mg/m<sup>3</sup></u>	<u>0.1 mg/m<sup>3</sup> Sk</u>	==	==	==	==	==
<u>Zinc chromates, as Cr</u>	<u>R,I,C</u>	==	<u>Cv 0.1 mg/m<sup>3</sup></u>	<u>Cv 0.1 mg/m<sup>3</sup></u>	==	==	==	==	==
<u>Zinc oxide dust (total)</u>	<u>R,I,C</u>	==	<u>15 mg/m<sup>3</sup></u>	<u>10 mg/m<sup>3</sup></u>	==	==	==	==	==

Notes: All units in ppm unless otherwise noted.

R = Respiratory (Inhalation)    I = Ingestion    A = Skin Absorption    C = Skin and/or Eye Contact  
 Cv = Ceiling value    Ca = Carcinogen    Sk = Skin  
 \*\* = Use 11.7 eV lamp

**TABLE 2**  
**Last Revised September 2002**

**MONITORING METHOD, ACTION LEVELS AND PROTECTIVE MEASURES**

<b>INSTRUMENT</b>	<b>HAZARD</b>	<b>ACTION LEVEL</b>	<b>ACTION RESPONSE</b>
Respirable Dust Monitor	Total Particulates	> 5 mg/m <sup>3</sup>	Upgrade to Level C Protection
OVA, HNU <sup>(2)</sup> , Photovac Microtip	Total Organic Vapors	Background  10 ppm > background or lowest OSHA permissible exposure limit, whichever is lower, or as modified for this task. Sustained for >5 minutes in the breathing zone.  50 ppm over background, unless lower values required due to respirator protection factors	Level D Protection  Upgrade to Level C - site evacuation may be necessary for specific compounds  Cease work; upgrade to Level B <sup>(3)</sup> may be required
Explosimeter <sup>(4)</sup> (LEL)	Flammable/Explosive Atmosphere	<10% Scale Reading  10-15% Scale Reading  >15% Scale Reading	Proceed with work  Monitor with extreme caution  Evacuate site
Oxygen Meter <sup>(5)</sup>	Oxygen-Deficient Atmosphere	19.5% - 23.5% O <sub>2</sub>  < 19.5% O <sub>2</sub>  > 23.5% O <sub>2</sub>	Normal - Continue work  Evacuate site; oxygen deficient  Evacuate site; fire hazard
Radiation Meter <sup>(6)</sup>	Ionizing Radiation	0.1 Millirem/Hour  > 1 Millirem/Hour	If > 0.1, radiation sources may be present <sup>(7)</sup>  Evacuate site; radiation hazard
Drager Tubes	Vapors/Gases	Species Dependent > 1 ppm vinyl chloride > 1 ppm benzene > 1 ppm 1,1-DCE	Consult Table 1 or other resources for concentration toxicity/detection data. Upgrade to Level C if concentration of compounds exceed thresholds shown at left; May need to cease work if other levels exceeded - site specific
Gas Chromatograph (GC)	Organic Vapors	3 ppm total OV > background or > lowest specific OSHA permissible exposure limit, whichever is lower	On-site monitoring or tedlar bag sample collection for off-site/laboratory analysis

**Notes:**

1. Monitor breathing zone.
2. Can also be used to monitor some inorganic species.
3. Positive pressure demand self contained breathing apparatus
4. Lower explosive limit (LEL) scale is 0-100%. LEL for most gasses is 15%.
5. Normal atmospheric oxygen concentration at sea level is 20%
6. Background gamma radiation is ~0.01-0.02 millirems/hour.
7. Contact H&A Health and Safety staff immediately.

## Appendix D: Generic Community Air Monitoring Plan

---

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

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

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

### Community Air Monitoring Plan

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

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

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

## VOC Monitoring, Response Levels, and Actions

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

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.
- All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

## Particulate Monitoring, Response Levels, and Actions

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

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ( $\text{mcg}/\text{m}^3$ ) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed  $150 \text{ mcg}/\text{m}^3$  above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m<sup>3</sup> above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m<sup>3</sup> of the upwind level and in preventing visible dust migration.
- All readings must be recorded and be available for State (DEC and DOH) personnel to review.

REVIEW COPY  
ONLY



**NEW YORK STATE DEPARTMENT OF HEALTH**  
**RADIOACTIVE MATERIALS LICENSE**

Pursuant to the Public Health Law and Industrial Code Rule 38, and in reliance on statements and representations heretofore made by the licensee designated below, a license is hereby issued authorizing radioactive material(s) for the purpose(s), and at the place(s) designated below. The license is subject to all applicable rules, regulations, and orders now or hereafter in effect of all appropriate regulatory agencies and to any conditions specified below.

1. NAME OF LICENSEE		3. LICENSE NUMBER	
Haley & Aldrich, Inc.		C3226	
FEIN: 04-2295689		4. EXPIRATION DATE	
Phone: (617) 666-4458		December 31, 2009	
2. ADDRESS OF LICENSEE		5a. REFERENCE	
465 Medford Street, Suite 2200		DL 06-259	
Boston, Massachusetts 02129		b. AMENDMENT NO.	
		---	
6. Radioactive Materials	7. Chemical and/or physical form	8. Maximum quantity licensee may possess at any one time	
A. Cesium 137	A. Sealed Sources	A. Not to exceed 200 millicuries total.	
B. Americium 241:Beryllium	B. Sealed Sources	B. Not to exceed 800 millicuries total.	

9. Authorized use:

Conditions 6.A. and 6.B.

- A. The licensee is authorized to use any sealed source, or associated portable moisture/density gauge, which has been manufactured and distributed in accordance with a specific license issued by an Agreement State or the United States Nuclear Regulatory Commission. Combinations of sources and devices must be compatible for use as stated in a Sealed Source and Device Registration Certificate (i.e., stated in the registration certificate for the source or device).
- B. No single source may exceed the maximum activity specified for that nuclide in the Sealed Source and Device Registration Certificate for any device in which the source is to be used.

- 10. A. This license does not authorize possession of radioactive material at the address in Condition 2 or at any permanent storage location in New York State. This license only authorizes the storage, use, and transportation incident to use, of licensed materials at temporary jobsites in New York State in accordance with paragraphs B and C of this Condition and with other Conditions of the license. Licensed material may be used at temporary job sites of the licensee anywhere within the State of New York, where the Department of Health exercises jurisdiction for regulating the use of radioactive material. Such use is permitted as long as this license and your license for storage and use of the authorized materials in another State remain in effect and without restriction.



NEW YORK STATE DEPARTMENT OF HEALTH

Page 2 of 4

RADIOACTIVE MATERIALS LICENSE

3. License Number C3226

5a. Ref. DL 06-259

b. Amend. No. ---

(Condition 10 continued)

- B. Overnight storage at other locations shall be in accordance with statements referenced in Condition 24 herein, providing that such storage may not be in a residence, or in an attached garage except within a vehicle. Any vehicle used for storage shall be driven only for purposes associated with use or transport of the contained radioactive material, by a person qualified to use the material, and no passengers shall be carried unless they are also involved in work under this license. Vehicular storage shall only be allowed if no other storage is possible and shall not exceed five (5) consecutive nights unless authorization to exceed this limit is obtained from the Department.
- C. Under no circumstances shall radioactive material authorized by this license be transferred to the custody of any person or firm other than the licensee, or be used or stored by another person or firm or its employees; unless that person or firm possesses a valid license to possess and use such radioactive material.
11. Licensed material shall be used by, or under the supervision of, Mark Dobday (Radiation Safety Officer), by licensee personnel trained and certified by the device manufacturer. The licensee shall maintain a complete and accurate record of the qualifications of each person permitted to use radiation sources under this license.
12. Sealed Sources containing radioactive materials shall not be opened or removed from gauges by the licensee.
13. A. The licensee is not authorized to dismantle, repair or effect any changes in the source holders/gauges. Any maintenance involving exposure of the source or removal of shielding is prohibited. All other maintenance shall be performed in accordance with the manufacturer's recommendations.
- B. The licensee shall not alter labels attached to gauges, and shall maintain labels in legible condition at all times.
14. The licensee shall instruct persons who engage in work under the license, in accordance with section 38.27(c) of Code Rule 38. Such instruction shall include the licensee's operating and emergency procedures, and other information contained in documents incorporated in Condition 24.
15. The licensee shall conduct a physical inventory every six (6) months to account for all Gauges received and possessed under the License. The records of the inventories shall be maintained for three (3) years from the date of the inventory for inspection by the Department, and shall include the quantities and kinds of licensed material, Manufacturer's Name and Model No., location of the gauges, the date of the inventory, and the name of the person who performed it.



NEW YORK STATE DEPARTMENT OF HEALTH

Page 3 of 4

RADIOACTIVE MATERIALS LICENSE

3. License Number C3226

5a. Ref. DL 06-259

b. Amend. No. ---

16. A. The licensee shall maintain a utilization log containing the identification of sources used, dates removed and returned to storage, the location of use, the identity of users, and the daily check of sliding blocks required by Condition 21.
- B. The log shall be kept at the location of storage and shall contain sufficient detail to enable the licensee to inform the Department at any time, of the exact location of each source.
17. Current copies of the following documents shall be maintained at temporary job sites for Department inspection:
- A. The manufacturer's instruction manual and the licensee's operating and emergency procedures.
- B. A copy of the results of the latest test for leakage and/or contamination performed on the sealed sources.
18. A. In the event of a serious incident involving licensed material, including but not limited to, the theft or loss of a gauge, or damage to a gauge, the Department shall be notified immediately by telephone. Subsequent information about the incident acquired by the licensee shall be reported as it is received. All gauge users must carry the NYSDOH's current telephone number in their emergency procedures.
- B. In the event that a gauge is damaged, the gauge and surrounding area shall be surveyed with an appropriate survey meter, and the results of the survey shall be reported to and approved by the Department before the gauge is removed from the site.
19. A. The licensee shall ensure that all persons authorized to use portable gauges comply with safe use and maintenance procedures and that they do not leave a gauge unattended or unsecured at any time, even for a few minutes.
- B. Each gauge shall be maintained as prescribed by the manufacturer. In particular, the licensee must take such actions as are necessary to keep gauges in compliance with the Sealed Source & Device Registry sheets for the devices, including any recalls, safety retrofits, inspections or other actions specified by the device manufacturer.
- C. Licensees shall ensure that gauges are only used by individuals who have received the required training, and who follow prescribed procedures. Any evidence of abuse, mishandling or failure to perform necessary maintenance by a worker must be addressed and corrected.
20. In addition to the possession limits in Item 8, the licensee shall further restrict the possession of licensed material to quantities below the minimum limit specified in Section 38.7 of 12 NYCRR 38 for establishing decommissioning financial assurance.



NEW YORK STATE DEPARTMENT OF HEALTH  
RADIOACTIVE MATERIALS LICENSE

Page 4 of 4

3. License Number C3226

5a. Ref. DL 06-259

b. Amend. No. ---

21. Each gauge shall be inspected on each day of use before use, and upon its return to storage, to ensure proper operation of all safety features including the following:
- A. Turn the gauge over and visually verify that the tungsten sliding block is completely closed, keeping as much distance as possible between you and the base of the gauge. If any portion of the opening is uncovered, the sliding block must be cleaned and returned to the fully closed position before transporting, using, or storing the gauge. The manufacturer's instructions for cleaning the sliding block must be followed.
  - B. If a radiation survey meter is available, and in good working order, radiation levels at the gauge surface shall also be checked. The exposure rate should be approximately 10-20 mrem per hour.
  - C. If a sliding block is found to be partially or fully open, the Department of Health must be notified by telephone within 24 hours.
22. Each portable nuclear gauge shall have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The gauge or its container must be locked when in transport, storage, or when not under the direct surveillance of an authorized user.
23. A minimum of two independent physical controls that form tangible barriers shall be used to secure each portable gauge from unauthorized removal, whenever the gauge is not under the control and constant surveillance of an authorized user.
24. Except as specifically provided otherwise in this License, the licensee shall conduct its program in accordance with the statements, representation and procedures contained in the documents, including any enclosures, listed below. The Department's Regulations shall govern, unless the statements, representation and procedures in the licensee's application and correspondence are more restrictive than the Regulations.
- A. License 20-8251, issued by the Commonwealth of Massachusetts, Department of Public Health.
  - B. License Application dated October 30, 2006, signed by Thomas Benedict, with attachments.

FOR THE NEW YORK STATE DEPARTMENT OF HEALTH

Date: 12/13/06  
DJS

By   
Clayton J. Bradt, CHP,  
Principal Radiophysicist

**STATE OF NEW YORK**  
**NOTICE TO EMPLOYEES**  
**STANDARDS FOR PROTECTION AGAINST RADIATION**



**YOUR EMPLOYER'S RESPONSIBILITY**

The transfer, receipt, possession or use of all sources of ionizing radiation in the State of New York is controlled by the applicable rules, regulations and orders of either the New York State Departments of Labor or Health or the New York City Department of Health. These agencies require either the registration or licensing of all significant radiation sources, and they require your employer to post or otherwise make available to you a copy of the applicable regulations, license and registration and the operating procedures applying to the work in which you are engaged and to explain relevant provisions to you. The applicable regulation in this installation is Part 16 of the New York State Sanitary Code.

**YOUR RESPONSIBILITY AS A WORKER**

You should familiarize yourself with the provisions of the New York State Sanitary Code, license and registration and the operating procedures which apply to the work in which you are engaged. You should observe these provisions for your own protection and the protection of your co-workers.

**WHAT IS COVERED BY THESE REGULATIONS**

1. Limits on exposure to radiation and radioactive material in controlled and uncontrolled areas;
2. Measures to be taken after accidental exposure;
3. Personnel monitoring, surveys and equipment;
4. Caution signs, labels and safety interlock equipment;
5. Exposure records and reports; and
6. Related matters.

**REPORTS ON YOUR EXPOSURE TO RADIATION**

If you work where personnel monitoring equipment is required, the New York State Department of Health requires your employer to provide you, upon request, a written report of your exposure to radiation both annually and at the time that you terminate employment. The New York State Department of Health also requires your employer to give you a written report if you receive any exposure in excess of the limits set for occupational exposure.

**INSPECTIONS**

All activities licensed or registered with the regulatory agencies in the State of New York are subject to inspection by representatives from these agencies.

**INQUIRIES**

Inquiries dealing with matters outlined above can be directed to:

Bureau of Environmental Radiation Protection  
New York State Department of Health  
547 River Street, Room 530  
Troy, NY 12180-2216  
(518) 402-7570

**POSTING REQUIREMENT**

Copies of this notice must be posted where employees working in or frequenting any portion of controlled areas can observe a copy on the way to or from their place of employment. Copies of Part 16 and other applicable documents, if not posted, are available for review at the following location:



# STATE OF NEW YORK DEPARTMENT OF HEALTH

Flanigan Square, 547 River Street, Troy, New York 12180-2216

Antonia C. Novello, M.D., M.P.H., Dr.P.H.  
*Commissioner*

Dennis P. Whalen  
*Executive Deputy Commissioner*

December 13, 2006

Mark Dobday, RSO  
Haley & Aldrich, Inc.  
465 Medford St., Ste 2200  
Boston, MA 02129

License No.: C3226  
Reference: DL 06-259  
Amendment: ---

Dear Mr. Dobday:

Enclosed is New York State Department of Health Radioactive Materials License C3226. This license authorizes the possession of radioactive materials in the types and amounts specified for the uses indicated. The specific conditions of this license and the provisions of Industrial Code Rule 38 (12 NYCRR 38) shall govern all activities conducted under this license. You should read these documents carefully to familiarize yourself with all applicable requirements including any statements, representations and procedures contained in documents specified in License Condition 24, to which you have committed as part of the licensing review process. These requirements should also be included in the initial and annual refresher training provided to all employees who use licensed material.

Please note especially License Conditions 18, 19 and 21. Condition 18 requires you and your workers to report accidents and incidents involving gauges to this office immediately by telephone. Condition 19 requires you to maintain gauges as prescribed by the manufacturer, and to prevent their abuse or mishandling. Condition 21 requires a daily check of the shielded sliding block on gauges, and a 24-hour report to this office if the daily check reveals a sliding block fully or partially open. You must record this daily check in the utilization log required by Condition 16 of the license.

Inspectors from the Radiological Health Unit will periodically inspect your program. You must maintain a copy of this license (including amendments) at the address indicated in License Condition 2, along with required records, for their review. If you have any questions, please do not hesitate to contact this office.

Sincerely,

Daniel Samson, CHP  
Associate Radiophysicist

enc: License  
*Notice to Employees*

# OPERATING PROCEDURE: OP1001

## EXCAVATION AND TRENCHING SAFETY

### PREPARATION AND APPROVALS

VERSION	AUTHORED /DATE	REVIEWED / DATE	REVIEWED / DATE	REVIEWED / DATE	APPROVED / DATE
Ver. 0.0	CLM/ May 2002	DBK/Jan 2003	CSO/Feb 2003	DBK/May 2003	
		TWN/Sep 2003	JPD/Sep 2003	NER/Oct 2003	SRK/Oct 2003

**Total Pages: 21**

© Haley & Aldrich, Inc., 2003



**TABLE OF CONTENTS**

		<b>Page</b>
<b>LIST OF TABLES</b>		<b>ii</b>
<b>1.</b>	<b>PURPOSE</b>	<b>1</b>
<b>2.</b>	<b>EQUIPMENT</b>	<b>1</b>
<b>3.</b>	<b>PROCEDURE</b>	<b>1</b>
3.1	Brief Description of the Contractor's Responsibilities	1
3.1.1	Heavy Equipment Operation	1
3.1.2	Stability of Adjacent Structures	2
3.1.3	Warning System for Mobile Equipment	2
3.1.4	Inspections	2
3.1.5	Fall Protection	3
3.2	Haley & Aldrich, Inc. Safety Practices	3
3.2.1	Pre-Excavation Requirements	3
3.2.2	Working Around Heavy Equipment	4
3.2.3	Work in Trenches and Excavations	4
3.2.4	Sloping As A Means Of Protection	5
3.2.5	Shoring or Shielding as a Means of Protection	5
3.2.6	Access and Egress	5
3.2.7	Protection From Loose Rock Or Soil	6
3.2.8	Protection from Hazards Associated With Water Accumulation	6
3.2.9	Hazardous Atmospheres	6
3.2.10	Emergency Rescue Equipment	7
3.2.11	Exposure to Falling Loads	7
3.3	Summary Of Haley & Aldrich Staff Responsibilities	7
3.3.1	Local Health and Safety Coordinator /Corporate Health and Safety Manager	7
3.3.2	Project Managers	7
3.3.3	Staff members	8

**TABLE OF CONTENTS**  
**(Continued)**

	<b>Page</b>
<b>APPENDIX A - References</b>	A-1
<b>APPENDIX B - Related Haley &amp; Aldrich Procedures</b>	B-1
<b>APPENDIX C - Forms</b>	C-1
<b>APPENDIX D - Glossary</b>	D-1
<b>APPENDIX E - Additional Definitions and Soils Classifications</b>	E-1
<b>APPENDIX F - Determination of Maximum Allowable Slope</b>	F-1

**LIST OF TABLES**

<b>Table No.</b>	<b>Title</b>	
1	Maximum Allowable Slopes for Soil or Rock Deposits	F-2

**OPERATING PROCEDURE: OP1001**

**EXCAVATION AND TRENCHING SAFETY**

**1. PURPOSE**

There are multiple hazards associated with working in and around excavations and trenches including cave-ins, potential running soils, dislodged excavated soils, lack of proper access and egress, and additional concerns associated with the performance of work in confined spaces. Nonfatal, and even fatal, injuries occur in association with excavation and trenching activities with a greater frequency than one might expect. Causes of bodily injury, illness, or death include asphyxiation, internal injuries due to physical crushing, and toxic exposures.

The purpose of this procedure is to provide Haley & Aldrich, Inc. staff engaged in excavation or trenching activities with an understanding of the hazards associated with these activities and to provide methods to control personal exposure to the hazards. This procedure is designed to comply with applicable Occupational Safety and Health Administration (OSHA) regulations (29 CFR 1926.650, Subpart P - Excavations).

**2. EQUIPMENT**

See equipment lists for related procedures, as pertinent, listed in Appendix B.

**3. PROCEDURE**

**3.1 Brief Description of the Contractor's Responsibilities**

The General Contractor or Construction Manager at a given site is typically responsible for general site safety, while individual companies are responsible for the safety of their own staff members.

**3.1.1 Heavy Equipment Operation**

Only experienced equipment operators will be allowed to operate heavy equipment such as backhoes, front-end loaders, etc. Where certification or licensing requirements exist, such personnel shall possess appropriate certification and/or licensing for operating specified heavy equipment. While operating heavy equipment in the work area, the equipment operator shall maintain communication with a designated signalman through direct voice contact or approved standard hand signals. In addition, all site personnel in the immediate work area shall be made aware of the equipment operations. All equipment and materials, such as pipe, rebar, etc., should be kept out of traffic lanes and access ways. At no time should the maximum load capacity of a piece of heavy equipment be exceeded, nor should any equipment be used for a function it was not designed for. Equipment should be stored so as not to endanger personnel at any time. At no time should the maximum load capacity of a piece of heavy equipment be exceeded.

### 3.1.2 Stability of Adjacent Structures

Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of staff members. These types of projects require that a Registered Professional Engineer with knowledge of excavation safety review the scope of work for safety.

Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to staff members shall not be permitted except when:

- A support system, such as underpinning, is provided to ensure the safety of staff members and the stability of the structure; or
- The excavation is in stable rock; or
- A registered professional engineer has approved the determination that the structure is a sufficient distance from the excavation so as to be unaffected by the excavation activity; or a registered professional engineer has approved the determination that such excavation will not pose a hazard to staff members. In addition, sidewalks, pavements, and appurtenant structures shall not be undermined unless a support system or another method of protection is provided to protect staff members from the possible collapse of such structures.

### 3.1.3 Warning System for Mobile Equipment

When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system should be utilized, such as barricades, hand or mechanical signals, or stop logs.

### 3.1.4 Inspections

The Contractor's representative competent person shall make daily inspections of excavations, adjacent areas, and protective systems for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. The competent person should conduct an inspection prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rain event or other hazard-increasing occurrence. These inspections are only required when staff member exposure can be reasonably anticipated. Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed staff members should be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

### 3.1.5 Fall Protection

Where staff members or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided. Adequate barrier physical protection shall be provided at all remotely located excavations where monitoring is absent. All wells, pits, shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall be backfilled.

Excavations and trenches should not be left unattended when the threat of a fall into the excavation is possible. The excavation should be properly barricaded with barricade tape and in some instances secured with a fence to eliminate accidental entry.

## 3.2 Haley & Aldrich, Inc. Safety Practices

All H&A staff engaged in activities in a construction zone must wear a hard hat, OSHA-approved work boots, long pants, and a shirt. Frequently safety eyewear is also required. Hearing protection is highly recommended. Orange safety vests are required on an increasing number of sites when visibility to construction equipment operators or vehicular traffic is a concern.

Because of the inherent dangers, entry into trenches and excavations should be avoided if there are means, other than entry, to perform the work. Where entry into trenches and excavations is necessary, strict adherence to the procedures specified in this OP is extremely important. Whenever there are questions regarding the safety of trench or excavation entry, contact the Local Health and Safety Coordinator immediately.

### 3.2.1 Pre-Excavation Requirements

#### 3.2.1.1 Utility Clearance

Please refer to OP1003 – Utility Clearance.

#### 3.2.1.2 Health And Safety Plan

All activities which will involve entry by H&A staff into excavations or trenches greater than 5 feet in depth will require that a written, site-specific Health and Safety Plan (HASP) be developed prior to the start of work and implemented once work begins. The HASP must be developed by the Project Manager and approved by the Local Health and Safety Coordinator. A possible exception to this rule may be made for large scale engineered excavations.

#### 3.2.1.3 Competent Person

A competent person must be present during all work, which involves entry, by any personnel, into trenches or excavations greater than 5 feet in depth. For the purpose of this

OP, a competent person is defined as an individual, who by education or experience, is capable of evaluating the hazards associated with trench or excavation collapse and is capable of classifying soils in accordance with the criteria specified in Attachment A of this OP. A competent person will have the authority to take corrective actions as needed or stop work if he/she determines that a safety hazard exists.

**H&A will not assume the role of the competent person on any excavation project. The contractor who operates the heavy equipment typically performs this function.**

### 3.2.2 Working Around Heavy Equipment

When working around heavy equipment, it is good practice to maintain visual contact with the operator if it is necessary to be within the area where the machine is working. Be aware that many large machines have blind spots where the operator can not see if there is a person present. Never assume that the operator knows where every person on a site is. Be aware of the surroundings at all times.

H&A staff should not operate the Contractor's equipment.

### 3.2.3 Work in Trenches and Excavations

It is H&A's policy to avoid entry into excavations and trenches when possible. However, it is apparent that staff members may have to enter excavations or trenches during the course of the many work activities H&A performs. Examples of excavations or trenches that may require H&A staff members to enter include (but are not limited to):

- Test pit excavations
- Tank removals
- Miscellaneous sampling events
- Site remediation excavations
- Foundation construction
- Caisson installation
- Utility installation

Each staff member in an excavation shall be protected from cave-ins and trench collapse by an adequate protective system except when:

- Excavations are made entirely in stable rock.
- Excavations are less than 5 feet in depth and an examination of the excavation by a competent person reveals no indication of a potential cave-in. The depth of the excavation is to be measured at its greatest vertical dimension. Be aware that crouching or kneeling in a trench, which is greater than three feet in depth, may still pose significant hazard for the staff member involved.

Protective systems may include sloping the excavation walls, shoring the excavation walls, or utilizing a shielding system. The protective system chosen must have the capacity to resist, without failure, all loads to be applied to the system. Protective systems in excavations greater than 20 feet deep must be designed by a professional engineer.

#### **3.2.4 Sloping As A Means Of Protection**

Sloping the walls of the trench or excavation is the preferred, and typically simplest, means of protecting staff members who must enter trenches or excavations which are greater than 5 feet in depth or where there is danger of collapse.

To assure the safety of the staff members in the excavation and to comply with the requirements specified in 29 CFR 1926.652, excavations may be sloped according to the following guidelines:

- The trench or excavation walls may be sloped back so that the ratio of the horizontal distance to the vertical rise (H:V ratio) of the sloped wall is at least 1½:1 (i.e., equivalent to an angle with the horizontal of 33 degrees or less);
- Alternatively, the maximum allowable slope of excavation walls may be determined by classifying the soil in accordance with Appendix E of this OP and determining the slope in accordance with Appendix F.

In many cases, determining the maximum allowable slope may allow the use of a steeper slope, which will result in a narrower excavation. However, determination of soil classification is complicated and requires that the competent person be familiar with the OSHA Excavation Standard.

#### **3.2.5 Shoring or Shielding as a Means of Protection**

Where sloping the walls of the trench or excavation is unfeasible (e.g., when there are dimensional constraints due to adjacent structures or property lines), the use of shoring or shielding systems may be necessary. Shoring systems may consist of soldier piles and lagging, sheet piles, slurry walls or soil nails and shotcrete. Shielding systems typically involves using a trench box.

Specific procedures for the construction and use of these systems should be provided by the Contractor.

#### **3.2.6 Access and Egress**

A stairway, ladder, ramp, or other safe means of egress shall be located in excavations or trenches that are 4 feet or more in depth so as to require no more than 25 feet of lateral travel for staff members.

Ramps and runways constructed of two or more structural members should have the structural members connected together to prevent displacement. Structural members used for ramps and runways should be of uniform thickness. Cleats or other appropriate means used to connect runway structural

members should be attached to the bottom of the runway or should be attached in a manner to prevent tripping. Structural ramps used in lieu of steps should be provided with cleats or other surface treatments on the top surface to prevent slipping.

### **3.2.7 Protection From Loose Rock Or Soil**

Adequate protection should be provided to protect staff members from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection should consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection such as sloping or benching. Protection should be provided by placing and keeping such materials or equipment at least 2 feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

### **3.2.8 Protection from Hazards Associated With Water Accumulation**

Staff members should not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect staff members against the hazards posed by water accumulation. The precautions necessary to protect staff members vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline. If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations should be monitored regularly to ensure proper operation. If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains should be inspected by a competent person after every storm event.

### **3.2.9 Hazardous Atmospheres**

Confined space entry (CSE) rules apply for entry into trenches and excavations greater than 5 feet in depth in which a hazardous atmosphere exists, or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are stored nearby. H&A employees must not perform CSE without specific authorization by the Corporate Health and Safety Manager, the Project Manager and without prior training and strict adherence to CSE rules. See OP1027.

- Adequate precautions, such as mechanical ventilation, shall be taken prior to entry into trenches and excavations in which the oxygen concentration is less than 19.5 percent or the concentration of flammable gases or vapors is in excess of 10 percent of the lower explosive limit (LEL).

- When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.
- Appropriate respiratory protection must be donned prior to entry into any trench or excavation in which airborne levels of toxic substances are present at concentrations in excess of their Threshold Limit Value (TLV) or Permissible Exposure Limit (PEL).

### **3.2.10 Emergency Rescue Equipment**

Emergency rescue equipment, such as breathing apparatuses, safety harnesses and lines, or basket stretchers, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.

### **3.2.11 Exposure to Falling Loads**

Staff members should avoid being underneath loads handled by lifting or digging equipment. Staff members should stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Staff members should stay clear of the opposite edge of a roll-off box or dump truck when they are being loaded. Soils that miss the container pose a great threat to bystanders.

## **3.3 Summary Of Haley & Aldrich Staff Responsibilities**

### **3.3.1 Local Health and Safety Coordinator /Corporate Health and Safety Manager**

- Will assist Project Managers with compliance with the procedure.
- Will develop, or at a minimum approve, all HASPs for activities involving entry into trenches and excavations greater than 5 feet in depth.
- Will perform field audits to help determine compliance status.

### **3.3.2 Project Managers**

- Will ensure that projects under their direct control or authority, which involve excavation or trenching, are conducted in a safe and efficient manner and in accordance with the requirements of this OP.
- Will ensure that projects under their direct control or authority, which involve excavation or trenching, have a written HASP prepared for the activity.

### 3.3.3 Staff members

- Will not enter trenches or excavations greater than 5 feet in depth unless the requirements in this OP have been met.
- Will exercise caution when working around construction equipment as discussed in this OP.
- When a perceived unsafe excavation is observed, will bring to the immediate attention of the Contractor's competent person that you recommend they review the situation and notify the project manager.

**APPENDIX A  
REFERENCES**

- OSHA Regulations (Standards - 29 CFR), 1926 Subpart P - Excavations (1926.650 to 1926.652)
- OSHA Handbook 2226 Excavations 2002 (Revised)

**APPENDIX B  
RELATED HALEY & ALDRICH PROCEDURES**

- OP1003      Utility Clearance
- OP2026      Exploratory Test Pits
- All 4000 series procedures

Haley & Aldrich

**APPENDIX C  
FORMS**

- See the Health and Safety Home Page (H&A Intranet) for a copy of the HASP.

Haley & Aldrich

**APPENDIX D  
GLOSSARY**

The following definitions are provided for terms used throughout this OP (as defined in 29 CFR 1926.650 and 1926.651). Other definitions can be found in Attachments E and F of this OP.

**Benching (Benching system)** - method of protecting staff members from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

**Cave-in (collapse)** - the separation of a mass of soil or rock material from the side of an excavation or the loss of soil from under a trench shield or support system and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

**Competent person** - A person who, by way of training or experience, is capable of classifying soils in accordance with 29 CFR 1910.120 Subpart P, Appendix A, who is capable of identifying existing and predictable hazards in excavations with working conditions which are unsanitary, hazardous, or dangerous to staff members, and who has the authority to take prompt corrective measures to eliminate them.

**Excavation** - any man-made cut, cavity, trench, or depression in an earth surface formed by earth removal.

**Faces (or sides)** - the vertical or inclined surfaces formed as a result of excavation work.

**Failure** - the breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.

**Hazardous atmosphere** - an atmosphere that may cause death, illness, or injury due to being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful.

**Protective system** - a method of protecting staff members from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

**Ramp** - an inclined walking or working surface that is used to gain access to one point from another and is constructed from earth or from structural materials such as steel or wood.

**Registered Professional Engineer** - a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of the OSHA standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

**Shield (Shield system)** - a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect staff members within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either pre-manufactured or job-built. Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

**Shoring (Shoring system)** - a structure such as a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and is designed to prevent cave-ins.

**Sides** - See "Faces."

**Sloping (Sloping system)** - a method of protecting staff members from cave-ins by excavating the sides of an excavation in a reverse incline. The angle of incline required to prevent a cave-in varies with such factors as soil type, environmental conditions of exposure, and application of surcharge loads.

**Stable rock** - natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against cave-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

**Support system** - a structure such as underpinning, bracing, or shoring that provides support to an adjacent structure, underground installation, or the sides of an excavation.

**Trench (Trench excavation)** - an open narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width (measured at the bottom) is not greater than 15 feet (4.6 m). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered a trench.

**APPENDIX E  
ADDITIONAL DEFINITIONS AND SOIL CLASSIFICATION**

**SCOPE AND APPLICATION**

This attachment describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. The attachment contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.

**DEFINITIONS**

The definitions and examples given below are based on, in whole or in part, the following: American Society for Testing Materials (ASTM) Standards D653-85 and D2488; The Unified Soils Classification System, The U.S. Department of Agriculture (USDA) Textural Classification Scheme; and The National Bureau of Standards Report BSS-121.

**Cemented soil** means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

**Cohesive soil** means clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with critical side slopes and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.

**Dry soil** means soil that does not exhibit visible signs of moisture content.

**Fissured** means a soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

**Granular soil** means gravel, sand, or silt, (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

**Layered system** means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

**Moist soil** means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into a small diameter threads before crumbling. Moisture granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

**Plastic** means a property of soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.

**Saturated soil** means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or shear vane.

**Soil classification system** means, for the purpose of this subpart, a method categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the environmental conditions of exposure.

**Stable rock** means natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

**Submerged soil** means soil which is underwater.

**Type A soil** means:

- Cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sand clay loam. Cemented soils such as caliche and hardpan are also considered Type A.

However, no soil is Type A if:

- The soil is fissured; or
- The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or
- The soil has been previously disturbed; or
- The soil is part of a sloped, layered system when the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
- The material is subject to other factors and would require it to be classified as a less stable material.

**Type B soils** means:

- Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48k Pa) but less than 1.5 tsf (144 kPa); or
- Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam, and in some cases, silty clay loam and sand clay loam.
- Previously disturbed soils except those that would otherwise be classed as Type C soil.

- Soil that meets the unconfined compressive strength of cementation requirements for Type A, but is fissured or subject to vibration; or
- Dry rock that is not stable; or
- Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

**Type C soil means:**

- Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less; or
- Granular soils including gravel, sand, and loamy sand; or
- Submerged soil or soil from which water is freely seeping; or
- Submerged rock that is not stable, or
- Material in a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or steeper.

**Unconfined compressive strength** means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

**Wet soil** means soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive materials will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

**APPENDIX F  
DETERMINATION OF MAXIMUM ALLOWABLE SLOPE**

**SCOPE AND APPLICATION**

This attachment contains specifications for sloping when used as methods of protecting staff members working in excavations from cave-ins. The requirements of this attachment apply when the design of sloping and benching protective systems is to be performed.

**DEFINITIONS**

**Actual slope** means the slope to which an excavation face is excavated.

**Distress** means that the soil is in a condition where a cave-in is imminent or is likely to occur. Distress is evidenced by such phenomena as the development of fissures in the face of or adjacent to an open excavation; cracking above the crest of the cut; the subsidence of the edge of an excavation; the slumping of material from the face or the bulging or heaving of material from the bottom of an excavation; the spalling of material from the face of an excavation; and ravelling, i.e., small amounts of material such as pebbles or little clumps of material suddenly separating from the face of an excavation and trickling or rolling down into the excavation.

**Maximum allowable slope** means the steepest incline of an excavation face that is acceptable for the most unfavorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V).

**Short-term exposure** means a period of time less than or equal to 24 hours that an excavation is open.

**REQUIREMENTS**

**Soil Classifications**

Soil Classifications shall be determined by the methods that are outlined in Attachment E of this OP by the competent person.

**Maximum Allowable Slope**

The maximum allowable slope for a soil or rock deposit shall be determined from the following table.

**TABLE 1  
MAXIMUM ALLOWABLE SLOPES FOR SOIL OR ROCK DEPOSITS**

Soil or Rock Type	Maximum allowable Slopes (H:V) <sup>(1)</sup> for excavations less than 20 Feet Deep <sup>(3)</sup>
Stable Rock	Vertical (90°)
Type A <sup>(2)</sup>	¾:1 (54°)
Type B	1:1 (45°)
Type C	1½:1 (33°)

## Notes:

1. H:V is the ratio of horizontal distance to vertical rise of the excavation side. Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.
2. A short-term maximum allowable slope of ½H:1V (63°) is allowed in excavations in Type A soil that are 12 feet (3.67 m) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67 m) in depth shall be ¾H:1V (54°) for Type A soil.
3. A registered professional engineer shall design sloping or benching for excavations greater than 20 feet deep.

**Actual Slope**

The actual slope shall not be steeper than the maximum allowable slope.

The actual slope shall be less steep than the maximum allowable slope, when there are signs of distress. If that situation occurs, the slope shall be cut back to an actual slope which is at least ½ horizontal to 1 vertical (½H:1V) less steep than the maximum allowable slope.

When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope, and shall assure that such reduction is achieved.

**APPENDIX E**

**Stormwater Pollution Control Plan**

**TARRYTOWN FORMER MGP SITE  
FINAL ENGINEERING REPORT  
SITE MANAGEMENT PLAN  
TARRYTOWN, NEW YORK**

**APPENDIX E  
BASIC STORMWATER POLLUTION CONTROL PLAN**

**ALERT**

*This Plan presents minimum recommend Stormwater Pollution Control practices to be employed during construction at the subject site. Any earthmoving during construction at the subject site needs to comply with the Site Management Plan and Excavation Work Plan, as well as with the New York State SPDES General Permit for Stormwater Discharges from Construction Activity, Permit No. GP-0-10-001.*

by

**Haley & Aldrich of New York  
Rochester, New York**

for

**Ferry Landings, LLC  
Tarrytown, New York**

**File No. 28590-019  
June 2010**

## Contents

1	NARRATIVE REPORT .....	1
2	STORMWATER MANAGEMENT OBJECTIVES.....	2
3	EXISTING CONDITIONS.....	3
4	POST-CONSTRUCTION CONDITIONS .....	4
5	CONTROLS.....	5
6	MAINTENANCE.....	6
7	INSPECTIONS.....	7
8	NON-STORMWATER DISCHARGES.....	8
9	CERTIFICATIONS.....	9

# 1 NARRATIVE REPORT

The ± 20 acre site is located in the City of Tarrytown, Westchester County, New York. The site is located on West Main St., situated along the east bank of the Hudson River, west of Railroad Ave. *Stormwater management, erosion and sediment control must comply with the New York State SPDES General Permit for Stormwater Discharges from Construction Activity, Permit No. GP-0-10-001.* Erosion and sediment control measures and pollution prevention measures employed in this project must be in compliance with the "New York Guidelines for Urban Erosion and Sediment Control" and the "New York State Stormwater Management Design Manual".

## 1.1 Nature of Construction

Construction may include earthmoving, removal and/or treatment of contaminated soil/sediment from a, demolition of existing buildings, construction of sheet pile walls, utility trench excavation, or other similar activities. Due to the presence of a site-wide catch basin and storm drain system, it is not anticipated that major changes to the existing site drainage will occur as a result of construction at the site.

## 1.2 Intended Sequence of Operations

The following is a sequential list of intended disturbances:

1. Placement of construction entrance, trailers, yard, and decontamination pad (if needed).
2. Installation of erosion control measures, including inlet protection at catch basins.
3. Construction activity.
4. Restoration of site to preexisting condition and drainage.

## 1.3 Area of Disturbance

There area of disturbance should be minimized. Disturbed areas should be brought to final grade and the earth surface stabilized whenever practical to do so.

## 1.4 Estimated Post-Development Runoff Coefficient

Prior to development, the site was almost entirely paved. Construction for re-development will encompass more green space than previously existed. The amount of runoff is expected to decrease compared to pre-development conditions.

## 1.5 Receiving Water / Wetland Acreage

The receiving water for the site is the Hudson River. There is an existing catch basin and storm drain system on site that conveys stormwater to the Hudson River via structures designed to mitigate stormwater quality prior to discharge. The site does not appear to contain wetland areas.

## **2 STORMWATER MANAGEMENT OBJECTIVES**

### **2.1 Purpose**

The purpose of storm water management plan is to maintain existing drainage patterns as much as possible. Also, the plan mitigates potential stormwater quality impacts, and prevents soil erosion and sediment transport resulting from stormwater runoff.

### **2.2 Scope**

Construction activities are not anticipated to alter existing drainage and will include differing methods of stormwater management to assure acceptable stormwater quality prior to exiting the site. Drainage from contaminated stockpile areas will be contained and treated. Construction water collected from excavations must be treated prior to discharge.

### **3 EXISTING CONDITIONS**

#### **3.1 Stormwater Runoff**

Under existing conditions the runoff from the project site is directed to a series of storm drains located throughout the site.

#### **3.2 Topography & Land Cover**

The site is relatively flat and slopes generally from east to west. The land cover is comprised of roads, parking areas, buildings, landscaped areas and open space.

#### **3.3 Soils**

The site is located on land that was built out into the river in stages over many years. Subsurface stratigraphy can be divided into three units: fill, silt with fine grained sand and clayey silt. The fill consists of generally black, fine to coarse sand, gravel, silt, bricks, asphalt, wood, cinders, slag, ash, and other construction related debris. The fill is underlain by silt and fine-grained sand with interbeds of medium grained sand. The lowermost layer consists of interbedded clay and silt.

## **4 POST-CONSTRUCTION CONDITIONS**

### **4.1 Site Improvements**

Post construction conditions will be defined by the purpose of the construction activity. Excavations in open areas will be backfilled and graded to preexisting conditions and stabilized using hay, mulch, seed or other control devices.

### **4.2 Environment**

The site has no listed environmentally sensitive areas. It is adjacent to the Hudson River.

## **5 CONTROLS**

### **5.1 Erosion and Sediment Controls**

The flat site grade and the expected nature of the subsurface excavations are not likely to produce significant opportunities for erosion or sediment transport. Runoff will likely be contained within the excavations and treated as construction water, as previously stated. Preventive measures will be taken to limit sediment transport into storm drains, curb inlets, and other outfalls using hay bales, silt fence, or other readily accepted BMP's. Soil stockpiles will have run-on and run-off BMPs in place. If additional measures are requested by the engineer or the State, a site plan will be amended to indicate the location of these protective measures.

### **5.2 Stormwater Management**

All of the stormwater runoff from the site will be directed to controlled stormwater sewers located throughout the site. Since the project does not significantly alter the runoff conditions, stormwater detention is not proposed.

### **5.3 Other Controls**

Off-site tracking of sediments and the generation of dust shall be minimized. A construction vehicle decontamination pad will be built for use by construction vehicles as needed prior to leaving the site. The contractor will be responsible for daily management of litter and construction debris in order to prevent these materials from being discharged with stormwater. During construction, the contractor will maintain on-site adequate machinery and personnel to promptly contain and collect any chemical or petroleum spills that may occur.

### **5.4 Approved Local or Regional Control Plans**

The project may be subject to other approval processes administered by the local municipalities.

## 6 MAINTENANCE

The erosion and sediment control measures will be installed and maintained by the Contractor until the final surface treatment is installed and the vegetated areas have been fully established. The property owner will assume responsibility for the erosion and sediment control system(s) thereafter. Routine maintenance will be performed on a regular basis.

## **7 INSPECTIONS**

### **7.1 Weekly Inspections**

Erosion and sediment control measures shall be inspected to ensure that they are operating correctly at a minimum on a weekly basis, and immediately following periods of rainfalls greater than 0.5 inch. The inspection must verify that all practices are adequately operational, maintained properly, and that sediment is removed from all control structures. The inspection must also look for evidence of soil erosion on the site, potential of pollutants entering drainage systems, problems at discharge points (such as turbidity in receiving water), and signs of soil and mud transport from the site to the public road at the entrance.

