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Work Plan

Supplemental Remedial Investigation (SRI) NYSEG Cortland/Homer Former MGP Cortland County, New York

August 1999

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WORK PLAN

SUPPLEMENTAL REMDIAL INVESTIGATION (SRI)

NYSEG CORTLAND/HOMER FORMER MGP

CORTLAND COUNTY, NEW YORK

Prepared for

NEW YORK STATE ELECTRIC & GAS CORPORATION

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NYSEG CORTLAND/HOMER FORMER MGP
CORTLAND COUNTY, NEW YORK

SECTION 1 - INTRODUCTION

1.1 OVERVIEW

In 1985, NYSEG (New York State Electric and Gas Corporation) began a study to evaluate the environmental impacts related to a former coal gasification site in Homer, NY (Cortland/Homer site). The site is located in a commercial area on U.S. Route 11 in the Village of Homer, Cortland County, NY (Figure 1).

Between 1985 and 1989, NYSEG's consultant conducted two remedial investigations at the Cortland/Homer former manufactured gas plant site (the site). The first investigation was conducted between 1985 and 1987 (E.C. Jordan Co., 1987), and the second was conducted between 1987 and 1989 (E.C. Jordan Co., 1989). Results of those investigations generally identified elevated levels of volatile organic compounds (VOCs) and polycyclic aromatic compounds (PAHs) in soils near the existing site building. The VOCs and PAHs identified are waste substances which are common in MGP process residuals. Soil borings suggested that site contaminants seemed to follow the surface contour of a subsurface silt layer, which might indicate that contaminants could migrate away from the site towards the West Branch of the Tioughnioga River. Groundwater data from the investigations were consistent with this general migration pattern.

Although the previous site investigations were fairly thorough in their approach, a number of data gaps remained to be filled in order to determine the potential risk of exposure to site residuals, and appropriate cleanup needs. NYSEG has selected Stearns & Wheler to complete a Supplemental Remedial Investigation (SRI) at the Homer/Cortland former MGP site, pursuant to NYSDEC Order on Consent # D0-0002-9309. The objective of the SRI will be to fill data gaps identified in the previous site investigations. The scope of work described in this Work Plan will further determine site conditions and exposure risks to facilitate the future implementation of interim remedial measures (IRMs), a feasibility study (FS), and ultimately, site remediation and risk management.

1.2 SRI OBJECTIVES

Figure 2 shows the site and includes sampling locations from previous investigations, as well as proposed sample locations for the SRI. Although the site has been well characterized, several areas have been identified which require further study. Those areas are:

A. **Indoor Air Quality**. The I.D. Booth building on the site is constructed entirely over one of the former gasholders and partially over the second holder. Indoor air quality was not evaluated in previous investigations. Additional air samples will be collected inside the building to evaluate the potential for the site impact indoor air quality.

B. **Surface Soils.** The site is almost entirely covered by buildings or pavement, and no surface soil samples were collected during previous investigations. There are, however, some areas on and near the site with areas of soil at the surface. These specific areas will be sampled as part of this SRI in order to assess the likelihood that site occupants could be exposed to site-related impacts via direct contact with soil.

C. **Former Purifying House.** During the previous investigations, seep samples that contained elevated levels of cyanide were collected from the basement of the Hayward Construction Company building, which is located east of the site across Route 11. Prior to its demolition, the Hayward Construction Company building was located hydraulically downgradient of the former purifying house. The I.D. Booth building on the site is constructed over part of the historic purifying house, and previous investigations failed to investigate this area. One test pit will be dug in the vicinity of the former purifying house as part of this SRI.

D. **Groundwater**. Groundwater samples collected during each of the two previous investigations contained detectable levels of volatile and semi-volatile organic compounds. Samples collected from Monitoring Well 3 contained levels of benzene exceeding the TCLP limit for this compound. Those exceedences were the basis for the site being added to the New York State Registry of Inactive Hazardous Waste Sites. There has been no groundwater sampling over the past few years. Additional groundwater sampling will be completed as part of the SRI to supplement past data in order to update the level of understanding of site groundwater conditions.

E. **Tioughnioga River.** Sediment samples collected during the previous two investigations contained detectable levels of volatile and semi-volatile organic compounds and cyanide. Further investigation of the river will take place to assess the potential impacts of the site on the river. Sampling shall include both surface water and sediment.

F. **Fish and Wildlife Impact Analysis (FWIA).** To assess the potential impact of the site on the Tioughnioga River, a Fish & Wildlife Impact Analysis (FWIA) will be conducted. The FWIA will be conducted through Step IIA, following the guidance cited in NYSDEC's Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites, dated October 1994.

G. **Former Gasholder.** As stated above, the I.D. Booth building is constructed over the former MGP's gasholders. One boring (B-4) was installed adjacent to the distribution holder during the 1985 investigation. The sample collected from that boring contained elevated levels of organic compounds. A test pit will be dug during the SRI within the footprint of the former distribution holder to determine the depth to the holder slab and determine if MGP residues are present on top of the slab.

H. **Municipal Water Supply Survey.** The site is located in an area where two or more municipal water districts terminate. It is possible that private drinking water wells exist in the area. A survey will be completed to determine if such wells are present.

I. **DNAPL Investigation.** During the remedial investigation completed in 1987, a soil boring (B-3) installed on the east side of the I.D. Booth building showed the presence of a "brown, viscous, oily material" (E.C. Jordan, 1987). This material was present above the lacustrine silt unit at a depth ranging from 30 to 41 feet below the ground surface. B-3 was subsequently grouted shut, and a monitoring well (MW-3) was installed in another boring located several feet away from B-3. The screened interval of MW-3 extends from 7 to 12 feet below ground surface; therefore, there is no way to monitor or collect a sample of the DNAPL previously reported to exist in B-3.

In order to monitor the DNAPL reported to exist near the present location of MW-3, and if possible collect a sample for physical analysis, a soil boring will be advanced in that area and a permanent monitoring well installed. In addition, two other borings will be advanced east of the Tioughnioga River, and these borings will likewise have permanent monitoring wells installed in them.

J. **Passive Soil Gas Survey.** The Riverside Motel is located a few hundred feet southeast of the site. Although it does not appear that contamination in soil or groundwater has migrated under the

Riverside Motel, it is possible that organic vapors may be present in the soil in close proximity to the motel, and possibly under it.

The scope of work summarized above and as described in Section 3 of this work plan will fill data gaps with respect to contaminant migration and exposure potential. This will help determine the need for IRMs and facilitate the completion of a feasibility study, if needed, in the future.

1.3 WORK PLAN ORGANIZATION

This work plan has been prepared to direct the course of work at NYSEG's Cortland/Homer former MGP site. Included in the plan are the following elements:

Historical Summary (Section 2)
Scope of Work (Section 3)
Project Schedule (Section 4)
Site Analytical Plan (Appendix A)
Health and Safety Plan (Appendix B)

When approved by NYSDEC, this work plan will be used throughout the SRI as a reference document that will govern how tasks are to be completed.

SECTION 2 - BACKGROUND

2.1 SITE HISTORY

Stearns & Wheler completed an historical records search as part of the preparation of this work plan. The search was completed to supplement NYSEG's previous efforts in this regard. Stearns & Wheler reviewed the following sources of information:

1. E.C. Jordan Investigation of the Former Coal Gasification Site Cortland/Homer, NY, Task 3 Report.

2. Town of Homer Assessor's Department.

3. Cortland County Clerk's Office.

4. Cortland County Real Property Tax Services.
5. Cortland County Planning Department.
6. Cortland County Historical Society.
7. Phillip's Free Library, Homer, NY.
8. EcoSearch Environmental Resources, Inc. Sanborn™ Fire Insurance Map Search.

In general, the findings of Stearns & Wheler's records review support those of NYSEG's previous review and previous findings summarized by E.C. Jordan. The following information was confirmed.

The Cortland/Homer coal gasification plant produced coal gas and carburetted water gas from 1858 to 1932. The gasholders continued to be used until the early 1930s for storage of natural gas. The by-products of the process included coal tar, coke, ash, and purification wastes, including spent oxide materials. The coal tars produced were disposed of in on-site storage vessels. Tar residues were also collected in the relief gasholder. Coke produced was stored outside and later sold as fuel for domestic use. It is also possible that at least some coal was stored outside.

In 1911, the plant was purchased by the predecessor of NYSEG, which later became NYSEG after a merger in 1918. The plant was closed in 1935 and remained idle until it was purchased by Brockway Motor Company, Inc. in 1944. In 1947, the site's buildings were razed and a new building was constructed on site. In 1960, the property was purchased by Mack Trucks, Inc. In 1971, the property was purchased by I.D. Booth, a plumbing supply distributor.

According to E.C. Jordan (1989), a 1,000-gallon gasoline underground storage tank (UST) and pump are located off the north side of the I.D. Booth building. The pump and UST were reportedly not used between the years 1984 and 1989. It is not known how or when the UST was decommissioned after use.

In 1972, I.D. Booth bought the adjacent property to the north, and demolished an on-site gasoline service station. The adjacent northern property had been owned previously by Mr. and Mrs. Arther Call prior to 1928. Call sold the northern property to R.E. Bucklin in 1928, and Clipper Service Station purchased the northern property in 1929. Clipper began leasing the northern property in

1966 to Suburban Propane Gas Corporation. Ithaca Propane purchased the northern property in 1969, and in 1971, Randolph Well & Pump Co., Inc. purchased the parcel from Ithaca Propane. Today, I.D. Booth occupies the southern two-thirds of the site building, and Bell Atlantic occupies the northern one-third.

2.2 SUMMARY OF PREVIOUS INVESTIGATIONS

Between 1985 and 1989, NYSEG's previous consultant conducted two remedial investigations at the Cortland/Homer former manufactured gas plant site. The first investigation was conducted between 1985 and 1987 (E.C. Jordan Co., 1987) and consisted of the following field tasks:

1. A geophysical investigation consisting of ground-penetrating radar and electromagnetic profiling.

2. Installation of nine soil borings, six of which were completed as groundwater monitoring wells.

3. Completion of three rounds of groundwater sampling.

4. Completion of three rounds of surface water sampling and one round of sediment sampling from the Tioughnioga River.

5. Collection of one seepage sample from the former Hayward Construction Company building.

6. Collection of outdoor air samples at six locations during the soil boring program.

7. Completion of a site survey and a preliminary land use survey within a 1/2-mile radius of the site.

Results of that investigation identified an apparent source area of coal tar-related chemicals in subsurface soils near the existing site building. Coal tar related VOCs and PAHs were found in shallow soils at a number of soil boring locations. Groundwater from monitoring wells downgradient of the site contained detectable quantities of VOCs and PAHs. Surface water samples from the Tioughnioga River east of the site general did not contain MGP-related substances, although downstream sediment samples did contain PAHs. In addition, amenable cyanide was detected in a seep sample collected in the basement of a building located east of the site across Route 11. Air samples collected within the site building indicated the presence of low levels of coal tar-related substances in air.

