Fort Plain Former MGP Site
MONTGOMERY COUNTY, NEW YORK

Site Management Plan
FINAL

NYSDEC Site Number: 4-29-007

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Fort Plain, New York

Certification Statement

I, Joseph Molina III, P.E. certify that I am currently a New York State registered Professional Engineer. To the best of my knowledge, and based on my inquiry of the persons involved in preparing this document under my direction, certify that this Final Site Management Plan was prepared in substantial conformance with applicable portions of the DER Technical Guidance for Site Investigation and Remediation (DER-10), and in general conformance with the Site management Plan Template provided by the New York State Department of Environmental Conservation.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 DESCRIPTION OF REMEDIAL PROGRAM

1.1 Introduction

This Site Management Plan (SMP) is required as an element of the remedial program for National Grid's Fort Plain former manufactured gas plant (MGP) site under the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program administered by New York State Department of Environmental Conservation (NYSDEC). The site was remediated in accordance with Order on Consent Index #A4-0473-0000, which was executed on November 7, 2003, the NYSDEC-approved *Final (100%) Remedial Design Report* (RD Report) prepared by ARCADIS (January 2010), and the Record of Decision (NYSDEC 2008) (ROD).

1.1.1 General

National Grid entered into an Order on Consent with the NYSDEC to investigation and remediate impacted media at an approximately 0.5 acre former MGP property located in the Village of Fort Plain, New York (**Figure 1**). The boundaries of the former MGP property are more fully described in the metes and bounds description that is part of the Environmental Easement. A figure showing the location and boundaries of the 0.5-acre former MGP property, along with an additional study area located east of the former MGP property, is provided in **Figure 2**. *For the purposes of this SMP, reference to the "Site" in the remainder of this SMP refers to both the former MGP property and the additional study area.*

After completion of the remedial work described in the RD Report, some MGP-residual impacts were left in the subsurface at this Site, which is hereafter referred to as "remaining impacts." This SMP was prepared to manage remaining impacts at the Site until the Environmental Easement associated with the former MGP property 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 ARCADIS, on behalf of National Grid, in accordance with the requirements in NYSDEC's *DER-10, Technical Guidance for Site Investigation and Remediation*, dated May 2010, and the guidelines provided by NYSDEC. This SMP addresses the means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) for the former MGP property that are required by the Environmental Easement.

1.1.2 Purpose

MGP-related impacts remain in subsurface media at the Site after completion of the remedial action. Engineering Controls (e.g., security fence, cover materials) have been incorporated into the remedy to control exposure to remaining impacts during the use of the former MGP property to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Montgomery County Clerk, will require compliance with this SMP and all ECs and ICs placed on the former MGP property. The ICs place restrictions on use of the former MGP property, and mandate monitoring and reporting measures for all ECs and ICs. This SMP identifies the methods necessary ensure compliance with all ECs and ICs required by the Environmental Easement. 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 detailed descriptions of the procedures required to manage remaining MGP impacts at the former MGP property and monitor groundwater within the Site after completion of the Remedial Action, including: (1) implementation and management of Engineering and Institutional Controls; (2) media monitoring, and; (3) performance of periodic inspections, certification of results, and submittal of periodic project reports.

To address these needs, this SMP includes two plans: (1) an Engineering and Institutional Control Plan (Section 2.0) for implementation and management of EC/ICs at the former MGP property; and (2) a Monitoring Plan (Section 3.0) for implementation of Site Monitoring. As stated in Section 4.0, an Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems is not required for this SMP as there are no treatment systems included as part of the remediation of the Site.

This SMP also includes a description of periodic inspections, reporting, and certifications for the submittal of data, information, recommendations, and certifications to NYSDEC (Section 5.0).

It is important to note that:

- This SMP details the specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the environmental easement, which is grounds for revocation of the Certificate of Completion (COC);
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the Order on Consent (#A4-0473-0000), and thereby subject to applicable penalties.

1.1.3 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. In accordance with the Environmental Easement for the former MGP property (Appendix A), 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 descriptions of the location, history of the former MGP property, and geologic/hydrogeologic conditions of the Site.

1.2.1 Site Location and Description

The Fort Plain former MGP property is located in the Village of Fort Plain, County of Montgomery, New York (**Figure 1**) and is identified as Block 2, Lot 38 on the Village of Fort Plain tax map Section No. 046.54. The former MGP property is an approximately 0.5-acre area bounded by a property used as a paved parking area to the north, a private residence to the south, State Route 5S (Hancock Street) to the east, and a steep hillside to the west (**Figure 2**). A property containing a diner, which is located within the additional study area, is identified as Block 2, Lot 40.1 on the Village of Fort Plain tax map, with the property boundaries also included on **Figure 2**.

The former MGP property is rectangular in shape and located within a developed (urbanized) area. A 6-foot-high chain-link fence with a locked access gate maintained by National Grid secures the property. The eastern portion of the property, formerly used for MGP operations, is generally level and contains stone, gravel, and fill material surface, with intermittent vegetation and shrub growth. An old stone wall associated with a former gas holder is located near the south end of the property. A portion of the property is currently used as an electrical substation. Multiple utility poles containing two active transformer banks and overhead transmission and distribution wires exist in the south eastern portion of the property.

According to historical maps and discussions with the former historian for the Village of Fort Plain, the western side of the former Erie Canal was located parallel to and approximately 10 to 20 feet east of Hancock Street. The Erie Canal was filled with rip-rap, fill dirt, and other available materials (e.g., wood) during the early 1900s. Otsquago Creek is located approximately 400 feet north of the Site and flows to the northeast and discharges to the Mohawk River approximately 1,200 feet northeast of the Site.

1.2.2 Former MGP Property History

Gas operations at the former MGP property date back to 1868. By 1891, Sanborn Fire Insurance maps indicate that a water gas plant and an associated “gasometer” were present. The location of this former gasometer correlates with the location of the southern gas holder shown on **Figure 2**. The MGP used coal and petroleum to manufacture gas for heating and lighting local homes and businesses. By 1901, a Sanborn map indicates that a gas holder was located at the north end of the property, within a single site building. This gas holder appears to be the one depicted as the former northern gas holder on **Figure 2**. In addition, a coal storage shed, generators, electrical transformers, and repair shop were present. The configuration of the structures remained relatively the same on the 1906 Sanborn map. By 1912, an electric transformer house had been added to the north end of the gas plant. Between 1912 and 1919, the portion of the Erie Canal located adjacent to the Site had been filled. Sanborn maps from 1926 indicate that the site configuration had changed, and the gasometer and northern gas holder were no longer shown. However, a 1927 site map shows the gasometer and gas holder still present on the property. By 1935, all of the gas buildings had been removed from the property. By 1952, the property was referred to as a Niagara Mohawk (now operating as National Grid) substation and only the transformer building and vacant substation building remained. From the mid-1800s through the mid-1950s, the land use north and east of the former MGP property was generally used for commercial/industrial activities, including a foundry to the north, and auto repair, welding, machine shops, and laundry to the east.

In 1994, the New York State Department of Transportation (NYSDOT) rebuilt Hancock Street in the area of the former MGP property. In addition, a 6-inch-diameter underdrain was installed south of the former MGP property to intersect and divert drainage from the steep hill that previously ran through the property. In 1996, the former transformer building was demolished down to the foundation.

1.2.3 Geologic Conditions

Prior to implementation of the remedy, subsurface investigations identified five principle geologic units beneath the former MGP property. In order of increasing depth from the ground surface, these geologic units include:

- Heterogeneous fill material consisting primarily of a mixture of gravel, sand, and silt ranging in thickness from approximately 6 to 18 feet. In areas on the former MGP site, the fill also contained a variety of materials, including brick, concrete, well-graded to silty gravel, well-sorted to silty sand with gravel, and silt with gravel and/or sand, and an assortment of man-made structures, originating from the property’s and surrounding area’s industrial history.
- Native silt and clay formation characterized as a confining layer. The native yellow/ brown/dark gray silt and clay formation was generally encountered between 13 to 18 feet below ground surface (bgs) across the former MGP property. The depth of the silt and clay contact generally becomes thinner and deeper further to the east and northeast.
- Native brown/gray fine to coarse sand and gravel formation generally encountered from 16 to 20 feet bgs beneath the silt and clay formation. The depth of the sand and gravel contact also became thinner and deeper further to the east and northeast.
- Dense, olive/gray/brown silt confining layer that was encountered in all soil borings at approximately 16 to 21 feet bgs.

- Brown, medium to coarse sand with some silts and gravels was encountered at 34 feet bgs at two deep soil borings installed in the area of the northern gas holder. This unit extended to the bottom of the soil borings (50 feet bgs).

The geologic sequence was also observed across the study area (i.e., at soil boring/monitoring well locations beyond the former MGP property), with the depth of the native silt and clay contact generally becoming deeper further to the northeast.

Geologic information collected during the multiple investigations was included in a database, and a 3-dimensional visualization model of the Site geology was prepared using Mining Visualization System (MVS) computer software platform. Cross-sections depicting the stratigraphic units using the MVS software is presented on **Figure 3**.

1.2.4 Hydrogeologic Conditions

Based on historical gauging events, groundwater beneath the Site flows in a north-northeast direction from the former MGP property towards Otsquago Creek, located approximately 400 feet to the north. The top of the groundwater table occurs in the fill material generally at a depth of approximately 4 to 6 feet bgs across most of the former MGP property. Depth to groundwater increases to the north and east to depths of 16 to 18 feet bgs at the north end of the former MGP property. Depth to groundwater at monitoring wells located across Hancock Street ranges between 16 and 18 feet bgs.

Hydraulic gradients ranging from 0.09 to 0.20 foot/foot were observed during the remedial investigations. Groundwater data collected during multiple phases of the investigation indicated a consistent flow pattern in a north-northeast direction.

Groundwater surface contours based on a recent gauging event (June 2011) are presented on **Figure 4**.

1.3 Summary of Remedial Investigation Findings

A Remedial Investigation (RI) was performed to characterize the nature and extent of MGP-impacts at the Site. Several environmental investigations and other studies have been performed as part of the RI starting in 1998. A *Remedial Investigation (RI) Report, Niagara Mohawk, Fort Plain Former MGP Site (revised)* (RI Report) was submitted to the NYSDEC in May 2004. Several subsequent investigations were conducted to further define the extent of impacts at the Site, to evaluate the potential presence of subsurface soil vapors, and to collect additional data to support preparation of the feasibility study and remedial design. The results of the RI and supplemental investigations are described in detail in the following reports:

- Stearns & Wheeler, LLC. *Preliminary Site Assessment/Interim Remedial Measures (PSA/IRM) Study (PSA Report)*. February 1998.

- Stearns & Wheeler, LLC. *Phase II Preliminary Site Assessment/Interim Remedial Measures (PSA/IRM) Study*, Fort Plain. New York. March 2000.
- Stearns & Wheeler, LLC. *Preliminary Site Assessment (Phase III)/Interim Remedial Measures (PSA/IRM) Study*, Niagara Mohawk, Fort Plain Former MGP Site. February 2002.
- Stearns & Wheeler, LLC. *Remedial Investigation (RI) Report, Niagara Mohawk, Fort Plain Former MGP Site (revised)*, Niagara Mohawk, Fort Plain Former MGP Site. May 2004.
- ARCADIS. *Additional Investigation Summary Report*. October 2005.
- ARCADIS. *Soil Vapor Evaluation Report, Fort Plain Former MGP Site*. May 2006.
- ARCADIS. *Pre-Design Investigation – Summary of Results*, Fort Plain Former MGP Site. January 2009 (included as Appendix C to the *Final (100%) Remedial Design Report* dated January 2010).

Generally, the RI determined that the primary MGP-related impacts associated with the Site is a dark colored, somewhat viscous, oil-like material, which is a dense non-aqueous phase liquid (DNAPL). This DNAPL formed as a condensate as the gas cooled and does not readily dissolve in water. DNAPLs are heavier than water if present in sufficient quantities. These materials were disposed, spilled, or leaked from the northern gas holder, and potentially other structures at various locations that no longer exist. The oil-like material contains many organic compounds that are regulated by the NYSDEC. Chief among these are benzene, toluene, ethylbenzene, and xylenes (collectively referred to as BTEX), and a more general class of organic compounds called polycyclic aromatic hydrocarbons (PAHs). As presented in the ROD, the specific 17 PAH compounds of concern at the Site include:

Acenaphthene	benzo(g,h,i)perylene	indeno(1,2,3-cd)pyrene
Acenaphthylene	benzo(k)fluoranthene	2-methlnaphthalene
Anthracene	chrysene	naphthalene
Benzo(a)anthracene	dibenzo(a,h)anthracene	phenanthrene
Benzo(a)pyrene	fluoranthene	pyrene
Benzo(b)fluoranthene	fluorene	

The nature and extent of MGP-related impacts that have been observed in soil and groundwater at the Site is summarized below.

1.3.1 Site-Related Soil

Most of the residual MGP impacts, including NAPL, were located within, or in close proximity to, the former northern gas holder on the former MGP property, or at locations hydraulically downgradient of the holder. Soil containing elevated concentrations of PAHs, visible sheens, stains, and/or NAPL were encountered between 4 to 16 feet bgs in the area of the northern gas holder, and at 18 to 25 feet below ground surface in the additional study area. Observations of

NAPL-impacted soil were generally consistent with the contour of the silt confining layer downgradient from the northern gas holder. Heavy sheens and an “oil-like material” were also observed within the southern gas holder immediately above the holder floor.

Visible evidence of sheens and staining on soil were observed in borings installed in the diner parking lot located to the east of the former MGP property across Hancock Street. These impacts within the additional study area appear to be primarily limited to a relatively thin zone, present from approximately 15 to 21 feet bgs, and located immediately above the silt and clay confining layer. Soil boring logs for most of these locations indicated the presence of stains and/or sheens rather than NAPL and/or saturated soil. Measurable NAPL has not accumulated in any of the existing monitoring wells, or had not accumulated in any of the historical monitoring wells, installed on the former MGP property or downgradient (east) of Hancock Street in the additional study area. The absence of NAPL suggests that, although historically MGP-related NAPL migrated from the former MGP property (gas operations occurred circa 1868 to 1935), the NAPL, in its current residual weathered state has limited overall mobility. Mobile NAPL; therefore, is not considered to be present at the Site.

Approximately 46 soil borings were installed to investigate pre-remediation subsurface soil conditions. The volatile organic compound (VOC) and semi-volatile organic compound (SVOC) results from the laboratory analyses from soil samples presented in the PSA/IRM Study (Stearns & Wheeler, 1998), Phase II PSA/IRM (Stearns & Wheeler, 2000), Phase III PSA/IRM Study (Stearns & Wheeler, 2002), and the RI Report (Stearns & Wheeler, 2004) are included in **Appendix B**. Analytical data for soil remaining at the Site after the soil removal remedial activities were completed are presented in **Table 1.**

Visual information from all of the subsurface investigations was used to develop a figure identifying the extent of soil containing sheens and/or NAPL. The approximate extent of soil containing heavy sheens and/or NAPL following the completion of remedial construction activities is depicted on **Figure 5**. The approximate extent of soil possessing BTEX or PAHs exceeding 6NYCRR Part 375-6 Unrestricted Use Soil Cleanup Objectives (SCOs) is also shown on **Figure 5**.

1.3.2 Site-Related Groundwater

The nature and extent of MGP-related impacts to groundwater at the Site have been characterized. Impacted groundwater is defined as groundwater containing MGP-related constituents (BTEX and/or PAHs) above NYSDEC Class GA Standards and/or Guidance Values (i.e., drinking water standards). This definition is used even though groundwater in the area is not used as a source for drinking water.

A summary of the total BTEX and total PAH analytical data for groundwater collected from wells within the study area from 2005 through June 2011 are included in **Table 2.** The June 2011 event represents a partial groundwater sampling event that was conducted after MGP source materials were excavated and removed from the former MGP property. **Figure 6** shows the locations of current monitoring wells and presents the most recent site-wide sampling results (August 2008) collected prior to implementation of the remedy on the former MGP property. This sampling event represents the most accurate “baseline” conditions prior to implementing the remedy on the former MGP property (this data is also included in **Table 2**). Based on the August 2008 groundwater data, the location of the BTEX and PAHs in groundwater extends from the former MGP property to the additional study area and just west of State Street. The highest concentrations of dissolved impacts were detected adjacent to the northern gas holder and in the parking area south of the diner. The location of impacted groundwater is generally consistent with locations where soil was observed to contain sheens and/or NAPL. Based on these observations, the extent of dissolved BTEX and PAHs has not migrated far from visibly impacted material. Geochemical data collected in 2007 indicated that conditions favoring aerobic degradation are present at the perimeter of the dissolved phase plume, where BTEX and PAH concentrations are low. The geochemical data collected in 2007 is presented in **Table 3**.

Concentrations of BTEX within groundwater samples collected from the hydraulically downgradient edge of the dissolved phase plume have decreased in concentration since 2005, indicating that the extent of the groundwater impacts has not increased over time. Additionally, based on the geochemical data, as well as the low to non-detectable concentrations of BTEX and PAHs in groundwater in downgradient wells, natural attenuation and biodegradation processes are active and, at minimum, have been effective components in controlling downgradient migration of the edge of the dissolved phase constituents (i.e., stabilizing plume migration).

1.3.3 Site-Related Soil Vapor Intrusion

To evaluate the potential for exposure from soil vapor intrusion, soil vapor samples were collected from the former MGP property, from the diner parking area adjacent to the diner structure, and from ambient air for comparison purposes. Analytical results from a soil vapor sampling program were presented in the *Soil Vapor Evaluation Report* (ARCADIS, 2006). MGP-related analytes that were detected in soil vapor samples collected from 3 and 9 feet bgs from both the former MGP property and the additional study area were present at concentrations two to three orders of magnitude below United States Environmental Protection Agency (USEPA) and New York State Department of Health (NYSDOH) screening values, or at ambient air concentrations. Based on these results, in January 2007 the NYSDEC concluded that the soil vapor intrusion pathway for MGP-related analytes had been satisfactorily investigated and that no further action was required on either the former MGP property or the additional study area. As stated in the ROD, exposures due to soil vapor intrusion from MGP-related impacts are unlikely. As a result, further discussion of potential soil vapor intrusion exposure under current conditions or monitoring requirements are not included in this SMP. A copy of the *Soil Vapor Evaluation Report* (ARCADIS, 2006) is included as **Appendix C**. A copy of the NYSDEC's January 2007 correspondence is included as **Appendix D**.

1.3.4 Former MGP Structures

Remnants of two former gas holders were present on the former MGP property during the remedial investigation:

- Former Northern Gas Holder: The gas holder was approximately 30 feet in diameter with the top of the holder just below ground surface and the bottom of the holder located approximately 9.5 feet below grade. The holder was filled with approximately 250 cubic yards miscellaneous soil, rubble, and debris that were impacted with MGP material.
- Former Southern Gas Holder: approximately 40 feet in diameter with the bottom of the holder located approximately 6.5 feet below grade. Similar to the northern gas holder, the southern gas holder was filled with approximately 300 cubic yards of miscellaneous soil, rubble, stone, and debris that are impacted with MGP material.

The locations of the holders are provided on **Figure 2**. Consistent with the NYSDEC Site remedy, the northern holder and contents were excavated and removed in December 2010, and the southern gas holder was capped in June 2011 (refer to Section 1.4). Miscellaneous concrete slabs, subsurface footings, and remnant piping that were encountered during excavation activities were removed and properly disposed off site.

1.4 Summary of Remedial Actions

The former MGP property was remediated in accordance with the NYSDEC-approved RD Report dated January 2010. As described in the ROD, the NYSDEC-selected remedy for the former MGP property included: 1) excavation of MGP source material from the former northern gas holder and surrounding soil to the top of the silt confining layer; 2) sampling and periodic removal of accumulated water from within the former southern gas holder; 3) enhanced natural attenuation of MGP-impacted groundwater; 4) site management; and 5) institutional controls. In addition to the remedial components presented in the ROD, in a letter dated March 2009 the NYSDEC required National Grid to evaluate and implement methods that could be used to control accumulation of water within the southern gas holder. The proposed remedy included installation of a cover system with a flexible membrane liner above the southern gas holder and installation of a drainage swale and outlet structure to transport surface runoff from the southern gas holder for infiltration at the former northern gas holder location. The NYSDEC subsequently approved the proposed strategy in a letter dated June 1, 2009. The following is a summary of the Remedial Actions performed at the Site:

- Excavation and removal of the northern gas holder and its contents, along with source material around the northern gas holder down to the silt/till confining layer. Approximately 1,270 cubic yards of brick, debris, and MGP-impacted soil was removed. Excavation and removal activities were conducted from September to December, 2010.
- Installation of a 4-inch diameter, Schedule 40 Polyvinyl chloride (PVC) monitoring/extraction well EW-1 within the southern gas holder for periodic monitoring and removal of NAPL (if present) and accumulated water in the holder that exceeds applicable groundwater standards (if any). This well was installed in June 2010.
- Enhanced natural degradation of Site groundwater by the addition of amendments and nutrients to the northern gas holder backfill material to stimulate indigenous bacteria to degrade dissolved-phase BTEX. Backfilling was conducted in December 2010.
- Installation of a cover system (geosynthetic clay liner covered with a linear low-density polyethylene [LLDPE] liner, geotextile fabric, and select fill) within the southern gas holder to control the accumulation of water within the holder that could contact impacted material, and placement of a berm along the eastern portion of the holder to prevent migration of surface water to adjacent areas. Installation of the cover system was completed in July 2011.
- Installation of a drainage swale and outlet structure to transport surface runoff from the southern gas holder and adjacent areas for infiltration at the former northern gas holder location. Installation of the drainage swale and outlet structure was completed in June 2011.
- Installation of a clean soil and stone cover to minimize potential exposure to remaining soil on the former MGP property. This task was completed in July 2011.
- Execution and recording of an Environmental Easement to restrict land use and prevent future exposure to MGP impacts remaining at the former MGP property [Note: National Grid is currently pursuing execution of the Environmental Easement. The Environmental Easement will be included as Appendix A].
- Development of this SMP for long-term management of remaining contamination, as required by the Environmental Easement which includes plans for: (1) EC/ICs, (2) monitoring, and (3) reporting;

Remedial activities, including installation of security fencing, concrete sidewalk and asphalt repair, and site restoration, were completed at the Site in August 2011.

1.4.1 Removal of MGP Structures and Impacted Materials.

To achieve the remedial action objectives for the Site, excavation and removal of MGP source material was required from within and around the northern gas holder down to the silt confining layer (to depths of approximately 16 feet bgs). The northern gas holder structure was also removed during excavation activities.

The soil cleanup objective (SCO) based on applicable and foreseeable land use for the former MGP property was defined in the ROD as removal of MGP source material. MGP source material is defined as soil that contains one or more of the following:

- visible NAPL, tar, or oil
- total BTEX over 10 milligrams per kilogram (mg/kg)
- sheens or odors with total PAHs over 500 mg/kg.

The area where excavation was performed to remove source material is provided on **Figure 7**. Excavation of soil was conducted to the top of the silt confining layer in the northern gas holder removal area. Soil excavation contours (i.e., top of silt) are also shown on **Figure 7**. Additionally, approximately 2 to 3 feet of surface material was removed from the southern gas holder (to approximate elevation of 315 feet above mean sea level [AMSL] to facilitate installation of the cover system. Approximately 2,200 cubic yards (3,306 tons) of brick, debris, and MGP-impacted soil was removed and transported for disposal to:

- Environmental Soil Management Company of New York (ESMI) (approximately 2,150 cubic yards; 3,190 tons)
- Ontario County Landfill (60 cubic yards; 116 tons)

Waste disposal documentation is provided in the *Final Engineering Report* (FER).

The excavation area was backfilled with Type A granular fill to approximately 4 to 5 feet below finished grade, and finished to final surface grade with Type C granular fill. The Type A backfill material was blended with approximately 2,750 pounds of a slow-release oxygen compound (Adventus EHC-O) to stimulate indigenous bacteria to enhance degradation of dissolved-phase BTEX.

1.4.2 Site-Related Treatment Systems

No long-term treatment systems were installed as part of the Site remedy. As stated in Section 1.4 (Summary of Remedial Actions), monitoring/extraction well EW-1 located within the southern gas holder will be subject to periodic monitoring and removal of 1) NAPL (if present) and 2) accumulated water that exceeds applicable groundwater standards (if any).; however, no active treatment systems were installed as part of the Site remedy.

1.4.3 Remaining MGP Impacts

This section presents a description of the remaining MGP impacts at the Site such that individuals performing intrusive activities can anticipate the environmental conditions they will encounter and plan appropriately. Minimum requirements for notifications, health and safety, management and screening of potentially impacted soil, sampling requirements, air monitoring, dust control, management of fluids and construction water, are presented in subsequent sections of this SMP.

1.4.3.1 Soil

The approximate extent of soil remaining at the Site with BTEX and/or PAH analytes at concentrations greater than their respective 6NYCRR Part 375-6 Unrestricted Use Soil Cleanup Objectives (SCOs) is shown on **Figure 5**. The depths of the above exceedances are also included on the figure. As shown on the figure:

- At the former MGP property exceedances of unrestricted use SCOs are generally located between 2 and 8 feet below grade.

- At the additional study area soil exceeding the unrestricted use SCOs is generally encountered at depths ranging from 14 to 27 feet below grade (exceedances are generally encountered shallower at the western side of the additional study area and deeper on the eastern side).

A non-woven geotextile demarcation layer exists between the former northern holder (i.e., excavation area) and the southern gas holder beneath the Type C granular fill material (approximately 2 to 3 feet below ground surface [bgs]). Analytical data for soil remaining at the Site that exceeds the unrestricted use SCOs is included in **Table 1**. As stated above, accessible soil containing source material in the vicinity of the northern gas holder on the former MGP property has been removed.

Areas remaining at the Site that contain visual MGP-related impacts include the following:

- Southern Gas Holder – Heavy sheens and an “oil-like material” have historically been observed within the southern gas holder immediately above the holder floor. Vegetation and surface material from above the southern gas holder area were removed and the gas holder cover system constructed above the existing fill material. Type C granular fill was installed above the cover system. A non-woven geotextile demarcation layer was installed between the Type C granular fill and the cover system. The southern gas holder cover system thickness ranges from approximately 4 feet thick in the northern portion of the holder to more than 8 feet thick in the southern portion of the holder. MGP-impacted material remains within the southern gas holder at depths ranging from 4 to 9 feet (in northern portion of the holder) and from 8 to 13 feet (in the southern portion of the holder) below the top of the newly installed southern gas holder cover.

- Additional Study Area – Visible evidence of sheens and staining were historically observed in soil borings completed in the diner parking lot located east of Hancock Street (e.g., SB-10-99, SB-40, SB-45A, TW-1, and TW-2). These impacts were primarily limited to a relatively thin zone from approximately 14 to 25 feet below grade and located immediately above the silt and clay confining layer.

1.4.3.2 Groundwater

The approximate extent of groundwater containing MGP-related COCs at concentrations greater than the Class GA standards and guidance values presented in NYSDEC's Division of Water, Technical and Operational Guidance Series (TOGS 1.1.1) *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (NYSDEC, reissued June 1998 and addended April 2000 and June 2004) is shown on **Figure 6**. **Figure 6** was created using analytical results from the most current site-wide sampling event (August 2008) prior to implementation of the remedial action. A summary of the groundwater analytical results from the August 2008 sampling event is included in **Table 2**. As stated in Section 1.3.2, the location of BTEX and PAHs in groundwater extends from the former MGP property to the diner parking area and immediately west of State Street. The highest concentrations of dissolved phase impacts were detected adjacent to the northern gas holder and in the parking area south of the diner. The location of impacted groundwater is generally consistent with locations where soil was observed to contain sheens and/or NAPL. Geochemical data have indicated that conditions favoring aerobic degradation are present at the perimeter of the plume where dissolved MGP-related impacts are low.

Groundwater samples from monitoring well MW-4 had historically contained the highest concentrations of dissolved phase MGP-related COCs. Monitoring well MW-4 was located within the northern gas holder excavation area and therefore abandoned during the remedial action. Groundwater samples collected from monitoring wells MW-7 and MW-10 (both located in the additional study area) have contained dissolved phase COCs at concentrations greater than TOGS 1.1.1 Glass GA standards and guidance values.

Depth to groundwater at the Site varies from approximately 5 feet below grade at monitoring well MW-2 (near the southern gas holder) to 16 feet below grade at monitoring well MW-3 (northern portion of the former MGP property) to 18 feet below grade at monitoring well MW-10 (in the northeast portion of the additional study area). As presented in the ROD, human exposure to groundwater is not likely because the area is supplied with public water.

2.0 Engineering and Institutional Control Plan

2.1 Introduction

2.1.1 General

Because MGP-impacted soil and groundwater remain beneath the former MGP property at depths that could be disturbed by utility workers, Engineering Controls and Institutional Controls (EC/ICs) are required to protect human health and the environment. This Engineering and Institutional Control Plan (EC/IC Plan) describes the procedures for the implementation and management of EC/ICs. The EC/IC Plan is one component of the SMP and is subject to revision by NYSDEC.

2.1.2 Purpose

This EC/IC Plan provides:

- A description of the EC/ICs;
- 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;
- A description of plans and procedures to be followed for implementation of EC/ICs, such as the implementation of the Excavation Work Plan (EWP) (**Appendix E**) for the proper handling of remaining MGP-related impacts that may be disturbed during maintenance or redevelopment work on the former MGP property; and
- Other provisions necessary to identify or establish methods for implementing the EC/ICs required by the remedy, as determined by the NYSDEC.

2.2 Engineering Control Systems

Engineering control systems at the former MGP property consist of soil cover and security fencing.

2.2.1 Composite Cover Systems

As stated in the ROD, under current use and daily operations, there are no existing exposure routes either on the former MGP property or the additional study area to subsurface soil. Potential exposure to remaining MGP-impacts in soil in the additional study area was not considered feasible under ordinary construction or maintenance as exceedances of unrestricted use SCOs generally exist at depths below 14 feet below ground level, below the remnants of the former Erie Canal. Construction or maintenance workers performing invasive activities on the former MGP property could be exposed via ingestion, direct contact, or inhalation. Exposure to remaining MGP impacts in soil at the former MGP property is prevented by a combination of the following:

- Composite cover system over the southern gas holder, consisting of a geosynthetic clay layer, a 60 mil LLDPE liner, a non-woven geotextile demarcation barrier, and a minimum of 2 feet of granular surface cover.
- Cover system/demarcation barrier placed over the flat portion of the MGP property comprised of a woven geotextile membrane covered by a minimum of 12-inches of Type C granular fill.

An EWP is presented in **Appendix E** and outlines the pre-soil disturbance notification requirements and procedures required in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining MGP impacts are disturbed. Procedures for the inspection and maintenance of the cover system are provided in the Monitoring Plan, included in **Section 4** of this SMP.

2.2.2 Security Fencing

The former MGP property is enclosed with a galvanized chain-linked fence along the perimeter to deter trespassers (**Figure 2**). The fence is 6 feet tall with barbed wire supporting arms and three strands of barbed wire. Entrance gates are maintained by locks, and “No Trespassing” signs are displayed on the fence. The fence will be inspected as part of the site-wide annual inspection (Section 3.5).

2.3 Criteria for Completion of Remediation/Termination of Engineering Controls

Generally, remedial processes are considered completed when effectiveness monitoring indicates that the remedy has achieved the remedial action objectives identified by the ROD. The framework for determining when remedial processes are complete is provided in Section 6.5 of NYSDEC DER-10.

2.3.1 Cover System

The cover systems at the former MGP property are permanent controls, and the quality and integrity of the systems will be inspected at defined, regular intervals until the EC/ICs are no longer required, and/or the written approval is granted by the NYSDEC.

2.3.2 Monitored Natural Attenuation

As presented in the ROD, groundwater monitoring activities to assess natural attenuation will continue for a period of 5 years. As described in Section 3.0 of this document, semi-annual groundwater sampling will be conducted from seven existing monitoring wells (MW-2, MW-3, MW-7, MW-8, MW-9, MW-10, and MW-12). The locations of these long-term monitoring wells are shown on **Figure 8.** The results of the monitoring will be summarized annually for the first 5 years; after the 5-year period, an evaluation of the long-term monitoring and the need for additional oxygen enhancement will be conducted. It is anticipated that annual sampling to document MNA will be required for an additional 25 years. Monitoring 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 dissolved levels of MGP-related VOCs and/or PAHs become asymptotic at a level that is not acceptable to the NYSDEC, additional treatment and/or control measures will be evaluated.

2.4 Institutional Controls

A series of Institutional Controls is required by the ROD to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent potential future exposure to remaining MGP-related impacts by controlling disturbances of the subsurface MGP impacts; and, (3) limit the use and development of the former MGP property. Adherence to these ICs is required by the Environmental Easement and will be implemented under this document. These ICs are:

- Compliance with the Environmental Easement and this document by the Grantor (i.e., National Grid) and the Grantor's successors and assigns.
- All ECs must be maintained as specified in this document.
- All ECs on the former MGP property must be inspected at a frequency and in a manner defined in this document.
- Groundwater monitoring and other environmental or public health monitoring must be performed as defined in this document.
- Data and information pertinent to management of the former MGP property must be reported at the frequency and in a manner defined in this document.

ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement.

The former MGP property has a series of ICs in the form of restrictions. Adherence to these ICs is required by the Environmental Easement. Restrictions that apply to the former MGP property are:

- The former MGP property may only be used for commercial use, which also includes industrial use, provided that the long-term EC/ICs included in this SMP are employed.

- The former MGP property may not be used for a higher level of use, such as unrestricted restricted residential, commercial, (as appropriate) use without additional remediation and amendment of the Environmental Easement, as approved by the NYSDEC.
- Future activities at the former MGP property that will disturb remaining MGP impacts must be conducted in accordance with this document.
- The use of the groundwater underlying the former MGP property is prohibited without treatment rendering it safe for intended use.
- The potential for vapor intrusion must be evaluated for any new buildings developed on the former MGP property, and any potential impacts that are identified must be monitored or mitigated.
- Vegetable gardens and farming on the former MGP property are prohibited.
- National Grid will submit an annual Certification Statement to the NYSDEC which certifies that: (1) controls employed at the former MGP 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 this document. The annual Certification Statement will be qualified to the extent that National Grid and/or National Grid's representatives are only present at the former MGP property on an intermittent basis. NYSDEC retains the right to access the former MGP property at any time to evaluate the continued maintenance of any and all controls. This certification statement 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 (e.g., qualified environmental professional).

2.4.1 Excavation Work Plan

The former MGP property has been remediated to remove MGP-related source material from above and below the groundwater, to the extent practicable, and as required by the ROD, and to eliminate potential exposures to utility workers to the remaining MGP impacts. As presented in Section 1.4.3.1, MGP-related impacts at the additional study area are located significantly below the paved parking surface and, as stated in the ROD, do not create a potential exposure to visitors or workers under the existing use or daily operations. Further, the remaining impacts are located below typical excavation depths (i.e., generally greater than 14 feet bgs). As a result, any intrusive work on the former MGP property that will encounter or disturb the remaining MGP-impacts, including any modifications or repairs to the existing cover system on the former MGP property, will be performed in compliance with the EWP included as **Appendix E** to this document. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a task-specific Health and Safety Plan (HASP). A Generic HASP

(GHASP) is attached as **Appendix F** to this SMP that can be used as a guide/template by Contractors when preparing a task-specific HASP prior to performing intrusive work. The Contractor must verify that their HASP is in current compliance with DER-10, and 29 CFR 1910, 29 CFR 1926, and all other applicable Federal, State and local regulations. Invasive work that may disturb the soil within a potentially impacted area must be performed in accordance with applicable federal, state, and local rules and regulations to protect worker health and safety. In addition, Contractors performing the monitoring and maintenance requirements of this document will also prepare and maintain a site- and task-specific HASP onsite during the work activities. The Contractor's HASP will cover all personnel who will be employed by the Contractor to perform the work at the former MGP property, including direct employees, as well as Subcontractors. If the Contractor does not wish to include Subcontractors under the HASP, the Subcontractor will be responsible for developing and implementing a HASP that meets the applicable requirements. The Contractor will submit the task-specific HASP to the NYSDEC for review prior to initiating intrusive activities. The site-specific HASPs will include information on activities anticipated to be conducted. All contractors who may come in to contact with potentially impacted environmental media will follow the site-specific HASP detailing the procedures that will be utilized to comply with applicable regulations. The Contractor has the sole responsibility for confirming that the worksite is safe, neat, and maintained in an orderly condition, and is free from hazards.

In addition, any work conducted pursuant to the EWP that may disturb potentially impacted materials must also be conducted in accordance with the procedures defined in a Community Air Monitoring Plan (CAMP). A copy of the NYSDOH-prepared generic CAMP is included as **Appendix G**. Based on future changes to State and Federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP must be updated and re-submitted with the notification provided in the EWP. Any intrusive construction work will be performed in compliance with the EWP, HASP and CAMP, and will be included in the periodic inspection and certification reports submitted under the Site Inspections, Reporting, and Certifications (Section 5).

National Grid and/or associated parties preparing the remedial documents submitted to the NYSDEC, and parties performing this work are completely responsible for the safe performance of all intrusive work, the structural integrity of excavations, proper disposal of excavation dewatering fluids, control of runoff from open excavations into remaining contamination, and for structures that may be affected by excavations (such as building foundations and bridge footings). National Grid will ensure that site development activities on the former MGP property will not interfere with, or otherwise impair or compromise, the engineering controls described in this SMP.

2.4.2 Soil Vapor Intrusion Evaluation

Prior to the construction of any enclosed structures located on the former MGP property, an evaluation will be performed to determine if any mitigation measures are necessary to eliminate potential exposure from soil vapors in the proposed structure. Alternatively, a soil vapor intrusion (SVI) mitigation system may be installed as an element of the building foundation without first conducting an investigation. This mitigation system will include a vapor barrier and passive sub-slab depressurization system that is capable of being converted to an active system.

Prior to conducting an SVI investigation or installing a mitigation system, a work plan will be developed and submitted to the NYSDEC and NYSDOH for approval. This work plan will be developed in accordance with the most recent NYSDOH "Guidance for Evaluating Vapor Intrusion in the State of New York". Measures to be employed to mitigate potential vapor intrusion will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, the NYSDOH guidance, and construction details of the proposed structure.

Preliminary (un-validated) SVI sampling data will be forwarded to the NYSDEC and NYSDOH for initial review and interpretation. Upon validation, the final data will be transmitted to the agencies, along with a recommendation for follow-up action, such as mitigation, if required.

SVI sampling results, evaluations, and follow-up actions, if applicable, will also be summarized in the next Annual Project Report following the field activities

2.5 Inspections and Notifications

2.5.1 Inspections

Inspections of all remedial components and monitoring wells installed at the Site will be conducted at the frequency specified in the SMP monitoring schedule. A comprehensive Site-wide inspection will be conducted annually. The inspections will determine and document the following:

- ECs established for the former MGP property continue to perform as designed
- ECs continue to be protective of human health and the environment
- Compliance with requirements of this SMP and the Environmental Easement
- Sampling and analysis of appropriate media during monitoring events
- ~~If~~ Site records are complete and up to date
- Changes, or needed changes, to the remedial or monitoring system

Inspections will be conducted in accordance with the procedures described in the Monitoring Plan (Section 3). The reporting requirements are outlined in the Inspection, Reporting, and Certification section of this document (Section 5).

If an emergency, such as a natural disaster (e.g., flooding, utility disruption, etc.) or an unforeseen failure of any of the ECs occurs, an inspection of the Site will be conducted within 5 days of the event, or as soon as reasonably appropriate and safe, to verify the effectiveness of the EC/ICs implemented at the Site by a qualified environmental professional as determined by NYSDEC.

2.5.2 Notifications

Based on the nature of the intended activity, the party proposing the activity, or damage to an EC, notifications will be submitted by National Grid to the NYSDEC for the following reasons:

- 60-day advance notice of any proposed changes in use of the former MGP property that are required under the terms of the Order on Consent, 6NYCRR Part 375, and/or Environmental Conservation Law.
- 15-day advance notice of any proposed ground-intrusive activities pursuant to the Excavation Work Plan.
- Notice within 48-hours of any damage to the southern gas holder cover that reduces or has the potential to reduce the effectiveness of the Engineering Control, 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 ECs 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.

In the event of an emergency situation (e.g., flooding, utility disruption, etc.), individuals planning to disturb potentially impacted soil or groundwater must provide notification to National Grid and the NYSDEC with as much notice prior to initiating work as reasonable and appropriate. If prior notification is not possible during an emergency situation, notifications should be made within 24 hours, or as soon as possible/reasonable after the emergency has been resolved.

2.6 Contingency Plan

The Contingency Plan outlines response activities to be implemented in the event of an emergency. Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions.

2.6.1 Emergency Telephone Numbers

In the event of any environmentally related situation or unplanned occurrence requiring assistance, the Owner or Owner's representative(s) should contact the appropriate party from the contact list below. For emergencies, appropriate emergency response personnel should be contacted (**Table 2-1**). Prompt contact should also be made to the individuals listed in **Table 2-2**, below. These emergency contact lists must be maintained in an easily accessible location at the site.

Table 2-1: Emergency Telephone Numbers

Medical, Fire, and Police	911
One Call Center	(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
Local Ambulance (Mid-Country Volunteer)	(518) 673-2212

Table 2-2: Other Contact Numbers

Mr. Bernard Franklin NYSDEC 625 Broadway Albany, New York 12233	Telephone: 1 (518) 402-9662 Email: bcfrankl@gw.dec.state.ny.us
Mr. Gerald Cummins National Grid 300 Erie Boulevard West Syracuse, New York 13202	Telephone: 1 (315) 428-6073 Email: gerald.cummins@nationalgrid.com
Mr. Albert DeMarco New York State Department of Health Empire State Plaza Corning Tower, Room 1787 Albany, New York 12237	Telephone: 1 (518) 402-7860 Email: ajd03@health.state.ny.us

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

2.6.2 Map and Directions to Nearest Health Facility

Site Location:	14 Hancock Street Fort Plain, New York
Nearest Hospital Name:	Little Falls Hospital
Hospital Location:	140 Burwell Road Little Falls, New York 13365
Hospital Telephone:	(315) 823-1000

Directions to the Hospital:

1. Start out going northwest on Hancock St/RT-5S toward Yios Crossing Rd. 0.1 mi
2. Turn left onto Main St/RT-5S. 0.0 mi
3. Turn right onto Canal St/RT-5S/RT-80. Continue to follow RT-5S. 12.1 mi
4. Turn right onto RT-169. 0.4 mi
5. Turn left to stay on RT-169. 1.9 mi
6. Turn left onto RT-5 W/RT-167 W/RT-169 N. 0.2 mi
7. Turn slight right onto E Main St/RT-169. 0.0 mi
8. Turn right onto Ward St. 0.1 mi
9. Turn right onto Burwell St. 0.1 mi
10. 140 BURWELL ST is on the left.

Total Distance: 15 miles

Total Estimated Time: 22 minutes

Figure 2-1: Map of Route from the Site to Hospital

<u>2.6.3 Response Procedures</u>

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 at the beginning of this Contingency Plan (**Table 2-1**). The list will also be included in the HASP that will be maintained on site whenever work is being conducted

<u>2.6.3.1 Spill Response Plan</u>

Spill response procedures have been developed for responding to unplanned release of oil, products, materials, hazardous waste, etc. to soil, surface water, or groundwater. All spills of materials associated with the remaining MGP-related impacts at the former MGP property will be immediately reported to National Grid's Project Manager (whose names and phone numbers are included in **Table 2-2**). In addition, reportable spills will be called in to the NYSDEC spills hotline upon discovery. Properly trained personnel will implement the following general spill response procedures (when possible):

1. *Ceasing Operation of the Affected Equipment*: This will consist of shutting off the equipment in use and/or closing any valves and stopping the leak, if possible.

2. *Containing the Spill*: If the spill occurs on land, absorbent material will be applied as necessary to stop the flow of the spilled material. .

3. *Cleaning Up the Spill:* Spills in water will be recovered using pumps, sorbent material, etc. as necessary until the spilled material is recovered (and no sheen or other evidence of the spill is observed on the water surface). Spills on land shall be recovered using pumps, sorbent material, and heavy equipment, as necessary until the spilled material is recovered. Other activities to be conducted during spill cleanup activities include: removing impacted soil/sorbent pads; using rags and cleaning solution to remove excess spilled material from equipment; and collecting verification samples to confirm that the impacted soil has been removed.

4. *Containerizing Spill Materials:* Spill materials, impacted soil, sorbent pads, etc. will be containerized in New York State Department of Transportation- (NYSDOT-) approved containers. The containers will be labeled with the waste type and date of accumulation in accordance with applicable regulations contained in 49 CFR Part 172. Samples will be collected to characterize the spilled materials for disposal (i.e., as a hazardous/non-hazardous waste and/or TSCA/non-TSCA waste, if necessary).

5. *Disposing of Spill Materials:* Impacted materials and spill cleanup debris will be disposed at a facility permitted to accept the materials. National Grid and/or the property owner shall be responsible for the coordination of the disposal activities.

6. *Performing Post-Spill Maintenance:* Following cleanup of the spill, National Grid and/or the property owner will ensure that all used spill cleanup material and equipment has been disposed or cleaned, as appropriate. If the equipment that caused the spill (if applicable) cannot be properly repaired, replacement equipment shall be obtained.

In the event that the release is of sufficient magnitude and cannot be controlled by diking, damming, absorbing, or other method, the local fire department, NYSDEC, and National Response Center shall be notified.

3.0 MONITORING PLAN

3.1 Introduction

3.1.1 General

This Monitoring Plan describes the requirements for evaluating the effectiveness of the groundwater remedy at reducing the dissolved MGP-related BTEX and PAH levels at the Site. Effectiveness monitoring is the periodic chemical and physical analysis of a media to determine if the remedy is performing as expected and remedial action objectives are being achieved. Additionally, this Monitoring Plan describes the requirements for verifying that the cover system on the former MGP property has maintained its integrity. Because there is no active treatment system required for this site, performance monitoring is not applicable.

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 groundwater and water accumulated within the southern gas holder.
- Assessing compliance with applicable NYSDEC standards, criteria and guidance (SCGs), specifically ambient groundwater standards.
- Assessing achievement of the remedial effectiveness criteria.
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment.
- Preparing the necessary reports for the various monitoring activities.

To adequately address these issues, this Monitoring Plan provides information on:

- Fluid level monitoring procedures.
- Sampling locations, protocol, and frequency.
- Information on designed monitoring systems (e.g., monitoring well logs).
- Analytical sampling program requirements.
- Reporting requirements.
- Quality Assurance/Quality Control (QA/QC) requirements.
- Inspection and maintenance requirements for monitoring wells.

- Annual inspection and certification.

Semi-annual monitoring of the effectiveness of the remedy and overall reduction in dissolved MGP-related impacts hydraulically downgradient of the former northern gas holder will be conducted for five years. The frequency thereafter will be determined by NYSDEC in concert with National Grid. Trends in dissolved MGP-related impact levels in groundwater within the affected areas will be evaluated to determine if the remedy continues to be effective in achieving remedial goals. In addition, annual sampling and analysis of accumulated water within the southern gas holder will be conducted. Monitoring programs are summarized in **Table 3-1** and outlined in detail in **Sections 3.2 and 3.3**.

Table 3-1: Monitoring/Inspection Schedule

Monitoring Program	Frequency	Matrix	Analysis
1	Semi-Annual[1] (for first 5-years)	Groundwater	Fluid levels in identified monitoring wells Semi-annual laboratory analysis for: - BTEX by USEPA Method 8260 - PAHs by USEPA Method 8270
2	Annual	Stone/cover material	Visual inspection
3	Annual	Monitoring Wells	Visual inspection
4	Annual Gauging Annual Sampling	Southern Gas Holder Fluids	Fluid level (annual) Laboratory analysis for: - BTEX by USEPA Method 8260 - PAHs by USEPA Method 8270

Note:
1. Semi-Annual is defined as two times per year

3.2 Cover System Monitoring

The surface cover of the former MGP property is subject to this SMP and shall be evaluated annually and repaired as needed. Because the remaining MGP impacts are only encountered at depths of 2 to 8 feet bgs and below a demarcation layer (as presented in Section 1.4.3.1), the annual inspections will focus on maintaining physical separation between workers on the former MGP property and the remaining MGP impacts. The evaluation will include a visual inspection of the stone/gravel cover over the portion of the former MGP property shown on **Figure 9** for evidence of recent excavation/subsurface utility work, erosion or removal of cover materials, settlement, or other pathways that could potentially result in exposure of on-site workers to subsurface MGP impacts. The NYSDEC shall be notified of significant items (i.e., items where measures are needed to prevent contact with, or migration of, impacted soils within the former MGP property promptly following inspection. Observed changes shall be documented in the annual report discussed in **Section 5.0**. A Site Inspection Form template is included in **Appendix H**. Needed repairs shall be made promptly.

3.3 Groundwater Monitoring Program

This section presents the water-level and quality monitoring requirements to document groundwater characteristics. The primary objective of the groundwater effectiveness monitoring is to document the concentrations of dissolved BTEX and PAHs at the plume fringe and to collect data to establish concentration trends. These data will be used to evaluate the groundwater remedy's effectiveness.

Groundwater monitoring will be performed on a semi-annual basis (i.e., two times per year, anticipated to occur in spring [April] and fall [October]) for a period of five years to assess the performance of the remedy. Monitoring will be conducted at seven monitoring wells (MW-2, MW-3, MW-7, MW-8, MW-9, MW-10, and MW-12). The network of monitoring wells has been selected to monitor groundwater conditions downgradient from the former northern gas holder (i.e., the source area). **Figure 8** identifies the wells to be sampled during monitoring activities; **Table 4** summarizes the effectiveness monitoring tasks and anticipated completion dates. Monitoring well construction details for the monitoring wells included in the groundwater monitoring program are included on the boring logs (**Appendix I)** and summarized in **Table 5**.

The sampling frequency may be modified with the approval NYSDEC. The SMP will be modified to reflect changes in sampling plans approved by NYSDEC.

Deliverables for the groundwater monitoring program are specified in **Section 3.7.**

3.3.1 Sampling Protocol

All monitoring well sampling activities will be recorded in a field book and documented on groundwater sampling field forms included in the Generic Field Sampling Plan (GFSP) presented in **Appendix J**. Field observations (e.g., well integrity, etc.) will be noted on the well sampling log, which will serve as the inspection form for the groundwater monitoring well network.

Groundwater level measurements will be obtained from seven monitoring well locations including MW-2, MW-3, MW-7, MW-8, MW-9, MW-10, and MW-12 prior to collecting groundwater samples. Groundwater levels at each well will be measured to the nearest one-hundredth of a foot from the reference point at the top of the well riser using the procedures described in the GFSP. An interface probe (IP) will also be used to determine the presence/absence of NAPL in each well and the length of the NAPL column, if present, using the procedures described in the GFSP. The measurements will be converted to elevations (referenced to NAVD88). If NAPL is identified, recovery will be attempted using manual methods (e.g., manual recovery, periodic pumping, etc.). Any recovered NAPL will be staged within the fenced former MGP property in a properly labeled NAPL accumulation drum. Groundwater elevation information will be used in conjunction with the existing hydraulic conductivity data to further evaluate horizontal groundwater flow gradients beneath the Site.

Groundwater samples will be collected from the seven monitoring wells listed above for laboratory analysis of:

- BTEX by USEPA Method 8260
- PAHs by USEPA Method 8270

Samples will be submitted to the contract laboratory for analysis using NYSDEC Analytical Services Protocol (ASP) methods. QA/QC samples (including trip blank, field duplicates, matrix spike, and matrix spike duplicates) will be collected and shipped via overnight courier for laboratory analysis, as referenced in the Generic Quality Assurance Project Plan (GQAPP) presented in **Appendix K**.

Groundwater samples will be collected using low-flow purging and sampling techniques, as described in the FSP. Field parameters (i.e., pH, conductivity, dissolved oxygen, temperature, and turbidity) will be monitored every 3 to 5 minutes during purging (as appropriate). Groundwater samples will be collected for laboratory analysis following the stabilization of field parameters and the reduction of turbidity levels to less than 50 nephelometric turbidity units (NTUs). Field parameters will be considered to have stabilized after three consecutive readings are within the following ranges:

- pH: +/- 0.1.
- Conductivity: +/- 3%.
- Oxidation/reduction potential (ORP): +/- 10 mV.
- Dissolved oxygen: +/- 10 %.
- Turbidity: less than 50 NTUs.

If the field parameters have not stabilized after the well purging activities (and the groundwater turbidity level is less than 50 NTUs), field personnel will document the field parameters and collect the sample. If the field parameters have stabilized, but the turbidity of the groundwater exceeds the 50 NTU goal, the pump flow rate will be decreased to no more than 100 milliliters per minute (mL/min), and additional purging will be performed. The purging will continue until the 50 NTU turbidity goal is achieved or, if not possible, until reasonable effort has been made to reduce the turbidity to less than 50 NTUs. Following purging, groundwater samples will be collected from all seven wells.

3.3.2 Monitoring Well Repairs, Replacement, and Decommissioning

If bio-fouling or silt accumulation occurs in the monitoring wells, the wells will be physically agitated/surged and redeveloped. 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 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 Annual Project 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.

3.4 Southern Gas Holder Extraction Well

This section presents the gauging and quality monitoring requirements to document the presence/absence of NAPL and water characteristics within the southern gas holder. These data will be used to evaluate the need to periodically remove accumulated water that exceeds ambient water quality standards.

3.4.1 Sampling Protocol

Gauging will be performed on an annual basis for a period of five years from extraction well EW-1. The location of EW-1 is shown on **Figure 8**; **Table 5** summarizes the well construction details. A well construction log for EW-1 is included in **Appendix I**. As presented in **Table 4**, EW-1 will be gauged and sampled annually during the annual site visits conducted in the fall (October).

All gauging and sampling activities will be recorded in a field book and documented on groundwater sampling field forms included in the GFSP presented in **Appendix I**. Field observations (e.g., well integrity, etc.) will be noted on the well sampling log, which will serve as the inspection form.

Water level measurements will be obtained during the annual site visits, and prior to collecting water samples on a bi-annual basis (i.e. every second year). The water level will be measured to the nearest one-hundredth of a foot from the reference point at the top of the well riser using the procedures described in the GFSP. An IP will also be used to determine the presence/absence of

NAPL in the well and the length of the NAPL column, if present, using the procedures described in the GFSP. The measurements will be converted to elevations (referenced to NAVD88). If NAPL is identified, recovery will be attempted using manual methods (e.g., manual recovery, periodic pumping, etc.). Recovered NAPL will be staged within the fenced former MGP property in a properly labeled NAPL accumulation drum.

Water samples will be collected from EW-1 on an annual basis for laboratory analysis of:

- BTEX by USEPA Method 8260
- PAHs by USEPA Method 8270

Samples will be submitted to the contract laboratory for analysis using NYSDEC ASP methods. QA/QC samples (including trip blank, field duplicates, matrix spike, and matrix spike duplicates) will be collected and shipped via overnight courier for laboratory analysis, as referenced in the GQAPP presented in **Appendix K**.

The water samples will be collected using low-flow purging and sampling techniques, as described in the GFSP. Field parameters (i.e., pH, conductivity, dissolved oxygen, temperature, and turbidity) will be monitored every 3 to 5 minutes during purging (as appropriate). Water samples will be collected for laboratory analysis following the stabilization of field parameters and the reduction of turbidity levels to less than 50 NTUs. Field parameters will be considered to have stabilized after three consecutive readings are within the following ranges:

- pH: +/- 0.1.
- Conductivity: +/- 3%.
- ORP: +/- 10 mV.
- Dissolved oxygen: +/- 10 %.
- Turbidity: less than 50 NTUs.

If the field parameters have not stabilized after the well purging activities (and the water turbidity level is less than 50 NTUs), field personnel will document the field parameters and collect the sample. If the field parameters have stabilized, but the turbidity of the water exceeds the 50 NTU goal, the pump flow rate will be decreased to no more than 100 mL/min, and additional purging will be performed. The purging will continue until the 50 NTU turbidity goal is achieved or, if not possible, until reasonable effort has been made to reduce the turbidity to less than 50 NTUs. Following purging, water samples will be collected from the well.

The gauging and sampling frequency may be modified with the approval of the NYSDEC. The SMP will be modified to reflect changes in sampling plans approved by the NYSDEC

3.4.2 Southern Gas Holder Pumping Schedule

As stated above, heavy sheens and an oil-like material were historically observed within the southern gas holder immediately above the holder floor. This material was assumed to be a potential MGP source material and has been capped/contained as part of the site remedy (as described in Section 1.4). It is anticipated that any water entering the southern gas holder would be impacted by this source material and; therefore, may contain MGP-related COCs at concentrations above ambient water quality standards and guidance values. While water within the SGH will be gauged and sampled every year (and NAPL removed, if detected), the water would only be removed for disposal every-other year (i.e., bi-annual), if required by the NYSDEC, based on the following:

- Groundwater samples collected from monitoring well MW-2 (located adjacent and hydraulically downgradient from the SGH) indicates the presence of MGP impacts above groundwater standards or guidance values.
- Analytical results from groundwater samples collected from monitoring well MW-2, MGP-related impacts (if existing) from the SGH appear to be migrating beyond the former MGP property.

Removal of water from within the SGH on a bi-annual basis (i.e., rather than an annual basis) is appropriate because removing the water does not reduce the potential for human and biota exposures (i.e., the holder is capped with an impermeable liner). Additionally, no added benefit to public health or the environment is achieved (i.e., there is no evidence that impacts are being released from the SGH).

If conditions change and evidence of impacts to groundwater at monitoring well MW-2 are documented (i.e. groundwater samples collected from monitoring well MW-2 contain MGP-related COCs at concentrations above ambient water quality standards and guidance values), water within the SGH may be removed on a more frequent basis (i.e., annually) as determined by National Grid and the NYSDEC.

3.4.3 Extraction Well Repairs, Replacement, and Decommissioning

Any repairs, replacement, and/or decommissioning associated with EW-1 will follow the requirements and protocols for Site monitoring wells presented in Section 3.3.2.

3.5 Site-Wide Inspection

Site-wide inspections will be performed once per year during the annual site visit. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring wells. The site-wide inspection will include the former MGP property and monitoring wells located within the additional study area. 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 usage of the properties.
- An evaluation of the condition and continued effectiveness of ECs, including condition of cover materials and physical condition of monitoring wells.
- General conditions at the time of the inspection.
- The management activities being conducted, including condition of security fencing.

3.6 Monitoring Quality Assurance/Quality Control

All sampling and analyses will be performed in accordance with the requirements of the GQAPP prepared for the site (**Appendix K**). Main Components of the QAPP include:

- QA/QC Objectives for Data Measurement.
- Sampling Program Requirements, including preparation and handling of sample containers, sample holding times, and field QC requirements (e.g., trip blanks, coded field duplicates, and matrix spike/matrix spike duplicates..
- Sample Tracking and Custody.
- Calibration Procedures for field and laboratory equipment.
- Analytical Procedures.
- Preparation of a Data Usability Summary Report (DUSR), which will present the results of data review, 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.

3.7 Monitoring Reporting Requirements

Semi-Annual Status Reports and Annual Project Reports will be prepared. Forms and any other information generated during the regular monitoring events and inspections will be kept in a central project file. All forms and other relevant reporting formats used during the monitoring/inspection events will be (1) subject to approval by NYSDEC and (2) submitted at the time of the Semi-Annual Status Reports and Annual Project Reports.

Monitoring results will be reported to NYSDEC on a semi-annual basis subsequent to each sampling event, as summarized below.

3.7.1 Semi-Annual Status Reports

Semi-Annual Status Reports will be prepared in letter format and submitted to the NYSDEC within 90 days of each semi-annual sampling event. The Semi-Annual Status Reports will include, at a minimum:

- Date of event.
- Personnel conducting sampling.
- Description of the activities performed.
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.).
- Tabulated groundwater sampling results (validated) compared to appropriate standards/ criteria.
- DUSR, attached to report on compact disk
- A water table contour figure illustrating sampling locations.
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all wells sampled (to be submitted electronically in the NYSDEC-identified format).
- Tabulated groundwater level and NAPL gauging data
- Tabulated DO data

No interpretation of the data will be conducted in the semi-annual report; interpretation will occur during preparation of the Annual Project Report. Data will be reported in hard copy or digital format as determined by NYSDEC (currently EqUIS 5).

3.7.2 Annual Project Reports

Annual Project Reports will be prepared in letter format and submitted to the NYSDEC within 90 days of each annual sampling event. The Annual Project Reports will include, at a minimum:

- Dates of the semi-annual, annual, and bi-annual sampling events conducted during the reporting period.
- Personnel who conducted the sampling events.
- Descriptions of the activities performed during the reporting period.

- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, inspection forms, etc.).
- Comprehensive results (validated) from the previous semi-annual, annual, and bi-annual sampling events included in data summary tables and compared to appropriate standards/criteria, with exceedances highlighted.
- Graphical representations of dissolved BTEX and PAHs in groundwater, as appropriate, including an evaluation of concentration trends.
- Water table contour and groundwater plume figures illustrating sampling locations.
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all wells sampled (to be submitted electronically in the NYSDEC-identified format).
- Any comments, observations, conclusions, or recommendations based on the evaluation of information included in the report.
- A determination as to whether groundwater conditions have changed since the previous reporting event.

After the initial 5-year monitoring period, the fifth Annual Project Report will also include:

- An evaluation of the effectiveness monitoring data collected during the 5-year period.
- An evaluation of the groundwater remedy component.

As presented in the ROD, the objectives of the effectiveness evaluation are to: 1) document naturally occurring chemical, biological, and/or physical processes that effect concentrations of MGP-related impacts dissolved in groundwater in response to the source removal actions, and; 2) to determine if natural degradation of dissolved MGP-related impacts is occurring.

The Annual Project Reports will also include the appropriate elements of a Periodic Review Report as described in Section 6.3 of NYSDEC DER-10 (Periodic Review).

Data will be reported in hard copy or digital format (currently EqUIS 5) as determined by NYSDEC.

The Annual Project Reports will also include the results from annual inspections and certifications associated with the Periodic Review reports presented in **Section 5.4**, below.

A summary of the monitoring program deliverables are summarized in **Table 3-2** below.

Table 3-2: Reporting Schedule

Task	Reporting Schedule*
Semi-Annual Status Report #1	September 2011
Annual Project Report #1	January 2012
Semi-Annual Status Report #2	July 2012
Annual Project Report #2	January 2013
Semi-Annual Status Report #3	July 2013
Annual Project Report #3	January 2014
Semi-Annual Status Report #4	July 2014
Annual Project Report #4	January 2015
Semi-Annual Status Report #5	July 2015
Annual Project Report #5	January 2016

* The frequency of events will be conducted as specified until otherwise approved by NYSDEC; due dates included in table are estimated.

4.0 OPERATION AND MAINTENANCE PLAN

4.1 Introduction

The Site remedy does not rely on any mechanical systems, such as sub-slab depressurization systems 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.

The schedule for pumping fluids from the SHG, if required, is presented in Section 3.4.2.

5.0 INSPECTIONS, REPORTING AND CERTIFICATIONS

5.1 General

This section of the SMP presents a discussion of site inspection, annual certification, and reporting requirements associated with the EC/ICs for the Site.

5.2 Site Inspections

5.2.1 Inspection Frequency

An inspection of the former MGP property and monitoring wells located within the additional study area will be conducted annually as specified in Section 3.5 of the Monitoring Plan. Inspections will also be conducted whenever a severe condition has occurred, such as an erosion or flooding event that may affect the ECs.

5.2.2 Inspection Forms, Sampling Data, and Maintenance Reports

Inspection and monitoring events will be recorded on the appropriate forms, including the Site Inspection Form included in **Appendix H**, and the field sampling forms included in the GFSP (**Appendix J**). These forms are subject to NYSDEC review and revision.

Applicable inspection forms and other records, including all media sampling data generated during the reporting period will be provided in electronic format in the Annual Project Report.

5.2.3 Evaluation of Records and Reporting

The results of the annual 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;
- The remedy continues to be protective of public health and the environment and is performing as designed in the RD Report.

5.3 Certification of Institutional Controls

Each Annual Project Report will include a Certification Statement signed by an expert that the NYSDEC finds acceptable (e.g., qualified environmental professional) that will indicate (if applicable):

- The ICs employed at the former MGP property are 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 controls to protect the public health and environment.
- Nothing has occurred that would constitute a violation or failure to comply with any requirements for the ICs.
- Access to the former MGP property will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of the ICs.
- Use of the former MGP property is compliant with the environmental easement.
- The information presented in this report is accurate and complete.
- All information and statements in the certification form are true.

The annual Certification Statement will be qualified to the extent that National Grid and/or National Grid's representatives are only present at the former MGP property on an intermittent basis. The signed Certification Statement will be included in the Annual Project Report.

5.4 Periodic Project Reports

As presented in **Section 3.7**, Semi-Annual Status Reports and Annual Project Reports will be prepared and submitted to the NYSDEC every year within 90 days of each groundwater sampling event. The Annual Project Reports will also include the appropriate elements of a Periodic Review Report as described in Section 6.3 of NYSDEC DER-10 (Periodic Review). The first Annual Project Report will be submitted to the Department not longer than eighteen months after the Certificate of Completion or equivalent document (e.g., Satisfactory Completion Letter) is issued. A projected Report Schedule is included as **Table 3-2** in **Section 3.7.2.** A single Annual Project Review report will be prepared that addresses the entire Site.

In addition to the media sampling results, laboratory deliverables, and sampling event details described in **Section 3.7.2**, the report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the former MGP property
- Results of the required annual site inspections and severe condition inspections, if applicable
- Applicable inspection forms and other records generated for the Site during the reporting period in electronic format
- An evaluation, which includes the following:

- Compliance of the remedy with the requirements of the site-specific ROD.
- Identification of any needed repairs to monitoring wells or institutional controls.
- Any new conclusions or observations regarding impacted areas of the former MGP property based on inspections or data generated by the Monitoring Plan.
- Recommendations regarding any necessary changes to the remedy and/or Monitoring Plan.
- The overall effectiveness of the remedy.

If intrusive activities have been conducted in potentially impacted areas of the former MGP property during the previous year, the report will also include the following:

- Verification that all work was performed in conformance with this SMP.
- Plans showing areas and depth of activities.
- Text narrative describing the activities performed, health and safety monitoring performed (both site-specific and community air monitoring, as required), disposal locations for media (e.g., soil, water), a discussion of the sampling performed and associated analytical results, a description of any problems encountered, and other pertinent information necessary to document that the site activities were performed pursuant to this SMP.

The Annual Project 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.

5.5 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.