### **7.2 Revisions to SWPPP**

Based on the inspections described above, the pollution prevention measures identified in this plan shall be revised as appropriate, but in no case later than seven (7) calendar days following the inspection. Such modifications shall provide for timely implementation of any changes to the plan within seven (7) calendar days following the inspection.

### **7.3 Inspection Reports**

An inspection report summarizing the scope of the investigation, name(s), date and major observations relating to the implementation of the stormwater pollution prevention plan, and actions taken shall be made and retained as part of the plan for at least three (3) years from the date that the site is finally stabilized.

## 8 NON-STORMWATER DISCHARGES

Non-stormwater discharges associated with excavation dewatering and drainage or runoff collected from the contaminated spoils stockpile will be treated prior to discharge. Effluent water will be tested prior to discharge to either the Hudson River or to the local water pollution control facility. Necessary Federal, state or local permits will be obtained prior to discharge.

## 9 CERTIFICATIONS

### 9.1 Licensed Professional

The undersigned hereby certifies that this SWPPP has been developed in a manner which will ensure compliance with water quality standards and with the *New York State SPDES General Permit for Stormwater Discharges from Construction Activity, Permit No. GP-0-10-001*.

Licensed Professional: \_\_\_\_\_

Company \_\_\_\_\_

Name/Title/Date \_\_\_\_\_

### 9.2 Contractor

All contractors and subcontractors involved with erosion and sediment control on the project site shall sign and date a copy of the following certification statement before undertaking any construction activity at the project site:

"I certify under penalty of law that I understand and agree to comply with the terms and conditions of the pollution prevention plan for the construction site identified in such plan as a condition of authorization to discharge storm water. I also understand that the 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."

Contractor: \_\_\_\_\_

Company \_\_\_\_\_

Name/Title/Date \_\_\_\_\_

Subcontractor: \_\_\_\_\_

Company \_\_\_\_\_

Name/Title/Date \_\_\_\_\_



**Revised 10 May 2005**  
**Updated 19 January 2007**  
**Updated 10 August 2010**

File No. 28590-008

Ferry Landings. LLC  
485 West Putnam Avenue  
Greenwich, CT 06830

Attention: Carl Monheit

Subject: Tarrytown Former MGP Site  
Post-Remediation Groundwater Monitoring Plan  
Tarrytown, New York  
Site No. C360069  
Brownfield Cleanup Index No. W3-1007-04-06

Ladies and Gentlemen:

This letter presents the Post-Remediation Groundwater Monitoring Plan (GMP) for the Tarrytown Former MGP Site, Tarrytown, New York (the Site) for your use. See Figure 1 for the site location. The GMP will be implemented in compliance with the New York State Department of Environmental Conservation (NYSDEC) letter dated 7 March 2005. This letter assesses the current groundwater monitoring network and details the post-remediation groundwater monitoring plan.

## **PURPOSE**

The objective of groundwater monitoring at the Tarrytown Former MGP site is to determine if the quality meets NYS groundwater standards. The GMP was prepared to collect the data necessary, among others, to determine whether or not that groundwater is in a process of self-attenuation (NYSDEC letter dated 7 March 2005).

## **ASSESSMENT OF CURRENT GROUNDWATER MONITORING NETWORK**

Five monitoring wells are to be used for post-remediation monitoring, two upgradient and three downgradient. The well locations are shown on Figure 2, as follows:

- MW-12: upgradient near the eastern site property line,
- MW-29: upgradient near the eastern site property line,
- MW-20: downgradient near the Hudson River, northern location,
- MW-21: downgradient near the Hudson River, central location, and
- MW-24: downgradient near the southern site property line, southern location.

During March and May 2005 MW-12, MW-20, MW-21, and MW-24 were inspected and found to be in satisfactory condition for use in the groundwater monitoring network. Of the remaining monitoring wells, some were removed during remediation excavation, some were destroyed due to site operations since 1997, and the remainder were not positioned near the property line or downgradient from known areas of residual contamination (See Table 1). Boring logs and well completion details for MW-12, MW-20, MW-21, MW-24 and MW-29 are found in Appendix A.

## **GROUNDWATER MONITORING PLAN**

### **Well Network**

The groundwater monitoring network consists of wells MW-12, MW-20, MW-21, MW-24 and MW-29. MW-12 was selected as it is the most upgradient monitoring well and historically lacks detectable concentrations of MGP-related contaminants of concern. MW-29 was installed as a second upgradient well, allowing a comparison of analytical results from two upgradient wells, which will enhance the evaluation of upgradient groundwater quality. The three downgradient wells are located near the Hudson River, MW-20 is in a northern location, MW-21 is in a central location and MW-24 is in a southern location along the site waterfront. MW-21 and MW-24 did not have a measurable LNAPL thickness or sheen when evaluated by Haley & Aldrich in 2003 (MW-20 was not inspected due to obstructed access). In April 2005, MW-20, MW-21, and MW-24 were inspected and found to exhibit no odors or sheens.

### **Well Installation and Well Development**

In August 2006, a hollow-stem auger drilling rig (provided by Geologic – Earth Explorations, Inc.) was used to install the new monitoring well (MW-29). Well MW-29 was installed in a 21 ft deep boring; the well extended to 19 ft below ground surface with a well screen in the bottom 15 ft of the well. The soil boring log and monitoring well installation report for monitoring well MW-29 are presented in Appendix A. Geologic – Earth Explorations, Inc. installed the surface seal and guard pipe at well location MW-29 and restored surface seals and installed guard pipes at well locations MW-12, MW-20, MW-21, and MW-24.

In March 2005, wells MW-12, MW-21, and MW-24 were probed and from one to four feet of fines were measured within the wells. In early May 2005, well MW-20 was also probed and about five feet of sediment was detected at the bottom of the well. On 11 August 2006, the five monitoring wells were developed using dedicated polyethylene tubing and Waterra inertial pumps with foot valves. The sediments were removed from the wells, and the wells were pumped until no visible change in turbidity was noticed in 6 to 12 gallons of discharge. The development water was observed for visual and olfactory evidence of petroleum contamination and was placed in drums for off-site disposal.

## Well Monitoring

The wells will be monitored annually. The annual sampling will occur in May or June, which is consistent with the average annual groundwater recharge period in the northeastern U.S. All sampling will take place during periods of falling tide, so that the possible influence of tidal variability is the same from sampling event to sampling event.

Samples should be collected using *Operating Procedure OP3013 - Monitored Natural Attenuation Groundwater Sample Collection Procedure*, by Haley & Aldrich, 2003 (see Appendix B). Operating Procedure OP3013 is based on the EPA document *Low-Flow (Minimal Drawdown) Methodology*, by R.W. Puls and M.J. Barcelona, dated April 1996. Samples collected should be analyzed for the compounds listed in Table 2 by a NYSDOH Environmental Laboratory Approval Program (ELAP) certified laboratory. These include BTEX compounds, PAH compounds and attenuation indicators. For comparison with historical evidence of light non-aqueous phase liquid (LNAPL) in some site monitoring wells, monitoring rounds shall include use of an interface probe to detect the presence of LNAPL in the monitoring well system.

During the annual sampling event, the wells will be inspected, and needed repairs identified and implemented prior to extraction of samples, if needed to avoid influence on sample quality. If no such influence is suspected (such as minor grout crack repair, repair of locking cap, etc.), the repairs will be completed within one month of the sampling event.

## Quality Assurance

Groundwater sampling will be performed, sample containers prepared and samples preserved for transport in accordance with EPA publication SW-846, entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Chapter Eleven. A Matrix spike/matrix spike duplicate sample will be taken to assess the effect of the sample matrix on organic target compounds. All laboratory results will be reported using NYSDEC ASP Category II deliverables.

## Completion

The NYSDEC Draft DER 10 Section 6.6(d)(i)(i) addresses conditions needed to discontinue groundwater monitoring as follows: *No further monitoring may be required if it has been satisfactorily demonstrated that the contaminant plume is discharging into a body of water with sufficient assimilative capacity to ensure that there is no contravention of surface water standards, threat to fish and wildlife resources or no threat to human health and the environment.*

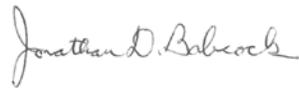
This demonstration may be provided if the data are supportive, for example, if constituents are all within groundwater quality standards or if a substantial decrease of contaminant concentration has occurred that is conclusively demonstrative of attenuation processes.

Ferry Landings. LLC  
Revised 10 May 2005  
Updated 19 January 2007  
Updated 10 August 2010  
Page 4

## REPORTING

Results of the groundwater sampling will be reported to NYSDEC annually, as part of the annual report required in the Site Management Plan.

Sincerely yours,  
HALEY & ALDRICH OF NEW YORK



---

Jonathan D. Babcock, P.E.  
Project Manager

### Attachments:

- Table 1 – Monitoring Well Network Evaluation
- Table 2 – Sampling Parameters and Recommended Analytical Methods
- Figure 1 – Project Locus
- Figure 2 - Monitoring Wells MW-12, MW-20, MW-21, MW-24, MW-29
- Appendix A – Boring and Well Completion Logs
- Appendix B – Low Flow Groundwater Sampling Procedures

G:\Projects\28590\008 Resp to FER Comments\Groundwater Monitoring Plan\Response & Final Document\2010\_0810\_HANY\_rev\_Final Groundwater Monitoring Plan.doc

**APPENDIX G**

**Quality Assurance Project Plan with Field Sampling Plan**

Quality Assurance Project Plan  
Site Management Plan - Tarrytown  
Revision No.: 1  
Date: June 7, 2010  
Section: Executive Summary  
Page: i of i

QUALITY ASSURANCE PROJECT PLAN (QAPP)

REVISION NUMBER 1  
June 7, 2010

Prepared By: Haley & Aldrich of New York



TABLE OF CONTENTS

	<u>Page</u>
1.0 PROJECT DESCRIPTION .....	1
1.1 INTRODUCTION .....	1
1.1.1 PROJECT OBJECTIVES .....	1
1.1.2 PROJECT STATUS/PHASE .....	1
1.1.3 QAPP PREPARATION GUIDELINES .....	1
1.2 SITE DESCRIPTION .....	2
1.3 SITE HISTORY .....	2
1.4 PROJECT OBJECTIVES AND INTENDED DATA USE .....	2
1.4.1 TARGET PARAMETER LIST .....	3
1.4.1.1 FIELD PARAMETERS .....	3
1.4.1.2 LABORATORY PARAMETERS .....	3
1.5 SAMPLING LOCATIONS .....	4
1.6 PROJECT SCHEDULE .....	4
2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES .....	1
2.1 MANAGEMENT RESPONSIBILITIES .....	1
2.2 QUALITY ASSURANCE RESPONSIBILITIES .....	1
2.3 LABORATORY RESPONSIBILITIES .....	2
2.4 FIELD RESPONSIBILITIES .....	4
3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA .....	1
3.1 PRECISION .....	1
3.1.1 DEFINITION .....	1
3.1.2 FIELD PRECISION SAMPLE OBJECTIVES .....	2
3.1.3 LABORATORY PRECISION SAMPLE OBJECTIVES .....	2
3.2 ACCURACY .....	2
3.2.1 DEFINITION .....	2
3.2.2 FIELD ACCURACY OBJECTIVES .....	2
3.2.3 LABORATORY ACCURACY SAMPLE OBJECTIVES .....	3
3.3 REPRESENTATIVENESS .....	3
3.3.1 DEFINITION .....	3
3.3.2 MEASURES TO ENSURE REPRESENTATIVENESS OF FIELD DATA .....	3
3.3.3 MEASURES TO ENSURE REPRESENTATIVENESS OF LABORATORY DATA .....	4
3.4 COMPLETENESS .....	4
3.4.1 DEFINITION .....	4
3.4.2 FIELD COMPLETENESS OBJECTIVES .....	4
3.4.3 LABORATORY COMPLETENESS OBJECTIVES .....	4
3.5 COMPARABILITY .....	5
3.5.1 DEFINITION .....	5

---

3.5.2 MEASURES TO ENSURE REPRESENTATIVENESS OF FIELD DATA.....5  
 3.5.3 MEASURES TO ENSURE REPRESENTATIVENESS OF LABORATORY DATA .....5  
 3.6 LEVEL OF QUALITY CONTROL.....6

4.0 SAMPLING CONTAINERS.....1  
 4.1 SAMPLE CONTAINERS.....1  
 4.2 SAMPLE LABELING .....1  
 4.3 FIELD QC SAMPLE COLLECTION .....2  
 4.3.1 EQUIPMENT RINSATE BLANK SAMPLE COLLECTION.....2  
 4.3.2 FIELD DUPLICATE SAMPLE COLLECTION.....2  
 4.3.2.1 WATER SAMPLES.....2  
 4.3.2.2 SOIL AND SEDIMENT SAMPLES.....2  
 4.3.3 MS/MSD SAMPLE COLLECTION.....2

5.0 CUSTODY PROCEDURES.....1  
 5.1 FIELD CUSTODY PROCEDURES.....1  
 5.1.1 FIELD PROCEDURES .....2  
 5.1.2 TRANSFER OF CUSTODY AND SHIPEMENT PROCEDURES.....3  
 5.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES.....4  
 5.3 STORAGE OF SAMPLES.....5  
 5.4 FINAL PROJECT FILE CUSTODY PROCEDURES.....5

6.0 CALIBRATION PROCEDURES AND FREQUENCY.....1  
 6.1 FIELD INSTRUMENT CALIBRATION PROCEDURES.....1  
 6.2 LABORATORY INSTRUMENT CALIBRATION PROCEDURES.....1

7.0 ANALYTICAL PROCEDURES.....1  
 7.1 FIELD ANALYTICAL PROCEDURES .....1  
 7.2 LABORATORY ANALYTICAL PROCEDURES.....1  
 7.2.1 PROJECT TARGET COMPOUNDS AND DETECTION LIMITS.....2  
 7.2.2 SPECIFIC QUALITY CONTROL CRITERIA .....2

8.0 INTERNAL QUALITY CONTROL CHECKS.....1  
 8.1 FIELD QUALITY CONTROL.....1  
 8.1.1 EQUIPMENT RINSATE BLANKS.....1  
 8.1.2 TRIP BLANKS.....1  
 8.1.3 FIELD DUPLICATE SAMPLES.....2  
 8.2 LABORATORY PROCEDURES.....2

9.0 DATA REDUCTION, VALIDATION AND REPORTING.....1  
 9.1 DATA REDUCTION.....1  
 9.1.1 FIELD DATA REDUCTION.....1  
 9.1.2 LABORATORY DATA REDUCTION .....1

---

9.2 DATA VALIDATION .....2  
9.2.1 PROCEDURES USED TO EVALUATE FIELD DATA .....2  
9.2.2 PROCEDURES USED TO VALIDATE LABORATORY DATA .....2  
9.3 DATA REPORTING.....3  
9.3.1 FIELD DATA REPORTING.....3  
9.3.2 LABORATORY DATA REPORTING .....3

10.0 PERFORMANCE AND SYSTEM AUDITS.....1  
10.1 FIELD PERFORMANCE AND SYSTEM AUDITS.....1  
10.1.1 INTERNAL FIELD AUDIT RESPONSIBILITIES.....1  
10.1.2 EXTERNAL FIELD AUDIT RESPONSIBILITIES.....1  
10.2 LABORATORY PERFORMANCE AND SYSTEM AUDITS.....2  
10.2.1 INTERNAL LABORATORY AUDIT RESPONSIBILITIES.....2  
10.2.2 EXTERNAL LABORATORY AUDIT RESPONSIBILITIES.....2

11.0 PREVENTATIVE MAINTENANCE .....1  
11.1 FIELD INSTRUMENT PREVENTATIVE MAINTENANCE .....1  
11.2 LABORATORY INSTRUMENT PREVENTATIVE MAINTENANCE.....1

12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS .....1  
12.1 FIELD MEASUREMENTS.....1  
12.2 LABORATORY DATA .....1  
12.2.1 PRECISION.....2  
12.2.2 ACCURACY.....2  
12.2.3 COMPLETENESS.....2  
12.3 STATISTICAL EVALUATIONS.....2  
12.3.1 PERCENT RECOVERY .....2  
12.3.2 RELATIVE PERCENT DIFFERENCE.....3

13.0 CORRECTIVE ACTION.....1  
13.1 FIELD CORRECTIVE ACTION .....1  
13.2 LABORATORY CORRECTIVE ACTION .....1  
13.3 CORRECTIVE ACTION DURING DATA VALIDATION AND ASSESSMENT.....2

14.0 QUALITY ASSURANCE REPORTS.....1

15.0 REFERENCES.....1

---

LIST OF TABLES

TABLE 1.1	SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
TABLE 1.2	PARAMETER LIST
TABLE 7.1	SUMMARY OF ANALYTICAL METHODS

ATTACHMENTS

ATTACHMENT 1	FIELD ANALYTICAL STANDARD OPERATING PROCEDURES
--------------	--

---

## 1.0 PROJECT DESCRIPTION

Protocols for sample collection, sample handling and storage, chain-of-custody procedures, and laboratory and field analyses are described or specifically referenced to related investigation documents.

### 1.1 INTRODUCTION

This QAPP has been prepared as a component of the Site Management Plan (SMP).

#### 1.1.1 PROJECT OBJECTIVES

The primary objectives for data collection activities include:

Any media sampling (e.g., soil, sediment, groundwater, vapor and/or surface water) to support implementation and management of site Engineering or Institutional Controls (EC or IC), ongoing monitoring (in accordance with SMP), and/or operation and monitoring of the implementation of the recovery systems.

Specific data quality objectives (DQO) for field and laboratory data collection and analysis activities are discussed in Section 1.4 of this plan.

#### 1.1.2 PROJECT STATUS/PHASE

The project status and investigation approach is presented in the SMP. Section 1 provides the Site background and summary of current status. Section 2 describes the EC and ICs in place at the site. Section 3 describes the monitoring plan. Section 4 summarizes operation and maintenance. Section 5 provides a summary of the reporting requirements.

#### 1.1.3 QAPP PREPARATION GUIDELINES

As previously noted, this QAPP has been prepared to present the project specific QA/QC elements in accordance with "EPA Guidance for Quality Assurance Project Plans", EPA QA/G-5,

---

EPA/600/R-98/018, February 1998 and NYSDEC Division of Remediation DRAFT DER-10, Technical Guidance for Site Investigation and Remediation, November 4, 2009.

## 1.2 SITE DESCRIPTION

The Site description is provided in Section 1.1 of the SMP and is incorporated here by reference.

## 1.3 SITE HISTORY

The Site history is provided in Section 1.2 of the SMP and is incorporated here by reference.

## 1.4 PROJECT OBJECTIVES AND INTENDED DATA USE

The site contains contamination left after completion of the remedial action. ECs have been incorporated into the site remedy to control exposure to remaining contamination during the use of the site to be protective of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Westchester County Clerk, requires compliance with this SMP and all ECs and ICs placed on the site. The ICs place restrictions on site use, and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. This SMP specifies the methods necessary for compliance with the ECs and ICs required by the Environmental Easement for contamination that remains at the site.

This SMP provides a detailed description of the procedures required to manage remaining contamination at the site after completion of the Remedial Action, including: (1) implementation and management of the ECs and ICs; (2) media monitoring; (3) operation and maintenance of the recovery systems; (4) performance of periodic inspections, certification of results, and submittal of Periodic Review Reports; and (5) defining criteria for termination of recovery system operations.

To address these needs, this QAPP covers any sampling (e.g., soil, sediment, groundwater, vapor and/or surface water) necessary under the SMP. This includes sampling to support implementation and management of site Engineering or Institutional Controls (EC or IC),

---

ongoing monitoring (in accordance with SMP), and/or operation and monitoring of the implementation of the recovery systems.

#### 1.4.1 TARGET PARAMETER LIST

The investigative program includes the sampling and analysis of environmental media for the presence of organic and inorganic constituents as specified in the SMP. A summary of sampling and analysis by media are provided on Table 1.1.

##### 1.4.1.1 FIELD PARAMETERS

Concurrent with sample collection, several field parameters will be determined by the field sampling personnel. For soils and solid matrices, these field parameters will include visual observations, odor identification, and VOC screening using handheld monitoring equipment. For aqueous samples (surface water and groundwater), at a minimum, the following parameters will be determined with field testing equipment: pH, specific conductivity, and temperature. The low-flow purging techniques utilized for groundwater sampling, will include additional field parameters including turbidity, dissolved oxygen, and oxidation/reduction potential (ORP) will be measured.

##### 1.4.1.2 LABORATORY PARAMETERS

Potential laboratory parameters include target compound list (TCL) volatile organic compounds (VOCs), BTEX VOCs, TCL-semi volatile organic compounds (SVOCs), Polyaromatic Hydrocarbons (PAHs), TCL polychlorinated biphenyls (PCBs), and target analyte list (TAL) metals excluding earth metals aluminum, calcium, iron, magnesium, potassium, and sodium.

Table 1.2 presents the estimated quantitation limits (EQL) for each compound or analyte. Method detection limit (MDL) studies have been performed in accordance with the procedures established in the Federal Register, Volume 49, number 209, October 26, 1984 pp. 198-199, the results of these MDL studies are presented in Appendix D.

---

1.5 SAMPLING LOCATIONS

The SMP provides a summary of potential vapor, soil and groundwater sampling associated with the site. It is possible, however, that depending on the nature of encountered field conditions, sampling media requirements may change. The person responsible for making such decisions will be the Field Quality Assurance (QA) Officer whose responsibilities are described in Section 2.0 of this QAPP.

1.6 PROJECT SCHEDULE

Current and long-term operation and monitoring schedules are described in the SMP.

---

## 2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

### 2.1 MANAGEMENT RESPONSIBILITIES

A description of the project organization and responsibilities of key personnel are as follows:

#### NYSDEC Project Manager

The NYSDEC Project Manager has the overall responsibility for regulatory oversight during performance of activities in the SMP.

#### Haley & Aldrich Project Manager

The Project Manager will provide final review of significant work products and may participate in technical meetings. The Project Manager will ensure that overall technical quality is maintained and will be actively involved in the direction of the project. The Project Manger has overall responsibility for ensuring that the project meets objectives.

The Project Manager will:

- i) Acquire and apply technical and other resources as needed to ensure performance within budget and schedule restraints;
- ii) Review work performed on each task to ensure quality, responsiveness, and timeliness; and
- iii) Be responsible for the preparation and quality of interim and final reports;

### 2.2 QUALITY ASSURANCE RESPONSIBILITIES

The Quality Assurance team will consist of a Quality Assurance Officer and the Project Manager. Quality Assurance responsibilities are described as follows:

#### Quality Assurance (QA) Officer

---

The QA Officer reports directly to the Project Manager and will be responsible for ensuring that all QA/QC procedures are being followed. The QA Officer will be responsible for overseeing the review of all field and laboratory data. Additional responsibilities include :

- i) Assuring the application and effectiveness of the QAAPP by the analytical laboratory and the project staff;
- ii) Conducting internal QA/QC of the investigation activities;
- iii) Providing input to the Project Manager as to corrective actions required resulting from the above-mentioned evaluations;
- iv) Preparation and review of data validation and audit reports; and
- v) Approval of the QAAPP.

The QA Officer will be assisted by the data validation staff in the evaluation and validation of field and laboratory generated data. The QA Officer will monitor the performance of the laboratory to ensure that the Data Quality Objectives for the project are met.

## 2.3 LABORATORY RESPONSIBILITIES

### Laboratory Project Manager

The Laboratory Project Manager will report directly to the Project QA Officer and will be responsible for ensuring all resources of the laboratory are available on an as-required basis. The Laboratory Project Manager will also be responsible for the approval of the final analytical reports and approval of the laboratory's ability to adhere to the QAAPP.

### Laboratory Operations Manager

The Laboratory Operations Manager will report to the Project Manager and will be responsible for coordinating laboratory analysis, supervising in-house chain-of-custody reports, scheduling sample analyses, overseeing data review, and overseeing preparation of analytical reports

### Laboratory QA Officer

The Laboratory QA Officer will have sole responsibility for review and validation of the analytical laboratory data generated as part of the RFI. The Laboratory QA Officer will sign all final

---

laboratory data reports provided from the analysis of the project samples and will provide Case Narrative descriptions of any data quality issues encountered during the analyses conducted by the laboratory. The QA Officer will also define appropriate QA procedures, overview QA/QC documentation, and approve this QAPP.

#### Laboratory Sample Custodian

The Laboratory Sample Custodian will report to the Laboratory Operations Manager and will be responsible for the following:

- i) Receiving and inspecting the incoming sample containers;
- ii) Recording the condition of the incoming sample containers;
- iii) Signing appropriate documents;
- iv) Verifying chain-of-custody and its correctness;
- v) Notifying the Project Manager and Operations Manager of sample receipt and inspection;
- vi) Assigning a unique identification number and customer number, and entering each into the sample receiving log;
- vii) Initiating transfer of samples to lab sections; and
- viii) Controlling and monitoring access/storage of samples and extracts.

#### Laboratory Technical Personnel

The laboratory technical staff will have the primary responsibility in the performance of sample analysis and the execution of the QA procedures developed to determine the data quality. These activities will include the proper preparation and analysis of the project samples in accordance with the contract laboratory's Quality Assurance Manual and associated Standard Operating Procedures.

#### Data Validation Staff

The data validation staff will be independent of the laboratory and familiar with the analytical procedures performed. The validation will include a review of each validation criterion as prescribed by the guidelines presented in Section 9.2.2 of this document and be presented in a formal written report for submittal to the Project Manager.

---

## 2.4 FIELD RESPONSIBILITIES

### Field QA Officer

The Field QA Officer is responsible for the overall operation of the field team and reports directly to the Project Manager. The Field QA Officer works with the project Health & Safety Officer to conduct operations in compliance with the project Health & Safety Plan. The Field QA Officer will facilitate communication and coordinate efforts between the Project Manager and the field team members. Other responsibilities include:

- i) Developing and implementing field-related work plans, ensuring schedule compliance, and adhering to management-developed project requirements;
- ii) Coordinating and managing field staff, including sampling and drilling;
- iii) Performing field system audits;
- iv) Overseeing quality control for technical data provided by the field staff;
- v) Preparing, and approving of text and graphics required for field team efforts;
- vi) Coordinating and overseeing technical efforts of subcontractors assisting the field team;
- vii) Identifying problems in the field, resolving difficulties in consultation with the Project Manager and Project QA Officer, implementing and documenting corrective action procedures;
- viii) Approving the QAPP; and
- ix) Participating in preparation of the final reports.

### Field Team Personnel

Field Team Personnel will be responsible for:

- i) Performance of field sampling activities as required under the SMP and in compliance with the DQO outlined in this QAPP; and
  - ii) Immediately reporting any accidents and/or unsafe conditions to the Site Health & Safety Officer and taking all reasonable precautions to prevent injury.
-

### 3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The SMP and associated QAPP are designed to produce data of the quality necessary to achieve the project objectives and meet or exceed the minimum standard requirements for field and analytical methods. The overall QA objective for measurement data is to develop and implement procedures for field sampling, chain-of-custody, lab analyses, and reporting that will provide results which are adequate for supporting the RI objectives and legally defensible in a court of law. The QAPP program will include:

- i) A mechanism for ongoing control of measurements and evaluation of data quality.
- ii) A measure of data quality in terms of precision, accuracy, representativeness, completeness, and comparability.

The following section is a general discussion of the criteria used to measure the field and laboratory analytical data quality. The laboratory reference data and standard operating procedures (SOPs) provided in the SMP, present the performance criteria for laboratory QC objectives.

#### 3.1 PRECISION

##### 3.1.1 DEFINITION

Precision is defined as a quantitative measure of the degree to which two or more measurements are in agreement. Precision will be stated in terms of relative percent difference (RPD). The overall precision of measurement data is a mixture of sampling and analytical factors. Precision will be determined by collecting and analyzing field duplicate samples and by creating and analyzing laboratory duplicates from one or more of the field samples. The analytical results from the field duplicate samples will provide data on sampling precision. The results from the laboratory created duplicate samples will provide data on analytical precision.

---

### 3.1.2 FIELD PRECISION SAMPLE OBJECTIVES

In the event of non-routine sampling events beyond SMP monitoring, field precision will be assessed through collection and measurement of field duplicates at a rate of 1 duplicate per 20 samples.

### 3.1.3 LABORATORY PRECISION SAMPLE OBJECTIVES

Laboratory duplicate analyses will be performed through the use of matrix spike/matrix spike duplicates (MS/MSD) for organic parameters and matrix duplicate (MD) analyses for certain inorganic parameters. The analytical data will be presented in summary table format.

## 3.2 ACCURACY

### 3.2.1 DEFINITION

Accuracy relates to the bias in a measurement system. Bias is the difference between the observed and the "true" value. Sources of error are the sampling process, field contamination, preservation techniques, sample handling, sample matrix, sample preparation and analytical procedure limitations.

### 3.2.2 FIELD ACCURACY OBJECTIVES

Sampling bias will be assessed by evaluating the results of field trip blanks. Trip blanks will be maintained and analyzed as appropriate for each sampling effort.

Trip blank samples will be prepared by the laboratory and provided with each cooler that includes volatile organic compound (VOC) analysis containers. Trip blank samples will be analyzed for each VOC for which environmental media have been collected for analysis.

---

### 3.2.3 LABORATORY ACCURACY SAMPLE OBJECTIVES

Analytical bias will be assessed through the use of known laboratory control sample analyses. Laboratory control samples (LCS) sample analysis will be performed as prescribed by the analytical method SOPs. LCS analyses will be performed with each analytical batch of project samples to determine the accuracy of the analytical system.

The results of the LCS analyses will be presented in a summary table reporting format and evaluated versus the acceptance criteria presented in the laboratory analytical reports.

The accuracy of organic parameter analyses is also monitored through the analysis of system monitoring or surrogate compounds. Surrogate compounds are added to each sample, standard, blank, and QC samples prior to the sample preparation and analysis. Surrogate compound percent recoveries provide information on the effect of the sample matrix on the accuracy of the analyses and are evaluated against the acceptance criteria presented in laboratory analytical reports.

### 3.3 REPRESENTATIVENESS

#### 3.3.1 DEFINITION

Representativeness expresses the degree to which sample data accurately and precisely represents a characteristic of a population, a parameter variation at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that is dependent upon the design of the sampling program. The representativeness criterion is satisfied by proper selection of sampling locations and quantity of samples collected.

#### 3.3.2 MEASURES TO ENSURE REPRESENTATIVENESS OF FIELD DATA

Representativeness will be addressed by describing sampling techniques and the rationale used to select sampling locations. Sampling locations may be biased (based on existing data, instrument surveys, observations, etc.) or unbiased (completely random or stratified-random approaches). Specific sampling technique descriptions, which allow consistency, repetitiveness and thus representativeness, are provided as SOPs.

---

### 3.3.3 MEASURES TO ENSURE REPRESENTATIVENESS OF LABORATORY DATA

Representativeness in the laboratory is ensured by using proper analytical procedures, and analyzing field duplicate samples. By definition, field duplicate samples are collected to be representative of a given point in space and time. Thus, sample duplicates provide both precision and representativeness information.

### 3.4 COMPLETENESS

#### 3.4.1 DEFINITION

Completeness is a measure of the amount of valid (usable) data obtained from a measuring system compared to the amount that was expected to be obtained under normal conditions. The completeness goal for all data uses is that a sufficient amount of valid data be generated so that determinations can be made related to the intended data use with a high degree of confidence.

#### 3.4.2 FIELD COMPLETENESS OBJECTIVES

Completeness is a measure of the amount of valid measurements obtained from all measurements taken in this project. Field completeness objective for this project will be > 90 percent.

#### 3.4.3 LABORATORY COMPLETENESS OBJECTIVES

Laboratory data completeness objective is a measure of the amount of valid data obtained from all laboratory measurements. The evaluation of the data completeness will be performed at the conclusion of each sampling and analysis effort. Corrective actions such as revised sample handling procedures will be implemented if problems are noted.

The completeness of the data generated will be determined by comparing the amount of valid data, based on independent validation, with the total data set. The completeness objective will be > 90 percent.

---

### 3.5 COMPARABILITY

#### 3.5.1 DEFINITION

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another.

#### 3.5.2 MEASURES TO ENSURE REPRESENTATIVENESS OF FIELD DATA

Sample data should be comparable with other measurement data for similar samples and sample conditions. This goal is achieved through using standard operating procedures to collect, preserve, store, and analyze representative samples and the reporting of analytical results. The field SOPs for the various activities to be conducted during this investigation provide guidelines to generate reproducible results.

#### 3.5.3 MEASURES TO ENSURE REPRESENTATIVENESS OF LABORATORY DATA

Comparability of laboratory data will also be measured with the results from the analysis of Standard Reference Materials (SRM) obtained from either EPA Cooperative Research and Development Agreement (CRADA) suppliers or the National Institute of Standards and Technology (NIST) for instrument initial and continuing calibration verification. The reported analytical data will be presented in standard units of mass of contaminant within a known volume or mass of environmental media.

- i) Solid Matrices - micrograms ( $\mu\text{g}$ ) contaminant per kilogram (kg) for organic analyses, and milligrams (mg) contaminant per kilogram (kg) for inorganic analyses of media (Dry Weight).
  - ii) Aqueous Matrices – micrograms ( $\mu\text{g}$ ) contaminant per liter (L) of media for organic analyses, and milligrams (mg) per liter (L) for inorganic analyses.
  - iii) Non-Aqueous Phase Liquids – (NAPL) – micrograms ( $\mu\text{g}$ ) contaminant per kilogram (kg) of media.
  - iv) Gaseous Matrices – micrograms ( $\mu\text{g}$ ) contaminant per cubic meter ( $\text{M}^3$ ) of media
-

Additional guidance on analytical data reporting is contained in the laboratory SOPs.

### 3.6 LEVEL OF QUALITY CONTROL

Trip, and method blanks samples, field duplicate samples, laboratory control and MS/MSD samples will be prepared and analyzed to determine the data quality provided by the sampling and analysis activities.

Trip blanks are used to assess the potential for contamination during sample storage and shipment. The trip blank consists of laboratory purified water that has been purged with an inert gas by the laboratory and provided with the sample containers to be used for the sampling of VOCs. Trip blanks will be preserved and handled in the same manner as the investigation samples. One trip blank will be included along with each shipment cooler containing project samples to be analyzed for VOCs.

Method blank samples will be prepared by the laboratory and analyzed concurrently with all project samples to assess potential contamination introduced during the analytical process.

As needed-for non routine sampling events, field duplicate samples are analyzed to check for sampling and analytical reproducibility. One field duplicate will be collected for every 20 or fewer investigative samples collected per day of sampling activities.

Matrix spikes will provide information to assess the precision and accuracy of the analysis of the target parameters within the environmental media collected at the Site. Matrix spikes will be performed in duplicate for all site TCL/TAL parameters. If needed for non-routine sampling events, one MS/MSD will be collected for every 20 or fewer investigative samples per sample matrix (i.e. soil, groundwater). Soil MS/MSD samples require a triple sample volume for VOCs only. Aqueous MS/MSD samples require triple the normal sample volume for VOCs analysis and double the volume for the remaining parameters.

---

#### 4.0 SAMPLING CONTAINERS

Samples of groundwater, surface water, soil, and sediment will be obtained as outlined in the SMP. The sampling procedures for the SMP will be consistent for the objectives of the project. The SMP describes each of the sampling tasks and objectives.

Refer to the SMP for the field investigation groundwater monitoring plan and field sampling pplan (operating procedures).

##### 4.1 SAMPLE CONTAINERS

Sample containers for each sampling task will be provided by the project laboratory. The containers will be cleaned by the manufacturer to meet or exceed the analyte specifications established in the U.S. EPA, " Specifications and Guidance for Obtaining Contaminant-Free Sample Containers", April 1992, OSWER Directive #9240.0-0.5A. Certificates of analysis for each lot of sample containers used during the RFI will be maintained by the laboratory and will be available upon request.

The appropriate sample containers, preservation method, maximum holding times, and shipping information for each target parameter and sampling task are provided in the standard procedures provided in Attachment 1.

##### 4.2 SAMPLE LABELING

Each sample will be labeled with a unique sample number that will facilitate tracking and cross-referencing of sample information. Field blank and field duplicate samples also will be numbered with a unique sample number to prevent analytical bias of field QC samples.

---

#### 4.3 FIELD QC SAMPLE COLLECTION

##### 4.3.1 EQUIPMENT RINSATE BLANK SAMPLE COLLECTION

Equipment rinse blank samples will be collected when non-dedicated or non-disposable sampling equipment is used to collect samples. Equipment rinse blanks consist of purified water that has been routed through decontaminated sampling equipment and collected into the appropriate containers. The containers will be filled in order of decreasing analyte volatility (i.e., VOCs first, SVOCs second, which are followed by the containers for the remaining analyses).

##### 4.3.2 FIELD DUPLICATE SAMPLE COLLECTION

###### 4.3.2.1 WATER SAMPLES

Field duplicate samples will be collected concurrently with the investigative sample alternating the filling of each sample container using the procedures identified in the SMP.

###### 4.3.2.2 SOIL AND SEDIMENT SAMPLES

Soil sample field duplicates will be collected concurrently with the investigative sample using the procedures identified in the SMP.

##### 4.3.3 MS/MSD SAMPLE COLLECTION

MS/MSD sample collection for aqueous samples requires triple the sample volume for VOC analysis and double the volume for all remaining parameters. Soil MS/MSD samples require triple volume for VOC analyses. No additional volume is required for remaining soil parameters.

---

## 5.0 CUSTODY PROCEDURES

Custody is one of several factors necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files. Final evidence files, including all originals of laboratory reports, are maintained under document control in a secure area.

Custody of a sample begins when it is collected by or transferred to an individual and ends when that individual relinquishes or disposes of the sample. A sample or evidence file is under your custody if:

1. the item is in actual possession of a person;
2. the item is in the view of the person after being in actual possession of the person;
3. the item was in actual possession but is stored to prevent tampering; or
4. the item is in a designated and identified secure area.

### 5.1 FIELD CUSTODY PROCEDURES

Field personnel will be required to keep written records of field activities on applicable preprinted field forms or in a bound field notebook. The logbooks provide the means of recording data collecting activities. These records will be written legibly in ink and will contain pertinent field data and observations. Entry errors or changes will be crossed out with a single line, dated and initialed by the person making the correction. Field forms and notebooks will be periodically reviewed by the Field QA Officer. Each member of the field team will be assigned a logbook. Each logbook title page should include field team member's name, project name, project start date, project end date, and unique logbook number.

The beginning of each entry in the logbook will contain the following information:

- i) Date,
  - ii) Start ,time
  - iii) Weather,
-

- iv) Names of field personnel (including subcontractors),
- v) Level of personal protection used at the Site, and
- vi) Names of all visitors and the purpose of their visit.

For each measurement and sample collected the following will be recorded:

- i) Detailed description of sample point,
- ii) Equipment used to collect sample or make measurement and the date equipment was last calibrated,
- iii) Time sample was collected,
- iv) Sample description,
- v) Depth sample was collected,
- vi) Volume and number of containers, and
- vii) Sampler identification.

#### 5.1.1 FIELD PROCEDURES

The data quality can be affected by sample collection activities. If the integrity of collected samples is questionable, the data, regardless of its analytical quality, will also be questionable.

The following procedure describes the process to maintain the integrity of the samples:

- i) Upon collection samples are placed in the proper containers. In general, samples collected for organic analysis will be placed in pre-cleaned glass containers, and samples collected for inorganic analysis will be placed in pre-cleaned plastic (polyethylene) bottles. The sample container, preservation methods, shipping, and packaging requirements are presented in standard procedures provided in Attachment 1.
  - ii) Samples will be assigned a unique sample number and will be affixed to a sample label. The information to be placed on the sample label will include the sample ID number, the sample type, the sampler's name, date collected, preservation technique, and analytical parameter and method to be performed. Information on the labels will be completed with a ballpoint pen or indelible marker.
-

Revision No.: 1  
Date: June 7, 2010  
Section: 5.0  
Page: 3 of 6

- iii) Samples will be properly and appropriately preserved by field personnel in order to minimize loss of the constituent(s) of interest due to physical, chemical or biological mechanisms. Sample aliquots that require preservation (pH adjustment) will be checked with pH paper at the time of preservation. Confirmation of preservation will include capping of the preserved sample, inverting the sample three times, uncapping and confirming the sample pH. If required, additional preservative will be added and the procedure repeated until proper preservation is achieved. Samples for VOC analysis will be collected in pre-preserved containers and will not undergo this procedure.
- iv) Appropriate volumes will be collected to ensure that the EQLs can be successfully achieved and that the required QC Sample Analyses can be completed.

#### 5.1.2 TRANSFER OF CUSTODY AND SHIPMENT PROCEDURES

- i) A chain-of-custody (COC) record will be completed during sample collection and will accompany each shipment identifying the contents of the shipment. The COC record will accompany the samples to the laboratory. The field personnel collecting the samples will be responsible for the custody of the samples until the samples are relinquished to the laboratory. Sample transfer will require the individuals relinquishing and receiving the samples to sign, date and note the time of sample transfer on the COC record. As few people as possible should handle the samples.
  - ii) Samples will be shipped or delivered in a timely fashion to the laboratory so that holding-times and/or analysis times as prescribed by the methodology can be met.
  - iii) Samples will also be transported in containers (coolers) packed with ice to maintain the temperatures prescribed in standard sampling procedures in Attachment 1. Samples will be packaged for shipment and shipped to the appropriate laboratory for analysis with a separate signed chain-of-custody record enclosed in each sample cooler. Water VOC samples will be placed in bubble wrap bags that contain three containers per bag while soil VOC samples will be placed in sealed sample pouches. The remaining samples in glass containers will be wrapped in bubble wrap and placed in the sample cooler. Samples in polyethylene containers will be placed upright directly in the sample cooler. All samples will be placed in an upright position and limited to one layer of samples per each cooler. Additional bubble wrap or packaging material will be added to fill the cooler. Shipping
-

containers will be secured with strapping tape and custody tape for shipment to the laboratory.

- iv) When samples are split with a third party and Site representatives, a separate chain-of-custody will be prepared for the samples and marked to indicate to whom the samples are being split. The person relinquishing the samples to the third party or the Site will require the representatives signature acknowledging sample receipt.
- v) If samples are sent by a commercial carrier, a bill of lading will be used. A copy of the bill of lading will be retained as part of permanent documentation. Commercial carriers are not required to sign the custody record as long as the custody record is sealed inside the sample cooler and the custody tape remains intact.
- vi) Samples will be picked up by a laboratory courier or transported overnight by a courier to the laboratory the same day they are collected unless collected on a weekend or holiday. In these cases, the samples will be stored in a secure location until delivery to the lab. Additional ice will be added to the cooler as needed to maintain proper preservation temperatures.

## 5.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

A full-time sample custodian will be assigned the responsibility of sample control. It will be the responsibility of the sample custodian to receive all incoming samples. Once received, the custodian will document that the custody tape on the coolers is unbroken, that each sample is received in good condition (i.e., unbroken, cooled, etc.), that the associated paperwork, such as chain-of-custody forms have been completed and will sign the chain-of-custody forms. In special cases, the custodian will document from appropriate sub-samples that chain-of-custody with proper preservation has been accomplished. The custodian will also document that sufficient sample volume has been received to complete the analytical program. The sample custodian will then place the samples into secure, limited access storage (refrigerated storage, if required). The sample custodian will assign a unique number to each incoming sample for use in the laboratory. The unique number will then be entered into the sample-receiving log. The laboratory date of receipt will also be noted.

---

Consistent with the analyses requested on the chain-of-custody form, analyses by the laboratory's analysts will begin in accordance with the appropriate methodologies. Samples will be removed from secure storage only after internal chain-of-custody sign-out procedures have been followed.

### 5.3 STORAGE OF SAMPLES

Sample containers with volume remaining will be returned to secure and limited access storage. Upon completion of all laboratory analyses for each sample submittal and generation of the laboratory report, samples will be stored by the sample custodian. The length of time that samples are held will be at least thirty (30) days after reports have been submitted. Disposal of remaining samples will be completed in compliance with all Federal, State, and local requirements.

Laboratory custody procedures and document control for those samples analyzed by the project laboratory will be carried out using the laboratory's standard operating procedures.

### 5.4 FINAL PROJECT FILE CUSTODY PROCEDURES

The final project file will be the central repository for all documents with information relevant to sampling and analysis activities as described in this QAPP. The Project Manager will be the custodian of the project file. The project files for site, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports, and data reviews will be maintained in a secured, limited access area and under custody of the Project Manager or his designee.