The second investigation conducted between 1987 and 1989 (E.C. Jordan Co., 1989) was intended to fill additional data needs, and consisted of the following field tasks:

1. Installation of 13 soil borings, 11 of which were completed as groundwater monitoring wells.

2. Completion of permeability testing on the newly installed wells.

3. Completion of two rounds of groundwater sampling and five rounds of water level measurements.

4. Installation of four test pits.

5. Collection of four seepage samples from the former Hayward Construction Company building (NYSEG subsequently purchased the building and it was razed in 1998).

6. Completion of one round of sediment sampling from the Tioughnioga River.

Results of that investigation generally verified the findings of the first investigation. The most elevated levels of VOCs and PAHs were in soils near the site building, which was identified as a source area in the first investigation. Soil borings suggested that site contaminants seemed to follow the surface contour of a subsurface silt layer, which was causing contaminants to migrate away from the site towards the West Branch of the Tioughnioga River. Groundwater data were consistent with this general migration pattern.

SECTION 3 - SCOPE OF SRI

The following sections provide detail regarding the methods that will be followed for completing the SRI. All field work will conform to the guidance set forth in the Site Analytical Plan (SAP) and

Health and Safety Plan (HSP), provided in Appendices A and B, respectively, of this work plan. Figure 2 illustrates the proposed sampling locations for the various items discussed below.

3.1 AIR SAMPLING PROGRAM

Three air samples will be collected inside the I. D. Booth building to evaluate the potential for the site impact indoor air quality. The samples shall be 24-hour time-weighted average samples. Analysis will include volatile organic compounds, including BTEX, according to USEPA Method TO-14. The sampling will involve the placement of Summa canisters in the building's interior, which will collect air samples over a 24-hour period. Appropriate locations for canister placement will be determined in the field based on an inspection of the building.

The scope of work will also require that 24-hour air samples be collected for PAH analysis. Among the more volatile PAHs is the compound naphthalene, which is a common MGP residual. As a fairly volatile compound, it can be used as an indicator of vapor phase MGP-related impact.

The sampling and analytical method for PAHs in air usually follows USEPA Method TO-13. This method requires that a high volume air sample be collected over an integrated time period (e.g., 24 hours), followed by GC/MS analysis for a full range of PAH compounds. Logistically, the 3- to 4- foot high sample collection apparatus can be cumbersome to deploy and may be difficult to place without disturbing daily activity. However, these difficulties can be overcome by an alternative low flow sampling method that relies on a modified USEPA Method TO-17, utilizing GC/FID analysis. Method TO-17 can be modified to allow a 24-hour air sample to be collected as opposed to the shorter duration (e.g., one hour) sample that is usually collected by that method. The modified TO-17 will thus meet the requirement of a 24-hour time-weighted sample without the difficulties related to the TO-13 method. Twenty-four-hour sampling and analysis will take place for naphthalene using a low flow sampling apparatus and collection method similar to those set forth in USEPA Method TO-10, and following modified analytical procedures involving GC/FID, as set forth under Method TO-17.

Sample analytical methodology and data deliverables will be in accordance with USEPA's *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air,* (January 1999). A full description of the sampling procedures and equipment is provided in the SAP (Appendix A) of this work plan.

3.2 SURFACE SOILS

Surface soil samples will be collected from the following locations (see Figure 2).

- one surface soil sample will be collected from the grassy area on the east side of the I.D. Booth building
- one surface soil sample will be collected from the gravel parking area east of the I.D. Booth storage yard and northeast of Natoli's Market
- one surface soil sample will be collected from the grassy area west of the Riverside Motel
- one surface soil sample will be collected from the grassy area north of the location of the former Hayward Construction Company building
- two surface soil samples to serve as representative background samples will be collected from north of the site. These sample locations will be agreed upon in the field by representatives of NYSDEC, NYSDOH, and NYSEG

All surface soils will be collected in the following manner: a square measuring 1 meter on all sides will be marked out in the sample location. A grab sample of the top 1 inch of soil just below the sod will be collected from five locations (each corner of the square and in the center of it). The five grab samples will be placed into a container and composited into one analytical sample.

Surface soil samples will be analyzed for Target Compound List (TCL) semi-volatile organic compounds, Target Analyte List (TAL) metals, total organic carbon (TOC), total petroleum hydrocarbons (TPH), reactive cyanide, reactive sulfide, and total cyanide. Sample analytical methodology and data deliverables will meet the requirements of the ASP Category B requirements.

3.3 FORMER PURIFYING HOUSE AREA

A test pit will be installed as close as practical to the east wall of the I.D. Booth building in the vicinity of the historic purifying house (Figure 2). The test pit will be installed with a backhoe and will extend to the maximum reach of the machine or the water table, whichever is less.

A Stearns & Wheler geologist will observe the excavation and create a log of the test pit. Real-time air monitoring for volatile organic compounds will be conducted using a Mini Rae photoionization detector (PID) while the excavation is open. Excavation spoil will be temporarily staged on 20 mil plastic sheeting. Upon completion of the test pit, the spoil will be placed back into the excavation in the reverse order of which it was removed, or in such a manner as to ensure that the most visibly contaminated material is placed into the bottom of the excavation. Grossly contaminated material (i.e., soil containing free tar, soil that is saturated with tar, or soil that causes real-time work zone air monitoring levels to be exceeded) will be containerized and stored on NYSEG's property adjacent to the site, east of Route 11, until it is tested and disposed of at an off-site facility permitted to accept such waste. The top 2 feet of backfill in the test pit will be clean, imported topsoil from a local commercial source. The area will be restored to original condition following completion of backfilling.

One sample will be collected from the test pit for analysis in a laboratory. The sample will be collected from the most contaminated strata of the test pit based on visual, olfactory and field screening (i.e., PID) techniques, and the judgment of the geologist. The sample will be analyzed for TCL volatile organic compounds, TCL semi-volatile organic compounds, TAL metals, TOC, TPH, reactive cyanide, reactive sulfide, and total cyanide. Sample analytical methodology and data deliverables will meet the requirements of the ASP Category B requirements.

3.4 GROUNDWATER

One round of groundwater samples will be collected from each of the previously installed monitoring wells. Some of the wells have not been sampled in several years; to assure good hydraulic communication with the aquifer, they will need to be redeveloped prior to sampling to remove sediments and other debris that may have accumulated in the wells. Prior to redeveloping, a NAPL (LNAPL and DNAPL) level measurement will be taken in each well using an interface probe. After redeveloping all of the wells, in situ hydraulic conductivity testing will be performed in each well using rising head test methods. Purged groundwater will be disposed of in a groundwater recharge pit on NYSEG property east of U.S. Route 11.

In situ conductivity tests and groundwater sampling will not be completed for a minimum of one week following well redevelopment. Groundwater samples will be analyzed for TCL volatile and semi-volatile organic compounds, TAL metals, TPH, total sulfur, and total cyanide. Sample analytical methodology and data deliverables will meet the requirements of the ASP Category B requirements. Groundwater sampling procedures are presented in the SAP (Appendix A) of this work plan.

3.5 TIOUGHNIOGA RIVER

A comprehensive surface water and sediment sampling program will be completed for the Tioughnioga River. Sediment sampling and evaluation of analytical results will follow the guidance in NYSDEC's Division of Fish, Wildlife and Marine Resources *Technical Guidance for Screening Contaminated Sediments,* dated March 1999. All work in the river will be conducted during a period of low flow conditions, which is anticipated to be in the late summer of the year, and will be completed by wading into the river, as needed.

A. **River Bank Reconnaissance.** A visual reconnaissance of the west bank of the Tioughnioga River will be conducted. Evidence of impacts to the River will be noted, such as oily sheens, stained sediments or river bank soils, tarry seeps, etc. Locations of any outfall pipes or other potential preferential contaminant migration pathways will also be noted. The reconnaissance and all subsequent testing in the river will be conducted from a point approximately 200 feet upstream of Well MW-18S to a point approximately 600 feet downstream of Well MW-18S.

B. **Sediment Probing.** Upon completion of the river bank reconnaissance, a sediment probing investigation will be conducted. A technician using a stainless steel rod will probe the sediments along transects over the entire width of the river, along the same reach of river as indicated above, and also around each outfall/potential preferential pathway discharge point identified during the reconnaissance. Sediment probing transects will be constructed perpendicular to the flow of the river; the upstreammost transect will be located approximately 200 feet upstream of MW-18S, and the downstreammost transect will be located approximately 600 feet downstream of MW-18S. From a point 100 feet upstream of MW-18S to a point 300 feet downstream of MW-18S, transects will be spaced at 25-foot intervals. Outside of this 400-foot zone (i.e., from 100 feet upstream of to 300 feet downstream of MW-18S), transects will be spaced at 50-foot intervals. Probe points along each transect will be spaced at 25-foot intervals, with the initial probe point on each transect being placed along the shoreline on the west bank of the river. If visual evidence of potential MGP impact is encountered (i.e., stained or tarry sediments, oily sheen rising to the water surface), probing will be conducted outward from that point in all directions at 10-foot intervals until the extent of the impacted area is identified. The location of any impacted areas relative to a fixed point of reference will be recorded in the field log book.

C. **Surface Water and Sediment Sampling.** Surface water and sediment samples will be collected following the completion of the probing investigation. For planning purposes, it is anticipated that a total of nine surface water and sediment samples each will be collected, although the actual number will depend on the outcome of the sediment probing. Two of the sample collection locations will be upstream of the site area (i.e., a minimum of 100 feet and 200 feet of the most upstream impacted area identified in the sediment probing investigation), and one sample collection location will be downstream of the site area (i.e., a minimum of 200 feet downstream of most downstream impacted area identified in the sediment probing investigation). The six remaining sample collection locations will be biased toward the most impacted areas of sediment based on the results of the river bank reconnaissance and the probing investigation; however, there will be a minimum distance of 25 feet and a maximum distance of 225 feet between sample collection locations. The sampling locations will be selected such that a sufficient amount of submerged fine-grained sediments (i.e., silts) are available to provide a representative sample. Sediment samples will be collected by a person wading in the river using a sampling device appropriate for the location specific conditions (i.e., soft sediments may be collected using a Lexan tube advanced by hand or tapped into the sediments with a hammer; harder sediments may require a split-barrel sampling device advanced with a hammer). River conditions at the time of sampling may require that the samples be collected from a floating platform. The sampling device will be advanced to a minimum depth of 2 feet to evaluate the potential of MGP contaminants to exist with depth. Samples collected for laboratory analysis will be from the top 3 inches of sediment. If MGP contaminants appear to be present in the sediments at depths greater than 3 inches, a second sample will be collected from the worst case interval below 3 inches in depth.