Tables

Table 1
Analytical Data for Soil Remaining at Site
Site Management Plan
Fort Plain Former MGP Site, Fort Plain, New York

Location ID: Sample Depth(Feet): Date Collected:	6 NYCRR Part 375 Unrestricted Use SCOs	Units	MW-3 8 - 10 07/29/97	MW-3 18 - 20 07/29/97	SB-26 4 - 6 07/11/01	SB-26 10 - 11 07/11/01	SB-26 15 - 15.5 07/11/01	SB-27 0 - 2 07/12/01	SB-27 2 - 4 07/12/01	SB-27 4 - 6 07/12/01	SB-27 6 - 8 07/12/01	SB-27 8 - 10 07/12/01	SB-28 2 - 4 07/12/01	B-34 4 - 6 06/10/03	B-35 13 - 15 06/11/03	SB-39 15 - 19 09/09/05	SB-40 16 - 18 09/01/05	SB-40 18 - 20 09/01/05	SB-41 14 - 16 09/02/05
VOCs																			
1,1,1-Trichloroethane	0.68	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	0.27	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	0.33	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	0.02	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	0.12	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	0.05	mg/kg	NA	**0.02 B**	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.06	mg/kg	0.012 U	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	0.0060 U	0.0060 U	0.0060 U	0.0060 U
Bromodichloromethane	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	0.76	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	1.1	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	0.37	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	0.25	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	1	mg/kg	0.012 U	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	0.0060 U	**0.0020 J**	0.0060 U	**0.0020 J**
Isopropylbenzene	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	0.05	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-t-Butyl Ether (MTBE)	0.93	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	1.3	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	0.7	mg/kg	0.012 U	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	0.0060 U	0.0060 U	0.0060 U	0.0060 U
Total Xylenes	0.26	mg/kg	0.012 U	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	0.019 U	**0.0060 J**	**0.0030 J**	**0.0070 J**
trans-1,2-Dichloroethene	0.19	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	- -	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.47	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	0.02	mg/kg	NA	0.011 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total BTEX	- -	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND [ND]	ND	ND	ND	ND	ND	ND	**0.0020 J**	ND	**0.0020 J**
Total VOCs	- -	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND [ND]	ND	ND	ND	ND	ND	ND	**0.0020 J**	ND	**0.0020 J**

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Location ID: Sample Depth(Feet): Date Collected:	6 NYCRR Part 375 Unrestricted Use SCOs	Units	MW-3 8 - 10 07/29/97	MW-3 18 - 20 07/29/97	SB-26 4 - 6 07/11/01	SB-26 10 - 11 07/11/01	SB-26 15 - 15.5 07/11/01	SB-27 0 - 2 07/12/01	SB-27 2 - 4 07/12/01	SB-27 4 - 6 07/12/01	SB-27 6 - 8 07/12/01	SB-27 8 - 10 07/12/01	SB-28 2 - 4 07/12/01	B-34 4 - 6 06/10/03	B-35 13 - 15 06/11/03	SB-39 15 - 19 09/09/05	SB-40 16 - 18 09/01/05	SB-40 18 - 20 09/01/05	SB-41 14 - 16 09/02/05
SVOCs																			
2,2'-Oxybis(1-Chloropropane)	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	- -	mg/kg	NA	0.95 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	0.034 U	0.032 U	NA	NA	NA	NA
2,4-Dinitrophenol	- -	mg/kg	NA	0.95 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	- -	mg/kg	0.42 U	0.38 U	**0.033J**	ND	ND	**0.62 J**	**0.096 J**	**1.6 J [1.1 J]**	**2.0 J**	**0.86**	**0.094 J**	0.03 U	0.028 U	0.37 U	**0.26 J**	3.8 U	8.0 U
2-Methylphenol	0.33	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	0.017 U	0.016 U	NA	NA	NA	NA
2-Nitroaniline	- -	mg/kg	NA	0.95 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	- -	mg/kg	NA	0.95 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	- -	mg/kg	NA	0.95 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	0.026 U	0.025 U	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	0.33	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	0.019 U	0.018 U	NA	NA	NA	NA
4-Nitroaniline	- -	mg/kg	NA	0.95 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	- -	mg/kg	NA	0.95 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	20	mg/kg	0.42 U	0.38 U	**1.1**	ND	ND	**0.40 J**	**6.8**	**11 [5.4]**	**7.5**	**1.2**	**0.77**	**0.035 J**	0.015 U	0.37 U	**2.9 J**	**0.92 J**	**5.6 J**
Acenaphthylene	100	mg/kg	**0.006 J**	0.38 U	**0.52 J**	ND	ND	**12**	**0.44 J**	**1.3 J [0.62 J]**	**0.92 J**	**0.20 J**	**0.29 J**	**0.024 J**	0.011 U	0.37 U	**1.1 J**	**0.34 J**	**1.7 J**
Acetophenone	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	100	mg/kg	**0.005 J**	**0.006 J**	**0.48 J**	ND	ND	**1.8 J**	**0.80 J**	**5.0 [2.7]**	**4.2**	**0.85**	**0.23 J**	**0.023 J**	0.012 U	0.37 U	3.6 U	3.8 U	**1.5 J**
Atrazine	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	1	mg/kg	**0.014 J**	**0.014 J**	**1.3**	**0.004 J**	ND	**4.6 J**	**0.65 J**	**3.2 J [1.7]**	**2.5 J**	**0.82**	**0.43**	**0.08 J**	0.015 U	0.37 U	**10**	**2.8 J**	**10**
Benzo(a)pyrene	1	mg/kg	**0.008 J**	**0.009 J**	**1.2**	ND	ND	**17**	**0.85 J**	**3.0 J [1.6]**	**2.5 J**	**0.79**	**0.90**	**0.085 J**	0.016 U	0.37 U	**8.4**	**2.1 J**	**9.4**
Benzo(b)fluoranthene	1	mg/kg	**0.009 J**	**0.01 J**	**0.66 J**	ND	ND	9.5	**0.44 J**	**1.5 J [0.77 J]**	**1.4 J**	**0.44 J**	**0.56**	**0.073 J**	0.038 U	0.37 U	**5.8**	**1.9 J**	**9.8**
Benzo(ghi)perylene	100	mg/kg	0.42 U	0.38 U	**0.73**	**0.005 J**	ND	41	**0.78 J**	**2.5 J [1.5 J]**	**1.8 J**	**0.46 J**	**1.8**	**0.035 J**	0.017 U	0.37 U	**4.2**	**1.3 J**	**8.0**
Benzo(k)fluoranthene	0.8	mg/kg	**0.013 J**	**0.011 J**	**0.81**	ND	ND	**7.9 J**	**0.50 J**	**2.0 J [1.0 J]**	**1.5 J**	**0.48 J**	**0.57**	**0.096 J**	0.039 U	0.37 U	**1.8 J**	**2.1 J**	**2.5 J**
Biphenyl	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy) methane	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl) ether	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	- -	mg/kg	NA	**0.017 JB**	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	**0.042 J**	0.036 U	NA	NA	NA	NA
Butyl benzyl phthalate	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	1	mg/kg	**0.015 J**	**0.014 J**	**1.1**	**0.007 J**	ND	**6.6 J**	**0.64 J**	**2.9 J [1.6]**	**2.3 J**	**0.75**	**1.0**	**0.095 J**	0.017 U	0.37 U	**9.0**	**2.4 J**	**12**
Dibenzo(a,h)anthracene	0.33	mg/kg	NA	0.38 U	**0.13 J**	ND	ND	**3.4 J**	**0.10 J**	**0.34 J [0.22 J]**	**.25 J**	**0.073 J**	**0.17 J**	0.019 U	0.018 U	0.37 U	**1.7 J**	**0.41 J**	**1.9 J**
Dibenzofuran	7	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	0.016 U	0.015 U	NA	NA	NA	NA
Diethyl phthalate	- -	mg/kg	NA	**0.015 JB**	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	- -	mg/kg	NA	**0.015 JB**	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl phthalate	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	100	mg/kg	**0.021 J**	**0.020 J**	**4.1**	**0.009 J**	ND	**12**	**2.7**	**10 [6.0]**	**9.4**	**2.4**	**0.45**	**0.063 J**	0.022 U	0.37 U	**9.1**	**2.4 J**	**18**
Fluorene	30	mg/kg	0.42 U	0.38 U	**0.76**	ND	ND	**0.24 J**	**1.9**	**4.5 [0.22]**	**2.9 J**	**0.47 J**	**0.14 J**	**0.024 J**	0.02 U	0.37 U	**1.8 J**	3.8 U	**2.3 J**
Hexachlorobenzene	0.33	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 1
Analytical Data for Soil Remaining at Site
Site Management Plan
Fort Plain Former MGP Site, Fort Plain, New York

Location ID:	6 NYCRR Part 375		MW-3	MW-3	SB-26	SB-26	SB-26	SB-27	SB-27	SB-27	SB-27	SB-27	SB-28	B-34	B-35	SB-39	SB-40	SB-40	SB-41
Sample Depth(Feet):	Unrestricted Use		8 - 10	18 - 20	4 - 6	10 - 11	15 - 15.5	0 - 2	2 - 4	4 - 6	6 - 8	8 - 10	2 - 4	4 - 6	13 - 15	15 - 19	16 - 18	18 - 20	14 - 16
Date Collected:	SCOs	Units	07/29/97	07/29/97	07/11/01	07/11/01	07/11/01	07/12/01	07/12/01	07/12/01	07/12/01	07/12/01	07/12/01	06/10/03	06/11/03	09/09/05	09/01/05	09/01/05	09/02/05
SVOCs																			
Hexachlorocyclopentadiene	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.5	mg/kg	0.42 U	0.38 U	0.52 J	ND	ND	17	0.48 J	1.5 J [0.90 J]	1.2 J	.31 J	.86	0.034 J	0.018 U	0.37 U	2.8 J	0.90 J	5.1 J
Isophorone	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	12	mg/kg	0.024 J	0.008 J	0.14 J	0.007 J	0.009 J	1.3 J	0.34 J	3.3 J [2.7]	5.2	5.7	1.1	0.034 U	0.032 U	0.37 U	3.6 U	3.8 U	0.62 J
Nitrobenzene	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-Di-n-propylamine	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-nitrosodiphenylamine	- -	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	0.8	mg/kg	NA	0.95 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	100	mg/kg	0.2 J	0.29 J	3.9	0.012 J	0.007 J	3.0 J	3.7	20 [10]	15	2.7	0.19 J	0.035 J	0.024 U	0.37 U	2.0 J	0.71 J	12
Phenol	0.33	mg/kg	NA	0.38 U	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	100	mg/kg	0.029 J	0.03 J	4.6	0.012 J	0.006 J	26	2.8	13 [7.7]	9.7	2.8	0.70	0.089 J	0.019 U	0.37 U	16	4.0 J	22
Total PAHs	- -	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND [ND]	ND	ND	ND	ND	ND	ND	77 J	22 J	120 J
Total SVOCs	- -	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND [ND]	ND	ND	ND	ND	ND	ND	77 J	22 J	120 J
PCBs																			
Aroclor 1016	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics																			
Arsenic	13	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	350	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	2.5	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	63	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.18	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	3.9	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	2	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA [NA]	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 1
Analytical Data for Soil Remaining at Site
Site Management Plan
Fort Plain Former MGP Site, Fort Plain, New York

Location ID: Sample Depth(Feet): Date Collected:	6 NYCRR Part 375 Unrestricted Use SCOs	Units	SB-41 18 - 22 09/02/05	SB-42 10 - 12 08/31/05	SB-42 18 - 20 08/31/05	SB-43 18 - 20 09/07/05	SB-43 20 - 22 09/08/05	SB-45 20 - 22 08/31/05	SB-45 22 - 23 08/31/05	SB-45A 20 - 22.8 09/07/05	SB-45B 15 - 17 09/09/05	SB-46 18 - 20 09/01/05	SB-46 20 - 22 09/01/05
VOCs													
1,1,1-Trichloroethane	0.68	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	0.27	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	0.33	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	0.02	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	0.12	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	0.05	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.06	mg/kg	0.0050 U [0.0050 U]	0.0050 U	**0.011**	0.0050 U	**0.0070**	0.77 U	0.73 U	**0.0040 J**	0.0060 U	0.0060 U	**0.0030 J**
Bromodichloromethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	0.76	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	1.1	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	0.37	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	0.25	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	1	mg/kg	**0.0020 J [0.0020 J]**	0.0050 U	**0.0040 J**	0.0050 U	0.0050 U	**0.52 J**	**0.68 J**	**0.0040 J**	0.0060 U	0.0060 U	**0.0060**
Isopropylbenzene	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	0.05	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-t-Butyl Ether (MTBE)	0.93	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	1.3	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	0.7	mg/kg	0.0050 U [0.0050 U]	0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.77 U	0.73 U	0.0060 U	0.0060 U	0.0060 U	0.0060 U
Total Xylenes	0.26	mg/kg	**0.0040 J [0.0030 J]**	0.016 U	0.016 U	0.016 U	0.016 U	2.3 U	**0.50 J**	**0.0040 J**	0.019 U	0.017 U	**0.012 J**
trans-1,2-Dichloroethene	0.19	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.47	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	0.02	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total BTEX	- -	mg/kg	**0.0020 J [0.0020 J]**	ND	**0.015 J**	ND	**0.0070**	**0.52 J**	**0.68 J**	**0.0080 J**	ND	ND	**0.0090 J**
Total VOCs	- -	mg/kg	**0.0020 J [0.0020 J]**	ND	**0.015 J**	ND	**0.0070**	**0.52 J**	**0.68 J**	**0.0080 J**	ND	ND	**0.0090 J**

Table 1
Analytical Data for Soil Remaining at Site
Site Management Plan
Fort Plain Former MGP Site, Fort Plain, New York

Location ID: Sample Depth(Feet): Date Collected:	6 NYCRR Part 375 Unrestricted Use SCOs	Units	SB-41 18 - 22 09/02/05	SB-42 10 - 12 08/31/05	SB-42 18 - 20 08/31/05	SB-43 18 - 20 09/07/05	SB-43 20 - 22 09/08/05	SB-45 20 - 22 08/31/05	SB-45 22 - 23 08/31/05	SB-45A 20 - 22.8 09/07/05	SB-45B 15 - 17 09/09/05	SB-46 18 - 20 09/01/05	SB-46 20 - 22 09/01/05
SVOCs													
2,2'-Oxybis(1-Chloropropane)	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	- -	mg/kg	**0.066 J [0.022 J]**	7.1 U	**0.17 J**	0.38 U	**0.026 J**	**14**	**8.3**	**2.7 J**	4.0 U	0.38 U	**2.5 J**
2-Methylphenol	0.33	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	0.33	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	20	mg/kg	**0.15 J [0.11 J]**	7.1 U	**0.42**	**0.051 J**	**0.13 J**	**65**	**34**	**5.5**	4.0 U	0.38 U	**6.2 J**
Acenaphthylene	100	mg/kg	0.37 U [0.35 U]	**0.47 J**	0.37 U	0.38 U	0.38 U	**13**	**6.6 J**	**2.0 J**	4.0 U	0.38 U	**2.9 J**
Acetophenone	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	100	mg/kg	**0.068 J [0.049 J]**	7.1 U	**0.043 J**	0.38 U	0.38 U	**39**	**21**	**3.7**	4.0 U	0.38 U	**6.0 J**
Atrazine	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	1	mg/kg	**0.047 J [0.037 J]**	**1.2 J**	0.37 U	**0.062 J**	0.38 U	**51**	**26**	**11**	**0.23 J**	0.38 U	**20**
Benzo(a)pyrene	1	mg/kg	**0.029 J [0.036 J]**	**0.93 J**	0.37 U	**0.078 J**	0.38 U	**40**	**22**	**9.2**	**0.22 J**	0.38 U	**20**
Benzo(b)fluoranthene	1	mg/kg	**0.046 J [0.032 J]**	**0.92 J**	0.37 U	**0.071 J**	0.38 U	**27**	**18**	**8.0**	**0.26 J**	0.38 U	**17**
Benzo(ghi)perylene	100	mg/kg	**0.056 J [0.35 U]**	**0.78 J**	0.37 U	**0.069 J**	0.38 U	**19**	**11**	**4.2**	4.0 U	0.38 U	**10**
Benzo(k)fluoranthene	0.8	mg/kg	**0.050 J [0.35 U]**	7.1 U	0.37 U	0.38 U	0.38 U	**8.8**	**20**	**8.8**	4.0 U	0.38 U	**18**
Biphenyl	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy) methane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl) ether	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	1	mg/kg	**0.034 J [0.032 J]**	**0.78 J**	0.37 U	**0.046 J**	0.38 U	**43**	**25**	**11**	4.0 U	0.38 U	**18**
Dibenzo(a,h)anthracene	0.33	mg/kg	0.37 U [0.35 U]	7.1 U	0.37 U	0.38 U	0.38 U	**7.2 J**	**4.2 J**	**1.6 J**	4.0 U	0.38 U	**3.6 J**
Dibenzofuran	7	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl phthalate	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	100	mg/kg	**0.096 J [0.073 J]**	**1.6 J**	**0.030 J**	**0.12 J**	**0.024 J**	**54**	**28**	**11**	**0.27 J**	0.38 U	**13**
Fluorene	30	mg/kg	**0.064 J [0.042 J]**	7.1 U	**0.16 J**	**0.026 J**	**0.033 J**	**36**	**20**	**3.6**	4.0 U	0.38 U	**4.0 J**
Hexachlorobenzene	0.33	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 1
Analytical Data for Soil Remaining at Site
Site Management Plan
Fort Plain Former MGP Site, Fort Plain, New York

Location ID: Sample Depth(Feet): Date Collected:	6 NYCRR Part 375 Unrestricted Use SCOs	Units	SB-41 18 - 22 09/02/05	SB-42 10 - 12 08/31/05	SB-42 18 - 20 08/31/05	SB-43 18 - 20 09/07/05	SB-43 20 - 22 09/08/05	SB-45 20 - 22 08/31/05	SB-45 22 - 23 08/31/05	SB-45A 20 - 22.8 09/07/05	SB-45B 15 - 17 09/09/05	SB-46 18 - 20 09/01/05	SB-46 20 - 22 09/01/05
SVOCs													
Hexachlorocyclopentadiene	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.5	mg/kg	**0.030 J [0.024 J]**	**0.47 J**	0.37 U	**0.043 J**	0.38 U	**13**	**7.4 J**	**2.9 J**	4.0 U	0.38 U	**6.8 J**
Isophorone	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	12	mg/kg	**0.21 J [0.084 J]**	7.1 U	**0.66**	0.38 U	**0.092 J**	**24**	**10**	**0.26 J**	4.0 U	0.38 U	7.5 U
Nitrobenzene	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-Di-n-propylamine	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-nitrosodiphenylamine	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	0.8	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	100	mg/kg	**0.23 J [0.15 J]**	**1.9 J**	**0.24 J**	**0.079 J**	**0.058 J**	**150 D**	**75**	**11**	4.0 U	0.38 U	**17**
Phenol	0.33	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	100	mg/kg	**0.16 J [0.11 J]**	**1.9 J**	**0.032 J**	**0.16 J**	**0.038 J**	**83**	**46**	**17**	**0.23 J**	0.38 U	**24**
Total PAHs	- -	mg/kg	**1.3 J [0.80 J]**	**11 J**	**1.8 J**	**0.81 J**	**0.40 J**	**690 J**	**380 J**	**110 J**	**1.2 J**	ND	**190 J**
Total SVOCs	- -	mg/kg	**1.3 J [0.80 J]**	**11 J**	**1.8 J**	**0.81 J**	**0.40 J**	**690 J**	**380 J**	**110 J**	**1.2 J**	ND	**190 J**
PCBs													
Aroclor 1016	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics													
Arsenic	13	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	350	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	2.5	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	- -	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	63	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.18	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	3.9	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	2	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1. Concentrations reported in milligrams per kilogram (mg/kg) which is equivalent to parts per million (ppm).
2. Bold indicates compounds detected at concentrations above the method detection limit (MDL).
3. Shaded values indicates compound detected at concentrations greater than 6 NYCRR Part 375-6 unrestricted use soil cleanup objective (SCO).
4. -- = Indicates SCO is not available for the given compound.
5. D = Indicates that the result was quantitated using a secondary dilution.
6. J = Estimated concentration. Presented concentration is less than the method detection limit but greater than the instrument detection limit.
7. U = Indicates that the compound was analyzed for, but not detected. The associated value is the compound quanitation limit.
8. NA = The sample was not analyzed for the given compound.
9. ND = Indicates that the compound was analyzed for, but not detected.
10. B = Indicates that the compound was also detected in the laboratory blank sample.

Table 2
Historical Groundwater Anayltical Data

Site Management Plan
National Grid, Fort Plain Former MGP Site

Total BTEX in Groundwater (µg/L)				
Monitoring Well I.D.	Sampling Date			
	Sept. 2005	July 2007	Aug-08	June 2011
MW-1	-	-	-	-
MW-2	-	BDL	BDL	BDL
MW-3	-	BDL	BDL	-
MW-4	4,600	5,360	*	-
MW-5	-	-	-	-
MW-6	-	-	-	-
MW-7	8	121	123	459
MW-8	-	BDL	BDL	-
MW-9	-	BDL	BDL	-
MW-10	188.6	162	71	17.9
MW-11	-	BDL	-	-

Total PAHs in Groundwater (µg/L)				
Monitoring Well I.D.	Sampling Date			
	Sept. 2005	July 2007	Aug-08	June 2011
MW-1	-	-	-	-
MW-2	-	BDL	BDL	BDL
MW-3	-	BDL	BDL	-
MW-4	345.0	571.0	*	-
MW-5	-	-	-	-
MW-6	-	-	-	-
MW-7	35.0	55.0	41.4	167.0
MW-8	-	BDL	BDL	-
MW-9	-	BDL	BDL	-
MW-10	59.0	130.0	42.2	16.3
MW-11	-	BDL	-	-

Notes:
1. "-" Indicates data not abaliable.
2. "*" Indicates heavy sheen or NAPL present in well; well not sampled.
3. BDL - Below detection limits.

Table 3
Groundwater Geochemical Data
Site Management Plan
Fort Plain Former MGP Site

Sample ID:	NYSDEC TOGS 1.1.1	MW-2	MW-3	MW-4		MW-7		MW-8	MW-9	MW-10		MW-11
Date Collected:	**GW Stds.**	**Jul-07**	**Jul-07**	**Sep-05**	**Jul-07**	**Sep-05**	**Jul-07**	**Jul-07**	**Jul-07**	**Sep-05**	**Jul-07**	**Jul-07**
Inorganics (mg/L)												
Cyanide	0.2	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U
Iron	0.3	0.710	2.20	9.90	0.530	22.7	13.1	0.0500 U	0.0500	18.1	8.30	0.140
Manganese	0.3	0.0930	0.180	0.153	0.0950	0.704	0.880	0.00300 U	0.0440	0.713	0.510	0.0250
Sulfide	- -	0.100 U	NA	1.00 U	0.100 U	1.00 U	0.100 U	0.100 U	0.100 U	1.00 U	0.100 U	0.100 U
Inorganics - Filtered (mg/L)												
Iron	0.3	0.710	2.60	NA	0.320	NA	10.9	0.0500 U	0.0500 U	NA	1.40	0.0500 U
Manganese	0.3	0.150	0.370	NA	0.0860	NA	0.960	0.00300 U	0.250	NA	0.360	0.00530
Conventional Parameters (mg/L)												
Ammonia	- -	0.170	NA	0.260	0.120	2.00	1.50	0.0200 U	0.0200 U	0.770	0.410	0.0200 U
Methane	- -	0.280	0.110	NA	0.0270	NA	0.660	0.00100 U	0.00100 U	NA	0.230	0.00100 U
Nitrate	- -	0.0500 U	NA	0.0500 U	0.0500 U	0.0500 U	0.0500 U	1.20	1.30	0.130	0.0500 U	1.20
Ortho Phosphate	- -	0.0360	NA	0.0100 U	0.0320	0.280	0.780	0.0200 U	0.0200 U	0.0810	0.280	0.0570
Sulfate	- -	29.8	NA	89.4	20.4	5.00 U	5.00 U	70.2	78.2	24.9	5.00 U	130
Total Alkalinity	- -	257	NA	347	318	463	537	346	344	490	389	305
Total Kjeldahl Nitrogen	- -	0.200 U	NA	0.850	0.200 U	2.40	2.00	0.210	0.200 U	1.00	0.880	0.200 U
Total Organic Carbon	- -	1.50	3.30	7.30	5.10	6.70	6.00	1.30	1.40	5.30	3.90	1.50

Field Data												
pH		7.19	7.37	NA	6.34	NA	6.47	5.43	7.5	NA	7.04	7.03
Dissolved Oxygen (mg/L)		1.78	7.97	NA	1.86	NA	4.24	7.11	6.49	NA	3.78	4.40
ORP (mV)		-60.1	-26.0	NA	-117.5	NA	81.1	170.0	280.2	NA	-17.6	170.4

Notes:
1. Concentrations reported in milligrams per liter (mg/L) unless otherwise noted.
2. -- = Indicates SCO is not available for the given compound.
3. U = Indicates that the compound was analyzed for, but not detected. The associated value is the compound quanitation limit.
4. NA = The sample was not analyzed for the given compound.

Table 4
Effectiveness Monitoring Tasks
Site Management Plan
Fort Plain Former MGP Site, Fort Plain, New York

Event	Anticipated Completion Dates	Activities To Be Completed				
		Effectiveness Monitoring[1]	Site Inspection[2]	MW Inspection[3]	EW-01 Gauging	EW-01 Sampling
SA-1 Monitoring (Semi-annual)	June 2011	X				
A-1 Monitoring (Annual)	October 2011	X	X	X	X	X
SA-2 Monitoring (Semi-annual)	April 2012	X				
A-2 Monitoring (Annual)	October 2012	X	X	X	X	X
SA-3 Monitoring (Semi-annual)	April 2013	X				
A-3 Monitoring (Annual)	October 2013	X	X	X	X	X
SA-4 Monitoring (Semi-annual)	April 2014	X				
A-4 Monitoring (Annual)	October 2014	X	X	X	X	X
SA-5 Monitoring (Semi-annual)	April 2015	X				
A-5 Monitoring (Annual)	October 2015	X	X	X	X	X

Notes:

1. Effectiveness Monitoring – includes semi-annual gauging of groundwater elevation and depth to bottom of MWs, and sampling of 7 MWs for analysis of BTEX by USEPA Method 8260 and PAHs by USEPA Method 8270
2. Site Inspection – Site inspection form included in SMP
3. Monitoring Well Inspections – Includes visual inspections of MWs associated with the Site

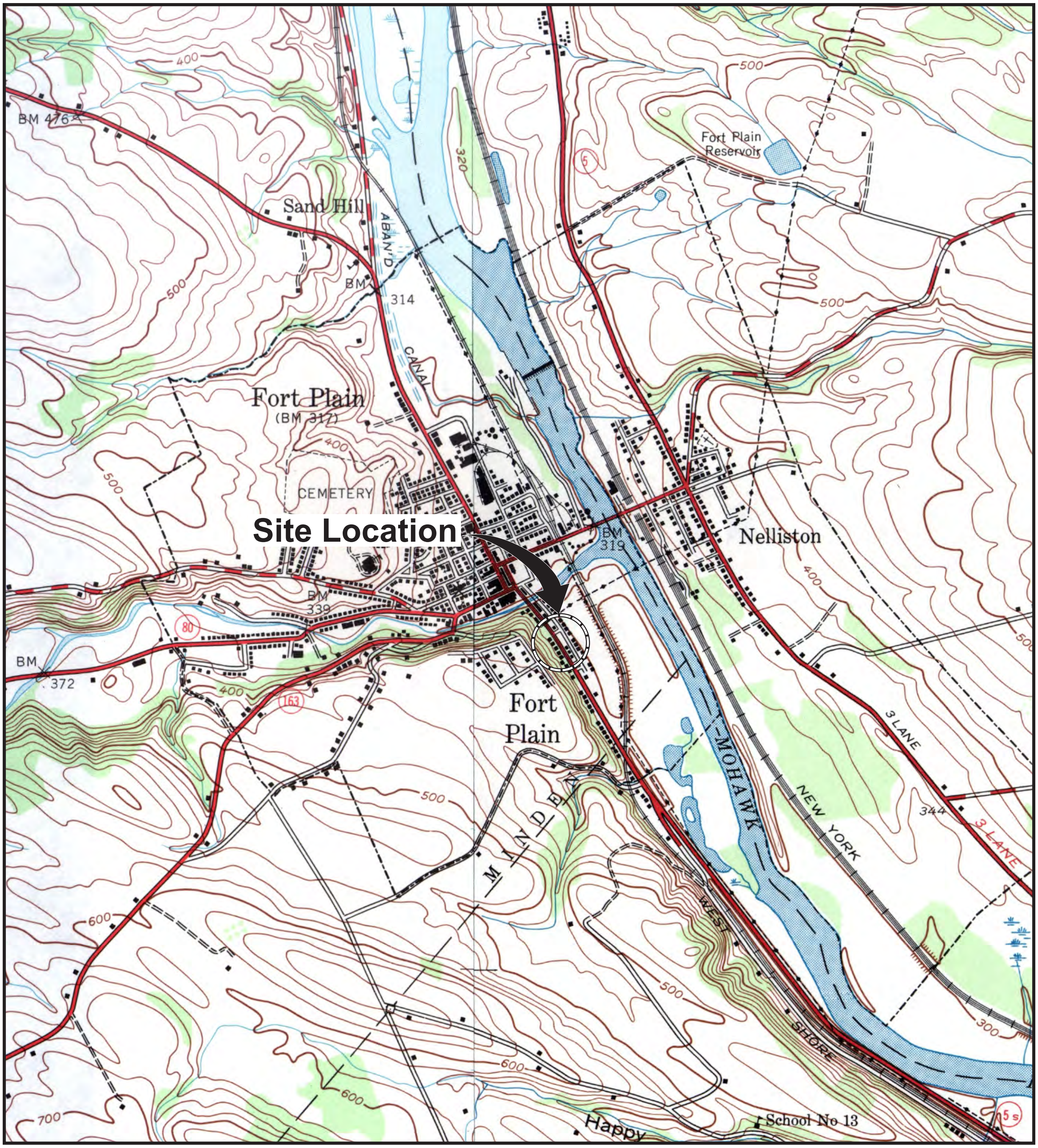
Table 5
Well Construction Details
Site Management Plan
Fort Plain Former MGP Site, Fort Plain, New York

Well ID	Date Installed	Northing	Easting	Top of Casing Elevation (ft AMSL)	Inside Diameter (inches)	Depth of Well (ft. bgs)	Screened Interval (ft bgs)	Sump?
MW-2	7/31/97	1492230.1	459794.32	317.5	2	18	8 - 18	N
MW-3	7/29/97	1492356.74	459678.82	315.1	2	22	12 - 22	N
MW-7	5/14/99	1492331.46	459813.94	313.1	2	25	15 - 25	N
MW-8	6/7/01	1492448.37	459777.34	312.0	2	25	15 - 25	N
MW-9	6/9/03	1492404.94	459861.28	311.1	2	26	16 - 26	N
MW-10	6/10/03	1492366.84	459817.94	313.2	2	25	15 - 25	N
MW-12	9/28/11	1492311.1	459713.3	315.4	2	20	3 - 17.7	Y
EW-1	6/11/10	1492217.05	459777.67	321.7	4	7.3	3.7 - 7.3	N

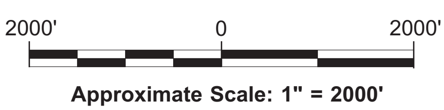
Notes:

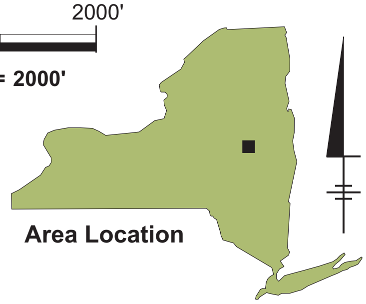
1. Horizontal survey is based on the North American Datum of 1983 (NAV83).
2. Vertical survey is based on the National American Vertical Datum of 1988 (NAVD 88).

Figures



REFERENCE: BASE MAP USGS 7.5 MIN. QUADS., CANAJOHARIE, AND FORT PLAIN NY, 1944.





Area Location

NATIONAL GRID
FORT PLAIN, NEW YORK
FORT PLAIN FORMER MGP SITE

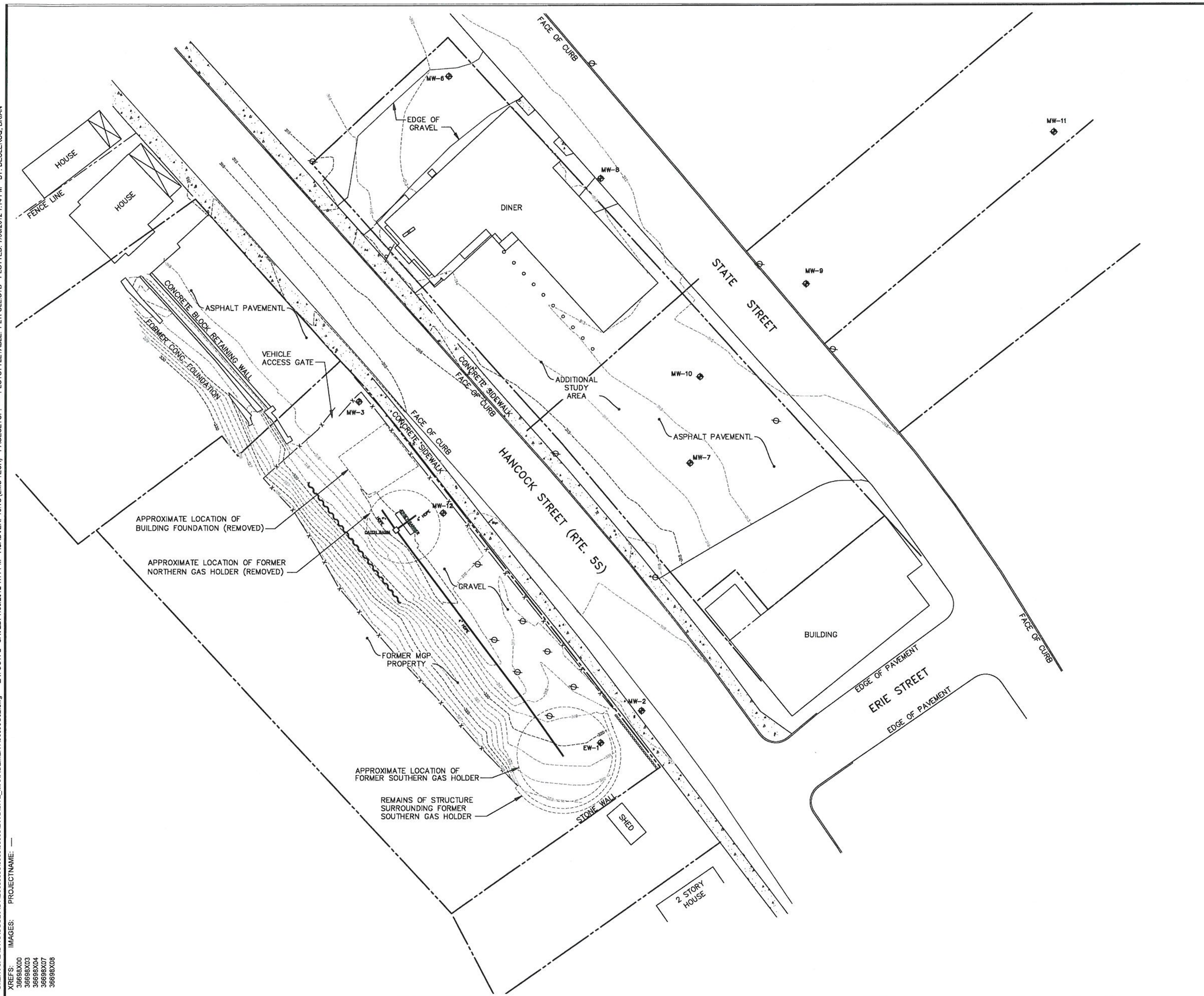
SITE MANAGEMENT PLAN

SITE LOCATION MAP

ARCADIS

FIGURE 1

11/21/2011 SYRACUSE-141ENV-DJHOWES
B0036698/0000/00009/CDR/36698N01.CDR



LEGEND:

- PROPERTY LINE
- NEW/EXISTING CHAIN LINK FENCE
- 350 GROUND SURFACE CONTOUR (1' INTERVAL)
- FORMER STRUCTURE
- BOLLARD
- UTILITY POLE
- MONITORING WELL/EXTRACTION WELL
- HORIZONTAL LIMITS OF REMAINING SHEET PILE

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. FIGURE DEVELOPED FROM SITE SURVEY ENTITLED "MAP SHOWING POST-CONSTRUCTION TOPOGRAPHIC CONDITIONS FORMER MANUFACTURED GAS PLANT FACILITY SITE No. 429007" PREPARED BY THEW ASSOCIATES, DATED 9/7/2011.

0 20' 40'
GRAPHIC SCALE

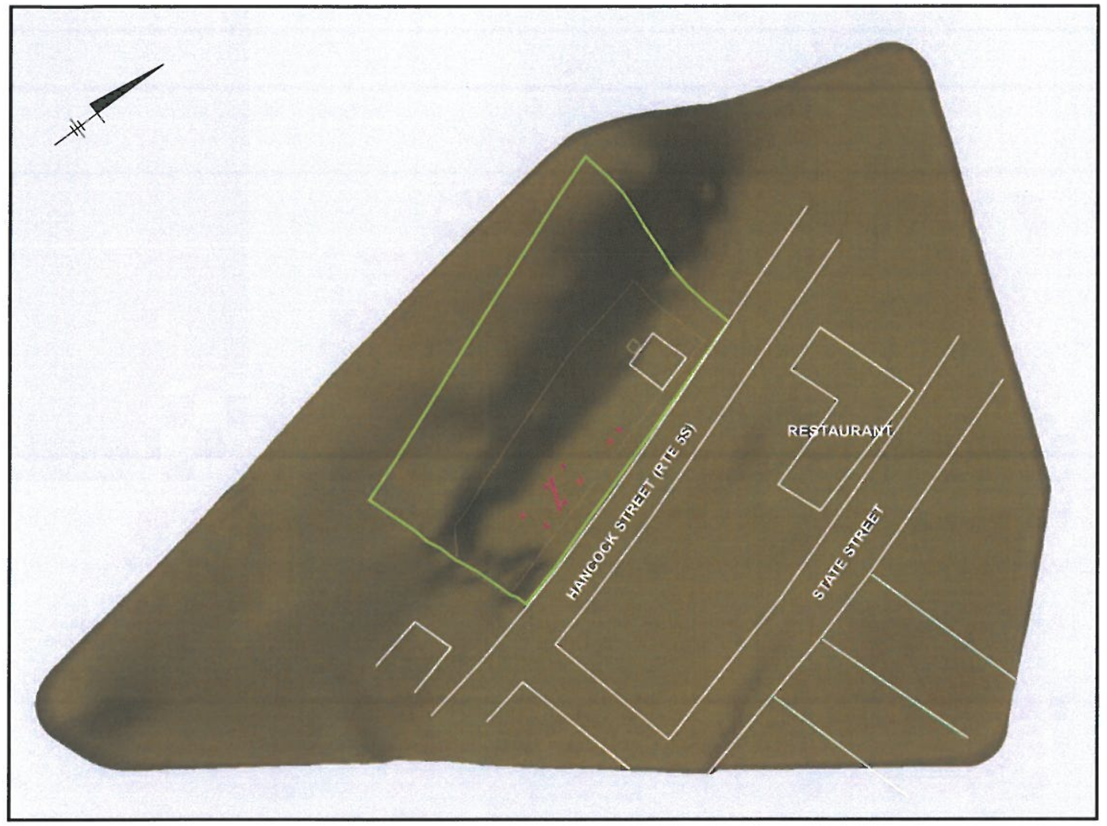
NATIONAL GRID
FORT PLAIN FORMER MANUFACTURED GAS PLANT SITE
SITE MANAGEMENT PLAN

SITE MAP

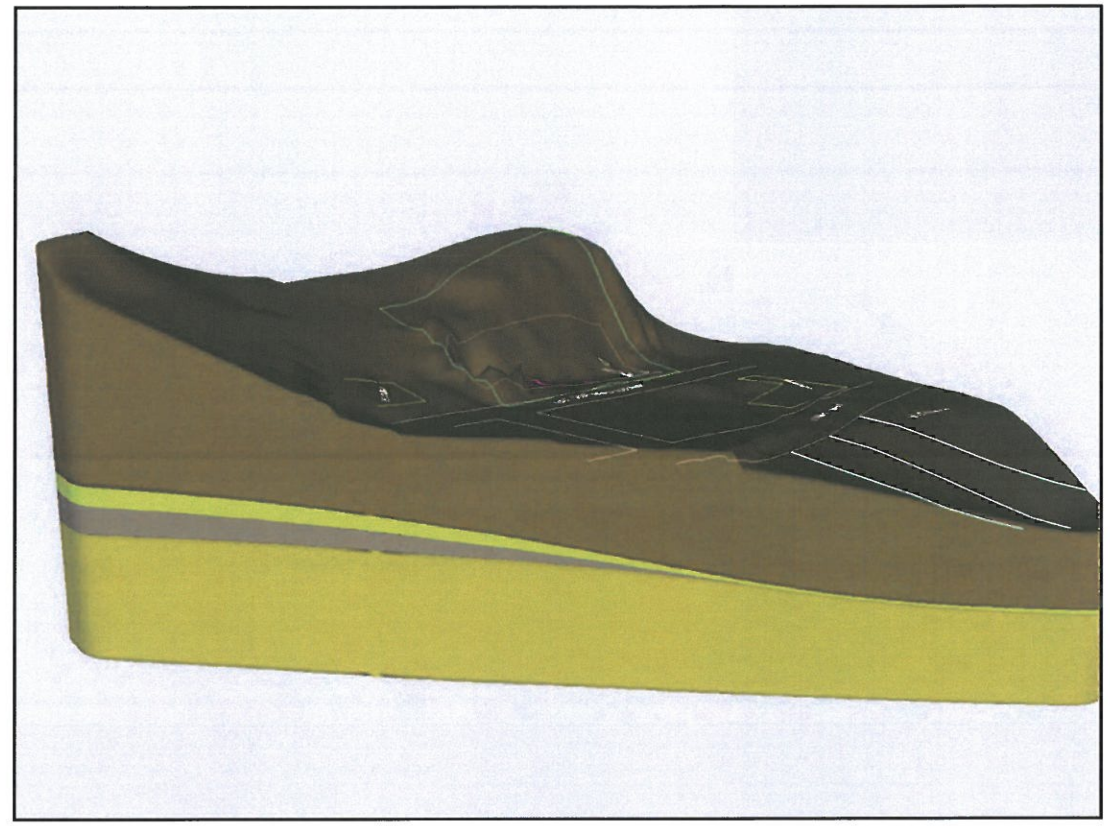
ARCADIS

FIGURE
2

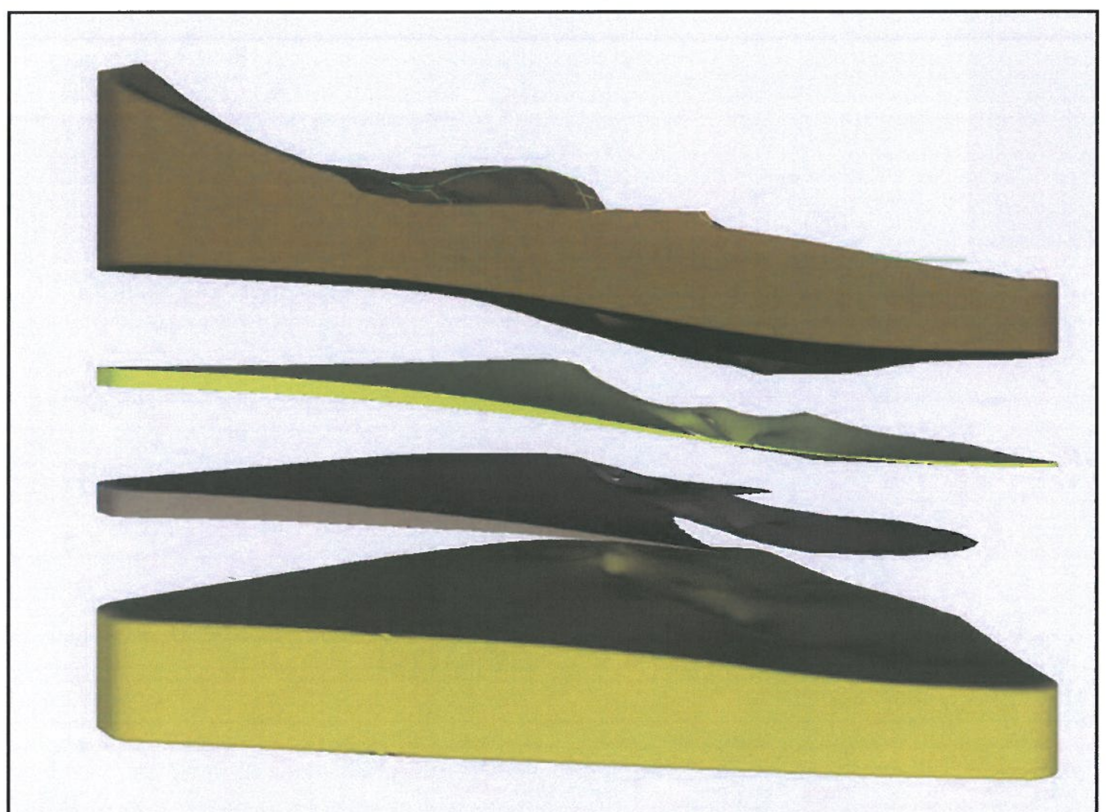
CITY: SYRACUSE, NY DIV/GROUP:141/ENV DB:DMW WLJ BGP KLS NES LD: PIC: PM: TM:M.BENOIT LYR:ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0036698\0000\00009\DWG\SITE_MANAGEMENT\36698G02.dwg LAYOUT: 2 SAVED: 7/30/2012 1:11 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: — PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 7/30/2012 1:14 PM BY: DECLERCQ, BRIAN
XREFS: 36698X00 36698X03 36698X04 36698X07 36698X08 IMAGES: PROJECTNAME: —



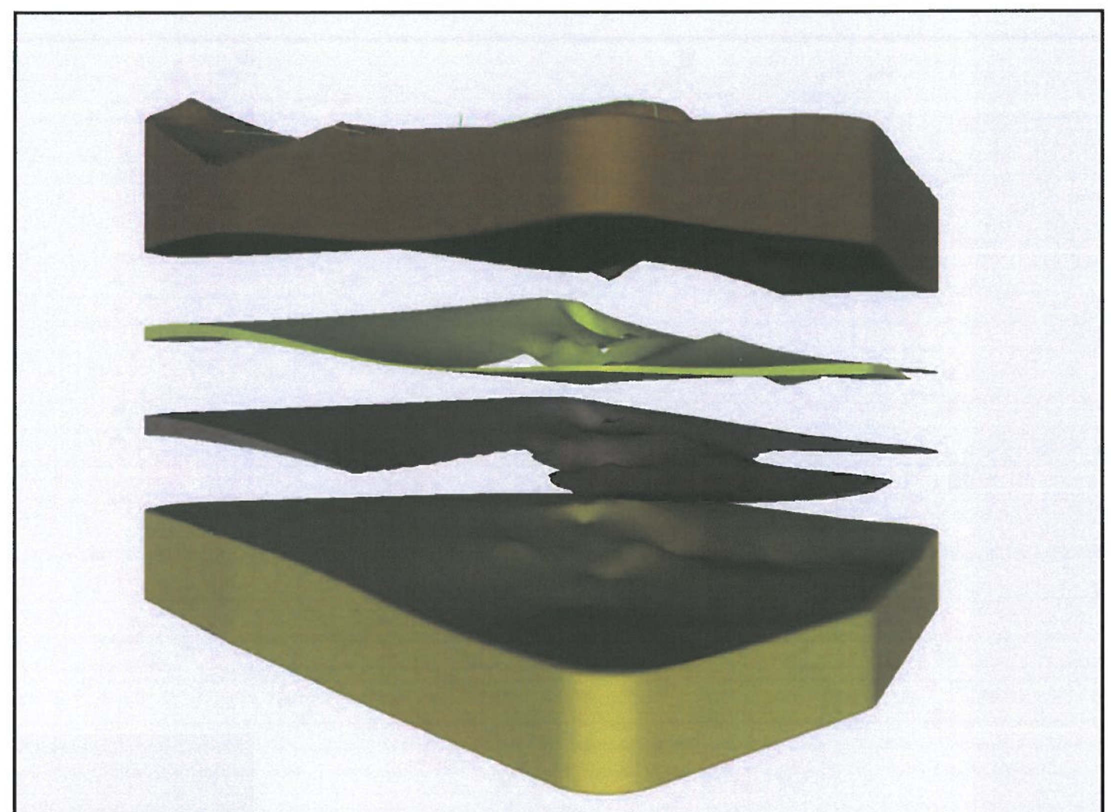
GEOLOGY IN PLAN VIEW



GEOLOGY CROSS SECTION FACING NORTHWEST



GEOLOGY CROSS SECTION - EXPANDED - FACING NORTHEST



GEOLOGY CROSS SECTION - EXPANDED - FACING WEST

LEGEND:

- FILL
- SILT AND CLAY
- SAND AND GRAVEL
- SILT
- FORMER MGP PROPERTY

NOTE:

VERTICAL EXAGGERATION = 3V, H1

NATIONAL GRID
FORT PLAIN FORMER MANUFACTURED GAS PLANT SITE
SITE MANAGEMENT PLAN

STRATIGRAPHIC UNITS

ARCADIS

FIGURE
3

07/25/2012 SYRACUSE-141ENV-DJHOWES
B0036698/0000/00009/CDR/36698G01.CDR

LEGEND:

- PROPERTY LINE
- CHAIN LINK FENCE
- FORMER STRUCTURE
- GROUND SURFACE CONTOURS (1' INTERVAL)
- BOLLARD
- UTILITY POLE
- EXISTING MONITORING WELL/EXTRACTION WELL
- CB CATCH BASIN
- 298 GROUNDWATER ELEVATION (FAMSL)
- (396.83) WATER TABLE ELEVATION (FAMSL)
- GROUNDWATER FLOW DIRECTION

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. ALL ELEVATIONS ARE REFERENCED TO NAVD 88.
3. FAMSL – FEET ABOVE MEAN SEA LEVEL.
4. GAUGING DATA COLLECTED ON JUNE 8, 2011.
5. FIGURE DEVELOPED FROM SITE SURVEY ENTITLED "MAP SHOWING POST-CONSTRUCTION TOPOGRAPHIC CONDITIONS FORMER MANUFACTURED GAS PLANT FACILITY SITE No. 429007" PREPARED BY THEW ASSOCIATES, DATED 9/7/2011.
6. MONITORING WELL MW-12 INSTALLED ON SEPTEMBER 28, 2011.

0 20' 40'
GRAPHIC SCALE

NATIONAL GRID
FORT PLAIN FORMER MANUFACTURED GAS PLANT SITE
SITE MANAGEMENT PLAN

GROUNDWATER CONTOUR MAP

ARCADIS

FIGURE
4

CITY: SYRACUSE, NY DIV/GROUP:141/ENV DB:MW WLJ BGP KLS NES LD: PIC: PM: TM:M.BENOIT LYR:ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0036698\0000\00009\DWG\SITE_MANAGEMENT\36698G05.dwg LAYOUT: 5 SAVED: 7/30/2012 1:31 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 7/30/2012 1:31 PM BY: DECLERCQ, BRIAN
XREFS: 36698X00 36698X03 36698X04 36698X07 IMAGES: PROJECTNAME: ---

LEGEND:

- PROPERTY LINE
- CHAIN LINK FENCE
- FORMER STRUCTURE
- BOLLARD
- UTILITY POLE
- EXISTING MONITORING WELL/PIEZOMETER LOCATION
- SOIL BORING
- MONITORING WELL THAT CAN NO LONGER BE LOCATED
- ABANDONED MONITORING WELL
- HORIZONTAL LIMITS OF NORTHERN GAS HOLDER REMOVAL
- APPROXIMATE EXTENTS OF SOIL CONTAINING COCs AT CONCENTRATIONS GREATER THAN 6NYCRR PART 375-6 UNRESTRICTED USE SCOs
- LOCATION CONTAINING NAPL AND/OR HEAVY SHEEN
- LOCATION CONTAINING ONE OR MORE COC AT CONCENTRATIONS GREATER THAN 6NYCRR PART 375-6 UNRESTRICTED USE SCOs
- LOCATION THAT DOES NOT CONTAIN COCs AT CONCENTRATIONS GREATER THAN 6NYCRR PART 375-6 UNRESTRICTED USE SCOs
- (4-6) DEPTH OF IMPACTS IN FEET

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. FIGURE DEVELOPED FROM SITE SURVEY ENTITLED "MAP SHOWING POST-CONSTRUCTION TOPOGRAPHIC CONDITIONS FORMER MANUFACTURED GAS PLANT FACILITY SITE No. 429007" PREPARED BY THEW ASSOCIATES, DATED 9/7/2011.
3. SELECT WELLS WERE ABANDONED IN JUNE 2010 PRIOR TO REMEDIAL CONSTRUCTION ACTIVITIES.
4. LOCATIONS WITHOUT COLOR INDICATIONS DID NOT CONTAIN NAPL OR HEAVY SHEENS AND ANALYTICAL SAMPLES WERE NOT COLLECTED.

0 20' 40'
GRAPHIC SCALE

NATIONAL GRID
FORT PLAIN FORMER MANUFACTURED GAS PLANT SITE
SITE MANAGEMENT PLAN

APPROXIMATE EXTENT OF SOIL EXCEEDING UNRESTRICTED USE SCOs

ARCADIS

FIGURE
5

CITY: SYRACUSE, NY DIV/GROUP:141/ENV DB:DMW WLJ BGP KLS NES LD: PIC: PM: TM:M.BENOIT LYR:ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0036698\0001\00009\DWG\SITE_MANAGEMENT\36698G06.dwg LAYOUT: 6 SAVED: 7/30/2012 1:44 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 7/30/2012 2:17 PM BY: DECLERCQ, BRIAN
XREFS: 36698X00 36698X03 36698X04 36698X07 IMAGES: PROJECTNAME: ---

LEGEND:

- PROPERTY LINE
- CHAIN LINK FENCE
- FORMER STRUCTURE
- BOLLARD
- UTILITY POLE
- EXISTING MONITORING WELL LOCATION
- MONITORING WELL THAT CAN NO LONGER BE LOCATED
- HORIZONTAL LIMITS OF NORTHERN GAS HOLDER REMOVAL
- APPROXIMATE EXTENTS OF GROUNDWATER CONTAINING ONE OR MORE COC AT CONCENTRATIONS GREATER THAN TOGS 1.1.1 CLASS GA STANDARDS AND GUIDANCE VALUES
- 5' APPROXIMATE DEPTH TO GROUNDWATER
- LOCATION CONTAINING ONE OR MORE COC AT CONCENTRATIONS GREATER THAN NYSDEC CLASS GA STANDARDS
- LOCATION THAT DOES NOT CONTAIN COCs AT CONCENTRATIONS GREATER THAN NYSDEC CLASS GA STANDARDS

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. FIGURE DEVELOPED FROM SITE SURVEY ENTITLED "MAP SHOWING POST-CONSTRUCTION TOPOGRAPHIC CONDITIONS FORMER MANUFACTURED GAS PLANT FACILITY SITE No. 429007" PREPARED BY THEW ASSOCIATES, DATED 9/7/2011.
3. THE NORTHERN GAS HOLDER WAS REMOVED AND MONITORING WELL MW-4 WAS ABANDONED IN 2010 AS PART OF REMEDIAL CONSTRUCTION ACTIVITIES.
4. FIGURE DEVELOPED BASED ON ANALYTICAL DATA FROM AUGUST 2008 SAMPLING EVENT. MONITORING WELLS MW-6 AND MW-11 WERE NOT SAMPLED AS PART OF THE LONG-TERM GROUNDWATER SAMPLING PROGRAM.
5. MONITORING WELL MW-12 INSTALLED ON SEPTEMBER 28, 2011.

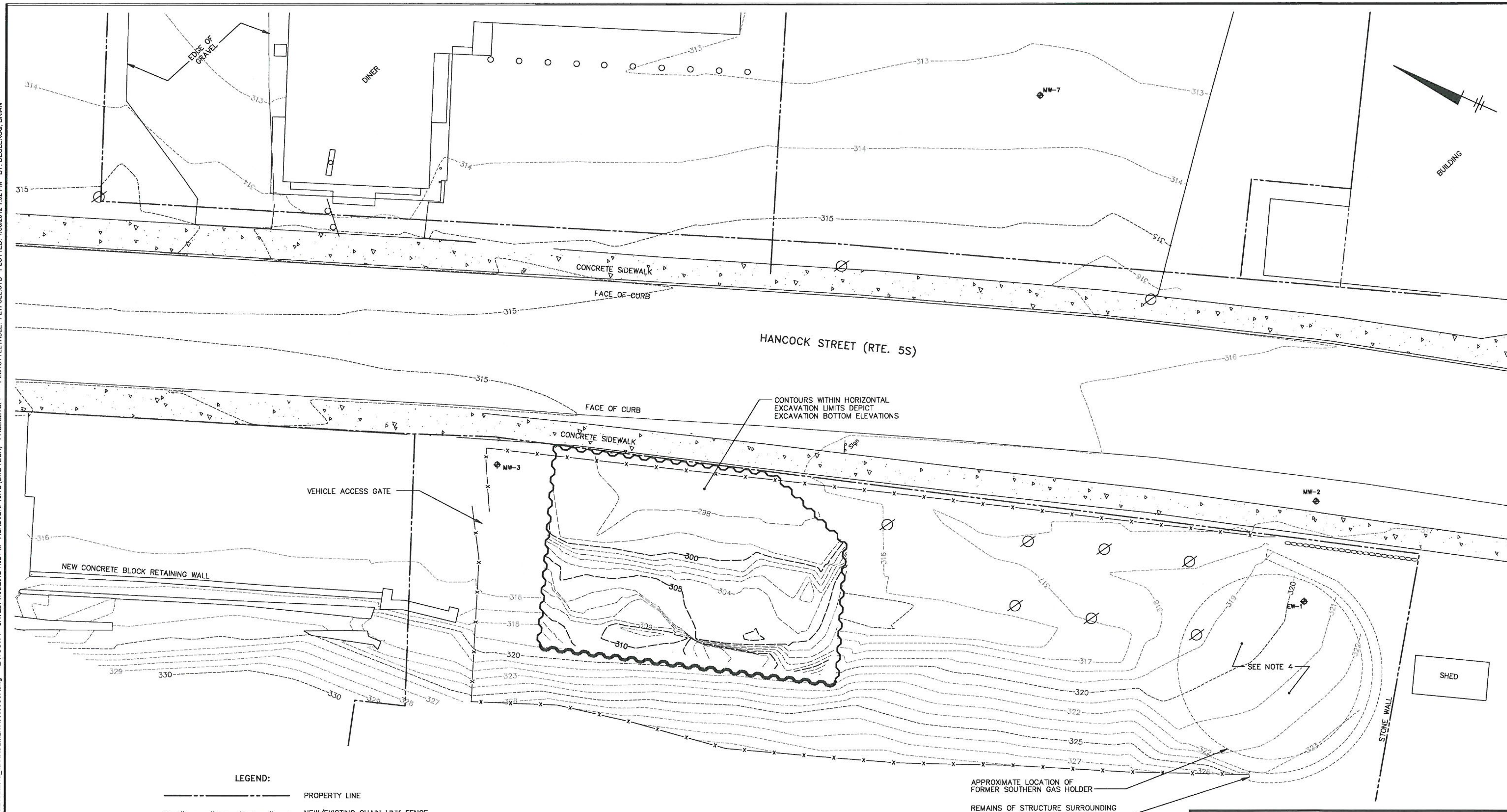
0 20' 40'
GRAPHIC SCALE

NATIONAL GRID
FORT PLAIN FORMER MANUFACTURED GAS PLANT SITE
SITE MANAGEMENT PLAN

APPROXIMATE EXTENT OF GROUNDWATER EXCEEDING CLASS GA STANDARDS

ARCADIS

FIGURE
6



LEGEND:

—— - ——	PROPERTY LINE
—x——x——x—	NEW/EXISTING CHAIN LINK FENCE
- - - 350 - - -	GROUND SURFACE CONTOUR (1' INTERVAL)
- - - - - -	FORMER MGP STRUCTURE
○	BOLLARD
⊘	UTILITY POLE
⊠	MONITORING WELL/EXTRACTION WELL
∿∿∿	HORIZONTAL LIMITS OF NORTHERN GAS HOLDER EXCAVATION (BOLD INDICATES PERMANENT SHEETING)

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. FIGURE DEVELOPED FROM SITE SURVEY ENTITLED "MAP SHOWING POST-CONSTRUCTION TOPOGRAPHIC CONDITIONS FORMER MANUFACTURED GAS PLANT FACILITY SITE No. 429007" PREPARED BY THEW ASSOCIATES, DATED 9/7/2011.
3. EXCAVATION BOTTOM DEVELOPED FROM SITE SURVEY ENTITLED "POST-EXCAVATION TOPOGRAPHIC CONDITIONS, NORTHERN GAS HOLDER AREA, FORMER MGP FACILITY-SITE NO. 429007" PREPARED BY THEW ASSOCIATES, DATED 12/15/2010.
4. PREVIOUSLY EXISTING MATERIAL WITHIN SOUTHERN GAS HOLDER REMOVED TO AN APPROXIMATE ELEVATION OF 315' TO FACILITATE INSTALLATION OF THE SOUTHERN GAS HOLDER COVER SYSTEM.

0 10' 20'
GRAPHIC SCALE

NATIONAL GRID
FORT PLAIN FORMER MANUFACTURED GAS PLANT SITE
SITE MANAGEMENT PLAN

EXCAVATION LIMITS

ARCADIS

FIGURE
7

CITY: SYRACUSE, NY DIV/GROUP:141/ENV DB:DMW WLJ BGP KLS NES LD: PIC: PM: TM:M.BENOIT LYR:ON=*;OFF=*REF* PAGESETUP: — PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 7/30/2012 1:52 PM BY: DECLERCQ, BRIAN
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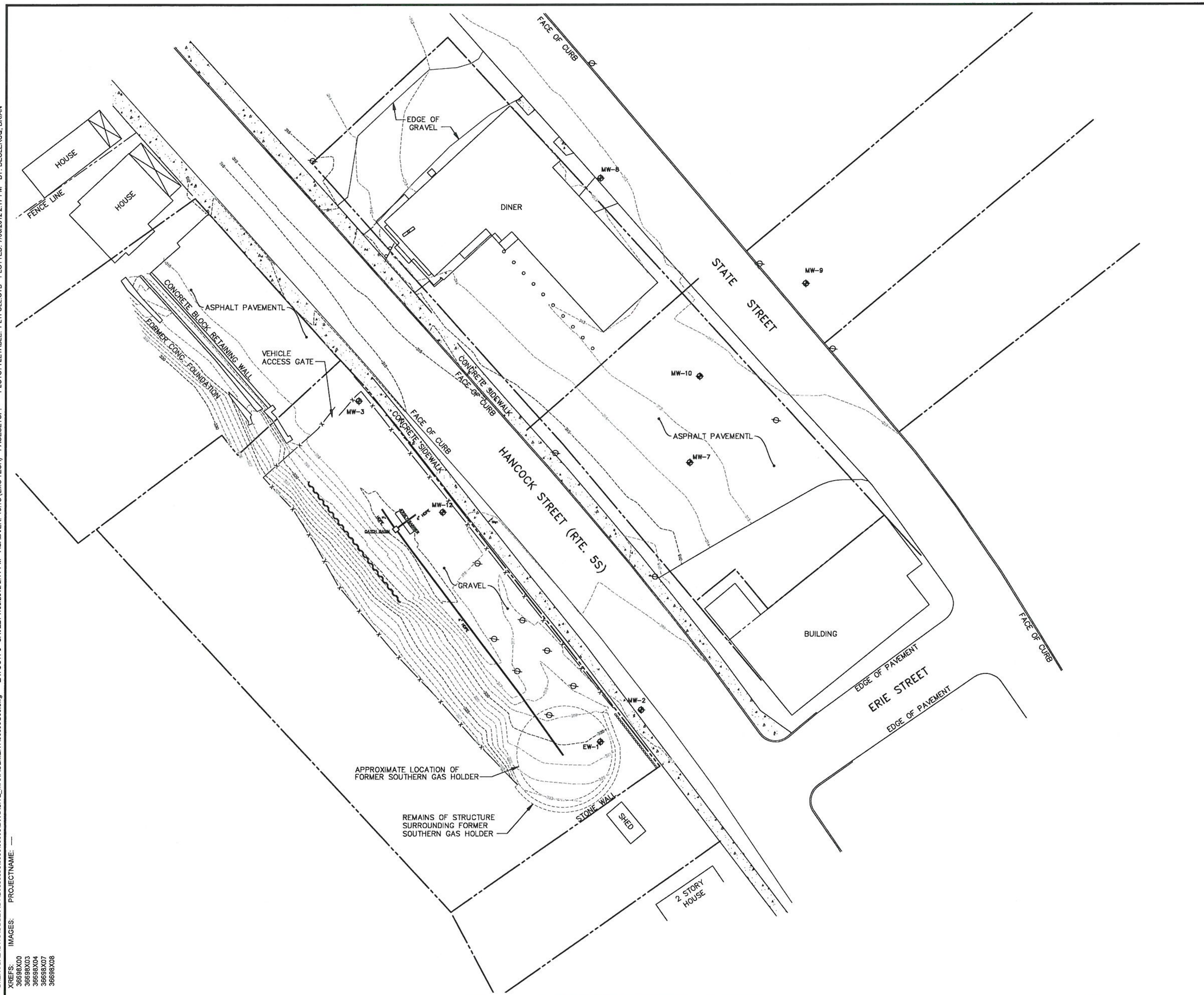
XREFS: 36698X00 36698X03 36698X04 36698X07 36698X08 36698X09 IMAGES: PROJECTNAME: —



CITY: SYRACUSE, NY DIV/GROUP:141/ENV DB:DMW WLJ BGP KLS NES LD: PIC: PM: TM:M.BENOIT LYR:ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0036698\0000\00009\DWG\SITE_MANAGEMENT\36698G08.dwg LAYOUT: 8 SAVED: 7/30/2012 2:11 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 7/30/2012 2:17 PM BY: DECLERCQ, BRIAN
XREFS: 36698X00 36698X03 36698X04 36698X07 36698X08 IMAGES: PROJECTNAME: ---

LEGEND:

- PROPERTY LINE
- NEW/EXISTING CHAIN LINK FENCE
- 350 GROUND SURFACE CONTOUR (1' INTERVAL)
- FORMER STRUCTURE
- BOLLARD
- UTILITY POLE
- MONITORING WELL/EXTRACTION WELL
- HORIZONTAL LIMITS OF REMAINING SHEET PILE

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. FIGURE DEPICTS MONITORING WELLS TO BE SAMPLED AS PART OF THE GROUNDWATER MONITORING PROGRAM AND EXTRACTION WELL EW-1.
3. FIGURE DEVELOPED FROM SITE SURVEY ENTITLED "MAP SHOWING POST-CONSTRUCTION TOPOGRAPHIC CONDITIONS FORMER MANUFACTURED GAS PLANT FACILITY SITE No. 429007" PREPARED BY THEW ASSOCIATES, DATED 9/7/2011.

0 20' 40'
GRAPHIC SCALE

NATIONAL GRID
FORT PLAIN FORMER MANUFACTURED GAS PLANT SITE
SITE MANAGEMENT PLAN

LOCATIONS OF EFFECTIVENESS MONITORING WELLS

ARCADIS

FIGURE
8

LEGEND:

- PROPERTY LINE
- NEW/EXISTING CHAIN LINK FENCE
- GROUND SURFACE CONTOUR (1' INTERVAL)
- FORMER STRUCTURE
- BOLLARD
- UTILITY POLE
- MONITORING WELL/EXTRACTION WELL
- HORIZONTAL LIMITS OF REMAINING SHEETPILE
- APPROXIMATE HORIZONTAL LIMITS OF NEW GRAVEL/STONE SURFACE COVER REQUIRING INSPECTION

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. FIGURE DEVELOPED FROM SITE SURVEY ENTITLED "MAP SHOWING POST-CONSTRUCTION TOPOGRAPHIC CONDITIONS FORMER MANUFACTURED GAS PLANT FACILITY SITE No. 429007" PREPARED BY THEW ASSOCIATES, DATED 9/7/2011.
3. NORTHERN GAS HOLDER BACKFILL CONSISTS OF TYPE C CRUSHED STONE ABOVE ELEVATION 308 FT AND TYPE A CRUSHED STONE BELOW ELEVATION 308 FT, SEPARATED BY WOVEN GEOTEXTILE.

0 20' 40'
GRAPHIC SCALE

NATIONAL GRID
FORT PLAIN FORMER MANUFACTURED GAS PLANT SITE
SITE MANAGEMENT PLAN

LOCATION OF COVER SYSTEM REQUIRING INSPECTION

ARCADIS

FIGURE
9

CITY: SYRACUSE, NY DIV/GROUP:141/ENV DB:DMW WLJ BGP KLS NES LD: PIC: PM: TM:M.BENOIT LYR:ON=*;OFF=*REF*
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XREFS: 36698X00 36698X03 36698X04 36698X07 36698X08 IMAGES: PROJECTNAME: —

ARCADIS

Appendix A

Environmental Easement (to be inserted at a later date)

Appendix B

Historical Analytical Data (1997 – 2003)

Phase I PSA/IRM

Table 11
Soils Analytical Results
Volatile Organic Compounds
NMPC Fort Plain
Jul-97

	Surface Soils						Soil Borings										
	SS-1A	SS-1B	SS-2A	SS-2B	SS-5A	SS-6A	DUPLICATE-1	SB-1A	MW-2A	MW-2B	MW-3A	MW-3B	MW-4A	MW-4B	MW-4C	MW-4D	Soil
Compound (ug/kg)	**0-2"**	0-2'	**0-2"**	0-2'	**0-2"**	**0-2"**	0-2'	0-8'	0-6'	10-12'	8-10'	18-20'	8-10'	12-14'	18-20'	14-16'	**Std.**
Chloromethane	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		NONE
Bromomethane	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		NONE
Vinyl Chloride	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		200
Chloroethane	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		1900
Methylene Chloride	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		100
Acetone	12U	53	12U	17B	120	14	120			97B		20B	22	8600U	1400U		200
Carbon Disulfide	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		2700
1,1-Dichloroethene	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		400
1,1-Dichloroethane	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		200
1,2-Dichloroethene (total)	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		300
Chloroform	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		300
1,2-Dichloroethane	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		100
2-Butanone	12U	18	12U	12U	25	11U	17U			22U		11U	12U	8600U	1400U		300
1,1,1-Trichloroethane	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		800
Carbon Tetrachloride	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		600
Bromodichloromethane	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		NONE
1,2-Dichloropropane	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		NONE
cis-1,3-Dichloropropene	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		300
Trichloroethene	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	27J		700
Dibromochloromethane	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		N/A
1,1,2-Trichloroethane	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		NONE
Benzene	12U	5	12U	12U	11U	11U	75	17	11U	140	12U	11U	83	1800J	6200	24	60
trans-1,3-Dichloropropene	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		N/A
Bromoform	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		NONE
4-Methyl-2-Pentanone	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		1000
2-Hexanone	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		NONE
Tetrachloroethene	12U	15	12U	12U	2J	11U	17U			22U		11U	12U	8600U	1400U		1400
1,1,2,2-Tetrachloroethane	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		600
Toluene	12U	15	12U	12U	11U	11U	4J	12U	11U	22U	12U	11U	18	14000	610J	17	1500
Chlorobenzene	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	8600U	1400U		1700
Ethylbenzene	12U	9	12U	12U	11U	11U	22	16	11U	22U	12U	11U	220	58000	1700	120	5500
Styrene	12U	15	12U	12U	11U	11U	17U			22U		11U	12U	1400	1400U		NONE
Xylene (total)	12U	13	12U	12U	11U	11U	83	11J	11U	22U	12U	11U	110	43000	1200J	87	1200

Shaded areas indicate exceedances of soil cleanup objectives (NYSDEC TAGM January 24, 1994)

Table 12
Soils Analytical Results
Semivolatile Organic Compounds
NMPC Fort Plain
Jul-97

	Surface Soils						Soil Borings									
Compound (ug/kg)	SS-1A 0-2"	SS-1B 0-2'	SS-2A 0-2"	SS-2B 0-2'	SS-5A 0-2"	SS-6A 0-2"	SB-1A 0-8'	MW-2A 0-6'	MW-2B 10-12'	MW-3A 8-10'	MW-3B 18-20'	MW-4A 8-10'	MW-4B 12-14'	MW-4C 18-20'	MW-4D 14-16'	Soil Std
Phenol	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	160J		30/MDL
bis(2-Chloroethyl)ether	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
2-Chlorophenol	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		800
1,3-Dichlorobenzene	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
1,4-Dichlorobenzene	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
1,2-Dichlorobenzene	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
2-Methylphenol	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		1000/MDL
2,2'-oxybis(1-Chloropropane)	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
4-Methylphenol	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		900
N-Nitroso-di-n-propylamine	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
Hexachloroethane	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
Nitrobenzene	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		200/MDL
Isophorone	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		4400
2-Nitrophenol	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		330/MDL
2,4-Dimethylphenol	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	160J		NONE
bis(2-Chloroethoxy)methane	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
2,4-Dichlorophenol	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
1,2,4-Trichlorobenzene	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
Naphthalene	260J	1400J	3600J	7700U	360U	450U	18000	21J	360U	24J	8J	32000	4700	8100	1400J	13000
4-Chloroaniline	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		220/MDL
Hexachlorobutadiene	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
4-Chloro-3-methylphenol	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		240/MDL
2-Methylnaphthalene	110J	400J	3100J	2400J	360U	450U	6600J	360U	360U	420U	380U	14000	1800	2800	410J	36400
Hexachlorocyclopentadiene	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
2,4,6-Trichlorophenol	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
2,4,5-Trichlorophenol	4200U	21000U	19000U	19000U	910U	1100U			910U		950U	11000U	2000U	3900		100
2-Chloronaphthalene	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
2-Nitroaniline	4200U	2100U	19000U	19000U	910U	1100U			910U		950U	11000U	2000	3900		430/MDL
Dimethylphthalate	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		7100
Acenaphthylene	1200J	3400J	180J	270J	12J	11J	8100J	34J	360U	6J	380U	1400J	240J	2500	4000J	41000
2,6-Dinitrotoluene	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		1000
3-Nitroaniline	4200U	21000U	19000U	19000U	910U	1100U			910U		950U	11000U	2000	3900		500/MDL
Acenaphthene	170J	10000	9500	8900	360U	450U	26000	22J	360U	420U	380U	13000	1600	4500	13000	50000
2,4-Dinitrophenol	4200U	21000U	19000U	19000U	910U	1100U			910U		950U	11000U	2000	3900		200/MDL
4-Nitrophenol	4200U	21000U	19000U	19000U	910U	1100U			910U		950U	11000U	2000	3900		100/MDL
Dibenzofuran	54J	400J	6300J	6000J	360U	450U			360U		380U	860J	100J	170J		6200
2,4-Dinitrotoluene	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
Diethylphthalate	1700U	8400U	7500U	7700U	7JB	15JB			360U		15JB	4300U	780U	1600U		7100
4-Chlorophenyl-phenylether	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
Fluorene	180J	7700J	9200	8500	360U	450U	23000	33J	360U	420U	380U	7500	1000	4500	9900	50000
4-Nitroaniline	4200U	21000U	19000U	19000U	910U	1100U			910U		950U	11000U	2000	3900		NONE
4,6-Dinitro-2-methylphenol	4200U	21000U	19000U	19000U	910U	1100U			910U		950U	11000U	2000	3900		NONE
N-Nitrosodiphenylamine (1)	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
4-Bromophenyl-phenylether	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
Hexachlorobenzene	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
Pentachlorophenol	4200U	21000U	19000U	19000U	910U	59J			910U		950U	11000U	2000	3900		410
Phenanthrene	2400	23000	45000	44000	84J	51J	80000	230J	17J	20J	29J	20000	2800	8900	30000	1000/MDL
Anthracene	440J	4900J	15000	14000	10J	49J	26000	35J	4J	5J	6J	6300	780	2600	5900J	50000
Carbazole	160J	380J	8600	8500	8J	11J			360U		380U	170	20J	84J		NONE
Di-n-butylphthalate	30JB	8400U	7500U	7700U	10JB	16JB			20JB		15JB	4300U	780U	1600U		8100
Fluoranthene	4700	34000	47000	45000	120J	92J	59000	200J	18J	21J	20J	8900	1400	4500	38000	50000
Pyrene	8900	55000	41000	38000	110J	250J	84000	260J	25J	29J	30J	13000	2100	6000	49000	50000
Butylbenzylphthalate	56J	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		50000
3,3'-Dichlorobenzidine	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		NONE
Benzo(a)anthracene	2700	17000	25000	22000	42J	35J	19000	70J	360U	14J	14J	5700	970	2000	14000	224/MDL
Chrysene	3600	20000	23000	21000	67J	71J	21000	91J	360U	15J	14J	5300J	900	1800	16000	400
bis(2-Ethylhexyl)phthalate	540JB	8400U	7500U	7700U	24JB	34JB			21JB		17JB	4300U	180JB	33JB		50000
Di-n-octylphthalate	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	27J	1600U		50000
Benzo(b)fluoranthene	4100	15000	19000	17000	63J	68J	11000J	62J	360U	9J	10J	2100J	370J	880J	12000	1100
Benzo(k)fluoranthene	3600	20000	17000	16000	76J	68J	21000	94J	360U	13J	11J	3800J	700J	1800	16000	1100
Benzo(a)pyrene	4200	20000	19000	17000	45J	100	21000	54J	360U	8J	9J	4000J	660J	1600	20000	61/MDL
Indeno(1,2,3-cd)pyrene	2500	13000	9700	9200	35J	81J	13000J	60J	360U	420U	380U	2000J	320J	850J	11000	3200
Dibenz(a,h)anthracene	1700U	8400U	7500U	7700U	360U	450U			360U		380U	4300U	780U	1600U		14/MDL
Benzo(g,h,i)perylene	1500J	5100J	5000J	5900J	90J	130J	7600J	49J	360U	420U	380U	1100J	250J	470J	8900	50000

Shaded areas indicate exceedances of soil cleanup objectives (NYSDEC TAGM January 24, 1994)
MDL: Method detection limit

41.3 251.4
mg/kg

444.3
ug/kg

64 µg/kg

37.1
mg/kg

PAHs ~ 52.6 mg/kg

Stearns Wheler
70184AA

Phase II PSA/IRM

Table 1
Soils Analytical Results
Volatile Organic Compounds
NMPC Fort Plain
May-99

	Sample ID & Depth												Soil clean up goal
	Holder	Near North Holder				Across Hancock Street							
	SB-2-99	SB-3-99	SB-4-99	SB-5-99	SB-6-99	SB-7-99	SB-8-99	SB-9-99	SB-10-99	SB-10A-99	SB-11-99	SB-12-99	
Compound (ug/kg)	5-6'	8-12'	6-7'	8-9'	7-9'	15-21'	22-26'	16-19'	24-27'	24-25'	24-24'	24-27	ug/kg
Chloromethane	U	U	U	U	U	U	U	U	U	U	U	U	NONE
Bromomethane	U	U	U	U	U	U	U	U	U	U	U	U	NONE
Vinyl Chloride	U	U	U	U	U	U	U	U	U	U	U	U	200
Chloroethane	U	U	U	U	U	U	U	U	U	U	U	U	1900
Methylene Chloride	**210J**	.9J	U	.8J	U	.7J	1JB	1JB	2JB	**1200J**	1JB	1JB	100
Acetone	**2200JB**	33	**940JB**	21	**690JB**	23	54B	51B	26B	**7000B**	180B	160B	200
Carbon Disulfide	U	.4J	93J	1J	U	.4J	2JB	.7JB	1JB	U	2JB	2JB	2700
1,1-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U	U	400
1,1-Dichloroethane	U	U	U	U	U	U	U	U	U	U	U	U	200
1,2-Dichloroethene (total)	U	U	U	U	U	U	U	U	U	U	U	U	300
Chloroform	U	U	U	U	U	.4J	U	U	U	U	U	U	300
1,2-Dichloroethane	U	U	U	U	U	U	5J	U	U	U	U	U	100
2-Butanone	**2200JB**	6J	**1000JB**	U	**950JB**	4J	9JB	6JB	5JB	**7100B**	17B	20B	300
1,1,1-Trichloroethane	U	U	U	U	U	.4J	U	U	U	U	U	U	800
Carbon Tetrachloride	U	U	U	U	U	U	U	U	U	U	U	U	600
Bromodichloromethane	U	U	U	U	U	U	U	U	U	U	U	U	NONE
1,2-Dichloropropane	U	U	U	U	U	U	U	U	U	U	U	U	NONE
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U	U	U	300
Trichloroethene	U	U	120J	U	U	U	U	U	U	U	U	U	700
Dibromochloromethane	U	U	U	U	U	U	U	U	U	U	U	U	N/A
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U	U	U	U	U	NONE
Benzene	**9000**	5J	U	54	**2000**	.2J	**88**	.7JB	9J	**1700J**	U	2J	60
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U	U	U	N/A
Bromoform	U	U	U	U	U	U	U	U	U	U	U	U	NONE
4-Methyl-2-Pentanone	U	U	U	U	U	U	U	U	U	U	1JB	U	1000
2-Hexanone	U	U	U	U	U	U	U	U	U	U	U	U	NONE
Tetrachloroethene	U	U	250J	U	U	U	3J	2J	.5J	U	17	10J	1400
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U	U	U	U	600
Toluene	**28000**	1J	230J	2J	**9000**	.8J	2J	1J	2J	**4000J**	.9J	1JB	1500
Chlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U	1700
Ethylbenzene	**54000**	U	U	14	**16000**	2J	40	U	14	**75000**	U	U	5500
Styrene	1000J	U	U	U	4200	U	U	U	U	670J	1J	U	NONE
Xylene (total)	**47000**	U	U	18	**17000**	2J	150	2J	14	**58000**	U	U	1200