The final project file will include:

- i) Project plans and drawings;
  - ii) Field data records;
  - iii) Sample identification documents and soil boring/monitoring well logs;
  - iv) All chain-of-custody documentation;
  - v) Correspondence;
  - vi) References, literature;
  - vii) Laboratory data deliverables;
  - viii) Data validation and assessment reports;
  - ix) Progress reports, QA reports; and
-

Quality Assurance Project Plan

Revision No.: 1  
Date: June 7, 2010  
Section: 5.0  
Page: 6 of 6

x) Final report.

The laboratory will be responsible for maintaining analytical logbooks, laboratory data and sample chain of custody documents. Raw laboratory data files and copies of hard copy reports will be inventoried and maintained by the laboratory for a period of six (6) years.

## 6.0 CALIBRATION PROCEDURES AND FREQUENCY

This section describes procedures for maintaining the accuracy for all the instruments and measurement equipment, which will be used for conducting field tests and laboratory analyses. These instruments and equipment will be calibrated prior to each use or according to a periodic schedule.

### 6.1 FIELD INSTRUMENT CALIBRATION PROCEDURES

Instruments and equipment used to gather, generate, or measure environmental data will be calibrated as specified in the field SOPs.

The field instruments are likely to include dissolved oxygen meters, pH meters, turbidity meters, specific conductance meters and PIDs. Field instruments will be used for real-time sample measurement during monitoring well sampling and organics screening for both on-site screening of soil samples and for health and safety air monitoring, as described in the HASP. On-site air monitoring for health and safety purposes and the screening of soil samples may be accomplished using PIDs.

Field instruments will be calibrated prior to use and the calibration will be verified after a maximum of 10 measurements. Specific information concerning calibration frequency, acceptance criteria, and the conditions that require more frequent calibration is contained in the field SOPs in Attachment 1.

Satisfactory completion of the pre-operation inspection will be noted on the Field Sampling Record, along with the results of each field measurement.

### 6.2 LABORATORY INSTRUMENT CALIBRATION PROCEDURES

Calibration procedures for a specific laboratory instrument will consist of initial calibration, initial calibration verification and continuing calibration verification. The laboratory follows standard procedures for each analysis performed in the laboratory which includes the calibration procedures, their frequency, acceptance criteria and the conditions that will require calibration. In all cases,

---

## Quality Assurance Project Plan

Revision No.: 1  
Date: June 7, 2010  
Section: 6.0  
Page: 2 of 4

the initial calibration will be verified using an independently prepared calibration verification solution.

The use of materials of known purity and quality will be utilized for the analysis of environmental samples. The laboratory will carefully monitor the use of all laboratory materials including solutions, standards and reagents through well-documented procedures.

All solid chemicals and acids/bases used by the laboratory will be reagent grade or better. All gases will be high purity or better. All Standard Reference Materials (SRMs) or Performance Evaluation (PE) Materials will be obtained from approved vendors of the National Institute of Standards and Technology (formerly National Bureau of Standards), the U.S. EPA Environmental Monitoring Support Laboratories (EMSL), or reliable Cooperative Research and Development Agreement (CRADA) certified commercial sources.

All materials including standards or standard solutions will be dated upon receipt, and will be identified by material name, lot number, purity or concentration, supplier, receipt/preparation date, recipient/preparer's name, expiration date and all other pertinent information.

---

## 7.0 ANALYTICAL PROCEDURES

Analytical procedures to be utilized for off-Site analysis of environmental samples will be based on referenced U.S. EPA analytical protocols and the laboratory SOPs that implement these methods.

### 7.1 FIELD ANALYTICAL PROCEDURES

Field analytical procedures include the measurement of pH/temperature, specific conductivity, dissolved oxygen, turbidity and ORP during sampling of groundwater, and the qualitative measurement of VOC during the collection of soil samples at the Site. Specific guidance in the measurement of these parameters is presented in the SOPs provided in Attachment 1 of this QAAPP.

### 7.2 LABORATORY ANALYTICAL PROCEDURES

Laboratory preparation and analytical SOPs are presented in Table 7.1. The laboratory SOPs are based on the U.S. EPA methodology requirements promulgated in:

- "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846 EPA, U.S. EPA Office of Solid Waste, 3<sup>rd</sup> Edition and promulgated updates, 1986;
  - "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983;
  - "Standard Methods for the Examination of Water and Wastewater", APHA, AWWA & WEF, 19th Edition, 1995, and;
  - "Standard Operating Procedure RSK 175", U.S.EPA Robert S. Kerr Environmental Research Laboratory, Ada OK.
  - U.S. EPA Method TO-15 Determination Of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed By Gas Chromatography/Mass Spectrometry (GC/MS)
-

7.2.1 PROJECT TARGET COMPOUNDS AND DETECTION LIMITS

A complete listing of project target compounds and project EQLs for each analyte group are listed in Table 1.2. MDLs have been experimentally determined by the project laboratory using the procedure identified in 40 CFR, Part 136 Appendix B.

7.2.2 SPECIFIC QUALITY CONTROL CRITERIA

The laboratory SOPs include a section that presents the minimum QC requirements for the project analyses. Section 8.0 references the frequency of the associated QC samples for each sampling effort and matrix.

---

## 8.0 INTERNAL QUALITY CONTROL CHECKS

This section presents the internal quality control checks that will be employed for field and laboratory measurements.

### 8.1 FIELD QUALITY CONTROL

QC procedures for pH/temperature, turbidity and conductivity of water samples and PID screening soil samples will include calibrating the instruments as described in Section 6.1 of this QAPP, measuring duplicate samples and checking the reproducibility of the measurements by taking multiple readings on a single sample or the measurement reference standards. The QC information for field equipment is stated in Section 3.0 of this QAPP. Assessment of field sampling precision and bias will be made by collecting field duplicates and equipment rinse blanks for laboratory analysis. Collection of the samples will be in accordance with the applicable procedures in Section 4.3 of this QAPP.

#### 8.1.1 EQUIPMENT RINSATE BLANKS

Internal quality control checks will include analysis of equipment rinse blanks to validate successful equipment cleaning activities. Whenever possible, dedicated equipment will be employed to reduce the possibility of cross-contamination of samples.

The frequency of equipment rinse blank sample preparation will be one for every 20 investigative samples, if needed for non-routine sampling events in the SMP.

#### 8.1.2 TRIP BLANKS

Trip blanks samples will be prepared by the project laboratory using laboratory purified water placed within pre-cleaned 40 milliliter (ml) VOC vials equipped with teflon septa. Trip blanks will accompany each sample delivery group (SDG) of environmental samples collected for analysis of VOCs.

---

Trip blank samples will be placed in each cooler which stores and transports project samples to be analyzed for VOCs along with the project samples.

### 8.1.3 FIELD DUPLICATE SAMPLES

As needed for non-routine sampling events under the SMP, field duplicate samples are collected in a similar fashion to investigative samples at a minimum frequency of one duplicate per at least one in every 20 or fewer investigative samples by matrix at a minimum, one per sampling event. Field duplicate samples are analyzed by the laboratory to evaluate matrix, sample and analytical reproducibility.

## 8.2 LABORATORY PROCEDURES

The laboratories identified in Section 7.0 of this QAPP have QC programs to ensure the reliability and validity of the analysis performed at the laboratory. All analytical procedures are documented in writing as SOPs and each SOP includes a QC section, which addresses the minimum QC requirements for the procedure. The internal quality control checks may vary slightly for each individual procedure but in general will include the following QC requirements:

- i) Calibration Standards;
  - ii) Instrument Performance Checks – Organics;
  - iii) Initial and Continuing Calibration Checks;
  - iv) Internal Standard Performance;
  - v) Method Blank Samples;
  - vi) Laboratory Control Samples and QC Check Samples;
  - vii) Matrix Spike/Matrix Spike Duplicates;
  - viii) Surrogates;
  - ix) ICP Interference Check Samples (ICS);
  - x) ICP Serial Dilution;
  - xi) ICP and ICP/MS QC Analyses;
  - xii) Reagent Checks; and
  - xiii) Blind Check Samples.
-

## Quality Assurance Project Plan

Revision No.: 1  
Date: June 7, 2010  
Section: 8.0  
Page: 3 of 6

All data will be properly recorded. Any samples analyzed in nonconformance with QC criteria will be re-analyzed by the laboratory, if sufficient volume is available.

## 9.0 DATA REDUCTION, VALIDATION AND REPORTING

All data generated through in field activities or by the laboratory operation shall be reduced and validated prior to reporting in accordance with the following procedures:

### 9.1 DATA REDUCTION

#### 9.1.1 FIELD DATA REDUCTION

Field data reduction procedures will be minimal in scope compared to those implemented in the laboratory setting. Only direct read instrumentation will be employed in the field. The pH, conductivity, temperature, turbidity and PID readings collected in the field will be generated from direct read instruments following calibration per manufacturer's recommendations. Such data will be written into field logbooks immediately after measurements are taken. If errors are made, results will be legibly crossed out, initialed and dated by the field member, and corrected in a space adjacent to the original entry. Later, when the results forms required for this study are being filled out, the Project Manager will proof the forms to determine whether any transcription errors have been made by the field crew.

#### 9.1.2 LABORATORY DATA REDUCTION

For this project, the equations that will be employed in reducing data are found in the appropriate chapter of SW-846, Third Edition. Two of these equations, expressing analytical accuracy and precision, are presented in Section 3 of this QAPP. Such formulae make pertinent allowances for matrix type. All calculations are checked at the conclusion of each operating day. Errors are noted; corrections are made, but the original notations are crossed out legibly. Analytical results for soil samples shall be calculated and reported on a dry weight basis.

Quality control data (e.g., laboratory duplicates, surrogates, matrix spikes, and matrix spike duplicates) will be compared to the method acceptance criteria. Data considered to be acceptable will be entered into the laboratory computer system. Data summaries will be sent to the Laboratory QA Officer for review. If approved, data are logged into the project database format. Unacceptable data shall be appropriately qualified in the project report. Case narratives will be

---

prepared which will include information concerning data that fell outside acceptance limits and any other anomalous conditions encountered during sample analysis.

## 9.2 DATA VALIDATION

Data validation procedures shall be performed for both field and laboratory operations as described below:

### 9.2.1 PROCEDURES USED TO EVALUATE FIELD DATA

Procedures to evaluate field data for this project will include review of field logbooks and checking for transcription errors to project specific documents. This task will be the responsibility of the Field QA Officer.

### 9.2.2 PROCEDURES USED TO VALIDATE LABORATORY DATA

The Project QA Officer or designee will perform analytical data validation using the following documents as guidance for the review process.

"U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-99/008, October 1999 and the "U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review", EPA-540/R-94-013, February 1994.

The specific data qualifiers used will be as presented and defined in the CLP National Functional Guidelines. Data review and validation will consist of two tiers of assessment that incorporates an approach similar to "Innovative Approaches to Data Validation", U.S. EPA Region III, June 1995.

The Data Validator will evaluate the completeness of each data package. Completeness checks will be administered on all data to determine whether deliverables specified in the QAPP are present. At a minimum, deliverables will include sample chain-of-custody forms, analytical results, QC summaries and supporting raw data from instrument printouts. The review will determine whether all required items are present and request copies of missing deliverables.

---

### 9.3 DATA REPORTING

Data reporting procedures shall be carried out for field and laboratory operations as indicated below:

#### 9.3.1 FIELD DATA REPORTING

Field data reporting shall be conducted principally through the transmission of report sheets containing tabulated results of all measurements made in the field and documentation of all field calibration activities.

#### 9.3.2 LABORATORY DATA REPORTING

The laboratory data reporting package will be sufficient to perform a data validation in accordance with protocols described in Section 9.2.2.

The Laboratory Project Manager will perform a final review of the data packages and case narratives to determine whether the report meets the project requirements. In addition to the record of the chain-of-custody, the final laboratory data report format shall consist of a NYSDEC ASP Category A deliverables.

Note: Only the TCL parameter list identified in Table 1.2 shall be included in the laboratory chromatographic quantitation reports.

The laboratory data will be downloaded into the EDDs directly from the laboratory information management system (LIMS). The EDDs will be provided by the laboratory for incorporation into the project files. The Project QA Officer will verify the correctness of the analytical database by comparing the data from the database to the hardcopy analytical reports for a minimum of 10 percent of the sample results. If discrepancies between the database and hardcopy analytical reports are detected, a complete verification of the database will be performed.

---

## 10.0 PERFORMANCE AND SYSTEM AUDITS

A performance audit is an independently obtained quantitative comparison with data routinely obtained in the field or the laboratory. Performance audits include two separate, independent parts: internal and external audits.

### 10.1 FIELD PERFORMANCE AND SYSTEM AUDITS

#### 10.1.1 INTERNAL FIELD AUDIT RESPONSIBILITIES

Internal audits of field activities include the review of sampling and field measurements conducted by the Field QA Officer. The audits will verify that all procedures are being followed. Internal field audits will be conducted once during each phase of the sampling and at the conclusion of the project. The audits will include examination of the following:

- i) Field sampling records, screening results, instrument operating records;
- ii) Sample collection;
- iii) Handling and packaging in compliance with procedures;
- iv) Maintenance of QA procedures; and
- v) Chain-of-custody reports.

Follow up audits will be conducted to correct deficiencies and to verify that procedures are maintained throughout the investigation. The field audit checklist is included in Appendix 4.

#### 10.1.2 EXTERNAL FIELD AUDIT RESPONSIBILITIES

External audits may be conducted by the NYSDEC Project Manager at any time during the field operations. These audits may or may not be announced and are at the discretion of the regulatory agency. The external field audits can include (but are not limited to) the following:

- i) Sampling equipment decontamination procedures;
  - ii) Sample bottle preparation procedures;
  - iii) Sampling procedures;
  - iv) Examination of health and safety plans;
-

- v) Procedures for verification of field duplicates; and
- vi) Field screening practices.

## 10.2 LABORATORY PERFORMANCE AND SYSTEM AUDITS

### 10.2.1 INTERNAL LABORATORY AUDIT RESPONSIBILITIES

The laboratory system audits will be conducted by the Project QA Officer or designee and performed on an annual basis. Laboratory performance audits may be conducted prior to field activities or on an annual basis, depending on the duration of the project.

The system audit will include an examination of laboratory documentation including: sample receiving logs, sample storage, chain-of-custody procedures, sample preparation and analysis, and instrument operating records.

The performance audits will include submittal of blind performance evaluation samples along with project samples. The Project QA Officer will evaluate the analytical results to ensure the laboratory is maintaining acceptable QC performance.

System audits, as opposed to performance audits, are strictly qualitative and consist of an on-site review of a laboratory's quality assurance system and physical facilities for calibration and measurement.

At the conclusion of internal or external system audits, reports are provided to the laboratory's operating divisions for appropriate comment and remedial/corrective action where necessary. Written response to internal as well as external audits will be required. Records of audits and corrective actions are maintained by the Laboratory QA Officer.

### 10.2.2 EXTERNAL LABORATORY AUDIT RESPONSIBILITIES

External audits will be conducted as required, by appropriate NYSDEC QA personnel and may be conducted at least once prior to sampling and analysis activities.

---

External audits may include any of the following:

- i) Review of laboratory analytical procedures
- ii) Laboratory on-site visits
- iii) Submission of performance evaluation samples for analysis

Failure of any of the above audit procedures can lead to laboratory disqualification, and another suitable laboratory will have to be chosen. An on-site review can consist of:

- i) Sample receipt procedures
- ii) Custody, sample security, and log-in procedures
- iii) Review of instrument calibration logs
- iv) Review of QA procedures
- v) Review of log books
- vi) Review of analytical SOPs
- vii) Personnel interviews

A review of a data package from samples recently analyzed by the laboratory can include (but not be limited to) the following:

- i) Comparison of resulting data to the SOP or method
  - ii) Verification of initial and continuing calibrations within control limits
  - iii) Verification of surrogate recoveries and instrument timing results
  - iv) Review of extended quantitation reports for comparisons of library spectra to instrument spectra, where applicable
  - v) Assurance that samples are run within holding times.
-

## 11.0 PREVENTATIVE MAINTENANCE

### 11.1 FIELD INSTRUMENT PREVENTATIVE MAINTENANCE

The field equipment preventative maintenance program ensures the effective completion of the sampling effort and is designed to minimize equipment down time. Program implementation is concentrated in three areas:

- Maintenance responsibilities.
- Maintenance schedules.
- Inventory of critical spare parts and equipment.

The maintenance responsibilities for field equipment will be assigned to the task leaders in charge of specific field operations. Field personnel will be responsible for daily field checks and calibrations and for reporting any problems with the equipment. The maintenance schedule will follow the manufacturer's recommendations. In addition, the field personnel will be responsible for determining that critical spare parts are included with the field equipment. An adequate inventory of spare parts will be maintained. The inventory will primarily contain parts that are subject to frequent failure, have limited useful lifetimes and/or cannot be obtained in a timely manner.

### 11.2 LABORATORY INSTRUMENT PREVENTATIVE MAINTENANCE

Analytical instruments at the laboratory will undergo routine and/or preventative maintenance. The extent of the preventative maintenance will be a function of the complexity of the equipment.

Generally, annual preventative maintenance service will involve cleaning, adjusting, inspecting and testing procedures designed to deduce instrument failure and/or extend useful instrument life. Between visits, routine operator maintenance and cleaning will be performed according to manufacturer's specifications by laboratory personnel.

Maintenance records will be placed on file at the laboratory and can be made available upon request.

---

12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

The following sections include the procedures and formulae utilized to assess the levels of precision, accuracy and completeness achieved during the associated sample analyses.

12.1 FIELD MEASUREMENTS

Field generated information such as pH and specific conductance data will be reviewed for validity. The review will be performed by the Field QA Officer and typically include bound logbooks/forms, data entry and calculation checks. Field data will be assessed by the Project Field QA Officer who will review the field results for compliance with the established QC criteria that are specified in Section 3.0 of this QAPP. The accuracy of pH and specific conductance will be assessed using daily instrument calibration, calibration check, and blank data. Accuracy will be measured by determining the percent recovery of calibration check standards. Precision of the pH and specific conductance measurements will be assessed on the basis of the reproducibility of duplicate readings of a single sample and will be measured by determining the relative percent difference of the readings. Accuracy and precision of the soil VOC screening will be determined using duplicate readings of calibration checks. Field data completeness will be calculated using the following equation:

$$\text{Completeness} = \frac{\text{Valid (usable) Data Obtained}}{\text{Total Data Planned}} \times 100$$

12.2 LABORATORY DATA

Laboratory results will be assessed for compliance with required precision, accuracy and completeness detailed in the following subsections:

---

Revision No.: 1  
Date: June 7, 2010  
Section: 12.0  
Page: 2 of 2

### 12.2.1 PRECISION

The precision of laboratory analysis will be assessed by comparing the analytical results between MS/MSD analyses. The relative percent difference (RPD) will be calculated for each pair of duplicate analyses (laboratory MS/MSDs and field duplicates).

### 12.2.2 ACCURACY

The accuracy of laboratory results will be assessed for compliance with the established QC criteria that are described in Sections 3.0 and 8.0 of the QAPP using the analytical results of method blanks, reagent/preparation blank, SRMs or QC check samples and MS/MSD samples. The percent recovery (%R) of matrix spike samples and SRMs will be calculated.

### 12.2.3 COMPLETENESS

Completeness will be assessed by comparing the number of valid (usable) results to the total possible number of results using the formula presented in Section 12.1.

## 12.3 STATISTICAL EVALUATIONS

In the examination of data and determination of their precision and accuracy, standard statistical formulae will be used. Further details are provided in the following subsections

### 12.3.1 PERCENT RECOVERY

The percent recovery of a parameter is calculated by dividing the amount recovered by the true amount added and multiplying by 100. The percent recoveries of spiked samples are evaluated to establish the analytical accuracy of a measurement. Percent recovery is calculated using the following formula:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

---

where:

SSR = Spiked Sample Result  
SR = Sample Result or Background  
SA = Spike Added

### 12.3.2 RELATIVE PERCENT DIFFERENCE

The relative percent difference (RPD) is calculated by dividing the absolute value of the difference between two numbers by their arithmetic mean and multiplying by 100. The RPD is used to evaluate the analytical precision of two replicate measurements (e.g., matrix spike/matrix spike duplicate). RPD is calculated using the following formula:

$$RPD = \frac{(R_1 - R_2)}{R_1 + R_2} \times 100$$

where:

R<sub>1</sub> = value of first result  
R<sub>2</sub> = VALUE OF SECOND RESULT

## 13.0 CORRECTIVE ACTION

### 13.1 FIELD CORRECTIVE ACTION

Corrective action is intended to address problems that arise by identification, recommendation, approval, and implementation of measures that counter unacceptable procedures or deficient quality control performance. The Field QA Officer and Project QA Officer will be responsible for ensuring the quality of the sampling procedures and environmental data and as such, will be responsible for initiating corrective action when appropriate.

The corrective action procedures will be as follows:

- i) Identify/define the problem.
- ii) Assign responsibility for investigating the problem.
- iii) Investigate/determine the cause of the problem.
- iv) Determine an appropriate corrective action to eliminate the problem.
- v) Implement the corrective action.
- vi) Evaluate the effectiveness of the corrective action.
- vii) Verify that the corrective action has eliminated the problem.
- viii) Prepare a written record detailing the problem, corrective action utilized, and solution of the problem.
- ix) Submit the Corrective Action Record (CAR) to the Task Coordinator who initiated the corrective action and the Project QA Officer, and Project Manager.

The above procedures may be implemented through the use of the Systems Audit as described previously. Any Field Team member of the project may initiate corrective action procedures by reporting in writing the nature of the suspected problem to the Project Manager or QA Officer. The Project Manager will begin corrective action by relating the problem to appropriate personnel.

### 13.2 LABORATORY CORRECTIVE ACTION

The following paragraphs define the corrective action decision process relative to possible non-compliant events encountered during laboratory analysis of the project samples. Corrective actions will be initiated by the laboratory QA personnel and will be implemented by laboratory staff chemists under the oversight of the laboratory QA personnel. As with field corrective actions, the

---

Revision No.: 1  
Date: June 7, 2010  
Section: 13.0  
Page: 2 of 2

laboratory QA personnel will document the problem, the corrective action undertaken and the resolution of the problem. The corrective actions will be performed prior to release of the data from the laboratory.

Documentation will be provided to the laboratory QA Officer and Project Manager.

### 13.3 CORRECTIVE ACTION DURING DATA VALIDATION AND ASSESSMENT

The Project QA Officer may identify the need for corrective action during either the data validation or data assessment processes. Potential types of corrective action may include re-sampling by the field team or re-injection/reanalysis of samples by the laboratory (if possible).

These actions are dependent upon the ability to mobilize the field team, whether the data to be collected is necessary to meet the required quality assurance objectives (e.g., the holding time for samples is not exceeded). All corrective actions will be documented by the Project Manager.

#### 14.0 QUALITY ASSURANCE REPORTS

Critically important to the successful implementation of the QA Plan is a reporting system that provides the means by which the program can be reviewed, problems identified and programmatic changes made to improve the plan.

QA reports to management include:

- Audit reports, internal and external audits with responses
- Performance evaluation sample results; internal and external sources
- Daily QA/QC exception reports/corrective actions

QA/QC corrective action reports will be prepared by the Project QA Officer when appropriate and presented to the project and/or laboratory management personnel so that performance criteria can be monitored for all analyses from each analytical department. The updated trend/QA charts prepared by the laboratory QA personnel will be distributed and reviewed by various levels of the laboratory management.

---

## 15.0 REFERENCES

1. New York State Department of Environmental Conservation, (2009). Technical Guidance for Site Investigation and Remediation (DRAFT DER-10). November 4, 2009.
  2. United States Environmental Protection Agency, (1999). EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations. EPA QA/R-5 Interim Final, November 1999.
  3. United States Environmental Protection Agency (1991). Preparation Aids for the Development of Category I Quality Assurance Project Plans. U.S. EPA/600/8-91/003, Risk Reduction Engineering Laboratory, Office of Research and Development, Cincinnati, Ohio, February 1991.
  4. United States Environmental Protection Agency, (1993). Data Quality Objectives Process for Superfund Interim Final Guidance. U.S. EPA/540/R-93-071, Office of Solid Waste and Emergency Response (OSWER), September 1993.
  5. United States Environmental Protection Agency, (1992). Specifications and Guidance for Contaminant-Free Sample Containers. OSWER Directive 9240.0-05A, April 1992.
  6. United States Environmental Protection Agency. U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. EPA 540/R-99-012.
  7. United States Environmental Protection Agency. U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. EPA 540/R-94-013.
  8. United States Environmental Protection Agency. Test Methods for Evaluating Solid Waste, Office of Solid Waste, U.S. EPA, SW-846, November 1986, with updates.
-

TABLE 1.1

**SUMMARY OF SAMPLING AND ANALYSIS PROGRAM**  
**TARRYTOWN FORMER MGP SITE MANAGEMENT PLAN**  
**TARRYTOWN, NY**

<i>Sample Matrix</i>	<i>Field Parameters</i>	<i>Laboratory Parameters</i>	<i>Comments</i>
Soil	PID VOC Screen	BTEX volatiles, PAHs	For site re-use of soils under site management plan
Soil	PID VOC Screen	TCL VOC, TCL SVOC, PCB, TAL Inorganics for comparison to 6 NYCRR Part 375 - Table 6.8b	For imported soil use on the site
Groundwater	pH/Temperature, DO, Specific Conductivity, Turbidity, ORP, Iron CO <sub>2</sub> , Alkalinity, Turbidity	BTEX volatiles, PAHs	In accordance with Table 2 of the Site Groundwater Monitoring Plan (see Appendix F of SMP)
Vapors	PID VOC Screen	US EPA TO-15 Compound List (excluding chlorinated VOCs)	In accordance with SMP.

*Notes:*

- (1) - A laboratory trip blank will be submitted with each shipment of samples for TCL VOC analysis.
- (2) - Field blank samples will not be required if dedicated or disposable sampling equipment is used.
- (3) - Matrix Spike/Matrix Spike duplicate (MS/MSD) analyses will be completed for organic and inorganic analyses at a frequency of one per group of twenty (20) for sample events where more than 20 samples.
- (4) - The frequency of Field Blanks and Field Duplicates will be one per 20 for sample events where more than 20 samples.

TCL = Target Compound List

TAL = Target Analyte List

VOC = Volatile Organic Compounds

BTEX = Benzene, Toluene, Ethylbenzene, o-xylene and p&m-xylene

PAH = Polyaromatic Hydrocarbons

SVOC = Semi-volatile Organic Compounds

PCB = Polychlorinated Biphenyls

DO = Dissolved Oxygen

ORP = Oxidation-Reduction Potential

TABLE 1.2

## TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST

Compound	Estimated		Method	
	Quantitation Limits (EQL) <sup>1</sup>		Detection Limits (MDL) <sup>2</sup>	
	Water (µg/L)	Soil (µg/kg)	Water (µg/L)	Soil (µg/kg)
<i>Target Compound List (TCL) Volatile Organic Compounds (VOC)<sup>3</sup></i>				
Acetone	25	750	1.1	75
Benzene	1	50	0.37	17
Bromodichloromethane	1	100	0.32	10
Bromoform	1	100	0.37	16
Bromomethane	1	250	0.3	26
2-Butanone	25	750	0.59	81
Carbon disulfide	5	250	0.24	35
Carbon tetrachloride	1	50	0.37	10
Chlorobenzene	1	50	0.38	8.1
Chloroethane	1	250	0.29	37
Chloroform	1	50	0.35	10
Chloromethane	1	250	0.49	15
Cyclohexane	1	1,200	0.33	8.5
Dibromochloromethane	1	50	0.37	13
1,2-Dibromo-3-chloropropane	1	250	0.82	81
1,2-Dibromoethane	1	250	0.34	19
1,2-Dichlorobenzene	1	100	0.38	16
1,3-Dichlorobenzene	1	100	0.38	9.5
1,4-Dichlorobenzene	1	100	0.38	16
Dichlorodifluoromethane	1	100	0.49	38
1,1-Dichloroethane	1	50	0.3	14
1,2-Dichloroethane	1	50	0.28	11
1,1-Dichloroethene	1	50	0.31	17
cis-1,2-Dichloroethene	1	50	0.35	16
trans-1,2-Dichloroethene	1	50	0.33	18
1,2-Dichloropropane	1	50	0.41	9.4
cis-1,3-Dichloropropene	1	50	0.35	12
trans-1,3-Dichloropropene	1	50	0.35	11
Ethylbenzene	1	50	0.41	14
2-Hexanone	50	2,500	0.58	30
Isopropylbenzene	5	250	0.39	7.9
Methyl acetate	10	1,200	0.54	45
Methylene chloride	5	250	0.29	41
Methylcyclohexane	1	1,200	0.42	16
4-Methyl-2-pentanone	50	2,500	0.26	29
Methyl tert-butyl ether	5	250	0.27	11
Styrene	1	50	0.35	17
1,1,2,2-Tetrachloroethane	1	100	0.4	11
Tetrachloroethene	1	50	0.42	15
Toluene	1	100	0.39	10
1,2,4-Trichlorobenzene	5	250	0.4	11
1,1,1-Trichloroethane	1	50	0.39	9.9

TABLE 1.2

## TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST

Compound	Estimated		Method	
	Quantitation Limits (EQL) <sup>1</sup>		Detection Limits (MDL) <sup>2</sup>	
	Water (µg/L)	Soil (µg/kg)	Water (µg/L)	Soil (µg/kg)
<i>TCL VOC (continued)</i>				
1,1,2-Trichloroethane	1	50	0.36	16
Trichloroethene	1	50	0.42	17
Trichlorofluoromethane	1	100	0.54	19
1,1,2-Trichloro-1,2,2-trifluoroethane	1	250	0.32	37
Vinyl chloride	1	100	0.36	11
Xylenes (total)	3	150	0.44	19
<i>TCL Semi-Volatile Organic Compounds (SVOC)</i>				
Acenaphthene	5	330	0.8	14
Acenaphthylene	5	330	0.71	19
Acetophenone	5	330	2.6	20
Anthracene	5	330	0.68	17
Atrazine	5	330	2.5	22
Benzaldehyde	10	330	2.8	14
Benzo(a)anthracene	4	330	0.7	23
Benzo(a)pyrene	4	330	0.73	15
Benzo(b)fluoranthene	4	330	0.94	20
Benzo(g,h,i)perylene	5	330	0.85	16
Benzo(k)fluoranthene	5	330	0.84	16
1,1'-Biphenyl	10	330	2.6	18
4-Bromophenylphenyl ether	5	330	0.88	15
Butylbenzylphthalate	5	330	0.88	21
di-n-Butylphthalate	5	330	0.67	23
Caprolactam	10	330	2.5	28
Carbazole	10	330	0.82	19
4-Chloroaniline	20	1,700	0.61	20
bis(2-Chloroethoxy)methane	5	330	0.87	26
bis(2-Chloroethyl)ether	4	330	0.97	18
2,2'-oxibis(1-Chloropropane)	5	330	0.78	27
4-Chloro-3-methylphenol	5	330	0.99	19
2-Chloronaphthalene	5	330	0.85	17
2-Chlorophenol	5	330	1	18
4-Chlorophenyl phenyl ether	5	330	0.79	17
Chrysene	5	330	0.75	22
Dibenz(a,h)anthracene	4	330	0.79	18
Dibenzofuran	5	330	1.1	17
3,3'-Dichlorobenzidine	4	2,000	0.93	18
2,4-Dichlorophenol	10	330	0.85	16
Diethylphthalate	5	330	0.65	19
2,4-Dimethylphenol	5	330	0.85	18
Dimethylphthalate	5	330	0.76	17
4,6-Dinitro-2-methylphenol	20	1,700	1.3	48

TABLE 1.2

## TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST

Compound	Estimated		Method	
	Quantitation Limits (EQL) <sup>1</sup>		Detection Limits (MDL) <sup>2</sup>	
	Water (µg/L)	Soil (µg/kg)	Water (µg/L)	Soil (µg/kg)
<i>TCL Semi-Volatile Organic Compounds (cont'd)</i>				
2,4-Dinitrophenol	20	1,700	3	47
2,4-Dinitrotoluene	5	330	0.79	22
2,6-Dinitrotoluene	5	330	0.57	15
bis(2-Ethylhexyl)phthalate	5	330	2.7	13
Fluoranthene	5	330	0.81	16
Fluorene	5	330	1	15
Hexachlorobenzene	5	330	0.74	22
Hexachlorobutadiene	5	330	0.73	16
Hexachlorocyclopentadiene	5	330	1.1	10
Hexachloroethane	5	330	0.74	17
Indeno(1,2,3-cd)pyrene	4	330	0.63	19
Isophorone	5	330	0.63	22
2-Methylnaphthalene	5	330	0.64	17
2-Methylphenol	5	330	1.1	21
4-Methylphenol	5	330	1.3	20
Naphthalene	5	330	0.75	17
2-Nitroaniline	20	1,700	0.7	13
3-Nitroaniline	20	1,700	0.71	22
4-Nitroaniline	20	1,700	1.3	17
Nitrobenzene	4	330	0.81	24
2-Nitrophenol	5	330	2.1	21
4-Nitrophenol	20	1,700	1.9	53
N-Nitroso-di-n-propylamine	5	330	0.67	15
N-Nitrosodiphenylamine (diphenylamine)	5	330	1.4	19
di-n-Octylphthalate	5	330	1.1	64
Pentachlorophenol	20	800	2.4	60
Phenanthrene	5	330	0.82	21
Phenol	5	330	2.6	18
Pyrene	5	330	1.1	21
2,4,5-Trichlorophenol	5	330	1.2	15
2,4,6-Trichlorophenol	4	330	1.7	19
<i>TCL Polychlorinated Biphenyls (PCB)</i>				
Aroclor 1016	0.2	330	0.054	5.3
Aroclor 1221	0.2	330	0.10	19
Aroclor 1232	0.4	330	0.1	11
Aroclor 1242	0.2	330	0.075	18
Aroclor 1248	0.2	330	0.061	4.6
Aroclor 1254	0.2	330	0.082	20
Aroclor 1260	0.2	330	0.044	7.4

TABLE 1.2

## TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST

<i>Compound</i>	<i>Estimated</i>		<i>Method</i>	
	<i>Quantitation Limits (EQL)<sup>1</sup></i>		<i>Detection Limits (MDL)<sup>2</sup></i>	
	<i>Water</i> <i>(mg/L)</i>	<i>Soil</i> <i>(mg/kg)</i>	<i>Water</i> <i>(mg/L)</i>	<i>Soil</i> <i>(mg/kg)</i>
<i>TAL Inorganics</i>				
Antimony	0.002	0.5	0.00012	0.23
Arsenic	0.01	0.1	0.0021	0.021
Barium	0.1	1.0	0.00094	0.066
Beryllium	0.001	0.2	0.0006	0.068
Cadmium	0.0005	0.05	0.000075	0.0023
Chromium	0.005	0.5	0.0015	0.13
Cobalt	0.007	0.5	0.00074	0.053
Copper	0.002	1.0	0.00033	0.14
Lead	0.003	0.3	0.0016	0.19
Manganese	0.015	1.0	0.00068	0.071
Mercury	0.0002	0.1	0.000087	0.016
Nickel	0.025	1.0	0.0029	0.15
Selenium	0.002	0.2	0.0003	0.052
Silver	0.0005	0.5	0.00013	0.1
Thallium	0.001	0.1	0.000033	0.0041
Vanadium	0.007	1.0	0.00067	0.069
Zinc	0.01	1.0	0.0022	0.24
Cyanide (total)	0.005	0.2	0.0018	0.088
<i>Additional Parameters</i>				
Hexavalent chromium	0.02	0.8	0.005	0.2

*Notes:*

- <sup>1</sup> - Please note that these are estimated quantitation limits and are presented for guidance only. Actual quantitation limits are highly matrix dependent and may be elevated due to matrix effects, QA/QC problems and high concentrations of target and non-target analytes.
- <sup>2</sup> - Method Detection Limits (MDL) are also presented for guidance only. Actual MDLs will vary depending on sample specific preparation factors. The MDLs are also highly matrix dependant and may be elevated due to matrix effects, QA/QC problems and high concentrations of target and non-target analytes. Laboratory MDLs are updated on a periodic basis and the MDLs in effect when the samples are analyzed will be used for reporting purposes.
- <sup>3</sup> - U.S. EPA Contract Laboratory Program, "Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration", OLM4.2, May 1999 Target Compound List.

TABLE 7.1

SUMMARY OF POTENTIAL ANALYTICAL METHODS

<i>Parameter</i> <sup>1</sup>	<i>Preparation Method</i> <sup>2</sup>	<i>Analytical Method</i> <sup>2</sup>
<b><u>Groundwater Samples</u></b>		
VOC	SW-846 5030B	SW-846 8260B
BTEX	SW-846 5030B	SW-846 8021B
PAHs	SW-846 3520C	SW-846 8270C
<b><u>Soil Samples</u></b>		
VOC	SW-846 5035 <sup>4</sup>	SW-846 8260B
BTEX	SW-846 5030B	SW-846 8021B
SVOC	SW-846 3550B	SW-846 8270C
PCB	SW-846 3550B	SW-846 8082
Metals <sup>3</sup>		
ICP Metals	SW-846 3050A	SW-846 6010B
ICP/MS Metals	SW-846 3050A	SW-846 6020
Mercury	SW-846 7471A	SW-846 7471A
Cyanide total)	SW-846 9012A	SW-846 9012A
Hexavalent Chromium	SW-846 3060	SW-846 7196A
<b><u>Vapor Samples</u></b>		
VOC <sup>3</sup>	EPA TO-15	EPA TO-15

**Notes:**

- <sup>1</sup> Refer to Tables 1.2 for the compounds/elements of each parameter group.
- <sup>2</sup> Preparation and Analytical Method References:
  - SW-846 - "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods ", SW-846, 3rd Edition, and Methods ", SW-846, 3rd Edition, and Promulgated Updates, November 1986.
  - US EPA Compendium Method TO-15 Determination Of Volatile Organic Compounds (VOCs) In Air Collected In Specially-Prepared Canisters And Analyzed By Gas Chromatography/ Mass Spectrometry (GC/MS)
- <sup>3</sup> Excluding chlorinated VOCs in accordance with SMP.
  - VOC = Volatile Organic Compounds
  - SVOC = Semi-Volatile Organic Compounds
  - PCB = Polychlorinated Biphenyls

# OPERATING PROCEDURE: OP3001

## PRESERVATION AND SHIPMENT OF ENVIRONMENTAL SAMPLES

### PREPARATION AND APPROVALS

VERSION	AUTHORED/DATE	REVIEWED / DATE	REVIEWED / DATE	REVIEWED / DATE	APPROVED / DATE
Ver 0.0	AKM/6-03	KLR/6-03			JAK/ September 2003

**Total Pages: 17**

© Haley & Aldrich, Inc., 2003



**TABLE OF CONTENTS**

	<b>Page</b>
<b>LIST OF TABLES</b>	<b>i</b>
<b>1. PURPOSE</b>	<b>1</b>
<b>2. EQUIPMENT &amp; SUPPLIES</b>	<b>1</b>
<b>3. PROCEDURE</b>	<b>2</b>
3.1 Selection of Sampling Parameters	2
3.2 Sampling Equipment and Container Selection	2
3.2.1 Reactivity of Container Material with Sample	3
3.2.2 Volume of the Container	3
3.2.3 Color of Container	3
3.2.4 Container Closures	3
3.2.5 Decontamination of Sample Containers	3
3.3 Sample Labels	4
3.4 Sample Presevation	4
3.4.1 Soil	5
3.4.2 Water	5
3.5 Chain-Of-Custody	7
3.6 Sample Sealing	7
3.7 Holding Times	8
3.8 Sample Storage and Transport	8
<b>APPENDIX A – References</b>	<b>A-1</b>
<b>APPENDIX B – Related Haley &amp; Aldrich Procedures</b>	<b>B-1</b>
<b>APPENDIX C – Forms</b>	<b>C-1</b>
<b>APPENDIX D – Glossary</b>	<b>D-1</b>
<b>APPENDIX E – Chain of Custody Record</b>	<b>E-1</b>

**LIST OF TABLES**

<b>Table No.</b>	<b>Title</b>	
1	Required Containers, Preservation Techniques, and Holding Times	9

## **OPERATING PROCEDURE: OP3001**

### **PRESERVATION AND SHIPMENT OF ENVIRONMENTAL SAMPLES**

#### **1. PURPOSE**

This operating procedure (OP) has been established to maintain consistency in preservation and shipment of environmental samples to protect the integrity of the samples prior to analysis. This OP may be modified to suit the needs of an individual site and to comply with specific regulatory programs (i.e. state, CERCLA, RCRA).

The objectives of this OP are to maintain the physical form and chemical composition of the sample and to prevent changes in contaminant concentration. To meet these objectives, there must be a measure of control over all sample handling procedures beginning with sample container cleaning procedures and ending with laboratory analysis. This OP deals with the first half of the control process: the procedures leading up to and ending with sample packaging and transport to the laboratory. The information provided herein will make it possible to choose the minimum number of sample handling and preservation practices necessary to ensure the integrity of a sample designated for analysis.

Refer to OP3000 for General Environmental Field Procedures and Protocol, including procedures for decontamination of sampling equipment and/or containers. Refer to OP3026 for Operating Procedures on completing a Chain of Custody.

#### **2. EQUIPMENT & SUPPLIES**

- Prepackaged or decontaminated sampling device
- Laboratory supplied sample containers
- Preservatives, as applicable
- Disposable gloves
- Litmus/pH paper, as applicable
- Labels
- Permanent/indelible marker
- Cooler
- Ice
- Bubble wrap
- Packing tape
- Chain of Custody

### **3. PROCEDURE**

There are four basic steps necessary to obtain meaningful analytical data: preparation of the sample container, sampling, sample preservation, and analysis. The amount of sample to be collected, and the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix being sampled and the parameter(s) of interest. In order to obtain meaningful analytical data, sample preservation techniques must be effective from the time of sample collection to the time of analysis.

#### **3.1 Selection of Sampling Parameters**

The selection of sampling parameters is dependent on the specific work objectives for a Site. When choosing preservatives for your sampling and analysis program, verify that the preservatives or lab techniques used do not contain chemicals that are also constituents of concern at the Site.

In addition, it is important to recognize acetone, as a high purity solvent rinse in sampling equipment decontamination procedures, is included as an analyte on the Target Compound List (TCL) and SW-846, but not on the Priority Pollutant List (PPL).

#### **3.2 Sampling Equipment and Container Selection**

Proper selection of sampling equipment and containers for sample collection is an important means of protecting the integrity of the sample. When selecting sampling equipment and containers, verify that the materials that come into direct contact with the sample are compatible with the chemical or physical properties of the contaminant(s) of concern. The type of sample containers to be used in a sampling event should be determined during sampling event planning and documented in the sampling and analysis plan.

As a general rule when obtaining soil samples using core barrel samplers, samples obtained for semivolatile organic compound (SVOC) analysis can be obtained within a core barrel or core barrel liner that is composed of stainless steel, steel, or brass. When only inorganic constituents are of concern, a plastic core barrel liner would be more appropriate. All of these materials are suitable for volatile organic compounds (VOCs) as long as the contact time is minimized. Often all of the above samples (SVOCs, inorganic, and VOCs) are obtained from a single soil core. In this situation, soils should be taken from the interior of the soil core to avoid potential interferences between the contaminants of concern and the surface of the core barrel that is in direct contact with the sample.

For sediment sampling, the analytical sediment sample is arbitrarily defined as that which passes a 10-mesh (approximately 2-mm openings) sieve. The purpose of this is to provide a basis for discrimination of sediment and foreign objects or materials. Stainless steel or nylon sieves may be used when inorganic constituents are to be determined. (For inorganic analyses, stainless steel sieves are acceptable provided the mesh is not soldered or welded to the frame.) Stainless steel or brass sieves are suitable for use when organic substances are to be determined. (For organic analyses, organic materials such as rubber or plastics should not be used in the storage or handling of samples.)

For water sampling, specifications on container design, including shape, volume, gas tightness, materials of construction, and use of cap liners, are defined for specific parameters or suites of parameters (for example,

amber glass containers protect photosensitive analytes, such as polychlorinated biphenyls (PCBs) from chemical alteration). Specifications for sample container selection are documented in parameter-specific analytical methods (for example, ASTM, U.S. EPA SW846, AWWA Standard Methods) as well as in Federal (40 CFR Part 136), state, and local regulatory guidelines on groundwater sample collection and preservation. Table 1 provides examples of common container materials, colors and volumes.