All sediment samples will be analyzed for TCL volatile and semi-volatile organic compounds, TAL metals, TOC, TPH (using NYSDOH Method 310.13), and total cyanide. Sample analytical methodology and data deliverables will meet the requirements of the ASP Category B requirements.

The surface water samples will generally be collected from the same area as the sediment samples. Where possible, surface water samples will be collected from a quiescent area of the river. All surface water samples will be collected prior to collecting any sediment samples. All surface water samples will be analyzed for TCL volatile and semi-volatile compounds, TAL metals, TPH, and total cyanide. Sample analytical methodology and data deliverables will meet the requirements of the ASP Category B requirements. A detailed description of sediment and surface water sampling methods is provided in the SAP (Appendix A) of this work plan.

3.6 FISH AND WILDLIFE IMPACT ANALYSIS

To assess the potential impact of the site on the Tioughnioga River, a FWIA will be conducted through Step IIA. The FWIA will be conducted following the guidance cited in the NYSDEC's *Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites*, dated October 1994.

3.7 GASHOLDERS

As mentioned previously, the I.D. Booth building is constructed entirely over the former gas relief holder and partially over the gas distribution holder. One boring (B-4) was installed adjacent to the distribution holder during the 1985 investigation. The sample collected from that boring contained elevated levels of organic compounds.

For the SRI, one test pit will be dug within the footprint of the former distribution holder to determine the depth to the holder slab and determine if MGP residues are present on top of the slab. The test pit will be installed with a backhoe and will extend to the lesser of the maximum reach of the machine, the water table, or refusal (presumably on the holder slab).

A Stearns & Wheler geologist will observe the excavation and create a log of the test pit. Real time air monitoring for volatile organic compounds will be conducted using a Mini Rae PID while the excavation is open. Excavation spoil will be temporarily staged on 20 mil plastic sheeting. Upon completion of the test pit, the spoil will be placed back into the excavation in the reverse order of which it was removed, or in such a manner as to ensure that the most visibly contaminated material is placed into the bottom of the excavation. The area will be restored to original condition following completion of backfilling. Any material that is grossly contaminated (e.g., free tar, significant airborne contamination) will be separated from the other material and containerized. Containerized material will be stored on NYSEG's property adjacent to the site, east of Route 11, until it is tested and disposed of at an off-site facility permitted to accept such waste.

One sample will be collected from the test pit for analysis in a laboratory. The sample will be collected from the most contaminated strata of the test pit based on visual, olfactory and field screening (i.e., PID) techniques, and the judgment of the geologist. The sample will be analyzed for TCL volatile organic compounds, TCL semi-volatile organic compounds, TAL metals, TOC, TPH, reactive cyanide, reactive sulfide, and total cyanide. Sample analytical methodology and data deliverables will meet the requirements of the ASP Category B requirements.

3.8 MUNICIPAL DRINKING WATER SUPPLY

The site is located in an area where two or more municipal water districts terminate. It is possible that private drinking water wells exist in the area. A water well survey will be completed to determine if such wells are present. The study will consist of an historical records search and/or a door-to-door survey of properties within 500 feet of the site. If such wells are identified, an attempt will be made to determine when the wells were installed, their depth, how often the water is used, and what the water is used for. The door-to-door survey, if completed, will be conducted in cooperation with a representative from the New York State Department of Health.

3.9 DNAPL

A number of soil borings will be installed as part of this SRI to confirm results of previous borings. One soil boring will be installed as close as possible to the location of previous boring B-3. This new boring will extend several feet into the top of the lacustrine silt unit to confirm that the unit is indeed acting as a confining unit. Extreme care will be taken so as not to fully penetrate the silt unit and possibly release DNAPL to a more permeable unit beneath it.

The new soil boring will be installed using 4-1/4-inch diameter hollow-stem augers. Continuous sampling will be performed using 2- or 3-inch diameter split-spoon samplers. A Stearns & Wheler geologist will log all samples and perform visual, olfactory, and field equipment (PID) screening of all split-spoon samples. The boring will be advanced through a sheet of plywood in which a hole has been cut. This will allow for effective collection of auger cuttings. All cuttings will be containerized on NYSEG's property, east of Route 11, until they are tested and disposed of at an off-site facility permitted to accept such waste.

A laboratory sample will be collected from the interval exhibiting the highest PID reading. The sample will be analyzed for TCL volatile and semi-volatile organic compounds, TAL metals, reactive cyanide, reactive sulfide, TOC, and total cyanide. Sample analytical methodology and data deliverables will meet the requirements of the ASP Category B requirements.

The proposed soil boring will be completed as a flush mount monitoring well. The well will be constructed of stainless steel riser and a 10-foot length of 0.010-inch slot screen with a 2-foot DNAPL collection sump at the bottom. The screen will be set such that the bottom of it is even with the surface of the silt unit, with the DNAPL sump extending into the silt unit. Upon completion, this well will be developed in the same manner and sampled using the same methodology as proposed for all the existing site wells as described in Section 3.4 and in the SAP.

In addition to the installation of the soil boring/monitoring well described above, two additional soil borings will be completed that will also be finished as monitoring wells. These borings/monitoring wells will be located on the east side of the Tioughnioga River, along its eastern bank. These wells will assist in determining if MGP-related contaminants are moving to the east side of the river, and will help to further refine local groundwater flow conditions.

One boring/monitoring well will be located directly across from the location of previous soil boring 20 (B-20); the other will be located directly across from the location of existing Monitoring Well 16 (MW-16). Both borings will extend to the top of the lacustrine silt unit. The soil borings will be installed using 4-1/4-inch diameter hollow-stem augers. Continuous sampling will be performed using 2- or 3-inch diameter split-spoon samplers. A Stearns & Wheler geologist will log all samples and perform visual, olfactory, and field equipment (PID) screening of all split-spoon samples. The borings will be advanced through a sheet of plywood in which a hole has been cut. This will allow for effective collection of auger cuttings. Containerized material will be stored on NYSEG's property adjacent to the site, east of Route 11, until they are tested and disposed of at an off-site facility permitted to accept such waste.

For each boring, one laboratory sample will be collected from the interval exhibiting the highest PID reading. The sample will be analyzed for TCL volatile and semi-volatile organic compounds, TAL metals, total cyanide, reactive sulfide, and TOC. Sample analytical methodology and data deliverables will meet the requirements of the ASP Category B requirements.

Both borings will be finished as flush mount groundwater monitoring wells. These wells will be constructed of Schedule 40 PVC riser and 10-foot lengths of 0.010-inch slot screens. Upon completion, these wells will be developed in the same manner and sampled using the same methodology as proposed for all the existing site wells as described in Section 3.4 and in the SAP.

3.10 PASSIVE SOIL GAS SURVEY

A passive soil gas survey will be conducted on property currently occupied by the Budget Inn, formerly the Riverside Motel. In order to determine if organic vapors are present under the motel, 11 passive soil gas samplers would be installed in a picket line fashion around the west wing of the motel. To assist in evaluation of the data from the “picket line” samplers, additional samples would need to be placed in areas expected to be “hot spots,” and also in areas thought to be unimpacted by the former MGP (background conditions). Two “hot spot” samplers would be deployed on the west side of Route 11 as close as practicable to the former gasholders. Two additional samplers would be deployed in areas presumably not impacted by the MGP site, yet thought to be indicative of typical background conditions. These background sample locations would be agreed upon in the field by representatives of NYSDEC, NYSDOH, and NYSEG. See Figure 2 for proposed sample locations, and Appendix A for a discussion of deploying passive soil gas survey kits.

3.11 SRI REPORT

Following completion of the SRI, a report will be prepared which summarizes field sampling methods and investigation findings, and provides recommendations for further site work, as needed.

SECTION 4 - PROJECT SCHEDULE

A schedule for completing the above scope of work is included as Figure 3.

TABLE 1

SAMPLING AND ANALYTICAL SUMMARY

TASK AREA	SAMPLE MATRIX	NO. OF SAMPLES	ANALYSES	
Indoor air	Gas	To be determined	VOCs Naphthalene	
Soil vapor survey	Gas	15	VOCs	
Surface soil	Soil	6	TCL SVOC TAL metals TOC TPH	R CN R S T CN
Purifying house	Soil	1	TCL VOC TCL SVOC TAL metals TOC	TPH R CN R S T CN
Gasholders	Soil	1	TCL VOC TCL SVOC TAL metals R CN	RS T CN TOC TPH
River	Sediment	9	TCL VOC TCL SVOC TAL metals TOC TPH T CN	
	Water	9	TCL VOC TCL SVOC TAL metals TPH T CN	
Groundwater	Water	17 (existing wells)	TCL VOC TCL SVOC TAL metals TPH TS T CN	
DNAPL	Water	3 (new wells)	TCL VOC TCL SVOC TAL metals TPH TS T CN	
	Soil	3	TCL VOC TCL SVOC TAL metals R CN	R S TOC T CN

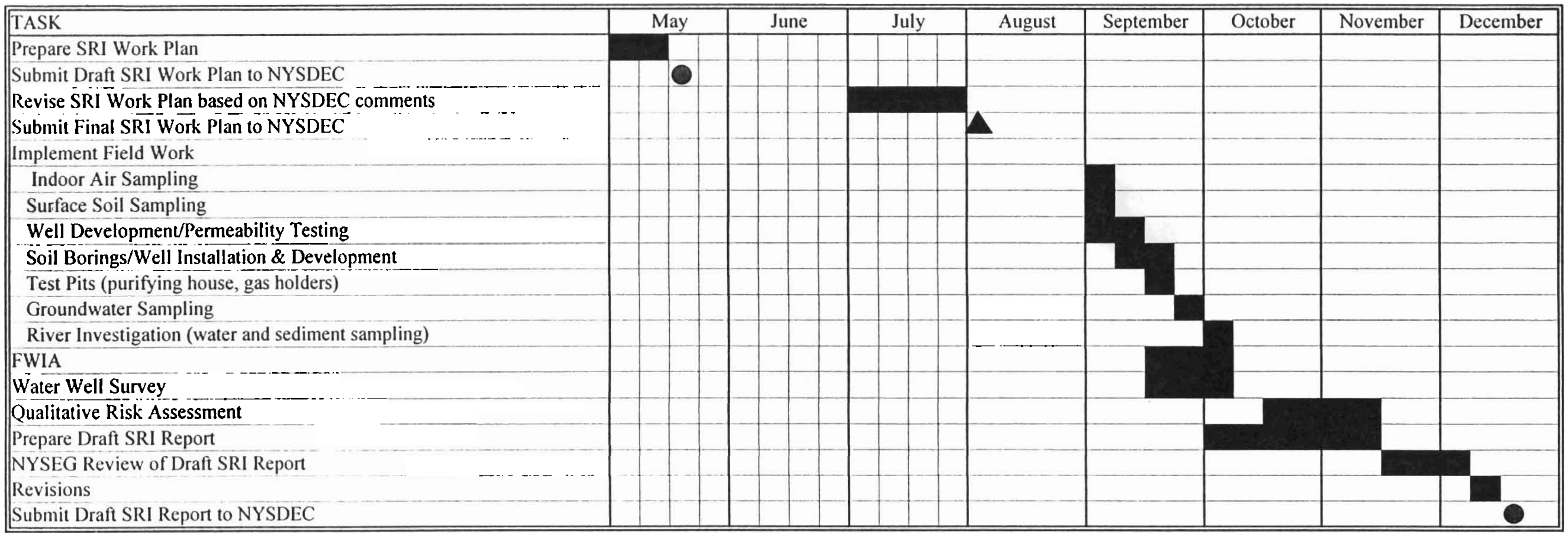
TABLE 2

QA/QC SUMMARY

MATRIX	ANALYSIS	NO. OF SAMPLES	DUPLICATES	MS	MSD
Soil/sediment	TCL VOC	14	1	1	1
	TCL SVOC	20	1	1	1
	TAL metals	20	1	1	1
	TOC	20	1	1	1
	TPH	17	1	1	1
	R CN	11	1	1	1
	R S	11	1	1	1
	T CN	20	1	1	1
Water	TCL VOC	29 (1)	1	1	1
	TCL SVOC	29	1	1	1
	TAL metals	29	1	1	1
	TPH	29	1	1	1
	T CN	29	1	1	1
	TS	20	1	1	1