Concentrations in bold face indicate exceedances of soil cleanup objectives (NYSDEC TAGM January 24, 1994)
See attached definitions of letter qualifiers

Table 2
Soils Analytical Results
TCL Semivolatile Organic Compounds
NMPC Fort Plain
May-99

	Sample ID & Depth												**Soil clean up goal**
	Holder	**Near North Holder**				**Across Hancock Street**							
	SB-2-99 5-6'	**SB-3-99 8-12'**	**SB-4-99 6-7'**	**SB-5-99 8-9'**	**SB-6-99 7-9'**	**SB-7-99 15-21'**	**SB-8-99 22-26'**	**SB-9-99 16-19'**	**SB-10-99 24-27'**	**SB-10A-99 24-25'**	**SB-11-99 24-24'**	**SB-12-99 24-27**	
Compound (ug/kg)													**ug/kg**
Phenol	25J	U	U	17J	**260J**	U	4J	U	U	U	U	U	30/MDL
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U	U	U	U	U	U	NONE
2-Chlorophenol	U	U	U	U	U	U	U	U	U	U	U	U	800
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U	NONE
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U	NONE
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U	NONE
2-Methylphenol	U	U	U	U	190J	U	U	U	U	U	U	U	1000/MDL
2,2'-oxybis(1-Chloropropane)	U	U	U	U	U	U	U	U	U	U	U	U	NONE
4-Methylphenol	7J	U	U	U	300J	U	U	U	U	U	U	U	900
N-Nitroso-di-n-propylamine	U	U	U	U	U	U	U	U	U	U	U	U	NONE
Hexachloroethane	U	U	U	U	U	U	U	U	U	U	U	U	NONE
Nitrobenzene	U	U	U	U	U	U	U	U	U	U	U	U	200/MDL
Isophorone	U	U	U	U	U	U	U	U	U	U	U	U	4400
2-Nitrophenol	U	U	U	U	U	U	U	U	U	U	U	U	330/MDL
2,4-Dimethylphenol	U	U	U	U	340J	U	U	U	U	U	U	U	NONE
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U	U	U	U	U	U	NONE
2,4-Dichlorophenol	U	U	U	U	U	U	U	U	U	U	U	U	NONE
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U	NONE
Naphthalene	2200	220J	3800J	2200	**150000E**	6J	4J	7J	4500	**300000**	16J	31J	13000
4-Chloroaniline	U	U	U	U	U	U	U	U	U	U	U	U	220/MDL
Hexachlorobutadiene	U	U	U	U	U	U	U	U	U	U	U	U	NONE
4-Chloro-3-methylphenol	U	U	U	U	U	U	U	U	U	U	U	U	240/MDL
2-Methylnaphthalene	390	75J	1100J	100J	**57000**	U	8J	U	470J	**150000**	U	8J	36400
Hexachlorocyclopentadiene	U	U	U	U	U	U	U	U	U	U	U	U	NONE
2,4,6-Trichlorophenol	U	U	U	U	U	U	U	U	U	U	U	U	NONE
2,4,5-Trichlorophenol	U	U	U	U	U	U	U	U	U	U	U	U	100
2-Chloronaphthalene	U	U	U	U	U	U	U	U	U	U	U	U	NONE
2-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U	430/MDL
Dimethylphthalate	U	U	U	U	U	U	U	U	U	U	U	U	7100
Acenaphthylene	20J	630J	9300J	630	11000	4J	U	U	570J	**12000J**	U	U	41000
2,6-Dinitrotoluene	U	U	U	U	U	U	U	U	U	U	U	U	1000
3-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U	500/MDL
Acenaphthene	150J	1500	11000J	610	45000	U	U	10J	4000	**120000**	11J	U	50000
2,4-Dinitrophenol	U	U	U	U	U	U	U	U	U	U	U	U	200/MDL

Concentrations in bold face indicate exceedances of soil cleanup objectives (NYSDEC TAGM January 24, 1994)
MDL: Method detection limit

Table 2 cont
Soils Analytical Results
TCL Semivolatile Organic Compounds
NMPC Fort Plain
May-99

	Sample ID & Depth												Soil clean up goal
	Holder	Near North Holder				Across Hancock Street							
Compound (ug/kg)	SB-2-99 5-6'	SB-3-99 8-12'	SB-4-99 6-7'	SB-5-99 8-9'	SB-6-99 7-9'	SB-7-99 15-21'	SB-8-99 22-26'	SB-9-99 16-19'	SB-10-99 24-27'	SB-10A-99 24-25'	SB-11-99 24-24'	SB-12-99 24-27	(ug/kg)
4-Nitrophenol	U	U	U	U	U	U	U	U	U	U	U	U	100/MDL
Dibenzofuran	7J	36J	U	37J	2400J	U	U	U	160J	5700J	U	U	6200
2,4-Dinitrotoluene	U	U	U	U	U	U	U	U	U	U	U	U	NONE
Diethylphthalate	6JB	U	U	U	U	7JB	11JB	9JB	U	U	7JB	8JB	7100
4-Chlorophenyl-phenylether	U	U	U	U	U	U	U	U	U	U	U	U	NONE
Fluorene	59J	2000	21000J	530	20000	5J	5J	8J	1400J	**55000**	10J	5J	50000
4-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U	NONE
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U	U	U	U	U	U	NONE
N-Nitrosodiphenylamine (1)	U	U	U	U	U	U	U	U	U	U	U	U	NONE
4-Bromophenyl-phenylether	U	U	U	U	U	U	U	U	U	U	U	U	NONE
Hexachlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U	NONE
Pentachlorophenol	U	U	U	U	U	U	U	U	U	U	U	U	410
Phenanthrene	170JB	**5000B**	**130000B**	**2000B**	**69000EB**	69JB	10J	20J	**8700**	**190000**	32J	8J	1000/MDL
Anthracene	41J	1800	32000J	550	20000	8J	U	5J	3100	**63000**	6J	U	50000
Carbazole	4J	U	U	32J	620J	U	U	U	U	580J	U	U	NONE
Di-n-butylphthalate	18JB	U	U	17JB	U	20JB	25JB	23JB	U	U	25JB	22JB	8100
Fluoranthene	89JB	5200B	**160000B**	1700B	26000B	80JB	8J	10J	6600	**86000**	18J	U	50000
Pyrene	110JB	6500B	**210000B**	2800B	**50000B**	110JB	10J	14J	10000	**110000**	35J	5J	50000
Butylbenzylphthalate	U	U	U	U	U	U	U	6J	U	U	U	U	50000
3,3'-Dichlorobenzidine	U	U	U	U	U	U	U	U	U	U	U	U	NONE
Benzo(a)anthracene	42JB	**1900B**	**6800B**	**710B**	**22000B**	30JB	U	8J	**7100**	**62000**	11J	U	224/MDL
Chrysene	46JB	**1800B**	**6900B**	**780B**	**20000B**	28JB	6J	12J	**6800**	**59000**	12J	6J	400
bis(2-Ethylhexyl)phthalate	14JB	U	U	21JB	U	52JB	20JB	18JB	U	U	72JB	35JB	50000
Di-n-octylphthalate	5JB	U	U	24JB	U	57JB	19J	6J	U	U	U	4JB	50000
Benzo(b)fluoranthene	37JB	**1400JB**	**43000B**	570B	**8100B**	24JB	6J	7J	**3500**	**27000J**	U	U	1100
Benzo(k)fluoranthene	41JB	**1600B**	**57000B**	790B	**14000B**	27JB	U	U	**3400**	**36000J**	U	U	1100
Benzo(a)pyrene	49JB	**2300B**	**82000B**	**1300B**	**20000B**	24JB	U	5J	**6300**	**57000**	17J	U	61/MDL
Indeno(1,2,3-cd)pyrene	30J	1400JB	**43000**	1100	**8800**	23J	U	U	2300	**24000J**	U	U	3200
Dibenz(a,h)anthracene	9J	**380J**	**9100J**	**250J**	**4300J**	U	U	U	**1500J**	**13000J**	U	U	14/MDL
Benzo(g,h,i)perylene	36J	1600	51000	2900	11000	37J	72J	U	2100	27000J	71J	U	50000

Concentrations in bold face indicate exceedances of soil cleanup objectives (NYSDEC TAGM January 24, 1994)
MDL: Method detection limit

35.3 mg/kg 855 mg/kg 0.61 0.21 mg/kg 1,397 mg/kg .343

Stearns Wheler
80182FA

Phase III PSA/IRM

Table 3
PAH LEVELS (LABORATORY ANALYSIS)
Subsurface Soils
Phase III Preliminary Site Assessment/Interim Remedial Measures Study
NMPC Fort Plain
Fort Plain, New York
June & July 2001

Concentrations in micrograms per kilogram (ppb)

Compound	NYSDEC Soil Cleanup Objectives *	SB-26A 4-6 ft	SB-26B 10-11 ft	SB-26C 15-15.5 ft	SB-27A 0-2 ft	SB-27B 2-4 ft	SB-27C 4-6 ft	Duplicate: SB-27D 4-6 ft	SB-27E 6-8 ft	SB-27F 8-10 ft	SB-28A 2-4 ft
Naphthalene	13000	140 J	7 J	8 J	1300 J	340 J	3300 J	2700	5200	5700	1100
2-Methylnaphthalene	36400	33 J	U	U	620 J	96 J	1600 J	1100 J	2000 J	860	94 J
Acenaphthylene	41000	520 J	U	U	12000	440 J	1300 J	620 J	920 J	200 J	290 J
Acenaphthene	50000	1100	U	U	400 J	6800	11000	5400	7500	1200	770
Fluorene	50000	760	U	U	240 J	1900	4500	220	2500 J	470 J	140 J
Phenanthrene	50000	3900	12 J	7 J	3000 J	3700	20000	10000	15000	2700	190 J
Anthracene	50000	480 J	U	U	1800 J	800 J	5000	2700	4200	850	230 J
Fluoranthene	50000	4100	9 J	U	12000	2700	10000	6000	8400	2400	450
Pyrene	50000	4600	12 J	6 J	25000	2800	13000	7700	9700	2800	700
Benzo(a)anthracene	224	1300	4 J	U	4600 J	650 J	3200 J	1700	2500 J	820	430
Chrysene	400	1100	7 J	U	8000 J	640 J	2900 J	1600	2300 J	750	1000
Benzo(b)fluoranthene	1100	660 J	U	U	9500	440 J	1500 J	770 J	1400 J	440 J	560
Benzo(k)fluoranthene	1100	810	U	U	7900 J	500 J	2000 J	1000 J	1500 J	450 J	570
Benzo(a)pyrene	50000	1200	U	U	17000	850 J	3000 J	1600	2500 J	790	900
Indeno(1,2,3-cd)pyrene	3200	520 J	U	U	17000	460 J	1500 J	600 J	1200 J	310 J	880
Dibenzo(a,h)anthracene	14	130 J	U	U	3400 J	100 J	340 J	220 J	250 J	73 J	170 J
Benzo(g,h,i)perylene	50000	730	5 J	U	41000	780 J	2500 J	1500 J	1800 J	460 J	1800
SUM of PAHs (ppb)		22,083	56	22	164,360	24,016	86,640	45,730	70,270	21,303	10,254
TOTAL PAHs by Immunoassay (ppb)		142,000	<20,000	<20,000	>500,000	86,400	324,000	364,000	372,000	272,000	<20,000

Notes:
* NYSDEC, 1998
U = Indicates that specified compound was analyzed for but was not detected above the method detection limit.
J = Indicates that the specified compound was analyzed for and was determined to be present in the sample, however, the concentration listed is an estimated value, which is less than the specified minimum detection limit, but greater than zero.
B = Indicates that the analyte was detected in the QC method blank.

Remedial Investigation

Table 5-1. Semivolatile Organic Compounds, Subsurface Soils. Niagara Mohawk Fort Plain Former MGP Site SRI (June 2003).

Concentrations in micrograms per kilogram (ppb)

Compound **	NYSDEC Soil Cleanup Objectives *	B-31 12-14 FT	B-32 24-26 FT	B-33 20-22 FT	B-34 4-6 FT	B-35 13-15 FT	B-36 2-4 FT	B-37 12-14 FT	B-38 22-24 FT
2-Methylphenol	100	U	U	U	U	U	230 J	U	U
4-Methylphenol	900	U	U	U	U	U	270 J	U	U
2,4-Dimethylphenol		U	U	U	U	U	500	U	U
4-Chloroaniline	220	U	U	U	U	U	600	U	U
Bis(2-ethylhexyl)phthalate	50,000	56 J	66 J	U	42 J	U	240 J	U	U
Dibenzofuran	6,200	U	86 J	1,400 J	U	U	16	U	U
Naphthalene	13,000	U	1,400	5,800 J	U	U	2,000	***86,000***	U
2-Methylnaphthalene	36,400	U	900	2,700 J	U	U	160 J	16,000 J	U
Acenaphthylene	41,000	U	200 J	3,300 J	24 J	U	350 J	9,500 J	U
Acenaphthene	50,000	U	1,300	18,000	35 J	U	240 J	6,600 J	U
Fluorene	50,000	U	720	15,000	24 J	U	47 J	8,700 J	U
Phenanthrene	50,000	U	2,500	39,000	35 J	U	140 J	25,000	U
Anthracene	50,000	U	850	14,000	23 J	U	38 J	7,600 J	U
Fluoranthene	50,000	U	1,100	17,000	63 J	U	78 J	13,000 J	U
Pyrene	50,000	32 J	1,500	31,000	89 J	U	98 J	18,000 J	U
Benzo(a)anthracene	224	18 J	950	***21,000***	80 J	U	69 J	***7,900*** J	U
Chrysene	400	U	***1,000***	***19,000***	95 J	U	85 J	***7,100*** J	U
Benzo(b)fluoranthene	1,100	U	410	***5,400***	73 J	U	58 J	***3,300*** J	U
Benzo(k)fluoranthene	1,100	U	490	***9,800***	96 J	U	78 J	***4,700*** J	U
Benzo(a)pyrene	50,000	34 J	830	14,000	85 J	U	100 J	7,000 J	U
Indeno(1,2,3-cd)pyrene	3,200	U	180 J	***6,700***	34 J	U	46 J	2,900 J	U
Dibenzo(a,h)anthracene	14	U	***140*** J	***5,800***	U	U	***30*** J	***1,900*** J	U
Benzo(g,h,i)perylene	50,000	U	180 J	8,100	35 J	U	76 J	3,600 J	U
TOTAL PAHS		84	14,650	235,600	791	U	3,693	228,800	U
TOTAL SVOCS		140	14,802	237,000	833	U	5,549	228,800	U

Notes:

* TAGM 4046

U = Indicates that specified compound was analyzed for but was not detected above the method detection limit.

J = Indicates that the specified compound was analyzed for and was determined to be present in the sample, however, the concentration listed is an estimated value, which is less than the specified minimum detection limit, but greater than zero.

B = Indicates that the analyte was detected in the QC method blank.

PAHs are italicized.

BOLD ITALICS indicates detection above NYSDEC Soil Cleanup Objective

** Analysis was completed for the full list of Method 8270. If a compound is not listed, it was not detected in any sample.

Appendix C

Soil Vapor Evaluation Report
(ARCADIS, 2006)

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Transmitted Via Hand Delivery

May 26, 2006

Mr. John Helmeset, P.E.
New York State Department of Environmental Conservation
Remedial Bureau C
Division of Environmental Remediation
625 Broadway
Albany, New York 12233-7017

Re: National Grid, Fort Plain Former MGP Site
Fort Plain, New York
Soil Vapor Evaluation Report
NYSDEC Site #4-29-007
BBL Project #: 36675

Dear Mr. Helmeset:

On behalf of National Grid, this letter report summarizes the work activities completed and presents the data collected during the soil vapor sampling conducted at the Fort Plain former Manufactured Gas Plant (MGP) site located in Fort Plain, New York. The soil vapor sampling was conducted from March 1, 2006 through March 3, 2006 in accordance with New York State Department of Environmental Conservation- (NYSDEC-) approved *Soil Vapor Evaluation Work Plan* (Work Plan), dated January 17, 2006.

The objectives of the soil vapor sampling activities were to:

- evaluate the presence/absence of MGP-related soil vapors on the former MGP parcel in the area possessing the highest known concentrations of MGP-related residuals;
- evaluate the presence/absence of MGP-related soil vapors adjacent to the boundaries of the former MGP parcel; and
- evaluate the presence/absence of MGP-related soil vapors at the parcel used as a commercial business (restaurant) east of Hancock Street and east of the former MGP parcel in an area known to possess hydrocarbons.

Previously collected site investigation information (e.g., laboratory analytical data, soil boring logs, field notes) was used to select the soil vapor sampling locations. Data from MW-4, SB-4-99, and SB-3-99 suggested that soils located adjacent to the northeast and south of the former northern gas holder appeared to possess the highest levels of hydrocarbons at the former MGP parcel; sheens, soil staining, and nonaqeuous phase liquid (NAPL) had been reported in this area. The data also indicated that these

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hydrocarbons existed from approximately 2 to 16 feet below ground surface (bgs). As presented in the Work Plan, the greatest potential for the presence of soil vapors was expected to exist in unsaturated areas where NAPL, sheens, and staining existed, and in areas where high levels of dissolved constituents existed in groundwater. Soil vapor points SG-3 and SG-5 were installed in these areas. In addition to collecting soil vapor samples from the areas with the highest known hydrocarbons, soil vapor samples SG-1, SG-2, SG-4, SG-6, and SG-7 were collected along the MGP parcel down- and cross-gradient boundaries.

Existing information was also reviewed to identify the area possessing the highest relative concentrations of hydrocarbons at the restaurant parcel. The area in the vicinity of SB-14-1 was selected because review of logs from soil borings installed on the restaurant parcel indicated:

- subsurface soils in this area possessed the highest volatile organic compounds (VOCs), as measured by a field photoionization detector (PID);
- sheens and/or staining of soils was noted from 18 to 21 feet bgs in this area (i.e., at or below the groundwater); and
- petroleum-like odors were noted from 15 to 18 feet bgs in this area (i.e., at or above the groundwater table).

Based on this, three soil vapor samples (SG-8, SG-9, and SG-10) were collected in the vicinity of SB-14-1. These three sampling points were installed as nested soil vapor sampling probes (i.e., soil vapors collected from three vertical intervals) to evaluate the vertical distribution of vapors in the subsurface. The three sampling locations were located within close horizontal proximity to each other.

SOIL VAPOR SAMPLING ACTIVITIES

On March 1 and March 3, 2006, Blasland, Bouck & Lee, Inc. (BBL) collected one round of soil vapor samples from 10 locations: seven from the former MGP parcel and three from the restaurant parcel. The sampling locations are shown on Figure 1.

Prior to installation, monitoring wells MW-4 and MW-10 were gauged to determine the depth to groundwater. Monitoring well MW-4 is located on the former MGP parcel in the vicinity of soil vapor sampling locations SG-1 through SG-6. Monitoring well MW-10 is located on the restaurant parcel in the vicinity of SG-8, SG-9, and SG-10. The depths to groundwater at these locations were 7.9 and 18.9 feet bgs, respectively. The groundwater level measurements, as well as with other observations were recorded on the Soil Gas Sample Collection Logs, included in Attachment A.

Based upon the depth to groundwater and the geology in the area of the former MGP parcel, vapor sampling points SG-1, SG-2, SG-3, SG-4, SG-5, SG-6, and SG-7 were installed and soil vapor samples were collected at depths of 3 to 4 feet bgs. Previous investigations indicated that fill materials extend to depths ranging from 6 to 16 feet bgs on the former MGP parcel. The fill includes a variety of materials, including brick, concrete, well-graded to silty gravel, well-sorted to silty sand with gravel, and silts (*Remedial Investigation Report*, October 2003). Below the fill layer, native clay and silt exists at between 13 to 18 feet bgs.

Based upon the depth to groundwater in the area of the restaurant parcel, nested vapor monitoring points SG-8, SG-9, and SG-10 were installed in the unsaturated zone such that samples were collected at depths of approximately 3, 9, and 14 feet bgs, respectively. The sequence of fill underlain by native silt and clay, similar to the former MGP parcel also exists on the restaurant parcel, with the depths to the native silt and clay contact generally becoming deeper further to the northeast. Based on information obtained from previous investigation reports for the Fort Plain site, Sanborn maps, and conversations with the former Fort Plain historian (Ms. Sandra Cronkite), the former Erie Canal is believed to have been located on the east side of Hancock Street, where the restaurant and parking area currently exist (i.e., where SG-8, SG-9, and SG-10 were installed). The canal was filled in between 1912 to 1919. Fill in this area includes cinders, construction debris, concrete, well-graded to silty gravel, well-sorted to silty sand with gravel, clay, and silts. According to the *Preliminary Site Assessment/Interim Remedial Measures Report*, (February 1998), a repair shop, welding shop, and machine shop were located in the area of the restaurant. In 1935, the repair shop, welding shop, and machine shop had been removed, and an auto repair shop was present. By 1952, the auto repair shop had been converted to a laundry.

In addition to the subsurface soil vapor samples, one outdoor ambient air sample was collected per day (total of two ambient air samples) to characterize site-specific ambient (i.e., background) outdoor air conditions. The two ambient air samples (Ambient 1 and Ambient 2) were collected concurrently with the subsurface soil vapor samples. Ambient 1 was collected north of the fence located at the northern end of the former MGP parcel, west of Hancock Street. This location was upwind of soil vapor sampling location SG-1. Ambient 2 was collected at a location near the southwestern corner of the restaurant building, in the vicinity of soil vapor sampling locations SG-8, SG-9, and SG-10. The ambient air samples were collected to evaluate outdoor background concentrations of the compounds included on the project target analyte list (*Soil Vapor Evaluation Work Plan, Attachment D*; BBL, 2006). The ambient air samples were collected from approximately 3 to 5 feet above ground surface.

Each soil vapor monitoring point consisted of a 1¼-inch-diameter steel drive rod affixed with an expendable point holder and expendable point at the downhole end. The monitoring point was installed using a Power Probe® direct push rig. Laboratory grade ¼-inch-inside diameter polyethylene tubing was used to connect each sampling point to a laboratory certified clean 1 liter SUMMA canister. A twist-to-lock connector was attached to one end of the sample collection tubing. The twist-to-lock connector and attached tubing were lowered through the drive rod, and the twist-to-lock connector was threaded into the expendable point holder. A hydrated bentonite mix was used to seal the borehole at each location to mitigate the potential for short-circuiting to the surface.

Prior to collecting a soil vapor sample, the sampling point and tubing were purged (one to three volumes) using a portable vacuum pump. Approximate purge volumes were recorded on the Soil Gas Sample Collection Logs (Attachment A).

The flow controller/regulator on each SUMMA canister, as well as the vacuum in the canister, was used to collect an air sample directly from the subsurface stainless steel sampling point. A duplicate sample was collected from vapor sampling point SG-3, using a stainless steel "Tee" fitting. The soil vapor samples were collected over a 2-hour time period. The collected air samples were sent to Severn Trent Laboratories, Inc. located in Knoxville, Tennessee for analysis of the project compound list organics by United States Environmental Protection Agency (USEPA) Method TO-15.

A helium tracer gas was used to verify the integrity of the soil vapor probe seal. An inverted plastic bucket was used as an enclosure to keep the tracer gas in contact with the probe seal, as described in the

New York State Department of Health's (NYSDOH's) draft guidance document. A portable monitoring instrument was used at each vapor sampling point to monitor the concentration of helium before, during purging, and after the soil gas sample was collected to verify the integrity of the probe seal.

After completion of the vapor sampling activities, a post-sampling ground survey was conducted by National Grid to document the vapor sampling locations. The sampling locations are shown on Figure 1.

RESULTS

The concentrations of the detected soil vapor VOCs are summarized in Table 1. The target analyte list included analysis for 41 volatile organics, nine n-alkanes, isopropyl benzene, and nine compounds reported as tentatively identified compounds (TICs) (*Soil Vapor Evaluation Work Plan, Attachment D*; BBL, 2006). Only compounds with detected concentrations are reported in the table (i.e., compounds that were analyzed for, but not detected, are not shown in the table). For discussion purposes, the analytical results collected from both the former MGP parcel and the restaurant parcel are compared to generic screening values presented in *USEPA's Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (OSWER, November 2002). This draft guidance is used as a screening tool to evaluate if detected vapors pose an unacceptable risk to human health. An evaluation whether a complete vapor intrusion exposure pathway exists has not been conducted. Based on the assumption that the former MGP parcel and the restaurant parcel will remain commercial/industrial, a risk factor of 1×10^{-4} was used, and the screening values were obtained from Table 2a of the draft guidance document. The results for the samples collected from vapor monitoring points SG-1 through SG-9 were compared to the Shallow Soil Vapor Screening Values obtained from the table. The results for the sample collected from SG-10 were compared to the Deep Soil Vapor Screening Values because the sample was collected at 14 feet bgs (soil located 10 feet bgs or deeper is considered deep soil by the guidance document).

For further discussion, the analytical results were also compared to the NYSDOH Sub-Slab Action Levels presented in the draft *Guidance for Evaluating Soil Vapor in the State of New York* (NYSDOH, February 2005). To date, the NYSDOH has developed sub-slab action levels for only three compounds: 1,1,1-trichloroethane, tetrachloroethene, and trichloroethene. Of the three, only 1,1,1-trichloroethane was detected in one of the samples (SG-2) collected on the former MGP parcel. None of these compounds were detected on the restaurant parcel.

None of the soil vapor samples contained analytes at concentrations greater than the USEPA's screening values or the NYSDOH's Sub-Slab Action Levels. Thirteen VOC analytes (of 41 on the target list), five alkanes (of nine on the target list), two TICs (of nine on the target list), and isopropyl benzene were detected in the soil vapor samples. Detected analytes were generally present at concentrations ranging from 2 to 3 orders of magnitude below USEPA and NYSDOH guidance values.

Based on review of the data, the following additional observations were made:

- total VOCs detected on the former MGP parcel appeared to be present at higher concentrations than detected on the restaurant parcel located east of Hancock Street (VOCs ranged from 19.8 to 136.9 micrograms per cubic meter [$\mu g/m^3$] and 13.2 to 25.0 $\mu g/m^3$, respectively). However, alkanes were detected at higher concentrations at the restaurant parcel (20.3 to 316 $\mu g/m^3$) when compared to those detected on the former MGP parcel (1.0 to 77.5 $\mu g/m^3$);

- the analytes detected with the highest relative concentrations on the former MGP parcel included xylenes (m-, p-, and o-), toluene, and ethyl benzene, while n-butane, pentane, and n-hexane (i.e., alkanes) were the analytes detected at the highest relative concentrations on the restaurant parcel located east of Hancock Street. Additionally, isopentane and 2,3-dimethylpentane were detected at higher concentrations at the restaurant parcel (9.74 to 121 $\mu g/m^3$) when compared to the former MGP parcel (3.54 to 21.5 $\mu g/m^3$);

- the shallow soil vapor concentrations of VOCs (i.e., not including alkanes or TICs) at SG-8 and SG-9 (i.e., at approximately 3 and 9 feet bgs) are generally equivalent to the ambient air concentrations (the locations of SG-8, SG-9, and SG-10 were selected based on the presence of high subsurface impacts relative to the other areas on the restaurant parcel);

- the presence of higher concentrations of alkanes and isopentane in soil vapors at the restaurant parcel may be indicative of potential petroleum releases by previous operations on this parcel; and

- the concentrations of total VOCs, alkanes, and isopentane increased with depth at the locations of the nested vapor monitoring points SG-8, SG-9, and SG-10. This soil vapor profile is expected since vapor concentrations will decrease as vapors diffuse vertically upward through the vadose zone, and as their biodegradation rate increases with increasing oxygen concentrations.

CONCLUSIONS

This section presents conclusions for the former MGP parcel and the restaurant parcel.

MGP Parcel

No further soil vapor evaluation is necessary for the former MGP parcel based on the following:

- no buildings or above grade structures exist on the parcel, the parcel is used as an active electrical substation, and the use of the parcel will remain commercial/industrial;

- access to the parcel is restricted by a fence; and

- detected analytes in soil vapors were generally present at concentrations ranging from 2 to 3 orders of magnitude below USEPA shallow soil screening values and NYSDOH sub-slab action levels both in the areas containing the highest subsurface impacts (as determined by historical investigations) and along the parcel boundaries.

Restaurant Parcel

No further soil vapor evaluation is necessary on the restaurant parcel based on the following:

- soil vapor results for VOCs obtained from soil vapor points SG-8 and SG-9 (approximately 3 and 9 feet bgs) were 2 to 3 orders magnitude below the USEPA shallow soil screening values and NYSDOH sub-slab action levels;

- soil vapor results for VOCs collected from soil vapor points SG-8 and SG-9 (approximately 3 and 9 feet bgs) were generally equivalent to ambient air concentrations (background levels); and
- based on the nature of the analytes detected in the soil vapor, the vapors may be indicative of historic operations associated the restaurant parcel (i.e., not MGP-related).

Please feel free to contact me at (585) 385-0090, ext. 34, with any questions or comments that you may have.

Sincerely,

BLASLAND, BOUCK & LEE, INC.

Bruce W. Ahrens

Bruce W. Ahrens
Associate, Senior Project Manager

BWA/ams/mey
Attachments

cc: Mr. Brian Stearns, P.E., National Grid
Mr. Terry Young, P.E., National Grid
Mr. Charles Willard, P.E., National Grid
Mr. William Holzhauer, National Grid
Mr. Larry S. Eckhaus, NYSDEC
Mr. Greg Rys, NYSDOH
Mr. Mark Distler, O'Brien & Gere
Mr. James Nuss, P.E., Blasland, Bouck and Lee

Table

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TABLE 1
SOIL VAPOR STUDY
SUMMARY OF DETECTED VOLATILE ORGANIC COMPOUNDS[1]
NATIONAL GRID
FORT PLAIN

Analyte	USEPA Shallow Soil Vapor Screening Values[2]	USEPA Deep Soil Vapor Screening Values[2]	NYSDOH Sub-Slab Action Levels[3]	Soil Vapor Sample Results[4]										Soil Vapor Compounds Range of Detection	Ambient Sample Results[4]	
				Former MGP Parcel							Restaurant Parcel				North of Site Fence	SW Corner of Restaurant
				Northern Boundary		Northern Gas Holder		Eastern Boundary			Southern Parking Area					
				SG-1	SG-2	SG-3	SG-4	SG-5	SG-6	SG-7	SG-8	SG-9	SG-10[5]		Ambient 1	Ambient 2
Volatile Organics																
Benzene	310	3,100	NV	4.0	4.8	2.1 [2.2]	0.67	2.5	1.5	1.2	1.5	3.4	8.1	0.67 - 8.1	0.93	1.2
Chloromethane	900	9,000	NV	1.0	<0.96	1.8 [1.7]	<0.96	2.0	1.6	1.3	1.0	2.2	6.2	1.0 - 6.2	1.5	1.6
Dichlorodifluoromethane	2,000	20,000	NV	1.6	2.4	2.3 [2.5]	2.7	2.9	2.4	2.7	3.3	2.8	4.1	1.6 - 4.1	2.8	3.2
Ethylbenzene	2,200	22,000	NV	26	18	1.3 [1.5]	2.7	2.0	52	2.7	<0.87	<0.87	<3.5	1.3 - 52	<0.81	<0.87
Naphthalene	30	300	NV	<2.4	4.2	<2.4	<2.4	<2.4	<2.4	8.9	<2.6	<2.6	<10	4.2 - 8.9	<2.4	<2.6
Toluene	4,000	40,000	NV	29	15	6.2 [7.1]	8.9	4.2	19	3.2	2.0	3.6	6.6	2.0 - 29	1.9	3.0
1,2,4-Trichlorobenzene	2,000	20,000	NV	<6.9J	<6.9J	<6.9J	<6.9J	<6.9J	<6.9J	<7.4J	<7.4J	<7.4J	<30J	6.9 - 30	<6.9J	<7.4J
1,1,1-Trichloroethane	22,000	220,000	1,000	<1.0	3.9	<1.0	<1.0	<1.0	<1.0	<1.1	<1.1	<1.1	<4.4	3.9	<1.0	<1.1
Trichlorofluoromethane	7,000	70,000	NV	1.1	1.1	1.2 [1.2]	1.2	1.3	1.2	1.3	1.4	1.4	<4.5	1.1 - 1.4	1.3	1.5
1,2,4-Trimethylbenzene	60	600	NV	4.5	2.0	0.94J [1.9J]	3.2	2.0	4.0	1.1	2.3	<0.98	<3.9	0.94 - 4.5	<0.91	<0.98
1,3,5-Trimethylbenzene	60	600	NV	2.2	<0.91	<0.91	<0.91	<0.91	2.2	<0.98	<0.98	<0.98	<3.9	2.2	<0.91	<0.98
m-Xylene & p-Xylene	70,000	700,000	NV	21	14	2.9J [3.8J]	7.5	3.3	35	3.6	1.7	1.3	<3.5	1.3 - 35	1.2	1.7
o-Xylene	70,000	700,000	NV	12	4.8	1.1J [1.5J]	2.5	1.4	18	1.2	<0.87	<0.87	<3.5	1.1 - 18	<0.81	<0.87
Total VOCs				102.4	70.2	19.8	29.4	21.6	136.9	27.2	13.2	14.7	25.0	14.7 - 136.9	9.63	12.2
n-alkanes																
n-Butane	NV	NV	NV	14	2.1	4.6	1.0	3.8	2.7	3.6	12	7.8	190	1.0 - 190	3.0	3.3
Pentane	NV	NV	NV	19	<2.7	<2.7	<2.7	<2.7	<2.7	<3.0	6.8	6.5	84	6.5 - 84	<2.7	<3.0
n-Hexane	2,000	20,000	NV	20	<1.6	<1.6	<1.6	<1.6	<1.6	<1.8	3.2	3.7	28	3.2 - 28	<1.6	<1.8
n-Heptane	NV	NV	NV	16	<1.9	2.2 [2.5]	<1.9	<1.9	2.2	<2.0	2.4	2.3	14	2.2 - 16	<1.9	<2.0
n-Octane	NV	NV	NV	8.5	<1.7	<1.7	<1.7	<1.7	29	<1.9	<1.9	<1.9	<7.5	8.5 - 29	<1.7	<1.9
Total Alkanes				77.5	2.1	6.8	1.0	3.8	33.9	3.6	24.4	20.3	316	1.0 - 316	3.0	3.3
Other																
Isopropylbenzene	4,000	40,000	NV	3.4	<1.8	<1.8	<1.8	<1.8	4.1	<2.0	<2.0	<2.0	<7.9	3.4 - 4.1	<1.8	<2.0
TICs																
Isopentane	NV	NV	NV	21.54	ND	ND [6.79]	ND	5.02	3.54	5.61	9.74	19.77	120.99	3.54 - 120.99	5.02	6.2
2,3-Dimethylpentane	NV	NV	NV	6.15	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.15	ND	ND

Notes:

1) All concentrations shown are in micrograms per cubic meter ($\mu g/m^3$).
2) Generic screening and risk levels (Risk factor=10^{-4},HQ=1), based on the assumption that former MGP parcel and restaurant parcel will remain commercial/industrial.
Reference: USEPA "Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils", OSWER, November 2002.
3) Sub-slab vapor concentration requiring mitigation even if intrusion is not detected. Soil Vapor/Indoor Air Matrix 2, "Guidance for Evaluating Soil Vapor in the State of New York," NYSDOH, February 2005, Public Comment Draft.
4) Samples collected on March 1 and 3, 2006 by Blasland, Bouck and Lee, Inc.
5) SG-10 results based on dilution factor of 4.
6) TICs = Tentatively Identified Compounds
7) VOCs = Volatile Organic Compounds
8) NA = Not Applicable
9) NV = No Value reported in draft guidance documents.
10) J indicates the compound was positively identified; however, the associated numerical value is an estimated concentration only.
11) A duplicate sample was collected from SG-3. The duplicate sample result (if different from the SG-3 sample result) is presented in brackets.
12) <1.0 indicates the compound was not detected above the reported sample quantitation limit of 1.0.
13) Only detected analytes are shown in table.
14) Laboratory analysis conducted by Severn Trent Laboratories located in Knoxville, Tennessee.
15) At sampling locations SG-8, SG-9, and SG-10, nested soil vapor sampling probes were used to collect soil vapors at three vertical intervals; these locations were in close horizontal proximity to each other.
16) SG-10 results compared to Deep Soil Vapor Screening Values because sample collected at depth of 14 feet. All other results compared to Shallow Soil Vapor Screening Values.
17) The quantitation limits for n-Decane, n-Dodecane, Hexachlorobutadiene, Pentane, and n-Undecane exceed the required reporting limits;
these compounds were not detected above the quantitation limits and are, therefore, not shown.

Figure

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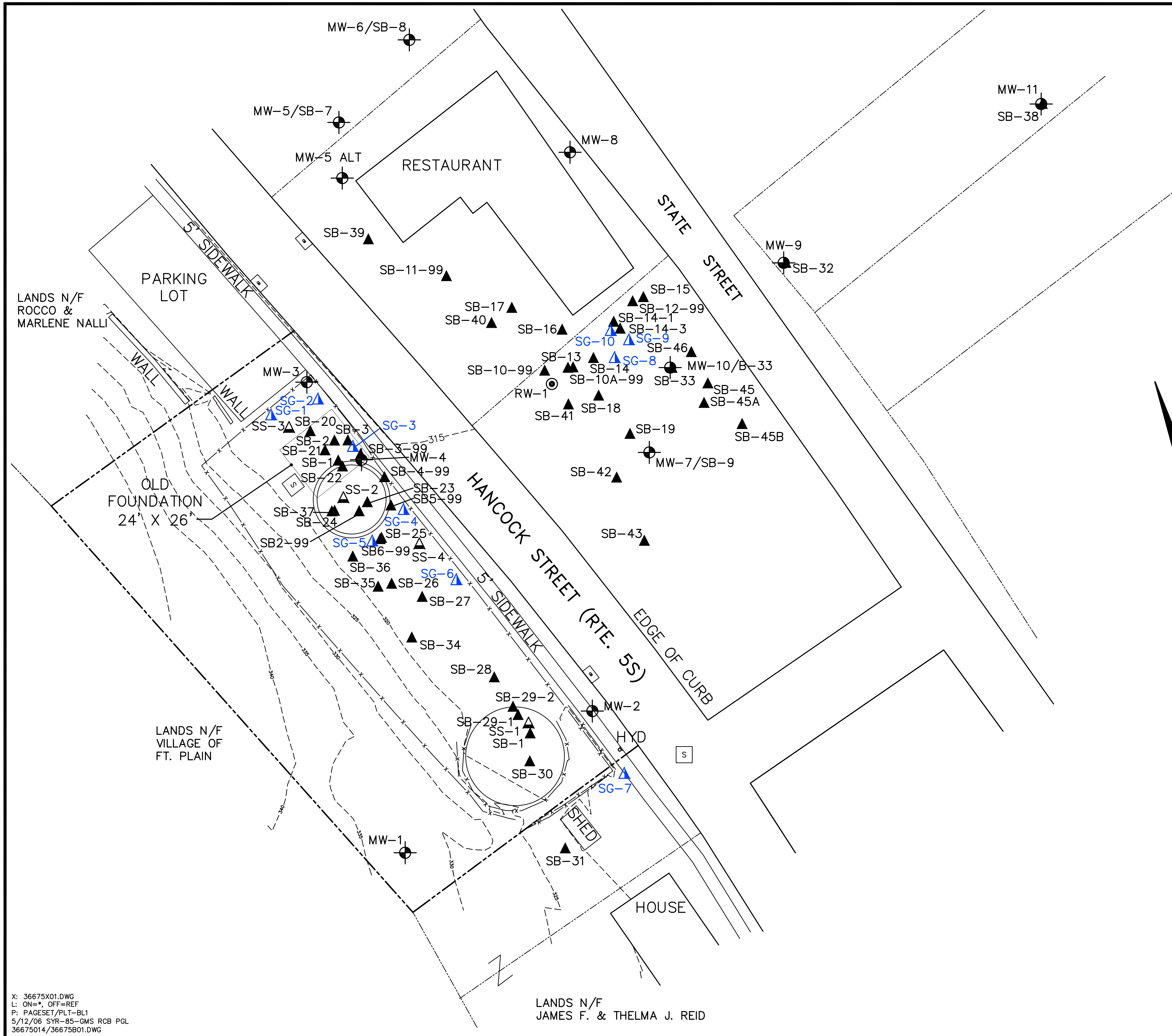

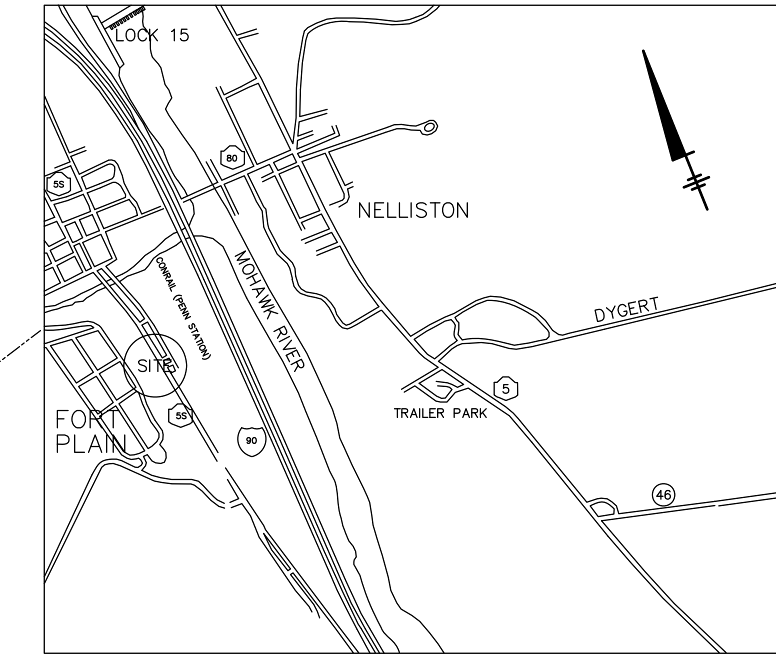

LOCATION SKETCH
NOT TO SCALE

LEGEND:

NMPC PROPERTY LINE
NON NMPC PROPERTY LINE
FENCE
CB CATCH BASIN
S SANITARY SEWER
HYDRANT
SOIL BORING
SOIL SAMPLE
MONITORING WELL
RECOVERY WELL
SOIL VAPOR MONITORING POINT

NOTE:

1. FIGURE DEVELOPED BASED ON FIGURE CREATED BY NIAGARA MOHAWK POWER CORPORATION ENTITLED FIGURE 1-2 FT. PLAIN SUBSTATION/FORMER MGP SITE PLAN AND SAMPLING LOCATIONS DATED OCTOBER 2003.
2. LOCATIONS OF SG-1 AND SG-2 ARE APPROXIMATE.

0 40' 80'
GRAPHIC SCALE

NATIONAL GRID
FORT PLAIN FORMER MGP SITE
SOIL VAPOR EVALUATION REPORT

SOIL VAPOR SAMPLING LOCATIONS

ARCADIS BBL
infrastructure, environment, facilities

FIGURE
1

X: 36675X01.DWG
L: ON=*, OFF=REF
P: PAGESET/PLT-BL1
5/12/06 SYR-85-GMS RCB PGL
36675014/36675B01.DWG

Attachment A

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Soil Gas Sample Collection Log

Sample ID: SG-1

Client:	National Grid	**Date/Day:**	3/1/06 Wed.
Project:	Fort Plain	**Weather:**	Sunny, Breezy
Location:	Fort Plain, NY	**Temperature:**	20°F
Project #:	36675	**Wind Speed/Direction:**	10-15 mph Northerly
Samplers:	SAB/JJB	**Subcontractor:**	
Logged By:	SAB	**Equipment:**	
Coordinates:		**Moisture Content of Sampling Zone (circle one):**	Dry Moist
Sampling Depth:	3.5'	**Approximate Purge Volume:**	100-200 ml
Time of Collection:	1415-1615	**Background PID Ambient Air Reading:**	0

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)
MW-4	7.92

0 ppm up to certain point

"%" is a concentration

54%

SUMMA Canister Information

Helium prior - 39.1%
After - 21.0%

Size (circle one): 1 L 6 L

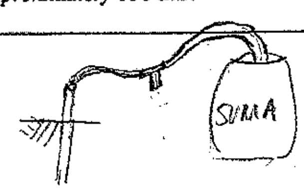
Canister ID: 11153 Flow Control - K234 Effluent - 0ppm

out of the sampling point during purging

Canister Pressure (inches Hg):		
Reported By Laboratory	**Measured Prior to Sample Collection**	**Measured Following Sample Collection**
.50	-30	-2

General Observations/Notes:

Approximating One-Well Volume (for purging):
When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL.
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.



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engineers, scientists, economists

Soil Gas Sample Collection Log

Sample ID: SG-2

Client:	National Grid	**Date/Day:**	3/1/06 Wed.
Project:	Fort Plain	**Weather:**	Sunny Breezy
Location:	Fort Plain, NY	**Temperature:**	20°F
Project #:	36675	**Wind Speed/Direction:**	10-15 mph Northerly
Samplers:	SAB / JJB	**Subcontractor:**	
Logged By:	SAB	**Equipment:**	
Coordinates:		**Moisture Content of Sampling Zone (circle one):**	Dry / Moist
Sampling Depth:	3.5'	**Approximate Purge Volume:**	100-200 ml
Time of Collection:	1355-1555	**Background PID Ambient Air Reading:**	0

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)
MW-4	7.92

33%

SUMMA Canister Information

Helium Prior - 26.5%
After - 8.7%

Size (circle one): 1 L 6 L

Canister ID: 12749

Flow Control - K224 Effluent - Opp

Canister Pressure (inches Hg):		
Reported By Laboratory	**Measured Prior to Sample Collection**	**Measured Following Sample Collection**
.51	-30	-2

General Observations/Notes:

Approximating One-Well Volume (for purging):
When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL.
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

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Soil Gas Sample Collection Log

Sample ID: SG-3

Client:	National Grid	**Date/Day:**	3/1/06 Wed.
Project:	Fort Plain	**Weather:**	Sunny Breezy
Location:	Fort Plain NY	**Temperature:**	30°F
Project #:	36675	**Wind Speed/Direction:**	10-15mph northerly
Samplers:	SAB/JJB	**Subcontractor:**	
Logged By:	SAB	**Equipment:**	
Coordinates:		**Moisture Content of Sampling Zone (circle one):**	Dry / Moist
Sampling Depth:	3.5'	**Approximate Purge Volume:**	100-200 ml
Time of Collection:	1322 - 1522	**Background PID Ambient Air Reading:**	0

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)
MW-4	7.92

59%

Helium Prior - 35%
After - 20.6%

SUMMA Canister Information

Size (circle one): 1 L 6 L

Canister ID: 3391 Flow Control - K175 Effluent - 0ppm

Canister Pressure (inches Hg):		
Reported By Laboratory	**Measured Prior to Sample Collection**	**Measured Following Sample Collection**
10	-26	-2

General Observations/Notes:

Approximating One-Well Volume (for purging):
When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL.
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

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Soil Gas Sample Collection Log

Sample ID: SG-4

Client:	National Grid	**Date/Day:**	3/1/06 Wed.
Project:	Fort Plain	**Weather:**	Sunny, Breezy
Location:	Fort Plain NY	**Temperature:**	15° F
Project #:	36675	**Wind Speed/Direction:**	5-10 mph, Northerly
Samplers:	SAB / JJB	**Subcontractor:**	
Logged By:	SAB	**Equipment:**	
Coordinates:		**Moisture Content of Sampling Zone (circle one):**	Dry / Moist
Sampling Depth:	3.5'	**Approximate Purge Volume:**	100 - 200 ml
Time of Collection:	1124 - 1324	**Background PID Ambient Air Reading:**	0

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)
MW-4	7.92

22%

Helium Prior - 30.9%
After - 6.8%

SUMMA Canister Information

Size (circle one): 1 L 6 L

Canister ID: 1135

Flow Control - K258 Effluent - 0ppm

Canister Pressure (inches Hg):		
Reported By Laboratory	**Measured Prior to Sample Collection**	**Measured Following Sample Collection**
.62	-30	-2

General Observations/Notes:

Approximating One-Well Volume (for purging):
When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL.
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

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Soil Gas Sample Collection Log

Sample ID: SG-5

Client:	National Grid	**Date/Day:**	3/1/06 Wed.
Project:	Fort Plain	**Weather:**	Sunny, Breezy
Location:	Fort Plain NY	**Temperature:**	15°F
Project #:	36675	**Wind Speed/Direction:**	5-10 mph / Northerly
Samplers:	SAB / JJB	**Subcontractor:**	
Logged By:	SAB	**Equipment:**	
Coordinates:		**Moisture Content of Sampling Zone (circle one):**	Dry / Moist
Sampling Depth:	3.51	**Approximate Purge Volume:**	100-200 ml
Time of Collection:	1100-13:00	**Background PID Ambient Air Reading:**	0

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)
MW-4	7.92

16%

Helium Prior - 12.9%
After - 2.1%

SUMMA Canister Information

Size (circle one): 1 L 6 L

Canister ID: 12573

Flow Control - K133 Efflont - Opp—

Canister Pressure (inches Hg):		
Reported By Laboratory	**Measured Prior to Sample Collection**	**Measured Following Sample Collection**
1.6	-27	-2

General Observations/Notes:

Approximating One-Well Volume (for purging):
When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL.
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

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Soil Gas Sample Collection Log

Sample ID: SG-6

Client:	National Grid	**Date/Day:**	3/1/06 Wed.
Project:	Fort Plain	**Weather:**	Sunny, Breezy
Location:	Fort Plain NY	**Temperature:**	15°F
Project #:	36675	**Wind Speed/Direction:**	5-16 mph northerly
Samplers:	SAB/JJB	**Subcontractor:**	
Logged By:	SAB	**Equipment:**	
Coordinates:		**Moisture Content of Sampling Zone (circle one):**	Dry Moist
Sampling Depth:	3.5'	**Approximate Purge Volume:**	100-200 ml
Time of Collection:	1036-1236	**Background PID Ambient Air Reading:**	0

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)
MW-4	7.92

22%

SUMMA Canister Information

Helium prior - 12.9%
After - 2.8%

Size (circle one): 1 L 6 L

Canister ID: 1143

Flow Control - K126 Effluent - 0ppm

Canister Pressure (inches Hg):		
Reported By Laboratory	Measured Prior to Sample Collection	Measured Following Sample Collection
.57	-21	-2

General Observations/Notes:

Approximating One-Well Volume (for purging):
When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL.
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

[signature]

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Soil Gas Sample Collection Log

Sample ID: SG - 7

Client:	National Grid	**Date/Day:**	3/3/06 Friday
Project:	Fort Plain	**Weather:**	Cloudy, Breezy
Location:	Fort Plain, NY	**Temperature:**	20°F
Project #:	36675	**Wind Speed/Direction:**	10-15mph, Northerly
Samplers:	JAB/SSS	**Subcontractor:**	
Logged By:	JAB	**Equipment:**	
Coordinates:		**Moisture Content of Sampling Zone (circle one):**	Dry Moist
Sampling Depth:	3.5'	**Approximate Purge Volume:**	200-300ml
Time of Collection:	945 - 1145	**Background PID Ambient Air Reading:**	0 ppm

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)

34%

Helium prior - 39.3%
After - 13.5%
Effluent - 0

SUMMA Canister Information

Size (circle one): 1 L 6 L

Canister ID: 1131 Flow control - K220

Canister Pressure (inches Hg):		
Reported By Laboratory	**Measured Prior to Sample Collection**	**Measured Following Sample Collection**
.57	-27	-2

General Observations/Notes:

Approximating One-Well Volume (for purging):
When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL.
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

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Soil Gas Sample Collection Log

Sample ID: SG - 8

Client:	National Grid	**Date/Day:**	3/3/06 Friday
Project:	Fort Plain	**Weather:**	Cloudy, Breezy
Location:	Fort Plain, NY	**Temperature:**	20°F
Project #:	36675	**Wind Speed/Direction:**	10-15 mph Northerly
Samplers:	SAB/JJB	**Subcontractor:**	
Logged By:	SAB	**Equipment:**	
Coordinates:		**Moisture Content of Sampling Zone (circle one):**	Dry / Moist
Sampling Depth:	3'	**Approximate Purge Volume:**	200 - 300 ml
Time of Collection:	1130 - 1330	**Background PID Ambient Air Reading:**	0 ppm

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)
MW-10	18.92

SUMMA Canister Information

94%

Helium Prior - 15.5%
After - 14.6%
Effluent - 0

Size (circle one): 1 L 6 L

Canister ID: 11362

Flow Control - 24626

Canister Pressure (inches Hg):		
Reported By Laboratory	**Measured Prior to Sample Collection**	**Measured Following Sample Collection**
.68	-22	-8

General Observations/Notes:

Approximating One-Well Volume (for purging):
When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL.
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

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Soil Gas Sample Collection Log

Sample ID: SG-9

Client:	National Grid	**Date/Day:**	3/3/06 Friday
Project:	Fort Plain	**Weather:**	Cloudy, Breezy
Location:	Fort Plain, NY	**Temperature:**	20°F
Project #:	36675	**Wind Speed/Direction:**	10-15 mph Northerly
Samplers:	SAB/JJB	**Subcontractor:**	
Logged By:	SAB	**Equipment:**	
Coordinates:		**Moisture Content of Sampling Zone (circle one):**	Dry / Moist
Sampling Depth:	9'	**Approximate Purge Volume:**	200-300 ml
Time of Collection:	1205 - 1405	**Background PID Ambient Air Reading:**	0 ppm

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)
MW-10	18.92

11%

SUMMA Canister Information

Helium Prior - 20.1%
After - 22
Effluent - 0

Size (circle one): 1 L 6 L

Canister ID: 12142

Flow Control - 24627

Canister Pressure (inches Hg):		
Reported By Laboratory	**Measured Prior to Sample Collection**	**Measured Following Sample Collection**
.68	-29	-6

General Observations/Notes:

Approximating One-Well Volume (for purging):
When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL.
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

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Soil Gas Sample Collection Log

Sample ID: SG - 10

Client:	National Grid	**Date/Day:**	3/5/06 Friday
Project:	Fort Plain	**Weather:**	~~[illegible]~~ Cloudy, Breezy
Location:	Fort Plain, NY	**Temperature:**	80°F
Project #:	36675	**Wind Speed/Direction:**	10-15 mph Northerly
Samplers:	SAB/JJB	**Subcontractor:**	
Logged By:	SAB	**Equipment:**	
Coordinates:		**Moisture Content of Sampling Zone (circle one):**	Dry / Moist
Sampling Depth:	14'	**Approximate Purge Volume:**	200-300 ml
Time of Collection:	1115-1315	**Background PID Ambient Air Reading:**	0 ppm

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)
MW-10	18.92

60%

Helium Prior - 17.7%
Aft. - 6.7%
Ambient - 0

SUMMA Canister Information

Size (circle one): 1 L 6 L

Canister ID: 2988

Flow Control - 24517

Canister Pressure (inches Hg):		
Reported By Laboratory	**Measured Prior to Sample Collection**	**Measured Following Sample Collection**
168	-30	-8

General Observations/Notes:

Approximating One-Well Volume (for purging):
When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL.
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

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Soil Gas Sample Collection Log

Sample ID: Ambient 1

Client:	National Grid	**Date/Day:**	3/1/06 Wed.
Project:	Fort Plain	**Weather:**	Sunny Breezy
Location:	Fort Plain, NY	**Temperature:**	20°F
Project #:	36675	**Wind Speed/Direction:**	10-15 mph Northerly
Samplers:	SAB/JJB	**Subcontractor:**	
Logged By:	SAB	**Equipment:**	
Coordinates:		**Moisture Content of Sampling Zone (circle one):**	Dry / Moist
Sampling Depth:	—	**Approximate Purge Volume:**	
Time of Collection:	1230-1430	**Background PID Ambient Air Reading:**	0

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)

SUMMA Canister Information

Size (circle one): 1 L 6 L

Canister ID: 93038 Flow Control - K172

Canister Pressure (inches Hg):		
Reported By Laboratory	**Measured Prior to Sample Collection**	**Measured Following Sample Collection**
.87	-23	0

General Observations/Notes:

Location - North side of site, west of Hancock St. North side of site fence. Upwind of SG-1 through SG-6

Approximating One-Well Volume (for purging):
When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL.
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

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Soil Gas Sample Collection Log

Sample ID: Ambient 2

Client:	National Grid	**Date/Day:**	3/3/06 Friday
Project:	Fort Plain	**Weather:**	Sunny, Breezy
Location:	Fort Plain, NY	**Temperature:**	20°F
Project #:	36615	**Wind Speed/Direction:**	10-15 mph Northerly
Samplers:	SAB/JTB	**Subcontractor:**	
Logged By:	SAB	**Equipment:**	
Coordinates:		**Moisture Content of Sampling Zone (circle one):**	Dry / Moist
Sampling Depth:	–	**Approximate Purge Volume:**	~~900~~ ~~300ml~~
Time of Collection:	1150 - 1350	**Background PID Ambient Air Reading:**	0 ppm

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)

SUMMA Canister Information

Size (circle one): 1 L / 6 L

Canister ID: 93112 Flow control-24623

Canister Pressure (inches Hg):		
Reported By Laboratory	**Measured Prior to Sample Collection**	**Measured Following Sample Collection**
.68	-30	-8

General Observations/Notes:

Location - Southwestern corner of Diner, adjacent to SG-8, SG-9, SG-10

Approximating One-Well Volume (for purging):
When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL.
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

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Soil Gas Sample Collection Log

Sample ID: SG-3 Dup.

Client:	National Grid	**Date/Day:**	3/1/06 Wed.
Project:	Fort Plain	**Weather:**	Sunny, Breezy
Location:	Fort Plain, NY	**Temperature:**	20°F
Project #:	36675	**Wind Speed/Direction:**	10-15mph Northerly
Samplers:	SAB/JJB	**Subcontractor:**	
Logged By:	SAB	**Equipment:**	
Coordinates:		**Moisture Content of Sampling Zone (circle one):**	Dry / Moist
Sampling Depth:	3.5'	**Approximate Purge Volume:**	100-200 ml
Time of Collection:	1322-1522	**Background PID Ambient Air Reading:**	0

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)
MW-4	7.92

SUMMA Canister Information

Helium Prior - 35%
After - 10.2%
Effluent - 0 ppm

Size (circle one): 1 L 6 L

Canister ID: 1537

Flow Control - K115

Canister Pressure (inches Hg):		
Reported By Laboratory	**Measured Prior to Sample Collection**	**Measured Following Sample Collection**
.52	-30	-2

General Observations/Notes:

Approximating One-Well Volume (for purging):
When using 1¼-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL.
Each foot of ¼-inch tubing will have a volume of approximately 10 mL.

Appendix D

NYSDEC Letter Correspondence (January 2007)

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.state.ny.us

Denise M. Sheehan
Commissioner

ENVIRONMENTAL SIR DEPT.
RECEIVED
JAN 2 3 2007
NATIONAL GRID

Mr. Brian Stearns, P.E.
300 Erie Blvd. West
Syracuse, NY 13202

Re: Fort Plain Former MGP Site
DEC Site #429007
Soil Vapor Evaluation Report

Dear Mr. Stearns:

The New York State Department of Environmental Conservation (Department) and the New York State Department of Health (NYSDOH) have reviewed Blasland, Bouck & Lee's May 26, 2006 report of Soil Vapor Intrusion (SVI) investigation results at the above-referenced site. Although the agencies do not compare SVI results to the USEPA Soil Vapor Screening Values referenced in the report, we accept the report's conclusion that no further sampling is necessary to evaluate SVI at the site. This is based on the following factors:

- No buildings are present on the MGP parcel, and access to the site is restricted by a fence. To ensure that SVI-related exposures do not occur in the future, an institutional control should be evaluated as part of the proposed remedy for the site.

- The pattern of vapor-phase contaminants beneath the restaurant parcel indicates that attenuation is occurring between the deep and shallow horizons. In samples taken from 3' and 9' feet below grade (SG-8 and SG-9), levels of potentially MGP-related contaminants are equivalent to site background levels. Only at the 14' horizon, just above the water table, do levels of benzene and toluene significantly exceed background. Although levels of n-alkanes beneath the restaurant exceed background, these compounds are not typically associated with MGP wastes, and were found at much lower levels beneath the MGP site.

Because the SVI pathway has been satisfactorily investigated, National Grid may proceed with preparation of the Feasibility Study, as outlined in your March 1, 2006 letter to John Helmeset.

Sincerely,

George W. Heitzman, P.E.
Chief, Remedial Section D
Remedial Bureau C
Division of Environmental Remediation

cc: G. Rys
G. Laccetti

ARCADIS

Appendix E

Excavation Work Plan

Infrastructure · Water · Environment · Buildings

Imagine the result

National Grid

Appendix E – Excavation Work Plan

Fort Plain Former MGP Site

Fort Plain, Montgomery County, New York
Site No. 4-29-007

September 2012

Table of Contents

Figures

This *Excavation Work Plan* (EWP) has been prepared to support the *Site Management Plan* (SMP). As described in the SMP, the former manufactured gas plant (MGP) property is defined is an approximately 0.5-acre area bounded by a property used as a paved parking area to the north, a private residence to the south, State Route 5S (Hancock Street) to the east, and a steep hillside to the west (Figure E-1). The boundaries of the former MGP property are more fully described in the metes and bounds description that is part of the Environmental Easement included as Appendix A of the SMP.

1. Notification

At least 15 days prior to the start of any activity that is anticipated to encounter remaining MGP-related impacts on the former MGP property, National Grid or their representative will notify the New York State Department of Environmental Conservation (NYSDEC). Areas where remaining MGP-related impacts may be potentially encountered on the former MGP property are shown on **Figure E-2**.

Currently, this notification will be made to:

Mr. Bernard Franklin
NYSDEC
Division of Environmental Remediation
625 Broadway, 11th Floor
Albany, New York 12233-7014
1.518.402.9662

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent, plans for re-grading (if necessary), intrusive elements or utilities to be installed below the cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control.

- A summary of environmental conditions anticipated in the work areas, including the nature and concentration levels of contaminants of concern (COCs), potential presence of remaining MGP impacts, and plans for any pre-construction sampling.

- A schedule for the work, detailing the start and completion of all intrusive work.

- A summary of the applicable components of this EWP.
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120.
- A copy of the contractor's task-specific Health and Safety Plan (HASP), in electronic format. The contractor may use the Generic HASP (GHASP) provided in **Appendix E** of the SMP as a template; however, the contractor must have a qualified safety professional prepare and sign their task-specific HASP and verify current OSHA requirements and protocols.
- Identification of disposal facilities for potential waste streams.
- Identification of sources of any anticipated backfill, along with all required chemical testing requirements.

2. Soil Screening Methods

Visual, olfactory and instrument-based soil screening will be performed by a qualified environmental professional during all remedial and development excavations into known or potentially ~~contaminated~~ MGP-impacted material. Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion.

Soils excavated within areas where remaining MGP impacts may be potentially encountered on the former MGP property will be segregated (based on previous environmental data and screening results) into material that requires off-site disposal, ~~material that requires testing,~~ material that can potentially be returned to the subsurface, and material that can be used as cover soil. Soil/fill potential suitable for reuse that is stockpiled shall be sampled and analyzed (as described in Section 7 of this EWP) to evaluate whether material can be replaced or transported off-site for treatment and/or disposal.

3. Stockpile Methods

~~Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.~~

~~Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced~~. Stockpiles of excavated material will, at minimum, be placed on top of polyethylene sheeting. If required by NYSDEC, stockpiles of excavated material shall be placed within an engineered staging area. Stockpiles will be covered using polyethylene sheeting to reduce potential infiltration of precipitation, migration of wind-blown dust, and direct contact exposures. Stockpiles will be routinely inspected and damaged polyethylene sheeting will be promptly replaced. During all soil disturbance activities, erosion and sedimentation control measures shall be employed in accordance with this EWP and in conformance with applicable laws and regulations (good work practices that require erosion and sedimentation control measures are not limited to potentially impacted areas). Proven soil conservation practices shall be incorporated in any such plans to mitigate soil erosion, off-site sediment migration, and water pollution from erosion. Appropriate temporary erosion control measures (e.g., silt fencing, hay bales) shall be implemented and maintained around all impacted and potentially impacted soil/fill stockpiles and un-vegetated soil surfaces during such activities. Such stockpiles shall be graded and compacted as necessary for positive surface water runoff and dust control.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained on-site and available for inspection by NYSDEC.

4. Materials Excavation and Load Out

A qualified environmental professional or person under their supervision will oversee all invasive work in the potentially impacted areas (as described Section 1 of the SMP), and the excavation and load-out of all excavated material. The owner of the property and its contractors are solely responsible for safe execution of all invasive and other work performed under this EWP.

The presence of utilities and easements on the former MGP property will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under ~~this~~ the SMP is posed by utilities or easements.

Loaded vehicles leaving the former MGP property will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and New York State Department of Transportation (NYSDOT) requirements (and all other applicable transportation requirements).

When necessary, a truck wash will be operated on-site. The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the former MGP property are clean of dirt and other materials derived during intrusive excavation activities. The qualified environmental professional will ~~be responsible for ensuring~~ monitor that all outbound trucks will be washed (as necessary) at the truck wash before leaving the former MGP property until the activities performed under this section are complete. Truck wash waters will be collected and disposed off-site in an appropriate manner.

Locations where vehicles enter or exit the former MGP property shall be inspected daily for evidence of off-site soil tracking. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

5. Materials Transported Off-Site

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

Material transported by trucks exiting the former MGP property will be secured with tight-fitting covers. Loose-fitting canvas-type or mess-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used. As necessary, all ~~All~~ trucks will be washed prior to leaving the former MGP property. As indicated above, truck wash waters will be collected and disposed off-site in an appropriate manner.

The truck transport route for all vehicles leaving the former MGP property with material destined for off-site treatment and/or disposal ~~are~~ is as follows:

- Proceed southeast on Hancock Street (NY-5S)
- Veer right onto West Main Street
- Turn left to enter NYS Interstate I-90 and proceed to destination.

All trucks loaded with materials from the former MGP property will exit the vicinity of the site using only this approved truck route. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and, (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the former MGP property. Queuing of trucks will be performed on-site, as feasibly possible, to minimize off-site disturbance. ~~Off-site queuing will be prohibited.~~

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

6. Materials Disposed Off-Site

All soil/fill/solid waste excavated and removed from potentially impacted area of the former MGP property will be treated as ~~contaminated~~ impacted and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from potentially impacted areas of the former MGP property is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials excavated from potentially impacted areas of the former MGP property will not occur without formal NYSDEC approval.

Off-site treatment and/or disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate (e.g. waste disposal facility, treatment facility, C/D recycling facility, etc.). Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Project Reports (described in Section 5 of the SMP). This documentation will include: waste profiles, laboratory analytical test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and impacted soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Track 1 unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

7. Materials Reused On-Site

Excavated materials outside potentially impacted areas on the former MGP property can be reused for on-site fill. Excavated soil/fill from any potentially impacted areas that is free of visible stains and obvious odors shall be considered potentially suitable for on-site reuse. Material potentially suitable for on-site reuse shall be placed on polyethylene sheeting in stockpiles not to exceed 250 cubic yards (CY). The stockpiled potentially reusable material shall be covered whenever soils are not actively being placed into or removed from the stockpile, during overnight/weekend hours, during periods of precipitation, or whenever dust action levels are exceeded. This material shall be covered using polyethylene sheeting to reduce potential infiltration of precipitation, migration of wind-blown dust, and direct contact exposures.

Stockpiled potentially reusable material from potentially impacted areas shall be sampled and analyzed to evaluate if the material can be replaced beneath site cover materials or must be transported for off-site disposal. One composite sample shall be collected for each 250 CY of potentially impacted soils, or as required by the disposal facility. As indicated in the *Generic Quality Assurance Project Plan* (Generic QAPP) included as Appendix J to the SMP, one duplicate sample shall also be collected for every 20 samples, with a minimum of one duplicate per sample delivery group (SDG) , or as required by the disposal facility. Each composite sample shall be formed using individual grab samples collected from five locations within each stockpile (i.e., five discrete grab samples per composite). The composite sample shall be formed by placing equal portions of soil from each of the five discrete grab sampling locations into a pre-cleaned, stainless steel bowl (or dedicated container). The composite sample shall be thoroughly homogenized using a stainless steel scoop or trowel before being transferred into the sample containers provided by the laboratory. The filled sample containers shall be labeled and transported to the laboratory using a chain-of-custody form. Each sample will be submitted for laboratory analysis for the constituents listed in Appendix 5 of DER-10. Material suitable for reuse on the former MGP property must meet the commercial use SCOs presented in 6NYCRR Part 375-6.

Chemical criteria for on-site reuse of material have been approved by NYSDEC ~~and are listed in Table [x]~~. The qualified environmental professional will ensure that procedures defined for materials reuse in ~~this~~ the SMP are followed and that unacceptable material does not remain on-site. On-site material, including historic fill and impacted soil, that is acceptable for re-use on-site will be placed below a demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

~~Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance.~~ Concrete crushing or processing on the former MGP property will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the former MGP property will not be reused on-site.

8. Fluids Management

Efforts shall be made to minimize the amount of water that could enter an excavation (e.g., installing a berm around the excavation or covering the excavation to prevent runoff from entering during precipitation). Water accumulated in excavations shall be pumped out during or after precipitation events (as appropriate), containerized, characterized, and appropriately disposed..

All liquids to be removed from the former MGP property, including excavation dewatering and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. At a minimum, water encountered in excavations shall be containerized then sampled and analyzed for the chemicals of concern (COCs) known to be in the area as determined by previous analytical results, which may include certain volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), as well as analytes required by potential off-site treatment/disposal facilities. Water shall be discharged to the local sewer authority (if authorized), transported off-site for proper disposal, or treated on-site via a treatment system that has been approved by the NYSDEC, as appropriate.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river), if feasible, will be performed under a State Pollution Discharge Elimination System (SPDES) permit. Runoff from surface discharges (if any) shall be controlled. No discharges shall enter a surface water body without proper permits. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the site, but will be managed off-site.

9. Cover System Restoration

After the completion of soil removal and any other invasive activities on the former MGP property, the cover system will be restored in a manner that complies with the March 2008 NYSDEC Record of Decision. The demarcation layer, or equivalent material, will be replaced to provide a visual reference to the top of the 'Remaining Contamination Zone', the zone that requires adherence to special conditions for disturbance of remaining impacted soils defined in the SMP.

If the type of cover system changes on the former MGP property from that which exists prior to the excavation (e.g., a soil or stone cover is replaced by asphalt), ~~(possibly "as shown on Figure [x]" discussed in section 1.4.4")~~ this will constitute a modification of the cover element of the remedy and the upper surface of the remaining impacted areas. A figure showing the modified surface will be included in the subsequent Periodic Project Report and in any updates to the SMP.

10. Backfill from Off-Site Sources

All materials proposed for import onto the former MGP property will be approved by the qualified environmental professional and will be in compliance with provisions in the SMP prior to receipt.

Imported material shall be sampled in accordance with the frequency requirements presented in Table 5.4(e) 10 of NYSDEC *DER-10: Technical Guidance for Site Investigation and Remediation* (DER-10). Imported material to be used in the former MGP property shall meet the commercial/industrial use levels presented in Appendix 5 of DER-10.

If topsoil is used in areas for the final cover or barrier layer in segments of the former MGP property, it shall be fertile, friable, natural loam surface soil, capable of sustaining plant growth, and free of clods or hard earth, plants or roots, sticks or other extraneous material that could discourage plant growth. Topsoil shall be seeded with a sustainable perennial mixture and appropriate erosion control measures shall be taken until the perennial grass is established.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially impacted sites will not be imported to the former MGP property. All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). ~~Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are listed in Table [x].~~ Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for the former MGP property, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the former MGP property.

Trucks entering the former MGP property with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

11. Stormwater Pollution Prevention

General stormwater pollution prevention activities to be conducted in support of Site excavation activities including the following:

- ~~Barriers and hay bale checks~~ Check dams (e.g., synthetic, stone, hay bales, etc.) will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained on-site and available for inspection by NYSDEC. All necessary repairs shall be made immediately.

- Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

- All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

- Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

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

- Silt fencing or hay bales will be installed around the perimeter of the construction area sufficient to prohibit storm water from migrating off site or to sewers.

12. Contingency Plan

If an underground tank or previously unidentified impacted materials are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for the full list of analytes (TAL metals; TCL VOCs and SVOCs, TCL pesticides and PCBs), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected impacted media identified by screening during invasive work will be promptly communicated by phone to NYSDEC's Project Manager (identified in Section 1 of this EWP). Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the periodic reports prepared pursuant to Section 5 of the SMP.