### 3.2.1 Reactivity of Container Material with Sample

Choosing the proper composition of sample containers will help to ensure that the chemical and physical integrity of the sample is maintained. For potentially hazardous material, glass is the recommended container type because it is chemically inert to most substances. Plastic containers are not recommended for most hazardous wastes because the potential exists for contaminants to adsorb to the surface of the plastic or for the plasticizers to leach into the sample.

In some instances, the sample characteristics or analytes of interest may dictate that plastic containers be used instead of glass. Because some metals species will adhere to the sides of glass containers in an aqueous matrix, plastic bottles must be used for samples collected for metals analysis. In the case of a strong alkali waste or hydrofluoric solution, plastic containers may be more suitable because glass containers may be etched by these compound creating adsorptive sites on the container surface.

### 3.2.2 Volume of the Container

The volume of sample to be collected will be dictated by the analytical method and the sample matrix. The laboratory must supply bottles of sufficient volume to perform the required analysis. Table 1 indicates the container volumes required for the various parameters. In most cases, the methodology dictates the volume of sample material required to complete the analysis. However, individual labs may provide larger volume containers for various analytes to ensure sufficient quantities for replicates or other quality control checks.

### 3.2.3 Color of Container

Whenever possible, amber glass containers should be used to prevent photodegradation of the sample, except when samples are being collected for metals analysis. If amber containers are not available, containers holding samples should be protected from light. However, 40-milliliter (ml) clear glass vials are often provided by laboratories for aqueous VOC analysis and are acceptable for use.

### 3.2.4 Container Closures

Container closures should form a leak-proof seal (i.e., screw caps or ground glass stoppers). Closures must be constructed of a material which is inert with respect to the sampled material, such as Polytetrafluoroethylene (PTFE) (e.g., Teflon<sup>®</sup>). Alternately, the closure may be separated from the sample by a closure liner that is inert to the sample material such as PTFE liner or septum.

### 3.2.5 Decontamination of Sample Containers

Sample containers must be laboratory cleaned, preferably by the laboratory performing the analysis. The cleaning procedure is dictated by the specific analysis to be performed on the sample.

When sampling for organic compounds, if your sample containers are not provided by the analytical laboratory, care should be taken to ensure that the containers are properly cleaned and prepared. Refer to ASTM Standard D3694-96 *Standard Practices for Preparation of Sample Containers and for Preservation of Organic Constituents* for guidance.

After the sample containers are cleaned, they can be pre-preserved or preserved in the field. Information on sample preservation is given in Section 3.4. Sample containers provided by a commercial analytical laboratory are cleaned and in many cases pre-preserved by the laboratory. The sample bottles should be prepared for shipment accompanied by a chain-of-custody and the cooler containing them should be sealed. The chain-of-custody must also accompany the bottles during transportation to the field, sample collection, transportation back to the lab, during analysis and final disposal of the sample container.

### 3.3 Sample Labels

Sample labels may be in the form of adhesive labels or tags, or both. Tags have the advantage of being removable to become part of the record keeping process, although their inadvertent loss or inappropriate removal may leave the sample without documentation. Labels should be made of waterproof paper and indelible ink should be used to make entries. Alternatively, sample information may be written directly on the sample container, as long as the writing can be done indelibly. Containers should be free from other labels and other writing to prevent any confusion. If both tags and labels are used, care should be taken to ensure that the information on both is identical.

Labels or tags should be filled out just before or immediately after sample collection. Labels should contain spaces for the following information:

- Project identification code.
- Sample identifying name
- Sampling location ID, sampling point ID.
- Sampling date and time.
- Analyses desired.
- Company name.

### 3.4 Sample Preservation

The need for sample preservation for specific analytes should be defined prior to the sampling event and documented in the site-specific sampling and analysis plan. Certain analytical methodologies for specific analytes require chemical additives in order to stabilize and maintain sample integrity. Unless the analysis is accomplished within 2 hours after sampling, preservation is preferred and usually required.

Preservatives are generally added to the sampling bottles by the laboratory prior to shipment into the field. If the sample bottles are not pre-preserved by the laboratory, preservatives may be added in the field immediately after the samples are collected. Many laboratories provide pre-preserved bottles as a matter of convenience and to help ensure that samples will be preserved immediately upon collection. A problem associated with this method arises if not enough sample is collected, resulting in too much preservative in the sample. More

commonly encountered problems with this method include the possibility of insufficient preservative provided to achieve the desired pH level or the need for additional preservation due to chemical reactions caused by the addition of sample liquids to pre-preserved bottles.

### **3.4.1 Soil**

#### 3.4.1.1 Composite Samples

When composite samples are collected, the appropriate preservation reagents must be added to the compositing vessel prior to collection. If the preservation requirements call for refrigeration, the sample must be refrigerated during the collection. The collection time for a single composite sample should not exceed 24 hours. If longer sampling periods are necessary, a series of composite sample should be collected.

#### 3.4.1.2 Grab Samples

In the absence of specific instructions, storage at a temperature of 4°C or lower for a period of time not to exceed 1 week is recommended.

#### 3.4.1.3 Sediment Samples

Sediment samples intended for both organic and inorganic compound analysis may undergo changes in composition during storage. The analytical method should specify the conditions necessary to assure requisite stability. In the absence of specific instructions, storage at a temperature of 4°C or lower for a period of time not to exceed 1 week is recommended, although it is known that microbiological activity does not cease under these conditions.

### **3.4.2 Water**

#### 3.4.2.1 Groundwater Samples

Groundwater samples are subject to chemical, physical, and biological change at the ground surface relative to in-situ conditions as a result of exposure to ambient conditions during sample collection.

Groundwater sample preservation procedures are grouped into two general categories: (1) physical preservation and (2) chemical preservation. Groundwater samples should be preserved in the field at the time of sample collection using physical means to prevent sample container breakage or temperature increases, and chemical means to minimize changes in groundwater sample chemistry prior to laboratory analysis.

Physical groundwater sample preservation methods include: (1) use of appropriate sample collection containers for each parameter being analyzed, (2) use of appropriate sample collection procedures (i.e. making sure there are no air bubbles in VOA vials) (3) use of appropriate packing of sample containers for shipment to prevent sample container breakage and potential cross-contamination of samples during shipment, and (4) temperature control.

Samples are cooled to reduce biological activity on the organic chemicals. Cool the sample to 4°C immediately after sampling using a wet ice water bath. During storage or shipment, or both, maintain the sample at 4°C. A temperature blank should be used with each shipping container of samples to determine actual sample temperatures at the time the sample shipment is received by the laboratory.

Chemical preservation of groundwater samples involves the addition of one or more chemicals (reagent-grade or better) on a parameter-specific basis to protect sample integrity. Table 1 provides examples of common analyte-specific chemical preservation methods. Chemical preservation is specified in numerous analytical methods as well as in various regulatory guidance documents such as 40 CFR Part 136.3. Chemicals can be used to adjust sample pH or inhibit microbial activity to prevent chemical alteration of samples. In most cases the samples containers will be pre-preserved by the analytical laboratory. In the case that the sample containers are not pre-preserved, refer to *ASTM D 6517-00 Standard Guide for Field Preservation of Ground-Water Samples* for guidance.

After the sample container is filled and preserved, it should be securely capped and gently inverted to ensure uniform distribution of the preservative throughout the sample.

Preservation must take place immediately upon sample collection except when samples are to be filtered. Samples requiring filtration must be processed immediately after collection. Filtered samples are then preserved immediately following the filtration process.

Samples must be placed into a cooler and maintained at 4°C immediately upon collection and preservation.

When collecting samples in pre-preserved containers, care must be taken not to pre-rinse the container with the sample and to avoid overfilling the container to prevent loss of chemical preservative. It may be necessary to establish site-specific protocol to address acceptable periods for storage and storage conditions for pre-preserved sample containers due to the potential for chemical reactions to occur between the chemical preservative and the empty sample container

Records should be kept for all forms of sample preservation used for groundwater samples. The following should be reported:

- Type of sample container(s) used for each parameter being analyzed (volume, materials of construction, type of cap, etc.);
- Packaging method(s) used to prevent sample bottle breakage during sample storage and shipment;
- How groundwater samples were cooled to 4°C, if required for physical preservation;
- Chemical preservative(s) used on a parameter-specific basis;

- Description of appearance of unpreserved and preserved samples, specifically noting any chemical reactions which may occur upon addition of chemical preservative (for example, effervescence, formation of precipitates, change in color).

### 3.5 Chain-Of-Custody

The purpose of a chain-of-custody is to provide accountability for and documentation of sample integrity from the time the samples are collected until sample disposal. A chain-of-custody is intended to be a legal form documenting sample possession during collection, shipment, storage and the process of analysis. Chain-of-custody procedures are necessary in a program to assure the ability to support data and conclusions adequately in a legal or regulatory situation. Refer to OP3026 for Operating Procedures on completing a Chain of Custody.

A single field sampling person should be assigned responsibility for custody of samples. An alternate custodian should also be assigned to cover the prime custodian's absence. As few people as possible should handle samples. The assigned field sampler should be personally responsible for the care and custody of the samples collected until they are properly transferred. While samples are in their custody, field personnel should be able to testify that no one was able to tamper with the samples without their knowledge.

A standard chain-of-custody form included in Appendix A has been designed for recording custody information related to field sample handling. The following information should be on the form:

- Sample identifying name.
- Sampling location ID, sampling point ID.
- Sampling date and time.
- Sampling interval.
- Signatures of sampling personnel and signatures of all personnel handling and receiving the samples.
- Project identification code.
- Preservation (to alert lab personnel): amount and type.
- Number of containers. Indicate number of replicates if there are multiple containers of the same type.
- Field notes.
- Analyses desired.
- Sample type: grab, composite, etc.

When transferring the possession of samples, the individuals relinquishing and the individuals receiving the samples should sign, date, and note the time on the custody record. Provisions should be made for receipt of samples at nonstandard hours, such as nights and weekends by non-laboratory personnel. Shipping documents, with noted time of receipt and receipt by whom, should be made part of the custody record.

### 3.6 Sample Sealing

Sample custody seals of waterproof adhesive paper may be used to detect unauthorized tampering with samples prior to receipt by the lab. When seals are used, they should be applied so that it is necessary to break them in order to open the sample cooler. It is helpful to cover the custody seal with clear packing tape to ensure the security of the cooler.

### **3.7 Holding Times**

Table 1 lists maximum holding times cited in the U.S. EPA “Guidelines Establishing Test Procedures for the Analysis of Pollutants under the Clean Water Act”. Sample containers should be shipped and received by the laboratory and as soon as possible to allow sufficient time for the laboratory to perform the requested analyses within the holding time defined by the applicable laboratory analytical method for each parameter.

### **3.8 Sample Storage and Transport**

Field personnel should package and ship samples in compliance with all applicable regulations including the Department of Transportation (for example, Title 49 Code of Federal Regulations, Part 172) and the International Air Transportation Association (IATA). Samples should be placed in a cooler to be maintained at 4°C. Special care should be taken when packaging glass (i.e., using bubble wrap). Sample containers should be shipped in a manner that will ensure the samples are received intact by the laboratory, at the appropriate temperature, and as soon as possible to allow sufficient time for the laboratory to perform the requested analyses within the holding time. Samples should be shipped well before the holding time is up and ideally should be shipped within 24 hours of sample collection.

**TABLE 1 - Required Containers, Preservation Techniques, and Holding Times**

Using USEPA-Contract Lab Program Methodologies for Aqueous and Nonaqueous Samples

Parameter	Sample Container (1)	Container Volume	Preservation	Maximum Holding Time
Volatile Organics	Aqueous-G, black phenolic plastic screw cap, teflon-lined septum	Aqueous 40 ml	Cool, 4 deg C, dark, 0.08% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual Cl <sub>2</sub>	10 days
	Nonaqueous-G, polypropylene cap, white teflon liner	Nonaqueous 120 ml		10 days
Total Organic Carbon	G - Preferred, P - If determined that there is no contributing organic contamination	100 ml	Cool, 4 deg C, dark, HCl or H <sub>2</sub> SO <sub>4</sub> to pH<2 if analysis can't be done within 2 hrs	2 Hrs - unpreserved 28 days - preserved
Base Neutral/Acid Extractable (Semivolatile) Organics	Amber Glass, Teflon lined cap	1 liter	Cool, 4 deg C, dark	Extraction Aqueous continuous liquid-liquid extraction must be <u>started</u> within 5 days Non-aqueous - <u>10 days</u> Analysis 40 days from validated time of sample receipt at the lab.
Total Petroleum Hydrocarbons	G	1 liter	Cool, 4 deg C	Aqueous 7 days
		4 oz		Non-Aqueous 28 days Gasoline in soil 7 days
Pesticide/PCBs	Amber G, Teflon lined cap	1 liter	Cool, 4 deg C, dark	Extraction Aqueous continuous liquid-liquid extraction must be <u>started</u> within 5 days Non-aqueous - <u>10 days</u> Analysis 40 days from validated time of sample receipt at the lab.
Metals except Mercury	Aqueous-P bottle, P cap, P liner	Aqueous - 1000 ml	Aqueous - HNO <sub>3</sub> to pH<2	180 days
	Nonaqueous-Flint G bottle, black phenolic cap, polyethylene liner	Nonaqueous 4, 8, 16, or 32 oz	Nonaqueous - 4 deg C until analysis	
Hexavalent Chromium	P, G	400 ml	Cool, 4 deg C	24 hrs
Mercury	Aqueous-P bottle, P cap, P liner	Aqueous - 1000 ml	Aqueous - HNO <sub>3</sub> to pH<2	26 days
	Nonaqueous-Flint G bottle, black phenolic cap, polyethylene liner	Nonaqueous 4, 8, 16, or 32 oz	Nonaqueous - 4 deg C until analysis	
Phenols	G Only	1 liter	Cool, 4 deg C, H <sub>2</sub> SO <sub>4</sub> to pH<2	28 days

**TABLE 1 - Required Containers, Preservation Techniques, and Holding Times  
(CONTINUED)**

Parameter	Sample Container (1)	Container Volume	Preservation	Maximum Holding Time
Cyanide	Aqueous-P bottle, P cap, P liner	Aqueous - 1000 ml	Aqueous - 0.6g ascorbic acid if residual Cl <sub>2</sub> , NaOH to pH>12, cool, 4 deg C until analyzed CaCO <sub>3</sub> in presence of sulfide	12 days
	Nonaqueous-Flint Glass bottle, black phenolic cap, polyethylene liner	Nonaqueous 4, 8, 16, or 32 oz	Nonaqueous Cool, 4 deg C until analyzed	
Sulfates	P, G	100 ml	Cool, 4 deg C	28 days
Sulfides	P, G	1 liter	Cool, 4 deg C, add 4 drops zinc acetate per 100 ml sample, NaOH to pH>9	7 days
Chloride	P, G	1 liter	Cool, 4 deg C	28 days
Total Nitrogen	Aqueous - P bottle, P cap, P liner	Aqueous - 1000 ml	H <sub>2</sub> SO <sub>4</sub> to pH<2	12 days
Nitrate	P, G	1 liter	Cool, 4 deg C, H <sub>2</sub> SO <sub>4</sub> to pH<2, (2 ml/L)	24 hrs - Unpreserved 28 days - preserved
Fluoride	Aqueous - P bottle, P cap, P liner	Aqueous - 1000 ml	4 deg C until analysis	26 days

Excerpt from Appendix 2-1 (NJDEP Field Sampling Procedures Manual, May 1992) which is based on 40 CFR part 136.3

P - Plastic, hard or soft

G - Glass

Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> - Sodium thiosulfate

HCl - Hydrochloric acid

Cl<sub>2</sub> - Chlorine

H<sub>2</sub>SO<sub>4</sub> - Sulfuric acid

HNO<sub>3</sub> - Nitric Acid

NaOH - Sodium hydroxide

CaCO<sub>3</sub> - Calcium carbonates

**APPENDIX A  
REFERENCES**

**A.1 Reference Procedure**

- American Society for Testing and Materials International, Standard Guide for Field Preservation of Groundwater Samples, ASTM D 6517-00, April 2000.
- American Society for Testing and Materials International, Standard Guide for Sample Chain-of-Custody Procedures, ASTM D 4840-99, January 2000.
- American Society for Testing and Materials International, Standard Practice for Collection and Handling of Soils Obtained in Core Barrel Samplers for Environmental Investigations, ASTM D 6640-01, April 2001.
- American Society for Testing and Materials International, Standard Practice for Estimation of Holding Time for Water Samples Containing Organic and Inorganic Constituents, ASTM D 4841-88, October 1985.
- American Society for Testing and Materials International, Standard Practice for Preparation of Sediment Samples for Chemical Analysis, ASTM D 3 976-92, December 1992.
- American Society for Testing and Materials International, Standard Practices for Preparation of Sample Containers and for Preservation of Organic Constituents, ASTM D 3694-96, March 1997.

**A.2 Other References**

- New Jersey Department of Environmental Protection, Field Sampling Procedures Manual, May 1992.
- United States Environmental Protection Agency Environmental Response Team, Groundwater Well Sampling SOP #: 2007, 26 January 1995.

**APPENDIX B**  
**RELATED HALEY & ALDRICH PROCEDURES**

- OP1004      Operation/Calibration of PID Photoionization Detector
- OP1007      Field Monitoring for Volatile Organics (breathing space-work zone)
- OP1009      Medical Surveillance Program
- OP1010      Health and Safety Plans
- OP1022      Health and Safety Manual
- OP3000      General Environmental Field Procedures and Protocols
- OP3006      Procedures for Subsurface Soil Sampling and Chemical Analysis
- OP3008      Manual Water Level Measurement Procedure
- OP3009      Monitoring Well Development Procedure
- OP3010      Groundwater Quality Sampling Procedure
- OP3012      Low Stress/Low Flow Groundwater Sample Collection Procedure
- OP3014      NAPL Monitoring and Sampling
- OP3026      Chain of Custody

**APPENDIX C**  
**FORMS**

Form 3001	Sampling Labels (Environmental)
Form 3003	Chain of Custody Record (Field)
Form 3005	Groundwater Sampling Record
Form 3006	Monitoring Well Devel Rpt
Form 3010	Low Flow Field Sampling Form

**APPENDIX D**  
**GLOSSARY**

*Chemical preservation* - the addition of acidic, alkaline or biologically toxic compounds, or combination thereof, to a groundwater sample to prevent changes in chemical properties of the sample that may occur after collection.

*Custody* - physical possession or control. A sample is under custody if it is in possession or under control so as to prevent tampering or alteration of its characteristics.

*Holding time* - the maximum amount of time that may transpire from the moment a sample container is filled to the time the sample is extracted or analyzed. Holding times are parameter-specific, variable in length, and defined by laboratory analytical methods.

*Physical preservation* - methods that are implemented to protect the physical integrity of a groundwater sample from the time the sample is collected until the sample is analyzed.

*Temperature blank* - a laboratory quality control sample that is transported with samples and is used by the laboratory performing sample analyses to verify that temperature-sensitive samples have been adequately cooled to 4°C for shipment to and arrival at the laboratory.

**APPENDIX E**  
**CHAIN OF CUSTODY RECORD**

See three-piece form in Forms cabinet.

# OPERATING PROCEDURE: OP3019

## COLLECTION OF GRAB SOIL GAS SAMPLES FROM PERMANENTLY INSTALLED SOIL GAS MONITORING WELLS USING SUMMA CANISTERS

### PREPARATION AND APPROVALS

VERSION	AUTHORED/DATE	REVIEWED / DATE	REVIEWED / DATE	REVIEWED / DATE	APPROVED / DATE
Ver. 0.0	RJR / Sept. 2003	CSO / Sept. 2003			JAK / Oct. 03

**Total Pages: 10**

© Haley & Aldrich, Inc. 2003

**TABLE OF CONTENTS**

	<b>Page</b>
<b>1. PURPOSE</b>	<b>1</b>
<b>2. EQUIPMENT &amp; SUPPLIES</b>	<b>1</b>
<b>3. PROCEDURE</b>	<b>1</b>
3.1 Quality Control/Quality Assurance	3
3.1.1 Sample Train Contamination	3
3.1.2 Field Duplicates	3
3.1.3 Method and Equipment Blanks	3
3.1.4 Summa Canister Check	3
3.2 Data Validation	4
3.2.1 Blanks	4
3.2.2 Duplicates (if collected)	4
<b>APPENDIX A – References</b>	<b>A-1</b>
<b>APPENDIX B – Related Haley &amp; Aldrich Procedures</b>	<b>B-1</b>
<b>APPENDIX C – Forms</b>	<b>C-1</b>
<b>APPENDIX D – Glossary</b>	<b>D-1</b>

## **OPERATING PROCEDURE: OP3019**

### **COLLECTION OF GRAB SOIL GAS SAMPLES FROM PERMANENTLY INSTALLED SOIL GAS MONITORING WELLS USING SUMMA CANISTERS**

#### **1. PURPOSE**

This operating procedure (OP) outlines the methods employed by Haley & Aldrich, Inc. (H&A) for the collection of grab soil gas samples from permanently installed soil gas monitoring wells using Summa canisters.

#### **2. EQUIPMENT & SUPPLIES**

- Monitoring well with ¼" brass hose barb fitting attached to the well cap
- ¼" OD Teflon tubing
- in-line vacuum gauge (if supplied by independent laboratory)
- in-line 7m filter (if supplied by independent laboratory)
- ¼" HDPE "T" fittings
- ¼" HDPE female hose barb adaptors
- ¼" ID Tygon tubing (various lengths)
- Tygon tubing clamps
- SKC personal air sampling pumps
- Digital bubble flow meter (if necessary)
- 6-L Summa canisters (supplied by independent laboratory)

This OP allows for the use of analogous materials and equipment.

#### **3. PROCEDURE**

The first step in the sampling procedure is to attach the sampling train to the installed well. Attach a small piece (~3") of Tygon tubing to the hose barb located on the well cap. A section of the ¼" OD Teflon tubing is attached (slip-fit) to this piece of Tygon tubing. The Tygon tubing should extend a minimum of ½" over the end of the Teflon tubing. Attach another 3" piece of Tygon tubing to the end of the Teflon tubing, followed by a ¼" HDPE "T" fitting. From the HDPE "T" fitting, attach two pieces of Teflon tubing using the Tygon tubing as connectors as above. One branch of the HDPE "T" fitting will lead to the Summa canister and the other will lead to the personal air sampling pump used for purging the well.

## Collection of Grab Soil Gas Samples From Permanently Installed Soil Gas Monitoring Wells Using Summa Canisters (OP3019)

In order to verify the vacuum in the Summa canister using the vacuum gauge supplied by the laboratory, attach the gauge to the ¼" male fitting on the Summa canister and open the valve approximately 1 1/4 turns. Record the initial vacuum on the Soil Gas Survey Sampling and Purge Information sheet (sampling record), close the valve, and remove the vacuum gauge. Attach the 7 $\mu$  filter to the Summa canister, followed by the Teflon tubing coming off the HDPE "T" fitting.

Prior to attaching the personal air sampling pump, the flow rate must be determined. If the personal sampling pump is equipped with a 0-5 L/min "floating ball" flow meter, turn the pump on and adjust the flow rate as necessary to yield a flow of approximately 3 L/min. If the personal sampling pump is not equipped with a 0-5 L/min "floating ball" flow meter, attach the pump to a digital bubble flowmeter with Tygon tubing. Turn the pump on and adjust the flow rate as necessary to yield a flow of approximately 3 L/min.

Record the flow rate on the sampling record for future reference.

Attach the personal air sampling pump to the sampling train. From the Teflon tubing attach a longer section (~1 foot) of Tygon tubing to the pump inlet. The Tygon tubing clamp will be placed over this section of tubing to isolate the pump during actual sample collection.

Purge the soil gas monitoring well. Using well installation reports to obtain well depth, calculate the volume of air present in the well, using the formula  $\pi r^2 h$ . (1"=2.54 cm, 1L= 1,000 cm<sup>3</sup>). Typical soil gas monitoring well construction is shown on Figure 3 of this report.

For example, a ½" diameter well that is six feet deep contains approximately 0.93L of air.

Purge the well at 3 L/minute for 5 to 7 minutes or 3 to 5 well volumes, whichever is greater. This will insure the sample collected for analysis is representative of soil gas located in the vadose zone.

After purging, immediately shut off the pump and close the hose clamp over the Tygon tubing. The well is now ready to be sampled. Immediately open the valve on the Summa canister gradually until sample flow can be heard and record the sample start time on the sampling record. Adjust the valve to allow the sample to be collected over an approximately one to three minute period, such that sample flow is still audibly detectable after the sample interval. Record the final time on the sampling record and close the valve. Use caution not to allow the Summa canister to sample until ambient conditions are achieved. At least 1-inch Hg final vacuum must remain in the Summa canister after sampling. Remove the Summa canister from the sampling train, remove the filter and the flow controller, and reattach the vacuum gauge. Open the valve and record the final vacuum reading on the sampling record. Close the valve, remove the vacuum gauge and replace the ¼" cap on the canister. Label the Summa canister sample tag with proper well ID, vacuum readings and sample interval.

Remove the sampling train tubing apparatus for the individual well and place into a sealable storage bag, and store for future sampling events. Label the storage bag with relevant soil vapor well designation, date of

## Collection of Grab Soil Gas Samples From Permanently Installed Soil Gas Monitoring Wells Using Summa Canisters (OP3019)

sampling, project name, and file number. Fill out Chain of Custody with project name, file number, sample identifications, Summa canister and related equipment serial numbers, date and time collected, and analysis requirements. Retain copies of the Chain of Custody record and relevant shipping information. Place canisters back into their original boxes and ship them to the laboratory via an overnight courier.

### **3.1 Quality Control/Quality Assurance**

#### **3.1.1 Sample Train Contamination**

Each sampling location will have a dedicated sampling train. This will minimize the possibility for cross-contamination between sampling locations. If soil or water is drawn into the sampling the train, it will need to be replaced.

The sampling trains may be removed and stored in 1-gallon storage bags (such as ZipLok bags) until needed for subsequent sampling events. A solvent-free environment should be used for storage, such as any Haley & Aldrich, Inc. office location, as appropriate.

#### **3.1.2 Field Duplicates**

A field duplicate may be collected. Duplicates should be collected from areas suspected to contain the contaminants of concern.

#### **3.1.3 Method and Equipment Blanks**

One ambient air sample will be collected upwind of the site. The ambient air sample will be collected adjacent to and simultaneous with field samples, using only a Summa canister and filter. The results from these samples may be used to assess background compounds at the site during sampling.

#### **3.1.4 Summa Canister Check**

For each lot of pre-cleaned Summa Canisters, the laboratory will remove one for a GC/MS certification check. If the canister passes certification, then it is re-evacuated and all canisters in the lot are considered clean. If the canister is found to be contaminated the entire lot of canisters is considered contaminated. Only canisters that have passed this certification check will be used for sample collection.

## 3.2. Data Validation

### 3.2.1 Blanks

Contaminants of Concern should not be present in blanks. If any testing parameter is found in a sample and an associated method blank, trip blank, or equipment blank, the results for that compound will be qualified with a "B" (in summary tables) if the sample concentration is less than three times the blank concentration.

### 3.2.2 Duplicates (if collected)

EPA Region I data validation guidance is not currently available for the evaluation of Summa canister analyses of soil gas. For the purposes of data assessment, Haley & Aldrich, Inc., will follow EPA Region I guidance for aqueous samples wherein both sample and duplicate results should be considered "estimated" if any analyte exceeds the 30% Relative Percent Difference (RPD) criterion. However, subjective judgements may be made about data usability based upon, but not limited to, instances where:

- Sample Quality Control (QC), such as surrogate recovery, is out of tolerance.
- Sample results are within 5 times the reporting limit.
- Sample chromatography indicates the presence of non-target response (such as hydrocarbon peak patterns).

The environmental analytical laboratory will follow EPA method guidance for the evaluation of laboratory duplicates. Laboratory acceptance criteria for duplicates are provided in the laboratory Quality Assurance Plan (QAP).

The Relative Percent Difference (RPD) of the duplicate will only be calculated for those target compounds that are detected at levels greater than five times the laboratory reporting limit.

**APPENDIX A**  
**REFERENCES**

- U.S.E.P.A., Soil Gas Sampling SOP# 2042, 1 June 1996, REV. #: 0.0
- U.S.E.P.A., Region I Lexington Laboratory, 18 September 2000 personal communication; P. Kahn.
- Compendium of Methods for the Determination of Organic Compounds in Ambient Air, EPA/625/R-96/010a, 2<sup>nd</sup> Edition, June 1999, USEPA ORD, Washington DC

**APPENDIX B**  
**RELATED HALEY & ALDRICH PROCEDURES**

- OP1004      Operation/Calibration of PID Photoionization Detector
- OP1005      Operation/Calibration of FID Flame Ionization Detector
- OP1007      Field Monitoring for Volatile Organics (breathing space-work zone)
- OP1009      Medical Surveillance Program
- OP1010      Health and Safety Plans
- OP3000      General Environmental Field Procedures and Protocols
- OP3001      Preservation and Shipment of Environmental Samples
- OP3002      Headspace Screening Procedure

**APPENDIX C**  
**FORMS**

Form 3001      Sampling Labels (Environmental)

Form 3003      Chain of Custody Record

Form 3004      Sampling Record

Form 3005      Groundwater Sampling Record

Haley & Aldrich

**APPENDIX D**  
**GLOSSARY**

*This page intentionally left blank.*

Haley & Aldrich

# OPERATING PROCEDURE: OP3003

## SURFICIAL SOIL SAMPLING

### PREPARATION AND APPROVALS

VERSION	AUTHORED/DATE	REVIEWED / DATE	REVIEWED / DATE	REVIEWED / DATE	APPROVED / DATE
Ver. 0.0	JML: June 2003	CSO July 2003			DHS Sept 2003

**Total Pages: 21**

© Haley & Aldrich, Inc. 2003

**TABLE OF CONTENTS**

	<b>Page</b>
<b>LIST OF FIGURES</b>	
<b>1. PURPOSE</b>	<b>1</b>
<b>2. EQUIPMENT &amp; SUPPLIES</b>	<b>1</b>
<b>3. PROCEDURE</b>	<b>2</b>
3.1 Preparation	2
3.2 Presampling Observations, Notes and Required Entries	3
3.3 Sampling Procedures	4
3.4 Sampling Device Instructions	5
3.4.1 Hand Scoops, Trowels, Spades and Shovels	5
3.4.2 Bucket and Bit Augers with Thin-Wall Tube Attachment	6
3.4.3 Hand Held Corer	8
3.4.4 Thin Tube Hand Held Sampling Trier	8
3.4.5 Split Spoon Sampler	9
3.4.6 Test Pit/Trench Excavation	10
3.4.7 Telescopic Mechanical Sampling Arm	11
3.5 Sample Containers	12
3.6 Chain-of-Custody Forms	12
3.7 Decontamination	12
3.8 Quality Assurance/Quality Control	12
3.9 Health and Safety	12
<b>APPENDIX A – References</b>	<b>A-1</b>
<b>APPENDIX B – Related Haley &amp; Aldrich Procedures</b>	<b>B-1</b>
<b>APPENDIX C – Forms</b>	<b>C-1</b>
<b>APPENDIX D – Glossary</b>	<b>D-1</b>

**LIST OF FIGURES**

<b>Figure No.</b>	<b>Title</b>	
1	Sampling Augers	13
2	Sample Coring Device	14
3	Sampling Trier	15

**OPERATING PROCEDURE: OP3003**

**SURFICIAL SOIL SAMPLING**

**1. PURPOSE**

The purpose of this Operating Procedure (OP) is to describe the procedures for the collection of representative samples of surficial soil. The procedures are intended specifically to minimize alteration of samples during collection. Surficial soil samples as referenced herein mean soils or soil-like material located less than 6 feet below ground surface which may contain quantities of contaminants.

Refer to OP3000 for General Environmental Field Procedures and Protocol, including procedures for decontamination of sampling equipment and/or containers. Refer to OP3001 for Operating Procedures on Preservation and Shipment of Environmental Samples.

Refer to OP3004 for Operating Procedures on Stream Sediment and Wetlands Soil Sampling. Refer to OP3006 for Operating Procedures on Subsurface Soil Sampling for Chemical Analysis.

Haley & Aldrich (H&A) personnel are to use the techniques in OP3003 to collect surficial soil samples. These operating procedures may be varied or changed as required, dependent upon site conditions, equipment limitations, or limitations imposed by the procedure. In all instances, the actual procedures used should be documented and described in an appropriate site report.

**2. EQUIPMENT & SUPPLIES**

Required:

1. Site map(s)/plan(s)
2. Safety equipment, as specified in the site-specific Health and Safety Plan
3. Field Log book
4. Stainless steel, plastic, or other appropriate homogenization bucket, bowl or pan
5. Plastic or stainless steel spoons and/or wooden tongue depressors
6. Appropriate size sample containers
7. Plastic zip lock bags
8. Sample Labels
9. Chain of Custody records and custody seals
10. Sampling Record Form (H&A Form 3004)
11. Cooler(s)
12. Ice
13. Decontamination supplies/equipment

Sampling equipment may include one or more of the following:

1. Stainless steel trowel(s) or scoop(s)
2. Stainless steel spade or shovel
3. Bucket auger
4. Bit auger
5. Continuous flight (screw) auger
6. Post-hole auger
7. Extension/drill rods
8. T-handle
9. Core sampler
10. Sampling trier
11. Thin wall tube sampler
12. Split spoons
13. Vehimeyer soil sampler outfit
14. Tubes
15. Points
16. Drive head
17. Drop hammer
18. Puller jack and grip
19. Backhoe
20. Telescopic mechanical sampling arm (aluminum poles)
21. Stainless steel sampling beaker

Optional:

1. Tape measure
2. Survey equipment or global positioning system (GPS) to locate sampling points
3. Survey stakes or flags
4. Camera and film
5. Plastic sheeting or cover

### **3. PROCEDURE**

#### **3.1 Preparation**

- Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies required.
- Obtain necessary sampling and monitoring equipment.
- Decontaminate or pre-clean equipment, and ensure that it is in working order.

- Prepare schedules and coordinate with staff, client, and regulatory agencies, if appropriate.
- Perform a general site survey prior to site entry in accordance with the site specific Health and Safety Plan.
- Use stakes, flagging, or buoys to identify and mark all sampling locations. Specific site factors, including extent and nature of contaminant, should be considered when selecting sample location. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations should be utility-cleared by the property owner or the On-Scene-Coordinator prior to soil sampling, and utility clearance should always be confirmed before beginning work.

### 3.2 Presampling Observations, Notes and Required Entries

The information listed below will be recorded in a project Field Log book and a Sampling Record Form. The Sampling Record Form is referenced in Appendix C. The following list of measurements and observations represent a minimum requirement for soil samples:

- Sampling Location Number
- Time
- Date Collected
- Samplers (names of individuals who actually collected samples)
- Sample Destination (Analytical Laboratory) to receive samples
- Description of Sample Location with Sketch or Map
- Sample Depth (i.e., distance in feet from ground surface)
- Photograph Number and Roll Used (if applicable).
- Observable Physical Characteristics
  - Odor
  - Color
  - Density, Consistency, etc.
  - Layering
  - Other
- Evidence of Stressed Vegetation or Wild Life in Area where Sample was taken

- Ambient Weather Conditions during Sampling
  - Air Temperature
  - Sky Condition
  - Recent Precipitation or Drought
- Samples Collected (enter all sample numbers collected at this location)

### 3.3 Sampling Procedures

- After entries are completed, label and number required sample bottles. Fill out the label in indelible ink and carefully and clearly address all categories and parameters.
- Sample analyses will be specified by the Project Coordinator and Site Manager. A list of these analyses and required containers and handling procedures is presented in a Site work plan or related document.
- Sampling instructions have been provided for seven sampling devices most often used to collect surficial soil samples. Select the appropriate sampling device.
- Refer to Operation Procedure OP2001 - Identification and Description of Soils in the Field Using Visual-Manual Methods, if observations of surficial soils are to be recorded.
- Decontaminate sampling device and/or container prior to use according to Operation Procedure OP3000 - General Environmental Field Procedures and Protocol.
- Sample containers (glass jars and vials) should be filled to the top. Refer to a Site work plan or related document for sample volume size and appropriate containers for given analyses. Sample containers should contain laboratory-provided preservatives, if necessary. Care should be taken to prevent the presence of air bubbles in VOA vials. All container caps will include an inner teflon septa or lining and must be tightly secured to contain the sample. All samples will be stored and shipped at 4°C. Refer to OP3001 for operating procedures on sample handling and preservatives.
- Check for appropriate liner in cap and secure cap tightly. Store the samples with ice in a cooler, following these sealing and packing procedures:
  - Ice will be placed in plastic zip-lock bags to contain ice water. Sample containers will be adequately layered in bubble wrap to prevent breakage. Samples will be positioned upright in the cooler to prevent breakage, and samples will be stored and shipped at 4°C.
  - All 40-milliliter VOA vials will be sealed in thick or heavy duty plastic zip lock bags.
  - Check to make sure all appropriate information is in Field Log Book or Sampling Record form and Chain-of-Custody form using indelible ink.

- If samples are to be shipped to a laboratory for analysis, a Chain-of-Custody record, custody seals, fragile markers, and reinforced nylon tape will all be properly affixed to or on the sample cooler. If samples are to be delivered to the laboratory directly by Haley & Aldrich, then only the Chain-of-Custody record is required.
- Chain-of-Custody Form - enclose in large plastic zip lock bag and tape to inside top of cooler lid.
- Custody Seals - place custody seal over cooler gasket separating the cooler lid from the cooler bottom at all sides except hinged location.
- Nylon Tape - tape completely around cooler at two locations. Tape reinforcing will prevent cooler from opening if the lid locking mechanism fails.
- Fragile Markers - fragile markers and upright stickers will be affixed to each side of the cooler.

### 3.4 Sampling Device Instructions

The specific procedures and equipment for surficial soil sampling will be defined in a Site work plan or related document. The following presents a description of seven sampling devices commonly used to collect surficial soil samples within 6 feet of ground surface. The split spoon sampler, when used with drilling equipment, can also collect subsurface soil samples to much greater depths. The most appropriate device for a specific sampling program as described in a Site work plan or related document has been selected based on site conditions (accessibility, type of soil, desired depth of samples, etc.) and on climate conditions (e.g. frozen ground in winter).

The selected devices for each sampling task are described in detail in a Site work plan or related document. Any changes to procedures outlined in a Site work plan or related document will be specified by the Site Manager.

#### 3.4.1 Hand Scoops, Trowels, Spades and Shovels

This method is probably the simplest, most expeditious, direct method for making soil samples accessible. Collection of samples from near-surface soil can be accomplished with tools such as spades, shovels, trowels, and scoops. These devices are easy to operate, decontaminate and work well for sampling most surficial soils. Surface material is removed to the required depth and a stainless steel or plastic scoop is then used to collect the sample. This method can be used in most soil types but is limited to sampling at or near the ground surface. Accurate, representative samples can be collected with this procedure depending on the care and precision demonstrated by the sample team member.

Hand scoops and trowels consist of the usual garden type trowel or scoop usually constructed of stainless steel. A stainless steel laboratory scoop is a preferred scoop device due to its non-corrosive nature. Scoops or trowels work well in collecting grab samples of surficial soils or sludges. A flat,

pointed mason trowel to cut a block of the desired soil is helpful when undisturbed profiles are required. A typical shovel or spade constructed of stainless steel can be used to collect representative soil samples near the surface. Devices plated with chrome or other exterior coatings that may chemically alter the sample should not be used. Plating is particularly common with garden implements such as potting trowels.

#### Procedures for Use

1. Carefully remove the top layer of soil to the desired sample depth with a cleaned, stainless steel spade, shovel, trowel, or scoop. In the case of sludges exposed to air, it may be desirable to remove the first 1-2 centimeters of material prior to collecting sample.
2. Using a cleaned, stainless steel scoop or trowel, collect the desired quantity of soil.
3. If volatile organic analysis is to be performed, transfer the sample directly into an appropriate, labeled sample container with a stainless steel lab spoon, new wooden tongue depressor or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

#### **3.4.2 Bucket and Bit Augers with Thin-Wall Tube Attachment**

This system consists of a bucket or bit auger, or a thin-wall tube sampler, a series of extensions/drill rods, and a "T" handle (Figure 1). A cleaned bucket or bit auger is used to bore a hole to the desired sampling depth and then is withdrawn. When using the bucket auger, the soil sample must be removed from the bucket with a cleaned, stainless steel spoon or trowel. The bucket auger can collect a large soil sample (up to 24 ounces) but is limited in penetrating depth to approximately 2 feet under ideal conditions. Bucket augers are useful for direct sample recovery, because they provide a large volume of sample in a short time. The bit auger has greater penetrating depth (up to 6 feet) but collects a small soil sample. The bit auger tip is removed from the auger when the desired sampling depth is reached and replaced with the thin wall tube attachment. The system is then lowered down the cored hole, and driven into the soil to the completion depth. The system is withdrawn and the core is collected from the thin wall tube sampler.

Other types of augers include continuous flight (screw) and post-hole augers. When continuous flight augers are used, the sample can be collected directly from the flights. The continuous flight augers are satisfactory when a composite of the complete soil column is desired. Post-hole augers have limited utility for sample collection as they are designed to cut through fibrous, rooted, swampy soil and cannot be used below a depth of approximately three feet.

This equipment can be used in a wide variety of soil conditions. The presence of rock layers and collapsing of the borehole usually prohibit sampling at depths greater than 3 to 6 feet. The equipment is inexpensive, easy to operate, and generally works well to sample most soils.

Procedures for Use

1. Attach the cleaned auger bucket or bit to a drill rod extension and further attach the "T" handle to the drill rod.
2. Clear the area to be sampled of any surface debris (twigs, rocks, litter). It may be advisable to remove the first 3 to 6 inches of surface soil for an area approximately 6 inches in radius around the drilling location.
3. Begin augering by rotation of the "T" handle, periodically removing accumulated soils onto a plastic sheet spread near the hole. This prevents accidentally brushing loose material back down the borehole when removing the auger or adding drill rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.
4. After reaching the desired depth, slowly and carefully remove the auger from the hole.
5. If a bucket auger is used, remove the soil sample with a cleaned, stainless steel spoon or trowel.
6. If a bit auger is used, remove the auger tip from the extension rods and replace with a cleaned, thin-wall tube sampler. Install the proper cutting tip.
7. Carefully lower the tube sampler down the borehole. Gradually press the tube sampler into the soil. Take care to avoid scraping the borehole sides. Avoid hammering the drill rods to facilitate coring, as the vibrations may cause the boring walls to collapse.
8. Remove the tube sampler and unscrew the drill rods.
9. Remove the cutting tip, and remove the core from the device.
10. Discard the top of the core (approximately 1 inch), as this possibly represents material collected before penetration of the layer of concern. Place the remaining core into the appropriate labeled sample container. Sample homogenization is not required.
11. If volatile organic analysis is to be performed, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, wooden tongue depressor or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval

into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

12. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger bit to the drill and assembly, and repeat previous steps, making sure to decontaminate the auger and tube sampler between samples.
13. Abandon the hole according to applicable state regulations. Generally, shallow holes can simply be backfilled with the removed soil material.

### 3.4.3 Hand Held Corer

The device consists of a "T" handle and cylindrical core tube (Figure 2). The device is equipped with a check valve at the top to prevent washout during retrieval through an overlying water layer, if applicable, and a nosepiece at the bottom to help contain the sample. This device can be used in a wide variety of soil conditions. Hand corers can also be fitted with brass or polycarbonate plastic liners.

#### Procedures for Use

1. Inspect the corer for proper pre-cleaning.
2. Press the corer in with a smooth continuous motion.
3. Twist the corer, and then withdraw the corer in a single smooth motion.
4. Remove the nosepiece and withdraw the sample into a stainless steel, plastic or other appropriate homogenization container.
5. Transfer the sample into an appropriate sample container with a stainless steel spoon, wooden tongue depressor or equivalent.