(1) Assumes 17 existing wells will be suitable for sampling.

PROPOSED PROJECT SCHEDULE
HOMER/CORTLAND, NY FORMER MGP SITE
NYSEG



Notes:

Schedule of tasks based on expedited NYSDEC review periods for draft documents, as indicated above.

Preparation of draft reports assumes a collaborative, concurrent effort between Stearns & Wheler and NYSEG

A passive soil gas survey may also occur, either as part of the SRI or as a follow up effort, pending site access agreement.

● Denotes submittal of draft document to NYSDEC

▲ Denotes submittal of final document to NYSDEC

Stearns&Wheler, LLC
ENVIRONMENTAL ENGINEERS & SCIENTISTS
CAZENOVIA, NEW YORK

DATE: 5/99 JOB No: 90103

NYSEG
CORTLAND/HOMER FORMER MGP SITE
SUPPLEMENTAL REMEDIAL INVESTIGATION

FIGURE 3
PROJECT SCHEDULE

REFERENCES

E. C. Jordan Co., July 1987. Investigation of Former Coal Gasification Sites, Cortland/Homer, Homer, NY. Task 2 Investigation Report.

E. C. Jordan Co., May 1989. Investigation of the Former Coal Gasification Site, Cortland/Homer, Homer, NY. Task 3 Report.

NYSDEC, October 1994. Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (FWIA).

NYSDEC, March 1999. Technical Guidance for Screening Contaminated Sediments.

APPENDICES

APPENDIX A

SITE ANALYTICAL PLAN

APPENDIX A-1

QUALITY ASSURANCE/QUALITY CONTROL PROJECT PLAN

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SECTION 1

PROJECT DESCRIPTION

The Cortland/Homer coal gasification plant produced coal gas and carburetted water gas from 1858 to 1932. The gasholders continued to be used for storage of natural gas until the early 1930s. The by-products of the process included coal tar, coke, ash, and purification wastes, including spent oxide materials. The coal tars produced were disposed of in on-site storage vessels. Tar residues were also collected in the relief gasholder. Coke produced was stored outside and later sold as fuel for domestic use. It is also possible that at least some coal was stored outside.

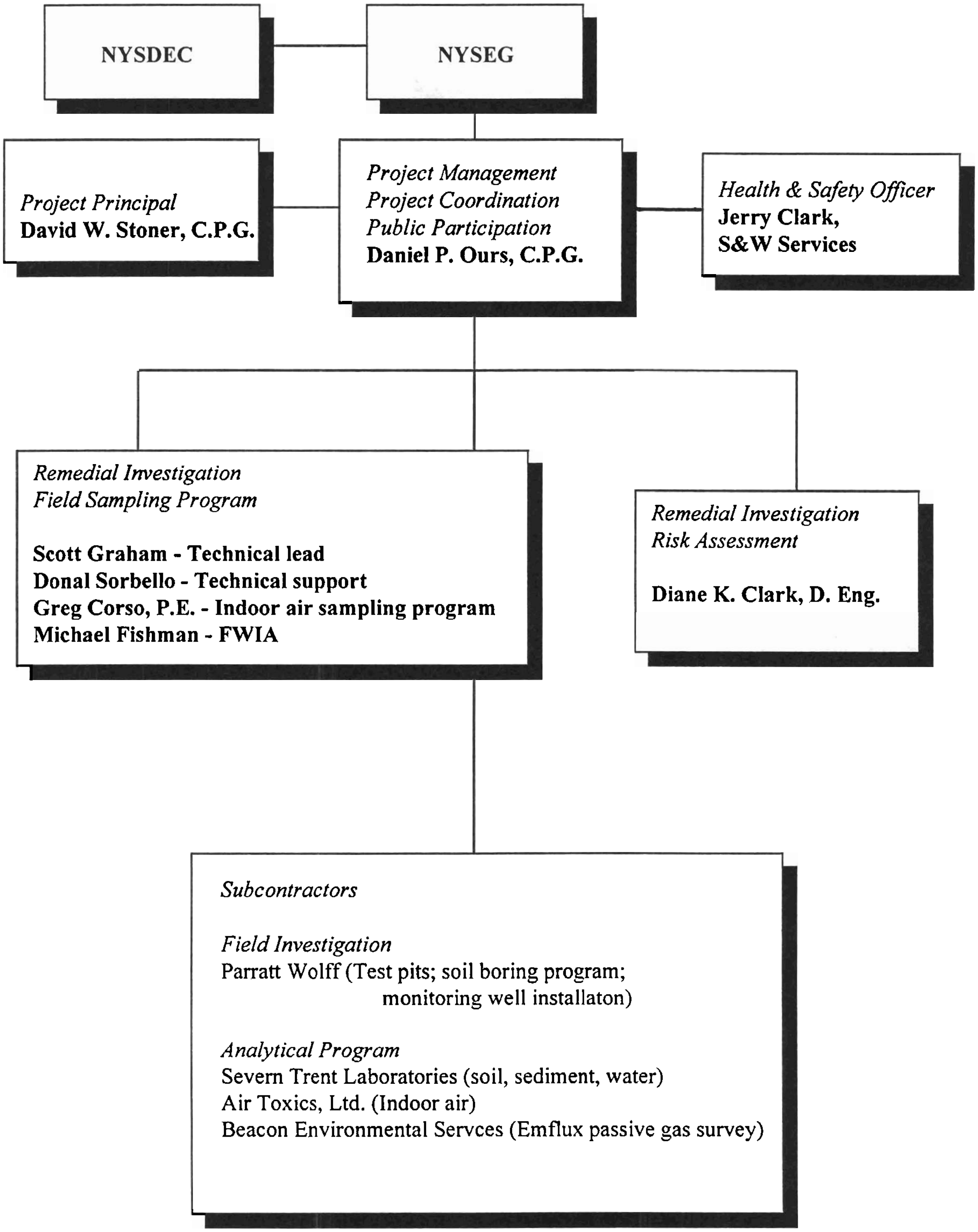
In 1911, the plant was purchased by the predecessor of NYSEG, which later became NYSEG after a merger in 1918. The plant was closed in 1935 and remained idle until it was purchased by Brockway Motors in 1944. In 1947, the site's buildings were razed and a new building was constructed on site. The property was purchased by I.D. Booth, a plumbing supply distributor, in 1971. In 1972, I.D. Booth bought the adjacent property to the north. Today, I.D. Booth occupies the southern two-thirds of the site building and Bell Atlantic occupies the northern one-third.

Results of Task 2 and Task 3 investigations (E.C. Jordan, 1987, 1989) identified an apparent source area of coal tar related chemicals in subsurface soils near the existing site building. Coal tar-related volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) were found in shallow soils at a number of soil boring locations. Groundwater from monitoring wells downgradient of the site contained detectable quantities of VOCs and PAHs. Surface water samples from the Tioughnioga River east of the site generally did not contain MGP-related substances, although downstream sediment samples did contain PAHs. In addition, amenable cyanide was detected in a seep sample collected in the basement of a building located east of the site across Route 11. Air samples collected within the site building indicated the presence of low levels of coal tar related substances in air. NYSEG is now undertaking a Supplemental Remedial Investigation (SRI) in order to fill data gaps from the previous Task 2 and Task 3 investigations.

SECTION 2

PROJECT ORGANIZATION

The organization of the project management team and areas of responsibility are shown in Figure 2-1 on the following page.



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CAZENOVIA, NEW YORK

DATE: 5/99 JOB No: 90103

NYSEG
CORTLAND/HOMER FORMER MGP SITE
SRI QAPP

FIGURE 2-1
PROJECT TEAM

SECTION 3

QA/QC OBJECTIVES FOR MEASUREMENT OF DATA

Levels of quality for all laboratory analyses shall be based on those stipulated in the New York State Department of Environmental Conservation Analytical Services Protocol (NYSDEC-ASP) where applicable. If NYSDEC-ASP is not specific, then the United States Environmental Protection Agency Contract Laboratory Protocol (USEPA CLP) will be followed. For the remainder of this document, ASP shall refer to the most recent update of the NYSDEC-ASP (December 1991). Field blanks and duplicate samples will be collected for QA purposes according to ASP requirements. Number and frequency of blanks and duplicates is itemized by matrix group in the Field Sampling Plan (FSP).

ASP analytical methods will be used for all analyses unless otherwise noted. Analyses that may be mandated by applicable regulations or site-specific conditions are listed in the FSP.

Detection limits set by NYSDEC-ASP will be used for all sample analyses unless otherwise noted. If NYSDEC-ASP-dictated detection limits prove insufficient to assess project goals (i.e., comparison to drinking water standards or attainment of ARARs), then ASP Special Analytical Services (SAS) or other appropriate methods will be described in the FSP.

The quality assurance/quality control objectives for all measurement data include completeness, representativeness, comparability, precision and accuracy.

COMPLETENESS

The analyses performed must be appropriate and inclusive. The parameters selected for analysis are chosen to meet the objectives of the study.

Completeness of the analyses will be assessed by comparing the number of parameters intended to be analyzed with the number of parameters successfully determined and validated. Data must meet QC acceptance criteria for 100 percent or more of requested determinations.

REPRESENTATIVENESS

Samples must be taken of the population and, where appropriate, the population will be characterized statistically to express the degree to which the data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process, or environmental condition.