13. Community Air Monitoring

Community air monitoring for VOCs and particulates will be conducted for soil disturbance activities within potentially impacted areas, in accordance with the New York State Department of Health (NYSDOH) Community Air Monitoring Plan (CAMP) included as Appendix F to the SMP. The quantity and locations of community air monitoring stations will be determined in conjunction with the NYSDOH, based on the size and location of the proposed excavation; however, at a minimum there will be one upwind and one downwind monitoring location. CAMP monitoring results will be included in the project report. Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

14. Odor Control Plan

This odor control plan is to address emissions of nuisance odors on-site and off-site. Specific odor control methods to be used on a routine basis are discussed below and in the NYSDOH CAMP included as Appendix F to the SMP. If nuisance odors are identified at the boundary of the former MGP property, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the property owner's Remediation Engineer, and any measures that are implemented will be discussed in the subsequent Periodic Project Report.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (a) direct load-out of soils to trucks for off-site disposal; (b) use of chemical odorants in spray or misting systems; and, (c) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

15. Dust Control Plan

Dust (i.e., particulate) monitoring will be performed in accordance with the CAMP included as Appendix F to the SMP. A dust suppression plan that addresses dust management during invasive work, within areas identified as potentially containing MGP-impacted soil, will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, un-vegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.

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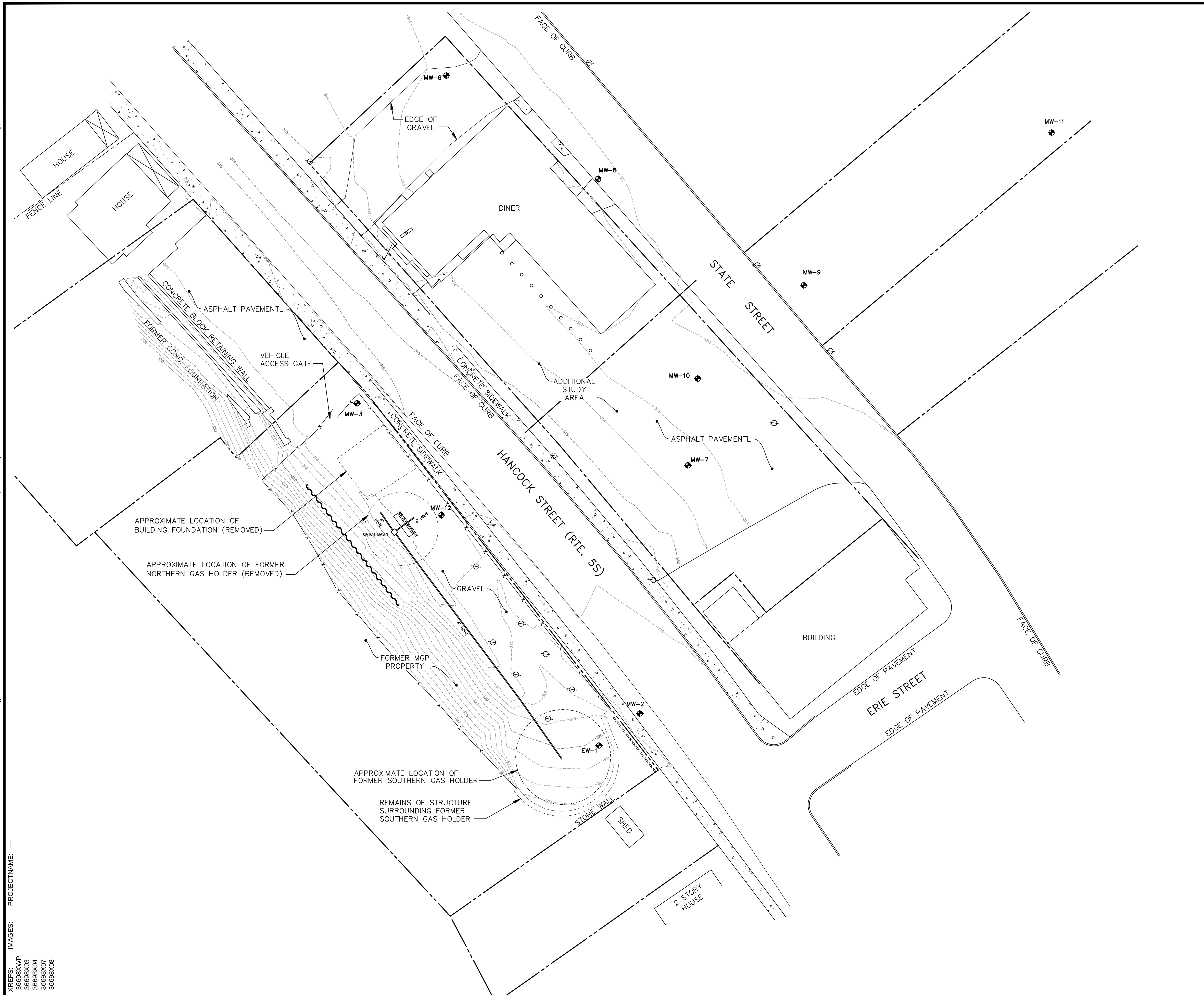
Figures



LEGEND:

- PROPERTY LINE
- NEW/EXISTING CHAIN LINK FENCE
- 350 GROUND SURFACE CONTOUR (1' INTERVAL)
- FORMER STRUCTURE
- BOLLARD
- UTILITY POLE
- MONITORING WELL/EXTRACTION WELL
- HORIZONTAL LIMITS OF REMAINING SHEET PILE

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. FIGURE DEVELOPED FROM SITE SURVEY ENTITLED "MAP SHOWING POST-CONSTRUCTION TOPOGRAPHIC CONDITIONS FORMER MANUFACTURED GAS PLANT FACILITY SITE No. 429007" PREPARED BY THEW ASSOCIATES, DATED 9/7/2011.

0 20' 40'
GRAPHIC SCALE

NATIONAL GRID
FORT PLAIN FORMER MANUFACTURED GAS PLANT SITE
EXCAVATION WORK PLAN

SITE MAP

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FIGURE
E1

CITY: SYRACUSE, NY DIV/GROUP:141/ENV DB:DMW WLJ BGP KLS NES LD: PIC: PM: TM:M.BENOIT LYR:ON=*;OFF=*REF* ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/7/2012 10:13 AM BY: DECLERCQ, BRIAN
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36698XWP
36698X03
36698X04
36698X07
36698X08

LEGEND:

- PROPERTY LINE
- CHAIN LINK FENCE
- FORMER STRUCTURE
- BOLLARD
- UTILITY POLE
- EXISTING MONITORING WELL/PIEZOMETER LOCATION
- SOIL BORING
- MONITORING WELL THAT CAN NO LONGER BE LOCATED
- ABANDONED MONITORING WELL
- HORIZONTAL LIMITS OF NORTHERN GAS HOLDER REMOVAL
- APPROXIMATE EXTENTS OF SOIL CONTAINING COCs AT CONCENTRATIONS GREATER THAN GNYCRR PART 375-6 UNRESTRICTED USE SCOs
- LOCATION CONTAINING NAPL AND/OR HEAVY SHEEN
- LOCATION CONTAINING ONE OR MORE COC AT CONCENTRATIONS GREATER THAN 6NYCRR PART 375-6 UNRESTRICTED USE SCOs
- LOCATION THAT DOES NOT CONTAIN COCs AT CONCENTRATIONS GREATER THAN 6NYCRR PART 375-6 UNRESTRICTED USE SCOs
- (4-6) DEPTH OF IMPACTS IN FEET

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. FIGURE DEVELOPED FROM SITE SURVEY ENTITLED "MAP SHOWING POST-CONSTRUCTION TOPOGRAPHIC CONDITIONS FORMER MANUFACTURED GAS PLANT FACILITY SITE No. 429007" PREPARED BY THEW ASSOCIATES, DATED 9/7/2011.
3. SELECT WELLS WERE ABANDONED IN JUNE 2010 PRIOR TO REMEDIAL CONSTRUCTION ACTIVITIES.
4. LOCATIONS WITHOUT COLOR INDICATIONS DID NOT CONTAIN NAPL OR HEAVY SHEENS AND ANALYTICAL SAMPLES WERE NOT COLLECTED.

0 20' 40'
GRAPHIC SCALE

NATIONAL GRID
FORT PLAIN FORMER MANUFACTURED GAS PLANT SITE
EXCAVATION WORK PLAN

REMAINING MGP-RELATED IMPACTS

ARCADIS

FIGURE
E2

CITY: SYRACUSE, NY DIV/GROUP: 141/ENV DB: DMW WLJ BGP KLS NES LD: PIC: PM: TM: M.BENOIT LYR: ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0036698\0000\00009\DWG\SITE_MANAGEMENT\36698E02.dwg LAYOUT: E2 SAVED: 9/7/2012 10:15 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 9/7/2012 10:15 AM BY: DECLERCQ, BRIAN
XREFS: 36698XWP 36698X03 36698X04 36698X07 IMAGES: PROJECTNAME: ----

Appendix F

Generic Health and Safety Plan

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Infrastructure, environment, facilities

Imagine the result

National Grid

Appendix F

Generic Health and Safety Plan

Fort Plain Former MGP Site
14 Hancock Street, Fort Plain, New York

September 2012

Tables

Attachments

Preface

This *Generic Health and Safety Plan* (GHASP) presents a guide for Contractors performing intrusive work in potentially impacted areas of the Fort Plain Former MGP site, or performing monitoring and maintenance requirements specified in the Site Management Plan (SMP).

Any intrusive work on either the former MGP property or the Route 5S Diner property that will encounter or disturb the remaining MGP-impacts, including any modifications or repairs to the existing cover system on the former MGP property, will be performed in compliance with a Contractor-prepared task-specific HASP. The Contractor's HASP must be in compliance with DER-10 and 29 CFR 1910, 29 CFR 1926, and all other applicable Federal, State and local regulations. Invasive work must be performed in accordance with applicable federal, state, and local rules and regulations to protect worker health and safety. The Contractor's HASP will cover all personnel who will be employed by the Contractor to perform the work at the Site, including direct employees, as well as Subcontractors. If the Contractor does not wish to include Subcontractors under the HASP, the Subcontractor will be responsible for developing and implementing a HASP that meets the applicable requirements. The Contractor will submit the task-specific HASP to the NYSDEC for review prior to initiating intrusive activities. The site-specific HASPs will include information on Site activities anticipated to be conducted. This GHASP may be used as a guide when preparing the task-specific HASP; however, current site conditions must be considered and specific site activities defined evaluated. All Contractor employees who may come in to contact with potentially impacted environmental media will follow the Contractor's site-specific HASP detailing the procedures that will be utilized to comply with applicable regulations. The Contractor has the sole responsibility for confirming that the worksite is safe, neat, and maintained in an orderly condition, and is free from hazards. The Contractor is also solely responsible by law for compliance and regulatory reporting requirements for all workplace and employee safety issues.

Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
BTEX	benzene, toluene, ethylbenzene, and xylene
CFR	Code of Federal Regulations
COC	constituent of concern
CPR	cardiopulmonary resuscitation
CRZ	contamination reduction zone
dBA	decibel
DEET	diethyltoluamide
^{o}C	degrees Celsius
^{o}F	degrees Fahrenheit
EMS	Emergency Medical Services
EZ	exclusion zone
FM	Factory Mutual Engineering Corporation
HASP	*Health and Safety Plan*
HSA	hollow-stem auger
HSO	Health and Safety Officer
HSS	Health and Safety Supervisor
II	Incident Investigation
JSA	Job Safety Analysis
kV	kilovolts
LEL	lower explosive limit
LPO	Loss Prevention Observation
LPS™	Loss Prevention System™
MGP	manufactured gas plant
MSDS	material safety data sheet
NEC	National Electrical Code
NESC	National Electrical Safety Code
NIOSH	National Institute for Occupational Safety and Health
NRR	noise reduction rating

NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PDI	Pre-Design Investigation
PEL	permissible exposure limit
PID	photoionization detector
PO	Project Officer
PPE	personal protective equipment
ppm	parts per million
PVC	polyvinyl chloride
RD Work Plan	*Remedial Design Work Plan*
RMSF	Rocky Mountain Spotted Fever
SPSA	safe performance self-assessment
SS	Site Supervisor
SSE	Short Service Employee
SZ	support zone
Ta adj	adjusted air temperature
TLV	Threshold Limit Value
UFPO	Underground Facility Protection Organization
UL	Underwriters Laboratory
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1. Introduction

1.1 Objective

This GHASP presents a guide for Contractors preparing task-specific HASPs prior to performing intrusive work in potentially impacted areas of the Fort Plain Former MGP site, or performing monitoring and maintenance requirements specified in the Site Management Plan (SMP). Specific hazard control methodologies must be evaluated and selected based on the tasks to be performed to minimize the potential of accident or injury.

1.2 Site and Facility Description

National Grid Fort Plain Former Manufactured Gas Plant (MGP) Site is located at 14 Hancock Street, in the Village of Fort Plain, Montgomery County, New York (site). The site is located on approximately 0.5 acres of property in the Village of Fort Plain, New York. The property is bordered on the east by Hancock Street (State Route 5S), on the south by a private residence, on the west by a steep wooded hillside that rises to a narrow wooded park bordering Clinton Avenue, and on the north by a parking lot. The property currently includes two elevated active transformer banks. The remainder of the property is vacant and undeveloped.

From the 1860s until the 1930s, MGP operations were conducted at the property. Remedial investigations indicated that subsurface MGP-impacted soil and groundwater exists at the site. Access to the former MGP property is secured by a chain-link fence.

1.3 Policy Statement

A fundamental principle of safety management is that all injuries, illnesses, and incidents are preventable. The Contractor will take every reasonable step to eliminate or control hazards to minimize the possibility of injury, illness, or incident.

This GHASP prescribes the general procedures that must be followed while performing Site activities; however, the Contractor performing the work must review and update their HASP based on the tasks being completed. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without prior approval of the New York State Department of Environmental conservation (NYSDEC). The Contractor’s HASP must be reviewed periodically to confirm that it is current and technically correct. Any changes in site conditions and/or the scope of work will require a review of and modification to the HASP. Such changes will be completed in the form of an addendum or a revision to this HASP.

1.4 Definitions

The following definitions are applicable to this HASP:

- *Site* – The area where the work is to be performed. The Site includes the Exclusion Zone (EZ), Contamination Reduction Zone (CRZ), and Support Zone (SZ).

- *Project* – All on-site work performed under the scope of work.

- *Contractor/Subcontractor* – Includes contractor personnel hired by National Grid and/or National Grid's Contractor.

- *On-Site Personnel* – All National Grid personnel or subcontractor personnel involved with the project.

- *Visitor* – All other personnel, except the on-site personnel. All visitors must receive approval to enter the site

- *Exclusion Zone (EZ)* – Any portion of the site where hazardous substances are, or are reasonably suspected to be present in the air, water, or soil.

- *Contamination Reduction Zone (CRZ)* – Area between the EZ and SZ that provides a transition between contaminated and clean areas. Decontamination stations are located in this zone.

- *Support Zone (SZ)* – All areas of the site, excluding the EZ and CRZ. The SZ surrounds the immediate area where project activities are under way. Support equipment is located in this zone.

2. Roles and Responsibilities

2.1 All Personnel

All personnel must adhere to the procedures outlined in the HASP during the performance of their work at the Site. Each person is responsible for completing tasks safely and reporting any unsafe acts or conditions to their supervisor. No person may work in a manner conflicting with these procedures. After due warnings, the Contractor's Project Manager will dismiss from the Site any person who violates safety procedures.

All personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating site activities. In addition, all personnel will attend an initial hazard briefing prior to beginning work at the site.

The roles of personnel are outlined in the following subsections. A summary table for key project personnel and contacts is provided below.

TABLE 2-1
KEY PERSONNEL

Contractor's Personnel		
Role	**Name**	**Address/Telephone Number**
Project Officer	To be determined	To be determined
Project Manager	To be determined	To be determined
Health and Safety Manager	To be determined	To be determined
Remedial Design Task Manager	To be determined	To be determined
Site Supervisor	To be determined	To be determined
Health and Safety Supervisor	To be determined	To be determined
Client		
Role	**Name**	**Address/Telephone Number**
National Grid Project Manager	Garry Cummins	300 Erie Boulevard West Syracuse, NY 13202 315.428.5731

Subcontractors		
Role	**Name**	**Address/Telephone Number**
To be determined	To be determined	To be determined

2.2 Contractor Personnel

2.2.1 Health and Safety Officer

The HSO or his/her designee (the Health and Safety Manager) has overall responsibility for the technical health and safety aspects of the project, including review and approval of this HASP. Inquiries regarding ARCADIS health and safety procedures, project procedures, and other technical or regulatory issues should be addressed to this individual. The HSO or his/her designee must approve changes or addenda to this HASP.

2.2.2 Project Manager

The Project Manager is responsible for verifying that project activities are completed in accordance with the requirements of this HASP. The Project Manager is responsible for confirming that the Site Supervisor (SS) has the equipment, materials, and qualified personnel to fully implement the safety requirements of this HASP. It is also the responsibility of the Project Manager to perform the following duties:

- Consult with the HSO on site health and safety issues.;
- Review Loss Prevention Observation (LPO) reports.
- Verify that all incidents are thoroughly investigated and reported to the National Grid Project Manager within 24 hours of notification.
- Approve, in writing, addenda or modifications to this HASP.
- Suspend work or modify work practices, as necessary, for personal safety, protection of property, and regulatory compliance.

2.2.3 Health and Safety Supervisor

The Contractor's Health and Safety Supervisor (HSS) is responsible for field health and safety issues, including the execution of this HASP. Questions in the field regarding health and safety procedures, project procedures, and other technical or regulatory issues should be addressed to this individual. The HSS will advise the Project Manager on health and safety issues, and will establish and coordinate the project air monitoring program if one is deemed necessary (see Section 6.1 – Air Monitoring). The HSS is the primary site contact on health and safety matters. It is the responsibility of the HSS to perform the following duties:

- Provide on-site technical assistance, if necessary.
- Participate in all Incident Investigations (IIs) and confirm that they are reported to the HSO and Project Manager within 24 hours.
- Coordinate site and personal air monitoring, as required, including equipment maintenance and calibration.
- Conduct site safety orientation training and safety meetings.
- Verify that Contractor's personnel have received the required physical examinations and medical certifications.
- Review site activities with respect to compliance with this HASP.
- Maintain required health and safety documents and records.
- Assist the SS in instructing field personnel on project hazards and protective procedures.
- Review LPO forms.

2.2.4 Site Supervisor

The SS is responsible for implementing this HASP, including communicating requirements to on-site personnel. The SS will be responsible for informing the Project Manager of changes in the work plan, procedures, or site conditions so that those changes may be addressed in this HASP. Other responsibilities are to perform the following duties:

- Consult with the HSS on site health and safety issues.
- Conduct LPOs at the site.
- Stop work, as necessary, for personal safety, protection of property, and regulatory compliance.
- Obtain a site map, determine and post routes to medical facilities, and post emergency telephone numbers.
- Notify local public emergency representatives (as appropriate) of the nature of the Site operations and post their telephone numbers (e.g., local fire department personnel who would respond for a confined-space rescue).
- Observe on-site project personnel for signs of ill-health effects.
- Investigate and report any incidents to the HSS.
- Verify that all on-site personnel have completed applicable training.
- Verify that on-site personnel are informed of the physical, chemical, and biological hazards associated with the site activities and the procedures and protective equipment necessary to control the hazards.
- Issue/obtain any required work permits (e.g., hot work, confined space).

2.3 All On-Site Personnel

All on-site personnel must read and acknowledge their understanding of this HASP before commencing work and abide by the requirements of the HASP. On-site personnel must sign the HASP Acknowledgement Form after reviewing this HASP.

All personnel will receive training in accordance with applicable regulations and be familiar with the requirements and procedures contained in this HASP prior to initiating site activities. In addition, all on-site personnel will attend an initial hazard briefing (prior to beginning work at the site) and the daily safety meetings.

All on-site personnel must perform a safe performance self-assessment (SPSA) prior to beginning each work activity. The SPSA process is presented in Section 4.1.1. This process must be performed prior to beginning each activity, and must be performed after any near miss or other incident to determine if it is safe to proceed. Safety issues should be either eliminated or mitigated prior to starting work. On-site personnel will immediately report the following to the SS or HSS:

- personal injuries and illnesses, no matter how minor
- unexpected or uncontrolled release of chemical substances
- symptoms of chemical exposure
- unsafe or hazardous situations
- unsafe or malfunctioning equipment
- changes in site conditions that may affect the health and safety of project personnel
- damage to equipment or property
- situations or activities for which they are not properly trained
- near misses

2.4 Visitors

All visitors to work areas must check in with the SS. Visitors will be cautioned to avoid contact with any materials that may be, or are suspected to be, impacted by constituents of concern (COCs).

Visitors requesting to observe work at the Site must don appropriate personal protective equipment (PPE) prior to entering the work area and must have the appropriate training and medical clearances to do so.

2.5 Stop Work Authority

Every employee at the Site has the responsibility to stop the work of another co-worker if the working conditions or behaviors are considered unsafe.

2.6 Short Service Employee Program

Recognizing that employees who are new to the Contractor are at a greater risk for incidents, the following guidelines are established to identify those employees and ease their transition. Short Service Employees (SSEs) will have an assigned field mentor to assist them in adjusting to the project requirements and procedures. SSEs will be identified in the field by wearing an orange hardhat.

- Employees new to the industry and new to the Contractor will be designated SSEs for 6 months.

- Employees experienced in the industry but new to the Contractor will be designated SSEs for 3 months.

Additionally, the following apply:

- a crew of two to three may have one SSE on site

- a crew of five may have two SSEs on site

- a crew of 10 or more may have no more than three SSEs on site

3. Project Hazards and Control Measures

3.1 Scope of Work

The scope of work will be outlined in the Contractor's Work Plan. The scope of work may include the following field activities:

- mobilization
- soil boring installation
- soil sampling
- water-level measurement; groundwater sampling
- excavation
- demobilization

3.2 Field Activities, Hazards, and Control Procedures

The Job Safety Analyses (JSAs) provided in Attachment A and the text below both identify potential health, safety, and environmental hazards associated with each type of field activity. Because of the complex and changing nature of field projects, supervisors must continually inspect the Site to identify hazards that may affect on-site personnel, the community, or the environment. The SS must be aware of these changing conditions and discuss them with the Project Manager whenever these changes impact employee health, safety, the environment, or performance of the project. The SS will keep on-site personnel informed of the changing conditions, and the Project Manager will write and/or approve addenda or revisions to this HASP, as necessary.

High voltage electrical sources represent the primary safety hazards that exist for all Site activities. Safety hazards associated with high voltage electrical sources include contact with overhead and underground conductors (e.g., conduits, cables, wires), the possibility of arcs and subsequent fire or explosion, and loud noises associated with automatic switching equipment. No work activities will be conducted in the vicinity of high voltage electrical sources without the direct supervision of a National Grid qualified employee.

The following sections contain generic summaries of several potential hazards and control measures for Site activities.

3.2.1 Mobilization

Site mobilization and survey will include determining the location of utilities and other installations and establishing work areas. Mobilization may also include setting up equipment and establishing a temporary site office. A break area will be set up outside of regulated work areas. Mobilization may involve clearing areas for the SZ and CRZ. During this initial phase, project personnel will walk the Site to confirm the existence of anticipated hazards and identify safety and health issues that may have arisen since the writing of this HASP.

3.2.1.1 Hazards

Potential hazards may be associated with heavy equipment operation (moving onto and around the Site), manual materials handling, installation of temporary on-site facilities (e.g., decontamination pads), and site preparation.

Manual materials handling and manual Site preparation may cause blisters; sore muscles; and joint and skeletal injuries; and may present eye, contusion, and laceration hazards. Installation of a temporary field office and support facilities may expose personnel to electrical hazards, underground and overhead utilities, and physical injury due to the manual lifting and moving of materials. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Environmental hazards may include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, and snakes; weather, such as sunburn, lightning, rain, and heat- or cold-related illnesses; and pathogens, such as rabies, and Lyme disease.

3.2.1.2 Controls

General control procedures for these types of hazards are discussed in Section 4 – General Safety Practices.

This example task includes the drilling of soil borings at specified locations using hollow-stem augers (HSAs). The equipment poses a hazard if it is not properly operated. The presence of overhead utilities and underground obstacles poses a hazard if boring equipment contacts them. As the hazards are similar to those encountered when using a conventional drill rig, the required control procedures are also the same as a conventional rig and are included in the following sections.

3.2.2 Drilling Hazards

The primary physical hazards for this activity are associated with the use of drilling equipment. Rig accidents can occur as a result of improperly placing the rig on uneven or unstable terrain or failing to adequately secure the rig prior to the start of operations. Underground and overhead utility lines can create hazardous conditions if contacted by drilling equipment. Tools and equipment, such as elevators, cat lines, and wire rope, have the potential for striking, pinning, or cutting personnel.

Wire Rope – Worn or frayed wire rope presents a laceration hazard if loose wires protrude from the main bundle.

Cat Lines – Cat lines are used on drilling rigs to hoist material. Accidents that occur during cat line operations may injure the employee doing the rigging, as well as injure the operator. Minimal hoisting control causes sudden and erratic load movements, which may result in hand and foot injuries.

Working Surfaces – Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, and slips and falls.

Materials Handling – The most common type of accident that occurs in materials handling operations is the “caught between” situation when a load is being handled and a finger or toe gets caught between two objects. Rolling stock can shift and/or fall from a pipe rack or truck bed.

3.2.2.1 Drilling Safety Procedures

Drill Crews – All drillers must possess required state or local licenses to perform such work. All members of the drill crew shall receive site-specific training prior to beginning work.

The driller is responsible for the safe operation of the drill rig, as well as the crew’s adherence to the requirements of this HASP. The driller must confirm that all safety equipment is in proper condition and is properly used. The members of the crew must follow all instructions of the driller, wear all PPE, and be aware of all hazards and control procedures. The drill crews must participate in the daily safety meetings and be aware of all emergency procedures.

Rig Inspection – Each day, prior to the start of work, the drill rig and associated equipment must be inspected by the driller and/or drill crew. Inspections must be documented. The following items must be inspected:

- vehicle condition
- proper storage of equipment
- condition of all wire rope and hydraulic lines
- condition of all drill rods and internal threads
- fire extinguisher
- first-aid kit

Drill Rig Set Up – The drill rig must be properly blocked and leveled prior to raising the derrick. The wheels that remain on the ground must be chocked. The leveling jacks shall not be raised until the derrick is lowered. The rig shall be moved only after the derrick has been lowered.

Site Drilling Rules – Before drilling activities commence, the existence and location of underground pipe, electrical equipment, and gas lines shall be determined. Underground Facilities Protection Organization must be contacted at least 3 days, but no more than 2 weeks prior to subsurface activities. The Contractor's SS will meet with electrical and natural gas locators on Site prior to marking out the underground utilities. During this meeting, the SS will provide the electric and natural gas locators with a site figure that shows the locations where drilling activities will be completed. The SS will conduct a Site walkover with the electrical and natural gas locators to visually identify each location where drilling activities are to be completed during site operations. The Subsurface Utility Checklist and its associated Underground Utility Procedure (see Attachment B) shall be used to document that nearby utilities have been marked on the ground and that the drilling areas have been cleared. The completed Subsurface Utility Checklist will be in the possession of the SS prior to commencement of any intrusive investigation.

Combustible gas readings of the general work area will be made regularly (see Section 6 – Air Monitoring).

Operations must be suspended and corrective action taken if the airborne flammable concentration reaches 10 percent of lower explosive limit (LEL) in the immediate area (a 1 foot radius) of the point of drilling or near any other ignition sources.

Under no circumstances will personnel be permitted to ride the traveling block or elevators nor will the cat line be used as a personnel carrier.

Overhead Electrical Clearances – If drilling is conducted in the vicinity of overhead power lines, the power to the lines must be shut off or the equipment must be positioned and blocked such that no part, including cables, can come within the minimum clearances as follows:

Table 3-1
OVERHEAD ELECTRICAL CLEARANCES

Nominal System Voltage	Minimum Required Clearance
0 to 50 kV	10 feet
51 to 100 kV	12 feet
101 to 200 kV	15 feet
201 to 300 kV	20 feet
301 to 500 kV	25 feet
501 to 750 kV	35 feet
751 to 1,000 kV	45 feet

kV – kilovolts

When the drill rig is in transit, with the boom lowered and no load, the equipment clearance must be at least 4 feet for voltages less than 50 kV, 10 feet for voltages of 51 kV to 345 kV, and 16 feet for voltages above 345 kV.

Rig Set Up – All well sites will be inspected by the driller prior to the location of the rig to verify that a stable surface exists. This is especially important in areas where soft, unstable terrain is common.

All rigs will be properly blocked and leveled prior to raising the derrick. Blocking provides a more stable drilling structure by evenly distributing the weight of the rig. Proper blocking confirms that differential settling of the rig does not occur.

When the ground surface is soft or otherwise unstable, wooden blocks, at least 24 inches by 24 inches and 4 inches to 8 inches thick, shall be placed between the jack swivels and the ground. The emergency brake shall be engaged and the wheels that are on the ground shall be chocked.

Hoisting Operations – Drillers should never engage the rotary clutch without watching the rotary table and determining that it is clear of personnel and equipment.

Unless the drawworks is equipped with an automatic feed control, the brake should not be left unattended without first being tied down.

Auger strings or casing should be picked up slowly.

During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller should be on the rig floor; no one else should be on the rig or derrick.

The brakes on the drawworks of the drill rig should be tested by the driller each day. The brakes should be thoroughly inspected by a competent individual each week.

A hoisting line with a load imposed should not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for line contact.

Workers should never stand near the borehole whenever any wire line device is being run.

Hoisting control stations should be kept clean and controls labeled as to their functions.

Cat Line Operations – Only experienced workers will be allowed to operate the cathead controls. The kill switch must be clearly labeled and operational prior to operation of the cat line. The cathead area must be kept free of obstructions and entanglements.

The operator should not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.

Personnel should not stand near, step over, or go under a cable or cat line that is under tension.

Employees rigging loads on cat lines shall:

- Keep out from under the load.
- Keep fingers and feet where they will not be crushed.
- Be sure to signal clearly when the load is being picked up.
- Use standard visual signals only and not depend on shouting to co-workers.
- Make sure the load is properly rigged, since a sudden jerk in the cat line will shift or drop the load.

Wire Rope – When two wires are broken or rust or corrosion is found adjacent to a socket or end fitting, the wire rope shall be removed from service or resocketed. Special attention shall be given to the inspection of end fittings on boom support, pendants, and guy ropes.

Wire rope removed from service due to defects shall be cut up or plainly marked as being unfit for further use as rigging.

Wire rope clips attached with U-bolts shall have the U-bolts on the dead or short end of the rope; the clip nuts shall be retightened immediately after initial load carrying use and at frequent intervals thereafter.

When a wedge socket fastening is used, the dead or short end of the wire rope shall have a clip attached to it or looped back and secured to itself by a clip; the clip shall not be attached directly to the live end.

Protruding ends of strands in splices on slings and bridles shall be covered or blunted.

Except for eye splices in the ends of wires and for endless wire rope slings, wire rope used in hoisting, lowering, or pulling loads, shall consist of one continuous piece without knot or splice.

An eye splice made in any wire rope shall have not less than five full tucks.

Wire rope shall not be secured by knots. Wire rope clips shall not be used to splice rope.

Eyes in wire rope bridles, slings, or bull wires shall not be formed by wire clips or knots.

Auger Handling – Auger sections shall be transported by cart or carried by two persons. Individuals should not carry auger sections without assistance.

Workers should not be permitted on top of the load during loading, unloading, or transferring of rolling stock.

When equipment is being hoisted, personnel should not stand where the bottom end of the equipment could whip and strike them.

Augers stored in racks, catwalks, or on flatbed trucks should be secured to prevent rolling.

3.2.3 Soil Sampling

This task consists of collecting soil samples for subsequent analysis and evaluation of either potential impact by COCs or for geotechnical parameters. The physical hazards of these operations are primarily associated with the sample collection methods and procedures utilized. COCs consist of MGP-related benzene, toluene, ethylbenzene, and xylene (collectively referred to as BTEX) and polycyclic aromatic hydrocarbons (PAHs).

Hazards – Inhalation and absorption (contact) of COCs are the primary routes of entry associated with soil sampling due to the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. During the course of this project, several different soil sampling methodologies may be utilized based on equipment accessibility and the types of materials to be sampled. These sampling methods may include the use of hand-auger/sampling probes, sampling spoons, or trowels. The primary hazards associated with these specific sampling procedures are not potentially serious; however, other operations in the area or the conditions under which samples must be collected may present chemical and physical hazards. The hazards directly associated with soil sampling procedures are generally limited to strains/sprains and potential eye hazards. Exposure to soil and water containing COCs is also possible. In addition to the safety hazards specific to sampling operations, hazards associated with the operation of vehicles, especially large vehicles with limited operator visibility, is a concern. Of particular concern will be the backing up of trucks, excavation equipment, and other support vehicles.

The flora and fauna of the site may present hazards of poison ivy, poison oak, ticks, fleas, mosquitoes, wasps, spiders, and snakes. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Freezing-weather hazards include frozen, slick, and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil.

Control – To control dermal exposure during soil sampling activities, a minimum of Modified Level D protection will be worn. Air monitoring may be conducted during soil sampling activities to assess the potential for exposure to airborne COCs. Subsurface soil samples will be collected and screened for volatile organic compounds (VOCs) using a photoionization detector (PID). If the results of air monitoring indicate the presence of organic vapors in a concentration causing concern, personnel will upgrade to Level C protection. Refer to Section 6 – Air Monitoring for a description of air monitoring requirements and action levels. A description of each level of personal protection is included in Section 5 – Personal Protective Equipment. Personnel will collect samples remotely from outside of excavations when feasible. Control procedures for environmental and general hazards are discussed in Section 4 – General Safety Practices.

3.2.4 Water-Level Measurement Activities

At monitoring well locations, field personnel may obtain depth-to-water measurements using an electronic water-level indicator. The hazards associated with these activities are primarily associated with the working surfaces and contact with the groundwater.

The work area may present slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, and slick walking surfaces and unstable soil. For water-level measurement, Modified Level D protection can be used for dermal protection, unless, based upon air monitoring and conditions during site activities, the HSS determines that a higher or lower protection level is necessary. Air sampling will be conducted to assess the potential for inhalation of potential contaminants. If the results of air monitoring indicate COCs in a concentration causing concern, based on Section 6 –Air Monitoring, personnel will upgrade to Level C protection. Refer to Section 6 for a description of requirements and action levels. A description of each level of PPE protection is included in Section 5 – Personal Protective Equipment.

3.2.5 Groundwater Sampling/Monitoring

Groundwater sampling/monitoring involves uncapping, purging (pumping water out of the well), and sampling/monitoring new and existing monitoring wells. A mechanical pump may be utilized to purge the wells and can be hand-, gas-, or electric-operated. Water samples taken from the wells are then placed in containers and shipped to an analytical laboratory for analysis. The physical hazards of these operations are primarily associated with the sample collection methods and procedures utilized.

Hazards – Inhalation and absorption (contact) of COCs are the primary routes of entry associated with groundwater sampling due to the manipulation of sample media and equipment, manual transfer of media into sample containers, and proximity of operations to the breathing zone. During the course of this project, several different groundwater sampling methodologies may be utilized based on equipment accessibility and the types of materials to be sampled. These sampling methods may include hand or mechanical bailing. The primary hazards associated with these specific sampling procedures are not potentially serious; however, other operations in the area, or the conditions under which samples must be collected, may present chemical and physical hazards. The hazards directly associated with groundwater sampling procedures are generally limited to strains/sprains from hand bailing and potential eye hazards. Exposure to soil and water containing COCs is also possible.

The flora and fauna of the site may present hazards of poison ivy, poison oak, ticks, fleas, mosquitoes, wasps, spiders, and snakes. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Freezing-weather hazards include frozen, slick, and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil.

Control – To control dermal exposure during groundwater sampling/monitoring activities, a minimum of Modified Level D protection will be worn. Air monitoring will be conducted during groundwater sampling/monitoring activities to assess the potential for exposure to airborne COCs. If the results of air monitoring indicate the presence of organic vapors in a concentration causing concern, personnel will upgrade to Level C protection. Refer to Section 6 – Air Monitoring for a description of air monitoring requirements and action levels. A description of each level of personal protection is included in Section 5 – Personal Protective Equipment. Control procedures for environmental and general hazards are discussed in Section 4 – General Safety Procedures.

3.2.6 Demobilization

Demobilization involves the removal of all tools, equipment, supplies, and vehicles brought to the Site. The hazards of this phase of activity are associated with heavy equipment operation and manual materials handling.

3.2.6.1 Hazards

Manual materials handling may cause blisters, sore muscles, and joint and skeletal injuries and may present eye, contusion, and laceration hazards. Heavy equipment operation presents noise and vibration hazards and hot surfaces to operators. Personnel in the vicinity of heavy equipment operation may be exposed to physical hazards resulting in fractures, contusions, and lacerations and may be exposed to high noise levels. The work area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Environmental hazards include plants, such as poison ivy and poison oak; aggressive fauna, such as ticks, fleas, mosquitoes, wasps, spiders, and snakes; weather, such as sunburn, lightning, rain, and heat- or cold-related illnesses; and pathogens, such as rabies, Lyme disease, and blood-borne pathogens.

3.2.6.2 Control

Control procedures for these hazards are discussed in Section 4 – General Safety Practices.

3.3 Chemical Hazards

The potential chemical hazards associated with Site operations are related to inhalation, ingestion, and skin exposure to soil and groundwater impacted with a number of constituents, primarily the following COCs: MGP-related BTEX and PAHs.

Airborne concentrations of COCs may be measurable during certain intrusive activities and will require monitoring during those activities. Air monitoring requirements for site tasks are outlined in Section 6.

The Chemical Hazard Data Table for site COCs can be found at Attachment C, and the Material safety data sheets (MSDSs) for the COCs are included in Attachment D.

4. General Safety Practices

4.1 General Safety Rules

General safety rules for site activities include, but are not limited to, the following:

- At least one copy of this HASP must be in a location at the site that is readily available to personnel, and all project personnel shall review this HASP prior to starting work.
- Consume or use food, beverages, chewing gum, and tobacco products only in the SZ or other designated area outside the EZ and CRZ. Cosmetics shall not be applied in the EZ or CRZ.
- Wash hands before eating, drinking, smoking, or using toilet facilities.
- Wear all PPE, as required, and stop work and replace damaged PPE immediately.
- Secure disposable coveralls, boots, and gloves at the wrists and legs and confirm closure of the suit around the neck.
- Upon skin contact with materials that may be impacted by COCs, remove contaminated clothing and wash the affected area immediately. Contaminated clothing must be changed. Any skin contact with materials potentially impacted by COCs must be reported to the SS or HSS immediately. If needed, medical attention should be sought.
- Practice contamination avoidance. Avoid contact with surfaces either suspected or known to be impacted by COCs, such as standing water, mud, or discolored soil. Equipment must be stored on elevated or protected surfaces to reduce the potential for incidental contamination.
- Remove PPE, as required, in the CRZ to limit the spread of COC-containing materials.
- At the end of each shift or as required, dispose of all single-use coveralls, soiled gloves, and respirator cartridges in designated receptacles designated for this purpose.
- Removing soil containing site COCs from protective clothing or equipment with compressed air, shaking, or any other means that disperses contaminants into the air is prohibited.

- Inspect all non-disposable PPE for contamination in the CRZ. Any PPE found to be contaminated must be decontaminated or disposed of appropriately.
- Recognize emergency signals used for evacuation, injury, and fire.
- Report all injuries, illnesses, near misses, and unsafe conditions or work practices to the SS or HSS.
- Use the "buddy system" during all operations requiring Level C PPE, and when appropriate, during Modified Level D operations.
- Obey all warning signs, tags, and barriers. Do not remove any warnings unless authorized to do so.
- Use, adjust, alter, and repair equipment only if trained and authorized to do so and in accordance with the manufacturer's directions.
- Personnel are to perform only tasks for which they have been properly trained and will advise their supervisor if they have been assigned a task for which they are not trained.
- The presence or consumption of alcoholic beverages or illicit drugs during the workday is strictly prohibited. Notify your supervisor if you must take prescription or over-the-counter drugs that could cause drowsiness or other side effects that could impair judgment.
- Remain upwind during site activities whenever possible.

4.1.1 Safe Performance Self Assessment

All on-site personnel are required to perform an SPSA using TRACK prior to beginning any activity. This three-step process requires each individual to:

- *Assess* the risk of the task to be performed. Ask the following questions:
  - What could go wrong?
  - What is the worst thing that could happen if something does go wrong?

- *Analyze* the ways the risk can be reduced. Ask the following questions:
  - Do I have all the necessary training and knowledge to do this task safely?
  - Do I have all the proper tools and PPE?
- *Act* to control the risk and perform the task safely.
  - Take the necessary action to perform the job safely.
  - Follow written procedures, and ask for assistance if necessary.

This process must be performed prior to beginning any activity, and must be performed after any near miss or other incident to determine if it is safe to proceed.

4.1.2 Loss Prevention Observation

The SS or the HSS will perform the LPO to identify and correct potential hazards and to positively reinforce behaviors and practices that are correct. The SS or HSS must identify potential deviations from safe work practices that could possibly result in an incident and take prompt corrective action. The LPO process includes the following steps:

- Identify tasks that have the greatest potential for hazardous incidents.
- Be familiar with the proper procedure for completing the task.
- Discuss with the observed employee the task and the SS/HSS role in observing the task.
- Observe the employee completing the task.
- Document positive conditions and actions and identify areas in need of improvement.

LPO forms are located at Attachment E.

4.1.3 Incident Investigation

An incident is any of the following events: first-aid cases, injuries, illnesses, near misses, spills/leaks, equipment and property damage, motor vehicle accidents, regulatory violations, fires, and business interruptions. All incidents should be investigated within 24 hours and reported to the Project Manager and the HSO.

The purpose of an incident investigation is to prevent the recurrence of a similar hazardous event. Incident investigations investigate all incidents in the same manner. Using the information gathered during an investigation, appropriate measures will be taken to protect personnel from the hazard in question. The Incident Investigation Form is included in Attachment F.

4.1.4 Job Safety Analysis

JSA is a tool used to identify potential hazards, and to develop corrective or protective systems to eliminate the hazard. A JSA lists all potential hazards associated with an activity. Hazards may be physical (such as lifting hazards or eye hazards) or environmental (such as weather). After identifying the hazards associated with an activity, control measures are evaluated and protective measures or procedures are then instituted. JSAs should be reviewed periodically so that the procedures and protective equipment specified for each activity are current and technically correct. Any changes in site conditions and/or scope of work may require review of and modification to the JSA in question. During this review process, comments on the JSA and its procedures should be obtained from personnel associated with the activity being analyzed.

4.2 Buddy System

On-site personnel should use the buddy system, as required by operations. Use of the “buddy system” is required during all operations requiring Level C to Level A PPE, and when appropriate, during Level D/Modified D operations. Crew members must observe each other for signs of chemical exposure, and heat or cold stress. Indications of adverse effects include, but are not limited to:

- changes in complexion and skin coloration
- changes in coordination
- changes in demeanor
- excessive salivation and pupillary response
- changes in speech pattern

Crew members must also be aware of the potential exposure to possible safety hazards, unsafe acts, or non-compliance with safety procedures.

Field personnel must inform their partners or fellow crewmembers of non-visible effects of exposure to toxic materials that they may be experiencing. The symptoms of such exposure may include, but are not limited to:

- headaches
- dizziness
- nausea
- blurred vision
- cramps
- iritation of eyes, skin, or respiratory tract

If protective equipment or noise levels impair communications, prearranged hand signals must be used for communication. Personnel must stay within line of sight of another team member.

4.3 Heat Stress

Heat stress is caused by a number of interacting factors, including, but not limited to, environmental conditions, clothing, and workload, as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load and, in particular, because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Personnel must be aware of the types and causes of heat-related illnesses and be able to recognize the signs and symptoms of these illnesses in both themselves and their co-workers.

Heat rashes are one of the most common problems in hot work environments. Commonly known as prickly heat, a heat rash is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

Heat cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused both by too much or too little salt.

Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution (plus or minus 0.3 percent sodium chloride), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Drinking commercially available carbohydrate electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

Heat exhaustion occurs from increased stress on various body organs due to inadequate blood circulation, cardiovascular insufficiency, or dehydration. Signs and symptoms include pale, cool, moist skin; heavy sweating; dizziness; nausea; headache, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment.

Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, which is a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment, be given fluid replacement, and be encouraged to get adequate rest.

Heat stroke is the most serious form of heat stress. Heat stroke occurs when the body's system of temperature regulation fails and the body's temperature rises to critical levels. This condition is caused by a combination of highly variable factors and its occurrence is difficult to predict.

Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature (e.g., a rectal temperature of 41 degrees Celsius [°C] [105.8 degrees Fahrenheit {°F}]). If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of workload and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first-aid treatment.

Regardless of the worker's protestations, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or exhaustion, that person may be predisposed to additional heat injuries.

Heat Stress Safety Precautions

Heat stress monitoring and work rest cycle implementation should commence when the ambient adjusted temperature exceeds 72°F. A minimum work rest regimen and procedures for calculating ambient adjusted temperature are described in Table 4-1.

TABLE 4-1
WORK/REST SCHEDULE

Adjusted Temperature	Work/Rest Regimen Normal Work Ensemble[b]	Work/Rest Regimen Impermeable Ensemble
90ºF (32.2ºC) or above	After each 45 minutes of work	After each 15 minutes of work
87.5º - 90ºF (30.8º-32.2ºC)	After each 60 minutes of work	After each 30 minutes of work
82.5º - 87.5ºF (28.1º - 30.8ºC)	After each 90 minutes of work	After each 60 minutes of work
77.5º - 82.5ºF (25.3º - 28.1ºC)	After each 120 minutes of work	After each 90 minutes of work
72.5º - 77.5ºF (30.8º - 32.2ºC)	After each 150 minutes of work	After each 120 minutes of work

a. For work levels of 250 kilocalories per hour (Light-Moderate Type of Work).

b. Calculate the adjusted air temperature (ta adj) by using this equation: ta adj ºF = ta ºF + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

c. A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

d. The information presented above was generated using the information provided in the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) Handbook.

To determine if the work rest cycles are adequate for the personnel and specific site conditions, additional monitoring of individual heart rates will be conducted during the rest cycle. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one third and maintain the same rest period.

Additionally, one or more of the following control measures can be used to help control heat stress and are mandatory if any site worker has a heart rate (measure immediately prior to rest period) exceeding 115 beats per minute:

- Site workers will be encouraged to drink plenty of water and electrolyte replacement fluids throughout the day.
- On-site drinking water will be kept cool (50 to 60°F).
- A work regimen that will provide adequate rest periods for cooling down will be established, as required.
- All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.
- Cooling devices, such as vortex tubes or cooling vests, should be used when personnel must wear impermeable clothing in conditions of extreme heat.
- Employees should be instructed to monitor themselves and co-workers for signs of heat stress and to take additional breaks as necessary.
- A shaded rest area must be provided. All breaks should take place in the shaded rest area.
- Employees must not be assigned to other tasks during breaks.

- Employees must remove impermeable garments during rest periods. This includes white Tyvek™-type garments.

All employees must be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress disorders.

4.4 Biological Hazards

Biological hazards may include poison ivy, snakes, thorny bushes and trees, ticks, mosquitoes, scorpions, and other pests.

4.4.1 Tick Borne Diseases

Lyme disease – The disease commonly occurs in summer and is transmitted by the bite of infected ticks. “Hot spots” in the United States include New York, New Jersey, Pennsylvania, Massachusetts, Connecticut, Rhode Island, Minnesota, and Wisconsin.

Symptoms of Lyme disease include a rash or a peculiar red spot, like a bull’s eye, which expands outward in a circular manner. The victim may have headache, weakness, fever, a stiff neck, and swelling and pain in the joints, and eventually, arthritis. Symptoms of erlichiosis include muscle and joint aches, flu-like symptoms, but there is typically no skin rash.

Erlichiosis – The disease also commonly occurs in summer and is transmitted by the bite of infected ticks. “Hot spots” in the United States include New York, Massachusetts, Connecticut, Rhode Island, Minnesota, and Wisconsin.

These diseases are transmitted primarily by the deer tick, which is smaller and redder than the common wood tick. The disease may be transmitted by immature ticks, which are small and hard to see. The tick may be as small as a period on this page.

Rocky Mountain Spotted Fever (RMSF) – This disease is transmitted via the bite of an infected tick. The tick must be attached 4 to 6 hours before the disease-causing organism (*Rickettsia rickettsii*) becomes reactivated and can infect humans. The primary symptom of RMSF is the sudden appearance of a moderate-to-high fever. The fever may persist for 2 to 3 weeks. The victim may also have a headache, deep muscle pain, and chills. A rash appears on the hands and feet on about the third day and eventually spreads to all parts of the body. For this reason, RMSF may be confused with measles or meningitis. The disease may cause death if untreated, but if identified and treated promptly, death is uncommon.

Control – Tick repellant containing diethyltoluamide (DEET) should be used when working in tick-infested areas, and pant legs should be tucked into boots. In addition, workers should search the entire body every 3 or 4 hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gentle and steady pulling action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks.

4.4.2 Poisonous Plants

Poisonous plants may be present in the work area. Personnel should be alerted to its presence and instructed on methods to prevent exposure.

Control – The main control is to avoid contact with the plant, cover arms and hands, and frequently wash potentially exposed skin. Particular attention must be given to avoiding skin contact with objects or protective clothing that have touched the plants. Treat every surface that may have touched the plant as contaminated, and practice contamination avoidance. If skin contact is made, the area should be washed immediately with soap and water and observed for signs of reddening.

4.4.3 Snakes

The possibility of encountering snakes exists, specifically for personnel working in wooded/vegetated areas. Snake venoms are complex and include proteins, some of which have enzymatic activity. The effects produced by venoms include neurotoxic effects with sensory, motor, cardiac, and respiratory difficulties; cytotoxic effects on red blood cells, blood vessels, heart muscle, kidneys, and lungs; defects in coagulation; and effects from local release of substances by enzymatic actions. Other noticeable effects of venomous snakebites include swelling, edema, and pain around the bite, and the development of ecchymosis (the escape of blood into tissues from ruptured blood vessels).

Control – To minimize the threat of snakebites, all personnel walking through vegetated areas must be aware of the potential for encountering snakes, and the need to avoid actions potentiating encounters, such as, but not limited to, turning over logs. If a snakebite occurs, an attempt should be made to obtain snake markings, size, and color for identification. The victim must be transported to the nearest hospital within 30 minutes; first aid consists of applying a constriction band and washing the area around the wound to remove any unabsorbed venom.

4.4.4 Spiders

Personnel may encounter spiders during work activities.

Two spiders are of concern, the black widow and the brown recluse. Both prefer dark sheltered areas, such as basements, equipment sheds and enclosures, and around woodpiles or other scattered debris. The black widow is shiny black, approximately 1-inch-long, and found throughout the United States. There is a distinctive red hourglass marking on the underside of the black widow's body. The bite of a black widow is seldom fatal to healthy adults, but effects include respiratory distress, nausea, vomiting, and muscle spasms. The brown recluse is smaller than the black widow and gets its name from its brown coloring and behavior. The brown recluse is more prevalent in the southern United States. The brown recluse has a distinctive violin shape on the top of its body. The bite of the brown recluse is painful and the bite site ulcerates and takes many weeks to heal completely.

Control – To minimize the threat of spider bites, all personnel walking through vegetated areas must be aware of the potential for encountering these arachnids. Personnel need to avoid actions that may result in encounters, such as turning over logs, and placing hands in dark places, such as behind equipment or in corners of equipment sheds or enclosures. If a spider bite occurs, the victim must be transported to the nearest hospital as soon as possible; first aid consists of applying ice packs and washing the area around the wound to remove any unabsorbed venom.

4.4.5 Mosquitoes

Personnel may be exposed to mosquitoes during work activities.

Typical exposure to mosquitoes does not present a significant hazard. However, if West Nile virus is prevalent in the area, exposure to this virus is increased. West Nile virus results in flu-like symptoms and can be serious if not treated or in immune-compromised individuals.

Control – To minimize the threat of mosquito bites, all personnel working outside must be aware of the potential for encountering mosquitoes and implement the basic precautions listed below:

- Avoid working at dawn or dusk when mosquitoes are most active.

- Prevent accumulation of standing water at the work-site.
- Apply an insect repellent that contains DEET to exposed skin.
- Wear light colored clothes, preferably with long-sleeves and full-length pants.
- Do not touch any dead birds or animals that you encounter.

If dead birds are detected near the site, report to the local County Health Department. If flu-like symptoms are present, contact your Doctor or the Health and Safety Officer for more information.

4.5 Noise

Exposure to noise over the Occupational Safety and Health Administration (OSHA) action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increases with the intensity and duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication, thereby increasing the risk of accidents on site.

Control – All personnel must wear hearing protection, with a noise reduction rating (NRR) of at least 20 when noise levels exceed 85 decibels (dBA). When it is difficult to hear a co-worker at normal conversation distance, the noise level is approaching or exceeding 85 dBA, and hearing protection is necessary. All site personnel who may be exposed to noise must also receive baseline and annual audiograms and training as to the causes and prevention of hearing loss.

Noise monitoring requirements are discussed in Section 6.2 – Noise Monitoring.

Whenever possible, equipment that does not generate excessive noise levels will be selected for this project. If the use of noisy equipment is unavoidable, barriers or increased distance will be used to minimize worker exposure to noise, if feasible.

4.6 Spill Control

All personnel must take every precaution to minimize the potential for spills during site operations. All on-site personnel shall immediately report any discharge, no matter how small, to the SS.

Spill control equipment and materials will be located on the site at locations that present the potential for discharge. All sorbent materials used for the cleanup of spills will be containerized and labeled appropriately. In the event of a spill, the SS will follow the provisions in Section 9 – Emergency Procedures to contain and control released materials and to prevent their spread to off-site areas.

4.7 Sanitation

Site sanitation will be maintained according to appropriate federal, state, and local requirements and the guidance provided below.

4.7.1 Break Area

Breaks must be taken in the SZ, away from the active work area after site personnel go through decontamination procedures. There will be no smoking, eating, drinking, or chewing gum or tobacco in any area other than the SZ.

4.7.2 Potable Water

The following rules apply to all field operations:

- An adequate supply of potable water will be provided at each project site. Potable water must be kept away from hazardous materials or media and contaminated clothing or equipment.

- Portable containers used to dispense drinking water must be capable of being tightly closed, and must be equipped with a tap dispenser. Water must not be consumed directly from the container (drinking from the tap is prohibited) nor may it be removed from the container by dipping.

- Containers used for drinking water must be clearly marked and shall not be used for any other purpose.

- Disposable drinking cups must be provided. A sanitary container for dispensing cups and a receptacle for disposing of used cups is required.

4.7.3 Sanitary Facilities

Access to facilities for washing before eating, drinking, or smoking, or alternate methods, such as waterless hand-cleaner, and paper towels will be provided.

4.7.4 Lavatory

If permanent toilet facilities are not available, an appropriate number of portable chemical toilets will be provided.

This requirement does not apply to mobile crews or to normally unattended site locations so long as employees at these locations have transportation immediately available to nearby toilet facilities.

4.8 Emergency Equipment

Adequate emergency equipment for the activities being conducted on site and as required by applicable sections of 29 Code of Federal Regulation (CFR) 1910 and 29 CFR 1926 will be on site prior to the commencement of project activities. Personnel will be provided with access to emergency equipment, including, but not limited to, the following:

- fire extinguishers of adequate size, class, number, and location, as required by applicable sections of 29 CFR 1910 and 1926

- industrial first-aid kits of adequate size for the number of personnel on site

- emergency eyewash and/or shower, if required by operations being conducted on site

4.9 Lockout/Tagout Procedures

Only fully qualified and trained personnel will perform maintenance procedures. Before maintenance begins, lockout/tagout procedures per OSHA 29 CFR 1910.147 will be followed.

Lockout is the placement of a device that uses a positive means, such as lock, to hold an energy- or material-isolating device such that the equipment cannot be operated until the lockout device is removed. If a device cannot be locked out, a tagout system shall be used. Tagout is the placement of a warning tag on an energy- or material-isolating device indicating that the equipment controls may not be operated until the tag is removed by the personnel who attached the tag.

4.10 Electrical Safety

Electricity may pose a particular hazard to site workers due to the use of portable electrical equipment. If wiring or other electrical work is needed, a qualified electrician must perform it.

General electrical safety requirements include:

- All electrical wiring and equipment must be a type listed by Underwriters Laboratories (UL), Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency.

- All installations must comply with the National Electrical Safety Code (NESC), the National Electrical Code (NEC), or United States Coast Guard (USCG) regulations.

- Portable and semiportable tools and equipment must be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle.

- Tools protected by an approved system of double insulation or its equivalent, need not be grounded. Double-insulated tools must be distinctly marked and listed by UL or FM.

- Live parts of wiring or equipment must be guarded to prevent persons or objects from touching them.

- Electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.

- All circuits must be protected from overload.

- Temporary power lines, switchboxes, receptacle boxes, metal cabinets, and enclosures around equipment must be marked to indicate the maximum operating voltage.

- Plugs and receptacles must be kept out of water unless of an approved submersible construction.

- All extension cord outlets must be equipped with ground fault circuit interrupters.

- Attachment plugs or other connectors must be equipped with a cord grip and be constructed to endure rough treatment.

- Extension cords or cables must be inspected prior to each use, and replaced if worn or damaged. Cords and cables must not be fastened with staples, hung from nails, or suspended by bare wire.

- Flexible cords must be used only in continuous lengths without splice, with the exception of molded or vulcanized splices made by a qualified electrician.

4.11 Lifting Safety

Using proper lifting techniques may prevent back strain or injury. The fundamentals of proper lifting include:

- Consider the size, shape, and weight of the object to be lifted. A mechanical lifting device or additional persons must be used to lift an object if it cannot be lifted safely alone.

- The hands and the object should be free of dirt or grease that could prevent a firm grip.

- Gloves must be used and the object inspected for metal slivers, jagged edges, burrs, or rough or slippery surfaces.

- Fingers must be kept away from points that could crush or pinch them, especially when putting an object down.

- Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.

- The load should be kept as low as possible, close to the body with the knees bent.

- To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible.

- A worker should not carry a load that he or she cannot see around or over.

- When putting an object down, the stance and position are identical to that for lifting; the legs are bent at the knees and the back is straight as the object is lowered.

4.12 Department of Transportation Dangerous Good Shipping Requirements

Hazardous materials and dangerous goods are those materials that have one or more of the following characteristics: explosives, compressed and liquefied gases, flammable liquids and solids, oxidizing materials, and other substances that are poisonous, infectious, radioactive, or corrosive. It is the handling, loading, packing, or placing of hazardous materials (dangerous goods) in or from a container or vehicle at any facility for the purpose of transportation (including storing) in the course of transportation. This also includes the packing and transporting for air and ground shipment of laboratory analysis samples.

Regulations governing hazardous materials and dangerous goods exist to protect people, the environment, or property when these goods are being transported by road, rail, sea, or air. Given the increased emphasis of federal (i.e., Federal Aviation Administration and United States Department of Transportation, and the Transportation of Dangerous Goods Act) attention to the transport of hazard material-containing goods, it is imperative that all shipments are packaged and transported such that they adhere to all federal requirements, whether shipping via ground or air. Anyone shipping samples should receive training on the appropriate preparation and shipping protocols prior to shipping any material that is, or suspected to be, hazardous. Employees who ship by air must have taken an IATA training course.

5. Personal Protective Equipment

5.1 Levels of Protection

PPE is required to safeguard site personnel from various hazards. Varying levels of protection may be required depending on the levels of COCs and the degree of physical hazard. This section presents the various levels of protection and defines the conditions of use for each level. A summary of the levels is presented in Table 5-1 in this section.

5.1.1 Level D Protection

The minimum level of protection that will be required of personnel at the Site will be Level D, which will be worn when no dermal hazard exists and air monitoring indicates no inhalation hazard exists. The following equipment will be used:

- work clothing as prescribed by weather
- steel-toe work boots, meeting American National Standards Institute (ANSI) Z41
- safety glasses or goggles, meeting ANSI Z87
- hi-visibility vest
- hard hat, meeting ANSI Z89, when falling object hazards are present
- hearing protection (if noise levels exceed 85 dBA, then hearing protection with a United States Environmental Protection Agency [USEPA] NRR of at least 20 dBA must be used)

5.1.2 Modified Level D Protection

Modified Level D will be used when airborne contaminants are not present at levels of concern, but site activities present a potential for skin contact with contaminated materials. Modified Level D consists of:

- nitrile gloves worn over nitrile surgical gloves
- latex/polyvinyl chloride (PVC) overboots when contact with COC-impacted media is anticipated

- steel-toe work boots, meeting ANSI Z41
- safety glasses or goggles, meeting ANSI Z87
- hi-visibility vest
- face shield in addition to safety glasses or goggles when projectiles or splash hazards exist
- hard hat, meeting ANSI Z89 when falling object hazards are present
- hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used)
- Tyvek® suit (polyethylene coated Tyvek® suits for handling liquids) when body contact with COC-impacted media is anticipated.

5.1.3 Level C Protection

Level C protection will be required when the airborne concentration of COCs reaches one-half of the OSHA Permissible Exposure Limit (PEL) or ACGIH TLV. The following equipment will be used for Level C protection:

- full-face, air-purifying respirator with combination organic vapor and HEPA cartridges
- polyethylene-coated Tyvek® suit, with ankles and cuffs taped to boots and gloves
- nitrile gloves worn over nitrile surgical gloves
- steel-toe work boots, meeting ANSI Z41
- chemical resistant boots with steel toes or latex/PVC overboots over steel toe boots
- hi-visibility vest
- hard hat, meeting ANSI Z89
- hearing protection (if noise levels exceed 85 dBA, then hearing protection with a USEPA NRR of at least 20 dBA must be used)

5.2 Selection of Personal Protection Equipment

Equipment for personal protection will be selected based on the potential for contact, Site conditions, ambient air quality, and the judgment of supervising site personnel and health and safety professionals. The PPE used will be chosen to be effective against the COCs present on the Site.

5.3 Site Respiratory Protection Program

Respiratory protection is an integral part of employee health and safety at the Site due to potentially hazardous concentrations of airborne COCs. The site respiratory protection program will consist of the following (as a minimum):

- All on-site personnel who may use respiratory protection will have an assigned respirator.
- All on-site personnel who may use respiratory protection will have been fit tested and trained in the use of a full-face air-purifying respirator within the past 12 months.
- All on-site personnel who may use respiratory protection must within the past year have been medically certified as being capable of wearing a respirator. Documentation of the medical certification must be provided to the HSS, prior to commencement of site work.
- Only cleaned, maintained, National Institute for Occupational Safety and Health-approved respirators will be used.
- If respirators are used, the respirator cartridge is to be properly disposed of at the end of each work shift, or when load-up or breakthrough occurs.
- Contact lenses are not to be worn when a respirator is worn.
- All on-site personnel who may use respiratory protection must be clean-shaven. Mustaches and sideburns are permitted, but they must not touch the sealing surface of the respirator.
- Respirators will be inspected, and a negative pressure test performed prior to each use.
- After each use, the respirator will be wiped with a disinfectant, cleansing wipe. When used, the respirator will be thoroughly cleaned at the end of the work shift. The

respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the face piece.

5.4 Using Personal Protective Equipment

Depending upon the level of protection selected, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory if Modified Level D or Level C PPE is used. All personnel entering the EZ must put on the required PPE in accordance with the requirements of this HASP. When leaving the EZ, PPE will be removed in accordance with the procedures listed, to minimize the spread of COCs.

5.4.1 Donning Procedures

These procedures are mandatory only if Modified Level D or Level C PPE is used on the site:

- Remove bulky outerwear. Remove street clothes and store in clean location.
- Put on work clothes or coveralls.
- Put on the required chemical protective coveralls.
- Put on the required chemical protective boots or boot covers.
- Tape the legs of the coveralls to the boots with duct tape.
- Put on the required chemical protective gloves.
- Tape the wrists of the protective coveralls to the gloves.
- Don the required respirator and perform appropriate fit check (Level C).
- Put hood or head covering over head and respirator straps and tape hood to facepiece (Level C.
- Don remaining PPE, such as safety glasses or goggles and hard hat.

When these procedures are instituted, one person must remain outside the work area to confirm that each person entering has the proper protective equipment.

5.4.2 Doffing Procedures

The following procedures are only mandatory if Modified Level D or Level C PPE is required for the Site. Whenever a person leaves the work area, the following decontamination sequence will be followed:

- Upon entering the CRZ, rinse contaminated materials from the boots or remove contaminated boot covers.
- Clean reusable protective equipment.
- Remove protective garments, equipment, and respirator (Level C). All disposable clothing should be placed in plastic bags, which are labeled with contaminated waste labels.
- Wash hands, face, and neck (or shower if necessary).
- Proceed to clean area and dress in clean clothing.
- Clean and disinfect respirator for next use.

All disposable equipment, garments, and PPE must be bagged in plastic bags and labeled for disposal. See Section 7 – Work Zones and Decontamination for detailed information on decontamination stations.

5.5 Selection Matrix

The level of personal protection selected will be based on air monitoring of the work environment and an assessment by the SS and HSS of the potential for skin contact with COCs. The PPE selection matrix is presented in Table 5-1. This matrix is based on information available at the time this HASP was written. The Airborne Contaminant Action Levels in Table 6-1 should be used to verify that the PPE prescribed in these matrices is appropriate.

TABLE 5-1
PPE SELECTION MATRIX

Task	Anticipated Level of Protection for Task Initiation
Mobilization	Level D
Soil groundwater sampling	Modified Level D
Soil borings, monitoring well installation	Modified Level D/Level C
Soil vapor surveys	Level D
Decontamination	Level D/Modified Level D
Site demobilization	Level D

6. Air Monitoring

6.1 Air Monitoring

Air monitoring will be conducted during all ground-intrusive activity to determine employee exposure based on the potential for generation of airborne constituents. The monitoring results will dictate work procedures and the selection of PPE. The monitoring devices to be used are a Rae Systems MultiRAE detector (PID with an 11.7 electronvolt lamp/oxygen/LEL/Hydrogen Sulfide sensors) (or equivalent), an MIE Personal Data RAM 1000 particulate monitor (or equivalent) and benzene colorimetric tubes capable of recording from 0.5 to 10 parts per million (ppm). The HSS will be responsible for utilizing the air monitoring results to determine appropriate health and safety precautions for Contractor personnel.

Air monitoring will be conducted continuously with the LEL/O_2/CO/H_2S meter if flammable/explosive vapors are suspected and during ground-intrusive activities. Continuous real-time monitoring for organic vapors for the purpose of estimating employee exposure level will be conducted in the breathing zone with the PID during all ground-intrusive activities. If a reading above 1 ppm in the work zone persists for more than 1 minute, the air monitoring and corrective actions outlined in Table 6-1 will be implemented. At a minimum, all readings will be manually recorded on an hourly basis on air monitoring logs (Attachment G) or field notebooks.

All work activity must stop where tests indicate the concentration of flammable vapors exceeds 10 percent of the LEL at a location with a potential ignition source. Such an area must be ventilated to reduce the concentration to an acceptable level.

6.2 Noise Monitoring

Noise monitoring may be conducted, as required. Hearing protection is mandatory for all employees in noise hazardous areas, such as around heavy equipment. As a general rule, sound levels that cause speech interference at normal conversation distance should require the use of hearing protection.

6.3 Monitoring Equipment Maintenance and Calibration

All direct-reading instrumentation calibrations should be conducted under the approximate environmental conditions the instrument will be used. Instruments must be calibrated before and after use, noting the reading(s) and any adjustments that are necessary. All air monitoring equipment calibrations, including the standard used for calibration, must be documented on a calibration log or in the field notebook. All completed health and safety documentation/forms must be reviewed by the HSS and maintained by the SS.

All air monitoring equipment will be maintained and calibrated in accordance with the specific manufacturers' procedures. Preventive maintenance and repairs will be conducted in accordance with the respective manufacturers' procedures. When applicable, only manufacturer-trained and/or authorized personnel will be allowed to perform instrument repairs or preventive maintenance.

If an instrument is found to be inoperative or suspected of giving erroneous readings, the HSS must be responsible for immediately removing the instrument from service and obtaining a replacement unit. If the instrument is essential for safe operation during a specific activity, that activity must cease until an appropriate replacement unit is obtained. The HSS will be responsible for ensuring a replacement unit is obtained and/or repairs are initiated on the defective equipment.

6.4 Action Levels

Table 6-1 presents airborne constituent action levels that will be used to determine the procedures and protective equipment necessary based on conditions as measured at the site.

TABLE 6-1
WORK ZONE/WORKER BREATHING ZONE
AIRBORNE CONSTITUENT ACTION LEVELS

Parameter	Reading in Breathing Zone	Action
Total Organic Vapors	0 ppm to < 0.5 ppm	Normal operations; record breathing zone monitoring measurements every hour
	> 0.5 ppm to 5 ppm	Increase recording frequency to at least every 15 minutes and use benzene detector tube to screen for the presence of benzene
	∃ 5 ppm to # 50 ppm	Upgrade to level C PPE, continue screening for benzene
	> 50 ppm	Stop work; evacuate work area, investigate cause of reading, reduce through engineering controls, contact HSO
Benzene (as determined by colorimetric tube)	0.5 ppm to 10 ppm	Upgrade to Level C PPE
	>10 ppm	Stop work; evacuate confined spaces/work

Parameter	Reading in Breathing Zone	Action
		area, investigate cause of reading; contact HSO
Airborne Particulates (During excavation activity)	0 to < 1 mg/m^3 $\underline{>}$1 mg/m^3	Normal operations; continue hourly breathing-zone monitoring. Recommend initiation of dust-suppression measures.
Oxygen	# 19.5 % > 19.5% to < 23.5 % ∃ 23.5 %	Stop work; evacuate confined spaces/work area, investigate cause of reading; ventilate area; contact HSO Normal operations Stop work; evacuate confined spaces/work area, investigate cause of reading; ventilate area; contact HSO
Carbon Monoxide	0 ppm to # 20 ppm > 20 ppm	Normal operations Stop work; evacuate confined spaces/work area, investigate cause of reading; ventilate area; contact HSO
Hydrogen Sulfide	0 ppm to # 5 ppm > 5 ppm	Normal operations Stop work; evacuate confined spaces/work area, investigate cause of reading; ventilate area; contact HSO
Flammable Vapors (LEL)	< 10% LEL ∃ 10% LEL	Normal operations Stop work; ventilate area; investigate source of vapors

6.5 Odor Control

If any odor complaints are received from members of the surrounding community and are related to the field investigation activities described herein, then the potentially odor-causing activity will be suspended, subsurface openings will be covered, and on-site personnel (in consultation with National Grid will evaluate an alternative course of action.

7. Work Zones and Decontamination

7.1 Work Zones

7.1.1 Authorization to Enter

All personnel who may be potentially exposed to hazardous substances must have completed hazardous waste operations initial training as defined under OSHA Regulation 29 CFR 1910.120, have completed their training or refresher training within the past 12 months, and have been certified by a physician as fit for hazardous waste operations to enter a site area designated as an EZ or CRZ. Personnel without such training or medical certification may enter the designated SZ only. The SS will maintain a list of authorized persons; only personnel on the authorized persons list will be allowed within the EZ or CRZ. In the event that it becomes necessary for National Grid personnel to enter the area designated as the EZ or CRZ (e.g., due to an electrical emergency, control switching), reasonable efforts (e.g., relocating equipment, conducting continuous air monitoring) will be implemented to redesignate the area as a non-restricted access area. If National Grid personnel are required to enter the EZ or CRZ, the SS will provide direct supervision and conduct continuous air monitoring while National Grid personnel are within the EZ or CRZ.

7.1.2 Site Orientation and Hazard Briefing

No person will be allowed in the work area during site operations without first being given a Site orientation and hazard briefing. This orientation will be presented by the SS or HSS, and will consist of a review of this HASP. This review must cover the chemical, physical, and biological hazards, protective equipment, safe work procedures, and emergency procedures for the project. Following this initial meeting, daily safety meetings will be held each day before work begins.

All people entering the site work areas, including visitors, must document their attendance at this briefing, as well as the daily safety meetings on the forms included with this HASP.

7.1.3 Certification Documents

A training and medical file may be established for the project and kept on site during all Site operations. Specialty training, such as first-aid/cardiopulmonary resuscitation (CPR) certificates, as well as current medical clearances for all project field personnel required to wear respirators, will be maintained within that file. All personnel must provide their training and medical documentation to the HSS prior to starting work.

7.1.4 Entry Log

A log-in/log-out sheet will be maintained at the site by the SS. Personnel must sign in and out on a log sheet as they enter and leave the work area, and the SS may document entry and exit in the field notebook.

7.1.5 Entry Requirements

In addition to the authorization, hazard briefing, and certification requirements listed above, no person will be allowed in any work area unless they are wearing the minimum PPE, as described in Section 5 – Personal Protective Equipment.

7.1.6 Emergency Entry and Exit

People who must enter the work area on an emergency basis will be briefed of the hazards by the SS. All activities will cease in the event of an emergency. People exiting the work area because of an emergency will gather in a safe area for a head count. The SS is responsible for confirming that all people who entered the work area have exited in the event of an emergency.

7.1.7 Contamination Control Zones

Contamination control zones are maintained to prevent the spread of contamination and to prevent unauthorized people from entering hazardous areas.

7.1.7.1 Exclusion Zone

An EZ may consist of a specific work area or may be the entire area of potential contamination. All employees entering an EZ must use the required PPE, and must have the appropriate training and medical clearance for hazardous waste work. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. Cones, caution tape, or a site diagram will identify the location of each EZ.

7.1.7.2 Contamination Reduction Zone

The CRZ or transition area will be established, if necessary, to perform decontamination of personnel and equipment. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be decontaminated in a specific location. The decontamination of all personnel will be performed on site adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the SZ.

7.1.7.3 Support Zone

The SZ is a clean area outside the CRZ located to prevent employee exposure to hazardous substances. Eating and drinking will be permitted in the support area only after proper decontamination. Smoking may be permitted in the SZ, subject to site requirements.

7.1.8 Posting

Work areas will be prominently marked and delineated using cones, caution tape, or a Site diagram.

7.1.9 Site Inspections

The SS will conduct a daily inspection of site activities, equipment, and procedures to verify that the required elements are in place. The Health and Safety Inspection Form in Attachment H may be used as a guide for daily inspections. A weekly LPO must also be completed and forwarded to the Project Manager for review.