### 3.4.4 Thin Tube Hand Held Sampling Trier

The system consists of a trier, a long hollow cylindrical tube with a slot trending almost its entire vertical length, and a "T" handle (Figure 3). The trier is driven into the soil to be sampled and used to extract a core sample from the appropriate depth. The tip and edges of the tube are sharp to allow the trier to cut a core by rotation of the "T" handle once it is completely pushed-down or manually driven to the depth of collection. Triers range from approximately 20 to 60 inches in length and from approximately 0.5 to 1 inch in diameter.

#### Procedures for Use

1. Insert the cleaned trier into the soil or sludge material at a 0 to 45° angle from horizontal. This orientation minimizes the spillage of sample from the sampler. Extraction of samples might require tilting of the containers.
2. Rotate the trier once or twice to cut a core of material.
3. Slowly withdraw the trier, making sure the slot is facing upward.
4. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, wooden tongue depressor or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

#### **3.4.5 Split Spoon Sampler**

Split spoon sampling is generally used to collect undisturbed soil cores of 18 or 24 inches in length. A split spoon sampler consists of a cylindrical hollow steel or stainless steel sampler usually 24 inches long and 2 or 3 inches in outside diameter. A series of consecutive cores may be extracted with a split spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole and the core extracted. Split spoon samplers collect in-situ soil samples that permit stratigraphic logging. To remove the split spoon sampler and collect a soil sample, remove the sampler from the driving rods and unscrew the tapered nosepiece and top piece from the sampler. The spoon will then split into two longitudinal sections. It may be necessary to use a pipe wrench to unlock the threaded nosepieces. This sampling device is almost always used in conjunction with a drilling rig and as such is an equipment intensive effort. However, the split spoon may be used with a hand-held drop hammer for collection of shallow soil samples (less than 6 feet below ground surface).

Refer to Operation Procedures OP2005 - Test Borings, Sampling, Standard Penetration Testing and Borehole Abandonment, and OP3006 - Procedures for Subsurface Soil Sampling for Chemical Analysis, which describe the use of this sampler in greater detail.

Procedures for Use

1. Assemble the sampler by aligning both sides of barrel and then screwing the drive shoe on the bottom and the head piece on top.
2. Place the sampler in a position perpendicular to the sample material.
3. Using a well ring, drive the tube. Do not drive past the bottom of the head piece or compression of the sample will result.
4. Record in the Field Log book or test boring log the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain this depth.
5. Withdraw the sampler, and open by unscrewing the bit and head and splitting the barrel. The amount of recovery and soil type should be recorded on the boring log. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, longitudinally. This sampler is typically available in 2 and 3 1/2 inch diameters. A larger barrel may be necessary to obtain the required sample volume.
6. Without disturbing the core, transfer it to appropriate labeled sample container(s) and seal tightly.

**3.4.6 Test Pit/Trench Excavation**

A backhoe can be used to remove sections of soil, when detailed examination of soil characteristics are required. This is a relatively expensive sampling method because of the cost of backhoe operation. Refer to Operation Procedure OP2026 - Exploratory Test Pits for more information on test pit excavations.

Procedures for Use

1. Prior to any excavation with a backhoe, it is important to ensure that all sampling locations are clear of overhead and buried utilities.
2. Review the site specific Health & Safety plan and ensure that all safety precautions including appropriate monitoring equipment are installed as required.
3. Using the backhoe, excavate a trench approximately three feet wide and approximately one foot deep below the cleared sampling location, or as specified in a Site work plan or related document. Place excavated soils on plastic sheets. Trenches greater than five feet deep must be sloped or protected by a shoring system, as required by OSHA regulations.

4. A shovel may be used to remove a one to two inch layer of soil from the vertical face of the pit where sampling is to be done.
5. Record in the Field Log book or test pit log the depth intervals from which the samples are being collected.
6. Samples are taken using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket. A telescopic mechanical arm (see next sampling device) and stainless steel sampling beaker may be used to collect samples.
7. If volatile organic analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel lab spoon, wooden tongue depressor or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.
8. Abandon the pit or excavation according to applicable state regulations. Generally, shallow excavations can simply be backfilled with the removed soil material. The test pit/excavation should be backfilled in accordance with a Site work plan or related document.

#### **3.4.7 Telescopic Mechanical Sampling Arm**

The device consists of an aluminum pole approximately 1 to 2 inches in diameter divided into three, 4-foot sections. Attached to the end of the pole is a stainless steel sampling beaker (usually with an 18-ounce capacity). The pole is capable of telescoping from 4 to 12 feet. This mechanical sampling arm is used to collect soil samples from test pits or other excavations. It allows a sample to be collected from a location that would otherwise be difficult to access.

##### Procedures for Use

1. Attach the cleaned, stainless steel beaker to the end of the pole either by tightening a clamp or wing nuts.
2. Make sure your feet are safely and securely positioned.
3. Telescope the pole to the required length.

4. Lower the pole end into the test pit or other excavation.
5. Collect the sample.
6. Remove the sample from the beaker with a cleaned, stainless steel scoop, trowel or new wooden tongue depressor.

### **3.5 Sample Containers**

The samples for each analysis will be collected in the appropriate containers and handled in accordance with the procedures described in a Site work plan or related document.

### **3.6 Chain-of-Custody Forms**

All samples submitted to the contract analytical laboratory for analyses, will be accompanied by a Chain-of-Custody form. Appropriate Chain-of-Custody procedures will be followed at all times during a sampling event and subsequent transport to the contract analytical laboratory. Refer to OP3026 for operation procedures on completing a Chain-of-Custody form and Chain-of-Custody procedures.

### **3.7 Decontamination**

Soil sampling equipment will be cleaned prior to and between each use according to Operation Procedure OP3000 – General Environmental Field Procedures and Protocol. After decontamination, the equipment will be wrapped in aluminum foil and placed on clean racks off the ground until it is used.

### **3.8 Quality Assurance/Quality Control**

There are no specific quality assurance (QA) activities that apply to the implementation of these operating procedures. However, the following QA procedures apply:

- All data must be documented on field data sheets or within site logbooks.
- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in a Site work plan or related document. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

### **3.9 Health and Safety**

When working with potentially hazardous materials, follow H&A health and safety procedures, in addition to the procedures specified in the site specific Health & Safety Plan.

**FIGURES**

Figure 1. Sampling Augers

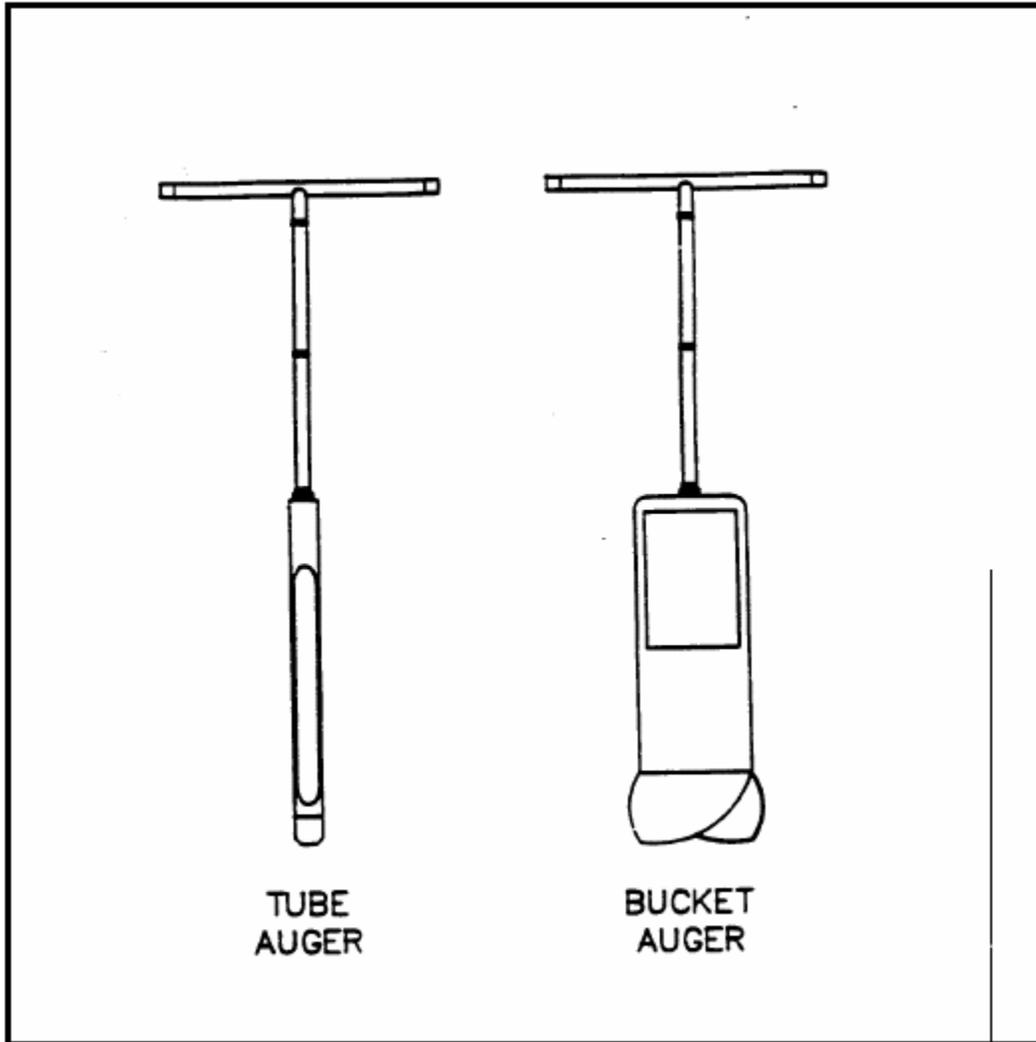


Figure 2. Sample Coring Device

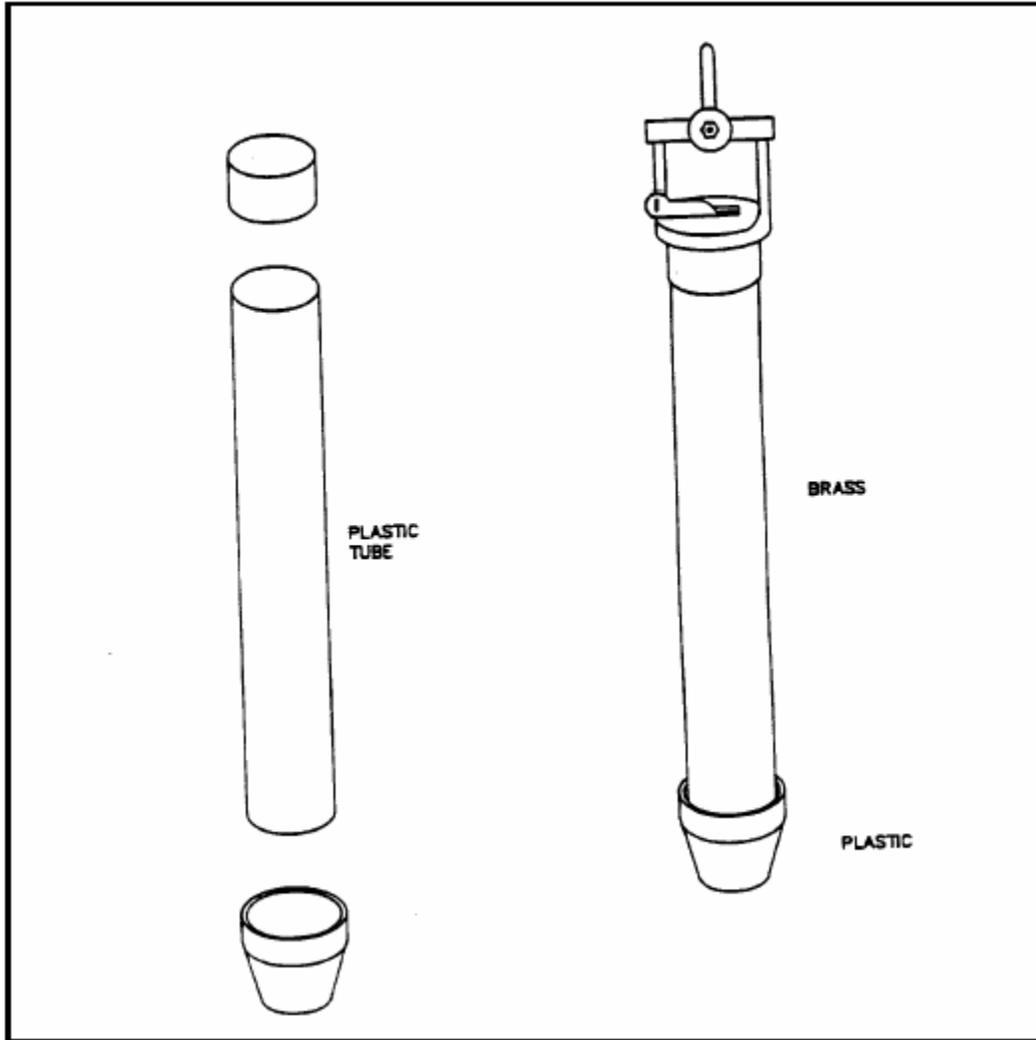
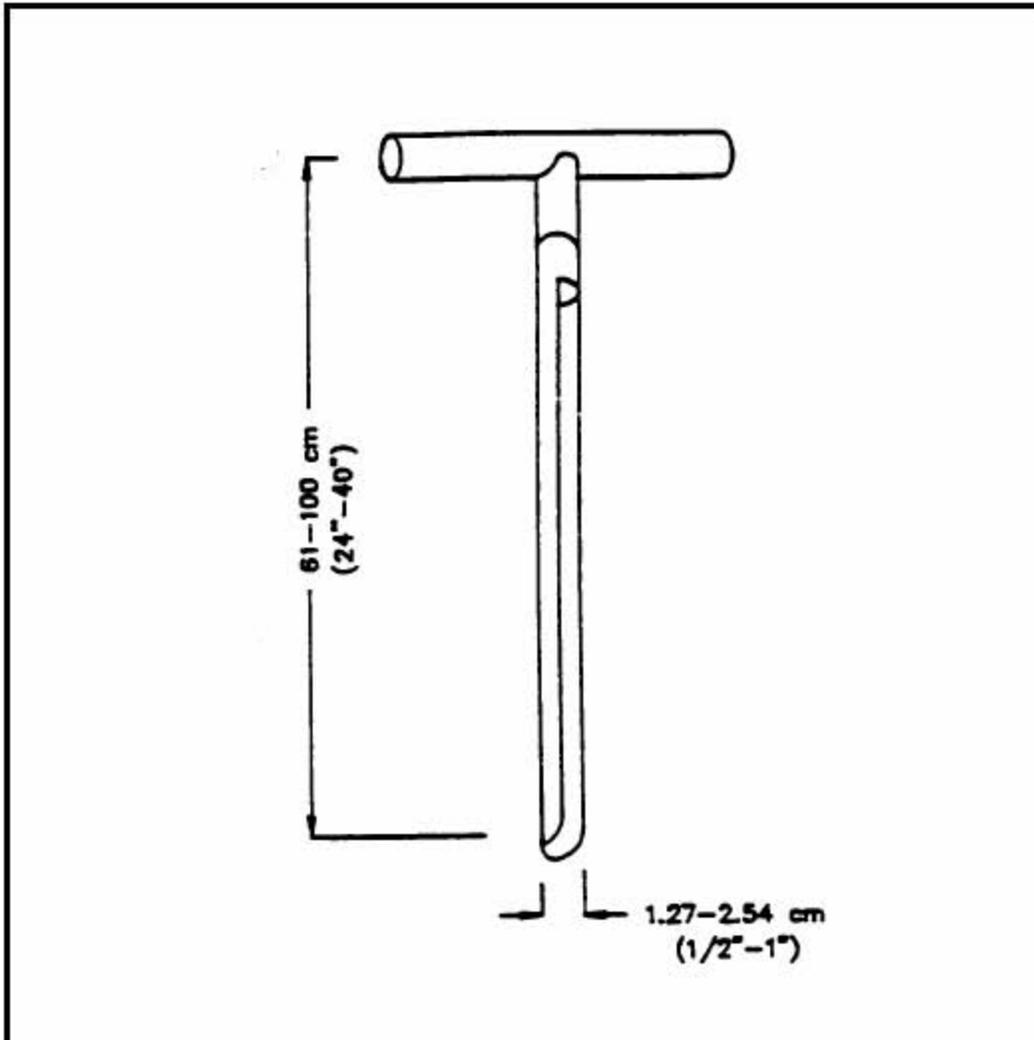


Figure 3. Sampling Trier



**APPENDIX A  
REFERENCES**

- Barth, D.S., Mason, B.J. (1984) Soil Sampling Quality Assurance Guide, Environmental Research Center, University of Nevada, U.S. EPA-600/4-84-043.
- New York State Department of Environmental Conservation (1991), RCRA Quality Assurance Project Plan Guidance, Division of Hazardous Substance Regulation.
- Scaff, M.R., McNabb, J.F., Robert F. Kerr, Manual of Groundwater Quality Sampling Procedures, Environmental Research Laboratory, pp. 72-80.
- United States Environmental Protection Agency (1982), Test Methods For Evaluating Solid Waste, Physical/Chemical Methods, U.S. EPA SW-846, 3rd Edition.
- United States Environmental Protection Agency, (1983) A Methods Manual-Volume II Available Sampling Methods, U.S. EPA-600/X-83-018.
- United States Environmental Protection Agency, (1983) Standard Operating Procedures Toxics and Waste Management Division.
- United States Environmental Protection Agency (1987), A Compendium of Superfund Field Operations Methods, EPA/540/P-87/001, pp. 10-40 to 10-48.
- United States Environmental Protection Agency Environmental Response Team (1994), Standard Operating Procedures: Sediment Sampling, SOP 2016, Rev. 0.0, p. 11, dated 11/17/94.
- United States Environmental Protection Agency Environmental Response Team (2000), Standard Operating Procedures: Soil Sampling, SOP 2012, Rev. 0.0, pp. 1-13, dated 02/18/00.

**APPENDIX B  
RELATED HALEY & ALDRICH PROCEDURES**

- OP1009 Medical Surveillance Program
- OP1010 Health and Safety Plans
- OP2001 Identification and Description of Soils in the Field Using Visual-Manual Methods
- OP2005 Test Borings, Sampling, Standard Penetration Testing and Borehole Abandonment
- OP2026 Exploratory Test Pits
- OP3000 General Environmental Field Procedures and Protocol
- OP3001 Preservation and Shipment of Environmental Samples
- OP3004 Stream Sediment and Wetlands Soil Sampling
- OP3006 Procedures for Subsurface Soil Sampling for Chemical Analysis
- OP3026 Chain of Custody

**APPENDIX C  
FORMS**

- Form 3001 Sampling Labels (Environmental)
- Form 3002 Chain of Custody (Electronic)
- Form 3003 Chain of Custody (Field)
- Form 3004 Sampling Record

Haley & Aldrich

**APPENDIX D  
GLOSSARY**

- This page intentionally left blank.

Haley & Aldrich

**APPENDIX H**

**Site Inspection Forms**

# SMP - ANNUAL SITE INSPECTION

<b>PROJECT</b>	Tarrytown Former MGP Site	<b>Name:</b>	<b>Routine/Nonroutine Inspection:</b>
<b>LOCATION</b>	Tarrytown, New York	<b>Company:</b>	<b>Weather:</b>
<b>DATE(s)</b>		<b>Title:</b>	<b>Other Noteworthy Conditions:</b>

**DNAPL Recovery System** (see attached monitoring and extraction forms for routine recovery and monitoring activities)

Visual Inspection Observations:

Recommended maintenance or repairs completed since previous inspection(s):

Deficiencies, performance notes or recommendations:

Other observations (include sketch or photos attachments as appropriate):

**UNDERWATER BARRIER CAP**

Visual Inspection and Integrity Observations (attach or include diver reports or inspection of cap)

Recommended maintenance or repairs completed since previous inspection(s):

Deficiencies, performance notes or recommendations (e.g., condition of stone cover, bentonite layer exposure, steel sheeting displacement and rigid probing results)

Other observations (include sketch or photos attachments as appropriate):

**SITE COVER - SOIL AND IMPERMEABLE SURFACE CAP**

Visual Inspection and Integrity Observations:

Recommended maintenance or repairs completed since previous inspection(s):

Deficiencies, performance notes or recommendations:

Other observations (include sketch or photos attachments as appropriate):

# SMP - ANNUAL SITE INSPECTION

Attach or summarize any site soil sampling or modifications to site cover conditions (or indicate no change):

## SOIL VAPOR MANAGEMENT SYSTEMS

Passive Systems - Visual Inspection Observations (note any vent/piping issues or blockages, integrity issues):

Active Systems (if any) - Visual and Inspection Observations (note each fan operational status, any repairs needed, piping issues or blockages, etc):

Recommended maintenance or repairs completed since previous inspection (note any by location, include sketches and photos as appropriate):

Deficiencies, performance notes or recommendations:

Other observations (include sketch or photos attachments as appropriate):

## GROUNDWATER MONITORING WELLS:

Visual Inspection and Integrity Observations including locks, access, riser or roadbox damage, etc (include markup of site plan or sketch as appropriate):

Recommended maintenance or repairs completed since previous inspection(s):

Other observations (include sketch or photos attachments as appropriate):

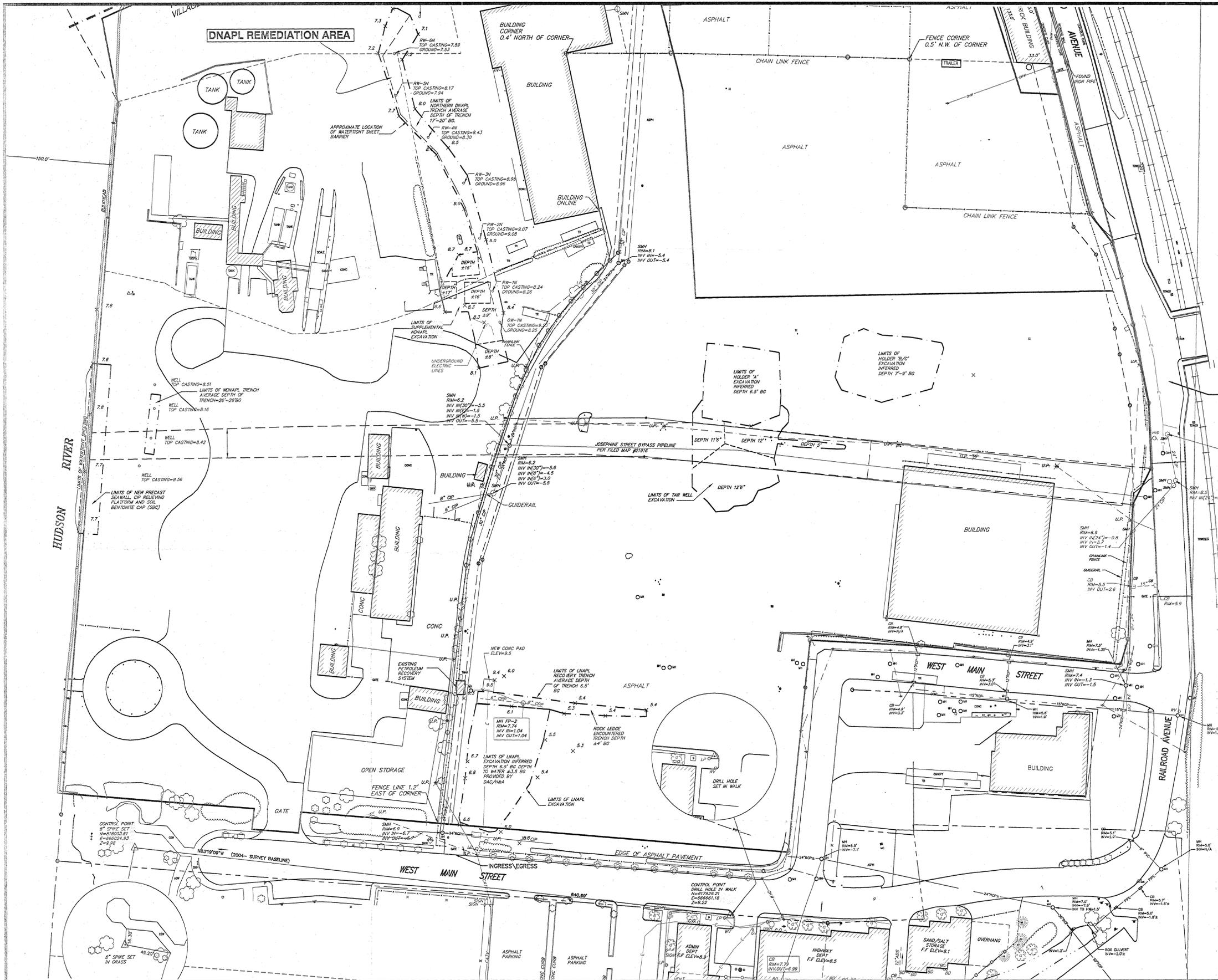
## OTHER SITE OBSERVATIONS (include any incidents, repairs, maintenance, or other observations affecting site management plan and reporting):





**APPENDIX I**

**Engineering Controls “As-Built” Drawings**



- LEGEND:**
- NO PHYSICAL BOUNDS
  - - - ADJACENT PROPERTY LINE
  - X 108.7 EXISTING SPOT GRADE
  - - - - - EXISTING FENCE
  - - - - - EXISTING OVERHEAD WIRES
  - - - - - EXISTING UNDERGROUND SEWER LINE
  - - - - - EXISTING UNDERGROUND STORM LINE
  - HYD EXISTING HYDRANT
  - CB EXISTING CATCH BASIN
  - SMH EXISTING SANITARY SEWER MANHOLE
  - DMH EXISTING STORM SEWER MANHOLE
  - UP EXISTING UTILITY POLE
  - WV EXISTING WATER VALVE
  - CV EXISTING GAS VALVE
  - WS EXISTING WATER SHUT OFF
  - EL EXISTING LIGHT POLE
  - EXISTING SIGN

**NOTES:**

UNAUTHORIZED ALTERATION OR ADDITION TO A SURVEY MAP BEARING A LICENSED LAND SURVEYOR'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW .

ONLY COPIES FROM THE ORIGINAL OF THIS SURVEY MARKED WITH AN ORIGINAL OF THE LAND SURVEYOR'S INKED SEAL OR HIS EMBOSSED SEAL SHALL BE CONSIDERED TO BE VALID TRUE COPIES .

SUB-SURFACE STRUCTURES NOT VISIBLE OR READILY APPARENT ARE NOT SHOWN AND THEIR LOCATION AND EXTENT ARE NOT CERTIFIED.

SUBJECT TO COVENANTS, EASEMENTS, RESTRICTIONS, CONDITIONS AND AGREEMENTS OF RECORD.

DWELLING SHOWN HEREON SERVED BY UNDERGROUND UTILITIES .

SURVEY SUBJECT TO ANY RIGHT , TITLE OR INTEREST THE PUBLIC MAY HAVE FOR HIGHWAY USE .

UNDERGROUND FACILITIES AND STRUCTURES SHOWN HEREON WERE TAKEN FROM DATA OBTAINED FROM PREVIOUS MAPS AND RECORD DRAWINGS. ALL ABOVE GROUND STRUCTURES AND SURFACE FEATURES SHOWN HEREON ARE THE RESULT OF A FIELD SURVEY UNLESS OTHERWISE NOTED. THERE MAY BE OTHER UNDERGROUND UTILITIES, THE EXISTENCE OF WHICH ARE NOT KNOWN OR CERTIFIED BY THE UNDERSIGNED. THE SIZE AND LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES MUST BE VERIFIED BY THE APPROPRIATE AUTHORITIES. THE UNDERGROUND FACILITIES PROTECTIVE ORGANIZATION MUST BE NOTIFIED PRIOR TO CONDUCTING TEST BORINGS, EXCAVATION AND CONSTRUCTION.

PROPERTY SHOWN HEREON LIES WITHIN FLOOD ZONE'S A3, B & C AREAS OF MINIMAL FLOODING, AS SHOWN ON FLOOD INSURANCE RATE MAP FOR THE TOWN OF GREENBURGH, N.Y. COMMUNITY PANEL #360933 0001 B, DATED NOVEMBER 18, 1981.

TOPOGRAPHY SHOWN HEREON COMPILED FROM AERIAL COMPLETED ON NOVEMBER 18, 1998. 2' CONTOUR INTERVAL, DATUM NAVD-1988. TOPOGRAPHY MAY NOT REFLECT THE CURRENT CONDITION OF SITE.

DEPTH OF DNAPL TRENCH 17'-20' BG (BELOW GRADE), PROFILES PROVIDED BY D.A. COLLINS ENVIRONMENTAL SERVICES JULY 12, 2004.

LNAPL TRENCH AND TAR WELL EXCAVATION DEPTHS MEASURED DURING INSTALLATION BY D.A. COLLINS ENVIRONMENTAL SERVICES/HALEY & ALDRICH.

DEPTH OF WATER IN LNAPL EXCAVATION MEASURED BY LEAD LINE, D.A. COLLINS ENVIRONMENTAL SERVICES/HALEY & ALDRICH, DURING INSTALLATION.

DEPTH OF DNAPL TRENCH 26'-28' BG (BELOW GRADE) PROVIDED BY DA COLLINS ENVIRONMENTAL SERVICES.

LIMITS OF NEW PRECAST SEAWALL, CIP RELIEVING PLATFORM AND SOIL BENTONITE CAP (SBC) PROVIDED BY DA COLLINS ENVIRONMENTAL SERVICES.

**SURVEY DATUM**

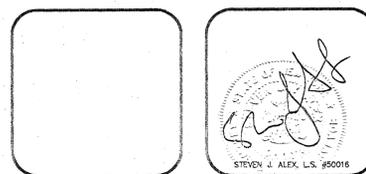
VERTICAL DATUM REFERENCE:  
 PID LK0999  
 DESCRIBED BY NATIONAL GEODETIC SURVEY 1955  
 AT TARRYTOWN.  
 NAVD-1988 7.44 (FEET) ADJUSTED  
 AT TARRYTOWN, AT THE NEW YORK CENTRAL RAILROAD STATION, AN  
 OUTLINED SQUARE ON THE TOP OF THE SOUTHWEST CORNER OF THE STONE  
 DOOR SILL OF WEST ENTRANCE TO BAGGAGE ROOM, 28 1/2 FEET EAST  
 OF EAST RAIL OF EAST TRACK, 28 FEET SOUTH OF NORTHWEST CORNER  
 OF STATION AND ABSOLUTE LEVEL WITH TRACKS.

HORIZONTAL DATUM REFERENCE:  
 This is a Height Modernization Survey Station.  
 AJ3348 CORS - This is a GPS Continuously Operating Reference Station.  
 AJ3348 DESIGNATION - NJ INST OF TECH 2 CORS ARP  
 AJ3348 CORS ID - NJ32  
 AJ3348 PID - AJ3348  
 AJ3348 STATE/COUNTY- NJ/ESSEX AJ3348 USGS QUAD - ELIZABETH (1995) AJ3348 AJ3348 \*CURRENT  
 SURVEY CONTROL AJ3348

NAD 83(CORS)- 40 44 29.30573(N) 074 10 39.72731(W) ADJUSTED  
 AJ3348 NAVD 88 - 50.24 (meters) 164.8 (feet) GPS OBS

**MAP REFERENCE :**

- MAP ENTITLED "TARRYTOWN PROPERTY DEVELOPMENT, TARRYTOWN FORMER MGP SITE LNAPL REMEDIATION" PREPARED BY HALEY AND ALDRICH OF NEW YORK, DATED DEC. 18, 2003.
- MAP ENTITLED "TARRYTOWN PROPERTY DEVELOPMENT, TARRYTOWN FORMER MGP SITE NORTHERN DNAPL BARRIER AND RECOVERY TRENCH REMEDIATION" PREPARED BY HALEY AND ALDRICH OF NEW YORK, DATED NOV. 23, 2003.



ALL RIGHTS RESERVED. COPY OR REPRODUCTION OF THIS PLAN OR ANY PORTION, THEREOF IS PROHIBITED WITHOUT THE WRITTEN PERMISSION OF THE DESIGN ENGINEER, SURVEYOR, OR ARCHITECT. UNAUTHORIZED ALTERATION OR ADDITION TO A SURVEY MAP BEARING A LICENSED LAND SURVEYOR'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

**THE CHAZEN COMPANIES**  
 Engineers/Surveyors  
 Planners  
 Environmental Scientists

**CHAZEN ENGINEERING & LAND SURVEYING CO., P.C.**

Dutchess County Office: 21 Fox Street, Poughkeepsie, New York 12601 Phone: (845) 454-3980  
 Capital District Office: 253 Quail Avenue, Troy, New York 12182 Phone: (518) 235-8090  
 Orange County Office: 110 Glen Street, Newburgh, New York 12550 Phone: (845) 867-1133  
 North Country Office: 253 Route 17K, Glens Falls, New York 12801 Phone: (518) 812-0513

rev.	date	description
4	3/24/05	ADD PERMANENT SURVEY MARKS AND DATUM
3	1/07/05	DNAPL TRENCH, BULKHEAD, WELLS
2	11/15/04	REVISE LNAPL TRENCH
1	10/22/04	DEPTHS OF EXCAVATION, GENERAL NOTES

**FERRY LANDINGS**

**AS-BUILT SURVEY**  
**GAS HOLDERS & TAR WELL**  
**LNAPL, DNAPL & WDNAPL**  
**REMEDICATION AREAS**

TOWN OF GREENBURGH, VILLAGE OF TARRYTOWN, WESTCHESTER COUNTY, NEW YORK

drawn	checked
TCR	SJA
date	scale
10/11/04	1" = 50'
project no.	50405.00
sheet no.	SP1
	1 of 1

**APPENDIX J**

**Baseline Post Remediation Groundwater Monitoring**

**2006 GROUNDWATER MONITORING REPORT  
TARRYTOWN FORMER MGP SITE  
TARRYTOWN, NEW YORK**

by

**Haley & Aldrich of New York  
Rochester, New York**

for

**Ferry Landings, LLC  
Greenwich, Connecticut**

**File No. 28590-011  
20 December 2006**

**HALEY &  
ALDRICH**

Haley & Aldrich of New York  
200 Town Centre Dr.  
Suite 2  
Rochester, NY 14623-4264  
Tel: 585.359.9000  
Fax: 585.359.4650  
HaleyAldrich.com

**HALEY &  
ALDRICH**

20 December 2006  
File No. 28590-011

Ferry Landings, LLC  
485 West Putnam Avenue  
Greenwich, Connecticut 06830

Attention: Carl Monheit  
Director of Development

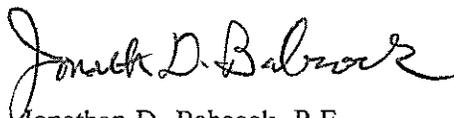
Subject: Tarrytown Former MGP Site  
2006 Groundwater Monitoring Report  
Tarrytown, New York  
Site No. C360064  
Brownfield Cleanup Index No. W3-1007-04-06

Dear Mr. Monheit:

This letter transmits the 2006 Groundwater Monitoring Report – Tarrytown Former MGP Site, Tarrytown, New York. The report includes a narrative of the investigation, a summary of results, and recommendations based on the information gained. The report appendices contain a monitoring well installation report and laboratory analytical results.

Do not hesitate to contact us if you have questions or require further information

Sincerely yours,  
HALEY & ALDRICH OF NEW YORK

  
Jonathan D. Babcock, P.E.  
Project Manager

  
Vincent B. Dick  
Vice President

Enclosures

G:\Projects\28590\011 Site Characterization 2006\Reports\2006 GW Monitoring Report\2006-1220-EGL-GW Monitoring Report-F.doc

## EXECUTIVE SUMMARY

This document presents the 2006 Groundwater Monitoring Report for the Tarrytown Former Manufactured Gas Plant (MGP) site. The site is located in Tarrytown, New York. The central portion of the site includes a former MGP, reportedly operated between 1873 and 1938. The site exhibited contamination in several areas that was derived either from the former MGP or from subsequent fuel storage and handling operations. Remediation of site contamination has been conducted under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program.

The groundwater monitoring conducted in August 2006 was performed in accordance with the NYSDEC-approved Site Management Plan (SMP), dated May 2006. The groundwater monitoring plan was prepared to collect data necessary to determine the progress of remaining groundwater self-attenuation processes, according to the NYSDEC letter dated 7 March 2005. Annual monitoring of groundwater for at least four additional years will be performed, in accordance with the SMP.

# TABLE OF CONTENTS

	<b>Page</b>
<b>EXECUTIVE SUMMARY</b>	<b>i</b>
<b>LIST OF TABLES</b>	<b>iii</b>
<b>LIST OF FIGURES</b>	<b>iii</b>
<b>1. INTRODUCTION</b>	<b>1</b>
1.1 Introduction	1
1.2 Site Description	1
1.3 Site Background	2
1.4 Groundwater Monitoring Objectives and Scope	2
<b>2. FIELD INVESTIGATION PROGRAM</b>	<b>2</b>
2.1 Groundwater Monitoring	3
2.2 Quality Assurance / Quality Control	3
<b>3. RESULTS</b>	<b>4</b>
<b>4. CONCLUSIONS</b>	<b>4</b>
<b>5. RECOMMENDATIONS</b>	<b>4</b>
<b>REFERENCES</b>	<b>5</b>
<b>TABLES</b>	
<b>FIGURES</b>	
<b>APPENDIX A – Monitoring Well Details and Low-Flow Stabilization Logs</b>	
<b>APPENDIX B – Laboratory Analytical Data and Data Usability Summary Reports</b>	

**LIST OF TABLES**

<b>Table No.</b>	<b>Title</b>
1	Tarrytown Former MGP Site Groundwater Samples

**LIST OF FIGURES**

<b>Figure No.</b>	<b>Title</b>
1	Project Locus
2	Monitoring Well Plan

## **1. INTRODUCTION**

### **1.1 Introduction**

This report presents the results of the groundwater monitoring conducted in August 2006 at the Tarrytown Former Manufactured Gas Plant (MGP) Site by Haley & Aldrich of New York (Haley & Aldrich). The groundwater monitoring was conducted in conformance with the Groundwater Monitoring Plan (GMP) which is an appendix to the Tarrytown Former MGP Site Management Plan (SMP), approved by the New York State Department of Environmental Conservation (NYSDEC) in May 2006. The investigation consisted of installation of one monitoring well, development of the new well and four others in the monitoring network, and collection of groundwater samples for analyses. The groundwater monitoring was conducted under the purview of the NYSDEC, in accordance with the Brownfield Cleanup Agreement (No. C 360064) between NYSDEC and the co-volunteers, Ferry Landings, LLC and Consolidated Edison of New York (Con Edison).

### **1.2 Site Description**

#### **A. General**

The site is located on the northwestern corner of the intersection of West Main and Railroad Avenue in Tarrytown, Westchester County, New York (see Figure 1) and is approximately 20-acres in size. The site is generally bordered by the Hudson River to the west, Water and Division Streets to the north, Railroad Avenue to the east, and West Main Street to the south (see Figure 2).

The site is located on land that was built out into the river in stages over several years. The area is relatively flat, sloping gently to the west and south towards the Hudson River and West Main Street. Ground surface elevations range approximately 10 to 12 feet above sea level in the northern portion of the site to 5 to 6 feet above sea level in the southern portion of the site. The eastern bank of the Hudson River is adjacent to the site and consists of a vertical seawall that extends approximately eight feet higher than the mean river level.

#### **B. Soils and Geology**

Subsurface stratigraphy of the site can be divided into three units: fill, silt with fine-grained sand, and clayey silt.

The uppermost unit encountered on the site is fill. The fill varies in thickness across the site from five feet in the eastern portion to greater than 19 feet in the western portion. The fill consists generally of black, fine to coarse sand, gravel, silt, bricks, asphalt, wood, cinders, slag, ash, and other construction-related debris including heavy wood pilings (Parsons, 1997).

The fill is generally underlain by tan, green to gray, silt and fine-grained sand with some interbeds of medium-grained sand. This silt and sand unit ranges in thickness from ten feet in the eastern portion of the site to several feet thick in the western portion. The lowermost unit encountered in soil borings consists of gray to greenish gray, interbedded clay, and silt. The thickness of this unit penetrated by explorations to date is highly variable across the site from less than one foot along the southern Hudson River boundary to approximately twelve feet along the northern river boundary (Parsons, 1997). The native soil units function as lower-

permeability base to the more variably permeable, overlying fill, and in all borings performed to date, these lower-permeability units have limited vertical penetration of dense non-aqueous phase liquid (DNAPL) from former MGP operations to the contact between the fill and the native soil units.

### **C. Groundwater**

The water table at the site ranges from approximately three to nine feet below ground surface. Groundwater levels at the site appear to vary seasonally, and are somewhat affected by tidal fluctuations in the Hudson River. The river is estuarine in the vicinity of the site and has a normal tidal range of three to four feet. Historical groundwater data indicate water levels at the site fluctuate by a half a foot to three feet (Parsons, 1997 and past Haley & Aldrich experience at site).

#### **1.3 Site Background**

The main activities on the site, just prior to remediation, included an asphalt batch plant in the northwest portion and a trucking terminal and maintenance facility in the southeast portion. The central portion of the site includes the former MGP, reportedly operated between 1873 and 1938. The operational boundary and outlines of former structures of the MGP, derived from Sanborn™ maps, are shown on Figure 2. The MGP was last operated by the Westchester Lighting Company, which has been succeeded in ownership by Con Edison.

As described in a number of previous reports (see References), the site exhibited contamination in several areas that was derived either from the former MGP, or from former fuel storage and handling operations subsequent to the MGP operations. Site remediation was started in 2005 and completed in 2006. Documentation of the remediation activities may be found in the NYSDEC-approved Final Engineering Report for Tarrytown Former MGP Site, April 2005.

#### **1.4 Groundwater Monitoring Objectives and Scope**

The objective of the groundwater monitoring was to determine the progress of remaining groundwater self-attenuation processes.

The scope of the groundwater monitoring was presented in the May 2006 Groundwater Monitoring Plan (GMP). Five monitoring wells are to be used for monitoring, two upgradient (MW-12 and MW-29) and three downgradient (MW-20, MW-21, and MW-24). The well locations are shown on Figure 2. One groundwater sample is to be collected from each location and analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), iron and manganese, and other laboratory parameters, as shown in Table 2 of the GMP.

## **2. FIELD INVESTIGATION PROGRAM**

This section describes the field investigation program. A hollow-stem auger (HSA) drilling rig (provided by Geologic – Earth Explorations, Inc.) was used to install the new monitoring well (MW-29), utilizing continuous split-spoon sampling. Photoionization detector (PID) readings were taken from each two-foot split-spoon sample section. The soil boring log and monitoring well installation report for monitoring well MW-29 are presented in Appendix A.

Geologic - Earth Explorations, Inc. installed the surface seal and guard pipe at well location MW-29 and restored surface seals and installed guard pipes at well locations MW-12, MW-20, MW-21, and MW-24.

On 11 August 2006, the five monitoring wells were developed using dedicated polyethylene tubing and Waterra inertial pumps with foot valves. The wells were pumped until no visible change in turbidity was noticed in 6 to 12 gallons of discharge. The development water was observed for visual and olfactory evidence of petroleum contamination and was placed in drums for off-site disposal. The following are the volumes of water removed from each well:

- MW-12 - 16.5 gallons
- MW-20 - 26.0 gallons
- MW-21 - 30.5 gallons
- MW-24 - 15.0 gallons
- MW-29 - 40.0 gallons

## 2.1 Groundwater Monitoring

According to the NYSDEC-approved GMP, the five wells are to be sampled on an annual basis for the first five years following the completion of the remedial action. Low flow sampling methods were utilized according to the GMP. Water level readings were taken on 17 August 2006, when the samples were collected. The following are the water level depths below ground surface (bgs) observed for the five wells:

- MW-12 - 4.0 ft
- MW-20 - 5.5 ft
- MW-21 - 8.3 ft
- MW-24 - 8.1 ft
- MW-29 - 4.5 ft

The water level reading in downgradient well MW-20 is apparently inconsistent with readings in the two other downgradient wells. It is noted that all of the downgradient wells are within 70 feet of the Hudson River, and may be expected to exhibit similar water levels. Additionally, the water level in MW-20 noted on the March 2000 boring log was 8.0 ft bgs, which is consistent with the water levels in MW-21 and MW-24 in 2006. This inconsistent water level reading does not affect the groundwater sampling or groundwater quality, and therefore it is noted, but no further action is recommended.