Non-dedicated sampling devices will be cleaned between sampling points by washing and rinsing with pesticide-grade methanol, followed by a thorough rinse with distilled water. Specific cleaning techniques are described in the Field Sampling Procedure. Two types of blank samples will accompany each sample set where Target Compound List (TCL) volatiles are to be analyzed (water matrix only). A trip blank, consisting of a 40 ml VOA vial of organic-free water prepared by the laboratory, will accompany each set of sample bottles from the laboratory to the field and back. This bottle will remain sealed throughout the shipment and sampling process. This blank will be analyzed for TCL volatile organic compounds along with the groundwater samples to ensure that contamination with TCL volatile compounds has not occurred during the bottle preparation, shipment and sampling phase of the project. In order to check for contaminant carryover when non-dedicated sampling equipment is used, a rinsate blank will be submitted to the laboratory. This blank will also be analyzed for TCL volatile organic compounds. The TCL compounds are identified in the United States Environmental Protection Agency (USEPA) Contract Laboratory Program dated 7/85 or as periodically updated. Field activities are audited by the Stearns & Wheler Quality Assurance Officer.

The analysis results obtained from the determination of identical parameters in field duplicate samples can be used to further assess the representativeness of the sample data.

COMPARABILITY

Consistency in the acquisition, preparation, handling and analysis of samples is necessary in order for the results to be compared where appropriate. Additionally, the results obtained from analyses of the samples will be compared with the results obtained in previous studies, if available.

To ensure the comparability of analytical results with those obtained in previous or future testing, all samples will be analyzed by NYSDEC-approved methods. The NYSDEC-ASP mandated holding times for various analyses will be strictly adhered to.

PRECISION AND ACCURACY

If it is determined necessary, the validity of the data produced may be assessed for precision and accuracy by a third party data validation. Analytical methods which will be used include gas chromatography/mass spectrometry (GC/MS), gas chromatography (GC), colorimetry, atomic spectroscopy, gravimetric and titrametric techniques. The following outlines the procedures for evaluating precision and accuracy, routine monitoring procedures, and corrective actions to maintain analytical quality control. All data evaluations will be consistent with NYSDEC-ASP procedures. Data will be 100 percent compliant with NYSDEC-ASP requirements.

The requirements of QA/QC are both method specific and matrix dependent. The procedures which may be used are described on this basis in Sections 6 and 9. The number of duplicate, spiked and blank samples analyzed will be dependent upon the total number of samples of each matrix to be analyzed, but there will be at least one split per matrix. The inclusion and frequency of analysis of field blanks and trip blanks will be on the order of one per each site. Samples to be analyzed for volatile organic compounds will be accompanied by trip and field blanks (water matrix) or field blanks (soil, sediment matrice).

Quality assurance audit samples will be prepared and submitted by the laboratory QA manager for each analytical procedure used. The degree of accuracy and the recovery of analyte to be expected for the analysis of QA samples and spiked samples is dependent upon the matrix, method of analysis, and compound or element being determined. The concentration of the analyte relative to the detection limit is also a major factor in determining the accuracy of the measurement. The lower end of the analytical range for most analyses is generally accepted to be five times the detection limit. At or above this level, the determination and spike recoveries for metals in water samples will be expected to range from 75 to 125 percent. The recovery of organic surrogate compounds and matrix spiking compounds determined by GC/MS will be compared to the guidelines for recovery of individual compounds as established by the United States Environmental Protection Agency Contract Laboratory Program dated 7/85 or as periodically updated.

The quality of results obtained for inorganic ion and demand parameters may be assessed by comparison of QC data with laboratory control charts for each test.

SECTION 4

SAMPLING PROCEDURES

MONITORING WELL INSTALLATION

A. **Drilling/Sampling Procedures.** Test borings shall be completed using the hollow-stem auger drilling method. The minimum inside diameter of the augers shall be 4-1/4 inches. All downhole equipment will be decontaminated on site prior to beginning work.

Samples of the encountered subsurface materials shall be collected every 2 feet. The sampling method employed shall be ASTM D-1586/Split Barrel Sampling using a standard 2-foot long, 2- or 3-inch outside diameter split- spoon sampler with a 140-pound hammer. Upon retrieval of the sampling barrel, the collected sample shall be placed in glass jars and labeled, stored on site (on ice in a cooler if necessary), and transmitted to the appropriate testing laboratory or storage facility. Chain-of-custody procedures will be practiced following Section 15, EPA-600/4-82-029, Handbook for Sampling and Sample Preservation of Water and Waste Waters.

A geologist will be on site during the drilling operations to fully describe each soil sample, following the Modified Burmeister Soil Description Procedure, and to retain representative portions of each sample. Specific procedures for soil description and collection are described in the Field Sampling Plan.

The drilling contractor will be responsible for obtaining accurate and representative samples, informing the geologist of changes in drilling pressure, keeping a separate general log of soils encountered including blow counts [i.e., the number of blows from a soil sampling drive weight (140 pounds)] required to drive the split-spoon sampler in 6-inch increments and installing monitoring wells to levels directed by the supervising geologist following specifications further outlined in this protocol.

B. **Monitoring Well Completion.** Initial downgradient monitoring wells will be constructed of 10 feet of .010-inch slot size well screen and riser casing that will extend from the screened interval to ground line. Both stainless steel and PVC will be used as described in the work plan (Section 3.10). Other materials utilized for completion will be washed silica sand (Q-Rock No. 4

or approved equivalent) bentonite grout, Portland cement, and a flush-mounted protective steel locking curb box.

The monitoring well installation method for wells installed within unconsolidated sediments shall be to place the screen and riser assembly into the casing once the screen interval has been selected. At that time, a washed silica sand pack will be placed around the well screen if required to prevent screen plugging. If a sand pack is not warranted, the auger string will be pulled back to allow the native aquifer material to collapse 2 to 3 feet above the top of the screen. Bentonite pellets will then be added to the annulus between the casing and the inside auger to insure proper sealing. Cement/bentonite grout will continue to be added during the extraction of the augers until the entire aquifer thickness has been sufficiently sealed off from horizontal and/or vertical flow above the screened interval. During placement of sand and bentonite pellets, frequent measurements will be made to check the height of the sand pack and thickness of bentonite layers by a weighted drop tape measure.

A flush-mounted steel curb box shall be located over the top of the well, at ground level, and secured by a Portland cement seal. The cement seal shall extend laterally at least 1 foot in all directions from the curb box and shall slope gently away to drain water away from the well. A monitoring well completion schematic for overburden wells is presented as Figure 4-1.

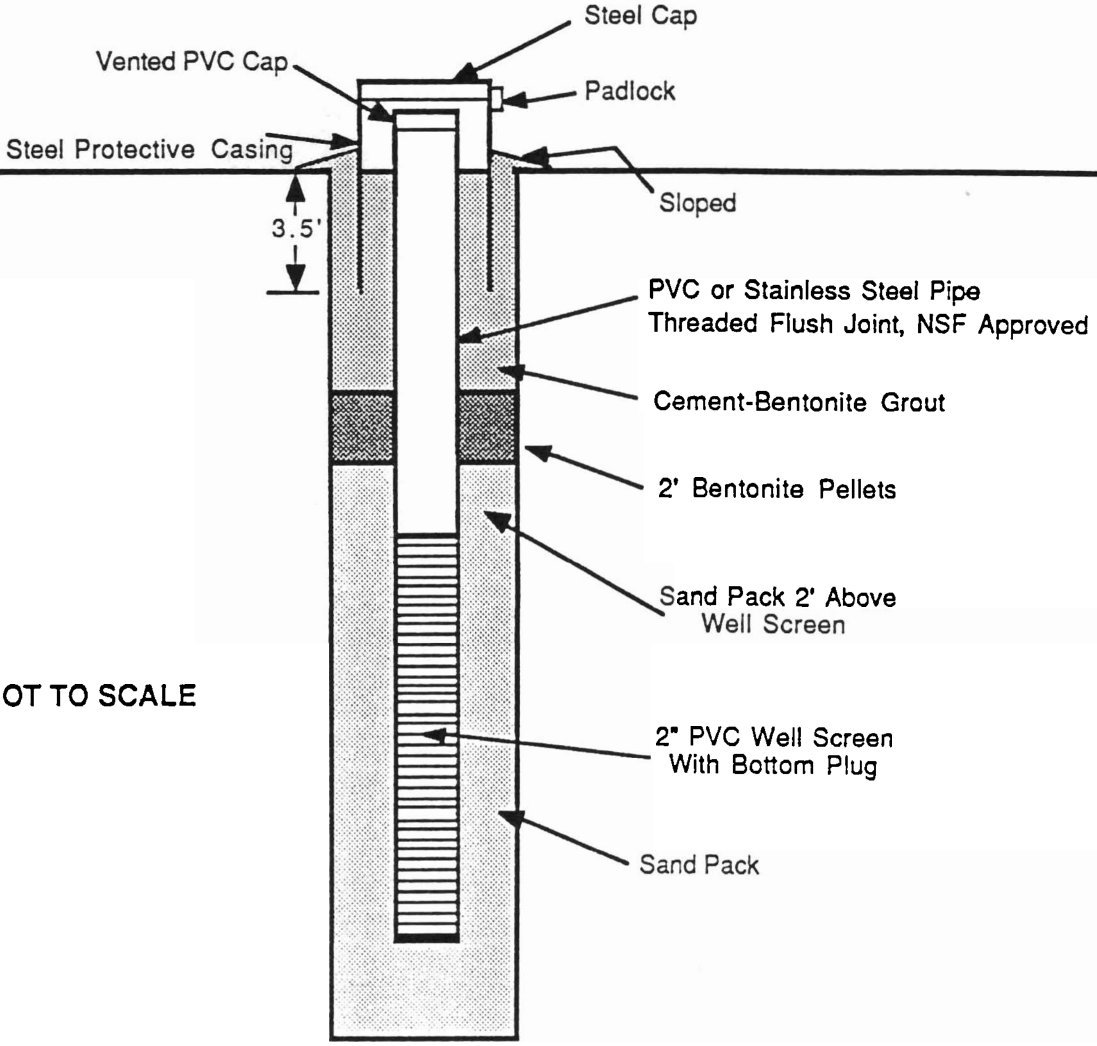
WELL DEVELOPMENT

All monitoring wells will be developed or cleared of all fine-grained materials and sediments that have settled in or around the well during installation so that the screen is transmitting representative portions of the groundwater. The development will be by one of two methods, pumping or bailing groundwater from the well until it yields relatively sediment-free water.

A decontaminated pump or bailer will be used and subsequently decontaminated after each use following procedures outlined in the Decontamination Protocol. Pumping or bailing will cease when specific conductivity, pH, and temperature are stable (i.e., consecutive readings are within 10 percent with no overall upward or downward trends in measurements).