7.2 Decontamination

7.2.1 Personnel Decontamination

All personnel wearing Modified Level D or Level C protective equipment in the EZ must undergo personal decontamination prior to entering the SZ. The personnel decontamination area will consist of the following stations at a minimum:

- *Station 1* – Personnel leaving the contaminated zone will remove the gross contamination from their outer clothing and boots.

- *Station 2* – Personnel will remove their outer garment and gloves and dispose of it in properly labeled containers. Personnel will then decontaminate their hard hats and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items are then hand carried to the next station.

- *Station 3* – Personnel will thoroughly wash their hands and face before leaving the CRZ. Respirators will be sanitized and then placed in a clean plastic bag.

7.2.2 Equipment Decontamination

All vehicles that have entered the EZ will be decontaminated at the decontamination pad prior to leaving the zone. If the level of vehicle contamination is low, decontamination may be limited to rinsing of tires and wheel wells with water. If the vehicle is significantly contaminated, steam cleaning or pressure washing of vehicles and equipment may be required.

7.2.3 Personal Protective Equipment Decontamination

Where and whenever possible, single-use, external protective clothing must be used for work within the EZ or CRZ. This protective clothing must be disposed of in properly labeled containers. Reusable protective clothing will be rinsed at the site with detergent and water. The rinseate will be collected for disposal.

When removed from the CRZ, the respirator will be thoroughly cleaned with soap and water. The respirator face piece, straps, valves, and covers must be thoroughly cleaned at the end of each work shift and ready for use prior to the next shift. Respirator parts may be disinfected with a solution of bleach and water, or by using a spray disinfectant.

8. Training and Medical Surveillance

8.1 Training

8.1.1 General

All onsite project personnel who work in areas where they may be exposed to site contaminants must be trained as required by OSHA Regulation 29 CFR 1910.120 (HAZWOPER). Field employees also must receive a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. Personnel who completed their initial training more than 12 months prior to the start of the project must have completed an eight-hour refresher course within the past 12 months. The SS must have completed an additional eight hours of supervisory training, and must have a current first-aid/CPR certificate.

8.1.2 Basic 40-Hour Course

The following is a list of the topics typically covered in a 40-hour HAZWOPER training course:

- General safety procedures.
- Physical hazards (fall protection, noise, heat stress, cold stress).
- Names and job descriptions of key personnel responsible for site health and safety.
- Safety, health, and other hazards typically present at hazardous waste sites.
- Use, application, and limitations of PPE.
- Work practices by which employees can minimize risks from hazards.
- Safe use of engineering controls and equipment on site.
- Medical surveillance requirements.
- Recognition of symptoms and signs which might indicate overexposure to hazards.
- Worker right-to-know (Hazard Communication OSHA 1910.1200).

- Routes of exposure to contaminants.
- Engineering controls and safe work practices.
- Components of a health and safety program and a site-specific HASP.
- Decontamination practices for personnel and equipment.
- Confined-space entry procedures.
- General emergency response procedures.

8.1.3 Supervisory Course

Management and supervisors must receive an additional eight hours of training, which typically includes:

- General site safety and health procedures.
- PPE programs.
- Air monitoring techniques.

8.1.4 Site-Specific Training

Site-specific training will be accomplished by onsite personnel reading this HASP or through a thorough site briefing by the Project Manager, SS, or HSS on the contents of this HASP before work begins. The review must include a discussion of the chemical, physical, and biological hazards; the protective equipment and safety procedures; and emergency procedures.

8.1.5 Daily Safety Meetings

Twice daily safety meetings will be held to cover the work to be accomplished, the hazards anticipated, the PPE and procedures required to minimize site hazards, and emergency procedures. The SS or HSS should present these meetings prior to beginning the day’s fieldwork and again after lunch. No work will be performed in an EZ before a safety meeting has been held. A safety meeting must also be held prior to new tasks, and repeated if new hazards are encountered. The Daily Safety Meeting Log is included in Attachment I.

8.1.6 First Aid and CPR

At least one employee current in first aid/CPR will be assigned to the work crew and will be on the site during operations. Refresher training in first aid (triennially) and CPR (annually) are required to keep the certificate current. These individuals must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens.

8.2 Medical Surveillance

8.2.1 Medical Examination

All personnel who are potentially exposed to site contaminants must participate in a medical surveillance program as defined by OSHA at 29 CFR 1910.120 (f).

8.2.2 Pre-Placement Medical Examination

All potentially exposed personnel must have completed a comprehensive medical examination prior to assignment, and periodically thereafter as defined by applicable regulations. The pre-placement and periodic medical examinations typically include the following elements:

- Medical and occupational history questionnaire.
- Physical examination.
- Complete blood count, with differential.
- Liver enzyme profile.
- Chest X-ray, at a frequency determined by the physician.
- Pulmonary function test.
- Audiogram.
- Electrocardiogram for persons older than 45 years of age, or if indicated during the physical examination.

- Drug and alcohol screening, as required by job assignment.

- Visual acuity.

- Follow-up examinations, at the discretion of the examining physician or the corporate medical director.

The examining physician provides the employee with a letter summarizing his findings and recommendations, confirming the worker's fitness for work and ability to wear a respirator. Documentation of medical clearance will be available for each employee during all project site work.

8.2.3 Other Medical Examinations

In addition to pre-employment, annual, and exit physicals, personnel may be examined:

- At employee request after known or suspected exposure to toxic or hazardous materials.

- At the discretion of the HSS, HSO, or occupational physician in anticipation of, or after known or suspected exposure to toxic or hazardous materials.

8.2.4 Periodic Exam

Following the placement examination, all employees must undergo a periodic examination, similar in scope to the placement examination. For employees potentially exposed over 30 days per year, the frequency of periodic examinations will be annual. For employees potentially exposed less than 30 days per year, the frequency for periodic examinations will be 24 months.

8.2.5 Medical Restriction

When the examining physician identifies a need to restrict work activity, the employee's supervisor must communicate the restriction to the employee and the HSS. The terms of the restriction will be discussed with the employee and the supervisor.

9. Emergency Procedures

9.1 General

Prior to the start of operations, the work area will be evaluated for the potential for fire, contaminant release, or other catastrophic event. Unusual conditions or events, activities, chemicals, and conditions will be reported to the SS/HSS immediately.

The SS/HSS will establish evacuation routes and assembly areas for the site. All personnel entering the site will be informed of this route and the assembly area.

9.2 Emergency Response

If an incident occurs, the SS or HS should take the following steps:

- Evaluate the incident and assess the need for assistance and/or evacuation.
- Call for outside assistance as needed.
- Confirm that the Project Manager is notified promptly of the incident.
- Take appropriate measures to stabilize the incident scene.

9.3 Fire

In the case of a fire on site, the SS/HSS will assess the situation and direct firefighting activities. The SS/HSS will confirm that the Project Manager is immediately notified of any fires. Site personnel will attempt to extinguish the fire with available extinguishers, if safe to do so. In the event of a fire that site personnel are unable to safely extinguish with one fire extinguisher, the local fire department will be summoned.

9.4 Contaminant Release

In the event of a contaminant release, the following steps will be taken:

- Notify SS/HSS immediately.
- Evacuate immediate area of release.

- Conduct air monitoring to determine needed level of PPE.

- Don required level of PPE and prepare to implement control procedures.

The SS/HSS has the authority to commit resources as needed to contain and control released material, and to prevent its spread to off-site areas.

9.5 Medical Emergency

All employee injuries must be promptly reported to the HSS/SS, who will:

- Confirm that the injured employee receives prompt first aid and medical attention.

- In emergency situations, the worker is to be transported by appropriate means to the nearest urgent care facility (normally a hospital emergency room).

9.6 Emergency Care Steps

Upon entering an accident area, site personnel must follow these emergency care steps:

- Survey the scene. Determine if it is safe to proceed. Try to determine if the conditions that caused the incident are still a threat. Protect yourself from exposure before attempting to rescue the victim.

- Do a primary survey of the victim. Check for airway obstruction, breathing, and pulse. Assess likely routes of chemical exposure by examining the eyes, mouth, nose, and skin of the victim for symptoms.

- Phone emergency medical services (EMS). Give the location, telephone number used, caller’s name, what happened, number of victims, victim’s condition, and help being given.

- Maintain airway and perform rescue breathing as necessary.

- Perform CPR as necessary.

- Do a secondary survey of the victim. Check vital signs and do a head-to-toe exam.

- Treat other conditions as necessary. If the victim can be moved, take him or her to a location away from the work area where EMS can gain access.

9.7 First Aid – General

All persons must report any injury or illness to their immediate supervisor or the SS. Trained personnel will provide first aid. Injuries and illnesses requiring medical treatment must be documented. The SS and HSS must conduct an incident investigation as soon as emergency conditions no longer exist, and first aid and/or medical treatment has been confirmed. Incident investigations must be completed and submitted to the Project Manager within 24 hours after the incident.

If first-aid treatment is required, first-aid kits are kept at the CRZ. If treatment beyond first aid is required, the injured person(s) should be transported to the medical facility. If the injured person is not ambulatory or shows any sign of not being in a comfortable and stable condition for transport, then an ambulance and/or paramedics should be summoned. If there is any doubt as to the injured worker's condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

9.7.1 First Aid – Inhalation

Any employee complaining of symptoms of chemical overexposure as described in Section 4, General Safety Practices, will be removed from the work area and transported to the designated medical facility for examination and treatment.

9.7.2 First Aid – Ingestion

Call EMS and consult a poison control center for advice. If available, refer to the MSDS for treatment information. If the victim is unconscious, keep them on their side and clear the airway if vomiting occurs.

9.7.3 First Aid – Skin Contact

Project personnel, who have had skin contact with contaminants will, unless the contact is severe, proceed through the CRZ to the wash area. Personnel will remove any contaminated clothing and then flush the affected area with water for at least 15 minutes. The worker should be transported to the medical facility if he or she shows any sign of skin reddening, irritation, or if he or she requests a medical examination.

9.7.4 First Aid – Eye Contact

Project personnel who have had contaminants splashed in their eyes, or who have experienced eye irritation while in the EZ, must immediately proceed to the eyewash station in the CRZ. Do not decontaminate prior to using the eyewash. Remove whatever protective clothing is necessary to use the eyewash. Flush the eye with clean running water for at least 15 minutes. Arrange prompt transport to the designated medical facility.

9.7.5 Reporting Injuries, Illnesses, and Near-Miss Incidents

Injuries and illnesses, however minor, will be reported to the SS immediately. The SS will notify National Grid immediately upon learning of a near-miss, injury or illness. The SS will complete an injury report and submit it to the Project Manager within 24 hours.

Near-miss incidents are situations in which no injury or property damage occurred, but under slightly different circumstances an injury or property damage could have occurred. Near misses are caused by the same factors as injuries; therefore, they must be reported and investigated in the same manner. An investigation must be done immediately after an injury, illness, near miss, or other incident to determine if it is safe to proceed with the work.

If an injury or illness is life-threatening or an emergency, please seek medical attention immediately. As soon as possible, notify your supervisor.

9.8 Emergency Information

The means to summon local public response agencies such as police, fire, and ambulance will be reviewed in the daily safety meeting. These agencies are identified in Table 9-1.

TABLE 9-1
EMERGENCY CONTACT
IN CASE OF EMERGENCY CALL 911

Agency/Name	Telephone No.
Police	518.993.3781/911
Fire	518.993.4271/911
Ambulance	911
Little Falls Hospital	315.823.1000/911
Contractor Project Manager	TBD
Site Supervisor: TBD	TBD
National Grid Project Manager: Garry Cummins	315.428.5731

It is the responsibility of the HSS to verify the directions to the hospital at the beginning of this project.

Directions to Little Falls Hospital, 140 Burwell Street, Little Falls, New York 13365:

1. Start at 14 Hancock Street, travel northwest towards Main Street.

2. Turn left on Main Street/Hancock Street.

3. Turn quick right onto Canal Street, travel 0.1 miles.

4. Turn right onto River Street, travel 0.6 miles.

5. Turn left onto West Main Street.

6. West Main Street becomes RT-5.

7. Continue on RT-5 West/RT-167 West/RT-169 North, travel approximately 15 miles.

8. Bear right onto East Main Street as you enter the City of Little Falls.

9. Turn quick right onto Ward Street, travel 0.1 miles.

10. Turn right onto Burwell Street, travel 0.1 miles.

Arrive at Little Falls Hospital, 140 Burwell Street, Little Falls, New York.

10. References

Standard Operating Safety Guides, USEPA (Publication 9285.1-03, June 1992);

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH, OSHA, USCG, USEPA (86-116, October 1985);

Title 29 of the Code of Federal Regulations (CFR), Part 1910.120;

Title 29 of the Code of Federal Regulations (CFR), Part 1926;

Pocket Guide to Chemical Hazards, DHHS, PHS, CDC, NIOSH (2005);

Threshold Limit Values, ACGIH (2007);

Quick Selection Guide to Chemical Protective Clothing, Forsberg, K. and S.Z. Mansdorf, 5th Ed. (2005);

Health and Safety Manual, ARCADIS;

Accident Prevention Rules, National Grid (2000); and

Corporate Safety and Health Manual, National Grid (revised July 1997).

Attachment A

Example Job Safety Analyses

ARCADIS

JOB SAFETY ANALYSIS

SECTION 1	
JSA Type:	Environmental Operations
JSA No:	JSA001497
Date:	5/20/2008
Work Type:	Environmental - Soil Boring with Drill Rig
Work Activity:	Drill, construct, develop monitor wells, sample groundwater, pack and ship samples
Project No.:	B00366980000 - FORT PLAIN - REMEDIAL DESIGN (FORT PLAIN - REMEDIAL DESIGN)

SECTION 2

Development Team	Position/Title	PC	Reviewed By	Position/Title	Date
Beyrle, Nicholas J.		☑	Ahrens, Bruce W.		
			Golubski, Jason R.		
			Webster, Charles P.		

SECTION 3

Job Steps	Potential Hazard(s)	Critical Action(s)	SOP Reference
Load required PPE, sampling equipment, and supplies into vehicle.	Lifting hazards, back strain, appropriate PPE not on site.	Review HASP/ JSA for proper PPE; Employ safe lifting techniques such as bending from the knees (not at the waist) and reducing twisting/side to side motion. Request assistance when lifting heavy objects (>50 lbs).	
Driving	Vehicle traffic on site, damage to vehicle from decomissioning debris (flat tire, etc.), heavy machinery, personnel on site.	Smith Defensive Training; be aware of surroundings, perform TRACK, obtain proper passes, stickers, identification, and track protection (if required) to work on site. Stop and look in all directions before crossing tracks. Follow all client specific health and safety regulations/procedures.	See Driving JSA for mobilization/demobilization from site.
Clear drilling locations.	Traffic hazards. Overhead and underground utility installations. Property	Initiate one call system for identification of utilities and get a list of the utilities contacted prior to drilling activities. If necessary coordinate private line locator for private property. Inspect area for obvious signs of utilities. Reference Utility Clearance Review Form. Review proposed locations	

	damage	against available construction drawings for utilities, tanks, product lines, etc. Clearly mark proposed borehole locations. Clear pathways for moving equipment into and out of work area. Review HASP and permit conditions.	
Set up of Drill Rig at Well Location	Vehicle accident during rig movement. Damage caused by rig while accessing set-up location. Contact with overhead installations. Sandy terrain, (rig sinking). Unwanted rig movement. Slips, trips, and falls.	Verify clear pathway to sampling location and clearance for raising mast. Provide as-needed hand signals and guidance to driver to place rig. Visually inspect rig (fire extinguisher on board, no oil or other fluid leaks, cabling/tooling and associated equipment in good condition, pressurized hoses secured with whip-checks or adequate substitute, jacks in good condition). Implement exclusion zone set-up. Set up work stations with clear walking paths to and from equipment. Never allow a rig to move with the mast upright!	
Clear upper five feet of drilling location using a hand auger.	Back strain, Exposure to chemical hazards, Contact with underground utilities, Repetitive motion injury, forceful exertions.	Use proper lifting techniques (bend at knees, not waist, minimize twisting) and tools. Share augering duties between field personnel to reduce repetitive motions. take breaks as needed. Complete the Underground Utility Checklist.	
Commence soil sample collection using Drill Rig	Cross-contamination from previous boring. Back strain. Heat or cold stress. Eye injury. Excessive noise exposure. Contact with underground utilities. Slips, trips and	Decontaminate sampling equipment after collecting a sample and decontaminate drilling equipment after each borehole using decontamination procedure annotated on subcontractor's WO. Use two people or more to lift heavy or awkward objects, minimize bending and twisting at the waist when lifting. Use PPE and air monitoring in accordance with HASP (especially note hearing protection). Monitor drilling progress, make	

	falls, cuts, pinch points. Equipment failure.	notations and observations in the field log book. Keep work area clear of tripping or slipping hazards. Perform periodic visual inspections of drill rig and equipment. Use Nitrile gloves when handling soil and work gloves when handling rig equipment such as hollow stem augers, split-spoons, etc...If cutting sleeves for lithology, cut away from the body.	
Collect samples in accordance with sampling plan.	Cross-contamination. Improper labeling or storage. Exposure to site contaminants.	Decontaminate sampling equipment between each sampling run. Label samples in accordance with the sampling plan. Store samples in proper containers, at correct temperature, and away from work area. Do not overtighten sample bottle caps. Perform air monitoring and wear proper PPE as given in the HASP.	
Well Construction	Silicosis from mixing Portland Cement and installing sand packs, injury from cutting pipe, back sprain/strains from handling sand bags and cement bags, mixing grout, and well pad completions, eye irritation from dust when mixing cement	Stay upwind when mixing and pouring cement, wear dust mask and safety glasses to avoid eye and skin irritation, use appropriate pipe cutter for monitor well height adjustment, utilize proper lifting techniques, use two man lifts for any bagged material >50lbs, don't overload/shovel, take your time.	
Store cuttings, properly in accordance with site-specific requirements.	Exposure to public. Traffic hazard or obstruction/inconvenience to site operation. Improper storage or disposal.	Have proper containment and labeling available on-site. Place materials in isolated location away from traffic and other site functions. Coordinate proper off-site disposal (where applicable). Use equipment such as pumps, drums, dollies, etc.) to transport water and/or cuttings. Wear PPE in accordance with HASP while conducting staging or disposal activities.	
	If backfill not performed immediately after drilling, slip/trip/fall hazards may	Barbed-wire fencing around drill pit to keep	

Backfill drill pit(as required in scope of work)	become associated with the open hole. Back strain, eye injury from splashing or release of pressurized grout (if used) Unauthrorized backfilling causes extra work.	cattle safe. Backfilling drill pit should be done in accordance with the scope of work. Verify drill pit backfill requirements.	
Package and deliver/ship samples to lab.	Bottle breakage. Cuts or acid burns. Back strain.	Do not overtighten bottle caps. Handle and pack bottle carefully (bubble wrap bags are helpful). Avoid contact with tape cutter, or cut away from the hand and body if using knife. Minimize bending and twisting while lifting; use two or more people as needed for heavy/awkward sample coolers. Use proper lifting techniques.	
Site Clean-up	Lifting hazards, back strain, fatigue	Employ safe lifting techniques such as bending from the knees (not at the waist) and reducing twisting/side to side motion. Request assistance when lifting heavy objects (>50 lbs). Notify site personnel of departure and location of any cuttings/purge water left on-site.	

SECTION 4
Personal Protective Equipment (PPE):
Hard Hat
Hearing Protection
Level D
orange traffic safety vest
Protective Gloves - Nitrile, Leather
Safety Glasses
Safety Shoes
Required and/or Recommended Equipment and Supplies: H2S Personal Monitor sunscreen Insect repellent Rain gear/ Inclement weather clothing First Aid kit Portable eyewash station 2-way radio/cell phones Traffic cones as necessary

JSA001497 - Under Review - In Progress - 05/20/2008 09:42 AM EST

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JOB SAFETY ANALYSIS

SECTION 1	
JSA Type:	Driving and Motor Vehicles
JSA No:	JSA001496
Date:	5/20/2008
Work Type:	Driving - Passenger Vehicle
Work Activity:	Drving to and from site.
Project No.:	B00366980000 - FORT PLAIN - REMEDIAL DESIGN (FORT PLAIN - REMEDIAL DESIGN)

SECTION 2

Development Team	Position/Title	PC	Reviewed By	Position/Title	Date
Beyrle, Nicholas J.		☑	Ahrens, Bruce W.		
			Golubski, Jason R.		
			Webster, Charles P.		

SECTION 3

Job Steps	Potential Hazard(s)	Critical Action(s)	SOP Reference
PRE-TRIP - Review TRACK Card	Worst case outcome of vehicle operation (blowout, breakdown, collision, injury or death).	Assess the potential hazards. Review weather and road conditions/closures before departing. Plan travel route and select alternate routes in case main roads are closed. Notify someone of your departure time/route/and ETA. Pack emergency supplies. Analyze how to reduce the risk. In icy conditions get into the vehicle slowly and consciously, keep legs close to vehicle and hold on to handle or door. Act to ensure safe operation of the vehicle. Recognize SWA.	
Assess the potential hazards. Review weather and road conditions/closures before departing. Plan travel route and select alternate routes in case main roads are closed. Notify someone of your departure time/route/and ETA. Pack emergency supplies. Analyze how to reduce the risk. Act to ensure safe operation of the vehicle. Recognize SWA.	Flat tire, blowout, impaired vision, obstacles, collision, injury or death.	Assure tires are properly inflated and there is sufficient tread. Assure there are no cuts or bulges in the sidewalls. Assure windshield and window glass is clean. Lift wiper arms and check wiper blades for damage or deterioration. Check behind vehicle for obstructions. Check under vehicle engine for evidence of fluid leaks.	
Check and adjust seat, mirrors, head lamps, turn signals, washer/wipers.	Back or body strain. Blind spots. Inability to signal intentions. Streaking windshield, impaired	Adjust seat so back is fully supported, upper arms close to body, pedals within easy reach. Adjust head restraint so that it is 2 to 6cm from the top of your head. Lower steering wheel so hands are below shoulders and shoulders are relaxed. Check mirror adjustments each time vehicle is re-started. Test operations of of front and rear turn signals. Locate and test operation of head	

	vision.	lamps, wiper and washer switches.	
Fasten seat belts.	Increased risk of more serious injury or death in collision.	Assure seat belt is in good condition and fastened. Assure all passenger seat belts are in good condition and fastened.	
Lock doors.	Ejection from vehicle in collision. Unwanted intrusion.	Lock all doors to vehicle.	
Start engine.	Unexpected movement.	Assure that transmission is in 'Park' and that parking brake is set.	
Check gauges and warning lights.	Overheated engine or break-down due to lack of critical fluids.	Assure there is sufficient gas, oil and other critical fluids.	
Pull out of parking space.	Collision with other vehicles, pedestrians, or stationary objects.	Check mirrors and over shoulder in all directions prior to pulling out of parking space. Signal if parallel parked along a street. Use spotter if not pulling forward out of spot.	
DURING TRIP - Keep your eyes moving,aim high in steering, leave yourself an out, get the big picture, make sure other drivers see you. Pay attention to driving at all times	Collision, injury or death to occupants or other parties.	Move eyes at least every 2 seconds. Scan major and minor intersections before entry (left-right-left). Check mirrors when slowing or stopping vehicle. Scan mirrors frequently, at least one mirror every 5-8 seconds. Avoid staring while evaluating road conditions. No use of cell phones or radios while driving in a vehicle on streets or on site. Maintain 15 second eye lead time (1 1/2 blocks in city traffic, 1/4 mile in highway traffic). Assess condition of traffic lights (fresh vs. stale). Assess information from distant objects. Adjust eye lead distance to speed. Maintain safety cushion around vehicle (front, sides, rear). Adjust vehicle space and speed to avoid unsafe intrusion by other drivers. At signal controlled intersections, stop 10 ft. behind crosswalks or behind other vehicles. At stop sign controlled intersections, approach stop sign cautiously and ascertain if cross traffic has to stop. Stop at or just behind limit line or crosswalk. When stopped, allow vehicle in front to move for 2 seconds before accelerating. Observe approaching merge areas and choose lane of least resistance. Cede right of way and allow other vehicles to merge, change lanes, make turns, etc. Avoid being unnecessarily boxed in. Avoid sudden acceleration and deceleration. Maintain a minimum 4 second following distance, adjust speed to traffic conditions, scan immediate and adjacent lanes before merging. Seek eye contact with other drivers. Cover or use horn when conditions warrant. Before changing lanes, signal well in advance, check mirrors and over shoulder, and allow adequate space before changing lanes. Break early to activate brake lights. Stay out of blind spots. Gently sound horn or flash lights if unsure other driver sees you. Turn on head lamps	

		in high traffic areas, at dusk, and in inclement weather. In inclement weather decrease speed and increase following distance, use low gears to enhance traction and do not use cruise control or overdrive, break gently to avoid skidding. If the wheels begin locking up ease off breaks. Apply steady pressure if ABS is present, do not pump breaks. If your rear wheels skid take foot off accelerator and steer in the direction you want the front wheels to turn. If front wheels skid take foot of the accelerator and shift to neutral, do not steer immediately, as traction returns steer in the direction you want to go and put the transmission in drive. If the vehicle gets stuck turn wheels from side to side moving snow away from tires, use shovel to remove snow from tires, and pour sand, cat litter etc.. to wheel path. Always focus on driving. Stop driving if you become distracted. Refrain from conducting involved or emotional discussions while driving - end the conversation or pull over to the side of the road if it becomes difficult to concentrate on driving while conversing with your passengers.	
Backing up.	Collision, injury or death to occupants or other parties.	Make all backing maneuvers slowly and cautiously. Check mirrors and over shoulders. When parking, look for pull-through parking to avoid backing. Use spotter when necessary.	
Parking.	Collision, injury or death to occupants or other parties.	Park away from other cars. Back into parking spot when possible and safe. Maintain cushion of safety from fixed objects. Set parking brake. If it is safe to do so, park so the first movement is forward. If parking on road place vehicle as barrier to oncoming traffic and use barricades/warning devices or cones.	
POST-TRIP - Report maintenance or mechanical problems upon returning vehicle.	Conditions worsen leading to mechanical failure resulting in accident, injury or death.	When exiting vehicle in icy conditions test the surface before putting all of your weight down, keep legs close to vehicle and hold on to handle or door. Report vehicle problems immediately to company representative or rental car agency. Review JSA again to ensure best practices have been followed.	

SECTION 4
Personal Protective Equipment (PPE):
orange traffic safety vest
Required and/or Recommended Equipment and Supplies: Wear vest if getting out of vehicle near active roadway. Emergency kit should be in vehicle

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Attachment B

Example Subsurface Utility Checklist and Underground Utility Policy

ARCADIS Infrastructure, environment, facilities		**Underground/Overhead Utility Checklist**	
Project Name:		**Date:**	
Project Number:		**Location:**	
Prepared By:		**Project Manager:**	

This checklist must be completed for any intrusive subsurface work such as excavation or drilling. It documents that overhead and underground utilities in the work area are identified and located. The Project Manager shall request utility markouts before the start of field operations to allow the client and utility companies sufficient time to provide them. If complete information is not available, a magnetometer or other survey shall be performed to locate obstacles prior to intrusive subsurface activities.

Procedure: A diagram of the work area depicting the proposed location of intrusive subsurface work sites (i.e., boring locations, excavation locations) must be attached to this form. The diagram must clearly indicate the areas checked for underground structures / utilities, and overhead power lines. This form and the diagram must be signed by the ARCADIS Project Manager (if present), the ARCADIS Site Supervisor, and the client representative.

Type of Structure	Present	Not Present	Method of Markout
Electric Power Line			
Natural Gas Line			
Telephone Line			
Water Line			
Product Line			
Sewer Line			
Steam Line			
Drain Line			
Underground Tank			
Underground Cable			
Overhead Power Line			
Overhead Product Line			
Other (Specify)			

Reviewed By		
Name	Job Title	Date
	Client Representative	
	BBL Project Manager	
	BBL Site Supervisor	

Attachment C

Chemical Hazard Information

National Grid
Fort Plain, New York

CHEMICAL HAZARD INFORMATION

Substance [CAS Number]	IP[1] (eV)	Odor Threshold (ppm)	Route[2]	Symptoms of Exposure	Treatment	TWA[3]	STEL[4]	Source[5]	IDLH (NIOSH)[6]
Benzene [71-43-2]	9.24	34-119	Inh Abs Ing Con	Irritated eyes, nose, and respiratory system; giddiness; headache; nausea; staggered gait; fatigue; anorexia, lassitude; dermatitis; bone marrow depression – carcinogenic	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	1 ppm (0.5 ppm) NIC-0.1 skin 0.1 ppm		PEL TLV REL	100 mg/m[4]
Coal-tar-pitch volatiles (benzene-soluble fraction) (polynuclear aromatic hydrocarbons [PAH]) [65996-93-2]	ND	ND	Ing Con	Eye sensitivity to light; eye and skin irritation, dermatitis, bronchitis; carcinogenic	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	0.2 mg/m^3 0.2 mg/m^3 0.1 mg/m^3		PEL TLV REL	Ca [80 mg/m^3]
Cyanides: calcium, potassium, and sodium [592-01-8; 151-50-8; 143-33-9]	NA	ND	Inh Abs Ing Con	Asphyxiation and death can occur; weakness, headache, and confusion; nausea and vomiting; increased respiratory rate; slow respiratory gasping; irritated eyes and skin	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	5 mg/m^3 5 mg/m^3 (skin)	C5 mg/m^3* C5 mg/m^3 *10 min	PEL TLV REL	25 mg/m^3
Ethylbenzene [100-41-4]	8.76	0.09-0.6	Inh Ing Con	Irritated eyes, mucous membranes; headache; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 100 ppm 100 ppm	125 ppm 125 ppm 125 ppm	PEL TLV REL	800 ppm
Ozone [1002815-6]	12.52	0.1 ppm	Inh Con	Irritation to eyes and mucous membranes; pulmonary edema; chronic respiratory disease	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	0.1 ppm 0.05 ppm C 0.1 ppm		PEL TLV REL	5 ppm
Toluene [108-88-3]	8.82	0.16-37	Inh Abs Ing Con	Fatigue, weakness; confusion, euphoria, dizziness; headache; dilated pupils, lacrimation; nervousness, muscular fatigue, insomnia; paralysis; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 50 ppm (skin) 100 ppm	150 ppm 150 ppm	PEL TLV REL	
Xylene (o-, m-, and p-isomers) [1330-20-7; 95-47-6; 108-38-3; 106-42-3]	8.56 8.56 8.44	1.1-20	Inh Abs Ing Con	Dizziness, excitement, drowsiness, incoordination, staggering gait; irritated eyes, nose, throat; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 100 ppm 100 ppm	150 ppm 150 ppm 150 ppm	PEL TLV REL	900 ppm

National Grid
Fort Plain, New York

CHEMICAL HAZARD INFORMATION

[1]IP	=	Ionization potential (electron volts).
[2]Route	=	Inh, Inhalation; Abs, Skin absorption; Ing, Ingestion; and Con, Skin and/or eye contact.
[3]TWA	=	Time-weighted average. The TWA concentration for a normal workday (usually 8 or 10 hours) and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day without adverse effect.
[4]STEL	=	Short-term exposure limit. A 15-minute TWA exposure that should not be exceeded at any time during a workday, even if the TWA is not exceeded.
[5]PEL	=	Occupational Safety and Health Administration (OSHA) permissible exposure limit (29 CFR 1910.1000, Table Z).
[5]TLV	=	American Conference of Governmental Industrial Hygiene (ACGIH) threshold limit value – TWA.
[5]REL	=	National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit.
[6]IDLH (NIOSH)	=	Immediately dangerous to life or health (NIOSH). Represents the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
NE	=	None established. No evidence could be found for the existence of an IDLH (NIOSH Pocket Guide to Chemical Hazards, Pub. No. 90-117, 1990, 1997).
C	=	Ceiling limit value which should not be exceeded at any time.
Ca	=	Carcinogen.
NA	=	Not applicable.
ND	=	Not Determined.
LEL	=	Lower explosive limits.
LC_{50}	=	Lethal concentration for 50 percent of population tested.
LD_{50}	=	Lethal dose for 50 percent of population tested.
NIC	=	Notice of intended change (ACGIH).

<u>References</u>:

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Attachment D

Material Safety Data Sheets

Genium Group, Inc.
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Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2004-07

Section 1 - Chemical Product and Company Identification

Material Name: Benzene **CAS Number:** 71-43-2
Chemical Formula: C_6H_6
Structural Chemical Formula: C_6H_6
EINECS Number: 200-753-7
ACX Number: X1001488-9
Synonyms: Benzene; BENZENE; (6)ANNULENE; BENZEEN; BENZEN; BENZIN; BENZINE; BENZOL; BENZOL 90; BENZOLE; BENZOLENE; BENZOLO; BICARBURET OF HYDROGEN; CARBON OIL; COAL NAPHTHA; CYCLOHEXATRIENE; EPA PESTICIDE CHEMICAL CODE 008801; FENZEN; MINERAL NAPHTHA; MOTOR BENZOL; NITRATION BENZENE; PHENE; PHENYL HYDRIDE; POLYSTREAM; PYROBENZOL; PYROBENZOLE
General Use: Manufacture of chemicals including styrene, dyes, and many other organic chemicals. Has been used in artificial leather, linoleum, oil cloth, airplane dopes, lacquers; as solvent for waxes, resins, oils etc.
May also be a minor component of gasoline, petrol.
Exposure should be minimized by use in closed systems.
Handling procedures and control measures should be evaluated for exposure before commencement of use in plant operations.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
benzene	71-43-2	99.9

OSHA PEL
TWA: 1 ppm; STEL: 5 ppm.

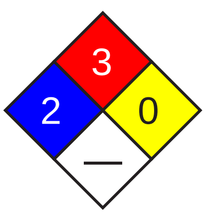
NIOSH REL
TWA: 0.1 ppm; STEL: 1 ppm.

DFG (Germany) MAK
Skin.

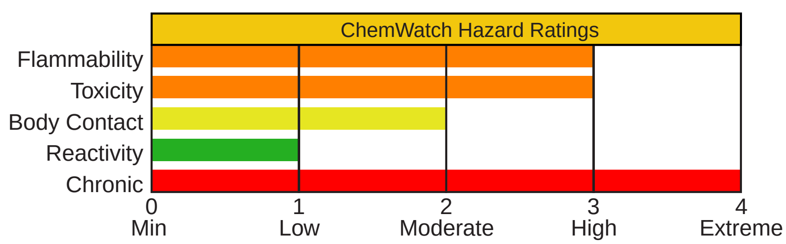
ACGIH TLV
TWA: 0.5 ppm; STEL: 2.5 ppm; skin.

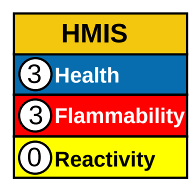
IDLH Level
500 ppm.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!

Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sweet odor. Irritating to eyes/skin/respiratory tract. Toxic. Also causes: headache, dizziness, drowsiness. Absorbed through the skin. Chronic: dermatitis, leukemia, bone marrow damage. Carcinogen. Reproductive effects. Flammable.

Potential Health Effects

Target Organs: blood, central nervous system (CNS), bone marrow, eyes, upper respiratory system, skin
Primary Entry Routes: inhalation, skin contact
Acute Effects
Inhalation: The vapor is discomforting to the upper respiratory tract and lungs and may be harmful if inhaled.
If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

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Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.
Inhalation hazard is increased at higher temperatures.
The symptoms of acute exposure to high vapor concentrations include confusion, dizziness, tightening of the leg muscles and pressure over the forehead followed by a period of excitement. If exposure continues the casualty quickly becomes stupefied and lapses into a coma with narcosis.
Effects of inhalation may include nausea, vomiting headache, dizziness, drowsiness, weakness, sometimes preceded by brief periods of exhilaration, or euphoria, irritability, malaise, confusion, ataxia, staggering, weak and rapid pulse, chest pain and tightness with breathlessness, pallor, cyanosis of the lips and fingertips and tinnitus. Severe exposures may produce blurred vision, shallow, rapid breathing, delirium, cardiac arrhythmias, unconsciousness, deep anesthesia, paralysis and coma characterized by motor restlessness, tremors and hyperreflexia (occasionally preceded by convulsions). Polyneuritis and persistent nausea, anorexia, muscular weakness, headache, drowsiness, insomnia and agitation may also occur. Two-three weeks after the exposure, nervous irritability, breathlessness and unsteady gait may still persist; cardiac distress and an unusual dicoloration of the skin may be evident for up to four weeks.
Hemotoxicity is not normally a feature of acute exposures although anemia, thrombocytopenia, petechial hemorrhage, and spontaneous internal bleeding have been reported. Fatal exposures may result from asphyxia, central nervous system depression, cardiac and respiratory failure and circulatory collapse; sudden ventricular fibrillation may also be fatal.
Death may be sudden or may be delayed for 24 hours. Central nervous system, respiratory or hemorrhagic complications may occur up to five days after the exposure and may be lethal; pathological findings include respiratory inflammation with edema, and lung hemorrhage, renal congestion, cerebral edema and extensive petechial hemorrhage in the brain, pleurae, pericardium, urinary tract, mucous membrane and skin.
Exposure to toxic levels has also produced chromosome damage.

Eye: The liquid is highly discomforting to the eyes, may be harmful following absorption and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.
The vapor is moderately discomforting to the eyes.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid may produce skin discomfort following prolonged contact.
Defatting and/or drying of the skin may lead to dermatitis. Open cuts, abraded or irritated skin should not be exposed to this material.
Toxic effects may result from skin absorption.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: The liquid is discomforting to the gastrointestinal tract and may be harmful if swallowed.
Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A2, Suspected human carcinogen; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

Chronic Effects: Liquid is an irritant and may cause burning and blistering of skin on prolonged exposure.
Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes.
Benzene is a myelotoxicant known to suppress bone-marrow cell proliferation and to induce hematologic disorders in humans and animals.
Signs of benzene-induced aplastic anemia include suppression off leukocytes (leukopenia), red cells (anemia), platelets (thromocytopenia) or all three cell types (pancytopenia). Classic symptoms include weakness, purpura, and hemorrhage. The most significant toxic effect is insidious and often irreversible injury to the blood forming tissue.
Leukemia may develop.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.
Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).

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Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.

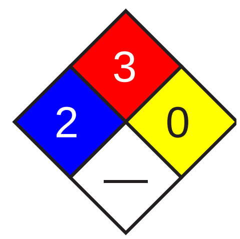
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:

1.Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
2.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.
Consider complete blood count. Evaluate history of exposure.

Section 5 - Fire-Fighting Measures

Flash Point: -11 °C Closed Cup
Autoignition Temperature: 562 °C
LEL: 1.3% v/v
UEL: 7.1% v/v



Fire Diamond

Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO).

Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

Large Spills: Pollutant - contain spillage. Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, bare lights or ignition sources. Increase ventilation.

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Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.
Storage Requirements: Store in original containers in approved flame-proof area.
No smoking, bare lights, heat or ignition sources.
DO NOT store in pits, depressions, basements or areas where vapors may be trapped. Keep containers securely sealed.
Store away from incompatible materials in a cool, dry well ventilated area.
Protect containers against physical damage and check regularly for leaks.
Observe manufacturer's storing and handling recommendations.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area. Local exhaust ventilation usually required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area.
Personal Protective Clothing/Equipment:
Eyes: Chemical goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Nitrile gloves; Neoprene gloves.
Safety footwear.
Do NOT use this product to clean the skin.
Respiratory Protection:
Exposure Range >1 to 10 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >10 to 100 ppm: Air Purifying, Negative Pressure, Full Face
Exposure Range >100 to 1000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >1000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black
Note: must change cartridge at beginning of each shift
Other: Overalls. Eyewash unit. Barrier cream. Skin cleansing cream.
Glove Selection Index:
PE/EVAL/PE .... Best selection
PVA .... Best selection
TEFLON .... Best selection
VITON .... Best selection
VITON/NEOPRENE .... Best selection
NITRILE+PVC .... Poor to dangerous choice for other than short-term immersion

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BUTYL .... Poor to dangerous choice for other than short-term immersion
NITRILE .... Poor to dangerous choice for other than short-term immersion
NEOPRENE.............................. Poor to dangerous choice for other than short-term immersion
PVC.. Poor to dangerous choice for other than short-term immersion
NATURAL RUBBER............... Poor to dangerous choice for other than short-term immersion
BUTYL/NEOPRENE .... Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, highly flammable liquid; floats on water. Characteristic aromatic odor. Highly volatile. Mixes with alcohol, chloroform, ether, carbon disulfide, carbon tetrachloride, glacial acetic acid, acetone and oils.

Physical State: Liquid
Vapor Pressure (kPa): 9.95 at 20 °C
Vapor Density (Air=1): 2.77
Formula Weight: 78.12
Specific Gravity (H_2O=1, at 4 °C): 0.879 at 20 °C
Evaporation Rate: Fast
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 80.1 °C (176 °F)
Freezing/Melting Point: 5.5 °C (41.9 °F)
Volatile Component (% Vol): 100
Water Solubility: 0.18 g/100 g of water at 25 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid reaction with oxidizing agents.

Section 11 - Toxicological Information

Toxicity
Oral (man) LD_{Lo}: 50 mg/kg
Oral (rat) LD_{50}: 930 mg/kg
Inhalation (rat) LC_{50}: 10000 ppm/7h
Inhalation (human) LC_{Lo}: 2000 ppm/5m
Inhalation (man) TC_{Lo}: 150 ppm/1y - I
Inhalation (human) TC_{Lo}: 100 ppm
Reproductive effector in rats

Irritation
Skin (rabbit): 20 mg/24 hr - mod
Eye (rabbit): 2 mg/24 hr - SEVERE

See NIOSH, *RTECS* CY 1400000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be subject to rapid volatilization near the surface and that which does not evaporate will be highly to very highly mobile in the soil and may leach to groundwater. It may be subject to biodegradation based on reported biodegradation of 24% and 47% of the initial 20 ppm in a base-rich para-brownish soil in 1 and 10 weeks, respectively. It may be subject to biodegradation in shallow, aerobic groundwaters, but probably not under anaerobic conditions. If released to water, it will be subject to rapid volatilization; the half-life for evaporation in a wind-wave tank with a moderate wind speed of 7.09 m/sec was 5.23 hours; the estimated half-life for volatilization from a model river one meter deep flowing 1 m/sec with a wind velocity of 3 m/sec is estimated to be 2.7 hours at 20 °C. It will not be expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms or hydrolyze. It may be subject to biodegradation based on a reported biodegradation half-life of 16 days in an aerobic river die-away test. In a marine ecosystem biodegradation occurred in 2 days after an acclimation period of 2 days and 2 weeks in the summer and spring, respectively, whereas no degradation occurred in winter. According to one experiment, it has a half-life of 17 days due to photodegradation which could contribute to removal in situations of cold water, poor nutrients, or other conditions less conductive to microbial degradation. If released to the atmosphere, it will exist predominantly in the vapor phase. Gas-phase will not be subject to direct photolysis but it will react with photochemically produced hydroxyl radicals with a half-life of 13.4 days calculated using an experimental rate constant for the reaction. The reaction time in polluted atmospheres which contain nitrogen oxides or sulfur dioxide is accelerated with the half-life being reported as 4-6 hours. Products of photooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate. It is fairly soluble in water and is removed from the atmosphere in rain.

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Ecotoxicity: LC_{50} Clawed toad (3-4 wk after hatching) 190 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Morone saxatilis (bass) 5.8 to 10.9 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Poecilia reticulata (guppy) 63 ppm/14 days /Conditions of bioassay not specified; LC_{50} Salmo trutta (brown trout yearlings) 12 mg/l/1 hr (static bioassay); LD_{50} Lepomis macrochirus (bluegill sunfish) 20 mg/l/24 to 48 hr /Conditions of bioassay not specified; LC_{100} Tetrahymena pyriformis (ciliate) 12.8 mmole/l/24 hr /Conditions of bioassay not specified; LC_{50} Cancer magister (crab larvae) stage 1, 108 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Crangon franciscorum (shrimp) 20 ppm/96 hr /Conditions of bioassay not specified

Henry's Law Constant: 5.3 $x10^{-3}$

BCF: eels 3.5

Biochemical Oxygen Demand (BOD): 1.2 lb/lb, 10 days

Octanol/Water Partition Coefficient: log K_{ow} = 2.13

Soil Sorption Partition Coefficient: K_{oc} = woodburn silt loam 31 to 143

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: BENZENE
Hazard Class: 3.1
ID No.: 1114
Packing Group: II
Label: Flammable Liquid[3]

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U019 Toxic Waste, Ignitable Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a), per CAA Section 112 10 lb (4.535 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

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Issue Date: 2004-07

Benzo(a)pyrene
BEN5560

Section 1 - Chemical Product and Company Identification

Material Name: Benzo(a)pyrene **CAS Number:** 50-32-8
Chemical Formula: $C_{20}H_{12}$
EINECS Number: 200-028-5
ACX Number: X1002798-4
Synonyms: B(A)P; BAP; BENZO(D,E,F)CHRYSENE; 3,4-BENZOPIRENE; 1,2-BENZOPYRENE; 3,4-BENZOPYRENE; 6,7-BENZOPYRENE; BENZO(A)PYRENE; 3,4-BENZPYREN; 3,4-BENZ(A)PYRENE; 3,4-BENZPYRENE; BENZ(A)PYRENE; BENZ[A]PYRENE; 3,4-BENZYLPYRENE; 3,4-BENZYPYRENE; 3,4-BP; BP; COAL TAR PITCH VOLATILES: BENZO(A)PYRENE
Derivation: Synthesized from pyrene and succinic anhydride.
General Use: Benzo(a)pyrene is no longer used or produced commercially in the US. In its pure form, benzo(a)pyrene may be used as a research laboratory reagent. It also occurs in combustion products of coal, oil, petroleum, wood and other biological matter; in motor vehicle and other gasoline and diesel engine exhaust; in charcoal-broiled foods; in cigarette smoke and general soot and smoke of industrial, municipal, and domestic origin. It occurs naturally in crude oils, shale oils, coal tars, gases and fly ash from active volcanoes and forest fires.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Benzo(a)pyrene	50-32-8	ca 100% wt

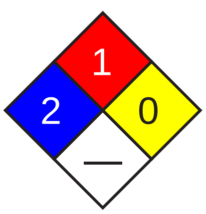
Except in laboratories, benzo(a)pyrene is usually mixed with other coal tar pitch chemicals. Consider exposure limits for coal tar pitch volatiles as a guideline. However, because benzo(a)pyrene is considered a probable carcinogen to humans, it is recommended that exposures to carcinogens be limited to the lowest feasible concentration.

OSHA PEL
TWA: 0.2 mg/m^3.

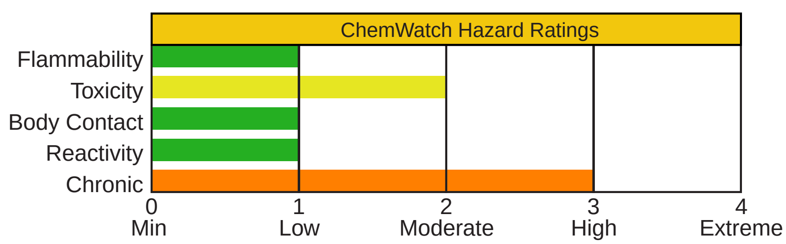
NIOSH REL

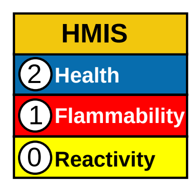
ACGIH TLV
Exposure by all routes should be carefully controlled to levels as low as possible.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Benzo(a)pyrene is a pale yellow, crystalline solid or powder that is irritating to the skin, eyes, and respiratory tract. It is a carcinogen and mutagen. Handle with extreme caution!

Potential Health Effects

Target Organs: Respiratory system, bladder, kidneys, skin.
Primary Entry Routes: Inhalation, ingestion.
Acute Effects
Inhalation: Respiratory tract irritation. Pregnant women may be especially susceptible to exposure effects of benzo(a)pyrene; exposure may damage the fetus. In general, polyaromatic hydrocarbons such as benzo(a)pyrene tend to localize primarily in body fat and fatty tissues (for ex. breasts) and are excreted in breast milk. Benzo(a)pyrene may also affect the male reproductive system (testes and sperm).

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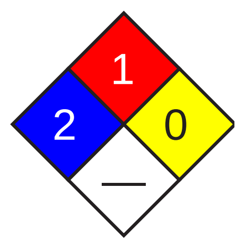
Eye: Irritation and/or burns on contact.
Skin: Irritation with burning sensation, rash, and redness; dermatitis on prolonged exposure. Sunlight enhances effects (photosensitization).
Ingestion: None reported.
Carcinogenicity: NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2A, Probably carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A2, Suspected human carcinogen; EPA - Class B2, Probable human carcinogen based on animal studies; MAK - Class A2, Unmistakably carcinogenic in animal experimentation only.
Medical Conditions Aggravated by Long-Term Exposure: Respiratory system, bladder, kidney, and skin disorders.
Chronic Effects: Inhalation: Cough and bronchitis. Eye: Photosensitivity and irritation. Skin: Skin changes such as thickening, darkening, pimples, loss of color, reddish areas, thinning of the skin, and warts. Sunlight enhances effects (photosensitization). Other: Gastrointestinal (GI) effects include leukoplakia (a pre-cancerous condition characterized by thickened white patches of epithelium on mucous membranes, especially of the mouth). Cancer of the lung, skin, kidneys, bladder, or GI tract is also possible. Smoking in combination with exposure to benzo(a)pyrene increases the chances of developing lung cancer. Persons with a high degree of inducibility of the enzyme aryl hydrocarbon hydroxylase may be a high risk population.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed.
Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of tepid water for at least 15 min. Consult an ophthalmologist if irritation or pain persist.
Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water (less than 15 min). Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water to dilute. Inducing vomiting is not necessary since benzo(a)pyrene has a low acute toxicity and therefore, is generally an unnecessary procedure. Consider activated charcoal/cathartic.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Monitor CBC and arterial blood gases, conduct liver, renal, and pulmonary function tests (if respiratory tract irritation is present), and urinalysis. Biological monitoring techniques testing for metabolites in blood or urine, or DNA adducts in blood or tissues are useful for epidemiological studies that determine if exposure has occurred. Because neither normal nor toxic levels have been established, those techniques may not be useful for evaluating individual patients.
Special Precautions/Procedures: Emergency personnel should protect against exposure.

Section 5 - Fire-Fighting Measures

Flash Point: None reported. Benzo(a)pyrene may burn, but does *not* readily ignite.
Autoignition Temperature: None reported.
LEL: None reported.
UEL: None reported.
Extinguishing Media: For small fires, use dry chemical, sand, water spray, or foam. For large fires, use water spray, fog, or foam.
General Fire Hazards/Hazardous Combustion Products: Carbon monoxide and carbon dioxide.
Fire-Fighting Instructions: Isolate hazard and deny entry. If feasible and without undue risk, move containers from fire hazard area. Otherwise, cool fire-exposed containers with water spray until well after fire is extinguished. Do not release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode and full protective clothing.



Fire Diamond

Section 6 - Accidental Release Measures

Spill/Leak Procedures: Notify safety personnel of large spills, remove heat and ignition sources, and provide adequate ventilation. Cleanup personnel should protect against dust inhalation and skin or eye contact. Clean up spills promptly.
Small Spills: Carefully scoop up spilled material and place into appropriate containers for disposal. For liquid spills, take up with a noncombustible, inert absorbent and place into appropriate containers for disposal.
Large Spills: For large spills, dike far ahead of liquid spill or contain dry spill for later disposal. Do not release into sewers or waterways. *Do not* dry sweep! Use a vacuum with a HEPA filter or a wet method to reduce dust. After cleanup is complete, thoroughly decontaminate all surfaces. *Do not* reuse contaminated cleaning materials.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

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Section 7 - Handling and Storage

Handling Precautions: Handle with extreme caution and take all necessary measures to avoid exposure to benzo(a)pyrene because it is a carcinogen and mutagen. Follow good personal hygiene procedures and thoroughly wash hands with soap and water after handling. Use safety pipettes for all pipetting.
Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.
Recommended Storage Methods: Store in tightly closed and properly labeled containers in a cool, well-ventilated area.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use a Class I, Type B, biological safety hood when working with benzo(a)pyrene in a laboratory. Decrease the rate of air extraction, so that benzo(a)pyrene can be handled without powder being blown around the hood. Keep glove boxes under negative pressure. Use vertical laminar-flow, 100% exhaust, biological safety cabinets for containment of in vitro procedures. The exhaust air flow should be sufficient to provide an inward air flow at the face opening of the cabinet. Ensure contaminated air sheaths that are under positive pressure are leak-tight. Never use horizontal laminar-flow hoods or safety cabinets where filtered air is blown across the working area towards the operator. Test cabinets before work begins to ensure they are functioning properly. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.
Administrative Controls: Consider preplacement and periodic medical examinations with emphasis on the oral cavity, bladder, kidneys, skin, and respiratory tract. Conduct urinalysis including specific gravity, albumin, glucose, and microscopic examination of centrifuged sediment for red blood cells. Also, include 14" x 17" chest roentgenogram, FVC + FEV1, and CBC to detect any leukemia or aplastic anemia. It is recommended that this exam be repeated on an annual basis and semiannual basis for employees 45 yr of age or older or with 10 or more years of exposure to coal tar pitch volatiles. Train workers about the hazards of benzo(a)pyrene and the necessary protective measures to prevent exposure. Periodically inspect lab atmospheres, surfaces such as walls, floors, and benches, and interior of fume hoods and air ducts for contamination. Post appropriate signs and labels on doors leading into areas where benzo(a)pyrene is used.
Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. In animal laboratories, wear protective suits (disposable, one-piece and close-fitting at ankles and wrists), gloves, hair covering, and overshoes. In chemical laboratories, wear gloves and gowns. Wear protective eyeglasses or chemical safety, gas-proof goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.
Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. The following respirator recommendations are for coal tar pitch volatiles. For any unknown concentration, wear any SCBA with a full facepiece and operated in a pressure- demand or other positive pressure mode, or any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive pressure mode. For escape, wear any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister having a high-efficiency particulate filter, or any appropriate escape-type SCBA. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.
Other: Shower and change clothes after exposure or at the end of the workshift. Separate contaminated work clothes from street clothes. Launder before reuse. Remove benzo(a)pyrene from your shoes and clean personal protective equipment. Use procedures to ensure laundry personnel are not exposed. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Pale yellow monoclinic needles with a faint, aromatic odor.
Physical State: Solid
Vapor Pressure (kPa): >1 mm Hg at 68 °F (20 °C)
Formula Weight: 252.30
Specific Gravity (H_2O=1, at 4 °C): 1.351
Boiling Point: >680 °F (>360 °C); 590 °F (310 °C) at 10 mm Hg
Freezing/Melting Point: 354 °F (179 °C)
Water Solubility: Insoluble; 0.0038 mg (+/- 0.00031 mg) in 1 L at 77 °F (25 °C)
Other Solubilities: Ether, benzene, toluene, xylene, concentrated hydrosulfuric acid; sparingly soluble in alcohol, methanol.

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Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Benzo(a)pyrene is stable at room temperature in closed containers under normal storage and handling conditions. It undergoes photo-oxidation when exposed to sunlight or light in organic solvents and is also oxidized by chromic acid and ozone. Hazardous polymerization cannot occur. Avoid heat and ignition sources and incompatibles.

Storage Incompatibilities: Strong oxidizers (chlorine, bromine, fluorine) and oxidizing chemicals (chlorates, perchlorates, permanganates, and nitrates).

Hazardous Decomposition Products: Thermal oxidative decomposition of benzo(a)pyrene can produce carbon monoxide and carbon dioxide.

Section 11 - Toxicological Information

Acute Oral Effects:

Rat, oral: 15 mg/kg produced gastrointestinal and musculoskeletal tumors.

Irritation Effects:

Mouse: 14 µg caused mild irritation.

Other Effects:

Rat, oral: 40 mg/kg on the 14th day of pregnancy caused changes in the extra embryonic structures.

Rat, oral: 2 g/kg administered 28 days prior to mating and 1-22 days of pregnancy produced a stillbirth.

Tumorgenicity, mouse, oral: 75 mg/kg administered to the female during the 12- 14 day of pregnancy produced biochemical and metabolic effects on the newborn.

Mouse, inhalation: 200 ng/m^3/6 hr administered intermittently over 13 weeks produced tumors of the lungs.

Human, HeLa cell: 1500 nmol/L caused DNA inhibition.

Human, lung cell: 1 µmol/L caused DNA damage.

Human, liver cell: 100 nmol/L caused DNA damage.

Rabbit, skin: 17 mg/kg administered intermittently over 57 weeks produced tumors of the skin and appendages.

See NIOSH, *RTECS* DJ3675000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to water, benzo(a)pyrene adsorbs very strongly to particulate matter and sediments, bioconcentrates in aquatic organisms which cannot metabolize it, but does not hydrolyze. Direct photolysis at the water surface, evaporation, or biodegradation may be important, but adsorption may significantly retard these processes. Adsorption to particulates may also retard direct photolysis when benzo(a)pyrene is released to air. Benzo(a)pyrene may be removed from air by reaction with nitrogen dioxide (half-life, 7 days) or ozone (half-life, 37 min), or photochemically produced hydroxyl radicals (estimated half-life, 21.49 hr). It will adsorb very strongly to the soil. Although it is not expected to appreciably leach to the groundwater, groundwater samples indicate that it can be transported there. It is not expected to significantly evaporate or hydrolyze from soils and surfaces. However, it may be subject to appreciable biodegradation in soils. It will adsorb very strongly to the soil. Although it is not expected to appreciably leach to the groundwater, groundwater samples indicate that it can be transported there. It is not expected to significantly evaporate or hydrolyze from soils and surfaces. However, it may be subject to appreciable biodegradation in soils.

Ecotoxicity: Oysters, BCF (bioconcentration factor): 3000; rainbow trout, BCF: 920; *Daphnia pulex*, BCF: 13,000.

BCF: Some marine organisms such as phytoplankton, certain zooplankton, scallops (*Placopecten sp*), snails (*Litternia littorea*), and mussels (*Mytilus edulis*) lack a metabolic detoxification enzyme system to metabolize benzo(a)pyrene and therefore, tend to accumulate benzo(a)pyrene. Humic acid in solution may decrease bioconcentration.

Octanol/Water Partition Coefficient: log K_{ow} = 6.04

Section 13 - Disposal Considerations

Disposal: Small quantities: 10 mL of a solution containing 0.3 mol/L of potassium permanganate and 3 mol/L of sulfuric acid will degrade 5 mg of benzo(a)pyrene. Also, can treat with sodium dichromate in strong sulfuric acid (1-2 days). Benzo(a)pyrene is also a good candidate for fluidized bed incineration at a temperature range of 842 to 1796 °F (450 to 980 °C) or rotary kiln incineration at 820 to 1600°C. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

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Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Environmentally hazardous substances, solid, n.o.s.*
Hazard Class: 9
ID No.: UN3077
Packing Group: III
Label: Class 9

Additional Shipping Information: * If it is in a quantity, in one package, which equals or exceeds the reportable quantity (RQ) of 1 lb (0.454 kg).

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U022 Toxic Waste
CERCLA 40 CFR 302.4: Listed per RCRA Section 3001, per CWA Section 307(a) 1 lb (0.454 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Amsterdam, NY 12010
(518) 842-4111

Issue Date: 2004-07

Ethylbenzene
ETH3050

Section 1 - Chemical Product and Company Identification

Material Name: Ethylbenzene **CAS Number:** 100-41-4
Chemical Formula: C_8H_{10}
Structural Chemical Formula: $C_6H_5•C_2H_5$
EINECS Number: 202-849-4
ACX Number: X1003016-1
Synonyms: AETHYLBENZOL; BENZENE,ETHYL-; EB; ETHYL BENZENE; ETHYLBENZEEN; ETHYLBENZENE; ETHYLBENZOL; ETILBENZENE; ETYLOBENZEN; PHENYLETHANE
General Use: Used in the manufacture of cellulose acetate, styrene and synthetic rubber; solvent or diluent; component of automotive and aviation gasoline.
Component of many petroleum hydrocarbon solvents, thinners.
The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
ethylbenzene	100-41-4	>95

OSHA PEL
TWA: 100 ppm; 435 mg/m^3.

OSHA PEL Vacated 1989 Limits
TWA: 100 ppm; 435 mg/m^3;
STEL: 125 ppm; 545 mg/m^3.

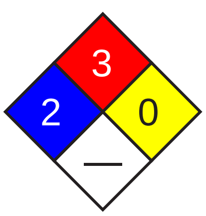
ACGIH TLV
TWA: 100 ppm; STEL: 125 ppm.

NIOSH REL
TWA: 100 ppm, 435 mg/m^3;
STEL: 125 ppm, 545 mg/m^3.

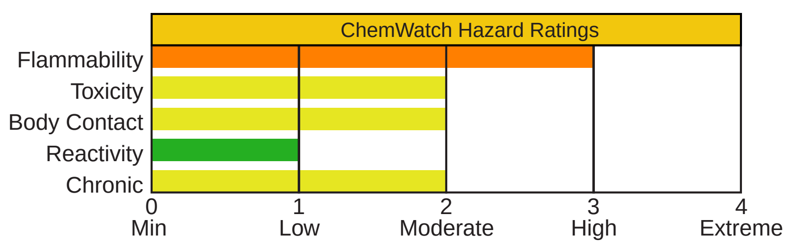
IDLH Level
800 ppm (10% LEL).

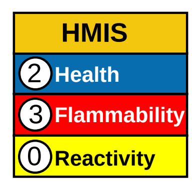
DFG (Germany) MAK
Skin.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; pungent odor. Irritating to eyes/skin/respiratory tract. Also causes: chest constriction, vertigo, narcosis, cramps, respiratory paralysis. Chronic: fatigue, sleepiness, headache, blood disorders, lymphocytosis. Flammable.

Potential Health Effects

Target Organs: eyes, respiratory system, skin, central nervous system (CNS), blood
Primary Entry Routes: inhalation, skin contact, eye contact
Acute Effects
Inhalation: The vapor is discomforting to the upper respiratory tract.
Inhalation hazard is increased at higher temperatures.
Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

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If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.
Inhalation of vapor may aggravate a pre-existing respiratory condition such as asthma, bronchitis, emphysema.
When humans were exposed to the 100 and 200 ppm for 8 hours about 45-65% is retained in the body. Only traces of unchanged ethyl benzene are excreted in expired air following termination of inhalation exposure.
Humans exposed to concentrations of 23-85 ppm excreted most of the retained dose in the urine (mainly as metabolites).
Guinea pigs that died from exposure had intense congestion of the lungs and generalized visceral hyperemia. Rats exposed for three days at 8700 mg/m^3 (2000 ppm) showed changes in the levels of dopamine and noradrenaline in various parts of the brain.
Eye: The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.
The vapor is discomforting to the eyes.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
Two drops of the material in to the conjunctival sac produced only slight irritation of the conjunctival membrane but no corneal injury.
Skin: The liquid is discomforting to the skin if exposure is prolonged and is capable of causing skin reactions which may lead to dermatitis.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.
The mean rate of absorption of liquid ethyl benzene applied to 17.3 cm2 area of the forearm of seven volunteers for 10-15 minutes was determined to be 38 mg/cm2/hr. Immersion of the whole hand in aqueous solutions of ethyl benzene (112-156 mg/l) for 1 hour yielded mean absorption rates of 118 and 215.7 ug/cm2/hr. The rate of absorption is thus greater than that of aniline, benzene, nitrobenzene, carbon disulfide and styrene.
Repeated application of the undiluted product to the abdominal area of rabbits (10-20 applications over 2-4 weeks) resulted in erythema, edema and superficial necrosis. The material did not appear to be absorbed through the skin in sufficient quantity to produce outward signs of toxicity.
Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid may produce considerable gastrointestinal discomfort and may be harmful or toxic if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.
Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.
Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.
Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.
Industrial workers exposed to a maximum level of ethyl benzene of 0.06 mg/l (14 ppm) reported headaches and irritability and tired quickly. Functional nervous system disturbances were found in some workers employed for over 7 years whilst other workers had enlarged livers.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.
Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.
Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.
Ingestion: Rinse mouth out with plenty of water. DO NOT induce vomiting.
Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
Give water (or milk) to rinse out mouth. Then provide liquid slowly and as much as casualty can comfortably drink.
Transport to hospital or doctor without delay.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:
1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.

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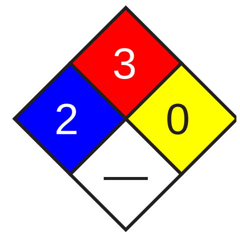
2.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance
4.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

Section 5 - Fire-Fighting Measures



Fire Diamond

Flash Point: 12.8 °C Closed Cup
Autoignition Temperature: 432 °C
LEL: 1.6% v/v
UEL: 7% v/v
Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are flammable.
Moderate fire hazard when exposed to heat or flame.
Vapor forms an explosive mixture with air.
Moderate explosion hazard when exposed to heat or flame.
Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion or decomposition leading to violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO).
May emit clouds of acrid smoke.
Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

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Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area.
General exhaust is adequate under normal operating conditions.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream with polyethylene gloves or Nitrile gloves.
Protective footwear.

Respiratory Protection:
Exposure Range >100 to <800 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range 800 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black

Other: Overalls. Eyewash unit.

Glove Selection Index:
VITON .... Best selection
TEFLON .... Best selection

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear highly flammable liquid; floats on water. Aromatic solvent odor. Soluble in alcohol, benzene, carbon tetrachloride and ether.

Physical State: Liquid
Vapor Pressure (kPa): 1.333 at 25.9 °C
Vapor Density (Air=1): 3.66
Formula Weight: 106.17
Specific Gravity (H_2O=1, at 4 °C): 0.8670 at 20 °C
Evaporation Rate: Fast

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 136.2 °C (277 °F) at 760 mm Hg
Freezing/Melting Point: -95 °C (-139 °F)
Volatile Component (% Vol): 100
Water Solubility: 0.01% by weight

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers.

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Section 11 - Toxicological Information

Toxicity
Oral (rat) LD_{50}: 3500 mg/kg
Inhalation (human) TC_{Lo}: 100 ppm/8h
Inhalation (rat) LC_{Lo}: 4000 ppm/4h
Intraperitoneal (mouse) LD_{50}: 2642 mg/kg~
Dermal (rabbit) LD_{50}: 17800 mg/kg~
Liver changes, utheral tract, effects on fertility, specific developmental abnormalities (musculoskeletal system) recorded.
NOTE: Substance has been shown to be mutagenic in various assays, or belongs to a family of chemicals producing damage or change to cellular DNA.

Irritation
Skin (rabbit): 15 mg/24h mild
Eye (rabbit): 500 mg - SEVERE

See NIOSH, *RTECS* DA 0700000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to the atmosphere, it exist predominantly in the vapor phase based on its vapor pressure where it will photochemically degrade by reaction with hydroxyl radicals (half-life 0.5 to 2 days) and partially return to earth in rain. It will not be subject to direct photolysis. Releases into water will decrease in concentration by evaporation and biodegradation. The time for this decrease and the primary loss processes will depend on the season, and the turbulence and microbial populations in the particular body of water. Representative half-lives are several days to 2 weeks. Some may be adsorbed by sediment but significant bioconcentration in fish is not expected to occur based upon its octanol/water partition coefficient. It is only adsorbed moderately by soil. It will not significantly hydrolyze in water or soil.
Ecotoxicity: LC_{50} Cyprinodon variegatus (sheepshead minnow) 275 mg/l 96 hr in a static unmeasured bioassay; LC_{50} Pimephales promelas (fathead minnow) 12.1 mg/l/96 hr (confidence limit 11.5 - 12.7 mg/l), flow-through bioassay with measured concentrations, 26.1 °C, dissolved oxygen 7.0 mg/l, hardness 45.6 mg/l calcium carbonate, alkalinity 43.0 mg/l; Toxicity threshold (cell multiplication inhibition test): Pseudomonas putida (bacteria) 12 mg/l ; LC_{50} Palaemonetes pugio (grass shrimp, adult) 14,400 ug/l/24 hr in a static unmeasured bioassay; LC_{50} Palaemonetes pugio (grass shrimp, larva) 10,200 ug/l/24 hr in a static unmeasured bioassay; Toxicity threshold (cell multiplication inhibition test): Microcystis aeruginosa (algae) 33 mg/l; Scenedesmus quadricauda (green algae) > 160 mg/l
Henry's Law Constant: 8.44×10^{-3}
BCF: goldfish 1.9
Biochemical Oxygen Demand (BOD): theoretical 2.8%, 5 days
Octanol/Water Partition Coefficient: $\log K_{ow} = 3.15$
Soil Sorption Partition Coefficient: $K_{oc} = 164$

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: ETHYLBENZENE
Hazard Class: 3.1
ID No.: 1175
Packing Group: II
Label: Flammable Liquid [3]

Additional Shipping Information: PHENYL ETHANE

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per CWA Section 307(a) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed

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TSCA: Listed

Section 16 - Other Information

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Material Safety Data Sheet Collection
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Issue Date: 2004-07

Toluene
TOL2320

Section 1 - Chemical Product and Company Identification

Material Name: Toluene **CAS Number:** 108-88-3
Chemical Formula: C_7H_8
Structural Chemical Formula: $C_6H_5CH_3$
EINECS Number: 203-625-9
ACX Number: X1001512-0
Synonyms: ANTISAL 1A; BENZENE,METHYL-; CP 25; METHACIDE; METHANE,PHENYL-; METHYL BENZENE; METHYL BENZOL; METHYLBENZENE; METHYLBENZOL; PHENYL METHANE; PHENYLMETHANE; TOLUEEN; TOLUEN; TOLUENE; TOLUENO; TOLUOL; TOLUOLO; TOLU-SOL
General Use: Used as a solvent for paint, resins, lacquers inks & adhesives. Component of solvent blends and thinners; in gasoline and aviation fuel. Used in the manufacture of chemicals, dyes, explosives, benzoic acid.
Some grades of toluene may contain traces of xylene and benzene.
Odor threshold: 2 ppm approx. Odor is not a reliable warning property due to olfactory fatigue.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
toluene	108-88-3	> 99.5

OSHA PEL
TWA: 200 ppm; Ceiling: 300 ppm; 500 ppm, 10-minute maximum peak.

OSHA PEL Vacated 1989 Limits
TWA: 100 ppm; 375 mg/m^3; STEL: 150 ppm; 560 mg/m^3.

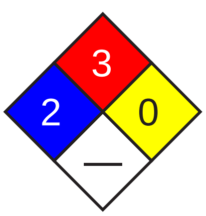
ACGIH TLV
TWA: 50 ppm; skin.

NIOSH REL
TWA: 100 ppm, 375 mg/m^3; STEL: 150 ppm, 560 mg/m^3.

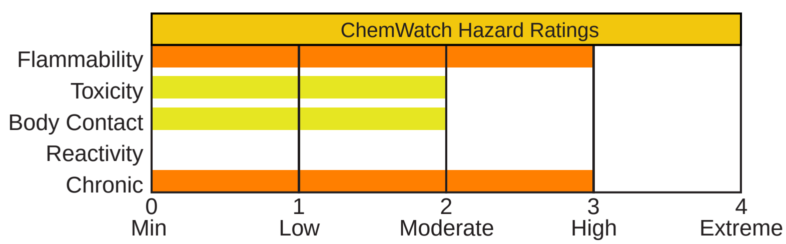
IDLH Level
500 ppm.

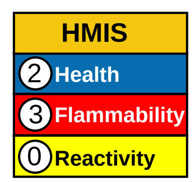
DFG (Germany) MAK
TWA: 50 ppm; PEAK: 200 ppm; skin.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Danger!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sickly, sweet odor. Irritating to the eyes/skin/respiratory tract. Also causes: weakness, headache, dizziness, confusion, and insomnia. Chronic: liver and kidney damage. May cause birth defects. Flammable.

Potential Health Effects

Target Organs: Skin, liver, kidneys, central nervous system.
Primary Entry Routes: Inhalation, skin contact/absorbtion.
Acute Effects
Inhalation: The vapor is highly discomforting to the upper respiratory tract.
Inhalation hazard is increased at higher temperatures.

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Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.
If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.
Central nervous system (CNS) depression may include nonspecific discomfort, symptoms of giddiness, headache, dizziness, nausea, anesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness. Serious poisonings may result in respiratory depression and may be fatal.

Eye: The liquid produces a high level of eye discomfort and is capable of causing pain and severe conjunctivitis.
Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.
The vapor is discomforting to the eyes if exposure is prolonged.
The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid may produce skin discomfort following prolonged contact.
Defatting and/or drying of the skin may lead to dermatitis and it is absorbed by skin.
Toxic effects may result from skin absorption.
Open cuts, abraded or irritated skin should not be exposed to this material.
The material may accentuate any pre-existing skin condition.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.
The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.
Chronic toluene habituation occurs following intentional abuse (glue-sniffing) or from occupational exposure. Ataxia, incoordination and tremors of the hands and feet (as a consequence of diffuse cerebral atrophy), headache, abnormal speech, transient memory loss, convulsions, coma, drowsiness, reduced color perception, frank blindness, nystagmus (rapid, involuntary eye-movements), decreased hearing leading to deafness and mild dementia have all been associated with chronic abuse.
Peripheral nerve damage, encephalopathy, giant axonopathy, electrolyte disturbances in the cerebrospinal fluid and abnormal computer tomographic (CT) scans are common amongst toluene addicts. Although toluene abuse has been linked with kidney disease, this does not commonly appear in cases of occupational toluene exposures. Cardiac and hematological toxicity are however associated with chronic toluene exposure. Cardiac arrhythmia, multifocal and premature ventricular contractions and supraventricular tachycardia are present in 20% of patients who abused toluene-containing paints.
Previous suggestions that chronic toluene inhalation produced human peripheral neuropathy have largely been discounted. However central nervous system (CNS) depression is well documented where blood toluene levels exceed 2.2 mg%. Toluene abusers can achieve transient circulating concentrations of 6.5 mg%. Amongst workers exposed for a median time of 29 years to toluene no subacute effects on neurasthenic complaints and pyschometric test results could be established.
The prenatal toxicity of very high toluene concentrations has been documented for several animal species and man. Malformations indicative of specific teratogenicity have not generally been found. The toxicity described in the literature takes the form of embryo death or delayed fetal growth and delayed skeletal system development. Permanent damage of children has been seen only when mothers had suffered from chronic intoxication as a result of "sniffing".