The low flow sampling stabilization logs are presented in Appendix A. One groundwater sample was taken from each monitoring well for laboratory analysis. The samples were analyzed for BTEX, PAHs, select metals (iron and manganese), and laboratory parameters (the analyte list may be found on Table 2 of the Groundwater Monitoring Plan) by Phoenix Environmental Laboratories, Inc. of Manchester, CT (Phoenix). Phoenix is certified under the NYS Environmental Laboratory Approval Program (ELAP). A summary of the laboratory analytical results is given in Table 1. Laboratory analytical reports are presented in Appendix B.

## 2.2 Quality Assurance / Quality Control

Sampling procedures followed the approved groundwater monitoring plan. A data usability summary report (DUSR) was prepared by Haley & Aldrich for the work performed by

Phoenix. The results presented were found to be compliant with the data quality objectives for the project. The DUSR is presented in Appendix B along with the laboratory analytical results. Tabulated results have been flagged as indicated by the laboratory and DUSR.

### 3. RESULTS

Table 1 presents results of the groundwater analyses at the Tarrytown Former MGP Site. Only MW-12 had concentrations of volatile organic compounds (VOCs) and PAHs that exceeded the NYSDEC TOGS 1.1.1 Class GA Groundwater Standards. Because this location is at the upgradient (eastern) boundary of the site, the detected compounds are not believed to have resulted from previous on-site activities. Iron and manganese concentrations in upgradient well MW-29, iron concentration in upgradient well MW-12 and iron concentration in downgradient well MW-21 exceeded the Class GA Groundwater Standards. Iron and manganese levels in downgradient wells MW-20 and MW-24 were significantly lower than in the upgradient wells and the other downgradient well.

### 4. CONCLUSIONS

Site-related groundwater was found to be within Class GA Groundwater Standards, with the exception of some organic compounds in upgradient monitoring well MW-12, iron and manganese in upgradient well MW-29, and iron in downgradient well MW-21. The range of iron and manganese concentrations among the wells described above suggests that the variability across the site may be attributable to variability in soil types used as the site was filled over many years. The exceedences are not considered to be a problem for human health because, according to the NYSEC-approved Site Management Plan, groundwater from this site may not be utilized without treatment.

### 5. RECOMMENDATIONS

Groundwater monitoring should continue annually, as set forth in the NYSDEC-approved Groundwater Monitoring Plan for this site. For comparison with historical evidence of light non-aqueous phase liquid (LNAPL) in some site monitoring wells, it is also recommended that future monitoring rounds include use of an interface probe to detect the presence of LNAPL in the monitoring well system.

## REFERENCES

- 1997 Parsons Engineering Science Site Investigation Report for the Tarrytown Site, ConEdison, Tarrytown, New York.
- 2002 Parsons Engineering Science Supplemental Site Investigation Report, Tarrytown Former MGP Site, ConEdison, Tarrytown, New York.
- 2003 Haley & Aldrich Report on Con Edison Tarrytown Former MGP Site, Tarrytown, New York.
- 2003 Haley & Aldrich Supplemental Site Investigation – Spring 2003, Tarrytown Former MGP Site, Tarrytown, New York.
- 2003 Haley & Aldrich Revised Conceptual Remediation Plan, Tarrytown Former MGP Site, Tarrytown, New York.
- 2005 Haley & Aldrich Final Engineering Report for Tarrytown Former MGP Site, Tarrytown, New York
- 2006 Haley & Aldrich Final Engineering Report Site Management Plan for Tarrytown Former MGP Site, Tarrytown, New York
- 2006 Haley & Aldrich Post-Remediation Groundwater Monitoring Plan, Tarrytown Former MGP Site, Tarrytown, New York

G:\Projects\28590\011 Site Characterization 2006\Reports\2006 GW Monitoring Report\2006-1220-EGL-GW Monitoring Report-F.doc

**Table 1**  
**Tarrytown Former MGP Site Groundwater Samples**  
**2006 Groundwater Monitoring Report**  
**Tarrytown, New York**

Parameter	NYSDEC TOGS 1.1.1 Groundwater Standards	MW-12	MW-20	MW-21	MW-24	DUP-081706 <sup>(2)</sup>	MW-29
	Date Sampled	8/17/2006	8/17/2006	8/17/2006	8/17/2006	8/17/2006	8/17/2006
<b>VOCs (ug/L)</b>							
Benzene	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl Benzene	5	20	<1.0	<1.0	<1.0	<1.0	<1.0
Methyl tert butyl ether	N/A	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	5	39	<1.0	<1.0	<1.0	<1.0	<1.0
p&m-Xylene	5	14	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	5	1.6	<1.0	<1.0	<1.0	<1.0	<1.0
<b>SVOCs (ug/L)</b>							
2-Methylnaphthalene	N/A	110	<10	<11	<50	<10	<10
Acenaphthene	20	41	<10	<11	<50	<10	<10
Acenaphthylene	N/A	<10	<10	<11	<50	<10	<10
Anthracene	50	<10	<10	<11	<50	<10	<10
Benz(a)anthracene	0.002	<10	<10	<11	<50	<10	<10
Benzo(a)pyrene	N/A	<10	<10	<11	<50	<10	<10
Benzo(b)fluoranthene	0.002	<10	<10	<11	<50	<10	<10
Benzo(ghi)perylene	N/A	<10	<10	<11	<50	<10	<10
Benzo(k)fluoranthene	0.002	<10	<10	<11	<50	<10	<10
Chrysene	0.002	<10	<10	<11	<50	<10	<10
Dibenz(a,h)anthracene	N/A	<10	<10	<11	<50	<10	<10
Fluoranthene	50	<10	<10	<11	<50	<10	<10
Fluorene	50	13	<10	<11	<50	<10	<10
Indeno(1,2,3-cd)pyrene	0.002	<10	<10	<11	<50	<10	<10
Naphthalene	10	600	<10	<11	<50	<10	<10
Phenanthrene	50	11	<10	<11	<50	<10	<10
Pyrene	50	<10	<10	<11	<50	<10	<10
<b>Metals (mg/L)</b>							
Iron	0.6	17.2	0.058	2.74	0.071	0.063	1.05
Manganese	0.6	0.31	0.005	0.431	0.007	0.006	1.01
<b>Miscellaneous Parameters (mg/L)</b>							
Nitrite as Nitrogen	N/A	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate as Nitrogen	N/A	0.05	<0.05	0.05	0.08	0.08	0.06
Sulfate	N/A	34	34	350	320	290	30
Tot.Org.Carbon	N/A	20	3.5	6	3.3	3.3	4.2
Dissolved Organic Carbon	N/A	15	2.2	4.5	2.2	2.8	2.8
Sulfide	N/A	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
B.O.D./5 day	N/A	8.7	<2.0	<2.0	<2.0	<2.0	<2.0
C.O.D.	N/A	51	120	38	69	46	12

**Footnotes:**

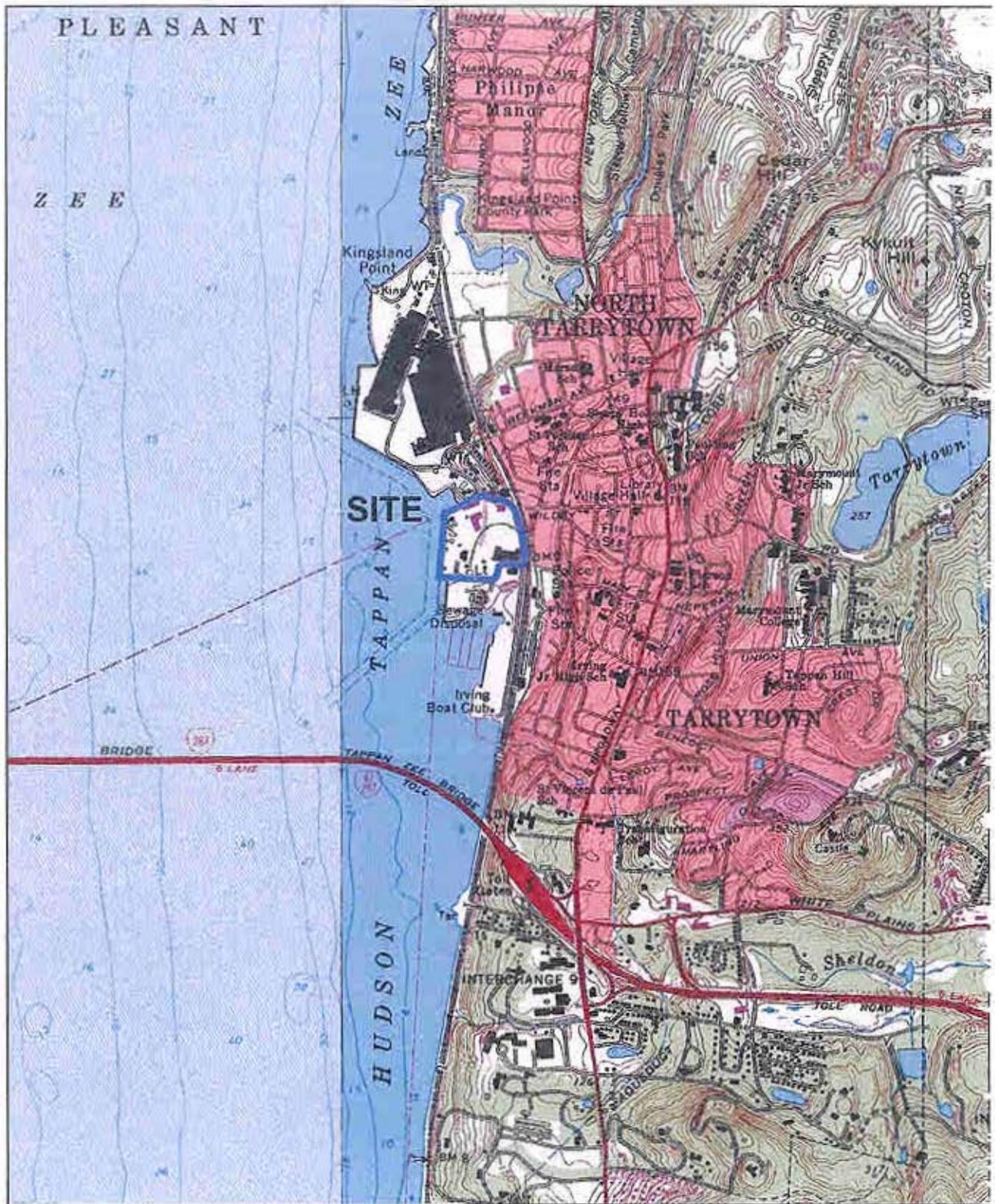
- (1) Division of Water Technical Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998.  
(2) Duplicate of MW-24.

**Notes:**

(A) Concentrations above the NYSDEC TOGS standards are shaded gray.

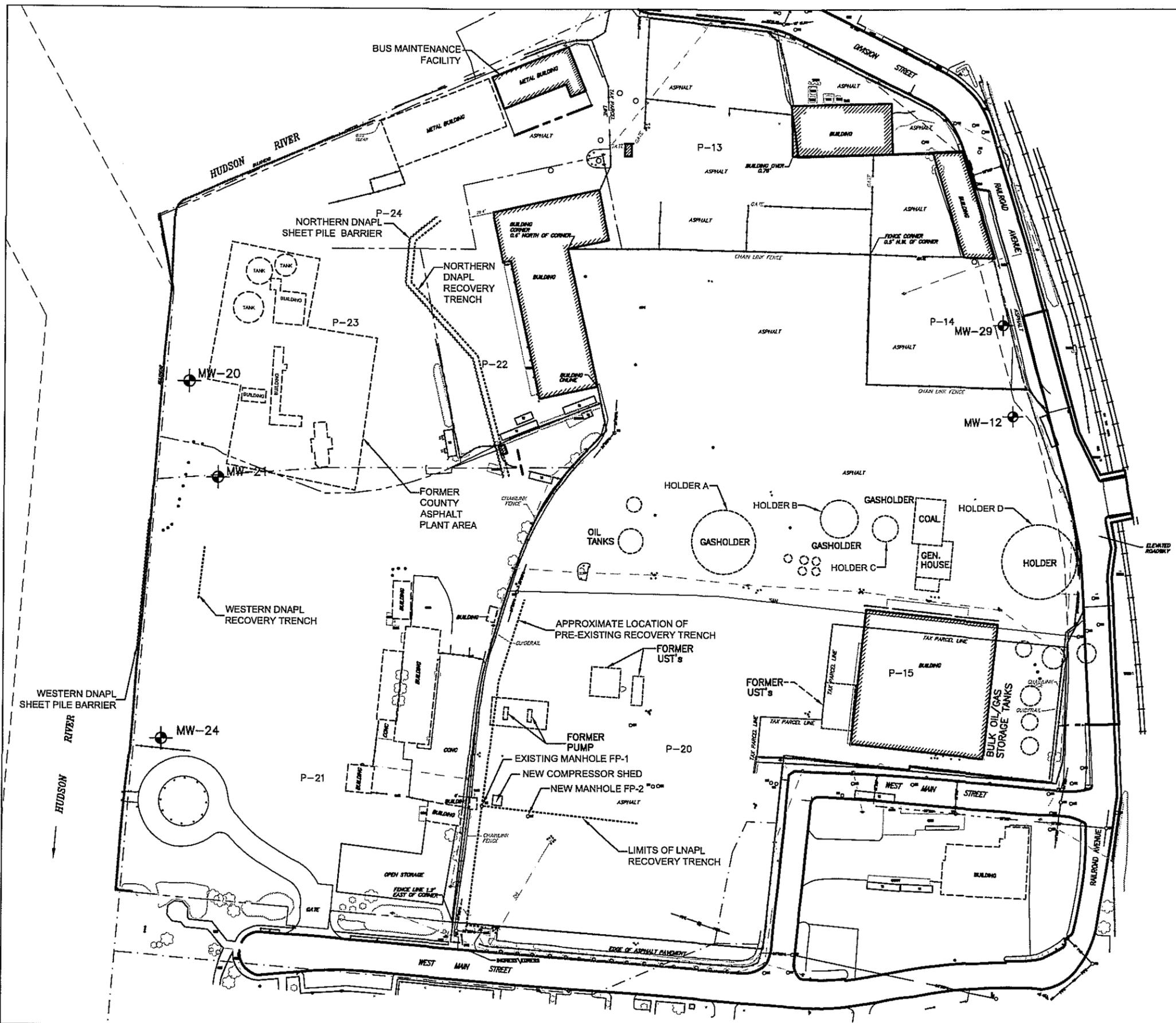
**Acronyms:**

VOC = Volatile Organic Compound  
SVOC = Semivolatile Organic Compound  
NYSDEC = New York State Department of Environmental Conservation



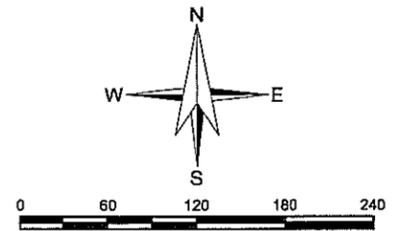
**HALEY  
ALDRICH**

G:\PROJECTS\28590\011 SITE CHARACTERIZATION 2006\DRAWINGS\28590-011-0001 - CW MONITORING INVESTPLAN.DWG



- LEGEND**
- MW-01 MONITORING WELL LOCATION
  - FORMER STRUCTURE
  - RECOVERY TRENCH
  - SHEET PILE BARRIER

- NOTES:**
1. LOCATIONS OF BORINGS SB-501 THROUGH SB-506, MW-29, AND SV-11 ARE APPROXIMATE ONLY, BASED ON TAPE MEASUREMENTS FROM KNOWN PHYSICAL FEATURES.
  2. BASE PLAN ILLUSTRATING EXISTING SITE STRUCTURES AND FEATURES DERIVED FROM CHAZEN COMPANIES DRAWING ENTITLED "ALTA/ACSM LAND TITLE SURVEY LANDS OF FERRY INVESTMENTS, LLC" DATED 12/20/02. DATE OF SURVEY WAS 12/08/98.



**HALEY & ALDRICH** TARRYTOWN PROPERTY DEVELOPMENT  
 FERRY LANDINGS, LLC  
 SITE NO. C360069  
 BROWNFIELD CLEANUP INDEX NO. W3-1007-04-06

TARRYTOWN FORMER MGP SITE  
 2006 GROUNDWATER MONITORING REPORT  
 MONITORING WELL PLAN

SCALE: AS SHOWN  
 DECEMBER 2006

**FIGURE 2**

**APPENDIX A**

**Monitoring Well Reports and Low-Flow Stabilization Logs**

**TEST BORING REPORT**

Boring No. **MW-29**

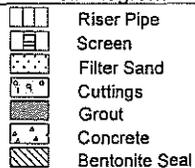
Project County Asphalt Plant Area and SV-10 Area Tarrytown, New York  
 Client NATIONAL RE/SOURCES  
 Contractor Geologic - Earth Explorations, Inc.

File No. 28590-008  
 Sheet No. 1 of 2  
 Start August 9, 2006  
 Finish August 9, 2006  
 Driller D. Lyons  
 H&A Rep. S. Brousseau

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	-	Rig Make & Model: CME-45C skid rig
Inside Diameter (in.)	4 1/4	1 3/8	-	Bit Type: Cutting Head
Hammer Weight (lb.)	-	140	-	Drill Mud:
Hammer Fall (in.)	-	30	-	Casing:
				Hoist/Hammer: Automatic Hammer

Depth (ft.)	SPT <sup>1</sup>	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size <sup>2</sup> , structure, odor, moisture, optional descriptions, geologic interpretation)	PID	Gravel		Sand			Field Test					
									% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength	
0							<b>-BITUMINOUS CONCRETE-</b>												
17		S1	0.5	NO WELL INSTALLED	0.4	SM	Dense, brown, silty SAND with gravel (SM), dry, coarse gravel lodged in spoon tip.	PID = 0.0 ppm											
19		2/24	2.0																
18																			
8		S2	2.0				SM	Medium dense, black to dark brown, silty SAND with gravel (SM), organic odor, dry, 75% coal particles/fragments.	PID = 0.0 ppm										
7		15/24	4.0																
6																			
6						3.0	ML	<b>-FILL-</b> Stiff, gray, SILT with sand (ML), dry. No recovery.	PID = N/A ppm										
5		S3	4.0																
6		0/24	6.0																
5																			
5																			
6		S4	6.0				ML	Stiff, gray, SILT with sand (ML), wet, with interbedded clay seams.	PID = 0.0 ppm										
6		14/24	8.0																
6																			
7																			
1		S5	8.0				ML	Medium stiff, gray, SILT with sand (ML), wet, with interbedded clay seams.	PID = 0.0 ppm										
2		12/24	10.0																
4																			
4																			
10		S6	10.0			ML	Medium stiff, gray, SILT with sand (ML), wet, with interbedded clay seams.	PID = 0.0 ppm											
2		18/24	12.0																
4																			
4																			
4																			
4		S7	12.0			ML	Stiff, gray, SILT with sand (ML), wet, with interbedded clay seams.	PID = 0.0 ppm											
5		14/24	14.0																
5																			
5																			
15		S8	15.0			ML	Medium stiff, gray, SILT with sand (ML), wet, with interbedded clay seams.	PID = 0.0 ppm											
2		22/24	17.0																
3																			
4																			
5																			
5		S9	17.0			ML	Stiff, gray, SILT with sand (ML), wet, with interbedded clay seams.	PID = 0.0 ppm											
5		14/24	19.0																
6																			
7																			
20							<b>-GLACIAL DEPOSITS-</b>												

USCS\_TBAPID USCSLBA4GLB USCSTCA.GDT G:\PROJECTS\28590008 RESP TO FER COMMENTS\FIELD\28590-008\TBID.GPJ Oct 4, 06

Water Level Data				Sample Identification			Well Diagram			Summary			
Date	Time	Elapsed Time (hr.)	Depth (ft.) to:			O	T	U	S	G		Overburden (lin. ft.)	Rock Cored (lin. ft.)
			Bottom of Casing	Bottom of Hole	Water								
08/09/06	0900	0	6.0	8.0	±6.0							21	-
												9S	

Field Tests: Dilatancy: R-Rapid, S-Slow, N-None      Plasticity: N-Nonplastic, L-Low, M-Medium, H-High  
 Toughness: L-Low, M-Medium, H-High      Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High  
<sup>1</sup>SPT = Sampler blows per 6 in.      <sup>2</sup>Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters).  
**Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.**

**Boring No. MW-29**

**TEST BORING REPORT**

Boring No. MW-29  
 File No. 28590-008  
 Sheet No. 2 of 2

Depth (ft.)	SPT <sup>1</sup>	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description  (Density/consistency, color, GROUP NAME, max. particle size <sup>2</sup> , structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel		Sand			Field Test					
								% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength	
20					21.0		Bottom of exploration at 21.0 ft. Note: Observation Well installed in borehole upon completion. Refer to Observation Well Installation Report MW-29 for complete well details. Drill cuttings placed in drum, drum sample "drum-S1" taken at 1030.											

USCS\_TB&APID USC&LIB4.GLB USC&CTCA.GDT G:\PROJECTS\28590\008 RESP TO FER COMMENTS\FIELD\28590-008\TB&PID.GPJ Oct 4, 06

<sup>1</sup>SPT = Sampler blows per 6 in. <sup>2</sup>Maximum particle size (mm) is determined by direct observation within the limitations of sampler  
 NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. MW-29

# OBSERVATION WELL INSTALLATION REPORT

Well No.  
MW-29  
Boring No.  
MW-29

PROJECT	County Asphalt Plant Area and SV-10Area	H&A FILE NO.	28590-008
LOCATION	Tarrytown, New York	PROJECT MGR.	J. Babcock
CLIENT	National Re/Sources	FIELD REP.	S. Brousseau
CONTRACTOR	Seaboard Drilling, Inc.	DATE INSTALLED	8/9/2006
DRILLER	D. Lyons	WATER LEVEL	±

Ground El. _____ ft	Location <u>See Plan</u>	<input checked="" type="checkbox"/> Guard Pipe
El. Datum _____		<input type="checkbox"/> Roadway Box

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL	Type of protective cover/lock	Locking Guard Pipe						
	-CONCRETE-	Height of top of guard pipe box above ground surface _____ ft Height of top of riser pipe above ground surface _____ ft Type of protective casing: _____ Length _____ ft Inside Square _____ in Depth of bottom of guard pipe _____ ft	3.00 ft 3.0 ft Guard Pipe 5.0 ft 4.0 in 2.00 ft						
-FILL-	-BENTONITE-	Type of Seals Concrete _____ Bentonite Seal _____	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Top of Seal (ft)</th> <th>Thickness (ft)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0.0</td> <td style="text-align: center;">1.0</td> </tr> <tr> <td style="text-align: center;">1.0</td> <td style="text-align: center;">2.0</td> </tr> </tbody> </table>	Top of Seal (ft)	Thickness (ft)	0.0	1.0	1.0	2.0
Top of Seal (ft)	Thickness (ft)								
0.0	1.0								
1.0	2.0								
3.0	3.0	Type of riser pipe: _____ Inside diameter of riser pipe _____ in Type of backfill around riser _____ Diameter of borehole _____ in Depth to top of well screen _____ ft Type of screen _____ Screen gauge or size of openings _____ in Diameter of screen _____ in Type of backfill around screen _____ Depth of bottom of well screen _____ ft Bottom of Silt trap _____ ft Depth of bottom of borehole _____ ft	Sched. 40 PVC 2.0 in Filter Sand & Bentonite 9.0 in 4.0 ft Sched. 40 PVC 0.010 in 2.0 in Filter Sand Note: 13-50 # bags used 19.0 ft 21.0 ft 21.0 ft						
-FLUVIAL DEPOSITS-	-FILTER SAND-								
21.0	21.0								

(Bottom of Exploration)  
(Numbers refer to depth from ground surface in feet)

(Not to Scale)

$$\begin{array}{r}
 4 \text{ ft} + 15 \text{ ft} + 2 \text{ ft} = 21 \text{ ft} \\
 \text{Riser Pay Length (L1)} \quad \text{Length of screen (L2)} \quad \text{Length of silt trap (L3)} \quad \text{Pay length}
 \end{array}$$

COMMENTS: \_\_\_\_\_

# LOW FLOW SAMPLING STABILIZATION LOG

WELL NO.  
MW-12  
Page 1 of 1

PROJECT	Tarrytown Former MGP Site	LOCATION	Tarrytown, NY	H&A FILE NO.	28590-011
SAMPLING DEVICE	Peristaltic pump / U-22 Horiba	TUBE TYPE	Poly	DATE	17 August 2006
WELL I.D.	2.0 in.	SCREEN LENGTH	15.0 ft.	WEATHER	P. Cloudy
WATER LEVEL	7.07	MEASURING POINT	Top of PVC	TEMPERATURE	80 - 85 °F
DEPTH TO BOTTOM	23.90	WELL VOLUME	2.75 gals.	FIELD REP	S. Brousseau

TIME	Ph	COND.	TURB.	DIS. O2	TEMP.	SAL.	REDOX	DEPTH WATER	FLOW RATE	Remarks (color, odor, sheen)
1157		ms/cm	N.T.U.	mg/L	°C	NA	mV	7.25*		Start pump @ lowest rate / * = (ft.) & from guard pipe.
1201	6.72	1.16	61	3.75	23.7	NA	-157	7.53		1st reading / NA = No sal probe w/ rental Horiba.
1205	6.65	1.14	19	1.90	23.7	NA	-159	7.58*		* = Past 0.30 ft. drawdown @ pump's lowest rate.
1210	6.64	1.14	25	1.60	23.6	NA	-160	7.64		
1215	6.64	1.14	24	1.56	23.4	NA	-160	7.66		
1220	6.64	1.13	25	1.45	23.3	NA	-159	7.70		
1225	6.64	1.13	28	1.44	23.0	NA	-158	7.73		
1230	6.64	1.13	24	1.44	23.0	NA	-157	7.74		
1235	6.63	1.08*	12	1.98*	23.1	NA	-137*	7.74		* = Cleaned out flow cell.
1240	6.64	1.12	12	1.48	22.9	NA	-146	7.75		
1245	6.64	1.12	12	1.74	22.9	NA	-149	7.76		
1250	6.64	1.13	12	1.92	22.9	NA	-151	7.75		
1255	6.65	1.13	10	2.02	22.9	NA	-153	7.75		
1300	6.65	1.14	9	2.07	22.8	NA	-153	7.76		
1305	6.65	1.14	9	2.08	22.7	NA	-154	7.77		Stable / Begin sampling.
										Coal tar odor / No color*.
										* = Purge water brown.
										PID = 0.9 ppm upon opening well
										Bottom of tubing @ 16.4 ft. below top of pvc.

**START PURGE** 1157      **STOP PURGE** 1305      **PURGE VOLUME** ~2.92 gals.

SAMPLE TYPE	SAMPLE TIME	SAMPLE TYPE	SAMPLE TIME
BTEX (8021)	1305	SULFIDE	1305
PAHs (8270)	1305	TOTAL IRON & MANGANESE	1305
DOC	1305	BOD5, SULFATE, NITRATE, NITRITE	1305
TOC & COD	1305		

well volume = 3.14 (PI) x radius<sup>2</sup> x height of water column.    2 in well = 0.163 gal/ft,    3 in = 0.367 gal/ft,    4 in = 0.653 gal/ft,    6 in = 1.469 gal/ft,  
 1 cu. ft. = 7.48 gal,    1 gal = 3.785 L,    1L = 0.264 gal,    0.5L/min = 0.132 gal/min,    1 in well = 0.041 gal/ft



# LOW FLOW SAMPLING STABILIZATION LOG

WELL NO.  
MW-21

Page 1 of 1

PROJECT	Tarrytown Former MGP Site	LOCATION	Tarrytown, NY	H&A FILE NO.	28590-011
SAMPLING DEVICE	Peristaltic pump / U-22 Horiba	TUBE TYPE	Poly	DATE	17 August 2006
WELL I.D.	2.0 in.	SCREEN LENGTH	20.0 ft.	WEATHER	P. Cloudy
WATER LEVEL	11.24	MEASURING POINT	Top of PVC	TEMPERATURE	80 - 85 °F
DEPTH TO BOTTOM	32.00	WELL VOLUME	3.39 gals.	FIELD REP	S. Brousseau

TIME	Ph	COND.	TURB.	DIS. O2	TEMP.	SAL.	REDOX	DEPTH WATER	FLOW RATE	Remarks (color, odor, sheen)
1618		ms/cm	N.T.U.	mg/L	°C	NA	mV	11.57*		Start pump @ lowest rate / *=(ft.) & from guard pipe.
1622	6.54	4.33	91	5.62	20.8	NA	-76	11.60		1st reading / NA=No sal probe w/ rental Horiba.
1625	6.47	4.12	66	3.03	19.8	NA	-78	11.63		
1630	6.45	4.09	21	2.10	19.9	NA	-82	11.63		
1635	6.47	4.03	18	1.93	20.4	NA	-87	11.61		
1640	6.49	4.02	17	1.81	20.6	NA	-87	11.62		
1645	6.43	3.96	26	1.64	21.2	NA	-79	11.62		
1650	6.36	3.99	25	1.61	21.0	NA	-72	11.61		
1655	6.34	4.00	41	1.58	21.4	NA	-69	11.61		
1700	6.31	4.02	38	1.56	20.9	NA	-65	11.61		
1705	6.30	3.85*	15*	4.32*	21.2	NA	-55*	11.61		*=Cleaned out flow cell.
1710	6.31	4.00	14	2.09	21.1	NA	-59	11.60		
1715	6.29	3.99	12	1.68	21.3	NA	-59	11.58		
1720	6.27	3.99	10	1.62	21.0	NA	-57	11.59		
1725	6.26	4.02	10	1.59	20.7	NA	-54	11.58		
1730	6.24	3.97	10	1.54	21.2	NA	-52	11.57		Stable / Begin sampling.
										Coal tar odor / No color*.
										*=Purge water brown.
										PID = 0.1 ppm upon opening well
										Bottom of tubing @ 21.6 ft. below top of pvc.

START PURGE 1618 STOP PURGE 1730 PURGE VOLUME ~2.50 gals.

SAMPLE TYPE	SAMPLE TIME	SAMPLE TYPE	SAMPLE TIME
BTEX (8021)	1730	SULFIDE	1730
PAHs (8270)	1730	TOTAL IRON & MANGANESE	1730
DOC	1730	BOD5, SULFATE, NITRATE, NITRITE	1730
TOC & COD	1730		

well volume = 3.14 (PI) x radius<sup>2</sup> x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft, 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min, 1 in well = 0.041 gal/ft



# LOW FLOW SAMPLING STABILIZATION LOG

WELL NO.  
MW-29  
Page 1 of 1

PROJECT	Tarrytown Former MGP Site	LOCATION	Tarrytown, NY	H&A FILE NO.	28590-011
SAMPLING DEVICE	Peristaltic pump / U-22 Horiba	TUBE TYPE	Poly	DATE	17 August 2006
WELL I.D.	2.0 in.	SCREEN LENGTH	15.0 ft.	WEATHER	P. Cloudy
WATER LEVEL	7.45	MEASURING POINT	Top of PVC	TEMPERATURE	80 - 85 °F
DEPTH TO BOTTOM	24.00	WELL VOLUME	2.70 gals.	FIELD REP	S. Brousseau

TIME	Ph	COND.	TURB.	DIS. O2	TEMP.	SAL.	REDOX	DEPTH WATER	FLOW RATE	Remarks (color, odor, sheen)
0939		ms/cm	N.T.U.	mg/L	°C	NA	mV	7.25*		Start pump @ lowest rate / *(ft.) & from guard pipe.
0942	6.84	3.17	44	4.50	21.5	NA	-66	7.53		1st reading / NA=No sal probe w/ rental Horiba.
0945	6.86	3.13	22	2.45	21.0	NA	-74	7.58*		*=Past 0.30 ft. drawdown @ pump's lowest rate.
0950	6.86	3.10	7	2.37	20.9	NA	-78	7.64		
0955	6.86	3.10	11	4.99	20.7	NA	-80	7.66		
1000	6.87	3.05	12	4.75	20.8	NA	-82	7.70		
1005	6.88	2.99	12	4.60	20.8	NA	-84	7.73		
1010	6.88	2.98	12	4.43	21.0	NA	-86	7.74		
1015	6.88	3.01	13	4.41	20.7	NA	-87	7.74		
1020	6.89	3.00	14	4.30	20.9	NA	-89	7.75		
1025	6.89	2.99	14	4.20	21.0	NA	-89	7.76		
1030	6.89	2.99	13	4.07	20.9	NA	-89	7.75		
1035	6.90	2.99	13	3.98	20.9	NA	-88	7.75		
1040	6.90	2.98	13	3.87	21.0	NA	-89	7.76		
1045	6.90	3.00	30	1.58	21.0	NA	-87	7.77		
1050	6.90	3.08	2*	8.07*	20.8	NA	-74*	8.23		*=Cleaned out flow cell.
1053*	6.90	3.09	2	7.68	20.9	NA	-81	8.21		*=Begin 3 minute readings.
1056	6.91	3.13	3	7.54	20.8	NA	-83	8.21		
1059	6.91	3.13	4	7.36	20.7	NA	-85	8.21		Stable.
1100	--	--	--	--	--	--	--	--		Begin sampling.
										No odor / No color*.
										*=Purge water brown.
										PID = 0.0 ppm upon opening well
										Bottom of tubing @ 16.5 ft. below top of pvc.

START PURGE 0939 STOP PURGE 1100 PURGE VOLUME ~3.05 gals.

SAMPLE TYPE	SAMPLE TIME	SAMPLE TYPE	SAMPLE TIME
BTEX (8021)	1100	SULFIDE	1100
PAHs (8270)	1100	TOTAL IRON & MANGANESE	1100
DOC	1100	BOD5, SULFATE, NITRATE, NITRITE	1100
TOC & COD	1100		

well volume = 3.14 (PI) x radius<sup>2</sup> x height of water column. 2 in well = 0.163 gal/ft, 3 in = 0.367 gal/ft, 4 in = 0.653 gal/ft, 6 in = 1.469 gal/ft, 1 cu. ft. = 7.48 gal, 1 gal = 3.785 L, 1L = 0.264 gal, 0.5L/min = 0.132 gal/min, 1 in well = 0.041 gal/ft

**APPENDIX B**

**Laboratory Analytical Data and  
Data Usability Summary Reports**



MEMORANDUM

29 September 2006  
File No. 28591-000

TO: Jon Babcock  
Sr. Engineer

FROM: Michael G. Nickelsen  
Sr. Scientist

SUBJECT: Tarrytown Data Validation

OFFICES

Boston  
Massachusetts

Cleveland  
Ohio

Dayton  
Ohio

Detroit  
Michigan

Hartford  
Connecticut

Kansas City  
Kansas

Los Angeles  
California

Manchester  
New Hampshire

Parsippany  
New Jersey

Portland  
Maine

Providence  
Rhode Island

San Diego  
California

Santa Barbara  
California

Tucson  
Arizona

Washington  
District of Columbia

Analytical results for environmental samples associated with Phoenix Environmental Laboratories, Inc. laboratory data packages GAH43649 and GAH45532 reviewed to determine the data usability. Each laboratory data package was reviewed with guidance provided by the United States Environmental Protection Agency (USEPA) National Functional Guidelines for Organic Data Review (EPA 540/R-99/008, Oct 1999), and/or National Functional Guidelines for Inorganic Data Review (EPA 540-R-04-004, Oct 2004). Laboratory method specific criteria as prescribed by "Test Methods for Evaluating Solid Waste", SW846, Update III, 1996 were used, where applicable, if the analytical anomaly identified was not addressed by the guidelines referenced above.

Data validation of the analytical results was performed by Ethan G. Lee and reviewed and approved by me.

G:\Projects\28590\011 Site Characterization 2006\Tarrytown Data Validation Memo\_092906.doc

**Data Usability Summary Report (DUSR)**  
**Tarrytown County Asphalt Plant**  
**Analytical Laboratory: Phoenix Environmental Laboratories, Inc. - Manchester, CT**  
**Sample Delivery Group # GAH45532**

Analytical results for the project samples were reviewed to evaluate the data usability. Data was assessed in accordance with guidance from the following Federal and/or State guidance documents:

- USEPA National Functional Guidelines for Inorganic Data Review (EPA 540-R-04-004)
- USEPA National Functional Guidelines for Organic Data Review (EPA 540/R-99/008)
- NYSDEC "Guidance for the Development of Quality Assurance Plans and Data Usability Summary Reports (DUSR)", September 1997

and method protocol criteria where applicable as prescribed by "Test Methods for Evaluating Solid Waste", SW846, Update III, 1996.

This DUSR pertains to the following samples:

Sample ID
MW-12
MW-20
MW-21
MW-24
MW-29
DUP-081706
EB-081706
TB-081706

Project Samples were analyzed according to the following analytical methods:

Parameter	Analytical Method	Holding Time Criteria
1. ICP Metals	EPA 6010B/200.7	180 days
2. Biochemical Oxygen Demand (BOD)	EPA 405.1/SM 5210B	24 hours
3. Chemical Oxygen Demand (COD)	EPA 410.4/SM 5220D	28 days
4. Total Organic Carbon (TOC)	EPA 415.1	28 days
5. Nitrogen, Nitrate (NO3)	EPA 300.0/SM 4500-	48 hours
6. Nitrogen, Nitrite (NO2)	EPA 300.0/354.1	48 hours
7. Sulfide, Soluble	EPA 376.2	ASAP (24 hours)
8. Sulfate	EPA 300.0/375.4	28 days
9. VOCs	EPA 8260B/624	14 days
10. SVOCs (BNAs)	EPA 8270C/625	7 days ext/40 days analysis

The following items/criteria applicable to the analysis of project samples and associated QA/QC procedures were reviewed.

- Holding Times
- Initial Calibration Procedures
- Continuing Calibration Procedures
- Blank Sample Analysis
- System Monitoring Compound Recoveries
- Laboratory Control Samples, Matrix Spike/Matrix Spike Duplicate Recoveries
- Duplicate Sample Analysis
- Sample Data Reporting Format
- Data Qualifiers
- Summary

**Preservation and Holding Times**

Maximum allowable holding times, measured from the time of sample collection to the time of sample preparation or analysis, were met for each project sample analyzed as part of this sample delivery group. No qualification of the data is recommended.

### **Initial Calibration Procedures**

Initial instrument calibration procedures for the analysis of project samples were consistent with the guidelines prescribed by EPA protocols. No Qualification of the data is recommended.

### **Continuing Calibration Procedures**

Continuing calibration verification (CCV) procedures for the analysis of project samples were consistent with the guidelines prescribed by EPA protocols. No Qualification of the data is recommended.

### **Blank Sample Analysis**

In accordance with cited USEPA guidelines, positive sample results should be reported unless the concentration of the compound in the project sample is less than or equal to 10 times (10X) the amount in any blank for metals and the common organic laboratory contaminants (methylene chloride, acetone, 2-butanone, cyclohexane, and phthalate esters), or 5 times (5X) the amount for other target compounds. Target analytes were not detected in associated blank samples (trip, equipment, method) prepared and analyzed concurrently with the project samples. No qualification of the data is recommended.

### **System Monitoring Compound Recoveries**

System monitoring/surrogate compounds are added to each sample prior to analysis of organic parameters by EPA Methods 8260B, 8270C, and/or 8082 to confirm the efficiency of the sample preparation procedure. The calculated recovery for each surrogate compound was evaluated to confirm the accuracy of the reported results. The calculated recovery of these compounds fell within the laboratory specific quality control criteria. In a few instances, sample extracts required dilution prior to analysis to either improve instrument performance by minimizing matrix interference or enable quantification of the detected target analytes within the instrument calibration range. Where applicable, the laboratory qualified the reported results indicating the system monitoring compound recovery could not be calculated due to a sample extract dilution. In cases where the instrument resolution appeared to be unaffected by the diluted sample matrix, the sample results were accepted without qualification. No qualification of the data is recommended.

### **Laboratory Control Samples, Matrix Spike/Matrix Spike Duplicate Recoveries**

Analytical precision and accuracy was evaluated based on the laboratory control and matrix spike sample analyses performed concurrently with the project samples. For matrix spike samples, after the addition of a known amount of each target analyte to the sample matrix, the sample was analyzed to confirm the ability to identify these compounds within the sample matrix. For LCS analyses, after the addition of a known amount of each target analyte into laboratory reagent water, the sample was analyzed to confirm the ability of the analytical system to accurately quantify the compounds. The reported recovery of MS/MSD and LCS analyses fell within the laboratory QA acceptance criteria. No qualification of the data is recommended.

### **Duplicate Sample Analysis**

The replicate percent difference (RPD) was evaluated for each duplicate sample pair to monitor the reproducibility of the data. The RPD for each sample pair was within the QA/QC limit of 30% for aqueous samples and 50% for solid matrices, for those target analytes with sample concentrations >5X the MDL. No qualification of the data is recommended.

### **Sample Data Reporting Format**

The sample data are presented using USEPA Contract Laboratory Protocol (CLP) format. The data package has been reviewed for completeness and found to contain each required sample result and associated QA/QC report form. The reporting format is complete and compliant with the objectives of the project. No qualification of the data is recommended.

### **Data Qualifiers**

Data qualifiers were assigned by the laboratory to the reported results to identify target analytes detected below the reporting limit but above the method detection limit, and/or when target analytes were detected in the associated method/preparation blank sample. Based on a spot check of the data qualifiers used, these flags appeared to be applied to the reported results in accordance with EPA guidance.

Organic analyses samples that contained concentrations of target analytes at a reportable level in the associated method blanks were flagged by the laboratory with a "B". If the target analyte concentration was greater than 10 times (10X) the amount in any blank for the common

laboratory contaminants or 5 times (5X) the amount for other target compounds, the "B" qualifier was not carried forward for database input; if less than the 10X or 5X rule the "B" qualifier was replaced with a "U". The "J" qualifier, which indicates an estimated value because the result was between the MDL and RL was carried through to the database.

**Summary**

The results presented in each report were found to be compliant with the data quality objectives for the project and usable. Based on our review, the usability of the data is 100%, with the few exceptions noted above.

G:\Projects\28590\011 Site Characterization 2006\Lab Results\GAH45532\_DV Notes.xls\Final Report



H&A OF NY

SEP - 8 2006

RECEIVED

Wednesday, August 30, 2006

Haley & Aldrich of NY  
200 Town Centre Dr Suite 2  
Rochester NY 14623

Attention: Mr Ethan Lee Env. Scientist

Sample ID#: AH45532-45539

This laboratory is in compliance with the QA/QC procedure outlined in EPA 600/4-79-019, Handbook for Analytical Quality in Water and Waste Water, March 1979, and SW846 QA/QC requirements of procedures used.

If you have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext. 200.

Sincerely yours,

A handwritten signature in cursive script that reads "Phyllis Shiller".