All well development and purge water will be disposed of in an existing groundwater recharge pit located east of U.S. Route 11.

Figure 4.1



NOT TO SCALE

OVERBURDEN WELL

DECONTAMINATION

All drilling equipment and associated tools including augers, drill rods, sampling equipment, wrenches and any other equipment or tools that have come in contact with contaminated materials will be decontaminated before any drilling on site begins, between each well, and prior to removing any equipment from the site. The preferred decontamination procedure will be to use a high pressure steam cleaner to remove soils and volatile organics from the equipment. The water used for this procedure will be contained and shall come from a controlled source, preferably a municipal drinking supply. Decontamination water from steam cleaning will be disposed of in NYSEG's groundwater recharge pit. Rinse water that contains cleaning agents, such as methanol and/or nitric acid solution, will be containerized for off-site disposal. Every effort will be made to minimize the generation of contaminated water.

SAMPLING PROGRAM

A. **Bottle Preparation.** Sampling of air, soil vapors, groundwater, surface water, sediment, and soil will be conducted as described in the Field Sampling Plan. Sample collection for water, sediment, and soil will require appropriate bottle selection. Special canisters will be provided by the laboratory for air samples and a sorbent sample collection device will be used for soil vapor. It is important to use the proper sample containers in order to minimize the alteration of the sample chemistry between the field and the laboratory. Sample containers will be prepared by the laboratory. Proper preservation will be performed, the jars tagged, and the chain-of-custody initiated prior to shipping. The number of bottles, bottle types and preservatives are shown in Table 4-1.

B. **Methods of Sampling.** As a minimum, sampling procedure standards will be in accordance with the most recent USEPA guidelines and/or regulations. Appropriate and acceptable procedural techniques based on sample type and location will be utilized when such USEPA guidelines and/or regulations are non-existent.

Referenced sampling standards are listed below. All standards will be the latest in effect at the time of writing.

TABLE 4-1

SAMPLE CONTAINERIZATION

ANALYSIS	BOTTLE TYPE	PRESERVATIVE(1)	HOLDING TIME(2)
WATER SAMPLES			
TCL semi-volatiles	1-liter glass bottle, amber	Cool to 4°C	7 days (until extraction, 40 days extracted)
TCL volatiles	40 mil, glass vial with septum cap	Cool to 4°C	7 days
TAL metals	1 liter, plastic bottle	Nitric acid topH <2	6 months Mercury: 26 days
TOC	Plastic or glass	Sulfuric acid to pH <2	28 days
Cyanide	Plastic or glass	Cool to 4°C	14 days
Sulfide	Plastic or glass	Cool to 4°C	7 days
SOIL, SEDIMENT, SOLID WASTE			
TCL organics	Wide mouth, plastic or glass	Cool to 4°C	7 days (until extraction, 40 days extracted)
TAL metals and inorganics	Wide mouth, plastic or glass	Cool to 4°C	6 monthsCyanide: 12 daysMercury: 28 days
GAS SAMPLES			
GC: TO-14 (VOCs)	6-liter Summa canister	None; avoid light and heat	48 hours
GC: TO-17 (naphthalene)	PUF cartridges	Cool to 4°C; wrap in foil	48 hours

(1) All samples will be preserved with ice during collection and shipment.
(2) From verified time of sample receipt by the analytical laboratory (within 24 to 48 hours of collection).

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FIELD OBSERVATION LOG
AND SAMPLING RECORD

SITE: ____________________ DATE OF SAMPLING EVENT: __________

PROJECT NUMBER ____________________ Weather/Temperature: __________

SAMPLERS: ____________________ Time of Arrival: __________

Time of Departure: __________

GROUNDWATER SAMPLING INFORMATION

	MW-1	MW-2	MW-3	MW-4
Depth of Well:				
Depth to Product:				
Product Thickness:				
Depth to Groundwater:				
Volume Bailed:				
Observations:				
Color:				
Sheen				
Odor				

Purging Method: ____________________

2-in casing: ________ft of water x 0.16 = ______gallons

3-in casing: ________ft of water x 0.38 = ______gallons

4-in casing: ________ft of water x 0.65 = ______gallons

AIR/GAS SAMPLING INFORMATION				
STATION I.D.				
ANALYTICAL METHOD				
SAMPLING TIME/DATE				
AMBIENT SOIL CONDITIONS*				

Moisture content of soils should be recorded (dry, moist, wet)

AMBIENT AIR CONDITIONS**

** Ambient conditions should be monitored during gas collection process by PID or other screening technique.

Comments: ____

____

____

____

____

Figure 4-2

1. **Water.**

USEPA 600-4-79-020, "Methods for Chemical Analysis of Water and Wastes"
National Water Well Association, "Manual of Groundwater Sampling Procedures"
USEPA 600-4-83-040, "Characterization of Hazardous Waste Sites - A Methods Manual: Volume II - Available Sampling Methods"

2. **Air.**

USEPA 625-R-96-010, "Compendium of Methods or the Determination of Toxic Organic Compounds in Ambient Air"

MONITORING WELL SAMPLING

The sampling of monitoring wells consists of three procedures: well evacuation, well sampling, and analytical field tests. Each of these procedures is summarized below. Detailed monitoring well sampling procedures are presented in the FSP.

A. **Well Evacuation.** Prior to sampling a monitoring well, the static water level will be recorded and a minimum of three well volumes evacuated to assure that the water in the well is truly representative of the groundwater. Evacuated groundwater will be disposed of in the groundwater recharge pit located east of U.S. Route 11. All well data will be recorded on the field sampling record (Figure 4-2). For shallow wells or deep wells with a relatively low static water level, evacuation will be accomplished by using a disposable polyethylene, stainless steel, or teflon bailer with a ball check valve at its lower end. Water samples to be analyzed for volatile and/or semi-volatile organics must be sampled by bailer.

A peristaltic pump may be used in cases where the water level is less than 20 feet, measured vertically, from the pump discharge. A dedicated length of polyethylene or PVC tubing will be used as the suction line to prevent cross contamination between wells. A precleaned foot valve will be attached to the suction line to prevent backdraining of pumped water into the well. The suction line intake will typically be set just above the screened section of the well. The foot valve will be washed consecutively with soapy water, methanol, and deionized water between wells.

Prior to well evacuation, an interface probe will be used to identify non-aqueous phase liquid (NAPL) in each well.

B. **Sampling Procedure.** Groundwater samples will be collected using either stainless steel, teflon, or disposable polyethylene bailers with a ball check valve at the lower end. Incorporation of a check valve onto the bailers assures that a sample is representative of the depth to which the bailer is lowered. All samples will be removed from a depth just above the well screen to further assure a representative groundwater sample. Before and after sampling, the sampling device will be cleaned inside and out with soapy water, methanol, and then rinsed with distilled deionized water.

In addition to water samples collected from the monitoring wells, two types of "blanks" will be collected and submitted to the chemical laboratory for analyses. The blanks will consist of 40 ml VOA vials, as follows:

1. **Trip Blank**. A trip blank will be prepared before the sample bottles are sent by the laboratory. It consists of a sample of 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 samples where sampling and analysis for TCL volatiles is planned (water matrix only). The trip blank will be analyzed for TCL volatile organic compounds as a measure of the internal laboratory procedures and their effect on the results.

2. **Field (Wash) Blanks.** Field wash blanks are analyzed to check the effectiveness of decontamination. Each sample consists of distilled deionized water (prepared by the laboratory) poured through a decontaminated bailer or other sampling apparatus. It is usually collected as a last step in the decontamination procedure prior to sampling of a monitoring well. The wash blank can be analyzed for all or some of the compounds which the subsequent monitoring well sample is scheduled for.

C. **Analytical Field Tests.** Air quality monitoring for organic vapors with a photoionization detector is implemented at each well before, during and after sampling. The purpose of air quality monitoring is three-fold: (1) to determine whether the use of respirators is needed while on site; (2) to locate potential “hot spots” from which vapors may emanate; and (3) to support or disprove suspicions regarding the locations of the areas of high contamination.

After filling the sample bottles, a beaker of groundwater is filled and immediately analyzed for temperature (°C), specific conductance (umhos/cm) and pH. Specific conductance and pH are measured by electronic probe. Temperature will be measured by probe or thermometer. All equipment is calibrated daily and cleaned prior to each sample measurement. During the sampling and field testing, field sampling records are completed.

SURFACE MATERIAL SAMPLING

Surface sampling is a component of the SRI.

A. **Surface Water Samples.** Surface water samples will be collected from the Tioughnioga River directly into the sample bottle or by using a Wheaton grab sampler. The equipment will be cleaned before each sample with soapy water, followed by methanol and a rinse with distilled deionized water.

After filling of the sample bottles, a beaker is filled with the surface water sample. The sample is immediately analyzed for temperature (°C), specific conductance (umhos/cm) and pH. Specific conductance and pH are measured with electronic probe. Temperature will be measured by probe or with a thermometer. All equipment is cleaned and calibrated before each sample. During the sampling and field testing, field surface sampling records are completed.

B. **Sediment Sampling.** Sediment samples will be collected from the upper 3 inches of the bed using a stainless steel spoon. The use of a stilling well will be based on observed water turbulence at the time of sampling. Rocks and vegetative material should be discarded. Care should be exercised to avoid losing the fine materials which tend to disperse when disturbed. The supernatant, or native water, on top of the final sample should not be removed.

The temperature, specific conductance and pH of any supernatant will be measured as described above where possible. This information, along with a sample description, will be recorded on the field surface sampling record. The sampling equipment will be washed before each sample with soapy water, followed by methanol, and finally distilled deionized water.

C. **Surface Soil Samples.** All surface soil samples will be collected by hand using a bucket auger or stainless steel spatula precleaned with soapy water, followed by methanol, and rinsed with distilled deionized water. The sampling location and sample description will be recorded on the sample record.

D. **Trip Blanks.** A trip blank consisting of distilled deionized water will be prepared by the laboratory and accompany the sample bottles into the field and back to the laboratory as previously described.