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.
Lay patient down. Keep warm and rested.
If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.
Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.
Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).
Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

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Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Following acute or short-term repeated exposures to toluene:

1. Toluene is absorbed across to alveolar barrier, the blood/air mixture being 11.2/15.6 (at 37 °C) The order of toluene, in expired breath, is of the order of 18 ppm following sustained exposure to 100 ppm.
The tissue/blood proportion is 1/3 except in adipose where the proportion is 8/10.
2.Metabolism by microsomal mono-oxygenation, results in the production of hippuric acid. This may be detected in the urine in amounts between 0.5 and 2.5 g/24hr which represents, on average 0.8 gm/gm of creatinine.
The biological half life of hippuric acid is in the order of 1-2 hours.
3.Primary threat to life from ingestion and/or inhalation is respiratory failure.
4.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
5.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
6.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
7.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
8.Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

BIOLOGICAL EXPOSURE INDEX - BEI

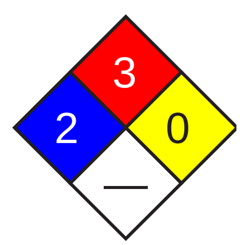
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Hippuric acid in urine	2.5 gm/gm creatinine	End of shift Last 4 hrs of shift	B,NS
Toluene in venous blood	1 mg/L	End of shift	SQ
Toluene in end-exhaled air		End of shift	SQ

NS: Non-specific determinant; also observed after exposure to other material
SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.
B: Background levels occur in specimens collected from subjects NOT exposed.

Section 5 - Fire-Fighting Measures

Flash Point: 4 °C Closed Cup
Autoignition Temperature: 480 °C
LEL: 1.2% v/v
UEL: 7.1% v/v
Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO) and carbon dioxide (CO_2).
Fire Incompatibility: Avoid contamination with strong oxidizing agents as ignition may result.

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Nitric acid with toluene, produces nitrated compounds which are explosive.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protective location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; Metal drum; Metal safety cans. Packing as supplied by manufacturer.
Plastic containers may only be used if approved for flammable liquid.
Check that containers are clearly labeled and free from leaks.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area; local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required in special circumstances.
If risk of overexposure exists, wear NIOSH-approved respirator. Correct fit is essential to ensure adequate protection.
Provide adequate ventilation in warehouses and enclosed storage areas.
In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.
Personal Protective Clothing/Equipment:

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Eyes: Safety glasses with side shields; chemical goggles. Full face shield.
DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Wear chemical protective gloves, eg. PVC. Wear safety footwear.

Respiratory Protection:
Exposure Range >200 to <500 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range 500 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black

Other: Overalls. Barrier cream. Eyewash unit.

Glove Selection Index:
PE/EVAL/PE .... Best selection
VITON/CHLOROBUTYL .... Best selection
VITON .... Best selection
PVA .... Best selection
TEFLON .... Satisfactory; may degrade after 4 hours continuous immersion
SARANEX-23 2-PLY............... Poor to dangerous choice for other than short-term immersion
CPE .... Poor to dangerous choice for other than short-term immersion
VITON/NEOPRENE .... Poor to dangerous choice for other than short-term immersion
SARANEX-23 .... Poor to dangerous choice for other than short-term immersion
NEOPRENE/NATURAL.......... Poor to dangerous choice for other than short-term immersion
NITRILE+PVC .... Poor to dangerous choice for other than short-term immersion
NITRILE .... Poor to dangerous choice for other than short-term immersion
BUTYL .... Poor to dangerous choice for other than short-term immersion
PVC... Poor to dangerous choice for other than short-term immersion
NEOPRENE.............................. Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear highly flammable liquid with a strong aromatic odor; floats on water. Mixes with most organic solvents.

Physical State: Liquid
Vapor Pressure (kPa): 2.93 at 20 °C
Vapor Density (Air=1): 3.2
Formula Weight: 92.14
Specific Gravity (H_2O=1, at 4 °C): 0.87 at 20 °C
Evaporation Rate: 2.4 (BuAc=1)
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 111 °C (232 °F) at 760 mm Hg
Freezing/Melting Point: -95 °C (-139 °F)
Volatile Component (% Vol): 100
Water Solubility: < 1 mg/mL at 18 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Segregate from strong oxidizers.

Section 11 - Toxicological Information

Toxicity
Oral (human) LD_{Lo}: 50 mg/kg
Oral (rat) LD_{50}: 636 mg/kg
Inhalation (human) TC_{Lo}: 100 ppm
Inhalation (man) TC_{Lo}: 200 ppm
Inhalation (rat) LC_{50}: > 26700 ppm/1h
Dermal (rabbit) LD_{50}: 12124 mg/kg
Reproductive effector in rats

Irritation
Skin (rabbit): 20 mg/24h-moderate
Skin (rabbit): 500 mg - moderate
Eye (rabbit): 0.87 mg - mild
Eye (rabbit): 2 mg/24h - SEVERE
Eye (rabbit): 100 mg/30sec - mild

See NIOSH, *RTECS* XS 5250000, for additional data.

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Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be lost by evaporation from near-surface soil and by leaching to the groundwater. Biodegradation occurs both in soil and groundwater, but it is apt to be slow especially at high concentrations, which may be toxic to microorganisms. The presence of acclimated microbial populations may allow rapid biodegradation. It will not significantly hydrolyze in soil or water under normal environmental conditions. If released into water, its concentration will decrease due to evaporation and biodegradation. This removal can be rapid or take several weeks, depending on temperature, mixing conditions, and acclimation of microorganisms. It will not significantly adsorb to sediment or bioconcentrate in aquatic organisms. If released to the atmosphere, it will degrade by reaction with photochemically produced hydroxyl radicals (half-life 3 hr to slightly over 1 day) or be washed out in rain. It will not be subject to direct photolysis.

Ecotoxicity: LC_{50} Aedes aegypti-4th instar (mosquito larvae) 22 mg/l /Conditions of bioassay not specified; LC_{50} Cyprinodon variegatus (sheepshead minnow) 277-485 mg/l 96 hr /Conditions of bioassay not specified; LC_{50} Calandra granaria (grain weevil) 210 mg/l /in air; LC_{50} Cancer magister (crab larvae stage I) 28 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Crangon franciscorum (shrimp) 4.3 ppm 96 hr /Conditions of bioassay not specified; LC_{50} Artemia salina (brine shrimp) 33 mg/l 24 hr /Conditions of bioassay not specified; LC_{50} Morone saxatilis (striped bass) 7.3 mg/l 96 hr /Conditions of bioassay not specified; LC_{50} Pimephales promelas (fathead minnows) 55-72 mg/l (embryos), 25-36 mg/l (1-day posthatch protolarvae), and 26-31 mg/l (30-day-old minnows)/ 96 hour /Conditions of bioassay not specified

Henry's Law Constant: 0.0067

BCF: eels 13.2

Biochemical Oxygen Demand (BOD): 0%, 5 days

Octanol/Water Partition Coefficient: log K_{ow} = 2.69

Soil Sorption Partition Coefficient: K_{oc} = silty loam 37

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: TOLUENE
Hazard Class: 3.1
ID No.: 1294
Packing Group: II
Label: Flammable Liquid[3]

Additional Shipping Information: TOLUOL

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U220 Toxic Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Issue Date: 2004-07

Xylene
XYL2260

Section 1 - Chemical Product and Company Identification

Material Name: Xylene **CAS Number:** 1330-20-7
Chemical Formula: C_8H_{10}
Structural Chemical Formula: $C_6H_4(CH_3)_2$
EINECS Number: 215-535-7
ACX Number: X1001166-8
Synonyms: BENZENE,DIMETHYL-; COMPONENT 1 (83%): XYLENES; COMPONENT 2 (17%): ETHYL BENZENE; DIMETHYLBENZENE; DIMETHYLBENZENES; EPA PESTICIDE CHEMICAL CODE 086802; KSYLEN; METHYL TOLUENE; METHYLTOLUENE; VIOLET 3; XILOLI; XYLENE; XYLENEN; XYLOL; XYLOLE
General Use: A strong solvent for general use in the manufacture of paints, varnishes, lacquers, thinners, inks, rubber, pesticides, herbicides and paint strippers.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
xylene	1330-20-7	> 95

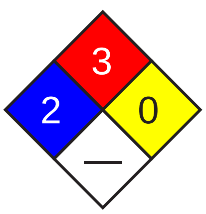
OSHA PEL
TWA: 100 ppm; 435 mg/m^3.

ACGIH TLV
TWA: 100 ppm; STEL: 150 ppm.

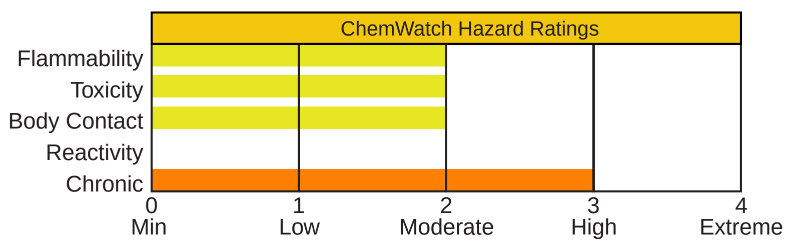
NIOSH REL
TWA: 100 ppm, 435 mg/m^3;
STEL: 150 ppm, 655 mg/m^3.

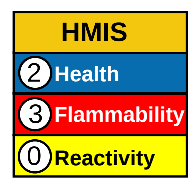
DFG (Germany) MAK
TWA: 100 ppm; PEAK: 200 ppm; skin.

Section 3 - Hazards Identification



Fire Diamond





ANSI Signal Word
Warning!


Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear, sweet smelling liquid. Irritating to the eyes/skin/respiratory tract. Also causes: dizziness, nausea, and drowsiness. Chronic: dermatitis, kidney/liver/peripheral nerve damage. May cause birth defects based on animal data. Flammable.

Potential Health Effects

Target Organs: central nervous system (CNS), eyes, gastrointestinal (GI) tract, liver, kidneys, skin
Primary Entry Routes: inhalation, skin absorption (slight), eye contact, ingestion
Acute Effects
Inhalation: Xylene is a central nervous system depressant. The vapor is discomforting to the upper respiratory tract and may be harmful if inhaled.
Inhalation hazard is increased at higher temperatures.
Toxic effects are increased by consumption of alcohol.
Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.
If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

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Headache, fatigue, lassitude, irritability and gastrointestinal disturbances (e.g., nausea, anorexia and flatulence) are the most common symptoms of xylene overexposure. Injury to the heart, liver, kidneys and nervous system has also been noted among workers. Transient memory loss, renal impairment, temporary confusion and some evidence of disturbance of liver function was reported in three workers overcome by gross exposure to xylene (10000 ppm). One worker died and autopsy revealed pulmonary congestion, edema, and focal alveolar hemorrhage.

Volunteers inhaling xylene at 100 ppm for 5 to 6 hours showed changes in manual coordination, reaction time and slight ataxia. Tolerance developed during the workweek but was lost over the weekend. Physical exercise may antagonize this effect. Xylene body burden in humans exposed to 100 or 200 ppm xylene in air depends on the amount of body fat with 4% to 8% of total absorbed xylene accumulating in human adipose tissues.

Eye: The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

The vapor is highly discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Corneal changes have been reported in furniture polishers exposed to xylene.

Skin: The liquid is highly discomforting to the skin and may cause drying of the skin, which may lead to dermatitis and it is absorbed by the skin.

Toxic effects may result from skin absorption.

Open cuts, abraded or irritated skin should not be exposed to this material.

The material may accentuate any pre-existing skin condition.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes.

Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.

Small excess risks of spontaneous abortion and congenital malformation was reported amongst women exposed to xylene in the first trimester of pregnancy. In all cases however the women had also been exposed to other substances.

Evaluation of workers chronically exposed to xylene has demonstrated a lack of genotoxicity. Exposure to xylene has been associated with increased risks of hemopoietic malignancies but, again simultaneous exposure to other substances (including benzene) complicate the picture. A long-term gavage study of mixed xylenes (containing 17% ethyl benzene) found no evidence of carcinogenic activity in rats and mice of either sex.

Exposure to the material for prolonged periods may cause physical defects in the developing embryo (teratogenesis).

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.

Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to xylene:

1.Gastrointestinal absorption is significant with ingestions.

For ingestions exceeding 1-2 mL (xylene)/kg, intubation and lavage with cuffed endotracheal tube is recommended.

The use of charcoal and cathartics is equivocal.

2.Pulmonary absorption is rapid with about 60-65% retained at rest.

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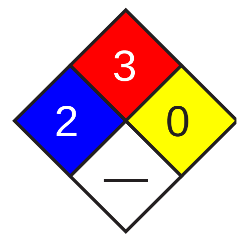
3.Primary threat to life from ingestion and/or inhalation is respiratory failure.
4.Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
5.Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
6.A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
7.Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
BIOLOGICAL EXPOSURE INDEX - BEI
These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Methylhippuric acids in urine	1.5 gm/gm creatinine	End of shift	
	2 mg/min	Last 4 hrs of shift.	

Section 5 - Fire-Fighting Measures

Flash Point: 25.6 °C
Autoignition Temperature: 241 °C
LEL: 1.0% v/v
UEL: 7.0% v/v
Extinguishing Media: Alcohol stable foam; dry chemical powder; carbon dioxide.
Water spray or fog - Large fires only.
General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are flammable.
Moderate fire hazard when exposed to heat or flame.
Vapor forms an explosive mixture with air.
Moderate explosion hazard when exposed to heat or flame.
Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion or decomposition leading to violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO).
Other combustion products include carbon dioxide (CO_2).



Fire Diamond

Fire Incompatibility: Avoid contamination with strong oxidizing agents as ignition may result.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.
Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.

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Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of overexposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights or ignition sources.
Avoid generation of static electricity. DO NOT use plastic buckets.
Ground all lines and equipment. Use spark-free tools when handling.
Avoid contact with incompatible materials.
When handling, DO NOT eat, drink or smoke.
Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.
Plastic containers may only be used if approved for flammable liquids.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.
CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear.
General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required in specific circumstances.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.
In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.
Personal Protective Clothing/Equipment:
Eyes: Safety glasses with side shields; or as required, chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Barrier cream with polyethylene gloves; Butyl rubber gloves or Neoprene gloves or PVC gloves.
Safety footwear.
Do NOT use this product to clean the skin.
Other: Overalls. Impervious protective clothing.
Eyewash unit.
Ensure there is ready access to an emergency shower.
Glove Selection Index:
PE/EVAL/PE .... Best selection
PVA .... Best selection
VITON .... Best selection
TEFLON .... Best selection
PVDC/PE/PVDC .... Poor to dangerous choice for other than short-term immersion
NATURAL+NEOPRENE......... Poor to dangerous choice for other than short-term immersion
NEOPRENE/NATURAL.......... Poor to dangerous choice for other than short-term immersion
NITRILE+PVC .... Poor to dangerous choice for other than short-term immersion
HYPALON .... Poor to dangerous choice for other than short-term immersion
NAT+NEOPR+NITRILE .... Poor to dangerous choice for other than short-term immersion
BUTYL .... Poor to dangerous choice for other than short-term immersion
BUTYL/NEOPRENE .... Poor to dangerous choice for other than short-term immersion
NITRILE .... Poor to dangerous choice for other than short-term immersion
NEOPRENE.............................. Poor to dangerous choice for other than short-term immersion
PVC.. Poor to dangerous choice for other than short-term immersion

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Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear colorless flammable liquid with a strong aromatic odor; floats on water. Mixes with most organic solvents.

Physical State: Liquid
Vapor Pressure (kPa): 0.5 at 15 °C
Vapor Density (Air=1): 3.66 at 15 °C
Formula Weight: 106.18
Specific Gravity (H_2O=1, at 4 °C): 0.87 at 15 °C
Evaporation Rate: 0.7 Bu Ac=1
pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point: 137 °C (279 °F) to 140 °C (284 °F)
Freezing/Melting Point: -47 °C (-53 °F)
Volatile Component (% Vol): 100
Water Solubility: Practically insoluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

<u>Toxicity</u>
Oral (human) LD_{Lo}: 50 mg/kg
Oral (rat) LD_{50}: 4300 mg/kg
Inhalation (human) TC_{Lo}: 200 ppm
Inhalation (man) LC_{Lo}: 10000 ppm/6h
Inhalation (rat) LC_{50}: 5000 ppm/4h
Reproductive effector in rats

<u>Irritation</u>
Skin (rabbit):500 mg/24h moderate
Eye (human): 200 ppm irritant
Eye (rabbit): 87 mg mild
Eye (rabbit): 5 mg/24h SEVERE

See NIOSH, *RTECS* ZE 2100000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Most of the xylenes are released into the atmosphere where they may photochemically degrade by reaction with hydroxyl radicals (half-life 1-18 hr). The dominant removal process in water is volatilization. Xylenes are moderately mobile in soil and may leach into groundwater where they are known to persist for several years, despite some evidence that they biodegrade in both soil and groundwater. Bioconcentration is not expected to be significant.
Ecotoxicity: LC_{50} Rainbow trout 13.5 mg/l/96 hr /Conditions of bioassay not specified; LD_{50} Goldfish 13 mg/l/24 hr /Conditions of bioassay not specified
Henry's Law Constant: 0.22
BCF: estimated at 2.14 to 2.20
Octanol/Water Partition Coefficient: log K_{ow} = 3.12 to 3.20
Soil Sorption Partition Coefficient: K_{oc} = 48 to 68

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

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Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: XYLENES
Hazard Class: 3.2
ID No.: 1307
Packing Group: III
Label: Flammable Liquid[3]

Additional Shipping Information: XYLOLS

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U239 Ignitable Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001 100 lb (45.35 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

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Attachment E

Example Loss Prevention Observation Form

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Loss Prevention Observation

Observer Name	Observer Title	Project/Project Number

Date ________________ Time ____ ☐ AM ☐ PM	Project Type / Task Observed

Background Information

List Critical Work Procedures

List Issue/Items Requiring Corrective Action

Root Cause Analysis

1. Employee lacks the skill or knowledge to carry out duties
2. Procedures, work standards, or expectations were not communicated
3. Procedures or work standards were not developed or were inadequate
4. Equipment, systems, or tools were inadequate
5. Employee chose not to take the time or put forth the effort to do the job properly
6. Supervisor did not require the employee to follow the standard procedure
7. Employee doesn't see any advantage to doing the job to standard
8. Uncontrollable

Criterion #	RCA #	Corrective Action Identified	Responsible Individual	Due Date	Closure Date

Results of Corrective Action

Reviewed by	Date	Reviewed by	Date

Environmental Operations

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	PRE-TASK PREPARATION	Correct	Questionable	Comments
1.	Health and Safety Plan / MSDSs on site			
2.	Employee familiar / trained on task			
3.	OSHA-required training/medical surveillance			
4.	Utility mark out / check performed			
5.	Traffic hazard addressed / work area marked			
6.	Walking / working surfaces free of hazards			
7.	Tailgate safety meeting performed			
8.	Impact on nearby residence/business evaluated			
9.	Communicates intentions to other personnel			
10.	Knowledge of emergency procedures			
11.	Distance between equipment and power lines			
12.	Personal protective equipment			
13.	Air monitoring equipment on site, calibrated			
14.	First aid kit / fire extinguisher on site			
15.	One person trained in first aid / CPR			
16.	Work zones established and marked			
	PERFORMING TASK			
17.	Employee trained in task to be performed			
18.	Correct body positioning			
19.	Proper lifting / pushing / pulling techniques			
20.	Keep hands / body away from pinch points			
21.	Walking / working surfaces kept clear of debris			
22.	Faces traffic as appropriate			
23.	Vehicles/ barricades to protect against traffic			
24.	Drill rig located properly, blocked / chocked			
25.	Drill rig moved only with derrick lowered			
26.	Excavator located on stable ground			
27.	Eye contact made with equipment operator			
28.	Spoil at least 2 feet back from edge of excavation			
29.	Excavation shored/sloped/benched			
30.	Excavation entry controlled			
31.	Equipment/tools used properly			
32.	Electrical equipment connected through GFCI			
33.	Power tools handled properly			
34.	Electrical cords inspected / in good condition			
35.	Follows lockout / tagout procedures			
36.	Air monitoring conducted/action levels understood			
37.	Equipment decontaminated properly			
38.	Personnel decon prior to eating/drinking/smoking			
39.	Decontamination effective			
	POST – TASK			
40.	Procedures / JSA adequate			
41.	Equipment / tools stored properly			
42.	Proper storage of soil / water / waste material			
43.	Work area secured			
44.	Other			

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Loss Prevention Observation Form

Environmental Operations

	PRE-TASK PREPARATION	Correct	Questionable	Comments
1.	Are Health and Safety Plan / MSDSs on site?			
2.	Is the employee familiar / trained on task?			
3.	OSHA-required training / medical surveillance?			
4.	Was utility mark out / check performed?			
5.	Was traffic hazard addressed / work area marked?			
6.	Are walking / working surfaces free of hazards?			
7.	Was the tailgate safety meeting performed?			
8.	Was SPSA performed prior to beginning work?			
9.	Communicates intentions to other personnel?			
10.	Knowledge of emergency procedures?			
11.	Distance between equipment and power lines?			
12.	Personal protective equipment?			
13.	Air monitoring equipment on site, calibrated?			
14.	Is a first aid kit / fire extinguisher on site?			
15.	Is one person trained in first aid / CPR?			
16.	Are work zones established and marked?			
	PERFORMING TASK			
17.	RSA before beginning new task?			
18.	Correct body positioning?			
19.	Proper lifting / pushing / pulling techniques?			
20.	Keep hands / body away from pinch points?			
21.	Are walking / working surfaces kept clear of debris?			
22.	Faces traffic as appropriate?			
23.	Do vehicles / barricades exist to protect against traffic?			
24.	Is the drill rig located properly, blocked / chocked?			
25.	Is the drill rig moved only with derrick lowered?			
26.	Is the excavator located on stable ground?			
27.	Is eye contact made with			

	equipment operator?			
28.	Is spoil at least 2 feet back from edge of excavation?			
29.	Is the excavation shored / sloped / benched?			
30.	Is the excavation entry controlled?			
31.	Are equipment / tools used properly?			
32.	Is electrical equipment connected through GFCI?			
33.	Are power tools handled properly?			
34.	Are electrical cords inspected / in good condition?			
35.	Follows lockout / tagout procedures?			
36.	Air monitoring conducted / action levels understood?			
37.	Was equipment decontaminated properly?			
38.	Were personnel decontaminated prior to eating / drinking / smoking?			
39.	Was the decontamination effective?			
	POST – TASK			
40.	Procedures / JSA adequate?			
41.	Are equipment / tools stored properly?			
42.	Proper storage of soil / water / waste material?			
43.	Is the work area secured?			
44.	Other?			
	Total #			**% Safe:** (Total Correct/[Total Correct + Total Questionable]) * 100]

ARCADIS

Attachment F

Example Incident Investigation Report

ARCADIS Infrastructure, environment, facilities	**Incident/Near-Miss Investigation Report**

☐ OSHA Recordable	☐ First Aid Injury	☐ Fire	Date of Incident:
☐ Lost Workday Injury	☐ Vehicle Accident	☐ Spill / Leak	
☐ Restricted Duty Injury	☐ Equipment Damage	☐ Near Miss	Incident Number:

Every employee injury, accident, and near miss must be reported within 24 hours of the injury. If the incident results in hospitalization, an immediate report must be made by telephone to the Project Manager and the Health and Safety Officer.

Project Information

Project Name:	Project #
Location of Incident:	

Employee

Name:	Employee Number:
Employment Status: ☐ Regular ☐ Part Time	How long in present job?

Injury or Illness Information

Where did the incident / near miss occur? (number, street, city, state, zip):

Employee's specific activity at the time of the incident / near miss:

Equipment, materials, or chemicals the employee was using when the incident / near miss occurred (e.g., the equipment employee struck against or that struck the employee; the vapor inhaled or material swallowed; what the employee was lifting, pulling, etc.):

Describe the specific injury or illness (e.g., cut, strain, fracture, etc.):

Body part(s) affected (e.g., back, left wrist, right eye, etc.):

Name and address of treatment provider (e.g., physician or clinic):	Phone No.:
If hospitalized, name and address of hospital:	Phone No.:
Date of injury or onset of illness: / /	Time of event or exposure: ☐ AM ☐ PM

Did employee miss at least one full shift's work? ☐ No ☐ Yes, 1st date absent (MM/DD/YYYY) / /

Has employee returned to work? ☐ Regular work ☐ Restricted work ☐ No
☐ Yes, date returned (MM/DD/YYYY) / /

To whom reported:	Other workers injured / made ill in this event? ☐ Yes ☐ No

Description of Incident / Near Miss: (Describe what happened and how it happened.)

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Incident/Near-Miss Investigation Report

Motor Vehicle Accident (MVA)			Company Vehicle?	☐ Yes ☐ No				
Accident Location (street, city, state)								
Vehicle Towed?	☐ Yes ☐ No	Other Vehicle?	☐ Yes ☐ No	# Vehicles Towed:		# of Injuries:		

Spill		
Material Spilled:	Quantity:	Source:
Agency Notifications:		
Cost of Incident $		

Third Party Incidents			
Name of Owner:		Address:	Telephone:
Description of Damage:			
Witness Name:		Address:	Telephone:
Witness Name:		Address:	Telephone:

#	Root Cause and Contributing Factors: Conclusion (Describe in Detail Why Incident / Near Miss Occurred)
1	
2	
3	
4	
5	

Root Cause(s) Analysis (RCA):

1. Lack of skill or knowledge.
2. Lack of or inadequate operational procedures or work standards.
3. Inadequate communication of expectations regarding procedures or work standards.
4. Inadequate tools or equipment.
5. Correct way takes more time and / or requires more effort.
6. Short-cutting standard procedures is positively reinforced or tolerated.
7. Person thinks there is no personal benefit to always doing the job according to standards.
8. Uncontrollable.

#	RCA #	Solution(s): How to Prevent Incident / Near Miss From Reoccurring	Person Responsible	Due Date	Closure Date

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Incident/Near-Miss Investigation Report

Investigation Team Members

Name	Job Title	Date

Results of Solution Verification and Validation

Reviewed By

Name	Job Title	Date
	Project Manager	
	Health and Safety Reviewer	

ARCADIS

Attachment G

Example Air Monitoring Log

ARCADIS
Infrastructure, environment, facilities

Air Monitoring Log

Project: **Date:**

Monitoring Instruments:

Air Monitor: **Activity:**

Level of Protection:

Time	Location	Instrument Reading	Comments

Attachment H

Example Subsurface Utility Checklist and Underground Utility Policy

ARCADIS Infrastructure, environment, facilities		Health and Safety Inspection Form			
Project Name:		**Date:**			
Project Number:		**Location:**			
Prepared By:		**Project Manager:**			
Auditor:		**HSS On Site:**			
		YES	**NO**	**N/A**	**COMMENTS**
GENERAL					
Is the HASP on site?					
Is the HASP finalized and approved?					
Is the OSHA poster displayed?					
Are emergency telephone numbers posted?					
Is emergency eyewash immediately available?					
Is an emergency shower immediately available?					
Are emergency notification means available (radio, telephone)?					
Is a first-aid kit immediately available?					
Is the first-aid kit adequately stocked?					
Is there a proper sanitation facility on site?					
DOCUMENTATION AND RECORDKEEPING					
Are only personnel listed and approved in the HASP on site?					
Are all personnel properly trained? (Check company-issued wallet cards.)					
Is the daily field log kept by the Site Manager?					
Are levels of PPE recorded?					
Are contaminant levels recorded?					
Are site surveillance records kept by HSS?					
Is a copy of current fit test records on site?					
Are calibration records maintained for air monitoring equipment?					
Are accident / incident forms on site?					
Are field team review sheets signed?					
Are additional hospital route directions available?					
Is the visitors' logbook being accurately maintained?					
Are MSDSs available for all chemicals on site?					
Are HASP revisions recorded?					
Is the first-aid kit inspected weekly?					
Are daily safety meetings held?					
Are emergency procedures discussed during safety meetings?					

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Health and Safety Inspection Form

	YES	NO	N/A	COMMENTS
EMERGENCY RESPONSES				
Is a vehicle available on site for transportation to the hospital?				
Are fire extinguishers on site and immediately available at designated work areas?				
Is at least one person trained in CPR and first aid on site at all times during work activities?				
Do all personnel know who is trained in CPR / first aid?				
PERSONAL PROTECTIVE EQUIPMENT (PPE)				
Is proper PPE being worn as specified in HASP?				
Level of PPE being worn.				
Is PPE adequate for work conditions?				
If not, give reason.				
Upgrade/downgrade to PPE level.				
Does any employee have facial hair that would interfere with respirator fit?				
If yes, willing to shave, as necessary?				
Fit-tested within the last year? (Documentation present)				
If Level B, is a back-up / emergency person suited up (except for air)?				
Does the HSS periodically inspect PPE and equipment?				
Is the PPE not in use properly stored?				
Is all equipment required in the HASP on site?				
Properly calibrated?				
In good condition?				
Used properly?				
Other equipment needed?				
List.				
Is monitoring equipment covered with plastic to minimize contamination?				
PERSONNEL AND EQUIPMENT DECONTAMINATION				
Is the decontamination area properly designated?				
Is appropriate cleaning fluid used for known or suspected contaminants?				
Are appropriate decontamination procedures used?				
Are decontamination personnel wearing proper PPE?				

Is the equipment decontaminated?				

ARCADIS Infrastructure, environment, facilities		Health and Safety Inspection Form			
		YES	NO	N/A	COMMENTS
PERSONNEL AND EQUIPMENT DECONTAMINATION (continued)					
Are sample containers decontaminated?					
Are disposable items replaced as required?					
WORK PRACTICES					
Was proper collection and disposal of potentially contaminated PPE performed?					
Was proper collection and disposal of decontamination fluid performed?					
Is water available for decontamination?					
Is the buddy system used?					
Is equipment kept off drums and the ground?					
Is kneeling or sitting on drums or the ground prohibited?					
Do personnel avoid standing or walking through puddles or stained soil?					
Are work zones established?					
If night work is conducted, is there adequate illumination?					
Is smoking, eating, or drinking in the exclusion or CRZ prohibited?					
To the extent feasible, are contaminated materials handled remotely?					
Are contact lenses not allowed on site?					
Is entry into excavations not allowed unless properly shored or sloped?					
Is a competent person on site during excavation?					
Are all unusual situations on site listed in HASP?					
If not, when?					
Action taken?					
HASP revised?					
CONFINED SPACE ENTRY					
Are employees trained according to 1910.146 – Confined Space Entry?					
Are all confined spaces identified? If not, list:					
Is all appropriate equipment available and in good working order?					
Is equipment properly calibrated?					
Are confined space permits used?					
Are confined space permits completely and correctly filled out?					

*N/A = Not Applicable

Attachment I

Example Daily Safety Meeting Log

Safety Meeting Log

Project:	Location:
Date / Time:	Activity:

1. Work Summary
2. Physical / Chemical Hazards: Has JSA been reviewed/modified to address changing conditions?
3. Protective Equipment/Procedures
4. Emergency Procedures
Does anyone want to volunteer any medical issues that the rest of us should know about? (For example: allergic to bees or ants and requires an auto-injector, medic alert bracelet, nitro for heart problem)
Location of first-aid kits, fire extinguishers, auto-injectors, etc.

5. Signatures of Attendees	

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Attachment J

Example Health and Safety Plan Acknowledgment Form

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Health and Safety Plan Acknowledgment

I have read the Site-Specific Health and Safety Plan, or its contents have been presented to me, and I understand the contents and I agree to abide by its requirements.

Name (Print)	Signature	Representing	Date

Appendix G

NYSDOH Generic Community Air Monitoring Plan

New York State Department of Health

Generic Community Air Monitoring Plan

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

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

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

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may require particulate monitoring. If radiological contamination is a concern, additional montiroing 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/purgins, 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 (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

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

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Appendix H

Site Inspection Form

Site Inspection Form
Fort Plain Former MGP Site - Fort Plain, New York

Date/Time: ______________________ Weather: ______________________

Personnel: ______________________ Temperature: ______________________

General Requirements

Photographs will be attached to document the condition of each inspection item identified below.
A written description of any item(s) that is considered to be in poor condition is required.

1. General Site Conditions:

Monitoring wells	☐ Good	☐ Poor*	
Pavement condition (Route 5S Diner)	☐ Good	☐ Poor*	
Signs of intrusive activities	☐ No	☐ Yes*	
Evidence of saw-cut asphalt	☐ No	☐ Yes*	
Evidence of trenching or excavation	☐ No	☐ Yes*	
Evidence of Settlement	☐ No	☐ Yes*	

Note:
- Asphalt pavement on surrounding properties is not an element of the Site remedy; inspection is to determine if intrusive activities may have occurred since the previous site visit.

2. Hillside West of Former MGP Property:

Failure/Obvious Movement	☐ No	☐ Yes*	

3. Site Security Fencing:

Condition	☐ Good	☐ Poor/Damaged*	
Gates Locked Upon Arrival	☐ No	☐ Yes*	

4. Concrete block retaining wall north of former MGP property:

Condition	☐ Good	☐ Poor*	☐ Failure*

Note:
- Concrete block retainng wall is not an element of Site remedy; inspection is to document general condition of wa

5. Southern Gas Holder Retaining Wall:

Condition	☐ Good	☐ Poor*	☐ Failure*

6. Former MGP Property Cover System:

Borrowing/Depressions	☐ No	☐ Yes*	
Standing Water	☐ No	☐ Yes*	
Missing Stone	☐ No	☐ Yes*	
Vegetative Growth	☐ No	☐ Yes*	
Evidence of Settlement	☐ No	☐ Yes*	
Sedimentation	☐ No	☐ Yes*	
Damage/Failure	☐ No	☐ Yes*	

Site Inspection Form
Fort Plain Former MGP Site - Fort Plain, New York

7. Drainage Swale:

Standing Water	☐ No	☐ Yes*
Missing Stone	☐ No	☐ Yes*
Vegetative Growth	☐ No	☐ Yes*
Sedimentation	☐ No	☐ Yes*

8. Drainage Basin:

Condition	☐ Good	☐ Poor*
Sediment/Debris Acccumulation	☐ No	☐ Yes*
Depth to water	____________ feet below ground surface	

9. Notes:

* Indicates condition should be reported to National Grid Project Manager/OM&M Coordinator.

Appendix H
Annual Inspection - Notes

It is anticipated that as part of the annual groundwater monitoring activities, an annual inspection will be conducted to document site conditions. Damaged features and other concerns will be immediately reported to the National Grid Project Manager and addressed as appropriate. The annual inspection will include the activities listed below.

- Documentation that monitoring wells have not been damaged. If any of the monitoring wells have been damaged since the previous groundwater sampling event, National Grid's Project Manager will be notified immediately and well repairs coordinated.

- Visual inspection of the hill side along the western portion of the former MGP property and the stone retaining wall in the southern portion of the property. The National Grid Project Manager will be notified immediately if any sign of slope movement is observed.

- Verification that security fencing and access gate surrounding the former MGP property is in good condition. If the fencing or access gate is found to be damaged (e.g., holes in fencing, evidence of tampering or access to the property by unauthorized personnel), National Grid's Project Manager will be notified immediately and will coordinate for the repair of the damaged fencing.

- Visual inspection of the surface material on the former MGP property. Obvious signs of borrowing by annuals, cap failure, or standing water within the footprint of the southern gas holder will be brought to the attention of the National Grid Project Manager.

- Visual inspection of the drainage swale for vegetation and solids accumulation. If any deficiencies (i.e., missing stone, sedimentation for upgradient sources) are noted for the drainage swale, National Grid's Project Manager will be notified and the issue addressed, as appropriate, to maintain flow over/within and minimize sedimentation of the cap and drainage swale. If significant solids accumulation (i.e., sediment/silt) is noted within the cleanout within the swale, National Grid will be notified and appropriate measures will be conducted to remove the accumulated material. Solids and water generated during the clean out activities should be containerized for off-site disposal in accordance with applicable rules and regulations.

Appendix I

Soil Boring and Monitoring Well Construction Logs

Project Name: NMPC FORT PLAIN

Job No. 70184AA

Start
Date 7/31/97 Time 0932

Finish
Date 7/31/97 Time 1330

Stearns and Wheler

Environmental
Engineers and Scientists

Boring ID: MW-2

Drilling Company: AMER. AUGER

Driller:

S&W Inspector: S&W--SLG

Drill Rig Type: ATV

Drilling Method: 4.25" HSA

Weather:

Elevation

X coord: feet
Y coord: feet

Groundwater Observations

Time :

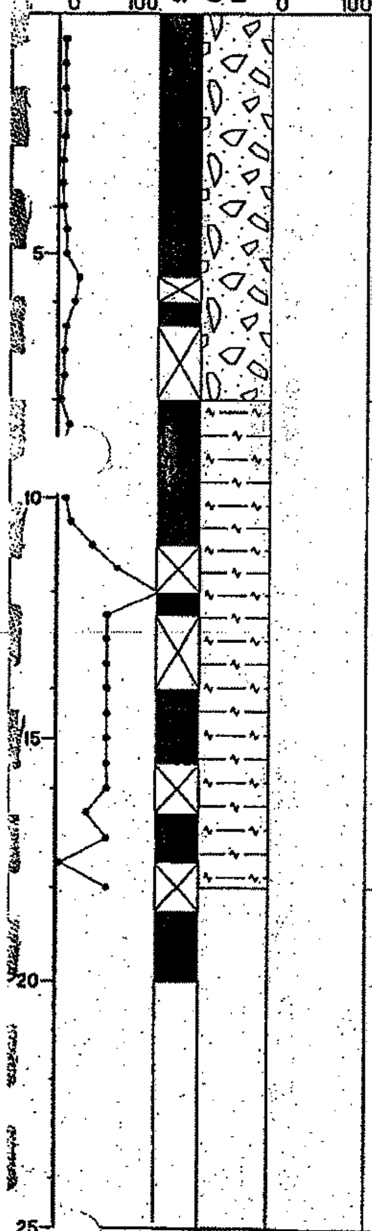
Date :

Casing Depth: 18

Boring Depth: 20

Water Depth :

Depth (ft)	Blow Counts 0 100	Samples	Graphic Log	PID (ppm) 0 100	Sample Description	Well Diagram



+ Sample location MW-2A composite (0-6')

Brown, loose dry, SAND, GRAVEL, SILT (fill)

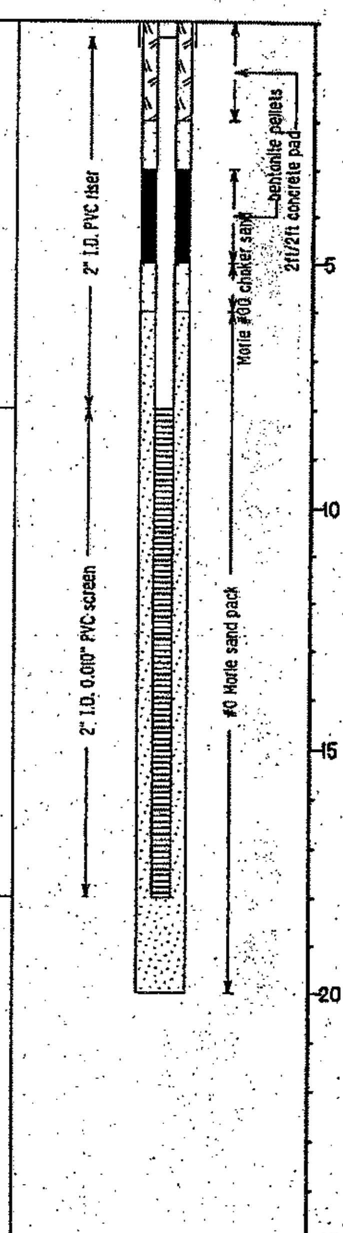
Brown-black, wet, SILT and f SAND, trace to little f gravel

+ Sample location MW-2B composite (10-12')

Black, wet, very stiff, SILT, some to little f sand, some f-m-c gravel

Black, dry, very stiff SILT, some to little f sand, some f-m-c gravel

Bottom of boring



- sample attempt
- sample recovered
- grain size analysis performed, results tabulated elswhere in report
- core attempt

Descriptions in log have been generalized for clarity of presentation. Significant changes in lithology have been noted. Original well logs are available from Stearns and Wheler files.

Project Name: NMPC FORT PLAIN

Job No. 70184AA

Start
Date 7/29/97 Time 1200
Finish
Date 7/29/97 Time 1415

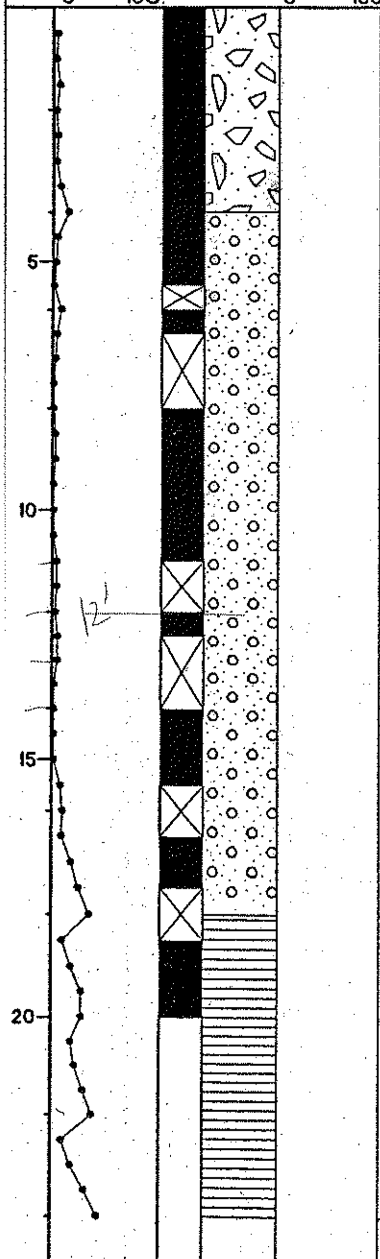
Stearns and Wheler

Environmental
Engineers and Scientists

Boring ID: MW-3

Drilling Company: AMER. AUGER	Weather:	Groundwater Observations
Driller:	Elevation	Time :
S&W Inspector: S&W--SLG		Date :
Drill Rig Type: ATV	X coord: feet	Casing Depth: 22
Drilling Method: 4.25" HSA	Y coord: feet	Boring Depth: 24
		Water Depth :

Depth (ft)	Blow Counts 0–100	Samples	Graphic Log	PID (ppm) 0–100	Sample Description	Well Diagram



Moist, stiff, f-m-c SAND, f gravel and bricks, Fill

Dark brown, moist-wet, stiff, f SAND and SILT, trace to little m-c gravel

♦ Sample depth MW-3A composite (8-10')

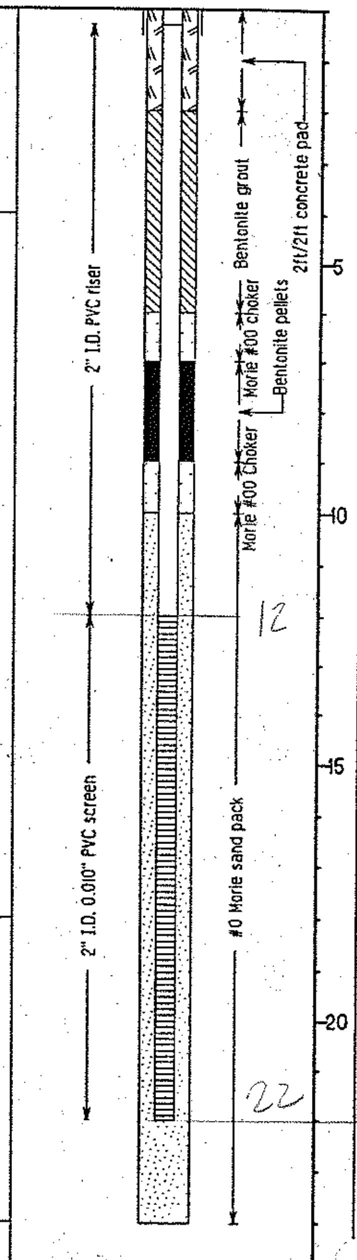
Brown, wet, soft, SILT, f-m-c SAND

Brown, wet, soft, silt, some to little f sand, mottled at 11 feet

Brown, moist, stiff, SILT, trace to little f sand

♦ Sample depth MW-3B composite (18-20')

Black, dry, very dense, CLAY some to little silt



▭ - sample attempt
■ - sample recovered
▬ - grain size analysis performed, results tabulated elswhere in report
▭ - core attempt

Descriptions in log have been generalized for clarity of presentation. Significant changes in lithology have been noted. Original well logs are available from Stearns and Wheler files.

Boring/Well ID: SB-9-99/MW-7

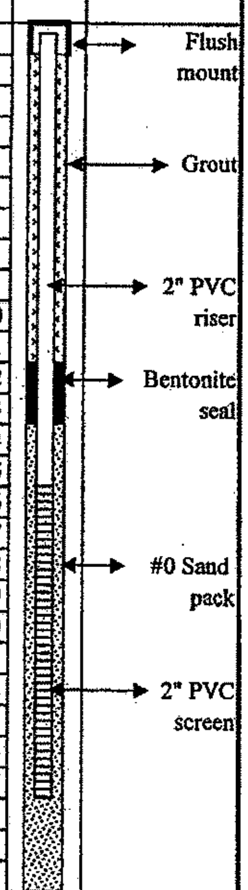
Project Name:	NMPC FT. PLAIN
Job. No.	80182 FA
Start Date & Time:	5/14/99
Finish Date & Time:	5/14/1999 1730
Drilling Co.:	LYON DRILLING
Driller:	HARRY LYON
S&W Inspector:	SLG
Backhoe Type:	CME 55
Drilling Method:	GEOPROBE/4.25 in. HS
Weather:	SUNNY 70 F

Groundwater Observations	
Time:	5/25/99
Casing Depth:	25
Boring Depth:	25
Depth to Water:	
Below Surface:	
Below Meas. Point:	16.31
Surface Elevation:	
Measuring Point Elevation:	
Groundwater Elevation:	

Sample Log Key: Sent for Lab Analysis
NAPL Key: NAPL Observed
Depth to Groundwater

Depth (ft)	Blow Counts	PID (PPM)	Sample Log	Recovery (ft)	NAPL	Lithology	Sample Description
1							
2		0					Dry, brown, SILT, SAND, GRAVEL fill
3							
4							
5							
6		0					Dry, brown, SILT, SAND, GRAVEL fill
7							
8							
9							
10		0					Dry, brown-black, SILT, SAND, GRAVEL fill
11							
12							
13							
14		40					Damp, gray-black, SILT & f SAND, some gravel
15							slight organic odor in .25 in. layer
16							
17							
18		42					Moist-damp, brown-black, ASH, SILT, SAND &
19							GRAVEL fill
20							
21		0					Dry, gray SILT
22							
23							Dry, gray SILT
24		0					
25							
26		0					
27							Bottom of boring
28							Sampled for TCL/TAL
29							
30							

Depth (ft) / Well Diagram



Stearns & Wheler, LLC ENVIRONMENTAL ENGINEERS & SCIENTISTS Niagara Mohawk Power Corporation Fort Plain, Former MGP Site Phase III Supplemental Investigation Fort Plain, New York Job No. 10060.10	**LOG OF BORING MW-8** (Page 1 of 1) Date Started : 6/7/01 Time : 7:35 am Date Completed : 6/7/01 Time : 9:55 am Drilling Contractor : Parratt & Wolff Driller : Glenn Lansing	Boring Total Depth : 25.2' bgs Drilling Method : HSA 4-1/4" ID Drilling Equipment : Mobile B-57 Hammer Wt./Drop : 140 lb./30" Sampling Method : S.S. 1-3/8" ID DTW During Drilling : 19' bgs, after 12 hrs:18.34' Logged By : BMc Survey By : NMPC Boring Location : 45' east & 7' north of NW corner of 5-S Diner.

Depth in Feet	Surf. Elev. 312.36	Blow Count	Recovery (inches)	Samples	PID (Vppm)
0–2	312	6, 6, 5, 3	4		ND
2–4	310	3, 2, 2, 2	3		ND
4–6	308	3, 4, 4, 6	10		ND
6–8	306	4, 8, 10, 11	5.5		ND
8–10	304	15, 12, 10, 9	8		1.7
10–12	302	3, 4, 7, 8	17.5		ND
12–14	300	5, 8, 6, 6	2		24.2
14–16	298	4, 8, 13, 12	19		45.1
16–18	296	8, 9, 9, 9	5.5		56.5
18–20	294	21, 36, 12, 26	7		57.4
20–22	292	6, 10, 16, 22	12		57.4
22–24	290	12, 35, 55, 50/3	11	NS	57.4
24–26	288			NS	

DESCRIPTION

TOPSOIL, w/ grass

Dry, very dark gray (3/1 2.5Y), (SW) WELL GRADED SAND w/ GRAVEL, 50-60% fine to coarse sand, 40-50% fine to coarse gravel, trace fines, loose, strong HCl reaction.

Wet, very dark gray (3/1 2.5Y), (SM) SILTY SAND w/ GRAVEL, 60% fine to coarse sand, 20% low plasticity fines, 20% fine gravel, loose, weak HCl reaction.

SILTY SAND w/ GRAVEL, very dark gray (3/1 10YR) Fine gravel @ contact.

Wet, mottled very dark gray & dark yellowish brown (3/1 & 3/6 10YR), (CL) CLAY, 100% highly plastic fines, medium dense, strong HCl reaction

SAA, CLAY.

SANDY CLAY w/ GRAVEL, mottled yellow & dark gray (7/6 & 4/1 10YR), 60% medium to highly plasticity fines, 25% fine to coarse gravel, 15% fine to coarse sand, medium dense, weak HCl reaction.

CLAY, mottled yellowish brown & dark yellowish brown (5/4 & 4/4 10YR), 100% highly plastic fines, trace medium sand.

Wet, very dark brown (2/2 10YR), (ML) SILT, 90% nonplastic fines, 10% fine sand, trace coarse sand, medium dense, no HCl reaction.

SILT, 85% fines, 15% medium to fine sand, trace coarse sand.

Wet, mottled very dark gray & dark yellowish brown (3/1 & 4/4 10YR), (CL) SANDY CLAY, 60% medium plasticity fines, 30% fine to coarse sand, 10% coarse gravel, medium dense, no HCl reaction.

SANDY CLAY, very dark gray (3/1 10YR), 50% fines, 30% fine to coarse gravel, 20% fine to coarse sand.

Wet, dark olive brown, (3/3 2.5Y), (GW-GM) WELL GRADED GRAVEL w/ SILT, 80% fine to coarse gravel, 10% fines, 10% fine to coarse sand, dense, weak HCl reaction.

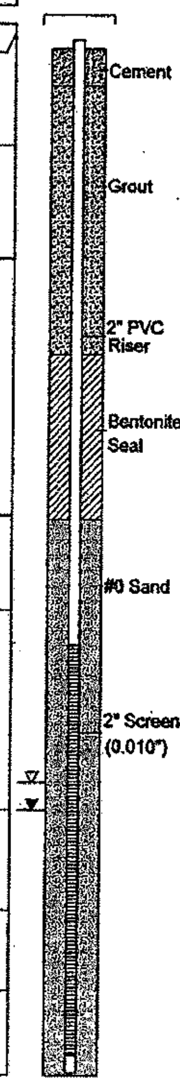
SAA, WELL GRADED GRAVEL w/ SILT.

Moist, mottled olive brown & dark grayish brown (4/4 & 4/2 2.5Y), (ML) SILT, 100% nonplastic fines, dense, strong HCl reaction.

Moist, black (2.5/1 2.5Y), (CL) CLAY, 100% highly plastic fines, very dense, strong HCl reaction.

Bottom of Boring 25.2' bgs

Well: MW-8
Elev.: 312.36



REMARKS

Begin drilling @ 7:35 am

8:30 am

9:55 am bottom of boring @25.2' bgs.

PID utilized: MiniRae 2000 calibrated to 100 ppm isobutylene.
ND represents volatile concentrations of less than 0.1 Vppm.
NS represents no sample attempted for this interval.

10-03-2001 d:\Jobs\Ft.Plain\MW-8.BOR

LOG OF BORING MW-8

(Page 1 of 1)

Stearns & Wheler, LLC
Environmental Engineers and Scientists

BORING LOG: SB-32 / MW-9

Niagara Mohawk Power Corporation
A National Grid Company
Remedial Investigation, Supplemental Work
Fort Plain, New York
L10060.11

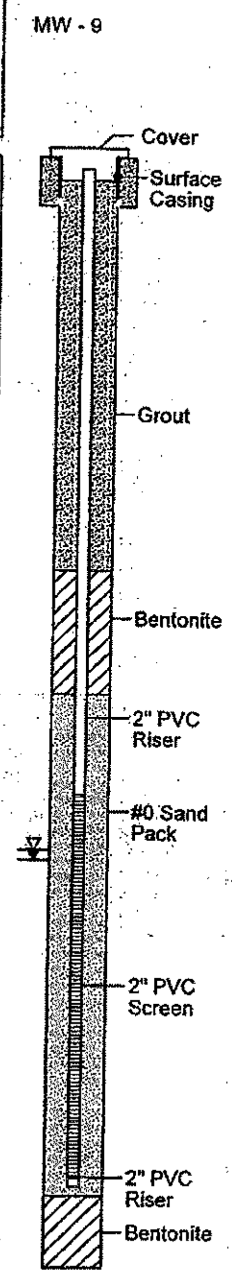
Date Started	: 6/9/03
Time	: 12:50 pm
Date Completed	: 6/9/03
Time	: 1:15 pm
Drilling Contractor	: Parratt-Wolff
Driller	: R.Bush

Total Boring Depth	: 28' b.g.
Drilling Method	: Direct-Push & Auger
Drilling Equipment	: IR A-300
Hammer Wt./Drop	: N/A
Sampling Method	: 1-7/8" S.S.
Logged By	: BMc
Survey	: NIMO
Boring Location	: NW corner of State Street : NIMO property.

Sample Type: Unrecovered; SS Sample; No Sample

Water Levels: ▼ During Drilling; ▽ After Completion (>24 hrs)

Depth (bgs)	Recovery (Inches)	PID (Vppm)	DESCRIPTION	REMARKS
0	13	ND	Surface: Grass Moist, very dark gray (2.5Y 3/1), (SM) SILTY SAND, 60% fine to medium sand, 40% medium plasticity fines, strong HCL rxn.	Begin drilling boring @12:50 pm, 6/9/03.
2	8	ND	Limestone cobble @ 1.7' b.g. Moist, dark olive gray (5Y 3/2), (ML) SANDY SILT, 60% medium plasticity fines, 40% fine sand, low dilatency, strong HCl rxn.	
4	6	ND	SAA, SANDY SILT w/ GRAVEL, 50% fines, 30% fine to medium sand, 20% gravel, trace coarse sand.	
6	16	ND	SAA, SANDY SILT w/ GRAVEL, dark brown (10YR 3/3) @ 6.6' b.g. 4" layer of 100% coarse sand.	
8	9	ND	Moist, dark brown (10YR 3/3), (SM) SILTY SAND, 60% fine to coarse sand, 40% low plasticity fines, trace fine gravel, strong HCL reaction.	
10	16	ND	SAA, SILTY SAND. Moist, very dark grayish brown (10YR 3/2), (ML) SILT, 95-100% nonplastic fines, 0-5% fine sand, rapid dilatency, strong HCL rxn.	
12	10	ND	Moist, very dark brown (10YR 2/2), (SM) SILTY SAND, 80% fine to coarse sand, 15% fines, 5% fine gravel, strong HCl rxn.	12' b.g. @ 1:15 pm
14	14	ND	Moist, brown - very dark brown (10YR 4/3 to 2/2), (GM) SILTY GRAVEL w/ SAND, 60% fine to coarse gravel, 20% fine to coarse sand, 20% fines, strong HCl reaction.	
16	16	ND	Moist, very dark brown - yellowish brown (10YR 5/4 to 2/2), (SW) WELL GRADED SAND w/ GRAVEL, 80% fine to coarse sand, 15-20% fine gravel, 0-5% fines, strong HCl reaction. Wet @ 17.5' b.g.	
18	8	ND	Wet, very dark brown (10YR 2/2), (SM) SILTY SAND w/GRAVEL, 60% fine to coarse sand, 20% fine gravel, 20% fines.	
20	8	ND	SAA, SILTY SAND w/GRAVEL.	
22	13	ND	Wet, very dark grayish brown (10YR 3/2), (GW) WELL GRADED GRAVEL w/ SAND, 60-70% fine to coarse gravel, 30-40% medium to coarse sand, trace fine sand & fines, strong HCl rxn.	22' b.g. @ 1:50 pm
24	4	1.6	Wet, olive gray (5Y 4/2), (ML) SILT, 90% nonplastic fines, 10% fine to medium sand, rapid dilatency, odor & sheen noted.	Collected B-32 24-26' b.g. 2:05 pm
26	NR			1:15 m 6/9/03 @ bottom of boring at 28.0' b.g.
28			BOTTOM of BORING, 28.0' b.g.	



PID utilized: MiniRae 2000 calibrated to 100 Vppm isobutylene.
NR represents no sample recovery.
NS represents no sample attempted for this interval.

BORING LOG: SB-32 / MW-9

Stearns & Wheler, LLC
Environmental Engineers and Scientists

BORING LOG: SB-33 / MW-10

Niagara Mohawk Power Corporation
A National Grid Company
Remedial Investigation, Supplemental Work
Fort Plain, New York

L10060.11

Date Started	: 6/9/03
Time	: 4:35 pm
Date Completed	: 6/10/03
Time	: 8:45 am
Drilling Contractor	: Parratt-Wolff
Driller	: R.Bush

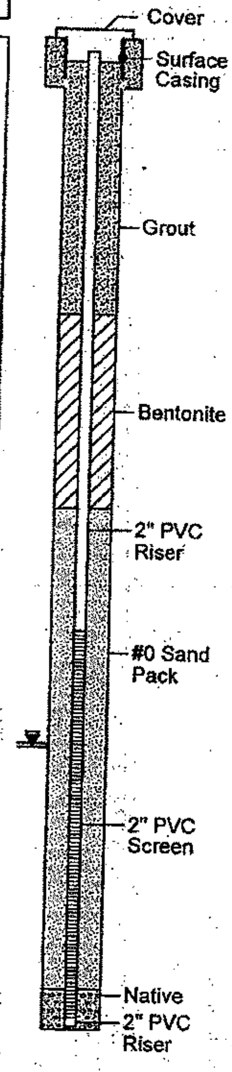
Total Boring Depth	: 24' b.g.
Drilling Method	: Direct-Push & Auger
Drilling Equipment	: IR A-300
Hammer Wt./Drop	: N/A
Sampling Method	: 1-7/8" S.S.
Logged By	: BMc
Survey	: NIMO
Boring Location	: In parking lot of restaurant : between MW-7 & MW-9

Sample Type
- Unrecovered
- SS Sample
- No Sample

Water Levels
- ▼ During Drilling
- ▽ After Completion (>24 hrs)

Depth (bgs)	Recovery (Inches)	Sample	PID (Vppm)	DESCRIPTION	REMARKS
0	19		2.2	Surface: Gravel & sand, pale yellow (2.5Y 7/3). Moist, very dark grayish brown (2.5Y 3/2), (SM) SILTY SAND w/ GRAVEL, 60% fine to coarse sand, 20% fines, 20% fine gravel, strong HCl rxn.	Begin drilling boring @4:35 pm, 6/9/03.
2	14		ND	SAA, SILTY SAND w/ GRAVEL, very dark gray (10YR 3/1), 40-50% sand, 30-40% fines, 20% gravel, trace yellow brick.	
4	NR				
6	8		ND	Wet, olive brown (2.5Y 4/3), (CL) CLAY, highly plasticity fines, no dilatency, strong HCL reaction.	
				Dry, gray (2.5Y 5/1), (GW) WELL GRADED GRAVEL, 90% fine to coarse gravel, 10% fine sand, trace fines, strong HCL rxn.	
8	7		0.3	Moist, very dark gray (2.5Y 3/1), (SM) SILTY SAND, 70% fine to coarse sand, 30% fines, trace yellow brick, strong HCl rxn.	
10	14		ND	Moist, very dark gray (2.5Y 3/1), (ML) SANDY SILT, 50-60% moderate plasticity fines, 40-50% fine to medium sand, trace coarse sand & fine gravel, strong HCl reaction.	10' b.g. @ 5:05 pm cap boring for night Restart boring 6/10/03 @ 7:35 am
12	12		ND	SAA, SANDY SILT.	
14	16		ND	Moist, very dark gray - gray (2.5Y 3/1 to 5/1), (GM) SILTY GRAVEL w/ SAND, 60-70% fine to coarse gravel, 20-30% moderately plastic fines, 10% fine to coarse sand, strong HCl rxn.	
16	18		1.1	SAA, SILTY GRAVEL, 70-80% gravel, 20% fines, 10% sand	
18	4		0.1	Wet @ 17.9' b.g. SAA, SILTY GRAVEL, wet, dark grayish brown (2.5Y 3/2), 60-70% gravel, 20-30% fines, 10% sand, sheen & odor noted.	
20	17		16.7	SAA, SILTY GRAVEL, odor & sheen noted, individual droplets of coal-tar noted between sand & gravel grains.	Collected B-33 20-22' b.g. 8:30 am
22	13		0.1	Wet, very dark gray (2.5Y 3/1), (ML) SILT, 100% nonplastic fines, rapid dilatency, odor & sheen noted in upper 2-3" of material. SAA, SILT.	8:45 m 6/10/03 @ bottom of boring at 24.0' b.g.
24				BOTTOM of BORING, 24.0' b.g.	
26					
28					

MW - 10



PID utilized: MiniRae 2000 calibrated to 100 Vppm isobutylene.
NR represents no sample recovery.
NS represents no sample attempted for this interval.

10-03-2003 J:\PROJECTS\L-XXXXX\L10060 - NMPC FT PLAIN\B-Logs\SB-33.bor

Date Start/Finish: 9/28/2011
Drilling Company: Parratt Wolff, Inc.
Driller's Name: Bill Rice
Drilling Method: Hollow Stem Auger
Auger Size: 4.25" ID
Rig Type: Diedrich D-50
Sampling Method: 3" x 2' Split Spoon

Northing: 1492311.1
Easting: 459713.3
Casing Elevation: 315.40 ft AMSL

Borehole Depth: 20' bgs
Surface Elevation: 315.70

Descriptions By: Nicholas (Klaus) Beyrle

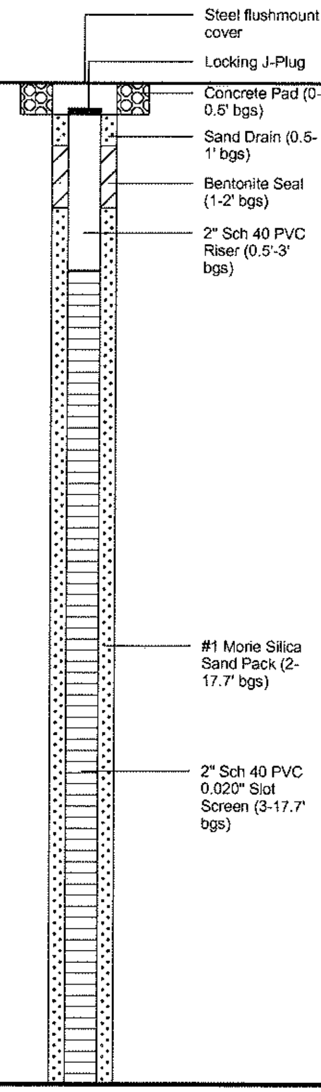
Well/Boring ID: **MW-12**

Client: National Grid

Location: Fort Plain Former MGP Site
14 Hancock Ave
Fort Plain, NY

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
0	315	1	0-2	1.0	6, 11, 11, 9	22	0.0		Gray very fine to very coarse angular GRAVEL (#2 stone, Type C). Moist (0-0.5' bgs). Dry to moist (0.5-1.0' bgs).
		2	2-4	0.0	NA	NA	NA		NO RECOVERY. Driller not able to recover sample from 2-4' bgs.
5	310	3	4-6	1.0	5, 5, 5, 6	10	0.0		Gray very fine to very coarse angular GRAVEL (#2 stone, Type C), wet.
		4	6-8	0.7	8, 10, 10, 10	20	0.0		
		5	8-10	0.5	8, 8, 5, 3	13	0.0		Gray very fine to medium angular GRAVEL (#1 stone) and fine to coarse SAND, little to trace Silt, wet. Geotextile fabric at 9.8' bgs, EHC-O material 9.8-9.85' bgs.
10	305	6	10-12	0.9	5, 4, 4, 5	8	0.0		
		7	12-14	1.2	6, 10, 14, 18	24	0.0		
15	300	8	14-16	1.8	18, 22, 21, 18	43	0.0		

Well/Boring Construction



ARCADIS
Infrastructure · Water · Environment · Buildings

Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = above mean sea level.

Horizontal Datum: North American Datum of 1983 (NAD83). Vertical Datum: North American Vertical Datum of 1988 (NAVD88).

Client: National Grid

Well/Boring ID: **MW-12**

Borehole Depth: 20' bgs

Site Location:
Fort Plain Former MGP Site
14 Hancock Ave
Fort Plain, NY

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
		9	16-18	2.0	16 17 13 24	30	0.0		Gray very fine to medium angular GRAVEL (#1 stone) and fine to coarse SAND, little to trace Silt, wet. Geotextile fabric at 9.8' bgs, EHC-O material 9.8-9.85' bgs.	#1 Morie Silica Sand Pack (2-17.7' bgs) 2" Sch 40 PVC 0.020" Slot Screen (3-17.7' bgs)
		10	18-20	1.5	28 32 42 50/0.4	74	0.0		Dark gray Silty CLAY, dense, hard, slight odor, moist. (TILL)	Sump (17.7-20' bgs) Grout (17.7-20' bgs)
20										
	295									
25										
	290									
30										
	285									
35										
	280									

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Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = above mean sea level.

Horizontal Datum: North American Datum of 1983 (NAD83). Vertical Datum: North American Vertical Datum of 1988 (NAVD88).

Client: National Grid

Well/Boring ID: **MW-12**

Site Location:
Fort Plain Former MGP Site
14 Hancock Ave
Fort Plain, NY

Borehole Depth: 20' bgs

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction

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Remarks: ags = above ground surface; bgs = below ground surface; NA = Not Applicable/Available; AMSL = above mean sea level.

Horizontal Datum: North American Datum of 1983 (NAD83). Vertical Datum: North American Vertical Datum of 1988 (NAVD88).

ARCADIS

Appendix J

Generic Field Sampling Plan

GENERIC
FIELD SAMPLING PLAN

FOR

SITE INVESTIGATIONS

AT

MANUFACTURED GAS PLANTS

Prepared for:

Niagara Mohawk
300 Erie Boulevard West
Syracuse, New York

Prepared by:

Foster Wheeler Environmental Corporation
One Park Place
300 South State Street, Suite 620
Syracuse, New York

NOVEMBER 2002

Site Specific
Revisions Attached: Supplement No. ___ Date

GENERIC
FIELD SAMPLING PLAN
TABLE OF CONTENTS

GENERIC
FIELD SAMPLING PLAN
TABLE OF CONTENTS (Cont'd)

Section 1 - Tables

Section 2 - Figures

Section 3 - Attachments

1.0 INTRODUCTION

This generic Field Sampling Plan (GFSP) has been prepared for Niagara Mohawk, a National Grid Company (NM) in response to the Voluntary Cleanup Order (VCO) (Index No. DO 0001 0011) between NM and the New York State Department of Environmental Conservation (NYSDEC). This document is intended to provide guidance for implementation of various types of environmental sampling activities that may be utilized during Site Investigation and/or Remedial Investigations, Interim Remedial Measures, Feasibility Studies, Remedial Designs, and/or Remedial Actions at MGP sites. The numbers and types of environmental samples to be collected are identified in the detailed respective Site-Specific Work Plans, to which this document is appended. If any discrepancy occurs between the Site Specific Work Plan and the Generic Work Plan/Field Sampling Plan then the Site Specific Work Plan will govern.

During the performance of any investigation, references in all work products to dense nonaqueous phase liquids (DNAPL) and/or other MGP impacted media (i.e. soil, water, sediments, etc.) will be made using the terminology and descriptions presented in the USEPA documents entitled ***Ground Water Issue - Dense Nonaqueous Phase Liquids*** (Huling and Weaver; March 1991) and included as Attachment B.

2.0 GENERAL FIELD GUIDELINES

2.1 Underground Utilities

All underground utilities, including electric, telephone, cable TV, sewers, water, natural gas, etc., will be identified prior to any drilling and subsurface sampling. Underground Facilities Protective Organization (UFPO) will be contacted by phone at least 72 hours prior to field activities so their underground utilities can be marked at the Site. Other potential on-site hazards such as sharp objects, known subsurface structures, overhead power lines, and building hazards will be identified during the Site reconnaissance visit.

2.2 Sample Identification

Each sample will be given a unique identification as shown in Table 1. With this type of identification, no two samples will have the same label. Labels or tags identified as shown in Table 1 will be attached to each sample container. Labels or tags will be rendered waterproof by either covering the label with clear plastic wrapping tape or utilizing waterproof material for the tag or label.

2.3 Sampling Equipment

The following is a general list of equipment, which may be necessary for sample collection:

- Stainless steel spoons and bowls for mixing soil and sediment samples;
- Appropriate sample containers (and coolers) provided by the laboratory;
- Sample bottles (kept closed and in the laboratory-shipped coolers until the samples are collected);
- Reagent-grade preservatives and pH paper or meter (or pre-preserved sample containers) for aqueous samples;
- Chain-of-Custody labels, tags, seals, and record forms;
- Logbook, field sampling records, and indelible ink markers;
- Laboratory grade decontamination detergents (such as Alconox, Liquinox, etc.), reagent-grade solvents, and deionized, organic-free water to be used for decontaminating equipment between sampling stations;
- Squirt Bottles;
- Ruler and measuring tape;
- Garbage bags;
- Paper towels and/or baby wipes;
- Buckets, wash basins, and scrub brushes to be used for decontaminating equipment;
- Digital camera or camera and film to document sampling procedures and sample locations;
- Stakes and flagging tape and/or spray paint to identify sampling locations;

- Shipping labels and forms;
- Knife;
- Vermiculite or other packing/shipping material for sample bottles;
- Strapping tape;
- Clear plastic tape;
- Duct tape;
- Aluminum Foil;
- Reclosable plastic bags;
- Ice;
- Portable field instruments, which may include but not be limited to a pH meter, conductivity meter, turbidity meter, dissolved oxygen (DO) meter or multi-parameter flow through cell, photoionization detector (PID), and water level indicator;
- Combustible gas indicator (CGI);
- Poly-sheeting;
- Driller's jars (for archiving samples);
- Polypropylene or stainless steel bailers;
- Poly propylene rope and/or Teflon line; and
- Submersible, peristaltic and/or centrifugal pump and associated tubing.

Other sampling materials and equipment may be utilized as warranted by field conditions encountered at time of sampling and media to be samples. Appropriate health and safety equipment and PPE, as per the Generic Environmental Health and Safety (EHS) Plan (Volume II) will be used.

2.4 Field Records

The Project Manager will control all field logbooks. Each field logbook will receive a serialized number and be issued to the field operations leader (FOL). Field logbooks will be maintained by the FOL and other team members while in the field to provide a daily record of significant events, observations, and measurements during the field investigation. All entries will be signed and dated at the bottom of each page.

Information pertinent to the field investigation and/or sampling activities will be recorded in the logbooks. The logbooks will be bound with consecutively numbered pages. Entries in the logbook will include, at a minimum, the following information:

- Name and title of author, date and time of entry, and physical/environmental/weather conditions during field activity;
- Purpose of sampling activity;
- Location of sampling activity;
- Name and address of field contact;
- Name and title of field crew members;

- Name and title of any Site visitors;
- Sample media (soil, sediment, groundwater, etc.);
- Sample collection method;
- Number and volume of sample(s) collected;
- Description of sampling point(s);
- Volume of groundwater removed before sampling;
- Preservatives used;
- Date and time of collection;
- Sample identification number(s);
- Sample distribution (e.g., laboratory);
- Field observations;
- Any field measurements made, such as pH, temperature, turbidity, conductivity, water level, etc.;
- References for all maps and photographs of the sampling site(s);
- Information pertaining to sample documentation such as:
    - Bottle lot numbers
    - Dates and method of sample shipments
    - Chain-of-Custody Record numbers
    - Overnight Shipping Air Bill Number

All original data recorded in Field Logbooks, Sample Tags, and Chain-of-Custody records will be written with waterproof ink. None of these accountable, serialized documents will be destroyed.

If an error is made on an accountable document assigned to one individual, that individual will make all corrections simply by crossing a single line through the error, placing the initials of the individual making the correction and date next to the crossed out information and entering the correct information. The erroneous information will not be erased. All field personnel will be instructed as to the proper field logging techniques for maintaining the integrity of the documentation.

3.0 EQUIPMENT DECONTAMINATION

3.1 Drill Rig and Backhoe Decontamination

A decontamination pad will be constructed of high-density polyethylene sheeting, no less than 10-millimeters thick, on a prepared surface sloped to a sump. The sump must also be lined and of sufficient volume to contain at least 20 gallons of decontamination water. The size of the pad shall be of sufficient size to contain the fluids generated during the decontamination of on-site equipment. The decontamination pad will be no larger than the back of the drill rig, since the back of the drill rig will be the largest piece of equipment anticipated on-site. Sides of the pad will be bermed so that all decontamination water is contained. Upon completion of all field activities, the decontamination pad will be properly decommissioned. To accomplish decommissioning, all free liquids will be removed from the surface of the High Density Polyethylene (HDPE) sheeting, including the sump area, and allowed to air dry. The HDPE sheeting will then be cut to manageable size, folded or rolled, and placed in the waste container (usually a roll-off container or 55-gallon drum). The earthen material or wood timbers used to construct the containment berm will be inspected to ascertain if the material has come in contact with decontamination liquids during use. If they have, the materials will be disposed in the waste container for subsequent disposal at an appropriate facility. If the materials have not been in contact with decontamination liquids, they may be reused.