Phyllis Shiller  
Laboratory Director

CT Lab Registration #PH-0618  
MA Lab Registration #MA-CT-007  
NY Lab Registration #11301  
RI Lab Registration #63  
NH Lab Registration #213693-A,B  
ME Lab Registration #CT-007  
NJ Lab Registration #CT-003  
PA Lab Registration #68-03530



### Environmental Laboratories, Inc.

587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06040  
Tel. (860) 645-1102 Fax (860) 645-0823

## Analysis Report

August 30, 2006

FOR: Attn: Ms. Elida S. Danaher  
Haley & Aldrich, Inc  
800 Connecticut Blvd., Suite 10  
East Hartford, CT 06108-7303

#### Sample Information

Matrix: WATER  
Location Code: HALEY  
Rush Request:  
P.O.#: 28590-01

#### Custody Information

Collected by: SB  
Received by: LB  
Analyzed by: see "By" below

#### Date

08/17/06  
08/18/06

#### Time

13:05  
16:30

### Laboratory Data

SDG I.D.: GAH45532

Phoenix I.D.: AH45532

Client ID: 28590-011 TARRYTOWN MW-12

Parameter	Result	RL	Units	Date	Time	By	Reference
Iron	17.2	0.002	mg/L	08/22/06		EKT	6010/E200.7
Manganese	0.31	0.001	mg/L	08/22/06		EKT	200.7/6010
B.O.D./5 day	8.7	2.0	mg/L	08/19/06	10:41	J/R	SM5210B
C.O.D.	51	10	mg/L	08/22/06		LK	SM5220 D
Dissolved Organic Carbon	15	1.0	mg/L	08/23/06		JL	415.2
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/18/06	19:42	J/E	300.0
Nitrate as Nitrogen	0.05	0.05	mg/L	08/18/06	19:42	J/E	300.0/9056
Sulfate	34	3.0	mg/L	08/18/06	19:42	J/E	300.0
Sulfide	< 0.05	0.05	mg/L	08/18/06		G/E	4500S-D/E376.2
Tot.Org.Carbon	20	1.0	mg/L	08/23/06		JL	415.1/SW9060
Semi-Volatile Extraction	Completed			08/18/06		O/K	SW3510/3520
Total Metals Digestion	Completed			08/18/06		AG	

#### Aromatic Volatiles

Benzene	ND	1.0	ug/L	08/21/06		R/J	SW8260
Ethyl Benzene	20	1.0	ug/L	08/21/06		R/J	SW8260
Methyl tert butyl ether	ND	2.0	ug/L	08/21/06		R/J	SW8260
o-Xylene	39	1.0	ug/L	08/21/06		R/J	SW8260
p&m-Xylene	14	1.0	ug/L	08/21/06		R/J	SW8260
Toluene	1.6	1.0	ug/L	08/21/06		R/J	SW8260

#### QA/QC Surrogates

%BFB (Surrogate Recovery)	99		%	08/21/06		R/J	SW8260
---------------------------	----	--	---	----------	--	-----	--------

#### Polynuclear Aromatic HC

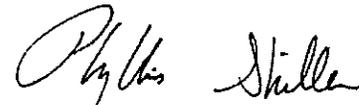
2-Methylnaphthalene	110	100	ug/L	08/24/06		KCA	SW 8270
---------------------	-----	-----	------	----------	--	-----	---------

Parameter	Result	RL	Units	Date	Time	By	Reference
Acenaphthene	41	10	ug/L	08/24/06		KCA	SW 8270
Acenaphthylene	ND	10	ug/L	08/24/06		KCA	SW 8270
Anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benz(a)anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(a)pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(b)fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(ghi)perylene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(k)fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Chrysene	ND	10	ug/L	08/24/06		KCA	SW 8270
Dibenz(a,h)anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Fluorene	13	10	ug/L	08/24/06		KCA	SW 8270
Indeno(1,2,3-cd)pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
Naphthalene	600	100	ug/L	08/24/06		KCA	SW 8270
Phenanthrene	11	10	ug/L	08/24/06		KCA	SW 8270
Pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
<b>QA/QC Surrogates</b>							
% 2-Fluorobiphenyl	70		%	08/24/06		KCA	SW 8270
% Nitrobenzene-d5	65		%	08/24/06		KCA	SW 8270
% Terphenyl-d14	52		%	08/24/06		KCA	SW 8270

**Comments:**

ND=Not detected BDL = Below Detection Limit RL=Reporting Limit

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.



Phyllis Shiller, Laboratory Director

August 30, 2006



**Environmental Laboratories, Inc.**  
 587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06040  
 Tel. (860) 645-1102 Fax (860) 645-0823

# Analysis Report

August 30, 2006

FOR: Attn: Ms. Elida S. Danaher  
 Haley & Aldrich, Inc  
 800 Connecticut Blvd., Suite 10  
 East Hartford, CT 06108-7303

## Sample Information

Matrix: WATER  
 Location Code: HALEY  
 Rush Request:  
 P.O.#: 28590-01

## Custody Information

Collected by: SB  
 Received by: LB  
 Analyzed by: see "By" below

## Date

08/17/06  
 08/18/06

## Time

19:05  
 16:30

## Laboratory Data

SDG I.D.: GAH45532  
 Phoenix I.D.: AH45533

Client ID: 28590-011 TARRYTOWN MW-20

Parameter	Result	RL	Units	Date	Time	By	Reference
Iron	0.058	0.002	mg/L	08/22/06		EKT	6010/E200.7
Manganese	0.005	0.001	mg/L	08/22/06		EKT	200.7/6010
B.O.D./5 day	< 2.0	2.0	mg/L	08/19/06	10:41	J/R	SM5210B
C.O.D.	120	10	mg/L	08/22/06		LK	SM5220 D
Dissolved Organic Carbon	2.2	1.0	mg/L	08/23/06		JL	415.2
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/18/06	19:52	J/E	300.0
Nitrate as Nitrogen	< 0.05	0.05	mg/L	08/18/06	19:52	J/E	300.0/9056
Sulfate	34	3.0	mg/L	08/18/06	19:52	J/E	300.0
Sulfide	< 0.05	0.05	mg/L	08/18/06		G/E	4500S-D/E376.2
Tot.Org.Carbon	3.5	1.0	mg/L	08/23/06		JL	415.1/SW9060
Semi-Volatile Extraction	Completed			08/18/06		O/K	SW3510/3520
Total Metals Digestion	Completed			08/18/06		AG	
<b><u>Aromatic Volatiles</u></b>							
Benzene	ND	1.0	ug/L	08/21/06		R/J	SW8260
Ethyl Benzene	ND	1.0	ug/L	08/21/06		R/J	SW8260
Methyl tert butyl ether	ND	2.0	ug/L	08/21/06		R/J	SW8260
o-Xylene	ND	1.0	ug/L	08/21/06		R/J	SW8260
p&m-Xylene	ND	1.0	ug/L	08/21/06		R/J	SW8260
Toluene	ND	1.0	ug/L	08/21/06		R/J	SW8260
<b><u>QA/QC Surrogates</u></b>							
%BFB (Surrogate Recovery)	97		%	08/21/06		R/J	SW8260
<b><u>Polynuclear Aromatic HC</u></b>							
2-Methylnaphthalene	ND	10	ug/L	08/24/06		KCA	SW 8270

Parameter	Result	RL	Units	Date	Time	By	Reference
Acenaphthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Acenaphthylene	ND	10	ug/L	08/24/06		KCA	SW 8270
Anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benz(a)anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(a)pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(b)fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(ghi)perylene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(k)fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Chrysene	ND	10	ug/L	08/24/06		KCA	SW 8270
Dibenz(a,h)anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Fluorene	ND	10	ug/L	08/24/06		KCA	SW 8270
Indeno(1,2,3-cd)pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
Naphthalene	ND	10	ug/L	08/24/06		KCA	SW 8270
Phenanthrene	ND	10	ug/L	08/24/06		KCA	SW 8270
Pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
<b>QA/QC Surrogates</b>							
% 2-Fluorobiphenyl	71		%	08/24/06		KCA	SW 8270
% Nitrobenzene-d5	65		%	08/24/06		KCA	SW 8270
% Terphenyl-d14	60		%	08/24/06		KCA	SW 8270

**Comments:**

ND=Not detected BDL = Below Detection Limit RL=Reporting Limit

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.


Phyllis Shiller, Laboratory Director  
August 30, 2006



**Environmental Laboratories, Inc.**  
 587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06040  
 Tel. (860) 645-1102 Fax (860) 645-0823

**Analysis Report**  
 August 30, 2006

FOR: Attn: Ms. Elida S. Danaher  
 Haley & Aldrich, Inc  
 800 Connecticut Blvd., Suite 10  
 East Hartford, CT 06108-7303

Sample Information

Matrix: WATER  
 Location Code: HALEY  
 Rush Request:  
 P.O.#: 28590-01

Custody Information

Collected by: SB  
 Received by: LB  
 Analyzed by: see "By" below

Date

08/17/06  
 08/18/06

Time

17:30  
 16:30

**Laboratory Data**

SDG I.D.: GAH45532  
 Phoenix I.D.: AH45534

Client ID: 28590-011 TARRYTOWN MW-21

Parameter	Result	RL	Units	Date	Time	By	Reference
Iron	2.74	0.002	mg/L	08/22/06		EKT	6010/E200.7
Manganese	0.431	0.001	mg/L	08/22/06		EKT	200.7/6010
B.O.D./5 day	< 2.0	2.0	mg/L	08/19/06	10:41	J/R	SM5210B
C.O.D.	38	10	mg/L	08/22/06		LK	SM5220 D
Dissolved Organic Carbon	4.5	1.0	mg/L	08/23/06		JL	415.2
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/18/06	20:02	J/E	300.0
Nitrate as Nitrogen	0.05	0.05	mg/L	08/18/06	20:02	J/E	300.0/9056
Sulfate	350	30	mg/L	08/25/06	10:24	G/E	300.0
Sulfide	< 0.05	0.05	mg/L	08/18/06		G/E	4500S-D/E376.2
Tot.Org.Carbon	6.0	1.0	mg/L	08/23/06		JL	415.1/SW9060
Semi-Volatile Extraction	Completed			08/18/06		O/K	SW3510/3520
Total Metals Digestion	Completed			08/18/06		AG	

**Aromatic Volatiles**

Benzene	ND	1.0	ug/L	08/21/06		R/J	SW8260
Ethyl Benzene	ND	1.0	ug/L	08/21/06		R/J	SW8260
Methyl tert butyl ether	ND	2.0	ug/L	08/21/06		R/J	SW8260
o-Xylene	ND	1.0	ug/L	08/21/06		R/J	SW8260
p&m-Xylene	ND	1.0	ug/L	08/21/06		R/J	SW8260
Toluene	ND	1.0	ug/L	08/21/06		R/J	SW8260

**QA/QC Surrogates**

%BFB (Surrogate Recovery)	99		%	08/21/06		R/J	SW8260
---------------------------	----	--	---	----------	--	-----	--------

**Polynuclear Aromatic HC**

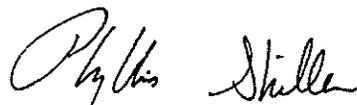
2-Methylnaphthalene	ND	11	ug/L	08/24/06		KCA	SW 8270
---------------------	----	----	------	----------	--	-----	---------

Parameter	Result	RL	Units	Date	Time	By	Reference
Acenaphthene	ND	11	ug/L	08/24/06		KCA	SW 8270
Acenaphthylene	ND	11	ug/L	08/24/06		KCA	SW 8270
Anthracene	ND	11	ug/L	08/24/06		KCA	SW 8270
Benz(a)anthracene	ND	11	ug/L	08/24/06		KCA	SW 8270
Benzo(a)pyrene	ND	11	ug/L	08/24/06		KCA	SW 8270
Benzo(b)fluoranthene	ND	11	ug/L	08/24/06		KCA	SW 8270
Benzo(ghi)perylene	ND	11	ug/L	08/24/06		KCA	SW 8270
Benzo(k)fluoranthene	ND	11	ug/L	08/24/06		KCA	SW 8270
Chrysene	ND	11	ug/L	08/24/06		KCA	SW 8270
Dibenz(a,h)anthracene	ND	11	ug/L	08/24/06		KCA	SW 8270
Fluoranthene	ND	11	ug/L	08/24/06		KCA	SW 8270
Fluorene	ND	11	ug/L	08/24/06		KCA	SW 8270
Indeno(1,2,3-cd)pyrene	ND	11	ug/L	08/24/06		KCA	SW 8270
Naphthalene	ND	11	ug/L	08/24/06		KCA	SW 8270
Phenanthrene	ND	11	ug/L	08/24/06		KCA	SW 8270
Pyrene	ND	11	ug/L	08/24/06		KCA	SW 8270
<b>QA/QC Surrogates</b>							
% 2-Fluorobiphenyl	72		%	08/24/06		KCA	SW 8270
% Nitrobenzene-d5	67		%	08/24/06		KCA	SW 8270
% Terphenyl-d14	56		%	08/24/06		KCA	SW 8270

**Comments:**

ND=Not detected BDL = Below Detection Limit RL=Reporting Limit

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.


Phyllis Shiller, Laboratory Director  
August 30, 2006



**Environmental Laboratories, Inc.**  
 587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06040  
 Tel. (860) 645-1102 Fax (860) 645-0823

**Analysis Report**  
 August 30, 2006

FOR: Attn: Ms. Elida S. Danaher  
 Haley & Aldrich, Inc  
 800 Connecticut Blvd., Suite 10  
 East Hartford, CT 06108-7303

Sample Information

Matrix: WATER  
 Location Code: HALEY  
 Rush Request: RUSH24HR  
 P.O.#: 28590-01

Custody Information

Collected by: SB  
 Received by: LB  
 Analyzed by: see "By" below

Date      Time

08/17/06      15:00  
 08/18/06      16:30

**Laboratory Data**

SDG I.D.: GAH45532  
 Phoenix I.D.: AH45535

Client ID: 28590-011 TARRYTOWN MW-24

Parameter	Result	RL	Units	Date	Time	By	Reference
Iron	0.071	0.002	mg/L	08/22/06		EKT	6010/E200.7
Manganese	0.007	0.001	mg/L	08/22/06		EKT	200.7/6010
B.O.D./5 day	< 2.0	2.0	mg/L	08/19/06	10:41	J/R	SM5210B
C.O.D.	69	10	mg/L	08/22/06		LK	SM5220 D
Dissolved Organic Carbon	2.2	1.0	mg/L	08/23/06		JL	415.2
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/18/06	20:22	J/E	300.0
Nitrate as Nitrogen	0.08	0.05	mg/L	08/18/06	20:22	J/E	300.0/9056
Sulfate	320	30	mg/L	08/25/06	10:31	G/E	300.0
Sulfide	< 0.05	0.05	mg/L	08/18/06		G/E	4500S-D/E376.2
Tot.Org.Carbon	3.3	1.0	mg/L	08/23/06		JL	415.1/SW9060
Semi-Volatile Extraction	Completed			08/18/06		O/K	SW3510/3520
	Completed			08/25/06		O/E	SW3510/3520
Total Metals Digestion	Completed			08/18/06		AG	
<b><u>Aromatic Volatiles</u></b>							
Benzene	ND	1.0	ug/L	08/21/06		R/J	SW8260
Ethyl Benzene	ND	1.0	ug/L	08/21/06		R/J	SW8260
Methyl tert butyl ether	ND	2.0	ug/L	08/21/06		R/J	SW8260
o-Xylene	ND	1.0	ug/L	08/21/06		R/J	SW8260
p&m-Xylene	ND	1.0	ug/L	08/21/06		R/J	SW8260
Toluene	ND	1.0	ug/L	08/21/06		R/J	SW8260
<b><u>QA/QC Surrogates</u></b>							
%BFB (Surrogate Recovery)	97		%	08/21/06		R/J	SW8260

**Polynuclear Aromatic HC**

Parameter	Result	RL	Units	Date	Time	By	Reference
2-Methylnaphthalene	ND	50	ug/L	08/27/06		KCA	SW 8270
Acenaphthene	ND	50	ug/L	08/27/06		KCA	SW 8270
Acenaphthylene	ND	50	ug/L	08/27/06		KCA	SW 8270
Anthracene	ND	50	ug/L	08/27/06		KCA	SW 8270
Benz(a)anthracene	ND	50	ug/L	08/27/06		KCA	SW 8270
Benzo(a)pyrene	ND	50	ug/L	08/27/06		KCA	SW 8270
Benzo(b)fluoranthene	ND	50	ug/L	08/27/06		KCA	SW 8270
Benzo(ghi)perylene	ND	50	ug/L	08/27/06		KCA	SW 8270
Benzo(k)fluoranthene	ND	50	ug/L	08/27/06		KCA	SW 8270
Chrysene	ND	50	ug/L	08/27/06		KCA	SW 8270
Dibenz(a,h)anthracene	ND	50	ug/L	08/27/06		KCA	SW 8270
Fluoranthene	ND	50	ug/L	08/27/06		KCA	SW 8270
Fluorene	ND	50	ug/L	08/27/06		KCA	SW 8270
Indeno(1,2,3-cd)pyrene	ND	50	ug/L	08/27/06		KCA	SW 8270
Naphthalene	ND	50	ug/L	08/27/06		KCA	SW 8270
Phenanthrene	ND	50	ug/L	08/27/06		KCA	SW 8270
Pyrene	ND	50	ug/L	08/27/06		KCA	SW 8270
<b>QA/QC Surrogates</b>							
% 2-Fluorobiphenyl	67		%	08/27/06		KCA	SW 8270
% Nitrobenzene-d5	64		%	08/27/06		KCA	SW 8270
% Terphenyl-d14	36		%	08/27/06		KCA	SW 8270

**Comments:**

ND=Not detected BDL = Below Detection Limit RL=Reporting Limit

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

  
 Phyllis Shiller, Laboratory Director  
 August 30, 2006



**Environmental Laboratories, Inc.**  
 587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06040  
 Tel. (860) 645-1102 Fax (860) 645-0823

# Analysis Report

August 30, 2006

FOR: Attn: Ms. Elida S. Danaher  
 Haley & Aldrich, Inc  
 800 Connecticut Blvd., Suite 10  
 East Hartford, CT 06108-7303

## Sample Information

Matrix: WATER  
 Location Code: HALEY  
 Rush Request:  
 P.O.#: 28590-01

## Custody Information

Collected by: SB  
 Received by: LB  
 Analyzed by: see "By" below

## Date

08/17/06  
 08/18/06

## Time

11:00  
 16:30

SDG I.D.: GAH45532

Phoenix I.D.: AH45536

## Laboratory Data

Client ID: 28590-011 TARRYTOWN MW-29

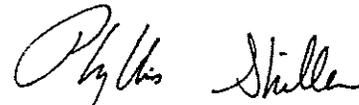
Parameter	Result	RL	Units	Date	Time	By	Reference
Iron	1.05	0.002	mg/L	08/22/06		EKT	6010/E200.7
Manganese	1.01	0.001	mg/L	08/22/06		EKT	200.7/6010
B.O.D./5 day	< 2.0	2.0	mg/L	08/19/06	10:41	J/R	SM5210B
C.O.D.	12	10	mg/L	08/22/06		LK	SM5220 D
Dissolved Organic Carbon	2.8	1.0	mg/L	08/23/06		JL	415.2
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/18/06	20:32	J/E	300.0
Nitrate as Nitrogen	0.06	0.05	mg/L	08/18/06	20:32	J/E	300.0/9056
Sulfate	30	3.0	mg/L	08/18/06	20:32	J/E	300.0
Sulfide	< 0.05	0.05	mg/L	08/18/06		G/E	4500S-D/E376.2
Tot.Org.Carbon	4.2	1.0	mg/L	08/23/06		JL	415.1/SW9060
Semi-Volatile Extraction	Completed			08/18/06		O/K	SW3510/3520
Total Metals Digestion	Completed			08/18/06		AG	
<b><u>Aromatic Volatiles</u></b>							
Benzene	ND	1.0	ug/L	08/22/06		R/J	SW8260
Ethyl Benzene	ND	1.0	ug/L	08/22/06		R/J	SW8260
Methyl tert butyl ether	ND	2.0	ug/L	08/22/06		R/J	SW8260
o-Xylene	ND	1.0	ug/L	08/22/06		R/J	SW8260
p&m-Xylene	ND	1.0	ug/L	08/22/06		R/J	SW8260
Toluene	ND	1.0	ug/L	08/22/06		R/J	SW8260
<b><u>QA/QC Surrogates</u></b>							
%BFB (Surrogate Recovery)	96		%	08/22/06		R/J	SW8260
<b><u>Polynuclear Aromatic HC</u></b>							
2-Methylnaphthalene	ND	10	ug/L	08/24/06		KCA	SW 8270

Parameter	Result	RL	Units	Date	Time	By	Reference
Acenaphthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Acenaphthylene	ND	10	ug/L	08/24/06		KCA	SW 8270
Anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benz(a)anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(a)pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(b)fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(ghi)perylene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(k)fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Chrysene	ND	10	ug/L	08/24/06		KCA	SW 8270
Dibenz(a,h)anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Fluorene	ND	10	ug/L	08/24/06		KCA	SW 8270
Indeno(1,2,3-cd)pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
Naphthalene	ND	10	ug/L	08/24/06		KCA	SW 8270
Phenanthrene	ND	10	ug/L	08/24/06		KCA	SW 8270
Pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
<b><u>QA/QC Surrogates</u></b>							
% 2-Fluorobiphenyl	70		%	08/24/06		KCA	SW 8270
% Nitrobenzene-d5	67		%	08/24/06		KCA	SW 8270
% Terphenyl-d14	53		%	08/24/06		KCA	SW 8270

**Comments:**

ND=Not detected BDL = Below Detection Limit RL=Reporting Limit

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.


Phyllis Shiller, Laboratory Director  
August 30, 2006



**Environmental Laboratories, Inc.**  
 587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06040  
 Tel. (860) 645-1102 Fax (860) 645-0823

# Analysis Report

August 30, 2006

FOR: Attn: Ms. Elida S. Danaher  
 Haley & Aldrich, Inc  
 800 Connecticut Blvd., Suite 10  
 East Hartford, CT 06108-7303

### Sample Information

Matrix: WATER  
 Location Code: HALEY  
 Rush Request:  
 P.O.#: 28590-01

### Custody Information

Collected by: SB  
 Received by: LB  
 Analyzed by: see "By" below

### Date      Time

08/17/06      10:00  
 08/18/06      16:30

## Laboratory Data

SDG I.D.: GAH45532  
 Phoenix I.D.: AH45537

Client ID: 28590-011 TARRYTOWN DUP-081706

Parameter	Result	RL	Units	Date	Time	By	Reference
Iron	0.063	0.002	mg/L	08/22/06		EKT	6010/E200.7
Manganese	0.006	0.001	mg/L	08/22/06		EKT	200.7/6010
B.O.D./5 day	< 2.0	2.0	mg/L	08/19/06	10:41	J/R	SM5210B
C.O.D.	46	10	mg/L	08/22/06		LK	SM5220 D
Dissolved Organic Carbon	2.8	1.0	mg/L	08/23/06		JL	415.2
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/18/06	20:42	J/E	300.0
Nitrate as Nitrogen	0.08	0.05	mg/L	08/18/06	20:42	J/E	300.0/9056
Sulfate	290	30	mg/L	08/25/06	10:38	G/E	300.0
Sulfide	< 0.05	0.05	mg/L	08/18/06		G/E	4500S-D/E376.2
Tot.Org.Carbon	3.3	1.0	mg/L	08/23/06		JL	415.1/SW9060
Semi-Volatile Extraction	Completed			08/18/06		O/K	SW3510/3520
Total Metals Digestion	Completed			08/18/06		AG	
<b><u>Aromatic Volatiles</u></b>							
Benzene	ND	1.0	ug/L	08/22/06		R/J	SW8260
Ethyl Benzene	ND	1.0	ug/L	08/22/06		R/J	SW8260
Methyl tert butyl ether	ND	2.0	ug/L	08/22/06		R/J	SW8260
o-Xylene	ND	1.0	ug/L	08/22/06		R/J	SW8260
p&m-Xylene	ND	1.0	ug/L	08/22/06		R/J	SW8260
Toluene	ND	1.0	ug/L	08/22/06		R/J	SW8260
<b><u>QA/QC Surrogates</u></b>							
%BFB (Surrogate Recovery)	98		%	08/22/06		R/J	SW8260

### Polynuclear Aromatic HC

2-Methylnaphthalene      ND      10      ug/L      08/24/06      KCA      SW 8270

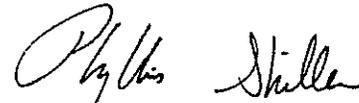
Parameter	Result	RL	Units	Date	Time	By	Reference
Acenaphthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Acenaphthylene	ND	10	ug/L	08/24/06		KCA	SW 8270
Anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benz(a)anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(a)pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(b)fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(ghi)perylene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(k)fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Chrysene	ND	10	ug/L	08/24/06		KCA	SW 8270
Dibenz(a,h)anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Fluorene	ND	10	ug/L	08/24/06		KCA	SW 8270
Indeno(1,2,3-cd)pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
Naphthalene	ND	10	ug/L	08/24/06		KCA	SW 8270
Phenanthrene	ND	10	ug/L	08/24/06		KCA	SW 8270
Pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
<b>QA/QC Surrogates</b>							
% 2-Fluorobiphenyl	72		%	08/24/06		KCA	SW 8270
% Nitrobenzene-d5	65		%	08/24/06		KCA	SW 8270
% Terphenyl-d14	55		%	08/24/06		KCA	SW 8270

**Comments:**

ND=Not detected BDL = Below Detection Limit RL=Reporting Limit

DUPLICATE INCLUDED

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.


Phyllis Shiller, Laboratory Director  
August 30, 2006



**Environmental Laboratories, Inc.**  
 587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06040  
 Tel. (860) 645-1102 Fax (860) 645-0823

# Analysis Report

August 30, 2006

FOR: Attn: Ms. Elida S. Danaher  
 Haley & Aldrich, Inc  
 800 Connecticut Blvd., Suite 10  
 East Hartford, CT 06108-7303

### Sample Information

Matrix: WATER  
 Location Code: HALEY  
 Rush Request:  
 P.O.#: 28590-01

### Custody Information

Collected by: SB  
 Received by: LB  
 Analyzed by: see "By" below

### Date      Time

08/17/06      20:00  
 08/18/06      16:30

## Laboratory Data

SDG I.D.: GAH45532  
 Phoenix I.D.: AH45538

Client ID: 28590-011 TARRYTOWN EB-081706

Parameter	Result	RL	Units	Date	Time	By	Reference
Iron	< 0.002	0.002	mg/L	08/22/06		EKT	6010/E200.7
Manganese	< 0.001	0.001	mg/L	08/22/06		EKT	200.7/6010
B.O.D./5 day	< 2.0	2.0	mg/L	08/19/06	10:41	J/R	SM5210B
C.O.D.	< 10	10	mg/L	08/22/06		LK	SM5220 D
Dissolved Organic Carbon	< 1.0	1.0	mg/L	08/23/06		JL	415.2
Nitrite as Nitrogen	< 0.01	0.01	mg/L	08/18/06	20:53	J/E	300.0
Nitrate as Nitrogen	< 0.05	0.05	mg/L	08/18/06	20:53	J/E	300.0/9056
Sulfate	< 3.0	3.0	mg/L	08/18/06	20:53	J/E	300.0
Sulfide	< 0.05	0.05	mg/L	08/18/06		G/E	4500S-D/E376.2
Tot.Org.Carbon	< 1.0	1.0	mg/L	08/23/06		JL	415.1/SW9060
Semi-Volatile Extraction	Completed			08/18/06		O/K	SW3510/3520
Total Metals Digestion	Completed			08/18/06		AG	

### Aromatic Volatiles

Benzene	ND	1.0	ug/L	08/22/06		R/J	SW8260
Ethyl Benzene	ND	1.0	ug/L	08/22/06		R/J	SW8260
Methyl tert butyl ether	ND	2.0	ug/L	08/22/06		R/J	SW8260
o-Xylene	ND	1.0	ug/L	08/22/06		R/J	SW8260
p&m-Xylene	ND	1.0	ug/L	08/22/06		R/J	SW8260
Toluene	ND	1.0	ug/L	08/22/06		R/J	SW8260

### QA/QC Surrogates

%BFB (Surrogate Recovery)	99		%	08/22/06		R/J	SW8260
---------------------------	----	--	---	----------	--	-----	--------

### Polynuclear Aromatic HC

2-Methylnaphthalene	ND	10	ug/L	08/24/06		KCA	SW 8270
---------------------	----	----	------	----------	--	-----	---------

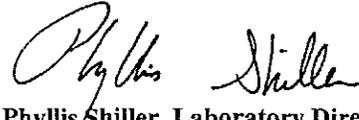
Parameter	Result	RL	Units	Date	Time	By	Reference
Acenaphthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Acenaphthylene	ND	10	ug/L	08/24/06		KCA	SW 8270
Anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benz(a)anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(a)pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(b)fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(ghi)perylene	ND	10	ug/L	08/24/06		KCA	SW 8270
Benzo(k)fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Chrysene	ND	10	ug/L	08/24/06		KCA	SW 8270
Dibenz(a,h)anthracene	ND	10	ug/L	08/24/06		KCA	SW 8270
Fluoranthene	ND	10	ug/L	08/24/06		KCA	SW 8270
Fluorene	ND	10	ug/L	08/24/06		KCA	SW 8270
Indeno(1,2,3-cd)pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
Naphthalene	ND	10	ug/L	08/24/06		KCA	SW 8270
Phenanthrene	ND	10	ug/L	08/24/06		KCA	SW 8270
Pyrene	ND	10	ug/L	08/24/06		KCA	SW 8270
<b>QA/QC Surrogates</b>							
% 2-Fluorobiphenyl	69		%	08/24/06		KCA	SW 8270
% Nitrobenzene-d5	65		%	08/24/06		KCA	SW 8270
% Terphenyl-d14	54		%	08/24/06		KCA	SW 8270

**Comments:**

ND=Not detected BDL = Below Detection Limit RL=Reporting Limit

EQUIPMENT BLANK INCLUDED

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.


Phyllis Shiller, Laboratory Director  
August 30, 2006



**Environmental Laboratories, Inc.**  
 587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06040  
 Tel. (860) 645-1102 Fax (860) 645-0823

**Analysis Report**  
 August 30, 2006

FOR: Attn: Ms. Elida S. Danaher  
 Haley & Aldrich, Inc  
 800 Connecticut Blvd., Suite 10  
 East Hartford, CT 06108-7303

Sample Information

Matrix: WATER  
 Location Code: HALEY  
 Rush Request:  
 P.O.#: 28590-01

Custody Information

Collected by: SB  
 Received by: LB  
 Analyzed by: see "By" below

Date

08/17/06  
 08/18/06

Time

9:00  
 16:30

Laboratory Data

SDG I.D.: GAH45532  
 Phoenix I.D.: AH45539

Client ID: 28590-011 TARRYTOWN TB-081706

Parameter	Result	RL	Units	Date	Time	By	Reference
<u>Aromatic Volatiles</u>							
Benzene	ND	1.0	ug/L	08/22/06		R/J	SW8260
Ethyl Benzene	ND	1.0	ug/L	08/22/06		R/J	SW8260
Methyl tert butyl ether	ND	2.0	ug/L	08/22/06		R/J	SW8260
o-Xylene	ND	1.0	ug/L	08/22/06		R/J	SW8260
p&m-Xylene	ND	1.0	ug/L	08/22/06		R/J	SW8260
Toluene	ND	1.0	ug/L	08/22/06		R/J	SW8260
<u>QA/QC Surrogates</u>							
%BFB (Surrogate Recovery)	99		%	08/22/06		R/J	SW8260

Comments: ND=Not detected BDL = Below Detection Limit RL=Reporting Limit

TRIP BLANK INCLUDED

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

*Phyllis Shiller*  
 Phyllis Shiller, Laboratory Director  
 August 30, 2006



**Environmental Laboratories, Inc.**  
 587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06040  
 Tel. (860) 645-1102 Fax (860) 645-0823

# QA/QC Report

August 30, 2006

## QA/QC Data

SDG I.D.: GAH45532

Parameter	Blank	Dup	LCS	LCS	LCS	MS	MS Dup	RPD
		RPD	%	%	RPD	Rec %	Rec %	

QA/QC Batch 62783, Sample No: AH45486 (AH45532, AH45533, AH45534, AH45535, AH45536, AH45537, AH45538)

### ICP Metals - Aqueous

Aluminum	BDL	5.80	101			106	104	1.9
Antimony	BDL	NC	101			101	103	2.0
Arsenic	BDL	NC	105			105	106	0.9
Barium	BDL	1.90	101			104	102	1.9
Beryllium	BDL	NC	105			103	102	1.0
Boron	BDL	---	---			---	---	NC
Cadmium	BDL	NC	102			97.2	97.2	0.0
Calcium	BDL	---	---			---	---	NC
Chromium	BDL	1.00	101			99.7	98.8	0.9
Cobalt	BDL	NC	102			100	99.6	0.4
Copper	BDL	2.90	102			109	106	2.8
Iron	BDL	0.3	101			99.4	97.6	1.8
Lead	BDL	NC	102			98.9	98.4	0.5
Magnesium	BDL	---	---			---	---	NC
Manganese	BDL	1.80	102			99.2	98.8	0.4
Molybdenum	BDL	---	---			---	---	NC
Nickel	BDL	7.60	103			100	99.1	0.9
Phosphorus	BDL	---	---			---	---	NC
Selenium	BDL	NC	112			110	110	0.0
Silver	BDL	NC	108			108	106	1.9
Thallium	BDL	NC	102			98.3	98.4	0.1
Tin	BDL	---	---			---	---	NC
Vanadium	BDL	NC	104			105	103	1.9
Zinc	BDL	0	103			99.6	100	0.4

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference

LCS - Laboratory Control Sample

LCS D - Laboratory Control Sample Duplicate

MS - Matrix Spike

MS Dup - Matrix Spike Duplicate

Phyllis Shiller, Laboratory Director

August 30, 2006



**Environmental Laboratories, Inc.**  
 587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06040  
 Tel. (860) 645-1102 Fax (860) 645-0823

# QA/QC Report

August 30, 2006

## QA/QC Data

SDG I.D.: GAH45532

Parameter	Blank	Dup	LCS	LCSD	LCS	MS	MS Dup	RPD
		RPD	%	%	RPD	Rec %	Rec %	
QA/QC Batch 62898, Sample No: AH44803 (AH45532, AH45533, AH45534, AH45535, AH45536, AH45537, AH45538) C.O.D.	BDL	NC				96		
QA/QC Batch 62988, Sample No: AH45532 (AH45532, AH45533, AH45534, AH45535, AH45536, AH45537, AH45538) Total Organic Carbon	BDL	0.0	93.8			98.1		
QA/QC Batch 62853, Sample No: AH45658 (AH45532, AH45533, AH45534, AH45535, AH45536, AH45537, AH45538) Chloride	BDL	0.0	94.9			101		
QA/QC Batch 62855, Sample No: AH45658 (AH45532, AH45533, AH45534, AH45535, AH45536, AH45537, AH45538) Nitrate as Nitrogen	BDL	7.7	101.1			96.5		
QA/QC Batch 62854, Sample No: AH45658 (AH45532, AH45533, AH45534, AH45535, AH45536, AH45537, AH45538) Nitrite as Nitrogen	BDL	NC	92.9			97.3		
QA/QC Batch 62856, Sample No: AH45658 (AH45532, AH45533, AH45534, AH45535, AH45536, AH45537, AH45538) Sulfate	BDL	NC	99.5			104		
QA/QC Batch 63068, Sample No: AH46679 (AH45534, AH45535, AH45537) Chloride	BDL	0.0	95.1			100		
QA/QC Batch 63070, Sample No: AH46679 (AH45534, AH45535, AH45537) Nitrate as Nitrogen	BDL	1.6	95.9			96.2		
QA/QC Batch 63069, Sample No: AH46679 (AH45534, AH45535, AH45537) Nitrite as Nitrogen	BDL	NC	101.7			101		
QA/QC Batch 63071, Sample No: AH46679 (AH45534, AH45535, AH45537) Sulfate	BDL	0.0	98.9			103		

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

- RPD - Relative Percent Difference
- LCS - Laboratory Control Sample
- LCSD - Laboratory Control Sample Duplicate
- MS - Matrix Spike
- MS Dup - Matrix Spike Duplicate

*Phyllis Shiller*  
 Phyllis Shiller, Laboratory Director  
 August 30, 2006



**Environmental Laboratories, Inc.**  
 587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06040  
 Tel. (860) 645-1102 Fax (860) 645-0823

# QA/QC Report

August 30, 2006

## QA/QC Data

SDG I.D.: GAH45532

Parameter	Blank	LCS %	LCSD %	LCS RPD	MS Rec %	MS Dup Rec %	RPD
-----------	-------	----------	-----------	------------	-------------	-----------------	-----

QA/QC Batch 62713, Sample No: AH44919 (AH45535)

### Polynuclear Aromatic HC

2-Methylnaphthalene	ND				69	70	1.4
Acenaphthene	ND				70	70	0.0
Acenaphthylene	ND				60	60	0.0
Anthracene	ND				72	73	1.4
Benz(a)anthracene	ND				74	75	1.3
Benzo(a)pyrene	ND				69	70	1.4
Benzo(b)fluoranthene	ND				72	71	1.4
Benzo(ghi)perylene	ND				72	76	5.4
Benzo(k)fluoranthene	ND				72	74	2.7
Chrysene	ND				73	73	0.0
Dibenz(a,h)anthracene	ND				76	80	5.1
Fluoranthene	ND				68	69	1.5
Fluorene	ND				74	75	1.3
Indeno(1,2,3-cd)pyrene	ND				75	78	3.9
Naphthalene	ND				69	71	2.9
Phenanthrene	ND				72	72	0.0
Pyrene	ND				63	63	0.0
% 2-Fluorobiphenyl	68				70	70	0.0
% Nitrobenzene-d5	67				67	68	1.5
% Terphenyl-d14	62				62	64	3.2

**Comment:** A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.

QA/QC Batch 62884, Sample No: AH45320 (ah45532, ah45533, ah45534, ah45535)

### Volatile

1,1,1,2-Tetrachloroethane	ND	102			94	91	3.2
1,1,1-Trichloroethane	ND	113			108	102	5.7
1,1,2,2-Tetrachloroethane	ND	92			93	91	2.2
1,1,2-Trichloroethane	ND	110			108	102	5.7
1,1-Dichloroethane	ND	118			111	101	9.4
1,1-Dichloroethene	ND	124			111	104	6.5
1,1-Dichloropropene	ND	106			102	102	0.0
1,2,3-Trichlorobenzene	ND	106			87	77	12.2
1,2,3-Trichloropropane	ND	88			80	90	11.8

# QA/QC Data

SDG I.D.: GAH45532

Parameter	Blank	LCS %	LCSD %	LCS RPD	MS Rec %	MS Dup Rec %	RPD
1,2,4-Trichlorobenzene	ND	109			88	81	8.3
1,2,4-Trimethylbenzene	ND	98			90	90	0.0
1,2-Dibromo-3-chloropropane	ND	105			99	91	8.4
1,2-Dichlorobenzene	ND	93			84	84	0.0
1,2-Dichloroethane	ND	107			102	96	6.1
1,2-Dichloropropane	ND	108			101	98	3.0
1,3,5-Trimethylbenzene	ND	96			88	88	0.0
1,3-Dichlorobenzene	ND	97			82	82	0.0
1,3-Dichloropropane	ND	102			97	93	4.2
1,4-Dichlorobenzene	ND	103			89	84	5.8
2,2-Dichloropropane	ND	82			81	115	34.7
2-Chlorotoluene	ND	96			87	90	3.4
4-Chlorotoluene	ND	99			87	88	1.1
Benzene	ND	106			99	96	3.1
Bromobenzene	ND	95			85	85	0.0
Bromochloromethane	ND	117			110	105	4.7
Bromodichloromethane	ND	108			103	97	6.0
Bromoform	ND	107			99	96	3.1
Bromomethane	ND	154			109	81	29.5
Carbon tetrachloride	ND	103			100	100	0.0
Chlorobenzene	ND	99			91	91	0.0
Chloroethane	ND	133			91	97	6.4
Chloroform	ND	115			110	98	11.5
Chloromethane	ND	123			87	94	7.7
cis-1,2-Dichloroethene	ND	118			108	101	6.7
cis-1,3-Dichloropropene	ND	119			119	108	9.7
Dibromochloromethane	ND	104			96	91	5.3
Dibromoethane	ND	113			109	102	6.6
Dibromomethane	ND	106			104	100	3.9
Dichlorodifluoromethane	ND	175			93	89	4.4
Ethylbenzene	ND	101			92	93	1.1
Hexachlorobutadiene	ND	103			81	82	1.2
Isopropylbenzene	ND	97			81	85	4.8
m&p-Xylene	ND	101			94	94	0.0
Methyl Ethyl Ketone	ND						
Methyl t-butyl ether (MTBE)	ND	122			104	97	7.0
Methylene chloride	ND	103			94	86	8.9
n-Butylbenzene	ND	104			89	86	3.4
n-Propylbenzene	ND	95			86	88	2.3
Naphthalene	ND	124			111	91	19.8
o-Xylene	ND	110			93	94	1.1
p-Isopropyltoluene	ND	101			85	87	2.3

**QA/QC Data**

SDG I.D.: GAH45532

Parameter	Blank	LCS %	LCSD %	LCS RPD	MS Rec %	MS Dup Rec %	RPD
sec-Butylbenzene	ND	96			91	93	2.2
Styrene	ND	112			92	92	0.0
tert-Butylbenzene	ND	97			89	91	2.2
Tetrachloroethene	ND	102			92	91	1.1
Toluene	ND	107			101	100	1.0
Total Xylenes	ND						
trans-1,2-Dichloroethene	ND	121			112	101	10.3
trans-1,3-Dichloropropene	ND	125			118	103	13.6
Trichloroethene	ND	110			105	99	5.9
Trichlorofluoromethane	ND	111			106	97	8.9
Vinyl chloride	ND	133			99	98	1.0
% 1,2-dichlorobenzene-d4	98	99			103	103	0.0
% Bromofluorobenzene	97	99			103	104	1.0
% Dibromofluoromethane	103	109			110	104	5.6
% Toluene-d8	97	102			100	103	3.0

QA/QC Batch 62774, Sample No: AH45532 (AH45532, AH45533, AH45534, AH45535, AH45536, AH45537, AH45538)

**Polynuclear Aromatic HC**

2-Methylnaphthalene	ND				72	78	8.0
Acenaphthene	ND				69	75	8.3
Acenaphthylene	ND				57	62	8.4
Anthracene	ND				72	72	0.0
Benz(a)anthracene	ND				75	79	5.2
Benzo(a)pyrene	ND				66	67	1.5
Benzo(b)fluoranthene	ND				70	75	6.9
Benzo(ghi)perylene	ND				55	63	13.6
Benzo(k)fluoranthene	ND				71	74	4.1
Chrysene	ND				73	79	7.9
Dibenz(a,h)anthracene	ND				68	76	11.1
Fluoranthene	ND				56	62	10.2
Fluorene	ND				77	84	8.7
Indeno(1,2,3-cd)pyrene	ND				66	73	10.1
Naphthalene	ND				72	77	6.7
Phenanthrene	ND				76	81	6.4
Pyrene	ND				51	56	9.3
% 2-Fluorobiphenyl	68				66	71	7.3
% Nitrobenzene-d5	60				63	71	11.9
% Terphenyl-d14	53				48	53	9.9

**Comment:** A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.

QA/QC Batch 62805, Sample No: AH45533 (AH45533)

**Volatiles**

1,1,1,2-Tetrachloroethane	ND	97			99	101	2.0
---------------------------	----	----	--	--	----	-----	-----

**QA/QC Data**

SDG I.D.: GAH45532

<b>Parameter</b>	<b>Blank</b>	<b>LCS %</b>	<b>LCSD %</b>	<b>LCS RPD</b>	<b>MS Rec %</b>	<b>MS Dup Rec %</b>	<b>RPD</b>
1,1,1-Trichloroethane	ND	103			108	112	3.6
1,1,2,2-Tetrachloroethane	ND	93			94	102	8.2
1,1,2-Trichloroethane	ND	109			109	110	0.9
1,1-Dichloroethane	ND	109			112	112	0.0
1,1-Dichloroethene	ND	112			115	116	0.9
1,1-Dichloropropene	ND	110			111	110	0.9
1,2,3-Trichlorobenzene	ND	99			97	94	3.1
1,2,3-Trichloropropane	ND	81			82	98	17.8
1,2,4-Trichlorobenzene	ND	106			96	93	3.2
1,2,4-Trimethylbenzene	ND	100			97	102	5.0
1,2-Dibromo-3-chloropropane	ND	95			96	98	2.1
1,2-Dichlorobenzene	ND	92			92	97	5.3
1,2-Dichloroethane	ND	102			105	104	1.0
1,2-Dichloropropane	ND	106			107	109	1.9
1,3,5-Trimethylbenzene	ND	97			94	101	7.2
1,3-Dichlorobenzene	ND	96			92	97	5.3
1,3-Dichloropropane	ND	99			104	103	1.0
1,4-Dichlorobenzene	ND	102			99	101	2.0
2,2-Dichloropropane	ND	65			87	118	30.2
2-Chlorotoluene	ND	96			94	103	9.1
4-Chlorotoluene	ND	96			96	103	7.0
Benzene	ND	105			105	107	1.9
Bromobenzene	ND	93			93	100	7.3
Bromochloromethane	ND	113			113	115	1.8
Bromodichloromethane	ND	102			103	105	1.9
Bromoform	ND	99			97	99	2.0
Bromomethane	ND	136			128	96	28.6
Carbon tetrachloride	ND	99			104	106	1.9
Chlorobenzene	ND	98			98	105	6.9
Chloroethane	ND	102			94	113	18.4
Chloroform	ND	107			110	106	3.7
Chloromethane	ND	91			99	113	13.2
cis-1,2-Dichloroethene	ND	111			113	113	0.0
cis-1,3-Dichloropropene	ND	121			121	120	0.8
Dibromochloromethane	ND	98			100	101	1.0
Dibromoethane	ND	109			111	112	0.9
Dibromomethane	ND	104			107	108	0.9
Dichlorodifluoromethane	ND	90			112	113	0.9
Ethylbenzene	ND	97			98	104	5.9
Hexachlorobutadiene	ND	98			96	94	2.1
Isopropylbenzene	ND	92			90	98	8.5
m&p-Xylene	ND	99			100	105	4.9