PASSIVE SOIL GAS SAMPLING

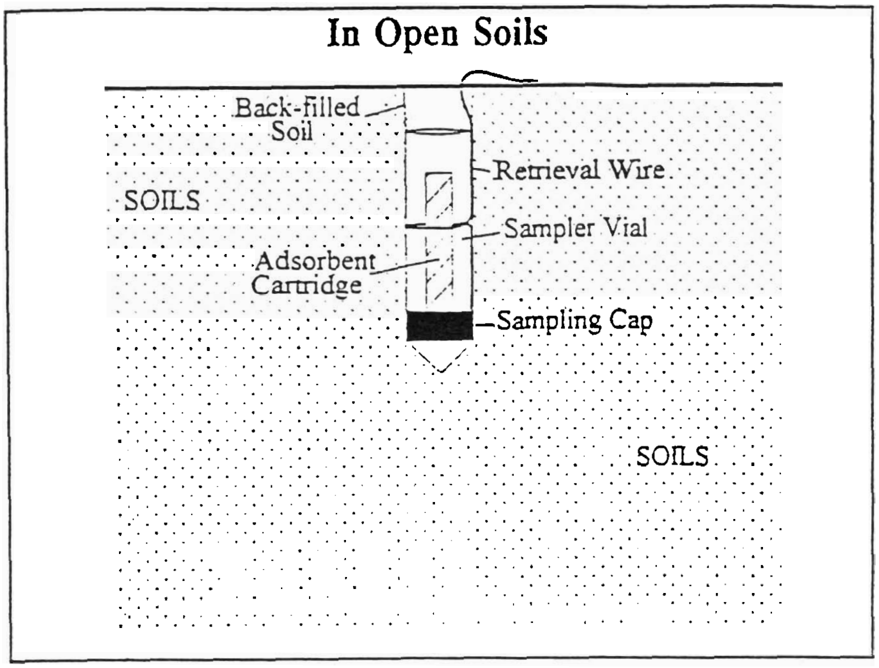
The following field procedures are routinely used during EMFLUX® soil gas surveys. Modifications can be and are incorporated from time to time in response to individual project requirements. In all instances, USEPA-approved quality assurance and quality control practices will be followed.

As a general rule, ambient conditions need to be precisely documented at the time the sample devices are deployed. Among the more critical information is the soil's moisture content, and the occurrence of precipitation in the 24-hour period before the test, and also during the test period itself. Soil conditions should be described as either dry, moist, or wet (saturated) at the time the samplers are deployed and retrieved. Also, depth to groundwater information, if available, should be recorded at some time during the sampling period. If possible, the period of the test should be planned so that heavy or long-duration rainfall events are avoided. Ideally, the conditions during the test should be as dry as possible.

1. Field personnel carry EMFLUX® system components and support equipment to the site and deploy the EMFLUX® collectors in a prearranged survey pattern.

2. For those sample locations covered with soils or vegetation, a field technician clears vegetation and debris, exposing the ground surface. Using a hammer and a 3/4-inch diameter pointed metal stake, the technician creates a hole approximately 3 inches deep. For those locations covered with an asphalt or concrete cap, the field technician drills a 1-inch diameter hole through the cap to the soils beneath. (If necessary, the collector can be sleeved with a 3/4-inch I.D. copper pipe for either capped or uncapped locations.)

3. The technician then removes the solid plastic cap from an EMFLUX® collector (a glass vial containing an adsorbent cartridge with a length of wire attached to the vial for retrieval) and replaces it with a sampling cap (a plastic cap with a hole covered by screen meshing). The


In Open Soils

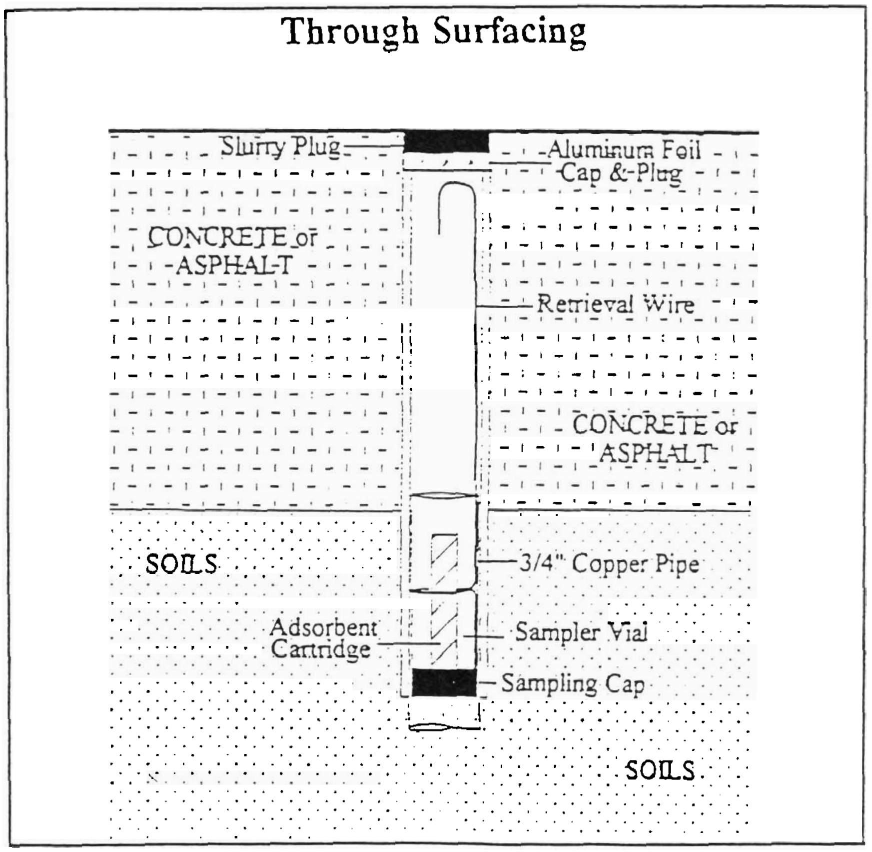

Through Surfacing

FIGURE 4-3

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technician inserts the collector, with the sampling cap end facing down, into the hole (Figure 4-3). The collector is then covered with either local soils for uncapped locations or, for capped locations, aluminum foil and a concrete patch. The collector's location, time and date of emplacement, and other relevant information are recorded on the Field Sampling Record.

4. As a quality control check during emplacement and retrieval, the technician takes periodic ambient air control samples with a PID and records the date, time, and location of each. (One or more trip blanks are also included as part of the quality control procedures.)

5. Once all EMFLUX® collectors have been deployed, field personnel schedule collector recovery (approximately 72 hours after emplacement) and depart, taking all no-longer-needed equipment and materials with them.

6. Field personnel retrieve the collectors at the end of the 72-hour exposure period. At each location, a field technician withdraws the collector from its hole and wipes the outside of the vial clean using gauze cloth; following removal of the sampling cap, the threads of the vial are also cleaned. A solid plastic cap is screwed onto the vial and the sample location number is written on the label. The technician then records sample point location, date, time, etc. on the Field Sampling Record (Figure 4-2).

7. Sampling holes are refilled with soil, sand, or other suitable material. If collectors have been installed through asphalt or concrete, the hole is filled to grade with a plug of cold patch or cement.

8. Following retrieval, field personnel ship the EMFLUX® collectors to the analytical laboratory.

Control samples will be collected at five locations in the passive gas survey to measure representative ambient air conditions. At these five locations, after the passive sampler is deployed, control sample vials will be exposed to air for 10 seconds, which is roughly the time the passive sampler would be exposed to air. The same procedure would take place during the retrieval of the samplers. In addition, one trip blank will accompany the sampling technician during deployment and retrieval of the samplers.

Because the analytical methods for the sorbent media are generally not as susceptible to contaminant recovery problems as other media (such as soil or water samples), the passive survey analytical procedures have been demonstrated to consistently and reliably recover contaminants present in the sorbent media. Therefore, standard protocol for the passive soil gas analysis generally does not require matrix or surrogate spikes.

AIR SAMPLING

Indoor air samples will be collected as 24-hour time-weighted average samples. Air sampling will take place according to two specific programs:

1. **VOCs.** Summa canisters will be used to collect air samples which will be analyzed for VOCs according to analytical Method TO-14.

2. **Naphthalene and 2-methylnaphthalene.** A modified Method TO-17 will be used to analyze air samples for the PAHs naphthalene and 2-methylnaphthalene. Low flow sampling pumps fitted with sampling cartridges, and polyurethane foam (PUF) will be used to collect the time-weighted samples.

A. **Sampling with Summa Canisters.** There are two basic methods of sampling with Summa canisters: grab and integrated. A grab sample is taken over a short period of time (i.e., 1 to 5 minutes), whereas an integrated sample is collected over longer periods (1 to 24 hours). For both types of sampling, an evacuated Summa canister is used to "pull" air into the canister.

The Summa canister comes with a brass plug that is removed prior to sampling. (The plug ensures the vacuum seal is maintained and that no dust fouls the valve.) A filter is used to prevent particulate matter from entering the canister during the sampling event. For grab sampling, a 5-micron filter is used. For integrated sampling, a 7-micron filter is used.

A vacuum gage measures the initial and final vacuum of the canister and monitors the filling of the canister when collecting an integrated sample. Other than to measure the receipt vacuum of the canister, a gage is generally not used for grab sampling. The gages are intended only to provide a relative measure of change. Their accuracy does not allow a canister-to-canister comparison.

1. Check the receipt pressure prior to use. The initial vacuum should be greater than 25 inches Hg.

   a. Verify that canister valve is closed.

   b. Remove brass plug and attach the gage tightly.

   c. Open and close the canister valve. The gage will register the level of vacuum. Record this value on the chain of custody.

   d. Verify that the canister valve is closed, remove the gage, and replace the brass plug. If the canister has less than 25 inches Hg, do not use. Order a new canister from the laboratory.

2. Measure the flow rate.

   a. Take the flow sensor provided with the canister and allow it to warm up for 15 minutes. Assemble as shown on Figure 4-4. BE SURE ALL CONNECTIONS ARE TIGHT (generally, finger tight plus 1/16 turn with a wrench).

   b. Open canister valve and note the flow.

   c. Close the valve.

3. Assemble hardware according to Figure 4-4. All fittings are 1/4-inch Swagelok®. A 9/16-inch open-end wrench is used to assemble the hardware: Canister → Flow controller → Gage → Filter. BE SURE ALL CONNECTIONS ARE TIGHT (generally, finger tight plus 1/16 turn with a wrench). Sampling can now begin.

4. Open valve and note the time.

In general, do not deploy sampling device in direct sunlight, as temperature swings will affect sample collection rate. As long as the pressure difference through the flow controller is greater than 4 inches Hg ambient pressure, the canister will fill at a constant rate. If the canister is properly prepared by the laboratory, and the fittings are adequately tight, this should not be a problem.