All equipment used in intrusive work including backhoe, drilling rig, augers, bits, tools, split-spoon samplers and tremie pipe will be cleaned with a high-pressure hot water or steam cleaning unit and scrubbed with a wire brush to remove dirt, grease, and oil before beginning field work and before leaving the project Site upon completion of the last sampling activity. All tools, drill rods, and augers will be placed on sawhorses or polyethylene plastic sheets following steam cleaning. Direct contact with the ground will be avoided. The back of the drill rig and all augers, rods, and tools will be decontaminated between each drilling location according to the above procedures. The backhoe bucket, arm, and any other part of the equipment, which may have contacted excavated soil, will be decontaminated between each test pit location. Tools, augers, and rods will be decontaminated between drilling monitoring wells.

Decontamination water collected in the sump of the decontamination pad will be at a minimum removed from the sump at intervals less than 90% of its capacity and prior to rain events. The liquids will be pumped to a 55-gallon drum and stored in an appropriate satellite storage area. All waste handling will be performed in accordance with waste handling regulations.

Unless sealed in manufacturers packaging, monitoring well casing and screens will be steam cleaned immediately before installation. The screen and casing shall then be wrapped in polyethylene plastic and transported from the designated decontamination area to the well location.

3.2 Sampling Equipment Decontamination

Prior to sampling, all non-dedicated/non-disposable equipment (i.e., bowls, spoons, and bailers) will be washed with potable water and a laboratory grade detergent (such as Alconox). Decontamination may take place at the sampling location as long as all liquids are contained in pails, buckets, 55-

gallon drums, etc. The sampling equipment will then be rinsed with potable water followed by a reagent-grade isopropanol rinse and finally a deionized water rinse. Additionally, all equipment used to collect samples for metals analysis will receive a nitric acid rinse followed by a deionized water rinse. Between rinses, equipment will be placed on polyethylene sheeting. At no time will decontaminated equipment be placed directly on the ground. Equipment will be wrapped in polyethylene plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location, where appropriate.

4.0 SITE RECONNAISSANCE AND SCREENING

The following practices, procedures and methods will be utilized in carrying out all field activities if specified in the Site-Specific Work Plan.

4.1 Site Reconnaissance

Following the contact with UFPO and markout of subsurface utilities at the Site, Site reconnaissance will be performed. The Site reconnaissance will be attended by the NM Project Manager, the Consultant Project Manager and/or the FOL, and representatives of the NYSDEC and/or the NYSDOH. During this task, the NYSDEC-approved sampling locations, as outlined in the Site-Specific Work Plan, will be marked in the field with a wooden stake and/or spray paint. Conflicts with the NYSDEC-approved sampling locations, based on the utility markout, will be modified during this visit.

Prior to this Site visit, the property owner and/or company representative will be contacted by the NM Project Manager to meet at the Site. The property owner and/or company representative will be asked if subsurface structures exist on the property and will be asked to identify their locations. Subsurface structures will consist, but are not limited to the following: septic tanks, cesspools, underground irrigation lines, water supply wells, vaults, leaching fields, propane, oil, and/or fuel tanks, underground utilities installed by the owner, drainage lines, etc.

4.2 Metal Detector Survey

A metal detector survey may be conducted using the magnetic cable locator model MAC-51B (or equivalent); to locate unidentified underground utilities and possible buried drums or tanks. The area around each proposed subsurface investigation point may be checked with the MAC-51B (or equivalent) prior to any subsurface investigation. Initially, the locator will be tested on known locations of underground utilities to verify that it is functioning properly.

If there is no indication of buried utilities, drums, or tanks, then subsurface sampling will proceed. However, if the locator indicates the presence of a buried object, activities will not proceed in that location until the type of buried object is determined. If the object cannot be identified from surface or shallow digging, a test pit may be required to determine the identity of the buried object. If a test pit is required, the procedure and scope will be reviewed with the NM Project Manager prior to conducting the work.

The NM Project Manager will keep the property owner or company representative informed of planned Site activities.

4.3 PAH Field Screening

PAH screening of soil samples may be used to determine the extent of PAHs in soil and to optimize the location of samples for confirmatory laboratory analysis.

If PAH field screening is conducted at any Site, then adequate facilities will be provided for proper use of the PAH-specific immunoassay test. The individual responsible for conducting the immunoassay test in the field shall receive instruction in the proper use and storage of the test kit. The instructions for the PAH Field Screening Kit are provided as Attachment A of the Generic

Quality Assurance Project Plan (QAPP) (Volume II). The test is a simple procedure designed to test any type of soil sample for PAHs. The test uses a semi-quantitative, colorimetric method that incorporates immunoassay technology. The test is performed using tubes, which are coated with a chemical that specifically reacts with PAHs. To perform the test, the standards, samples and reagents are added in a step-wise manner to the coated tubes. The procedure results in a color change within each tube inversely proportional to the concentration of PAHs. The color in the tubes is read by inserting the tubes in a standardized color photometer. The test consists of the following three steps:

1. Sample Preparation: First, PAHs are extracted from the soil using a solvent. The extract is clarified using a disposable 0.45-micron filter tip.
2. Testing: After sample preparation, the PAH standards and the sample and the enzyme are added to the coated tubes. After 10 minutes incubation, the tubes are rinsed and color-developing reagents are added. Within a few minutes, color development occurs in the tubes.
3. Results Interpretation: The color of the sample tube is compared against the color of the standard tube using a photometer to determine if PAHs are present in the sample. The result will indicate concentrations in three ranges; less than 1 ppm, between 1 and 100 ppm, and over 100 ppm.

4.4 PCB Field Screening

Polychlorinated biphenyls (PCBs) screening of soil samples may be used to determine the extent of possible PCBs in soil and to optimize the location of samples for confirmatory laboratory analysis. The field screening may be conducted using a PCB-specific immunoassay test. The individual responsible for conducting the immunoassay test in the field shall receive instruction in the proper use and storage of the test kit. The instructions for the PCB Field Screening Kit are provided as Attachment A of the Generic Quality Assurance Project Plan (QAPP) (Volume II). The test is a simple procedure designed to test any type of soil sample for PCBs. The test uses a semi-quantitative, colorimetric method that incorporates immunoassay technology. The test is performed using tubes, which are coated with a chemical that specifically reacts with PCBs. To perform the test, the standards, samples and reagents are added in a step-wise manner to the coated tubes. The procedure results in a color change within each tube proportional to the concentration of PCB. The color in the tubes is read by inserting the tubes in a comparative photometer. The test consists of the following three steps:

1. Sample Preparation: First, PCBs are extracted from the soil using a solvent. The extract is clarified using a disposable 0.45-micron filter tip.
2. Testing: After sample preparation, the PCB standards and the sample are added to the coated tubes using dropper bottles. After 10 minutes incubation, the tubes are rinsed and color-developing reagents are added. Within a few minutes, color development occurs in the tubes.
3. Results Interpretation: The color of the sample tube is compared against the color of the standard tube using a photometer to determine the concentration of the sample. The result will indicate concentrations in 3 ranges; less than 5 ppm, between 5 and 50

ppm, and over 50 ppm. Also, with a dilution samples can be tested for over 500 ppm.

PCB specific screening with the eminase test kits will be utilized on-sites, which have historically been associated with either electrical equipment from a certain time period that employed the use of PCB oils or when records may reflect the use of PCBs at that facility. The test kits will be used as part of an overall analytical program, which will include laboratory analysis of on-site soils.

4.5 Private Water Supply Inventory

If off-site groundwater impacts are detected through the sampling program, or if specifically requested by the NYSDEC, than an inventory of private water supply sources within a one-half mile radius around the project Site will be researched. The research will be conducted by contacting the municipal Water Department (if one exists), the municipal engineer, the NYS Department of Health and consulting the *Atlas of Community Water System Sources*, and/or the United States Geologic Society (USGS).

5.0 SUBSURFACE BORING PROTOCOL

5.1 Drilling Methods and Sample Collection

Overburden

Soil borings, in general, will be drilled with hollow-stem augers or flush-joint casing. When advancing a soil boring, re-entry of the split-spoon sampler into the previously sampled interval shall not be permitted. Hollow-stem augers with center plug will be advanced at two-foot intervals, consistent with the split-spoon sampling pace. Alternative methods may be used at the geologist's discretion with the authorization of NM and NYSDEC. Split-spoon sampling will be conducted in accordance with ASTM Specification D-1586-84 for standard penetration test and split barrel sampling, unless otherwise authorized by the field geologist. Split-spoons will be decontaminated after each sample is collected.

A plywood sheet or other suitable basin (during mud or water rotary drilling) will be placed around the augers during drilling to contain soil cuttings/mud drilling and prevent them from contacting the ground surface. Soil cuttings will be placed in a 55-gallon steel drum or a roll-off container for subsequent sampling and disposal. Decontamination water and drilling mud/water will be placed in tanks and/or 55-gallon steel drums for proper disposal.

Boring Completion Methods

All soil borings will be completed by adding cement/bentonite grout, via tremie pipe, from the bottom of the borehole up to the ground surface as the augers are withdrawn. The grout will be mixed in the following relative proportions: 30 gallons of water to three 94-pound bags of cement to 25 pounds granular bentonite.

Geoprobe® Coring

If prescribed in the Site-Specific Work Plan, Geoprobe® coring will be performed in accordance with the manufacturer's specifications. An assembled Geoprobe Macro-Core® open-tube soil sampler, with a one use dedicated liner, will be driven one sampling interval (approximately 4 feet) into the subsurface then retrieved using a Geoprobe® soil probing machine. The collected soil core will be removed from the sampler along with the liner. The field geologist will classify and sample the soil located within the liner. Upon completion, the excess soil will be placed into a 55-gallon drum for disposal and the inner liner properly disposed. After decontamination, the Macro-Core sampler will be reassembled using a new liner. The clean sampler will then be advanced back down the same borehole to collect the next soil core interval.

Upon completion of sampling, the borehole will be grouted from the base of the borehole to ground surface. As the Geoprobe® piping is removed from the borehole, grout will be place in the Geoprobe® piping and allowed to flow out, via gravity, into the void left by the piping.

Procedures for geologic logging and field classification will be as presented in Section 5.2.

Shelby Tube Sampling

Shelby tube samples will be collected in accordance with the latest revision of ASTM D/587. When the desired sampling depth is reached, the hollow-stem auger or casing will be cleaned out using whatever method is preferred so as not to disturb the material to be sampled. The Shelby tube will be lowered to the bottom of the borehole, then advanced (pushed) via pressure without rotation by a continuous relatively rapid motion until 24 inches of penetration is achieved. At the discretion of the field geologist, a period of approximately 10 minutes, measured from the time of insertion, will be allowed to provide for sample adhesion to the tube walls. Prior to removal, the tube may be rotated two complete revolutions to shear the bottom of the sample from the native material.

Upon removal, the field geologist will log the tops and bottoms of the sample for soil classification. Samples recovered via Shelby tube will be preserved in conformance with the latest revision of ASTM D 4220. To preserve the natural moisture content of the samples, the tube ends will be sealed with a minimum of 0.50 inch of paraffin wax. Plastic slip caps will be applied at the ends of the sample tube, taped, then dipped and sealed in wax.

Rock Coring

Conventional or wire-line HX or NX coring will be used if rock drilling is specified in the Site-Specific Work Plan. Prior to drilling at such locations, a minimum 4-inch diameter, temporary steel casing or equivalent will be placed or locked into the top of bedrock. Rock coring will be conducted in accordance with the latest version of ASTM D2113. Upon retrieval, the core will be placed in a core box labeled as follows:

Outer Core Box and/or End Panels

1) Project/Site name
2) Site location
3) Boring/well number
4) Box number
5) Core run number and footage interval
6) Date

Inside Core Box Cover (in columns)

1) Boring/well number
2) Run number
3) Depth interval
4) Actual recovery
5) Rock quality degree (RQD) in percent
6) PID screening results where applicable
7) Comments

In addition, a geologist will be on-site during the drilling operations to fully describe each core, including:

1) Color
2) Thickness of bedding
3) Rock type
4) Additional petrographic information
5) Texture
6) Weathering state
7) Structure
8) Detailed description of discontinuities and fillings
9) Formation name
10) Detailed description of visible impacts
11) Miscellaneous observations

Sample descriptions, PID readings, and drilling locations will be recorded in the field logbook.

5.2 Geologic Logging, Soil Classification and Documentation

The field geologist will log borehole geology in the field logbook and on field forms. All samples collected from the borehole will be classified in accordance with ASTM standards D2487 Standard Method for Classification of Soils for Engineering Purposes and D2488 Standard Practice for Description and Identification of Soils or using the Burmeister Method and classifying the soils using the Unified Soil Classification System. The field geologist will be on-site during the drilling operations to classify/log each sample in the field logbook and/or field forms including:

- Site;
- Boring number;
- Interval sampled;
- Date;
- Initials of sampling personnel;
- Drilling Company's Name;
- Soil type;
- Color;
- Feet of recovery;
- Moisture content;
- Texture;
- Grain size and shape;
- Relative density;
- Consistency;
- Visible evidence of residues; and

- Miscellaneous observations (including organic vapor readings).

If no recovery, or limited recovery, is observed in the sample, then a description regarding the lack of sample recovery should be provided on the log of boring, if evidence of an obstruction or equivalent can be identified. If no observable evidence is identified then no opinion or guess should be entered on the log of boring.

Figure 1 presents an example of a log of boring form to be completed. If this form is not utilized, the form used should be approved by the Consultant's Project Manager as well as NM's project manger.

Photo documentation

Photo documentation of the Site activities will be conducted consistently throughout the implementation of the field program. A photographic log will be created and maintained as part of the overall field program. Visually impact materials and/or distinct stratigraphic changes in the soil column will be included in the photographic documentation for the individual Sites.

6.0 MONITORING WELL INSTALLATION AND DEVELOPMENT

Monitoring wells will be installed at the locations identified in the Site-Specific Work Plan. After the completion of drilling and monitoring well installation, all wells will be developed prior to the collection of groundwater samples. The following procedures will be used to install and develop all monitoring wells.

6.1 Monitoring Well Specifications

Monitoring wells installed in unconsolidated deposits that do not penetrate a presumed confining layer will be constructed according to the following specifications:

- PVC or stainless steel 2-inch diameter threaded, flush-joint casing and screens with O-rings will be installed.
- Wells will be screened in the unconsolidated deposits. Screens will be approximately 10 feet in length, and slot openings will be 0.020 inch. Alternatives may be used at the discretion of the field geologist, based on Site-specific geologic conditions.
- A sump, up to 2 feet in length, may be attached to the bottom of the screen to collect dense nonaqueous phase liquids (DNAPLs), if appropriate. A sump will not be installed if DNAPL is not observed in the boring.
- The top of the casing will extend to approximately 2 to 3 feet above ground surface where possible, given Site-specific considerations. Otherwise, flush-mount casings will be used.
- Where appropriate, the annulus around the screens will be backfilled with silica sand (#1 Morie or equivalent), based on Site-specific geologic conditions and screen slot size, to a minimum height of 2 feet above the top of the screen.
- A bentonite pellet/chip seal or slurry (30 gallons water to 25 to 30 lbs. bentonite, or relative proportions) will be placed above the sand pack. The bentonite pellet/chip seal will be installed via gravity and allowed to hydrate for at least 1 hour before placement of grout above the seal. If the bentonite slurry method is used for installation of the seal, then a side discharging tremie pipe will be utilized for the installation of the bentonite seal. Where possible, the bentonite seal will be a minimum of 24-inches in depth, except in those instances where the top of the well screen is in close proximity to the ground surface. In these instances, the well will be completed in accordance with specifications provided by the field geologist, which will incorporate an adequate surface seal into the well design.
- A fine sand pack (Morie 00 or equivalent) approximately 1 foot thick will be placed above and below the bentonite seal to isolate it and to prevent mixing of components.
- The remainder of the annular space will be filled with a cement-bentonite grout up to the ground surface. The grout will be pumped from the bottom up. The grout will be mixed in the following relative proportions: 30 gallons of water to three 94-pound bags of cement to 25 pounds granular bentonite. The grout will be allowed to set for a minimum of 48 hours before wells are developed.

- Each monitoring well will have an expansion plug or plumbers plug and a 4-inch diameter, steel casing with a hinged, locking cap placed over the monitoring well. The protective casing will extend approximately 2 feet below ground surface and be cemented in place. In some areas, it may be necessary to provide flush mounted casings. All wells will have keyed-alike locks and the keys will be maintained by the NM project manager.
- A concrete surface pad (2 ft x 2 ft x 6-inch) will be sloped to channel water away from the well casing.
- A weep hole will be drilled at the base of the protective standpipe casing to allow any water between the inner and outer casing to drain. If a flush mounted protective casing is installed then a small diameter drainage tube will be installed in the side of the casing discharging to the surrounding subsurface soils.
- The flush mounted monitoring well protective casing will be a minimum 8-inch diameter box or equivalent. All flush mounted well risers will be capped with an expansion plug or plumbers plug.
- The top of the PVC well casing will be permanently marked/notched and surveyed to 0.01 foot, and elevations will be determined relative to a fixed benchmark or datum. The measuring point on all wells, the permanent mark/notch will be on the innermost PVC casing.
- Each outer casing will be permanently labeled using a steel hand stamp or equivalent (i.e. MW-4).

Modification of the above installation procedure will be subject to changes in the field. All field-executed changes will be communicated to the NYSDEC for their discussion and approval, if appropriate.

Based on field conditions and evaluation of the best methodology to ensure the integrity of the seal, the field geologist will select the best method (i.e. bentonite pellet via gravity or bentonite slurry via tremie) to install the bentonite seal above the sand pack.

Figure 3 shows details of an overburden monitoring well construction diagram for wells installed in unconsolidated material. Figure 2 shows details of a monitoring well installed with a flush mounted protective casing.

Figure 4 shows details of a typical double-cased monitoring well construction diagram for wells installed in unconsolidated soils that <u>do</u> penetrate a presumed confining layer. The decision to install double-cased wells will be made on a boring-specific basis by the field geologist. Double-cased wells will be installed when the boring for the monitoring well penetrates a presumed confining layer. The confining layer shall be defined as a minimum five (5) foot thick, predominantly clay unit which has been shown to be laterally continuous across the Site. In the event the field geologist and NM and NYSDEC Project Managers decide a reasonable possibility exists for contamination to be deposited in deeper, clean zones during the drilling and installation of a monitoring well, the well will be double-cased. The purpose of the steel protective casing will be to minimize the possibility that residual contamination is deposited at the depth of the screened interval during the drilling process.

Monitoring wells that penetrate confining layers will be installed according to the following specifications:

- 6-inch inside diameter (ID) steel outer casings will be installed to a depth of at least 2 feet below the lower limit of observed or measured contamination and/or the confining layer. This casing will be grouted in place with cement to inhibit downward migration of contamination.
- The 6-inch casing will be installed through 6.25-inch ID hollow-stem augers. The augers will be filled with grout prior to their removal to ensure the integrity of the borehole and the grout seal. Then, the 6-inch casing will be installed into the grout and hydraulically pushed approximately 1-foot beyond the bottom of the boring. A 3–foot thick grout plug will be installed at the base of the 6-inch diameter pipe through which the borehole will be advanced. Potable water will be tremied to the bottom of the inside of the casing to dilute the grout, thereby allowing the grout to be more easily pumped out of the casing. The grout, pumped out of the casing, will be drummed and staged with other investigation-derived waste (IDW).
- The cement-bentonite grout remaining in the annulus between the casing and the formation will be allowed to set for at least 24 hours before drilling is continued. The drilling will then continue using 4-inch diameter flush-joint spin casing and potable water. All lubricant water will be containerized.
- The well will be constructed of 2-inch diameter PVC or stainless steel riser pipe and screen, sand pack, bentonite seal, grout, and surface casing as specified for single cased monitoring wells discussed above and in accordance with NYSDEC requirements. The bentonite seal may consist of pellets or a bentonite slurry mixture in proportions relative to 30 gallons of water to 25-30 pounds of bentonite. The grout mix will consist of 30 gallons water to three 94-pound bags of cement and 25 pounds of granular bentonite.

Monitoring wells to be installed as open holes in bedrock will be installed according to the following specifications:

- Advance each boring to the top of the bedrock surface. Borehole advancement will be conducted using 6¼-inch inner diameter (ID) continuous flight hollow-stem augers in 2-foot intervals, to permit the continuous collection of subsurface soil samples with carbon steel split-spoon samplers in accordance with Section 5.1. Confirmation of the bedrock surface depth will be based upon split-spoon and hollow stem auger refusal.
- Overbore the borehole to a 12-inch diameter borehole, in which to install a temporary 10-inch carbon steel overburden casing to bedrock, utilizing an appropriately sized tri-cone roller bit or thin wall bit. A 3–foot thick grout plug will be installed at the base of the 10-inch diameter pipe through which the borehole will be advanced, if appropriate.

- Subsequent to temporary casing installation, continue borehole advancement into the bedrock to a depth of 5 feet below the bedrock surface, first using the rock coring method for logging (see Section 5.1) and then overboring with a 9-inch outer diameter (OD) tri-cone roller bit via the water rotary method.
- Set a permanent 6-inch carbon steel casing 5-feet into the competent bedrock by the spin casing method.
- Backfill the annular space around the well casing with bentonite/cement slurry to the surface. The ratio of cement to bentonite for grouting will be approximately 30 gallons of water to three 94-pound bags of cement to every 25 pounds of granular bentonite.
- Remove the 10-inch temporary casing during pressure grouting. Allow grout to cure for at least 24 hours.
- Continue coring and then drilling in the borehole to the maximum anticipated total depth (i.e. 10 feet below the point where groundwater was encountered) and/or the depth where fracture zones indicate sufficient yield, first using the rock coring method and then overboring utilizing the water rotary method and a 5-inch OD tri-cone roller bit or equivalent.
- Complete the open hole monitoring well with a protective locking stick-up or flushmount box installed in a concrete pad as per Section 6.1.
- If the borehole extends to a depth greater than 25 feet below the bottom of the surface casing (due to depth and/or yield of groundwater), construct the monitoring well using 10 feet of 2-inch diameter Schedule 40 PVC or Schedule 5 stainless steel wire wound screen (0.010-inch slot or a slot size appropriate to the formation) and 2-inch diameter Schedule 40 PVC or Schedule 5 stainless steel riser pipe. For non-flushmounted wells, at least 2 to 3 feet of riser pipe must extend above the ground surface. Flushmounted wells will only be installed in high traffic areas, such as roadways, sidewalks, etc.
- Backfill the annular space to a minimum height of 2 feet above the top of screen with a sand pack. The sand pack shall be Morie #1 silica sand or equivalent (based on Site-specific geologic conditions and screen slot size). The remaining annular space will be filled with bentonite/cement grout up to the ground surface. The ratio of cement to bentonite for grouting will be approximately 30 gallons of water to three 94-pound bags of cement to every 25 pounds of granular bentonite.
- Complete the constructed monitoring well as described with a protective locking stickup or flushmount box installed in a concrete pad as per Section 6.1.

Modification of the above installation procedure will be subject to changes in the field. All field-executed changes will be communicated to the NYSDEC for their discussion and approval, if appropriate.

Characteristics of each newly installed well will be recorded on the appropriate well construction diagram. Each well will be identified with a well number placed on the inside of the well cap and on the outside of the protective casing or outside flush-mount cover. Each separate source of potable water used for the drilling process will be sampled once for TCL/TAL compounds.

6.2 Monitoring Well Development

After a minimum of 24 hours after completion, the monitoring wells will be developed by one or a combination of the following techniques:

- Surging;
- Bailing;
- Using a centrifugal pump and dedicated polyethylene tubing;
- Positive displacement pumps and dedicated polyethylene tubing, and/or
- Other methods recommended by the field geologist and approved by the NM and NYSDEC Project Managers.

Development water will initially be monitored for organic vapors with a PID. In addition, the development water will be observed for the presence of non-aqueous phase liquids (NAPLs) or sheens. The development water will be contained in a tank and/or 55-gallon steel drums on-site. The purge water will be disposed of in accordance with NYSDEC requirements. The wells will be developed until the water in the well is reasonably free of visible sediment (<50 NTU if possible) or until pH, temperature and specific conductivity stabilize, assuming a minimum of 10 well volumes of water has been removed from the monitoring well during development. In no case will well development exceed 8 hours per well. Following development, wells will be allowed to recover for at least one week before groundwater is purged and sampled. All monitoring well development will be overseen by a field geologist and recorded in the field logbook.

6.3 In-Situ Hydraulic Conductivity Testing

In-situ hydraulic conductivity testing may be performed on selected monitoring wells as indicated in the Site-Specific Work Plan to obtain estimates of groundwater velocities and potential groundwater recovery rates for the aquifer. The objective of the hydrogeologic testing is to determine the hydraulic properties of the aquifer in the vicinity of the Site.

Slug tests may be conducted in selected monitoring wells utilizing the rising or falling head slug test technique. Rising head tests can be performed in unconfined and confined aquifers. Falling head tests should only be performed in confined aquifers. The slug tests will be performed by subjecting water-bearing units in the screened interval to a stress caused by the sudden displacement of the water level within the well. The rising head tests will be conducted as follows:

- Slugs and other downhole equipment will be decontaminated before and after each test by methods described in Section 3.2.
- Prior to conducting each slug test, the static water level in the well will be measured to the nearest 0.01 foot. Water levels will be measured during the test with an electric sounder (water level indicator) and with pressure transducers attached to a data logger, thereby providing water level measurements by two independent devices.
- A weighted slug of known volume will be inserted gently into the well below the water table. The water level will be measured until the water level returns to static

conditions.

- The slug will be suddenly withdrawn from the well and the water level recovery will be monitored at appropriate intervals until recovery is complete and stabilized.
- Wells, which were bailed dry during development, may not be able to provide meaningful data through slug tests. Tests will be terminated in wells which do not recover significantly (>80% of static level) within a certain amount time, at the discretion of the field geologist. These wells will be bailed dry and their recovery measured with an electronic water level indicator.

The falling head tests will be conducted as follows:

- Slugs and other downhole equipment will be decontaminated before and after each test by methods described in Section 3.2.
- Prior to conducting each slug test, the static water level in the well will be measured to the nearest 0.01 foot. Water levels will be measured during the test with an electronic sounder (water level indicator) and with pressure transducers attached to a data logger, thereby providing water level measurements by two independent devices.
- A weighted slug of known volume will be quickly inserted into the well below the water table. The water level will be measured until the water level returns to static conditions.
- The test will be terminated in wells which do not recover significantly (>80% of static level) within an unspecified time, at the discretion of the field geologist.

The slug test data will be analyzed using the Cooper, Bredehoeft, and Papadopulos (1967) type curve method or the Bouwer and Rice (1976, 1989) method. The Cooper et al. analysis assumes that the well penetrates a confined aquifer, and the Bouwer and Rice method applies where unconfined conditions are prevalent.

6.4 Well Abandonment

Unconsolidated monitoring wells will be abandoned in the following manner:

- Remove the protective casing and concrete pad.
- Over drill the well casing using hollow-stem augers or casing to at least one foot below the depth of the boring/well as indicated in the soil boring log.
- Remove the well casing from the hole. If the casing cannot be removed while the augers are in place, cutoff the casing at least two feet, and if possible five feet, below the ground surface.
- Add cement/bentonite grout via tremie pipe from the bottom of the augers as the augers are withdrawn.
- If the well casing cannot be overdrilled and removed, the well casing will be filled with cement/bentonite grout from the bottom up using a tremie pipe. The grout mixture will be as specified for the well installation (see Section 6.1).

- Add grout to the point where the casing was cut off. From that point up to ground surface, backfill with native soil material surrounding the boring/well.

Consolidated (bedrock) monitoring wells or open holes will be abandoned in the following manner:

- Remove the protective casing and concrete pad.
- Add cement/bentonite grout via tremie pipe from the bottom of the well up to the ground surface. The grout mixture will be as specified for the well installation (see Section 6.1).
- Add grout to the point where the casing was cut off. From that point up to ground surface, backfill with native soil material surrounding the boring/well.

6.5 Packer Testing

Attachment A presents the packer test procedures to be used in the event the hydraulic conductivity of a discrete bedrock zone is required for the purpose of determining the well screen interval of bedrock wells. Down-hole packer equipment will be decontaminated following the procedures in the FSP (see Section 3.1) prior to use at each location and prior to demobilization.

7.0 TEST PIT EXCAVATIONS

When specified in the Site-Specific Work Plan, test pits will be excavated using a rubber-tired or track backhoe. In the event deep excavations are anticipated, a track hoe will be utilized. Locations of test pits, if proposed in the Site-Specific Work Plan, will be finalized in the field, based on the location of potential source areas and existing underground utilities. If the prospective test pit location is covered by asphalt or concrete, the area will be saw cut prior to excavation. During excavation activities, personnel will stand upwind of the excavation area to the extent possible. Air monitoring will be conducted in accordance with the Generic EHS Plan (Volume II). Test pit materials will be logged, as well as photographed for future reference. Material removed from the test pit will be placed on polyethylene sheeting. Should sampling of excavated material be performed, samples will be collected with a decontaminated or a new disposable sampling tool, or equivalent, from the center of the backhoe bucket. Upon completion, the materials from the test pit will be placed back in the excavation in the reverse order in which it was excavated. The location and size of the test pit will be measured and described in the field logbook.

Visually clean soils, such as surface soils, will be segregated from soils that may be impacted. The visually clean soils will be used to cover the impacted soils/source materials when placed back in the excavation. At a minimum, the top two feet of back filled soil will be visually clean. If the original (top) two feet of soil is impacted or some portion of it is impacted then the soil will be replaced and/or supplemented with certified clean fill. Test pits will be backfilled as soon as possible after completion and in general prior to the cessation of activities at the end of the day. The closure of individual test pits, prior to work cessation at the end of the day, will be performed on a case by case basis utilizing criteria for the maintenance of safe working and overall Site conditions. For gravel roadways and parking areas, the backfill will be tamped down in 18-inch lifts. A 6-inch layer of clean run-of-crush gravel will be tamped in-placed as the final lift. For test pits located in asphalt-covered areas, the surface will be replaced with cold or hot asphalt mix, compacted by rolling, and trimmed flush with the adjoining surface. Test pits located in grass covered areas will be returned to original grade and reseeded. Following restoration of the excavation, the test pit will be staked/marked to facilitate subsequent location by surveying crews.

7.1 Underground Utilities

Potential for encountering underground utilities is part of any subsurface investigation, where test pitting will be utilized as part of the investigation. When performing test pitting in areas of suspected live underground utilities the test pits will be advanced by hand digging to a depth of five (5) feet below ground surface to confirm the location of the live utility. If investigation of abandoned underground utilities is required, then the parameters of the investigation will be specified in the Site Specific Work Plan.

If an abandoned under ground pipe/structure, associated historically with the former MGP operations, is encountered during the test pitting operation, then excavation activity will cease until the pipe or underground structure can be adequately investigated. The investigation of the piping will include the description of the pipe/structure construction, material, condition, orientation, dimension, and contents of the pipe/structure, if possible. If the piping/structure interior can not be readily accessed then penetration of the underground utility may be necessary. Penetration of any underground utility should be conducted with the utmost care and consideration given for the utilization of proper tools (spark proof, beryllium coated, etc) for the task at hand. Once the interior of the pipe is accessible then a sample will be taken of the pipe contents, and sent to a laboratory for analysis.

If prior to initiation of test pitting activities, a live underground utility is identified in the area of anticipated test pitting, then the live underground line, if feasible, will be shut down. Consideration must be given to impacts to the facility operations prior to shutting down any active utility. (See the lockout tag out procedure section of the Generic HSP).

If during test pitting activities an unexpected live underground utility is encountered, excavation will cease, the orientation and dimensions of the underground utility will be recorded, and if possible, the live utility will be shielded from damage and test pitting will continue. If shielding is not possible then the test pit will be back filled and a new test pit attempted in the general vicinity of the initial location. When performing excavation activities next to a live underground utility, care will be taken not to undermine or impact the operation of the live underground utility. If a pipe or underground utility is accidentally severed, the owner of the utility, then NM, will immediately be notified. Liquid flows or electricity will be shut off immediately and appropriate repairs initiated as soon as possible. If a release of liquid occurs, the Consultant PM will notify NM who will then notify NYSDEC. All appropriate response actions will be implemented.

8.0 GROUNDWATER SAMPLING

The following is a step-by-step sampling procedure to be used to collect groundwater samples from the monitoring wells. Well sampling procedures will be recorded on the form shown in Figure 5. Sample management is detailed in the Generic QAPP (Volume II).

- Groundwater samples will not be collected until at minimum, one week following well development.
- Prior to sampling, measure the static water level from the surveyed well elevation mark on the top of the PVC or stainless steel casing with a decontaminated water level probe. The elevation of nearby surface water bodies will also be recorded using bulkheads, culverts, or other convenient structures as reference points in which the elevation is known. These relative measurements will be used to aid with interpreting the relationship between observed surface water and groundwater fluctuations. Record time, date, and measurement to nearest 0.01 foot and record in the field logbook.
- Decontaminate all field test equipment and meter probes prior to use on-site.
- Prior to collecting a round of groundwater elevations an oil/water interface probe will be used to determine the presence of LNAPL and DNAPL in the well.
- A round of groundwater elevations will be collected prior to the start of sample collection. The measurement at each well location will be made from the top of the PVC or stainless steel casing with a water level probe. The measurements will be made in as short a time frame as practical to minimize temporal fluctuations in hydraulic conditions.
- Place a plastic sheet on the ground to prevent contamination of the bailer rope and/or the tubing associated with the purging (pump) equipment.
- Purge the well by removing a minimum of 3 well volumes or at least one volume of saturated sand pack, whichever is greater or use the low flow sampling procedures below. Purging will be conducted with a teflon, stainless steel or disposable polyethylene bailer, or a centrifugal, submersible, peristaltic, or whale pump and dedicated polyethylene tubing, or other methods at the discretion of the field geologist, and with the prior approval of NM and NYSDEC. Purging of the well to stabilized parameters may be performed at between 100 to 500ml/min. If the well goes dry before the required volumes are removed, the well may be sampled when it recovers sufficiently.
- Collect volatile organic analyte (VOA) or BTEX samples with Teflon, stainless steel or dedicated polyethylene bailers lowered by a dedicated polypropylene and/or Teflon line or other methods as indicated. TCL SVOCs, PAHs, pesticide/PCBs, TAL metals, natural attenuation parameters, and other non-conventional parameters may be collected with Teflon, stainless steel, or dedicated polyethylene bailer or a submersible, or peristaltic pump using the low-flow sampling technique. Low flow well sampling will be at a rate less than or equal to 100ml/min.

Low-flow sampling procedures may be utilized to collect samples for metals analysis if sample turbidity is excessive. Low flow sampling will be performed according to USEPA (1998) guidance. The pump should be capable of throttling to a low flow rate suitable for sampling.

- Measure temperature, pH, turbidity, DO, and conductivity, at 5 to 10 minute intervals. When the parameters stabilize over 3 consecutive readings, sampling may commence. Record results in the field logbook prior to sample collection.
- Fill sample containers for VOCs or BTEX first. Sample containers for SVOCs and other analytes are then filled.
- After all samples are collected, dispose of polypropylene line and bailer, or other dedicated disposable sampling equipment.

9.0 SURFACE WATER SAMPLING

Surface water samples will be collected at the locations indicated in the Site-Specific Work Plan. Sample management is detailed in the Generic QAPP (Volume II). A decontaminated stainless steel or glass cup may be used to collect the water for these samples or the sample bottles may be directly dipped into the water. At no time will a sample jar, which contains preservative, be submerged in the sampling media. The sample should be collected from mid-depth by submersing the sampling device or sample container to a mid-depth position and opening the container and allowing it to fill. If this methodology does not work effectively then an alternative sampling device (i.e. bacon bomb etc) can be utilized. The stainless steel or glass cup will be decontaminated following the procedures outlined in Section 3.2. Surface water samples will be collected downstream first, and then progressing in an upstream direction. If sediment sampling is to be performed in conjunction with surface water sampling at corresponding locations, the surface water sample will be collected prior to the sediment sample.

Surface water flow measuring techniques will vary greatly based upon the existing field conditions. A discussion regarding the investigative techniques for collection of surface water flow measurements will be discussed in detail in the Site Specific Work Plan.

All Field data will be recorded in the logbook and on the sample log sheet (Figure 6).

10.0 SURFACE SOIL SAMPLING

Surface soil samples will be collected at the locations indicated in the Site-Specific Work Plan. Sample management is detailed in the Generic QAPP (Volume II). Samples will be collected using decontaminated stainless steel equipment or disposable sampling equipment. If the selected sampling location is in a vegetated area, the vegetation will be removed over a one square foot area prior to sample collection. The sample will be collected from within the top 2-inches of the exposed ground surface. Samples will be collected by hand digging into the soil with a pre-cleaned stainless steel trowel or a disposable sampling tool. All samples selected for laboratory analysis will be placed in the appropriate containers provided by the laboratory. Sample containers for volatile organic analysis will be filled first. Next, a sufficient amount of the remaining soil will be homogenized by mixing the sample in a decontaminated stainless steel bowl with a decontaminated steel trowel or disposable scoop. This composite sample will be analyzed for all remaining parameters identified in the Site-Specific Work Plan.

All samples collected for analysis will be placed immediately into laboratory sample jars and properly stored in a cooler with ice to $4^{o}C$ before transport to the laboratory.

Duplicate samples will be collected at the frequency detailed in the Generic QAPP by alternately filling two sets of sample containers. Composite samples may be required to obtain a sufficient soil volume.

In addition, surface soil samples will be described by including:

- Site;
- Location number;
- Interval sampled;
- Date;
- Initials of sampling personnel;
- Soil type;
- Color;
- Moisture content;
- Texture;
- Grain size and shape;
- Relative density;
- Consistency;
- Visible evidence of residues; and
- Miscellaneous observations (including organic vapor readings).

11.0 SUBSURFACE SOIL SAMPLING

11.1 Samples for Laboratory Analysis

Subsurface soil samples selected for laboratory analysis will be obtained from a standard 2-foot split-spoon or Geoprobe® samplers and placed in the appropriate containers provided by the laboratory. The soil samples will be collected from the 2-foot sampling interval (assuming full recovery) of the split-spoon. Additionally, the Geoprobe® methodology will utilize the standard 2-foot sampling interval. Sample containers for volatile organic analysis will be filled first. Samples for volatile analysis will be collected or biased toward the collection of that portion of the sample that exhibits the highest PID reading or as otherwise detailed in the Site-Specific Work Plan. Next, a sufficient amount of the remaining soil will be homogenized by mixing the sample in a decontaminated stainless steel bowl with a decontaminated stainless steel trowel or disposable scoop.

All samples collected for analysis will be placed immediately into sampling containers provided by the laboratory and properly stored on ice to 4°C before transport to the laboratory. Sample management is detailed in the Generic QAPP (Volume II). In addition, a geologist will be on-site during the drilling operations to fully describe each sample including:

- Soil type and sorting;
- Color;
- Feet of recovery;
- Moisture content;
- Texture;
- Grain size and shape;
- Relative density;
- Consistency;
- Visible evidence of residues; and
- Miscellaneous observations.

Duplicate samples will be collected at the frequency detailed in the Generic QAPP by alternately filling two sets of sample containers.

11.2 Geotechnical Testing

When identified in the Site-Specific Work Plan, laboratory geotechnical testing will be performed on selected soil samples in accordance with appropriate ASTM standards. Geotechnical analysis will be performed on soil samples collected in Shelby tubes or in glass sampling containers including, but not limited to, the following tests: grain size and sieve analysis, total organic carbon, permeability, specific gravity, Atterberg Limits, porosity, moisture content, and bulk density.

12.0 SEDIMENT SAMPLING

Proposed sediment sampling locations are identified in the Site-Specific Work Plan. Sample management is detailed in the Generic QAPP (Volume II). Sample locations in surface waterways will be marked along the bank prior to sampling. For all sample locations, the distance from the waterline to the sample location will be measured and recorded in the field logbook. Sediment samples will be collected from the furthest downstream point, progressing toward the furthest upstream sampling location. Following the completion of sampling the sediment locations will be marked along the shoreline for subsequent location by a survey crew.

12.1 Shallow Sediment Samples

Shallow sediment samples collected in shallow water will be collected with a Wildco core sampler, clam shell, lexane tubes, hand auger, vibracore or split-spoon sampler. Where possible, rocks and vegetative material will be discarded, and care will be taken to retain fine materials, which tend to disperse when disturbed. Sampling personnel will stand downstream of the sampling point to minimize disturbance of the bottom sediments during collection. Equipment will be decontaminated between samples following procedures outlined in Section 3.2. Field data will be recorded on the field sampling records. Surface sediment samples will be collected from a depth interval of 0 to 6 inches (0 to 15 cm) using these same procedures as outlined above. Sediments, which are located near shore and are not submerged, will be collected with a decontaminated trowel or disposable sampling tool.

12.2 Deep Water Sediment Samples

Sediment sampling in deeper water and samples requiring retrieval from deeper depths will be obtained using a barge-mounted drilling system or similar watercraft. Either a tripod and cat-head assembly or a Vibracore system will be used on the barge to advance the sampling apparatus into the bottom sediments. The tripod and cat-head assembly will be equipped either with a five-foot long "California" split-spoon sampler or a standard 2-foot long split-spoon sampler for sample collection. Split spoon samplers can be fitted with a sediment sampling head or shoe to ensure adequate recovery of the sample. To keep the hole open for subsequent samples and to minimize cross-contamination, 3-inch spin casing will be advanced, with plug, into the sediment. The spin casing will be advanced in 2-foot increments prior to sampling. The sediment sampler will then be pushed ahead or below the base of the 3-inch spin casing. The spin casing will be pumped free of sediment after each sample is collected. When the casing is free of sediment, it will be advanced 2 additional feet in preparation for the next sample collection.

The Vibracore uses a vibrating motion to advance a barrel and flexible plastic liner to achieve sample collection. A “core catcher” retains the sediment sample upon retrieval. Samples will be obtained by cutting the plastic liner longitudinally using a knife, then the sediment samples will be placed in sampling jars, based on sampling interval compensating for compression.

Sediment samples will be visually classified for texture and screened for the evolution of organic vapors with a PID. Samples will be collected or biased toward the collection of that portion of the sample that exhibits the highest PID reading or as otherwise detailed in the Site-Specific Work Plan.

The sediment samples will be collected from the 2-foot sampling interval (assuming full recovery) of the split-spoon. Visible staining or contamination will be noted in the field logbook.

12.3 Sediment Probing

When identified in the Site Specific Work Plan, sediment probing will be utilized to evaluate the presence of NAPL in the stream bedding. The near-shore sediment probing will be performed on a Site by Site basis. In keeping with NYSDEC standard protocols requiring the observance of sheens on the adjacent water bodies during site investigations, with out disturbance by probing, will not be changed as a result of the implementation of a sediment probing investigation.

Implementation of a sediment probing investigation will involve the use of multiple sections of 3/8-inch to ½-inch threaded rod and associated threaded female couplings. The threaded rod will be pushed into the sediment at multiple locations in an attempt to disturb the near surface sediments as well as deeper sediments. Upon detection of any sheen a stake will be located along the shoreline to provide a marker for the subsequent location by a survey crew, if require by the Site specific Work Plan. Sediment probing can also be used to provide information on the depth of competent material below the soft surface sediments.

Personnel will stand downstream of the sampling point to minimize disturbance of the bottom sediments prior to utilizing the probe. Equipment will be decontaminated prior to use in the stream and post use, following procedures outlined in Section 3.2. Field data regarding the location, depth, odor, and description of the sheen will be recorded on the field logbook.

Sediment probing in deeper water and samples requiring retrieval from deeper depths will be obtained by utilizing a rowboat or similar watercraft.

13.0 AIR MONITORING

13.1 Ambient Air Monitoring

Air monitoring will be conducted with a photoionization detector (PID) and combustible gas indicator (CGI) during all drilling and intrusive activities. The PID will be used to monitor for organic vapors in the breathing zone, borehole, and along the Site's perimeter and to screen samples for analysis. The CGI measures the concentration of combustible gas or vapor in air, indicating the results as a percentage of the lower explosive limit (LEL) of the calibration gas. Action levels are identified in the Generic EHS Plan (Volume II).

PID and CGI readings will be recorded in the field logbook and on the soil-boring log during drilling activities. The PID and CGI are calibrated at least once each day and more frequently if needed with the manufacturer specified calibration gas. The detailed procedures for the PID and CGI operation and calibration are included in the Generic EHS Plan (Volume II).

13.2 Perimeter Air Sampling

Perimeter air sampling may be required during field activities at the Site. Air sampling may be required during test pit excavation and/or during soil excavation/removal associated with an IRM. The basis for such sampling will be outlined in the Site-Specific Work Plan.

Prior to the collection of air samples, air-sampling stations, commonly one (1) upgradient and two (2) downgradient will be set up at the Site perimeter. The location of these stations is based on daily wind direction during the field activities. A sample station would be setup so that the sample media (Summa canister, high volume sampler, whole air sampler or absorbent tube, etc.) would draw in air from approximately 2 to 4 feet above the ground surface. The sampling media would remain in place a maximum 24-hour period before it is shipped overnight to a laboratory for testing. Air samples are commonly analyzed for BTEX via Method TO-15 (summa canister using a whole air sampler) or TO-17 (using an absorbent tube) and PAHs via Method TO-13 (using a high volume sampler).

13.3 Building Interior Air Sampling for Volatile Organic Compounds (VOC)

When identified in the Site Specific Work Plan, building air sampling will be performed in the on-site buildings during follow up investigations. Interior air sample collection will be performed in the basement and on the first floor of buildings potentially impacted by on-site contaminants. Various collection techniques will be used based on the type of contamination anticipated and the requirements set forth in the USEPA ERT SOP # 1704, #2121, and # 2119. Interior air sampling will conform to NYSDOH indoor air sampling regulations and the off-site Laboratory will have the New York State Environmental Laboratory Approval Program (ELAP) certification.

The following procedure will be used for air sampling of VOCs, based on USEPA ERT SOP #1704:

I. *Subatmospheric Pressure Sampling Using a Fixed Orifice, Capillary, or Adjustable Micrometering Valve*

- Complete the appropriate information on the Canister Sampling Data Field Sheet.
- A canister, which is evacuated to 0.05 mm Hg and fitted with a flow restricting device, is opened to the atmosphere which contains the VOCs for sampling. The pressure differential causes the sample to flow into the canister.
- This technique can be used to collect grab samples having a duration of 10 to 30 seconds or time-integrated samples having a duration of 12 to 24 hours. The sampling duration is depends on the degree to which the flow is restricted.
- As the pressure approaches atmospheric pressure, a critical orifice flow regulator will cause a decrease in the flow rate.
- Record data on an appropriate data sheet and/or in the field logbook.

The following procedure will be used for air sampling of VOCs, and is based on USEPA ERT SOP #1704:

II. *Subatmospheric Pressure Sampling or Pressurized Sampling Using a Mass Flow Controller/Vacuum Pump Arrangement (Andersen Sampler Model 87-100)*

- Complete the appropriate information on the Canister Sampling Data Field Sheet.
- Open a canister, which is evacuated to 0.05 mm Hg and connected in line with the sampler, to the atmosphere, which contains the VOCs for sampling.
- A whole air sample will be drawn into the system through a stainless steel inlet tube by a direct drive blower motor assembly. A small portion of this whole air sample is drawn from the inlet tube by a specially modified inert vacuum pump in conjunction with a mass flow controller.
- The initially evacuated canister is filled by the action of the flow controlled pump to near atmospheric pressure (subatmosphereic pressure sampling) or a positive pressure not to exceed 25 psig (pressurized sampling).
- A digital time program is used to pre-select sample duration and start and stop times.
- Record data on an appropriate data sheet and/or in the field logbook.

The following procedure will be used for air sampling of SVOCs and/or pesticides/PCBs, and is based on USEPA ERT SOP #2121:

- Using a calibrated sampler, place the sampler in the desired location. The polyurethane foam (PUF) sampler should be in the breathing zone in order to prevent elevated results. It should be located in an unobstructed area, at a distance of twice the height of any obstruction to air flow but no closer than two meters to the obstacle.

- Assemble the sampling system by attaching the legs and magnehelic panel to the platform. Connect the motor to the platform, making sure that the gasket is placed between the motor and the platform. Plug the motor into the timer located on the magnehelic panel. Connect the magnehelic to the venturi with tubing. Adjust the exhaust hose to face downwind of the sampler.
- Put on clean surgical gloves.
- Place the loaded sampling module into the quick release fitting and engage by locking the two levers down securely. Remove the metal cover.
- Record the pump number, location, sample start time, time/counter at the start, and other pertinent information on an appropriate data sheet and/or in the field logbook.
- Plug in the unit. If necessary, adjust the magnehelic gauge by turning the ball valve in order to achieve the reading required to reach the target flow rate. Wait approximately two minutes for the magnehelic reading to stabilize.
- Allow the sampling system to operate for the predetermined duration. If the sampling system is in use for more than 24 hours, the initial calibration should be audited every 24 hours. If the resultant value for the check is +/- 7 percent of the initial calibration, the sampling system must be recalibrated.

The following procedure will be used for air sampling of metals, and is based on USEPA ERT SOP #2119:

- Record the actual flow rate. Insert Assemble the sampling trains with clean filter cassettes. Verify the pump calibration by removing the inlet plug from the cassette, attaching a rotameter with Tygon tubing and turning on the sampling pump. Check to make sure all the connections are tight.
- Record the actual flow rate on an appropriate data sheet and/or in the field logbook. Replace the inlet plug until ready to sample.
- Set the sampling pump timer (low volume pumps) for the predetermined sampling time, or record the elapsed timer on the data sheet/logbook. This will be determined based on the type of pump being used.
- Deploy sampling pumps at sampling locations. Remove the cassette cap or inlet plug from the cassette. Sampling for elements can be conducted with the cassettes open-faced (cassette cap removed) or closed-faced (only inlet port plug removed). Open-faced is preferred because it allows even loading of the filter cassette and should be used whenever high particulate concentrations are expected in order to allow greater particulate loading of the filter. Closed-faced sampling is performed when there is a possibility that the sample may be shaken and particulates may be lost.
- Turn on the sampling pump and let it run for the predetermined sampling period.
- After the sampling period is over, verify the sampling period by reading the sample run time (low volume pumps) or by checking the elapsed time on the counter

(medium volume pumps). Record the length of sampling time on the data sheet and/or in the field logbook. Turn off the pump.

- Verify the pump calibration by attaching a rotameter with Tygon tubing and turning on the sampling the inlet plug.
- Remove the sampling cassette from the sampling train and insert the outlet plug. Calculate sample volume.

14.0 GEOPHYSICAL AND SOIL GAS SURVEYS

When specified in the Site Specific Work Plan, geophysical and soil gas surveys will be carried out at the site with the primary objective being to delineate areas of possible subsurface impacts from former MGP operations. Delineation of impacted areas will allow for a more focused and efficient sampling program during subsequent phases. Sampling locations may be located downgradient of potential historical MGP operations areas to determine if these areas act as contaminant sources. Also, boring locations can be adjusted to avoid large subsurface metallic bodies, thereby minimizing the potential for release of hazardous material from buried containers, and avoiding the expense associated with multiple boring attempts due to subsurface refusal. Furthermore, additional valuable subsurface information may be derived from this study, including:

- Delineation of underground structures(i.e. holder, and tar well);
- Mapping of existing site utilities and former MGP utilities; and,
- Detection of underground storage tanks (USTs) and/or other potential contaminant source areas.

If potential historical MGP operations areas prove to act as contaminant sources, the results of the geophysical investigation may also provide important information necessary for an Interim Removal action.

14.1 Geophysical Survey GPR and TDEMI

Two geophysical methods can be used for the geophysical survey: Time-domain Electromagnetic Induction (TDEMI) and ground penetrating radar (GPR). TDEMI can detect ferrous and non-ferrous metallic objects, such as a single 55-gallon drum, at a depth of up to 3 m (10 ft) bgs; GPR can detect both metallic and non-metallic subsurface targets at depths varying from several centimeters up to 20 m (65 ft bgs) or more, dependent upon frequency of induced waves, soil conductivity, and presence of extremely reflective interfaces. GPR can also be utilized to locate void spaces, detect disturbed soil or differential fill, and map Site Stratigraphy.

The TDEMI system utilized at the site will be the Geonics EM61 High Sensitivity Metal Detector or similar equipment. The EM61 is a one-person portable system designed primarily for industrial site assessment. The EM61 is relatively insensitive to nearby surface cultural interferences such as buildings, powerlines, and fences, and has the ability to record digital data at 0.17 second intervals, which translates to a spatial sample density of approximately 0.17 m (0.55 ft) along the ground surface.

The GPR system utilized at the site will be the Geophysical Survey Systems, Inc. (GSSI) SIR-2, or equivalent and will be equipped with both 200 and 500 MHZ antennas. The GSSI SIR-2 is a monostatic GPR system, in which a single antenna is used as the transmitter and receiver. The antennas are shielded to ensure a high proportion of the energy produced is focused into the subsurface, decreasing noise from surrounding fences, buildings, and other features. The GPR reflection section is displayed in real time as data is acquired, and an analog record is output by an in-the-field printer. Data is also digitally logged to a high-capacity drive at a rate of 32 scans/second, which translates to a spatial sample density of approximately 0.03 m (0.1 ft) along the ground surface.

Geophysical Survey Ground Penetrating Radar (GPR) and Time-Domain Electromagnetic Induction (TDEMI)

The geophysical investigation will encompass all areas suspected of former MGP operations. The survey area will be run over both paved and vegetative cover and will be divided into four (4) subplots ranging in size from 0.2 to 0.5 acres. The EM61 data will be acquired using a Leica system 530 Global Positioning System (GPS), or equivalent equipment, for navigational control. GPS data will be captured in one second intervals, utilizing the real-time kinematic (RTK) mode, which provides centimeter-grade positional accuracy. GPR data will be acquired along a pre-established orthogonal grid system, with line and station spacing appropriate for detection of targets of interest.

Concurrent with geophysical data acquisition, cultural features maps will be developed which will detail the location of potential interferences such as buildings, fences, utilities, etc. These maps will be utilized in the interpretation stage to more accurately assess the significance of geophysical anomalies observed in the data.

TDEMI data will be processed and interpreted using manufacturer-supplied software. TDEMI data will be interpolated to accurate State Name Planar coordinates with appropriate shifts and filters applied, and data extrapolated to a regularly spaced grid system using accepted mathematical methods. These data will then be displayed as high-resolution color maps. Proprietary software will then be utilized to isolate and characterize subsurface anomalies potentially related to steel structures or buried drums.

GPR data will be processed and interpreted using WINRAD and/or GRADIX software packages or equivalent. Processing may include “rubber sheeting” of data to appropriate coordinates, application of appropriate gains and filters, display of color-coded GPR sections, and advanced processing techniques, such as migration and deconvolution. Diffraction hyperbolas or other discrete anomalies will be identified and characterized and compared with locations of EM61 anomalies. GPR anomalies, which occur in areas free of EM61 anomalies can be attributed to non-metallic targets, and may be associated with plastic barrels.

A final report including description of data collected, maps of the geophysical data, and interpretation of these data will be included in the Final Report.

Geophysical Survey [Ground Penetrating Radar (GPR) and Time-Domain Electromagnetic Induction (TDEMI) Procedure

The geophysical survey will be conducted using the following procedure:

1. Clear the surface of the area to be surveyed (performed by clearing and grubbing subcontractor). This may include cutting underbrush to a height less than 0.3m (1 foot), removing trees less than 7.5 cm (3 inches) in diameter, removing brush, and mowing grasses greater than 0.6m (2 feet) in height. A sweep for metal objects on the ground surface will be conducted, and surficial metal identified will be noted and removed from the area of investigation.

2. Establish survey control within the investigation area. Survey markers will be installed both within and around the boundary of the survey area, and these points will be utilized to establish and calibrate the GPS base station.

3. Acquire data from each instrument from a test line prior to commencement of each day's activities. This test line will be performed over a known subsurface object or over a pre-placed object (such as a steel pipe).

4. Obtain GPS reading at a known survey point.

5. Begin survey at the southwest corner of the investigation area (or a subdivision of the investigation area) and progress northward (or eastward) until the area boundary or a major obstruction is encountered. TDEMI data will be acquired at a sampling rate of approximately 6 samples per second, which translates to a sample density of 1 sample every 0.17 meters (0.55 feet) based on an average walking pace. GPS data will be acquired concurrently with TDEMI data, at a rate of [1 sample] per second. GPR readings will be acquired at a sampling rate of approximately 32 scans per second, which translates to a sample density of 1 sample every 0.03 meters (0.1 feet) based on an average walking pace.

6. After reaching the grid boundary or obstruction, reverse direction, and acquire survey data in the opposite direction along a parallel line at the following line spacing**:** 1 meter (3 ft) for TDEMI readings and 2-meters (6 ft) for GPR readings.

7. Continue acquiring data in opposing directions, until the entire investigation area has been covered.

8. Acquire several lines of TDEMI data over a known linear metallic object placed upon the ground surface. This procedure will allow for accurate time shifting of geophysical data necessary for merging the geophysical and GPS data.

9. Acquire data from the test line subsequent to each day's activities, for quality assurance comparison.

10. Obtain GPS reading at known survey point for QA comparison.

14.2 Geophysical Survey Magnetometer and FDEMI

A geophysical investigation to delineate areas of possible subsurface impacts can be performed by utilizing two geophysical methods: magnetometry and frequency-domain electromagnetic induction (FDEMI).

Geophysical data will be collected using two instruments: a Geometrics G-858G magnetometer (configured as a vertical gradiometer and including a continuous-recording base station) and a Geonics EM31-MK2 ground conductivity meter or equivalent equipment. Positional data will be verified by utilizing a Leica System 530 GPS system, or equivalent, for navigational control. GPS data will be captured at one second intervals, utilizing the real-time kinematic (RTK) mode, which provides centimeter-grad positional accuracy**.**

Geophysical Survey Magnetometry and Frequency-Domain Electromagnetic Induction (FDEMI) Procedure

The geophysical survey will be conducted using the following data collection procedure:

1. Clear the surface of the area to be surveyed (performed by clearing and grubbing subcontractor). This may include cutting underbrush to a height less than 1 foot, removing trees less than 3 inches in diameter, removing brush, and mowing grasses greater than 2 feet in height. A sweep for metal objects on the ground surface will be conducted, and surficial metal identified will be noted and removed from the area of investigation.

2. Establish survey control within the investigation area. Survey markers will be installed both within and around the boundary of the survey area, and these points will be utilized to establish positional control, as well as calibrate the GPS base station.

3. Acquire data from a test line prior to commencement of each day's activities. This test line will be performed over a known subsurface object or over a pre-placed object (such as a steel pipe).

4. Set up magnetometer base station.

5. Begin survey at the southwest corner of the investigation area (or a subdivision of the investigation area) and progress northward (or eastward) until the area boundary or a major obstruction is encountered. Magnetometry data will be acquired at a sampling rate of approximately 10 samples per second, which translates to a sample density of 1 sample every 0.1 meters (0.33 feet) based on an average walking pace. FDEMI conductivity readings will be acquired at a sampling rate of approximately 2.5 samples per second, which translates to a sample density of 1 sample every 0.4 meters (1.3 feet) based on an average walking pace. GPS data will be acquired concurrently with geophysical data, at a rate of 1 sample per second.

6. After reaching the boundary or obstruction, reverse direction, and acquire survey data in the opposite direction along a parallel line at the following line spacing: 1 meter for magnetometer readings and 2 meters for conductivity readings.

7. Continue acquiring data in opposing directions, until the entire investigation area has been covered.

8. Acquire several lines of geophysical data for a known linear metallic object placed upon the ground surface. This procedure will allow for accurate time shifting of geophysical data necessary for merging the geophysical and GPS data.

9. Repeatedly (at least 3 times per day) revisit a calibration station and collect data with the EM31, in order to provide for an instrument drift correction.

10. Acquire data from the test line subsequent to each day's activities, for quality assurance comparison.

The geophysical data will be processed and interpreted using manufacturer-supplied software. Data will be interpolated to NYS State Plane coordinates, filtered as appropriate, extrapolated to a grid system, and displayed on maps of the Site.

14.3 Downhole Geophysics

Downhole gamma-ray geophysical logging, if required in the Site Specific Work Plan, will be conducted by a utilizing existing wells or soil borings as they are completed. Gamma-ray logging may be conducted in cased as well as uncased boreholes, and, because clays typically contain a higher percentage of gamma emitting minerals, can be useful for identification and correlation of clayey zones. The gamma-ray log can provide information on stratigraphic changes in the subsurface soils.

1. Be certain that the well has ample clearance for the gamma probe to pass without obstruction or binding. A dummy cylinder with the same diameter as the gamma log tool may be lowered downhole as a test for obstructions. Downhole may be performed if significant uncertainty exists. Wear appropriate health and safety equipment.

2. Set the tripod over the wellhead and park the mobile unit at a convenient location.

3. Slowly and carefully lower the probe to the bottom of the well with the logger recording the counts per second (cps) of gamma radiation. The descent is a "dry" run until the well bottom is attained.

4. Set the plotter so the gamma-ray logging is recorded on a graph. Set the upward speed at a constant rate. Bring the probe to the surface.

5. If the graph is successfully plotted, perform appropriate decontamination on the probe and the line and proceed to the next logging location.

14.4 Soil Gas Survey

A soil gas survey, if required by the Site Specific Work Plan, will be performed around the Site to delineate areas of possible subsurface impacts and potential source areas. A sampling grid of approximately 100 feet by 100 feet or depending on the size of the investigation area, will be utilized across a majority of the Site, with soil gas samples collected at the grid nodes. Additional soil gas samples will be collected at 25 foot by 25 foot grid nodes in the vicinity of the potential test pit locations, at 50 foot by 50 foot grid nodes around the east-northeast Site buildings, and at any other additional areas determined during the field investigation (e.g., elevated levels present during real-time sampling, etc.). Actual sampling locations will be adjusted in the field to ensure sample targeting of all suspected areas of subsurface impacts. A field gas chromatograph (GC) will be used to determine sample screening concentrations of volatile organic compounds (VOCs). Water table, barometric, and temperature changes can vary the results.

The FOL or his designee, will be present on-site during active soil gas collection activities. The following soil gas survey activities will occur:

- Location of the soil gas survey locations;
- Comparison of the field GC data with applicable quality assurance data to determine acceptability of results;
- Determination of the need for additional or a reduction in the number of soil gas survey points;
- Supervision of the topographic surveying to locate the sampling points;
- Review of the data analysis and evaluation from the soil gas survey report; and

- Recommendation for movement of the proposed field investigation sampling locations based on the soil gas survey results.

Soil Gas Survey Procedure

1. Record ambient air temperature and barometric pressure.

2. Drill a hole into the soil either by hand auger, rotary hammer, or driven rod (as conditions dictate), to roughly 4 to 5 feet in depth. The depth may be reduced based upon conditions at the Site at the time of sampling; all changes will be noted on Field Change Requests (see Section 13.0 of the QAPP).

3. Insert a probe, slightly smaller in diameter than the borehole, into the hole, and the hole will be sealed by packing soil around the expansion bulb at the probe top. The probe assembly will be selected by the soil gas crew and FOL, to provide the best probe assembly for the Site conditions. A typical assembly would consist of a 1/4-inch O.D. stainless steel probe, approximately 5-feet in length, and Teflon tubing, with a reducing tee and cap attached to the fitting.

4. Ensure/test vacuum with a gauge attached to the probe.

5. Extract soil gas through the probe via a vacuum pump connected to the tubing. Purge approximately 3 to 5 sample volumes prior to sampling to remove any introduced ambient contamination.

6. Remove the soil gas sample with a 500 uL gas-tight syringe or equivalent device, inserted into the tubing in front of the pump. This volume is adequate for achieving the required detection limit of 25 ug/L. If necessary, due to field conditions, the sample can be stored in a pressurized container.

7. Immediately inject the sample into the calibrated GC (see Step 8), and plot the chromatogram. Identify and quantify, based on standard peaks, any contaminants present in the soil gas sample.

8. Calibrate the GC prior to sample analysis. Initial instrument calibration should consist of a minimum of 3 concentration points (5 points are preferred), to demonstrate the working range and linearity. Linearity will be assumed if the ratio of the area response to the amount injected is constant over the working range (i.e., less than 20 percent Relative Standard Deviation). In addition, an initial verification of a less than 25 ug/L detection limit shall be run.

9. Check the sample probe for contamination between each sample location, by drawing ambient air through the probe via the pump, and checking that the response is not greater than background levels. If necessary, decontaminate the probes using methanol and deionized water, and then air drying.

Calibration standards will be run at the beginning and end of each sampling day, and a method blank shall be analyzed every 12 hours and after any highly contaminated samples to check for carry-over. In addition, an environmental field duplicate will be chosen and analyzed every 20 samples.

15.0 FIELD INSTRUMENTS

All field analytical equipment will be calibrated immediately prior to each day's use and more frequently if required. A calibration log will be created on which all equipment calibration will be recorded. Further details on calibration, precision, accuracy, etc. are provided in the Generic QAPP (Volume II). The calibration procedures will conform to manufacturer's standard instructions. This calibration will ensure that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. If an equipment malfunction is identified during calibration then the malfunctioning equipment will be within 24-hours or applicable fieldwork will be terminated as necessary until the malfunctioning equipment is repaired or replaced. Records of all instrument calibration will be maintained by the Field Operations Leader (FOL) and will be subject to audit by the Project Quality Assurance Manager (PQAM). Copies of all of the instrument manuals will be maintained on-site by the FOL.

15.1 Portable Photoionization Detector

The photoionization detector (PID) will be equipped with a minimum 10.6 eV lamp. The PID should be capable of ionizing and detecting compounds with an ionization potential of less than 10.6 eV. This accounts for up to 73% of the volatile organic compounds on the NYSDEC ASP Target Compound List. Calibration will be performed at the beginning and end of each day of use with a standard calibration gas specified by the manufacturer. If the unit experiences abnormal perturbation or erratic readings, additional calibration will be required. All calibration data will be recorded in field logbooks and on calibration log sheets to be maintained on-site by the FOL.

A battery check will be completed at the beginning and end of each working day. If erratic readings are experienced, the battery will be checked for proper voltage. This information will also be recorded in field logbooks and on the calibration log sheets.

15.2 pH Meter

Calibration of the pH meter will be performed at the start of each day of use, and after very high or very low readings. National Institute of Standards and Technology - traceable standard buffer solutions, which bracket the expected pH range, will be used. The standards will most likely be pH of 7.0 and 10.0 standard units. The use of the pH calibration and slope knobs will be used to set the meter to display the value of the standard being checked. The pH meter readings during calibration must be within 0.1 of the reference solution. The calibration data will be recorded on calibration sheets maintained on-site by the FOL.

15.3 Specific Conductivity Meter

Calibration checks using the conductivity standard will be performed at the start of each day of use, after five to ten readings or after very high or low readings. The portable conductivity meter will be calibrated on a daily basis using a reference solution specified by the manufacturer. Readings must be within 5 percent to be acceptable. The thermometer of the meter will be calibrated against the field laboratory thermometer on a weekly basis.

15.4 Turbidity Meter

Calibration using a turbidity standard will be performed at the start of each day of use and after very high or low readings. The portable turbidity meter will be calibrated using a reference solution specified by the manufacturer. The turbidity reading must be within ±2 NTU of the standard to be acceptable.

15.5 DO Meter

Calibration using a DO standard will be performed at the start of each day of use. The portable DO meter will be calibrated using a calibration solution specified by the manufacturer. The DO reading must be within 5% of the standard to be acceptable.

15.6 Combustible Gas Indicator

Calibration of the CGI will conform to the procedures prescribed in the Generic Environmental Health and Safety Plan (Volume II). Calibration will occur at the start of each day of use. The CGI

16.0 MANAGEMENT OF INVESTIGATION DERIVED WASTE

During the implementation of field activities, investigation derived wastes (IDW) will be generated at the Site. These IDWs will include the following: soil drilling mud/water, development and purge water, decontamination wash water, PPE, polysheeting, spent decontamination fluids, etc. Following the generation of these IDWs, they will be properly containerized in 55-gallon drums, frac tanks, agricultural poly tanks, and/or roll-off containers. PPE will be bagged and placed in 55-gallon drums. The containers will be properly labeled with the date of generation, the Site name, client name and address, contents of the containers, etc. Upon generation the IDW will be immediately containerized. The containers will be secured at the end of each day at the Site. The containers will be segregated on-site in a temporary fenced area and signs stating "Do Not Enter" will be posted on the fencing. Upon completion of the field activities, the containers will be sampled for disposal characteristics. IDW materials will be will be removed from the Site within 90 days of generation. Waste handling procedures and regulations will be strictly adhered to during all phases of waste handling.

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USEPA, 1998: Low-Flow (Minimal Drawdown) Ground Water Sampling Procedures. 540/5-95/504.

TABLES

Table 1
METHOD FOR IDENTIFYING AND LABELING SAMPLES

LLLL*	LL*	NN*	NN/NNNN*
Site	Sample Type	Sample Location	Depth/Time

Site :
Sample Type: Monitoring Well (MW), Surface Soil (SS), Subsurface Soil (SB), Sediment (SD), Surface Water (SW), Waste Water (WW), Solid Waste (WA)

Sample Number: Number referenced to a sample location map illustrated in the Site-Specific Work Plan.