**QA/QC Data**

SDG I.D.: GAH45532

Parameter	Blank	LCS %	LCSD %	LCS RPD	MS Rec %	MS Dup Rec %	RPD
Methyl Ethyl Ketone	ND						
Methyl t-butyl ether (MTBE)	ND	108			108	106	1.9
Methylene chloride	ND	98			95	97	2.1
n-Butylbenzene	ND	101			96	98	2.1
n-Propylbenzene	ND	97			92	103	11.3
Naphthalene	ND	120			117	107	8.9
o-Xylene	ND	107			99	106	6.8
p-Isopropyltoluene	ND	96			93	98	5.2
sec-Butylbenzene	ND	102			100	105	4.9
Styrene	ND	107			100	106	5.8
tert-Butylbenzene	ND	98			96	103	7.0
Tetrachloroethene	ND	99			97	104	7.0
Toluene	ND	107			108	112	3.6
Total Xylenes	ND						
trans-1,2-Dichloroethene	ND	114			115	114	0.9
trans-1,3-Dichloropropene	ND	119			121	115	5.1
Trichloroethene	ND	107			108	109	0.9
Trichlorofluoromethane	ND	90			105	107	1.9
Vinyl chloride	ND	100			109	116	6.2
% 1,2-dichlorobenzene-d4	96	98			101	102	1.0
% Bromofluorobenzene	96	98			100	103	3.0
% Dibromofluoromethane	105	103			104	102	1.9
% Toluene-d8	98	101			102	102	0.0

QA/QC Batch 62933, Sample No: AH45536 (AH45536, ah45537, ah45538)

**Volatiles**

1,1,1,2-Tetrachloroethane	ND	99			91	94	3.2
1,1,1-Trichloroethane	ND	115			100	103	3.0
1,1,2,2-Tetrachloroethane	ND	94			90	96	6.5
1,1,2-Trichloroethane	ND	110			101	111	9.4
1,1-Dichloroethane	ND	117			103	112	8.4
1,1-Dichloroethene	ND	127			104	107	2.8
1,1-Dichloropropene	ND	118			102	104	1.9
1,2,3-Trichlorobenzene	ND	90			77	92	17.8
1,2,3-Trichloropropane	ND	99			84	81	3.6
1,2,4-Trichlorobenzene	ND	88			73	91	22.0
1,2,4-Trimethylbenzene	ND	101			89	95	6.5
1,2-Dibromo-3-chloropropane	ND	92			88	99	11.8
1,2-Dichlorobenzene	ND	97			84	89	5.8
1,2-Dichloroethane	ND	106			93	101	8.2
1,2-Dichloropropane	ND	114			102	107	4.8
1,3,5-Trimethylbenzene	ND	101			88	90	2.2

# QA/QC Data

SDG I.D.: GAH45532

Parameter	Blank	LCS %	LCSD %	LCS RPD	MS Rec %	MS Dup Rec %	RPD
1,3-Dichlorobenzene	ND	95			83	88	5.8
1,3-Dichloropropane	ND	103			97	102	5.0
1,4-Dichlorobenzene	ND	97			83	94	12.4
2,2-Dichloropropane	ND	116			101	81	22.0
2-Chlorotoluene	ND	101			89	90	1.1
4-Chlorotoluene	ND	102			88	90	2.2
Benzene	ND	113			102	105	2.9
Bromobenzene	ND	99			90	91	1.1
Bromochloromethane	ND	119			108	113	4.5
Bromodichloromethane	ND	105			96	99	3.1
Bromoform	ND	93			87	94	7.7
Bromomethane	ND	105			74	109	38.3
Carbon tetrachloride	ND	110			95	91	4.3
Chlorobenzene	ND	106			94	96	2.1
Chloroethane	ND	139			100	94	6.2
Chloroform	ND	111			97	107	9.8
Chloromethane	ND	144			98	85	14.2
cis-1,2-Dichloroethene	ND	119			105	113	7.3
cis-1,3-Dichloropropene	ND	114			109	119	8.8
Dibromochloromethane	ND	94			89	95	6.5
Dibromoethane	ND	112			105	111	5.6
Dibromomethane	ND	106			99	107	7.8
Dichlorodifluoromethane	ND	174			91	96	5.3
Ethylbenzene	ND	105			95	94	1.1
Hexachlorobutadiene	ND	95			79	87	9.6
Isopropylbenzene	ND	106			88	86	2.3
m&p-Xylene	ND	105			95	95	0.0
Methyl Ethyl Ketone	ND						
Methyl t-butyl ether (MTBE)	ND	115			101	106	4.8
Methylene chloride	ND	105			86	88	2.3
n-Butylbenzene	ND	96			79	89	11.9
n-Propylbenzene	ND	102			89	88	1.1
Naphthalene	ND	94			98	123	22.6
o-Xylene	ND	111			96	96	0.0
p-Isopropyltoluene	ND	101			84	88	4.7
sec-Butylbenzene	ND	101			93	94	1.1
Styrene	ND	110			90	95	5.4
tert-Butylbenzene	ND	104			93	93	0.0
Tetrachloroethene	ND	103			90	90	0.0
Toluene	ND	116			104	105	1.0
Total Xylenes	ND						
trans-1,2-Dichloroethene	ND	121			102	108	5.7

**QA/QC Data**

SDG I.D.: GAH45532

Parameter	Blank	LCS %	LCSD %	LCS RPD	MS Rec %	MS Dup Rec %	RPD
trans-1,3-Dichloropropene	ND	110			100	114	13.1
Trichloroethene	ND	115			102	105	2.9
Trichlorofluoromethane	ND	126			94	90	4.3
Vinyl chloride	ND	145			98	98	0.0
% 1,2-dichlorobenzene-d4	98	102			100	100	0.0
% Bromofluorobenzene	95	102			103	99	4.0
% Dibromofluoromethane	106	100			97	102	5.0
% Toluene-d8	97	103			103	101	2.0

QA/QC Batch 62890, Sample No: AH45670 (ah45539)

**Volatiles**

1,1,1,2-Tetrachloroethane	ND	93			96	96	0.0
1,1,1-Trichloroethane	ND	107			110	107	2.8
1,1,2,2-Tetrachloroethane	ND	81			90	93	3.3
1,1,2-Trichloroethane	ND	96			108	104	3.8
1,1-Dichloroethane	ND	107			115	108	6.3
1,1-Dichloroethene	ND	115			118	114	3.4
1,1-Dichloropropene	ND	107			108	107	0.9
1,2,3-Trichlorobenzene	ND	82			92	87	5.6
1,2,3-Trichloropropane	ND	86			77	90	15.6
1,2,4-Trichlorobenzene	ND	80			91	84	8.0
1,2,4-Trimethylbenzene	ND	89			92	95	3.2
1,2-Dibromo-3-chloropropane	ND	80			88	87	1.1
1,2-Dichlorobenzene	ND	84			87	89	2.3
1,2-Dichloroethane	ND	97			102	97	5.0
1,2-Dichloropropane	ND	100			107	104	2.8
1,3,5-Trimethylbenzene	ND	89			91	93	2.2
1,3-Dichlorobenzene	ND	84			88	90	2.2
1,3-Dichloropropane	ND	90			100	97	3.0
1,4-Dichlorobenzene	ND	85			92	92	0.0
2,2-Dichloropropane	ND	110			94	113	18.4
2-Chlorotoluene	ND	91			91	94	3.2
4-Chlorotoluene	ND	90			92	94	2.2
Benzene	ND	101			105	104	1.0
Bromobenzene	ND	88			89	93	4.4
Bromochloromethane	ND	105			120	111	7.8
Bromodichloromethane	ND	99			102	99	3.0
Bromoform	ND	90			92	93	1.1
Bromomethane	ND	107			104	91	13.3
Carbon tetrachloride	ND	104			98	103	5.0
Chlorobenzene	ND	93			97	99	2.0
Chloroethane	ND	123			112	111	0.9

**QA/QC Data**

SDG I.D.: GAH45532

Parameter	Blank	LCS %	LCSD %	LCS RPD	MS Rec %	MS Dup Rec %	RPD
Chloroform	ND	103			112	102	9.3
Chloromethane	ND	135			91	106	15.2
cis-1,2-Dichloroethene	ND	105			118	110	7.0
cis-1,3-Dichloropropene	ND	103			119	114	4.3
Dibromochloromethane	ND	89			95	94	1.1
Dibromoethane	ND	99			109	106	2.8
Dibromomethane	ND	97			105	103	1.9
Dichlorodifluoromethane	ND	163			102	99	3.0
Ethylbenzene	ND	93			96	99	3.1
Hexachlorobutadiene	ND	86			92	88	4.4
Isopropylbenzene	ND	93			87	92	5.6
m&p-Xylene	ND	94			96	99	3.1
Methyl Ethyl Ketone	ND						
Methyl t-butyl ether (MTBE)	ND	102			108	104	3.8
Methylene chloride	ND	94			96	93	3.2
n-Butylbenzene	ND	85			93	89	4.4
n-Propylbenzene	ND	88			90	95	5.4
Naphthalene	ND	86			114	98	15.1
o-Xylene	ND	98			97	100	3.0
p-Isopropyltoluene	ND	90			88	91	3.4
sec-Butylbenzene	ND	89			98	100	2.0
Styrene	ND	97			95	98	3.1
tert-Butylbenzene	ND	92			95	98	3.1
Tetrachloroethene	ND	93			94	95	1.1
Toluene	ND	103			107	107	0.0
Total Xylenes	ND						
trans-1,2-Dichloroethene	ND	112			112	115	2.6
trans-1,3-Dichloropropene	ND	101			115	106	8.1
Trichloroethene	ND	102			109	106	2.8
Trichlorofluoromethane	ND	117			98	105	6.9
Vinyl chloride	ND	135			109	110	0.9
% 1,2-dichlorobenzene-d4	97	100			100	102	2.0
% Bromofluorobenzene	97	100			100	102	2.0
% Dibromofluoromethane	101	99			104	102	1.9
% Toluene-d8	97	105			101	102	1.0

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

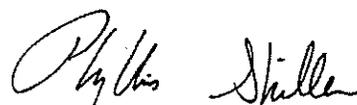
RPD - Relative Percent Difference

LCS - Laboratory Control Sample

LCSD - Laboratory Control Sample Duplicate

MS - Matrix Spike

MS Dup - Matrix Spike Duplicate



Phyllis Shiller, Laboratory Director

August 30, 2006



# CHAIN OF CUSTODY RECORD

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040  
 Email: service@phoenixlabs.com Fax (860) 645-0823

Client Services (860) 645-8726

Temp 6° Pg 1 of 1

**Data Delivery (check one):**

Fax #: 860.282.9500

Email: \_\_\_\_\_

Format:  Excel  Pdf  Gis Key

Customer: HALEY & ALDRICH, INC.  
 Address: 800 CONNECTICUT BLVD.  
EAST HARTFORD, CT 06108

Project: 28590-011 TARRYTOWN  
 Report to: ELIDA DANAHER  
 Invoice to: ACCOUNTING

Project P.O.: 28590-011  
 Phone #: 860.282.9400  
 Fax #: 860.282.9500

**Client Sample - Information - Identification**

Sampler's Signature: [Signature] Date: 17 Aug 2006

Analysis Request

**Matrix Code:**

DW=drinking water WW=wastewater S=soil/solid O=Oil  
 GW=groundwater SL=sludge A=air X=Other

Item #	Phoenix Sample #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled
45537		MW-12	WATER	17 AUG 2006	1305
45533		MW-20	WATER	17 AUG 2006	1905
45534		MW-21	WATER	17 AUG 2006	1730
45535		MW-24	WATER	17 AUG 2006	1500
45536		MW-29	WATER	17 AUG 2006	1100
45537		DUP-081706	WATER	17 AUG 2006	1000
45538		EB-081706	WATER	17 AUG 2006	2000
45539		TB-081706	WATER	17 AUG 2006	0900

Analysis Request		BTEX B201	PAMS B270	DOC	BOD5	SULFATE	NITRATE & NITRITE	TOC & COD	SULFIDE	TOTAL IRON & MANGANESE	GL AMBER 250ml As is	Soil VOA Vial I   Methanol     Sod Bisulfate	GL Soil container ( ) oz	40 ml VOA Vial ( ) oz	GL Amber 1000ml As is     HCl	PL As is     250ml     H2SO4	PL H2SO4     500ml     1000ml	PL HNO3 250ml     500ml	Bacteria Bottle	
45537		X	X	X	X	X	X	X			1			2	1	1	1	1	1	8
45533		X	X	X	X	X	X	X			1			2	1	1	1	1	1	8
45534		X	X	X	X	X	X	X			1			2	1	1	1	1	1	8
45535		X	X	X	X	X	X	X			1			2	1	1	1	1	1	8
45536		X	X	X	X	X	X	X			1			2	1	1	1	1	1	8
45537		X	X	X	X	X	X	X			1			2	1	1	1	1	1	8
45538		X	X	X	X	X	X	X			1			2	1	1	1	1	1	8
45539		X											2							2

Relinquished by: [Signature] Accepted by: [Signature] Date: 18 Aug 2006 Time: 12:50  
[Signature] [Signature] 8:18:06 16:30

Comments, Special Requirements or Regulations:

**Turnaround:**  
 1 Day\*  
 2 Days\*  
 3 Days\*  
 Standard  
 Other  
 \* Surcharge Applies

**Requirements for CT/RI**  
 Res. Criteria  
 GW Protection  
 GA Mobility  
 GB Mobility  
 SW Protection  
 Res. Vol.  
 Ind. Vol.  
 RCP Certification

**Requirements for MA**  
 GW-1  
 GW-2  
 GW-3  
 S-1  
 S-2  
 S-3  
 MCP Certification  
 Other

September 7, 2006

Mr. Jonathan Babcock  
Haley & Aldrich, Inc.  
200 Town Centre Drive, Suite 2  
Rochester, NY 14623-4264

**RE: P2602296**  
**County Asphalt Plant/28590-008**

Dear Mr. Babcock:

Enclosed are the results of the sample(s) submitted to our laboratory on August 22, 2006.  
For your reference, these analyses have been assigned our service request number P2602296.

All analyses were performed in accordance with our laboratory's quality assurance program. Results are intended to be considered in their entirety and apply only to the samples analyzed. Columbia Analytical Services is not responsible for use of less than the complete report. Your report contains 12 pages.

Columbia Analytical Services is certified by the California Department of Health Services, Certificate No. 2380; Arizona Department of Health Services, Certificate No. AZ0550; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA20007; The American Industrial Hygiene Association, Laboratory #101661. Please contact me for specific method(s) and analyte(s) corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**Columbia Analytical Services, Inc.**



Kate Aguilera  
Project Manager

## LABORATORY REPORT

Client:	HALEY & ALDRICH, INC.	Date of Report:	09/07/06
Address:	200 Town Centre Drive, Suite 2 Rochester, NY 14623-4264	Date Received:	08/22/06
Contact:	Mr. Jonathan Babcock	CAS Project No:	P2602296
Client Project ID:	County Asphalt Plant/28590-008	Purchase Order:	Verbal
		New York Lab ID:	11221

---

One (1) Stainless Steel Summa Canister labeled:

“SV-11”

---

The sample was received at the laboratory under chain of custody on August 22, 2006. The sample was received intact. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the sample at the time that it was received at the laboratory.

#### Volatile Organic Compound Analysis

The sample was analyzed by combined gas chromatography/mass spectrometry (GC/MS) for selected volatile organic compounds and tentatively identified compounds. The analyses were performed according to the methodology outlined in EPA Method TO-15. The analyses were performed by gas chromatography/mass spectrometry, utilizing a direct cryogenic trapping technique. The analytical system used was comprised of an Agilent Model 5973 inert GC/MS/DS interfaced to a Tekmar AutoCan Elite whole air inlet system/cryogenic concentrator. A 100% Dimethylpolysiloxane capillary column (RT<sub>x</sub>-1, Restek Corporation, Bellefonte, PA) was used to achieve chromatographic separation.

The results of analyses are given on the attached data sheets. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for utilization of less than the complete report.

---

Reviewed and Approved:



Liliana Marghitoiu  
Analytical Chemist  
Air Quality Laboratory

Reviewed and Approved:



Chris Parnell  
GCMS-VOA Team Leader  
Air Quality Laboratory

**COLUMBIA ANALYTICAL SERVICES, INC.**

RESULTS OF ANALYSIS

Page 1 of 4

Client: **Haley & Aldrich, Inc.**  
 Client Sample ID: **SV-11**  
 Client Project ID: **County Asphalt Plant/28590-008**

CAS Project ID: P2602296  
 CAS Sample ID: P2602296-001

Test Code: EPA TO-15  
 Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS8  
 Analyst: Liliana Marghitoiu  
 Sampling Media: Summa Canister  
 Test Notes:  
 Container ID: AC01202

Date Collected: 8/18/06  
 Date Received: 8/22/06  
 Date(s) Analyzed: 8/31 - 9/1/06  
 Volume(s) Analyzed: 0.10 Liter(s)  
 0.020 Liter(s)

Pi 1 = -3.5      Pf 1 = 3.5

Can D.F. = 1.63

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	16	ND	3.3	
74-87-3	Chloromethane	ND	16	ND	7.9	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	16	ND	2.3	
75-01-4	Vinyl Chloride	ND	16	ND	6.4	
106-99-0	1,3-Butadiene	ND	16	ND	7.4	
74-83-9	Bromomethane	ND	16	ND	4.2	
75-00-3	Chloroethane	ND	16	ND	6.2	
64-17-5	Ethanol	ND	82	ND	43	
75-05-8	Acetonitrile	ND	16	ND	9.7	
107-02-8	Acrolein	ND	16	ND	7.1	
67-64-1	Acetone	110	82	46	34	
75-69-4	Trichlorofluoromethane	ND	16	ND	2.9	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	16	ND	6.6	
107-13-1	Acrylonitrile	ND	16	ND	7.5	
75-35-4	1,1-Dichloroethene	ND	16	ND	4.1	
75-09-2	Methylene chloride	ND	16	ND	4.7	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	16	ND	5.2	
76-13-1	Trichlorotrifluoroethane	ND	16	ND	2.1	
75-15-0	Carbon Disulfide	37	16	12	5.2	
156-60-5	trans-1,2-Dichloroethene	ND	16	ND	4.1	
75-34-3	1,1-Dichloroethane	ND	16	ND	4.0	
1634-04-4	Methyl tert-Butyl Ether	ND	16	ND	4.5	
108-05-4	Vinyl Acetate	ND	16	ND	4.6	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Verified By: MS

Date: 9/6/06

**COLUMBIA ANALYTICAL SERVICES, INC.**

RESULTS OF ANALYSIS

Page 2 of 4

Client: **Haley & Aldrich, Inc.**  
 Client Sample ID: **SV-11**  
 Client Project ID: **County Asphalt Plant/28590-008**

CAS Project ID: P2602296  
 CAS Sample ID: P2602296-001

Test Code: EPA TO-15  
 Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS8  
 Analyst: Liliana Marghitoiu  
 Sampling Media: Summa Canister  
 Test Notes:  
 Container ID: AC01202

Date Collected: 8/18/06  
 Date Received: 8/22/06  
 Date(s) Analyzed: 8/31 - 9/1/06  
 Volume(s) Analyzed: 0.10 Liter(s)  
 0.020 Liter(s)

Pi 1 = -3.5      Pf 1 = 3.5

Can D.F. = 1.63

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
78-93-3	2-Butanone (MEK)	ND	16	ND	5.5	
156-59-2	cis-1,2-Dichloroethene	ND	16	ND	4.1	
110-54-3	n-Hexane	ND	16	ND	4.6	
67-66-3	Chloroform	ND	16	ND	3.3	
107-06-2	1,2-Dichloroethane	ND	16	ND	4.0	
71-55-6	1,1,1-Trichloroethane	ND	16	ND	3.0	
71-43-2	Benzene	18	16	5.5	5.1	
56-23-5	Carbon Tetrachloride	ND	16	ND	2.6	
78-87-5	1,2-Dichloropropane	ND	16	ND	3.5	
75-27-4	Bromodichloromethane	ND	16	ND	2.4	
79-01-6	Trichloroethene	ND	16	ND	3.0	
123-91-1	1,4-Dioxane	ND	16	ND	4.5	
10061-01-5	cis-1,3-Dichloropropene	ND	16	ND	3.6	
108-10-1	4-Methyl-2-pentanone	ND	16	ND	4.0	
10061-02-6	trans-1,3-Dichloropropene	ND	16	ND	3.6	
79-00-5	1,1,2-Trichloroethane	ND	16	ND	3.0	
108-88-3	Toluene	55	16	15	4.3	
591-78-6	2-Hexanone	ND	16	ND	4.0	
124-48-1	Dibromochloromethane	ND	16	ND	1.9	
106-93-4	1,2-Dibromoethane	ND	16	ND	2.1	
123-86-4	n-Butyl Acetate	ND	16	ND	3.4	
127-18-4	Tetrachloroethene	ND	16	ND	2.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Verified By: MS

Date: 9/6/06

COLUMBIA ANALYTICAL SERVICES, INC.

RESULTS OF ANALYSIS

Page 3 of 4

Client: **Haley & Aldrich, Inc.**  
 Client Sample ID: **SV-11**  
 Client Project ID: **County Asphalt Plant/28590-008**

CAS Project ID: **P2602296**  
 CAS Sample ID: **P2602296-001**

Test Code: **EPA TO-15**  
 Instrument ID: **Tekmar AUTOCAN/Agilent 5973inert/6890N/MS8**  
 Analyst: **Liliana Marghitoiu**  
 Sampling Media: **Summa Canister**  
 Test Notes:  
 Container ID: **AC01202**

Date Collected: **8/18/06**  
 Date Received: **8/22/06**  
 Date(s) Analyzed: **8/31 - 9/1/06**  
 Volume(s) Analyzed: **0.10 Liter(s)**  
**0.020 Liter(s)**

Pi 1 = -3.5 Pf 1 = 3.5

Can D.F. = 1.63

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
108-90-7	Chlorobenzene	ND	16	ND	3.5	
100-41-4	Ethylbenzene	ND	16	ND	3.8	
179601-23-1	<i>m,p</i> -Xylenes	48	16	11	3.8	
75-25-2	Bromoform	ND	16	ND	1.6	
100-42-5	Styrene	ND	16	ND	3.8	
95-47-6	<i>o</i> -Xylene	24	16	5.6	3.8	
111-84-2	<i>n</i> -Nonane	ND	16	ND	3.1	
79-34-5	1,1,2,2-Tetrachloroethane	ND	16	ND	2.4	
98-82-8	Cumene	ND	16	ND	3.3	
80-56-8	alpha-Pinene	8,300	16	1,500	2.9	
622-96-8	4-Ethyltoluene	ND	16	ND	3.3	
108-67-8	1,3,5-Trimethylbenzene	ND	16	ND	3.3	
95-63-6	1,2,4-Trimethylbenzene	41	16	8.4	3.3	
100-44-7	Benzyl Chloride	ND	16	ND	3.1	
541-73-1	1,3-Dichlorobenzene	ND	16	ND	2.7	
106-46-7	1,4-Dichlorobenzene	ND	16	ND	2.7	
95-50-1	1,2-Dichlorobenzene	ND	16	ND	2.7	
5989-27-5	<i>d</i> -Limonene	410	16	74	2.9	
96-12-8	1,2-Dibromo-3-chloropropane	ND	16	ND	1.7	
120-82-1	1,2,4-Trichlorobenzene	ND	16	ND	2.2	
91-20-3	Naphthalene	ND	16	ND	3.1	
87-68-3	Hexachlorobutadiene	ND	16	ND	1.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Verified By: MS

Date: 9/6/06

**COLUMBIA ANALYTICAL SERVICES, INC.**

RESULTS OF ANALYSIS

Page 4 of 4

**Client:** Haley & Aldrich, Inc.  
**Client Sample ID:** SV-11  
**Client Project ID:** County Asphalt Plant/28590-008

CAS Project ID: P2602296  
 CAS Sample ID: P2602296-001

**Tentatively Identified Compounds**

**Test Code:** EPA TO-15  
**Instrument ID:** Tekmar AUTOCAN/Agilent 5973inert/6890N/MS8  
**Analyst:** Liliana Marghitoiu  
**Sampling Media:** Summa Canister  
**Test Notes:** T  
**Container ID:** AC01202

**Date Collected:** 8/18/06  
**Date Received:** 8/22/06  
**Date Analyzed:** 8/31 - 9/1/06  
**Volume(s) Analyzed:** 0.10 Liter(s)  
 0.020 Liter(s)

Pi 1 = -3.5      Pf 1 = 3.5

Can D.F. = 1.63

GC / MS Ret. Time	Compound Identification	Concentration µg/m <sup>3</sup>	Data Qualifier
4.62	Propane + Propene	100	
18.07	C <sub>10</sub> H <sub>16</sub> Compound	700	
18.51	C <sub>10</sub> H <sub>16</sub> Compound	400	
18.57	Camphene	2,000	
19.05	beta-Pinene	400	
19.16	C <sub>10</sub> H <sub>18</sub> Compound	80	
19.19	n-Decane	200	
19.37	C <sub>10</sub> H <sub>18</sub> Compound	400	
19.61	p-Isopropyltoluene	1,000	
19.74	C <sub>10</sub> H <sub>18</sub> Compound	100	
19.83	C <sub>10</sub> H <sub>14</sub> Aromatic Compound + C <sub>9</sub> H <sub>10</sub> Compound	60	
20.51	C <sub>10</sub> H <sub>14</sub> Aromatic Compound + Unidentified Compound	70	
20.99	C <sub>8</sub> H <sub>16</sub> Compound + Tetramethylbenzene Isomer	100	
21.39	5-Methylundecane	100	
21.91	n-Dodecane	200	

T = Analyte is a tentatively identified compound, result is estimated.

Verified By: MS      Date: 9/6/06

**COLUMBIA ANALYTICAL SERVICES, INC.**

RESULTS OF ANALYSIS

Page 1 of 4

**Client:** Haley & Aldrich, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** County Asphalt Plant/28590-008

**CAS Project ID:** P2602296  
**CAS Sample ID:** P060831-MB

**Test Code:** EPA TO-15  
**Instrument ID:** Tekmar AUTOCAN/Agilent 5973inert/6890N/MS8  
**Analyst:** Liliana Marghitoiu  
**Sampling Media:** Summa Canister  
**Test Notes:**

**Date Collected:** NA  
**Date Received:** NA  
**Date(s) Analyzed:** 8/31/06  
**Volume(s) Analyzed:** 1.00 Liter(s)

D.F. = 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	1.0	ND	0.20	
74-87-3	Chloromethane	ND	1.0	ND	0.48	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	1.0	ND	0.14	
75-01-4	Vinyl Chloride	ND	1.0	ND	0.39	
106-99-0	1,3-Butadiene	ND	1.0	ND	0.45	
74-83-9	Bromomethane	ND	1.0	ND	0.26	
75-00-3	Chloroethane	ND	1.0	ND	0.38	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	1.0	ND	0.60	
107-02-8	Acrolein	ND	1.0	ND	0.44	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	1.0	ND	0.18	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	1.0	ND	0.41	
107-13-1	Acrylonitrile	ND	1.0	ND	0.46	
75-35-4	1,1-Dichloroethene	ND	1.0	ND	0.25	
75-09-2	Methylene chloride	ND	1.0	ND	0.29	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	1.0	ND	0.32	
76-13-1	Trichlorotrifluoroethane	ND	1.0	ND	0.13	
75-15-0	Carbon Disulfide	ND	1.0	ND	0.32	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	ND	0.25	
75-34-3	1,1-Dichloroethane	ND	1.0	ND	0.25	
1634-04-4	Methyl tert-Butyl Ether	ND	1.0	ND	0.28	
108-05-4	Vinyl Acetate	ND	1.0	ND	0.28	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Verified By: HJ

Date: 9/6/06

**7**

**COLUMBIA ANALYTICAL SERVICES, INC.**

RESULTS OF ANALYSIS

Page 2 of 4

Client: **Haley & Aldrich, Inc.**  
 Client Sample ID: **Method Blank**  
 Client Project ID: **County Asphalt Plant/28590-008**

CAS Project ID: P2602296  
 CAS Sample ID: P060831-MB

Test Code: EPA TO-15  
 Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS8  
 Analyst: Liliana Marghitoiu  
 Sampling Media: Summa Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date(s) Analyzed: 8/31/06  
 Volume(s) Analyzed: 1.00 Liter(s)

D.F. = 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
78-93-3	2-Butanone (MEK)	ND	1.0	ND	0.34	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	ND	0.25	
110-54-3	n-Hexane	ND	1.0	ND	0.28	
67-66-3	Chloroform	ND	1.0	ND	0.20	
107-06-2	1,2-Dichloroethane	ND	1.0	ND	0.25	
71-55-6	1,1,1-Trichloroethane	ND	1.0	ND	0.18	
71-43-2	Benzene	ND	1.0	ND	0.31	
56-23-5	Carbon Tetrachloride	ND	1.0	ND	0.16	
78-87-5	1,2-Dichloropropane	ND	1.0	ND	0.22	
75-27-4	Bromodichloromethane	ND	1.0	ND	0.15	
79-01-6	Trichloroethene	ND	1.0	ND	0.19	
123-91-1	1,4-Dioxane	ND	1.0	ND	0.28	
10061-01-5	cis-1,3-Dichloropropene	ND	1.0	ND	0.22	
108-10-1	4-Methyl-2-pentanone	ND	1.0	ND	0.24	
10061-02-6	trans-1,3-Dichloropropene	ND	1.0	ND	0.22	
79-00-5	1,1,2-Trichloroethane	ND	1.0	ND	0.18	
108-88-3	Toluene	ND	1.0	ND	0.27	
591-78-6	2-Hexanone	ND	1.0	ND	0.24	
124-48-1	Dibromochloromethane	ND	1.0	ND	0.12	
106-93-4	1,2-Dibromoethane	ND	1.0	ND	0.13	
123-86-4	n-Butyl Acetate	ND	1.0	ND	0.21	
127-18-4	Tetrachloroethene	ND	1.0	ND	0.15	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Verified By: MJ

Date: 9/6/06

COLUMBIA ANALYTICAL SERVICES, INC.

RESULTS OF ANALYSIS

Page 3 of 4

Client: **Haley & Aldrich, Inc.**  
 Client Sample ID: **Method Blank**  
 Client Project ID: **County Asphalt Plant/28590-008**

CAS Project ID: **P2602296**  
 CAS Sample ID: **P060831-MB**

Test Code: **EPA TO-15**  
 Instrument ID: **Tekmar AUTOCAN/Agilent 5973inert/6890N/MS8**  
 Analyst: **Liliana Marghitoiu**  
 Sampling Media: **Summa Canister**  
 Test Notes:

Date Collected: **NA**  
 Date Received: **NA**  
 Date(s) Analyzed: **8/31/06**  
 Volume(s) Analyzed: **1.00 Liter(s)**

D.F. = 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
108-90-7	Chlorobenzene	ND	1.0	ND	0.22	
100-41-4	Ethylbenzene	ND	1.0	ND	0.23	
179601-23-1	<i>m,p</i> -Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	1.0	ND	0.097	
100-42-5	Styrene	ND	1.0	ND	0.23	
95-47-6	<i>o</i> -Xylene	ND	1.0	ND	0.23	
111-84-2	n-Nonane	ND	1.0	ND	0.19	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.0	ND	0.15	
98-82-8	Cumene	ND	1.0	ND	0.20	
80-56-8	alpha-Pinene	ND	1.0	ND	0.18	
622-96-8	4-Ethyltoluene	ND	1.0	ND	0.20	
108-67-8	1,3,5-Trimethylbenzene	ND	1.0	ND	0.20	
95-63-6	1,2,4-Trimethylbenzene	ND	1.0	ND	0.20	
100-44-7	Benzyl Chloride	ND	1.0	ND	0.19	
541-73-1	1,3-Dichlorobenzene	ND	1.0	ND	0.17	
106-46-7	1,4-Dichlorobenzene	ND	1.0	ND	0.17	
95-50-1	1,2-Dichlorobenzene	ND	1.0	ND	0.17	
5989-27-5	d-Limonene	ND	1.0	ND	0.18	
96-12-8	1,2-Dibromo-3-chloropropane	ND	1.0	ND	0.10	
120-82-1	1,2,4-Trichlorobenzene	ND	1.0	ND	0.13	
91-20-3	Naphthalene	ND	1.0	ND	0.19	
87-68-3	Hexachlorobutadiene	ND	1.0	ND	0.094	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Verified By: MS Date: 9/6/06

COLUMBIA ANALYTICAL SERVICES, INC.

RESULTS OF ANALYSIS

Page 4 of 4

Client: **Haley & Aldrich, Inc.**  
Client Sample ID: **Method Blank**  
Client Project ID: **County Asphalt Plant/28590-008**

CAS Project ID: P2602296  
CAS Sample ID: P060831-MB

**Tentatively Identified Compounds**

Test Code: EPA TO-15  
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS8  
Analyst: Liliana Marghitoiu  
Sampling Media: Summa Canister  
Test Notes:  
Date Collected: NA  
Date Received: NA  
Date Analyzed: 8/31/06  
Volume(s) Analyzed: 1.00 Liter(s)

D.F. = 1.00

GC / MS Ret. Time	Compound Identification	Concentration $\mu\text{g}/\text{m}^3$	Data Qualifier
	No Compounds Detected		

**Columbia Analytical Services, Inc.**  
**Sample Acceptance Check Form**

Client: Haley & Aldrich, Inc. Work order: P2602296

Project: County Asphalt Plant/28590-008

Sample(s) received on: 8/22/06 Date opened: 8/22/06 by: MZ

*Note:* This form is used for all samples received by CAS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client or as required by the method/SOP.

		<u>Yes</u>	<u>No</u>	<u>N/A</u>
1	Were <b>custody seals</b> on outside of cooler/Box?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Were custody seals on outside of sample container?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Were <b>sample containers</b> properly marked with client sample ID?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Did <b>sample containers</b> arrive in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Were <b>chain-of-custody</b> papers used and filled out?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Did <b>sample container labels</b> and/or tags agree with custody papers?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Was <b>sample volume</b> received adequate for analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Are samples within specified holding times?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Cooler Temperature <u>NA</u> °C			
	Blank Temperature <u>NA</u> °C			
9	Is pH (acid) <b>preservation</b> necessary, according to method/SOP or Client specified information?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Is there a client indication that the submitted samples are <b>pH</b> (acid) preserved?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Were <b>VOA vials</b> checked for presence/absence of air bubbles?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
10	<b>Tubes:</b> Are the tubes capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Do they contain moisture?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11	<b>Badges:</b> Are the badges properly capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Are dual bed badges separated and individually capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

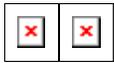
Lab Sample ID	Required pH <small>(is received, if required)</small>	pH <small>(is received, if required)</small>	VOA Headspace <small>(Presence/Absence)</small>	Receipt / Preservation Comments
P2602296-001			NA	

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_



## **APPENDIX K**

### Truck Routes

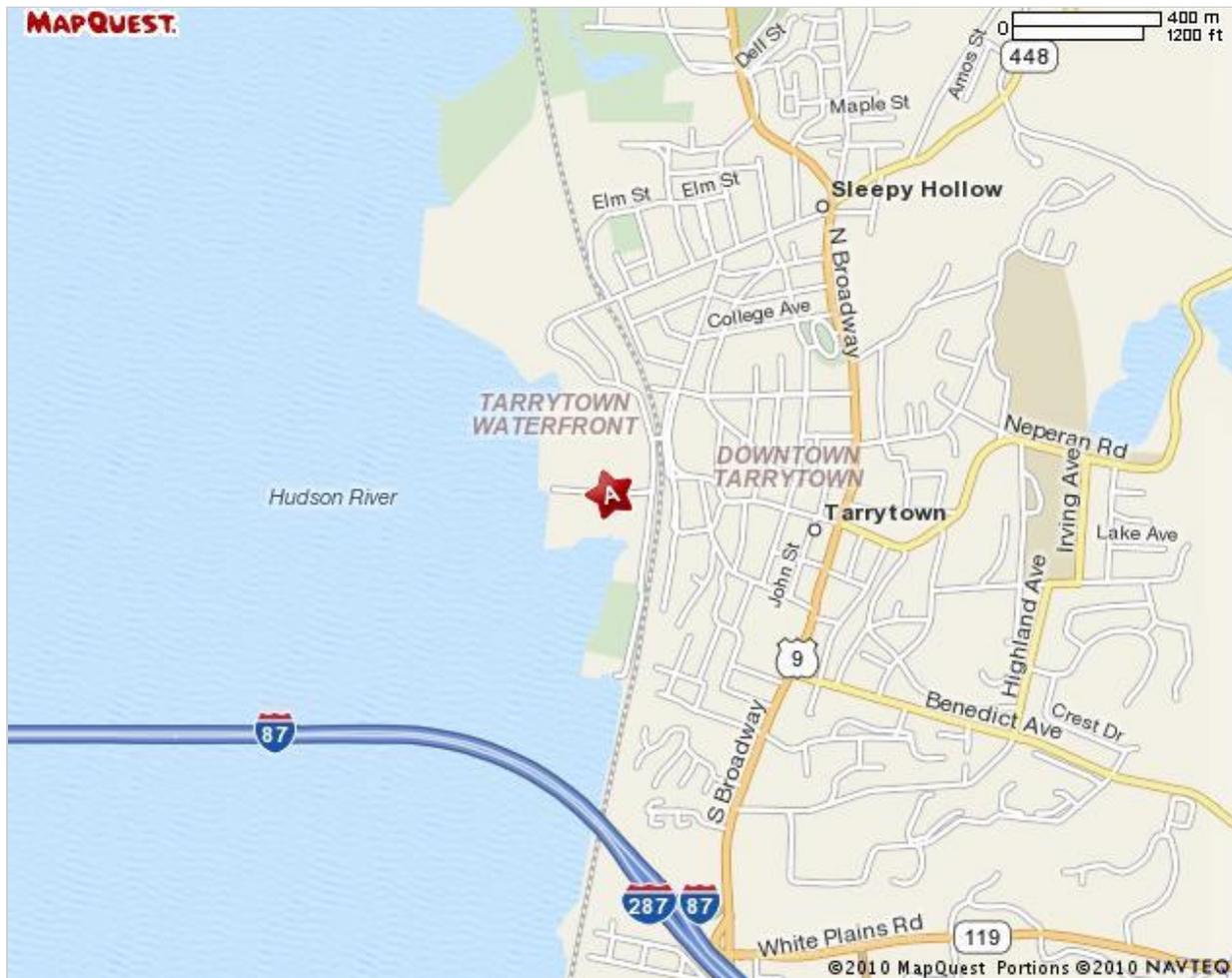


# MAPQUEST.

**Map of 189 W Main St**  
Tarrytown, NY 10591-3674

Notes

The Tarrytown Former MGP Site may be reached via I-87 and NYS Route 9. Local roads are shown on the next sheet. Truck use may be limited by weight restrictions on local roads.



[All rights reserved. Use subject to License/Copyright](#) | [Map Legend](#)

Directions and maps are informational only. We make no warranties on the accuracy of their content, road conditions or route usability or expeditiousness. You assume all risk of use. MapQuest and its suppliers shall not be liable to you for any loss or delay resulting from your use of MapQuest. Your use of MapQuest means you agree to our [Terms of Use](#)

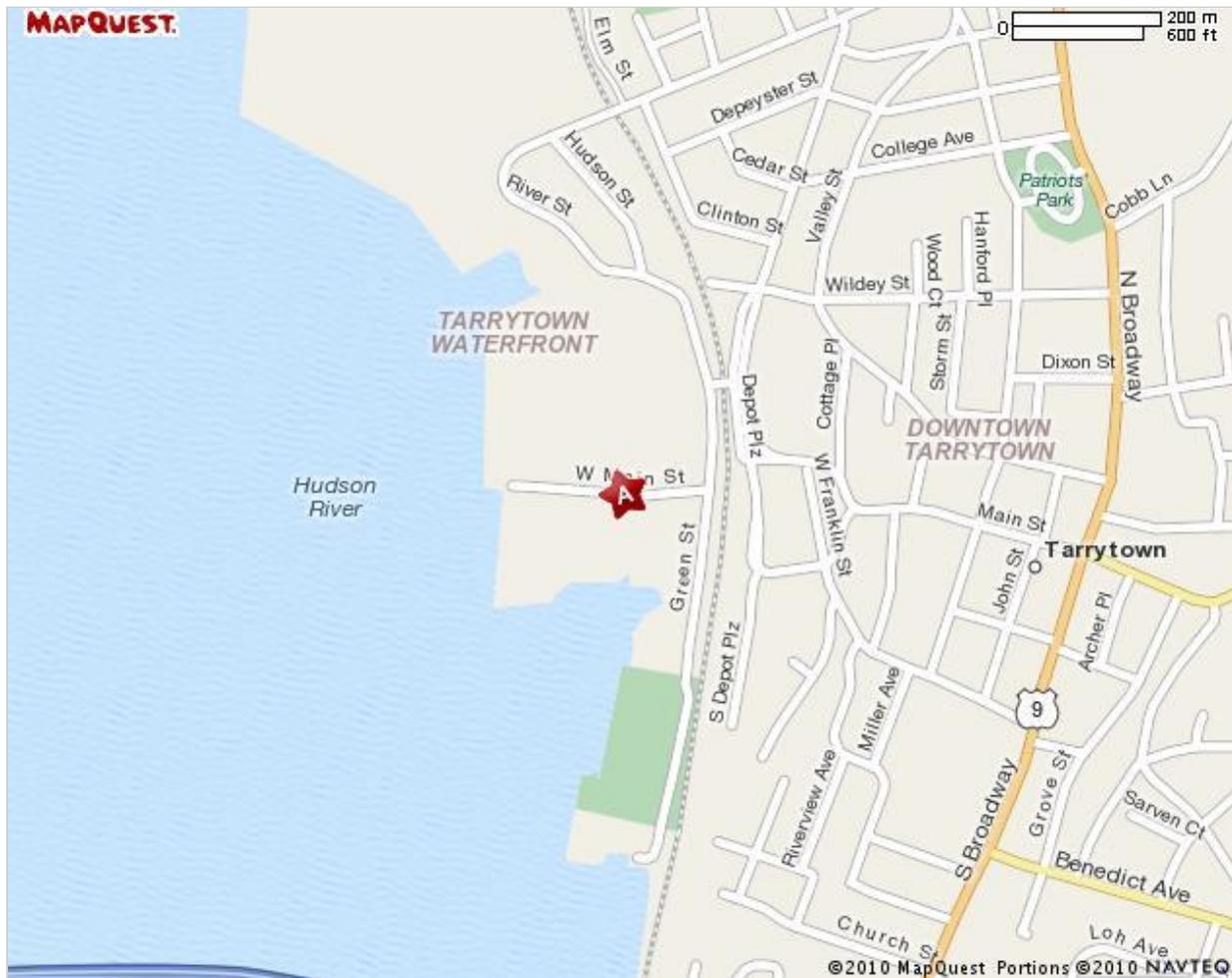


# MAPQUEST.

**Map of 189 W Main St**  
Tarrytown, NY 10591-3674

Notes

The Tarrytown Former MGP Site may be reached via I-87 and NYS Route 9. Local roads are shown on the next sheet. Truck use may be limited by weight restrictions on local roads.



[All rights reserved. Use subject to License/Copyright](#) | [Map Legend](#)

Directions and maps are informational only. We make no warranties on the accuracy of their content, road conditions or route usability or expeditiousness. You assume all risk of use. MapQuest and its suppliers shall not be liable to you for any loss or delay resulting from your use of MapQuest. Your use of MapQuest means you agree to our [Terms of Use](#)