* L = Letter
* N = Number

FIGURES

Figure 1

LOG OF BORING

PROJECT:
PROJECT NO.:
LOCATION:

DATE STARTED: :
DATE COMPLETED: :
GEOLOGIST: :
DRILLER: :
DRILLING METHOD: :

GW DEPTH: :
ELEVATION: :

Depth in feet	RECOVERY	USCS	GRAPHIC	DESCRIPTION	TIME	DATE	PID (ppm)	Sample I.D.	COMMENTS
0									
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									

Notes:

10-18-2001 P:\Front Street\Boring Logs\Blank BOR

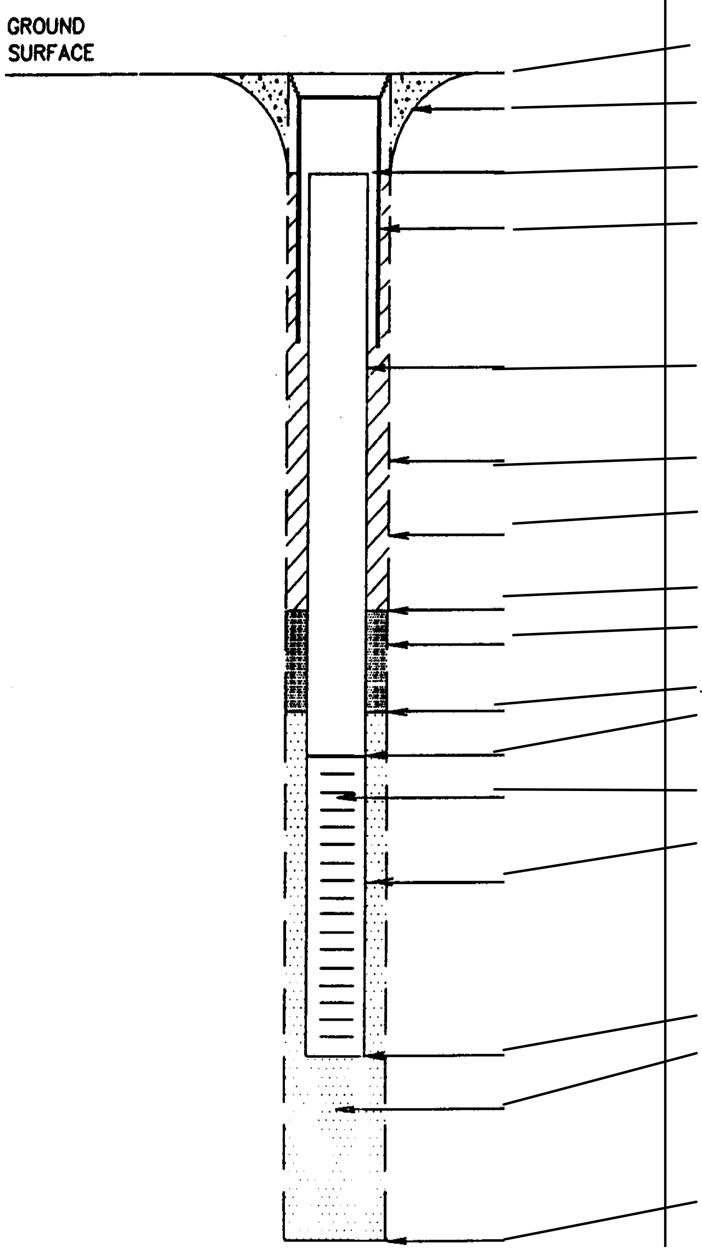
Figure 2

UNCONSOLIDATED
MONITORING WELL
CONSTRUCTION DIAGRAM

WELL NO. ______________

PROJECT ______________
PROJECT NO. ______________
DATE ______________ BORING NO.: ______________
ELEVATION ______________
LOGGED BY: ______________

DRILLER ______________
DRILLING METHOD ______________
DEVELOPMENT METHOD ______________



ELEVATION OF TOP OF SURFACE CASING: ________
TYPE OF SURFACE SEAL: ______________
GROUND SURFACE ELEVATION: ________
ELEVATION OF TOP OF RISER: ________

I.D. OF SURFACE CASING: ______________
TYPE OF SURFACE CASING: ______________
____

RISER PIPE I.D. ______________
TYPE OF RISER PIPE: ______________

BOREHOLE DIAMETER: ______________

TYPE OF BACKFILL: ______________
____

ELEVATION/DEPTH TOP OF SEAL: ________
TYPE OF SEAL: ______________
____

ELEVATION/DEPTH TOP OF SAND PACK: ________
ELEVATION/DEPTH TOP OF SCREEN: ________

TYPE OF SCREEN: ______________
SLOT SIZE X LENGTH: ______________
TYPE OF SAND PACK: ______________
____

ELEVATION/DEPTH BOTTOM OF SCREEN: ________

ELEVATION/DEPTH BOTTOM OF SAND PACK: ________
TYPE OF BACKFILL BELOW OBSERVATION WELL: ______________
____

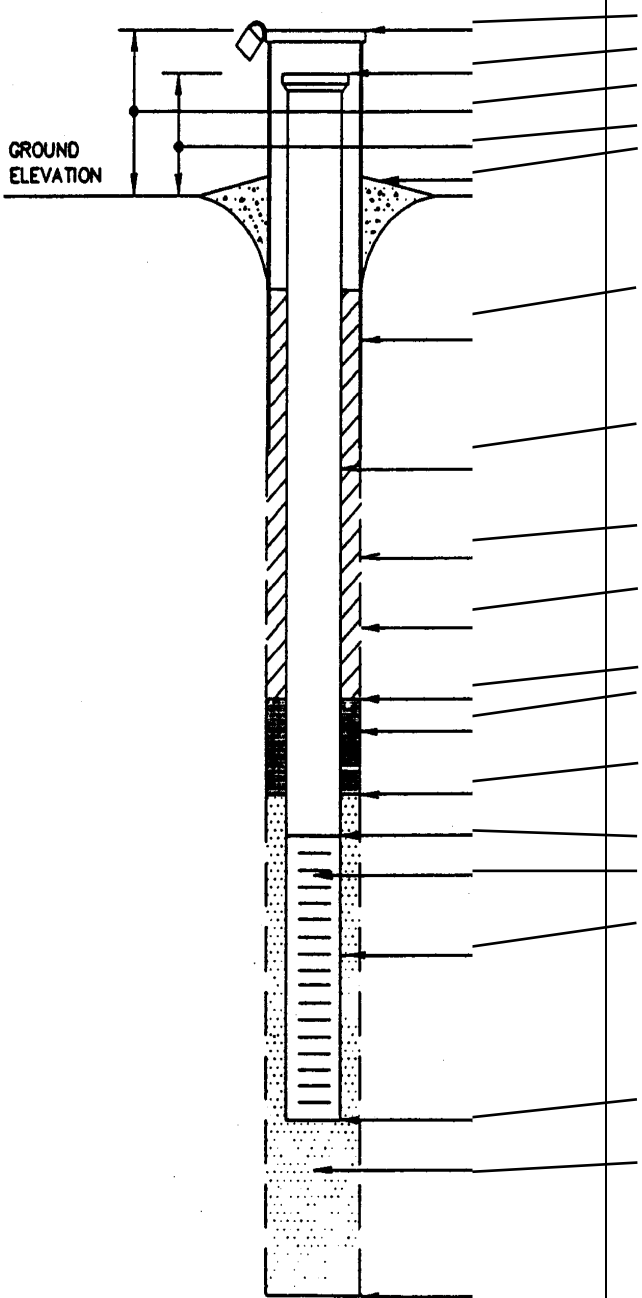
ELEVATION/DEPTH OF HOLE:

Figure 3

OVERBURDEN
MONITORING WELL
CONSTRUCTION DIAGRAM

WELL NO. ______________

PROJECT ______________	DRILLER ______________
PROJECT NO. ______________	DRILLING METHOD ______________
DATE ______________ BORING NO.: ______________	DEVELOPMENT METHOD ______________
ELEVATION ______________	
FIELD GEOLOGIST ______________	



ELEVATION OF TOP OF SURFACE CASING: ________

ELEVATION OF TOP OF RISER PIPE: ________

STICK-UP TOP OF SURFACE CASING: ________

STICK-UP RISER PIPE: ________

TYPE OF SURFACE SEAL: ________

I.D. OF SURFACE CASING: ________

TYPE OF SURFACE CASING: ________

RISER PIPE I.D. ________

TYPE OF RISER PIPE: ________

BOREHOLE DIAMETER: ________

TYPE OF BACKFILL: ________

ELEVATION/DEPTH TOP OF SEAL: ________

TYPE OF SEAL: ________

DEPTH TOP OF SAND PACK: ________

ELEVATION/DEPTH TOP OF SCREEN: ________

TYPE OF SCREEN: ________

SLOT SIZE X LENGTH: ________

TYPE OF SAND PACK: ________

ELEVATION/DEPTH BOTTOM OF SCREEN: ________

ELEVATION/DEPTH BOTTOM OF SAND PACK: ________

TYPE OF BACKFILL BELOW OBSERVATION WELL: ________

ELEVATION/DEPTH OF HOLE: ________

NOT TO SCALE

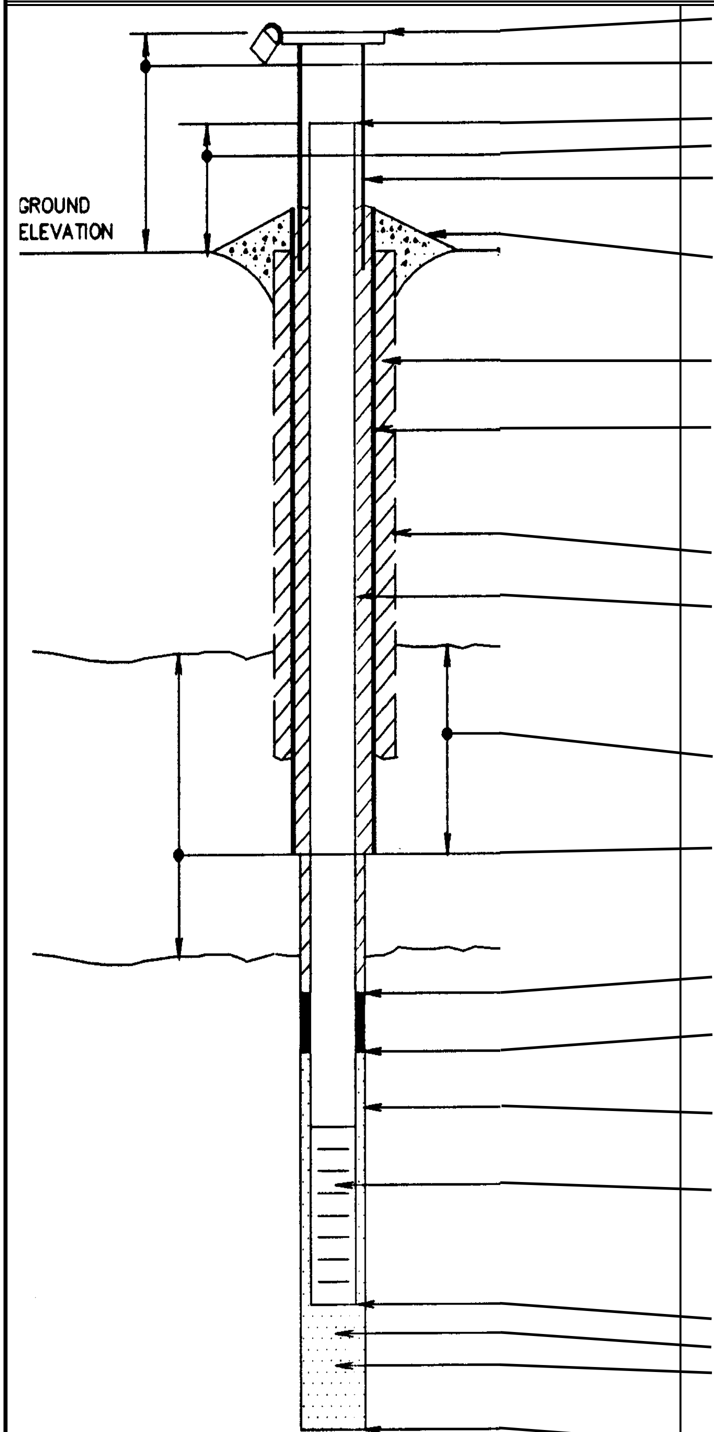
Figure 4

DOUBLE CASED
MONITORING WELL
CONSTRUCTION DIAGRAM

WELL NO. ____________

PROJECT ____________
PROJECT NO. ____________
DATE ____________ BORING NO.: ____________
ELEVATION ____________
FIELD GEOLOGIST ____________

DRILLER ____________
DRILLING METHOD ____________
DEVELOPMENT METHOD ____________



ELEVATION OF TOP OF CASING: ______
STICK-UP OF CASING ABOVE GROUND SURFACE ______
ELEVATION OF TOP OF RISER PIPE: ______
STICK-UP RISER PIPE: ______
I.D. OF SURFACE CASING: ______
TYPE OF SURFACE CASING: ______
TYPE OF SURFACE SEAL: ____________

TYPE OF BACKFILL: ____________
I.D. OF UPPER AQUIFER CASING: ____________
TYPE OF UPPER AQUIFER CASING: ____________

BOREHOLE DIAMETER/DEPTH: ____________

I.D.OF RISER: ____________
TYPE OF RISER: ____________

DEPTH CASING IS SET IN CONFINING LAYER: ______

APPROXIMATE THICKNESS OF CONFINING LAYER: ______

ELEVATION/DEPTH TOP OF SEAL: ______
TYPE OF SEAL: ____________
DEPTH TOP OF SAND PACK: ______
TYPE OF SAND PACK: ____________
BOREHOLE DIAMETER: ______

TYPE OF SCREEN: ____________
SLOT SIZE X LENGTH: ____________
I.D. OF SCREEN: ____________

ELEVATION/DEPTH BOTTOM OF SCREEN: ______
ELEVATION/DEPTH BOTTOM OF SAND PACK: ______
TYPE OF BACKFILL BELOW OBSERVATION WELL: ______
ELEVATION/DEPTH OF HOLE: ______

NOT TO SCALE

Figure 5

WELL PURGE DATA SHEET

PROJECT NAME: ______________________________
PROJECT No.: _________________________________
DATE: ____

Well I.D.: _____________________

Casing Volume

Well Diameter (d) = __________ ft

Well Radius (r_w) = __________ ft

Well Depth (TD) = __________ ft

Static Water Level (WL)= ___________ ft

Height of Water in Well (T):

T = TD (ft) - WL (ft)
T = ________ - ________
T = ________ ft

Gallons of Water per Well Volume (Casing):

$V_C = 0.163 \times T(ft) \times r_w(in)^2$
$V_C = 0.163 \times$ ___ x ___ ^{2}
$V_C =$ ______ gallons

Filter Pack Volume

Borehole Diameter (d_b) = ____________ ft

Borehole Radius (r_b) = ______________ ft

Depth to Top of Filter Pack (D_f) = ______ ft

P = estimated porosity of filter pack

Height of Water in Filter Pack (T_F)

T_F = TD - WL[1](or TFP[2])
T_F = _________ - _________
T_F = _________ ft

Gallons of Water per Filter Pack Volume

$V_F = (0.163 \times r_b^2 - 0.163 \times r_w^2) \times T_F \times P$

$$\mathbf{V_T = V_C + V_F}$$

Total Volume Purged: **Design = ________ gallons**
Actual = ________ gallons

Water Quality:

	pH (SU)	Spec. Conduct (umhos/cm)	Temp. (°C)	Eh (mV)	D.O. (ml/L)
Initial					
Volume 1					
Volume 2					
Volume 3					
Volume 4					
Volume 5					

Purge Method: ____ Suction Pump ____ Submersible Pump ____ Bailer ____ Other____________

Notes/Observations: ____
____
____

Sampler(s) Present: ____

1. From Top of Inner Casing
2. Top of Filter Pack - used if entire filter pack saturated

Figure 6

SAMPLE LOG SHEET

I. SAMPLE IDENTIFICATION

Project: ____________________ Project No.:
Client: ____________________ Project Manager: ____________
Sample Name/Number: ____________ Date: ________ Time: ______ Hrs
Sampling Location/Depth: ____________ Type: ______ Grab ______ Composite
Sample Matrix: ______ Surface Water ______ Groundwater ______ Sediment
______ Soil ______ Waste
______ Other (Specify) ____________________

Sampled By: ____________________

II. SAMPLE SOURCE

______ Well ______ Outfall ______ Leachate
______ Drum ______ Boring ______ River/Stream
______ Bldg/Structures ______ Tank ______ Impoundment
______ Test Pit/Trench ______ Other (Specify) ____________

Source Description ____________________

III. FIELD OBSERVATIONS/MEASUREMENTS

Appearance/Color: ____________________
Volatile Organic Analysis (VOA): ______ HNU ______ OVA ______ Other
VOA Readings: Off Sample ________ Respiratory Zone ________
$LEL/O_2/H_2S$ Readings: LEL ______ O_2 ______ H_2S ______
Radioactivity (mR/hr): ____________________
pH: ________ Conductivity: ________ Temperature: ________
Salinity: ____________ Other: ____________
Observations: ____________________

IV. SAMPLE DISPOSITION

Preservation: ____________________
Laboratory Name: ____________________
Laboratory Location: ______ On-Site ______ Off-Site
Forwarded to Laboratory: Date: ________ Time: ________ Hrs
Laboratory Sample No.: ____________________
Chain of Custody No.: ____________ Airbill No.: ____________

V. ADDITIONAL REMARKS

ATTACHMENTS

ATTACHMENT A

ATTACHMENT B

PACKER TEST PROCEDURES

I. Introduction

Packer testing is a method used to estimate the hydraulic conductivity of discrete bedrock zones within an open-bedrock corehole or open-bedrock well/piezometer. A packer test involves tightly sealing off a selected interval in the bedrock hole, pumping clean water into the test interval under a specified head for a specified duration, and recording the volume of water pumped into the formation during the test duration. To allow interpretation of the flow characteristics (e.g., laminar or turbulent), the rock fracture response (e.g., dilation, washout, or void filling) and the representative conductivity value for the tested bedrock interval, five test increments are performed at three different head conditions. The hydraulic conductivity is calculated based on the observed test pumping rates, the total applied head values, the geometry of the tested interval, and the pattern of pumping rates achieved during each of the five test increments.

The following presents methods for both single and double packer testing.

II. Materials

The equipment used for packer testing consists of two assemblies:

(1) A packer apparatus consisting of inflatable rubber packer(s) and a length of perforated pipe; and
(2) A water system, including a water meter, pressure gauge and valves to adjust and maintain the water pressure and flow.

The following list of equipment to be used for packer testing is meant to serve only as a guide because actual site and borehole conditions may require modifications. The driller may provide much of the equipment. Typical equipment and materials used to perform packer testing include:

- Drill rig to install and remove the packer and water pipe;
- Packer (pneumatic or hydraulically actuated);
- Water pipe, ranging from 1 to 2 inches in diameter, depending on the permeability and surface area of the test section;
- Flow meter of the same diameter as the water pipe above;
- Pump, capacity to approximately 50 gpm;
- Storage tanks of appropriate volume for holding clean water for injection into test interval;
- Two pressure transducers, sized in accordance with the depth of the test interval and the excess injection pressure to be applied during the test;
- Compressed gas cylinders, regulators, and tubing for inflating pneumatic packers or alternative pressure source if hydraulically-actuated packers are used;
- Water swivel or elbow;
- Hose or piping of the same diameter as the water pipe;
- Electronic data logger for recording transducer output;
- Water level indicator or equivalent oil/water interface meter with 0.01 foot

increments;

- Stopwatch;
- Constant-head injection data sheets (an example is provided in Figure 1);
- Personal Protective Equipment (PPE) as required by the Site-specific EHS Plan;
- Decontamination supplies (as needed); and
- Field logbook.

III. Packer Apparatus Configurations

Either single-packer or double-packer configurations may be used to perform the packer test. The single-packer test typically is performed after each core run during the drilling of corehole. The packer is seated at the top of the interval of rock core just removed, and the newly exposed section of bedrock is tested. To remove sediment from the corehole wall, the corehole may be bailed, surged or swabbed prior to packer testing. The test should not be initiated, however, until the water level in the drill casing returns to the static level.

Single-packer tests may provide more reliable results than double-packer tests because if water leaks past a single, upper packer, the leak may be discerned by the recognition of a rising water level in the corehole or drill casing above the packer or by the appearance of water in the casing at the ground surface. In contract, if a double-packer configuration is used, leakage past the lower packer may enter a permeable corehole section below the lower packer without being recognized as leakage.

The double-packer configuration is used if discrete rock intervals are to be tested in a previously-drilled long open corehole. Two packers are placed in the corehole and inflated with the perforated portion of the pipe between the packers. The spacing between the packers, corresponding to the test interval length, typically is 5 to 0 feet. Specified bedrock intervals are tested starting from the bottom of the hole and working upwards at intervals selected by the supervising geologist/engineer.

IV. Water System

The water system typically is assembled with a bypass valve and line connected to the main water line before the water meter valve. The purposes of the bypass valve are (1) to dampen the surge of water produced by the action of the pump, thus providing a relatively constant flow rate and water pressure; and (2) to allow a pressure bypass so that relatively low pressures may be applied to the tested rock interval, if appropriate. A surge suppression tank may also be plumbed into the water system before the bypass line to help dampen pump surge affects.

A water meter valve and the water meter follow the bypass valve and line. Flow to the tested rock interval passes through the water meter valve and is recorded by the water meter. The bypass and water meter valves are used simultaneously to maintain the water in the line at the desired pressure. The maximum water pressure for a particular pumping rate is achieved with the meter valve fully opened and the bypass valve fully closed. The bypass valve should be used as much as possible, however, to utilize its surge damping effect.

The remainder of the water system apparatus consists of a check valve, a relief valve and line, a water pressure gauge, and finally a length of riser pipe connecting the perforated pipe and packer assembly to the water supply apparatus. The pressure gauge indicates the water pressure in the apparatus at that location, rather than the pressure applied to the tested rock interval. The total head applied during a test consists of the gauge pressure plus the elevation head (the vertical distance between the pressure gauge and the static water level in the corehole), minus the frictional head loss between the pressure gauge and the perforated pipe where the water exits the apparatus and enters the tested rock interval. The magnitude of frictional head loss depends on the length of riser pipe used and the pumping rate, and is best determined empirically by calibrating the test assembly in the field. Alternately, frictional losses may be estimated based on hydraulics equation such as the Hazen-Williams equation (Meritt, 1983), which relates head loss to pipe geometry and flow rate.

V. Packer Test Apparatus Calibration

The frictional head loss in the riser pipe assembly should be determined in the field by a calibration process to obtain a reliable estimate of the total head applied to the test interval. The calibration is performed by pumping water through the apparatus at a constant pressure and flow rate for a specified duration, typically a few minutes. The gauge pressure, total flow volume, pumping duration, and riser pipe length are recorded, and the procedure is repeated at a different flow rate. The process is repeated at several flow rates that span the representative range of flow rates achievable by the pump.

The calibration is performed with the water system and packer apparatus laid out horizontally along the ground surface. The packer(s) remain deflated during the calibration procedure to avoid rupturing. The perforated section of pipe is supported slightly above the ground surface so that water may drain freely during pumping through the test assembly. The perforated pipe section and the pressure gauge are situated at approximately equal elevation during the calibration to eliminate the elevation head between the pressure gauge and the perforated pipe section. Because the elevation head is zero, the pressure gauge measurements obtained during calibration indicate only the frictional head loss in the pipe assembly.

The calibration process should be repeated and a separate set of gauge pressure versus pumping rate data generated for each total length of riser pipe used during actual packer testing. The calibration procedure may be performed after the appropriate riser-pipe lengths are identified by the performance of packer tests. The data of gauge pressure versus pumping rate are later plotted on a X-Y axis. A best-fit power-law regression curve is calculated for each data set to determine the mathematical relationship between pumping rate and frictional loss. During hydraulic conductivity calculation, frictional head loss for each observed flow rate is estimated from the plot of calibration data corresponding to the length of riser pipe used during the test.

VI. Test Gauge Pressure Calculation

Appropriate test pressures to be used during each of the five test increments are calculated as follows:

(1) Calculate the maximum gauge pressure, to be used during test increment #3 as:

P_3 (psi) = 0.75 x Depth of Test Section Midpoint (feet)

(2) Calculate the gauge pressures to be used during the other test increments as:

$P_1 = P_5 = 0.4 \times P_3$ and

$P_2 = P_4 = 0.7 \times P_3$.

VII. Packer Test Procedures

Prior to testing a given bedrock interval, the corehole identification number, the depth of the test interval, the static depth to water in the corehole, the gauge height above ground surface, and the length of riser pipe used in the apparatus are recorded on a packer test data log. After the packer(s) have been seated at the desired interval, the remainder of the test is performed as follows:

1. Open the bypass valve completely with the water meter valve closed.

2. Start the pump or open other water supply.

3. Open the meter valve slowly to allow water to flow and pressure to build. If this valve is completely opened and additional pressure is still needed, it may be obtained by slowly closing off the bypass valve, thus forcing more water through the water meter valve.

4. After the desired pressure for a desired given test increment has been achieved, record the time and volume form the totalizing water meter.

5. To perform a test increment, record the water meter reading at one minute intervals for 5 to 10 minutes of continuous pumping. Check the gauge to ensure the pressure remains constant throughout the test increment, and adjust the flow valves as needed to maintain constant pressure.

6. Adjust the valves in the water system to achieve the calculated appropriate pressure for the next test increment, and repeat steps #4 and #5 above.

7. If the appropriate test interval gauge pressure cannot be achieved due to a highly-permeable tested bedrock interval, the maximum achieved gauge pressure and the pumping rate data for the five minute test increment should be recorded.

8. The packer test for a given bedrock interval is complete after all five test increments have been performed.

9. Record the test data on the packer test data log.

VIII. Packer Test Data Reduction

Packer test data are reduced to develop estimates of hydraulic conductivity for each tested interval based on standard data reduction procedures (United States Bureau of Reclamation, 1974; Houlsby, 1976). Data are entered into an automatic packer-test data reduction spreadsheet program. The spreadsheet calculates the hydraulic conductivity from each of the five test increments for each tested bedrock interval as:

$$K = Cp\ Q/H$$

where:

K = hydraulic conductivity (feet per year);
Q = flow rate (gallons per minute);
H = total head applied during test (feet); and
Cp = packer coefficient.

Based on equations published in the Earth Manual (United States Bureau of Reclamation 1974), the packer coefficient can be calculated from:

$$Cp = [70267 \ln (L/r)] / 2\pi L$$

where:

L = length of the tested bedrock interval (feet); and
r = radius of tested bedrock corehole (feet).

In addition to the hydraulic conductivity value, the packer test reduction spreadsheet calculates a Ludgeon value (Houlsby, 1976) for each of the five test increments. The five Ludgeon values are evaluated to interpret the type of flow and bedrock formation response and most representative calculated hydraulic conductivity value for the tested bedrock interval from the following list:

(1) Laminar Flow
Indication: Ludgeon values are approximately equal.
Conductivity: Average of values from five test increments.

(2) Turbulent Flow
Indication: Ludgeon value from increment #3 is less than those from the lower pressure increments, which are approximately equal in value.
Conductivity: Value from increment #3.

(3) Dilation of Bedrock Fractures
Indication: Ludgeon value from increment #3 is greater than those from the lower pressure increments which are approximately equal in value.
Conductivity: Average value from increments #1 and #5.

(4) Wash-out of Fracture Filling Materials
Indication: Progressive increase in five Ludgeon values without any return to lower values during increments #4 and #5.
Conductivity: Value from increment #1.

(5) Void Filling
Indication: Progressive decrease in five Ludgeon values without any return to values during increments #4 and #5.

Conductivity: Value from increment #5.

REFERENCES

Houlsby, A.C., 1976, Routine Interpretation of the Ludgeon Water-Test, Q. Jl. Engng. Geol. Vol. 9, pp. 303-313.

Meritt, F.S., 1983, Standard Handbook for Civil Engineers, McGraw-Hill, New York.

United States Bureau of Reclamation, 1974, Earth Manual, 2nd Edition, Department of the Interior, Denver, Colorado, pp. 573-578.

FIGURE 1
TYPICAL CONSTANT-HEAD INJECTION TEST DATA SHEET

SITE:	ENV. CONSULTING FIRM:
BOREHOLE NO.:	FIELD PERSONNEL:
LOCATION:	DATE:
	TEST NO:
Pilot hole diameter:	Pretest water level:
Top of test section:	Product layer thickness:
Bottom of test section:	Reference point:
ID of water pipe:	Elevation of reference point:
Packer type:	Transducer type:
Length of packer:	Transducer calibration:
Depth to packer bottom:	Flowmeter:
Pretest water pressure (Po):	Start reading:
Packer inflation pressure:	End reading:

S#	Pt	t	Q	delta Q
Step No.	Test Section Pressure (psi)	Time from Start of Test (min)	Flow Rate (gpm)	Change in Flow Rate between Readings (gpm)

Appendix K

Generic Quality Assurance Project Plan

GENERIC
QUALITY ASSURANCE PROJECT PLAN

FOR

SITE INVESTIGATIONS

AT NON-OWNED FORMER MGP SITES

Prepared for:
Niagara Mohawk
300 Erie Boulevard West
Syracuse, New York

Prepared By:
Foster Wheeler Environmental Corporation
One Park Place
300 South State Street, Suite 620
Syracuse, New York

NOVEMBER 2002

TABLE OF CONTENTS
GENERIC QUALITY ASSURANCE PROJECT PLAN

TABLE OF CONTENTS (CONT'D)

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

1.0 GENERAL

This Generic Quality Assurance Project Plan (QAPP) has been prepared to specify procedures that will provide data of known, documented quality, and which will be legally defensible, should the need exist. This document specifically supplements the Generic Field Sampling Plan (FSP), also attached as an appendix to a Site-Specific Work Plan. To the extent discrepancies exist between this Generic QAPP and the Site-Specific Work Plan, the Site-Specific Work Plan shall control.

2.0 PROJECT DESCRIPTION

The project sites are Former Non-owned Manufactured Gas Plant (MGP) sites. The purpose of the investigations is to gather sufficient data to enable the New York State Department of Environmental Conservation (NYSDEC) and Niagara Mohawk, a National Grid Company (NM) to characterize chemical substances which are or may be present at the Sites and to enable the NYSDEC and NM to determine whether such substances pose a significant threat to public health or the environment. This document can also be used to support a Site Management Plan (SMP).

The data collected as a result of these investigations will be used to support the Site Characterizations and Remedial Investigation/Feasibility Studies (RI/FS) as described in the Site-Specific Work Plans. The types, numbers, and locations of environmental samples to be collected are also described in the Site-Specific Work Plans. Field procedures for all environmental sampling activities are detailed in the FSP or SMP.

3.0 PROJECT ORGANIZATION

The project organization is described in detail in the Site-Specific Work Plan. The project organization describes the relationship between the NM Project Manager, NYSDEC Project Manager, NM's Engineering Consultant, and subcontractors (e.g. laboratories, data validators, drillers, etc.).

For the purpose of quality control, the Engineering Consultant's Project Quality Assurance Manager (PQAM) will be responsible for review of data upon receipt from the analytical laboratory. The PQAM will assure that data validation screening is performed by trained and experienced data validators using the applicable criteria specified in the most current NYSDEC ~~2001~~ Analytical Services Protocol (ASP). For the purposes of this document, all references to ASP indicate the most current ~~2001~~ NYSDEC Analytical Services Protocol. The specific requirements for data validation screening are given in Section 9.3. The PQAM will be responsible for ensuring that all analytical data are in conformance with requirements of this QAPP.

4.0 QA/QC OBJECTIVES FOR MEASUREMENT OF DATA

The overall quality assurance (QA) objective for the project is to develop and implement procedures which will provide data of known, documented quality. Field and laboratory quality assurance/quality control (QA/QC) requirements defined in the NYSDEC ASP and other applicable guidelines ensure acceptable levels of data quality will be maintained throughout the sampling and analysis program.

The QA/QC objectives for all measurement data include precision, accuracy, representativeness, completeness, and comparability. The data reduction, validation, and reporting scheme is presented in Figure 1. The quality assurance samples to be collected (type and frequency of collection) are specified in the Site-SpecificWork Plans.

4.1 Precision

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value (USEPA, 1987). Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation (relative standard deviation), range (maximum value minus minimum value), and relative range are common. For this project, precision will be evaluated by recording duplicate measurements of the same parameter on similar sample aliquots under the same conditions and calculating the relative percent difference (RPD) between the values. The formula for calculating RPD is presented in Section 13.2.

RPDs can only be calculated when the duplicate samples both contain detectable concentrations of the analyte. If an analyte is considered not detected at the detection limit, then RPD cannot be calculated. Instead, the results of the analysis of the two-spiked laboratory samples will be used to determine precision.

Measurement data for this project will include field data as well as laboratory analytical data. Laboratory precision will be performed according to the requirements described in the associated analytical methods. The field measurement data may include immunoassay polycyclic aromatic hydrocarbon (PAH) and/or polychlorinated biphenyl (PCB) screening, pH, conductivity, temperature, turbidity, organic vapor readings, and water level measurements. The objective for precision of field data collection methods is to take replicate (minimum of two for every 20 samples) measurements for field parameters to determine the reproducibility of the measurements.

Precision of the immunoassay screening will be evaluated by the field analysis of replicate samples as equivalent levels of PAHs/PCBs. As the screening is not quantitative (i.e., the screening determines if the constituents are present above or below standard values and does not provide a numeric result), RPDs cannot be calculated on the field-analyzed samples. Therefore, measurement of equivalent levels of constituent (i.e., detected below the same standard or within the same range of two standards) will be considered as denoted precision of the screening test.

For the pH meter, precision will be tested by multiple readings in the medium of concern. Consecutive readings should agree within 0.1 pH units after the instrument has been field calibrated with standard buffers before each use. The thermometer will be visually inspected prior to each use to ensure its condition is satisfactory. Consecutive measurements of a given sample should agree to within 1°Celsius. After calibration, the conductivity meter will be tested for precision at ± 1% of full-scale, depending on the meter/scale. The organic vapors will be measured using a Photovac Microtip (or equivalent) photoionization detector (PID). Daily background and upwind readings of drilling and sampling activities will be measured prior to commencing work and at periodic intervals throughout each day's activities. The natural variation/fluctuation in measurements at background or upwind locations will be used for baseline background values, and the variability will be noted. Water level indicator readings will be precise within 0.01 feet for duplicate measurements or additional water level measurements will be collected to determine whether the difference is due to operator or instrument error. Turbidity measurements will be calibrated to a precision of ± 2% nephelometric turbidity units (NTUs).

4.2 Accuracy

Accuracy is a measure of the difference between a measured value and the "true" or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material and is expressed as the percent of the known quantity, which is recovered, or measured. The recovery of a given analyte is dependent upon the sample matrix, method of analysis, and the specific compound or element being determined. The concentration of the analyte relative to the detection limit of the analytical method is also a major factor in determining the accuracy of the measurement. Concentrations of analytes that are close to the detection limits are less accurate because they are affected by such factors as instrument "noise". Higher concentrations will not be as affected by instrument or other variables and thus will be more accurate.

The accuracy of laboratory-measured data will be evaluated by determining the percent recovery of both matrix and blank spike samples as described in Section 13.1. For the measurement of organics by gas chromatography (GC) or GC/mass spectroscopy (MS), the recovery of a surrogate spiked into each sample, blank, and standard will also be used to assess accuracy.

Accuracy between the immunoassay screening and the laboratory analytical results will be evaluated by the confirmatory testing of 10 percent (i.e., one in ten) of the environmental samples at the off-site laboratory. The rate of potential false positives and negatives should be less than 15 percent. Screening samples will not be spiked in the field by the addition of known parameter concentrations. However, the confirmatory samples sent to the off-site laboratory will undergo surrogate spiking and recovery evaluation and, to the extent possible, may be chosen as the site-specific matrix spike sample(s) for additional accuracy determination.

The objective for accuracy of the other field measurements is to achieve and maintain factory equipment specifications for the field equipment. Field measurements cannot be assessed for accuracy by spiking the medium with the analytical parameter and measuring the increase in response; therefore, these instruments can only be assessed for accuracy by the response to a known sample (such as a calibration standard) used to standardize them. The pH meter, conductivity meter, and turbidity meter are calibrated with solutions traceable to the National Institute of Standards and Technology (NIST, formerly the National Bureau of Standards).

All volatile organic detectors (such as the PID) will be calibrated to an appropriate standard daily prior to use.

4.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program. Samples must be representative of the environmental media being sampled. Selection of sample locations and sampling procedures will incorporate consideration of obtaining the most representative sample possible.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree that is technically possible, that the data derived represents the in-place quality of the material sampled. Every effort will be made to ensure chemical compounds will not be introduced into the sample via sample containers, handling, or analysis. Decontamination of sampling devices and digging equipment will be performed between samples as outlined in the FSP. Laboratory sample containers will be thoroughly cleaned in accordance with procedures outlined in Section 5.2. Analysis of field blanks, trip blanks, and method blanks will also be performed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated through the analysis of field duplicate samples, coded to ensure the samples are treated and analyzed as separate samples. The analytical laboratory will make every reasonable effort to assure the samples are adequately homogenized prior to taking aliquots for analysis, so the reported results are representative of the sample received. Many means of homogenization expose the sample to significant risk of contamination or loss through volatilization, and these should be avoided if possible.

Chain-of-custody procedures will be followed to document that contamination of samples has not occurred during container preparation, shipment, and sampling. Details of blank/duplicate and chain-of-custody procedures are presented in Sections 5.3 and 6.1.

4.4 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid. The QC objective for completeness is generation of valid data for 100 percent of the analysis requested. Any data deficiencies and their impact on project goals will be evaluated during data validation and discussed in the Data Usability Summary Report (DUSR) (see Section 9.3.2).

4.5 Comparability

Comparability expresses the degree of confidence with which one data set can be compared to another. The comparability of all data collected for this project will be ensured by:

- Using identified standard methods for both sampling and analysis phases of this project;
- Ensuring traceability of all analytical standards and/or source materials to USEPA or NIST;
- Verifying all calibrations with an independently prepared standard from a source other than that used for calibration;
- Using standard reporting units and reporting formats including the reporting of QC data;
- The validation of all analytical results, including the use of data qualifiers in all cases where appropriate; and
- The requirement that all validated flags be used any time an analytical result is used for any purpose whatsoever.

These steps will ensure all future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

5.0 SAMPLING PROCEDURES

5.1 Sampling Program

The objective of the sampling program is to provide current data concerning the presence and nature and extent of MGP-related impacts in ~~contamination of~~ groundwater, surface water, soils (surface and subsurface), and/or sediment. Sampling and analysis may include as identified in the Site-Specific Work Plan:

- groundwater samples
- surface water samples
- sediment samples
- surface and/or subsurface soil samples
- air samples

5.2 Sampling Procedures and Handling

Sample Container Preparation

Sample containers will be properly washed and decontaminated by the factory or laboratory prior to use. All preservatives will be added to containers prior to shipment by the laboratory. The types of containers and preservation techniques are shown in Table 1. Records of the sources of bottles and preservatives will be kept by the analytical laboratory.

Methods of Sampling

As a minimum, sampling procedures will be in accordance with the most recent NYSDEC or USEPA guidelines and/or regulations, as appropriate. Alternate techniques will be utilized when such guidelines and/or regulations are inappropriate or non-existent. Alternate techniques will be implemented only after consultation with NYSDEC, whenever possible.

Referenced sampling procedures are listed below. All procedures will be the latest in effect as of the date of this Generic QAPP; however, must be verified/updated by the party performing the sampling.

- USEPA - 600-4-79-020, "Methods for Chemical Analysis of Water and Wastes"
- National Water Well Association - "Manual of Ground-water Sampling Procedures"
- USEPA - 600-4-83-040, "Characterization of Hazardous Waste Sites - a Methods Manual: Volume II. Available Sampling Methods"
- USEPA - OSWER - 9950.1 "RCRA Ground-water Monitoring Technical Enforcement Guidance Document"
- USEPA - 540/S-95/504, “Low-Flow (Minimal Drawdown) Ground Water Sampling Procedures”
- NYSDEC – “Technical and Administrative Guidance Memoranda” (TAGMs)

All sampling methods are explained in detail in the FSP.

5.3 Quality Assurance Samples

<u>Field Quality Control Samples</u>

To assess field sampling and decontamination performance, two types of "blanks" will be collected and submitted to the laboratory for analyses. The blanks will include:

> **Trip Blank** - A trip blank will be prepared by the laboratory, and will consist of 40-ml volatile organic analysis (VOA) vials containing distilled, deionized water which accompanies the other sample bottles into the field and back to the laboratory. A trip blank will be included with each shipment of water samples for which analysis for Target Compound List (TCL) volatiles or benzene, toluene, ethylbenzene and total xylenes (BTEX) is planned. The trip blank will be analyzed for TCL volatile organic compounds or BTEX to assess any contamination introduced as a result of sampling and transport, handling and storage.
>
> **Equipment Blank** - Equipment blanks will be taken at a minimum frequency of one per 20 field samples per sample matrix as specified in the Site-SpecificWork Plan. Equipment blanks are used to determine the effectiveness of the decontamination procedures for sampling equipment. It is a sample of deionized, distilled water provided by the laboratory, which has passed through or over the sampling apparatus. It is usually collected as a last step in the decontamination procedure, prior to collecting a sample. The equipment blanks will be analyzed for the same parameters as the matrix being sampled.

In addition, the precision of field sampling procedures will be assessed by collecting coded field duplicates and matrix spike (MS)/matrix spike duplicates (MSD)/matrix duplicates (MD).

The duplicates will consist of:

> **Field Duplicate** - To determine the reproducibility and homogeneity of samples, coded field duplicates will be collected. The samples are termed "coded" because they will be labeled in such a manner that the laboratory will not be able to determine that they are a duplicate sample. This will eliminate any possible bias that could arise. The frequency of collection of these samples is one per 20 field samples as specified in the Site-SpecificWork Plans. The criteria for assessing coded field duplicates are given in Section 6.0.
>
> **Matrix Spike/Matrix Spike Duplicate/Matrix Duplicate (MS/MSD/MD)** - MS/MSD/MD samples (MSD for organics; MD for inorganics) will be collected at a frequency of one pair per 20 field samples per seven day sample delivery group (SDG). The reproducibility and homogeneity of the samples can be assessed by determining the RPD for both spike and non-spike compounds as described in Section 13.0. The MS, MSD, and MD samples should be Site-Specific, unless otherwise authorized by the

Engineering Consultant's Project Manager and/or PQAM after consultation with NM and NYSDEC personnel whenever possible.

6.0 SAMPLE TRACKING AND CUSTODY

Sample chain-of-custody (COC) will be initiated by the laboratory with selection and preparation of the sample containers. To reduce the chance for error, the number of personnel handling the samples will be minimized.

In-situ or on-site monitoring data will be controlled and entered in permanent logbooks. Personnel involved in the COC and transfer of samples will be trained on the purpose and procedures prior to implementation.

Evidence of sample traceability and integrity will be provided by COC procedures. These procedures document the sample traceability from the selection and preparation of the sample containers by the laboratory, to sample collection, to sample shipment, to laboratory receipt and analysis. The sample custody flowchart is shown in Figure 2. A sample will be considered to be in a person's custody if the sample is:

- In a person's possession;
- Maintained in view after possession is accepted and documented;
- Locked and tagged with custody seals so that no one can tamper with it after having been in physical custody; or
- In a secured area which is restricted to authorized personnel.

6.1 Field Sample Custody

A COC record will accompany the sample from time of collection to receipt by the analytical laboratory. If samples are split and sent to different laboratories, COC records will be sent with each sample. The "remarks" column on the COC will be used to record specific considerations associated with sample acquisition such as: sample type, container type, sample preservation methods, and analyses to be performed. Two copies of this record will accompany the samples to the laboratory. The laboratory will maintain one file copy, and the completed original will be returned to the Engineering Consultant’s Project Manager.

Individual sample containers, provided by the laboratory, will be used for shipping/couriering samples. The shipping containers are insulated, and ice will be used to maintain samples at approximately four degrees Celsius until samples are returned and in the custody of the laboratory. All sample bottles within each shipping container will be individually labeled and controlled.

Each sample shipping container will be assigned a unique identification number by the laboratory, and will be marked with indelible ink on the outside of the shipping container. This number will be recorded on the COC record. The field sampler will indicate each individual sample designation/location number in the space provided on the appropriate COC form for each sample collected. The shipping container will then be closed, and a seal provided by the laboratory affixed to the latch. This seal must be broken to open the container. Tampering may be indicated if the seal is broken before receipt at the laboratory. The laboratory will contact the FOL or Engineering

Consultant's Project Manager, and the associated samples will not be analyzed if tampering is apparent.

6.2 Laboratory Sample Custody

The FOL will notify the laboratory of upcoming field sampling activities and the subsequent transfer of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival.

The laboratory sample program will meet the following criteria:

- The laboratory will designate a sample custodian who is responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.
- Upon receipt of the samples, the custodian will check the original chain-of-custody documents and compare them with the labeled contents of each sample container for correctness and traceability. The sample custodian will sign the COC record and record the date and time received.
- Care will be exercised to annotate any labeling or descriptive errors. In the event of any discrepancy in documentation, the laboratory will immediately contact the Engineering Consultant's Project Manager and/or PQAM as part of the corrective action process. A qualitative assessment of each sample container will be performed to note any anomalies, such as broken or leaking bottles. That assessment will be recorded as part of the incoming COC procedure.
- The samples will be stored in a secured area at a temperature of approximately four degrees Celsius until analyses are to commence.
- A laboratory tracking record will accompany the sample or sample fraction through final analysis for control.
- A copy of the tracking form will accompany the laboratory report and will become a permanent part of the project records.

6.3 Sample Tracking System

A sample tracking system will be implemented to monitor the status of sampling events and laboratory analysis of samples. Sample numbers, types, analytical parameters, sampling dates, and sample delivery group (SDG) designations for samples, and required due dates for receipt of analytical results will be entered into the system. The Engineering Consultant's Project Manager will use the tracking system to monitor the project sampling schedules and the status of analytical reports, and to implement any penalty clauses for late delivery per standard laboratory subcontracts when necessary.

A description of the sample tracking system follows:

1. For each day that samples are collected, the Field Operations Lead (FOL) or designee will complete a COC form listing all appropriate samples.
2. The FOL or designee will retain the client copy of the COC, and forward the laboratory copy of the COC with the sample shipment.
3. The FOL or designee will fax copies of the completed COC form and Daily Status and Monitoring Report to the Engineering Consultant's PM. The Engineering Consultant's PM or a designated employee will confirm sample shipment with the laboratory and resolve any sample transfer issues.
4. The status of analytical results will be tracked by the Engineering Consultant's PM or designee using the information provided on the completed COC form and Daily Status and Monitoring Report. The information shall be summarized in a computerized database, as warranted.

Upon receipt of the analytical results from the laboratory, the Engineering Consultant's PM or designee will review the data package for completeness and contract compliance. The Engineering Consultant's PM will then forward the result package to the data validator for validation. The data validator shall be required to submit a complete set of validated data to the Engineering Consultant's PM within 60 days of receipt of the data package report.

The Engineering Consultant's Project Manager or a designated representative will maintain day-to-day contact with the laboratory concerning specific samples and analyses directly or by assignment.

7.0 CALIBRATION PROCEDURES AND FREQUENCY

7.1 Field Instrumentation Calibration

The FOL will be responsible for ensuring that instrumentation are of the proper range, type and accuracy for the test being performed, and that all of the equipment are calibrated at their required frequencies, according to their specific calibration protocols/procedures.

All field measurement instruments must be calibrated according to the manufacturer's instructions prior to the commencement of the day's activities. Exceptions to this requirement shall be permitted only for instruments that have fixed calibrations pre-set by the equipment manufacturer. Calibration information shall be documented on instrument calibration and maintenance log sheets or in a designated field logbook. The calibration information (log sheet or logbook) shall be maintained at the site during the on-site investigation and, once the field work is completed, shall be placed in the Engineering Consultant's project files. Information to be recorded includes the date, the operator, and the calibration standards (concentration, manufacturer, lot number, expiration date, etc.). All project personnel using measuring equipment or instruments in the field shall be trained in the calibration and usage of the equipment, and are personally responsible for ensuring that the equipment has been properly calibrated prior to its use.

In addition, all field instruments must undergo response verification checks at the end of the day's activities and at any other time that the user suspects or detects anomalies in the data being generated. Verification checks may also be performed at the request of NM or NYSDEC representatives. The checks consist of exposing the instrument to a known source of analyte (e.g., the calibration solution), and verifying a response. If an unacceptable instrument response is obtained during the check (i.e., not within specifications), the data shall be labeled suspect, the problem documented in the site logbook, and appropriate corrective action taken.

Any equipment found to be out of calibration shall be re-calibrated. When instrumentation is found to be out of calibration or damaged, an evaluation shall be made to ascertain the validity of previous test results since the last calibration check. If it is necessary to ensure the acceptability of suspect items, the originally required tests shall be repeated (if possible), using properly calibrated equipment, to acquire replacement data for the measurement in question.

Any instrument consistently found to be out of calibration shall be repaired or replaced within 24 hours or field work will be terminated until the malfunctioning equipment is repaired/replaced.

7.2 Laboratory Instrumentation Calibration

Personnel at the laboratory will be responsible for ensuring that analytical instrumentation are of the proper range, type and accuracy for the test being performed, and that all of the equipment are calibrated at their required frequencies, according to specific protocols/procedures.

Off-site laboratory equipment shall be calibrated using certified/nationally recognized standards and according to the applicable methodologies and the laboratory Standard Operating Procedures (SOPs). In addition, these methods/procedures specify the appropriate operations to follow during calibration or when any instrument is found to be out of calibration.

8.0 ANALYTICAL PROCEDURES

All off-site laboratory samples will be analyzed according to the methods provided in Exhibit D of the NYSDEC ASP. QA/QC procedures given in Exhibit E and I of the ASP will be followed. Regardless of the method used, all analytical and extraction holding times must meet the NYSDEC ASP requirements for that analytical group (i.e., volatile analyses, including BTEX, have a holding time of seven days, if unpreserved). Holding times will be calculated from verified time of sample receipt at the laboratory. For NYSDEC ASP, samples must be received at the laboratory within 48 hours of sample collection. The analytical laboratory chosen for the project will be certified, and must maintain certification, under the New York State Department of Health's Environmental Laboratory Approval Program for analyses of solid and hazardous waste. The breakdown of investigative samples is detailed in the Site-Specific Work Plan. Laboratory analytical methods and quantitation limits are presented in Tables 2 and 3 of this Generic QAPP. The method detection limits (MDLs) for the analytes will be specified by the laboratory selected for the project based on its most recent MDL studies, and subject to approval by the NYSDEC.

Field screening samples will be analyzed according to the NYSDEC ASP and the manufacturer’s instructions. Unless site-specific requirements dictate a change in concentration limits (which would be explained within the Site-Specific Work Plan), the standard levels for the PAH and PCB screening will be 1 ppm and 10 ppm. The test system user shall be technically qualified individual who has received training in the immunoassay analysis requirements, procedures and potential risks prior to field screening of samples. Use of the field screening test kits will only occur in a controlled environment, following the storage and handling procedures outlined in the NYSDEC ASP and the manufacturer’s instructions. Additional technical information on the field screening testing are presented in Attachments 1 and 2.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the ASP.

The data package provided by the laboratory will contain all items specified in the ASP, as appropriate to the analyses performed. Category B reporting will be used.

9.1 Chain-of-Custody Records

Completed copies of the COC records accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the report of analytical testing.

9.2 Data Handling

One complete copy and one additional copy of the analytical data summary report will be provided by the laboratory. One set of the analytical data will be forwarded directly to the data validator by the laboratory. The Engineering Consultant's Project Manager will immediately arrange for filing of the complete package, after the QA/QC reviewer checks the package to ensure all deliverables have been provided. The second data summary report will be used to generate summary tables. These tables will form the foundation of a working database for assessment of the site contamination condition.

The Engineering Consultant's Project Manager will maintain close contact with the QA/QC reviewer to ensure all non-conformance issues are acted upon prior to data manipulation and assessment routines. Once the QA/QC review has been completed, the Engineering Consultant's Project Manager may direct the team leaders or others to initiate and finalize the analytical data assessment.

9.3 Data Validation

9.3.1 Full Data Validation

Data validation is a basic step in the control and processing of the project data generated by the laboratory. The data validation process will consist of a systematic review of the analytical results and QC documentation, and will be performed in accordance with the guidelines identified in Section 9.3.1. All off-site laboratory data will undergo full validation, unless otherwise stated in the Site-Specific Work Plan. On the basis of this review, the data validator will make judgments and express concerns and comments on the quality and limitations of specific data, as well as on the validity of the overall data package. The data validator will prepare documentation of his or her review and conclusions in a Data Usability Summary Report (DUSR; see Section 9.3.2).

The data validator will inform the Engineering Consultant's Project Manager of data quality and limitations, and assist the Project Manager in interacting with the laboratory to correct data omissions and deficiencies. The laboratory may be required to rerun or resubmit data depending on the extent of the deficiencies, and their importance in meeting the data quality objectives within the overall context of the project. The validated laboratory data will be reduced into a computerized tabulation which will be suitable for inclusion in the Site Characterization and RI Reports and will be designed to facilitate comparison and evaluation of the data. The data tabulations will be sorted by classes of constituents and by sample matrix. Each individual table will present the following information:

- Sample matrix, designations, and locations;
- Sample dates;
- Constituents for which positive results were obtained;
- Reported constituent concentrations in the field and/or trip blanks associated with the samples;
- Constituent concentration units;
- Name and location of laboratory which performed the analyses;
- Data qualifiers provided by the laboratory; and
- Data qualifiers and comments provided by the data validator, if any.

9.3.2 Data Usability Summary Report (DUSR)

A Data Usability Summary Report (DUSR) will be prepared after reviewing and evaluating the analytical data. The parameters to be evaluated in reference to compliance with the analytical method protocols includes all sample chain-of-custody forms, holding times, raw data (instrument print out data and chromatograms), calibrations, blanks, spikes, controls, surrogate recoveries, duplicates and sample data. If available, the field sampling notes should also be reviewed and any quality control problems should be evaluated as to their effect on the usability of the sample data.

The DUSR will describe the samples and analysis parameters reviewed. Data deficiencies, analytical method protocol deviations and quality control problems will be described and their effect on the data will be discussed in the DUSR.

Resampling/reanalysis recommendations, if applicable, will be made. Data qualifications are documented for each sample analyte following the NYSDEC ASP guidelines.

This work will be performed by trained and experienced data validators who meet the NYSDEC approval criteria. The Environmental Scientist preparing the DUSR must submit a resume to the NYSDEC Quality Assurance Unit documenting relevant experience in environmental sampling and analysis methods and data review and documentation of a Bachelors Degree in Natural Science or Engineering. The results of the data validation screening (i.e. missed holding times or data rejected due to blank contamination) will be incorporated into the data summary tables used in the final investigative report. The DUSR identifies data gaps caused by non-compliant or rejected data, and will indicate what steps have been or will be taken to fill these gaps.

10.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

10.1 Quality Assurance Batching

Each set of samples will be analyzed concurrently with calibration standards, method blanks, MS, MSD or MD, and QC check samples (if required by the protocol). The MS/MSD/MD samples will be designated by the field personnel. If no MS/MSD/MD samples have been designated, then the laboratory must contact the Project Quality Assurance Officer (PQAO) or Engineering Consultant's Project Manager for corrective action.

10.2 Organic Standards and Surrogates

All standard and surrogate compounds are checked by the method of mass spectrometry for correct identification and gas chromatography for degree of purity and concentration. When the compounds pass the identity and purity tests, they are certified for use in standard and surrogate solutions. Concentrations of the solutions are checked for accuracy before release for laboratory use. Standard solutions are replaced monthly or earlier based upon data indicating deterioration.

10.3 Laboratory Quality Control Samples

The quality control samples included are detailed below.

Method Blanks/Preparation Blanks: Analyses for organic compounds (method blank) and inorganics (preparation blank) include a blank analysis of the laboratory reagent water. The blank is analyzed with each set of samples or more often as required to verify that contamination has not occurred during the analytical process. The concentration of target compounds in the blanks must be less than or equal to the method detection limits specified in the ASP for the selected method of analysis.

Matrix Spike/Matrix Spike Duplicate Analysis - This analysis is used to determine the effects of matrix interference on analytical results. Spikes of analytes are added to aliquots of sample matrix in the manner specified in the ASP. Selected samples are spiked to determine accuracy as a percentage recovery of the analyte from the sample matrix and precision as RPD between the MS and MSD samples. A matrix duplicate is prepared in the same manner as the matrix spike sample.

Analytical Duplicate Samples - Replicate samples are aliquots of a single sample that are split on arrival at the laboratory, or upon analysis. Significant differences between two replicates, split in a controlled laboratory environment, will result in flagging the affected analytical results.

Surrogate Spike Analyses - Surrogate spike analyses are used to determine the efficiency of recovery of organic analytes in the sample preparations and analyses. Calculated percentage recovery of the spike is used as a measure of the accuracy of the total analytical method.

Laboratory Control Sample/ (Spike Blank) - For each method which requires a laboratory control sample (LCS) or spike blank, a LCS spike blank will be prepared with each quality control batch and analyzed according to criteria specified in the ASP. These samples support an assessment of the ability of the analytical procedure to generate a correct result without matrix effects or interference affecting the analysis.

11.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS

Quality assurance audits may be performed by the Project Quality Assurance Manager (PQAM) or personnel designated by the PQAM. The PQAM and his or her designees function as an independent body and report directly to Engineering Consultant's quality assurance management. The PQAM may plan, schedule, and approve system and performance audits based upon the Engineering Consultant's procedure customized to the project requirements. These audits may be implemented to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s). At times, the PQAM may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits.

Formal audits encompass documented activities performed by qualified lead auditors to a written procedure or checklists to objectively verify that quality assurance requirements have been developed, documented, and instituted in accordance with contractual and project criteria. Formal audits may be performed on project and subcontractor work at various locations.

Audit reports will be written by lead auditors after gathering and evaluating all resultant data. Items, activities, and documents determined by lead auditors to be in noncompliance will be identified at exit interviews conducted with the involved management. Noncompliances will be logged, documented, and controlled through audit findings which are attached to and are a part of the integral audit report. These audit finding forms will then be directed to management to satisfactorily resolve the noncompliance in a specified and timely manner. All audit checklists, audit reports, audit findings, and acceptable resolutions must be approved by the PQAM prior to issue. QA verification of acceptable resolutions will be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the PQAM will close out the audit report and findings.

It is the Engineering Consultant's Project Manager's overall responsibility to verify that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports must be submitted to the Engineering Consultant's Project Manager within 15 days of completion of the audit. Serious deficiencies must be reported to the Engineering Consultant's Project Manager within 24 hours.

Serious deficiencies identified during an audit will be reported to NM and NYSDEC as part of the DUSR or Site investigation and/or RI Reports.

11.1 System Audits

System audits, performed by the PQAM or designated auditors, may encompass evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory quality control procedures and associated documentation may be audited. These audits may be performed once during the performance of the project. However, if conditions adverse to quality are detected or if the Engineering Consultant's Project Manager requests the PQAM to perform unscheduled audits, these activities will be instituted.

11.2 Performance Audits

In accordance with the requirements for NYSDOH ELAP CLP certification, the laboratory will participate in all performance evaluation testing.

Also, one field audit may be performed by the PQAM or designated auditor during collection of the field samples to verify that field samplers are following established sampling procedures. Performance of a field audit will be based on the type of investigation activities being performed, the length of the field project, and any available information concerning prior inspections of the project or sampling team. The Site-Specific Work Plan will provide details on the performance of a field audit.

12.0 PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULES

12.1 Preventive Maintenance Procedures

Equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendations and written procedure developed by the operators. Analytical instruments will be serviced at intervals recommended by the manufacturer. An instrument repair/maintenance log book will be kept for each instrument, and this log will be available on-site during field activities and, at the completion of the investigation, be placed in the project files. Entries include the date of service, type of problem encountered, corrective action taken, and initials and affiliation of the person providing the service.

The instrument use log book will be monitored by the analysts to detect any degradation of instrument performance. Changes in response factors or sensitivity are used as indications of potential problems. These are brought to the attention of the laboratory supervisor and preventive maintenance or service is scheduled to minimize down time. Back-up instrumentation and an inventory of critical spare parts are maintained to minimize delays in completion of analyses.

Use of equipment in need of repair will not be allowed, and field work will be terminated until the malfunction is repaired or the instrument replaced.

12.2 Schedules

Written procedures, where applicable, will identify the schedule for servicing critical items in order to minimize the downtime of the measurement system. It will be the responsibility of the operator to adhere to this maintenance schedule and to arrange any necessary and prompt service as required. Service to the equipment, instruments, tools, gauges, etc. shall be performed by qualified personnel.

12.3 Records

Logs shall be established to record and control maintenance and service procedures and schedules. All maintenance records will be documented and traceable to the specific equipment, instruments, tools, and gauges. Records produced shall be reviewed, maintained, and filed by the operators at the laboratories and by the data and sample control personnel when and if equipment, instruments, tools, and gauges are used at the sites. The Engineering Consultant’s Project Manager or the PQAM may audit these records to verify complete adherence to these procedures.

12.4 Spare Parts

Where appropriate, a list of critical spare parts will be identified by the operator in consultation with the equipment manufacturer. These spare parts will be stored for availability and use in order to reduce the downtime. In lieu of maintaining an inventory of spare parts, a service contract for rapid instrument repair or backup instruments will be available.

13.0 ASSESSMENT PROCEDURES FOR DATA ACCEPTABILITY

Procedures used to assess data precision and accuracy will be in accordance with the appropriate laboratory method, and as periodically updated.

13.1 Accuracy

The percent recovery is calculated as below:

$$\% = \frac{Ss - So}{S} \times 100$$

So = The background value, i.e.; the value obtained by analyzing the sample

S = Concentration of the spike added to the sample

Ss = Value obtained by analyzing the sample with the spike added

% = Percent Recovery

13.2 Precision

The relative percent difference (RPD) is calculated as below:

$$RPD = \frac{|V1 - V2|}{0.5\,(V1 + V2)} \times 100$$

V1, V2 = The two values obtained by analyzing the duplicate samples

13.3 Completeness

Completeness is the measure of the amount of valid data obtained from a measurement system compared to the total amount expected to be obtained under ideal conditions. A target of 100 percent completeness, calculated for each analysis method, has been established as the overall project objective.

$$PC = \frac{NA}{NI} \times 100$$

where:

PC = Percent completeness
NA = Actual number of valid analytical results obtained
NI = Theoretical number of results obtainable under ideal conditions

14.0 CORRECTIVE ACTION

The following procedures have been established to assure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected.

When a significant condition adverse to quality is noted on-site, at the laboratory, or at a subcontractor location, the cause of the condition will be determined and corrective action taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the FOL, Engineering Consultant's Project Manager, and involved subcontractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action. All project personnel have the responsibility, as part of the normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality.

At a minimum, corrective actions may be initiated:

- When predetermined acceptance standards are not attained
- When procedure or data compiled are determined deficient
- When equipment or instrumentation is found faulty
- When samples and test results are questionably traceable
- When quality assurance requirements have been violated
- When designated approvals have been circumvented
- As a result of system and performance audits
- As a result of a management assessment
- As a result of laboratory/inter-field comparison studies
- As required by NM
- As required by NYSDEC ASP, 2001

<u>Procedure Description</u>

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups, monitor on-going work performance in the normal course of daily responsibilities.

Work may be audited at Engineering Consultant's office, Site, laboratory, and subcontractor locations by the PQAM and/or designated auditor. Items, activities, or documents ascertained to be in noncompliance with quality assurance requirements will be documented and corrective actions mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the PQAM (Section 11.0).

Technicians assigned quality assurance functions will also control noncompliance corrective actions by having the responsibility of issuing and controlling an appropriate Corrective Action Request Form. All project personnel may identify a noncompliance; however, the technician is responsible for documenting, numbering, logging, and verifying the closeout action. It is the Engineering Consultant's Project Manager's responsibility to verify that all recommended corrective actions are produced, accepted, and received in a timely manner.

The Corrective Action Request (CAR) identifies the adverse condition, reference document(s), and recommended corrective action(s) to be administered. The issued CAR is directed to the responsible manager in charge of the item or activity for action. The individual to whom the CAR is addressed returns the requested response promptly to the technician in charge, affixing his signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The technician maintains the log for status control of CARs and responses, confirms the adequacy of the intended corrective action, and verifies its implementation. The technician will issue and distribute CARs to specified personnel, including the originator, responsible project management involved with the condition, the Engineering Consultant's Project Manager, involved subcontractor, and the FOL, at a minimum. CARs are transmitted to the project file for the records.

15.0 QUALITY ASSURANCE REPORTS

Quality assurance reports to management may consist of the reports on audits, reports on correction of deficiencies found in audits, a final QA report on field sampling activities, and the data validation report.

At the end of the project, the PQAM may submit a lessons leaned report to the Engineering Consultant’s Project Manager which will discuss the QA activities. That report may include discussions of any conditions adverse or potentially adverse to quality, such as responses to the findings of any field or laboratory audits; any field, laboratory, or sample conditions which necessitated a departure from the methods or procedures specified in this QAPP; field sampling errors; and any missed holding times or problems with laboratory QC acceptance criteria; and the associated corrective actions undertaken. This report shall not preclude immediate notification to project management of such problems when timely notice can reduce the loss or potential loss of quality, time, effort, or expense.

These reports, if prepared, shall be reviewed by the Engineering Consultant’s Project Manager for completeness and the appropriateness of any corrective actions, and they shall be retained in the project files.

In the final investigative report, laboratory and field QC data will be presented, including a summary of QA activities and any problems and/or comments associated with the analytical and sampling effort. Any corrective actions taken in the field, results of any audits, and any modifications to laboratory protocols will be discussed.

Attachment 1

NYSDEC ASP Methods 4035 (PAHs) and 4020 (PCBs)

Attachment 2

Field PAH and PCB Soil Test Technical Guides and Test Kit Instructions

TABLE 3
TARGET ANALYTES AND CONTRACT REQUIRED QUANTITATION (CRQ) LIMITS[1]

	Contract Required Quantitation Limit Water Samples (ug/L)	**Contract Required Quantitation Limit Soil Samples (ug/kg)**
NYSDEC ASP TCL Volatile Organic Compounds (by 2001-1)		
Acetone	10	10
Benzene	10	10
Bromodichloromethane	10	10
Bromoform	10	10
Bromomethane	10	10
2-Butanone	10	10
Carbon disulfide	10	10
Carbon tetrachloride	10	10
Chlorobenzene	10	10
Chloroethane	10	10
Chloroform	10	10
Chloromethane	10	10
Dibromochloromethane	10	10
1,1-Dichloroethane	10	10
1,2-Dichloroethane	10	10
1,1-Dichloroethene	10	10
1,2-Dichloroethene (cis and trans)	10	10
1,2-Dichloropropane	10	10
cis-1,3-Dichloropropene	10	10
trans-1,3-Dichloropropene	10	10
Ethylbenzene	10	10
2-Hexanone	10	10
4-Methyl-2-pentanone	10	10
Methylene chloride	10	10
Styrene	10	10
1,1,2,2-Tetrachloroethane	10	10
Tetrachloroethene	10	10
Toluene	10	10
1,1,1-Trichloroethane	10	10
1,1,2-Trichloroethane	10	10
Trichloroethene	10	10
Vinyl chloride	10	10
Total Xylenes	10	10

NOTES

1. Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. Quantitation limits listed for soil are based on wet weight.
2. If the information provided in this table differs from the most recent version of the ASP (2001), the ASP requirements will take precedence. In addition, if site-specific requirements dictate a change in quantitation limits, the Site-Specific Work Plan (which will include this information) will take precedence.

TABLE 3 (Cont'd)
TARGET ANALYTES AND CRQ LIMITS[1]

	Contract Required Quantitation Limit Water Samples(ug/L)	Contract Required Quantitation Limit Soil Samples(ug/kg)
NYSDEC ASP TCL - Semivolatile Organic Compounds (by 2001-2) Base/Neutral Extractables		
Acenaphthene	10	330
Acenaphthylene	10	330
Anthracene	10	330
Benzo(a)anthracene	10	330
Benzo(b)fluoranthene	10	330
Benzo(k)fluoranthene	10	330
Benzo(g,h,i)perylene	10	330
Benzo(a)pyrene	10	330
bis(2-Chloroethoxy)methane	10	330
bis(2-Chloroethyl)ether	10	330
bis(2-ethylhexyl)phthalate	10	330
4-Bromophenyl phenyl ether	10	330
Butyl benzyl phthalate	10	330
Carbazole	10	330
4-Chloroaniline	10	330
2-Chloronaphthalene	10	330
4-Chlorophenyl phenyl ether	10	330
Chrysene	10	330
Dibenz(a,h)anthracene	10	330
Dibenzofuran	10	330
Di-n-butylphthalate	10	330
1,2-Dichlorobenzene	10	330
1,3-Dichlorobenzene	10	330
1,4-Dichlorobenzene	10	330
3,3'-Dichlorobenzidine	10	330
Diethyl phthalate	10	330
Dimethyl phthalate	10	330
2,4-Dinitrotoluene	10	330

NOTES

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TABLE 3 (Cont'd)
TARGET ANALYTES AND CRQ LIMITS[1]

	Contract Required Quantitation Limit Water Samples(ug/L)	Contract Required Quantitation Limit Soil Samples(ug/kg)
NYSDEC ASP TCL - Semivolatile Organic Compounds (by 2001-2, Cont.)		
2,6-Dinitrotoluene	10	330
Di-n-octylphthalate	10	330
Fluoranthene	10	330
Fluorene	10	330
Hexachlorobenzene	10	330
Hexachlorobutadiene	10	330
Hexachlorocyclopentadiene	10	330
Hexachloroethane	10	330
Indeno(1,2,3-cd)pyrene	10	330
Isophorone	10	330
2-methyl Naphthalene	10	330
Naphthalene	10	330
2-Nitroaniline	25	800
3-Nitroaniline	25	800
4-Nitroaniline	25	800
Nitrobenzene	10	330
N-Nitroso-diphenylamine	10	330
N-Nitroso-dipropylamine	10	330
2,2' Oxybis(1-chloropropane)	10	330
Phenanthrene	10	330
Pyrene	10	330
1,2,4-Trichlorobenzene	10	330

NOTES

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TABLE 3 (Cont'd)
TARGET ANALYTES AND CRQ LIMITS[1]

	Contract Required Quantitation Limit Water Samples(ug/L)	Contract Required Quantitation Limit Soil Samples(ug/kg)
NYSDEC ASP TCL - Semivolatile Organic Compounds (by 2001-2, Cont.) **Acid Extractables (cont.)**		
4-Chloro-3-methylphenol	10	330
2-Chlorophenol	10	330
2,4-Dichlorophenol	10	330
2,4-Dimethylphenol	10	330
4,6-Dinitro-2-methylphenol	25	800
2,4-Dinitrophenol	25	800
2-Methylphenol	10	330
4-Methylphenol	10	330
2-Nitrophenol	10	330
4-Nitrophenol	25	800
Pentachlorophenol	25	800
Phenol	10	330
2,4,5-Trichlorophenol	25	800
2,4,6-Trichlorophenol	10	330
NYSDEC ASP TCL Pesticides and PCBs (by 2001-3)		
Aldrin	0.05	1.7
alpha-BHC	0.05	1.7
beta-BHC	0.05	1.7
delta-BHC	0.05	1.7
gamma-BHC (Lindane)	0.05	1.7
Chlordane (alpha &/or gamma)	0.05	1.7
4,4'-DDD	0.10	3.3
4,4'-DDE	0.10	3.3
4,4'-DDT	0.10	3.3
Dieldrin	0.10	3.3
Endosulfan I	0.05	1.7
Endosulfan II	0.10	3.3
Endosulfan sulfate	0.10	3.3

NOTES

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2. If the information provided in this table differs from the most recent version of the ASP (2001), the ASP requirements will take precedence. In addition, if site-specific requirements dictate a change in quantitation limits, the Site-Specific Work Plan (which will include this information) will take precedence.

TABLE 3 (Cont'd)
TARGET ANALYTES AND CRQ LIMITS[1]

	Contract Required Quantitation Limit Water Samples(ug/L)	Contract Required Quantitation Limit Soil Samples(ug/kg)
NYSDEC ASP TCL - Pesticides and PCBs (by 2001-3, Cont.)		
Endrin	0.10	3.3
Endrin Aldehyde	0.10	3.3
Endrin Ketone	0.10	3.3
Heptachlor	0.05	1.7
Heptachlor Epoxide	0.05	1.7
Methoxychlor	0.50	17.0
Toxaphene	5.0	170.0
Aroclor-1016	1.0	33.0
Aroclor-1221	2.0	67.0
Aroclor-1232	1.0	33.0
Aroclor-1242	1.0	33.0
Aroclor-1248	1.0	33.0
Aroclor-1254	1.0	33.0
Aroclor-1260	1.0	33.0
NYSDEC ASP TAL Metals and Cyanide (by CLP-M)		
Aluminum	200	
Antimony	60	
Arsenic	10	
Barium	200	
Beryllium	5	
Cadmium	5	
Calcium	5000	
Chromium	10	
Cobalt	50	
Copper	25	
Iron	100	
Lead	3	
Magnesium	5000	

NOTES

1. Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. Quantitation limits listed for soil are based on wet weight.
2. If the information provided in this table differs from the most recent version of the ASP (2001), the ASP requirements will take precedence. In addition, if site-specific requirements dictate a change in quantitation limits, the Site-Specific Work Plan (which will include this information) will take precedence.

TABLE 3 (Cont'd.)
TARGET ANALYTES AND CRQ LIMITS[1]

	Contract Required Quantitation Limit Water Samples(ug/L)	Contract Required Quantitation Limit Soil Samples(ug/kg)
NYSDEC ASP TAL Metals and Cyanide (by CLP-M) (Cont.)		
Manganese	15	
Mercury	0.2	
Nickel	40	
Potassium	5000	
Selenium	5	
Silver	10	
Sodium	5000	
Thallium	10	
Vanadium	50	
Zinc	20	
Cyanide	10	

NOTES

1. Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. Quantitation limits listed for soil are based on wet weight.
2. If the information provided in this table differs from the most recent version of the ASP (2001), the ASP requirements will take precedence. In addition, if site-specific requirements dictate a change in quantitation limits, the Site-Specific Work Plan (which will include this information) will take precedence.

These CRQLs are the instrument detection limits obtained in pure water that must be met using the procedure in Exhibit E. The quantitation limits for samples may be considerably higher depending on the sample matrix.

TABLE 1
SAMPLE CONTAINERIZATION

Analysis	Bottle Type	Preservation[1]	Holding Time[2]
Aqueous Samples			
Volatile Organics (BTEX)	40 ml glass vial with Teflon-lined septa	Cool to 4^oC	7 days
PCBs/Pesticides	1000 ml amber glass	Cool to 4^oC	5 days*
Semivolatile Organics (PAHs)	1000 ml amber glass	Cool to 4^oC	5 days*
Metals	1000 ml polyethene	HNO_3 to pH <2	6 months (Mercury 26 days)
Cyanide	1000 ml polyethene	NaOH to pH >12	12 days
Soil & Sediment Samples			
Volatile Organics (BTEX)	Wide-mouth glass w/ teflon-lined septa [3]	Cool to 4^oC	7 days
Semivolatile Organics (PAHs)	Wide-mouth glass w/ teflon cap [3]	Cool to 4^oC	5 days*
Pesticide/PCBs	Wide-mouth glass w/ teflon cap [3]	Cool to 4^oC	5 days*
Metals, Cyanide	Wide mouth glass w/ teflon cap [3]	Cool to 4^oC	Metals - 6 months Mercury - 26 days Cyanide - 12 days

NOTES

1. All samples to be preserved in ice at 4°C during collection and transport.
2. Days from verified time of sample receipt (VTSR) by the laboratory.
3. Sized appropriately for the analytical method.
4. If the information provided in this table differs from the most recent version of the ASP (2001), the ASP requirements will take precedence. In addition, if site-specific requirements dictate a change in containerization requirements, the Site-Specific Work Plan (which will include this information) will take precedence.

* Extraction of water samples for pesticides/PCB analysis by separating funnel must be completed within five days of VTSR. Continuous liquid-liquid extraction is the required extraction for water samples for semivolatiles. Continuous liquid-liquid extraction of water samples, or sonication or soxhlet procedures for semivolatile and pesticides/PCB analyses, shall be started within five days. If a re-extraction and reanalysis must be performed, the extraction must start within 10 days and completed within 12 days of VTSR. Extracts of either water or soil/sediment samples must be analyzed within 40 days of VTSR.

TABLE 2
LABORATORY ANALYSIS PROGRAM

Matrix	Parameter [1]	Analytical Method [2]
Water	BTEX	Method 8260B*
	VOC	2001-1
	SVOC	2001-2
	PAHs	Method 8270C*
	PCBs and Pesticides	2001-3
	Metals	CLP-M (various for individual metals)
	Cyanide	CLP-M
Soil & Sediments	BTEX	Method 8260B*
	VOC	2001-1
	SVOC	2001-2
	PAHs	Method 8270C*
	Pesticides and PCBs	2001-3
	Metals	CLP-M (various for individual metals)
	Cyanide	CLP-M
	TCLP	Method 1311; Method Series 7000, 8000
Waste Characteristics		Methods 1010/1020A; 9040B/9041A; Section 7.3

NOTES

1. Abbreviations: BTEX = Benzene, Toluene, Ethylbenzene, Xylene; VOCs = Volatile organic compounds; SVOCs = Semivolatile organic compounds; PAHs = Polycyclic aromatic Hydrocarbons; TCLP = Toxicity Characteristic Leaching Procedure; PCBs = Polychlorinated Biphenyls; CLP = Contract Laboratory Program.
2. NYSDEC Analytical Services Protocol, 2001, Category B deliverables.
   Analyses must meet NYSDEC ASP holding time specified for Methods in Exhibit I Part II.
3. If the information provided in this table differs from the most recent version of the ASP (2001), the ASP requirements will take precedence. In addition, if site-specific requirements dictate a change in analytical requirements, the Site-Specific Work Plan (which will include this information) will take precedence

* BTEX and PAH analyses must meet NYSDEC ASP holding time specified for Methods 2001-1 and 2001-2, respectively.

Figure 1 Data Reduction, Validation and Reporting

Figure 2 Sample Custody