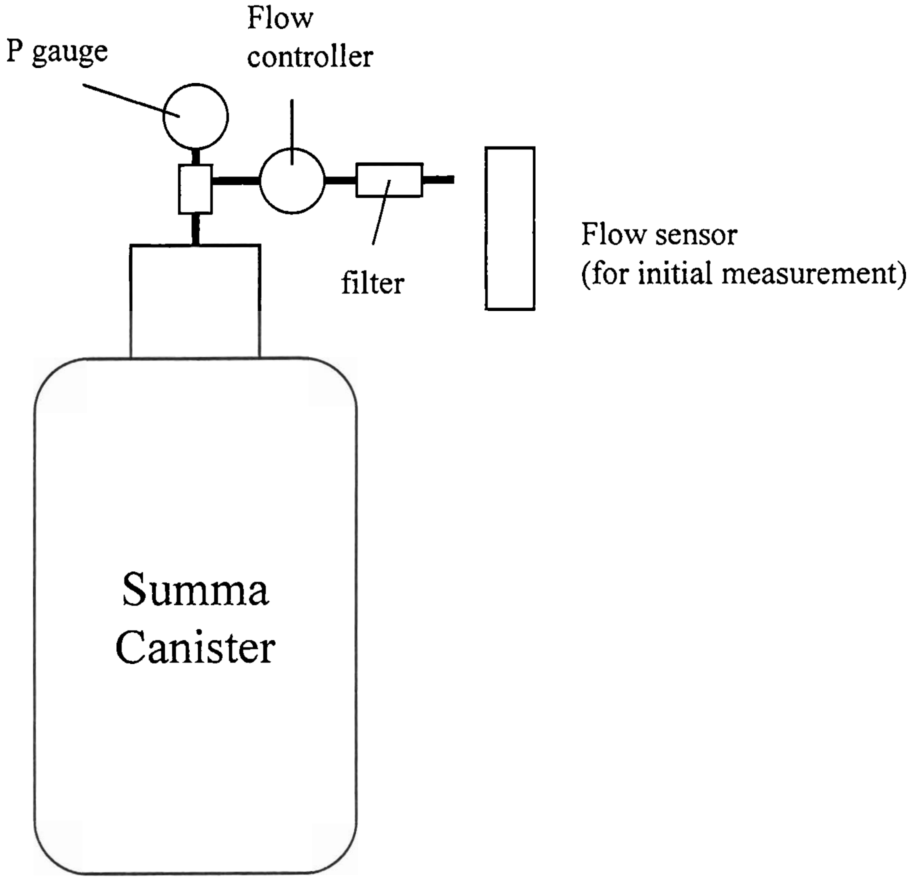

P gauge
Flow
controller
filter
Flow sensor
(for initial measurement)
Summa
Canister

FIGURE 4-4

Ideally, the final vacuum in the canister should be greater than 4" Hg. It will usually run between 6 and 12 inches Hg for a 24-hour test. If it is less than this, then the sample will be skewed towards the first portion of the sampling period. Although non-linear, the sample may still be valid if the beginning and ends of the sampling period are clearly defined, and the initial and final vacuums are recorded.

B. Sampling with Low Flow Pumps.

1. Carefully remove a clean sample (PUF) cartridge from its foil wrapping and connect it to the pump with flexible tubing.

2. Locate the sampling pump in an unobstructed area away from obstacles to air flow. The PUF cartridge should be between 3 and 6 feet above the ground.

3. Turn the pump on to activate the time meter and begin sampling. Record the start time.

4. At the end of the desired sampling period, turn the pump off. Remove the PUF cartridge and place it in the foil packaging. Use new aluminum foil if needed to complete a tight wrap.

5. Place the PUF cartridge in a cooler, and return to the laboratory for analysis.

SAMPLE PRESERVATION AND SHIPMENT

Since all bottles will contain the necessary preservatives as shown in Table 4-1, they need only be filled. The 40 ml VOA vials must be filled brim full with no air bubbles. The other bottles should be filled to within about 1 inch from the top.

The bottles will be sent from the laboratory in coolers which will be organized on a per site basis. Following sample collection, the bottles should be placed on ice in the shipping cooler. The samples will be cooled to 4°C, but not frozen.

Final packing and shipment of coolers will be performed in accordance with guidelines outlined in the "User's Guide to the CLP." Chain-of-custody documentation (Figure 4-5) will accompany all sample shipments.

Figure 4-5

CHAIN OF CUSTODY RECORD

Stearns&Wheler, LLC
ENVIRONMENTAL ENGINEERS & SCIENTISTS
One Remington Park Drive
Cazenovia, New York 13035
(315) 655-8161 fax 315.655.4180

Job #________________ **Due Date**________________

Sample Type
1. wastewater
2. soil
3. sludge
4. sediment
5. drinking water
6. water (gw/mw/sw)
7. other (specify)

Container Type
- P - plastic
- G - clear glass
- AG - amber glass
- V - voa

ANALYSES

Company:	
Address:	
Phone #: ( )	Fax #: ( )
Contact Person:	

Lab ID	Sample ID	Sample Type	Container Size / Type	Sampling Date/Time	Preservative Information							

Sampled By:	Date/Time:	°C:			
Relinquished By:	Date/Time:	°C:	Received By:	Date/Time:	°C:
Relinquished By:	Date/Time:	°C:	Received By:	Date/Time:	°C:
Method of Shipment:					

SWCOC.XLS

Make and Keep a Copy of This Document
Prior to Forwarding With Samples!!

SECTION 5

SAMPLE CUSTODY

The program for sample custody and sample transfer is in compliance with the NYSDEC-ASP, as periodically updated. If samples may be needed for legal purposes, chain-of-custody procedures, as defined by NEIC Policies and Procedures (USEPA-330/9-78-001-R, Revised June 1988) will be used. Sample chain-of-custody is 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 should be minimized.

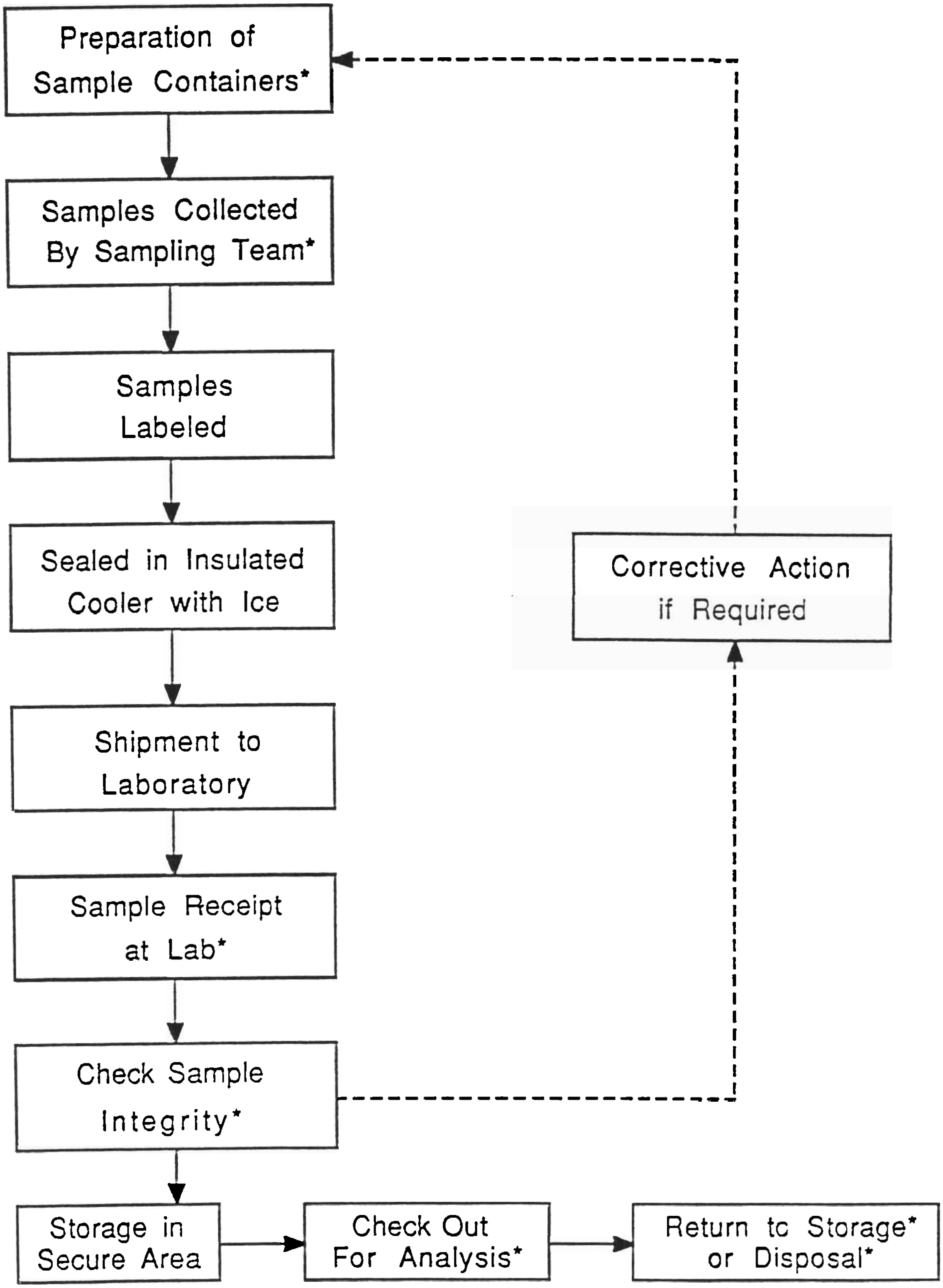
FIELD SAMPLE CUSTODY

A chain-of-custody record accompanies the sample from initial sample container selection and preparation at the laboratory, shipment to the field for sample containment and preservation, and return to the laboratory. An example of a sample custody flow chart is provided in Figure 5-1. If samples are split and sent to different laboratories, a copy of the chain-of-custody record will be sent with each sample. Figure 4-5 is a typical example of a chain-of-custody record. The "Remarks" column is 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 follow the samples to the laboratory. The laboratory maintains one file copy and the completed original is returned to the site inspection team. Individual sample containers provided by the laboratory are used for shipping samples. The shipping containers are insulated and chemical or ice water is used to maintain samples at approximately 4°C until samples are returned and in the custody of the laboratory. All sample bottles within each shipping container are individually labeled and controlled. Samples are to be shipped to the laboratory within 24 to 48 hours of the day of collection.

Each sample shipping container is assigned a unique identification number by the laboratory. This number is recorded on the chain-of-custody record and is marked with indelible ink on the outside of the shipping container. The field sampler will indicate the sample designation/location number in the space provided on the appropriate chain-of-custody form for each sample collected. The shipping container is closed and a seal provided by the laboratory is affixed to the latch. This seal must be broken to open the container, and this indicates possible tampering if the seal is broken

Figure 5.1

SAMPLE CUSTODY



*requires sign-off on Chain of Custody Form

Stearns & Wheler

before receipt at the laboratory. The laboratory will contact the site investigation team leader and the sample will not be analyzed if tampering is apparent.

LABORATORY SAMPLE CUSTODY

The site investigation team leader or Project Quality Assurance Officer notifies 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 meets the following criteria:

1. The laboratory has designated a sample custodian who is responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.

2. 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 signs the chain-of-custody record and records the date and time received.

3. Care is exercised to annotate any labeling or descriptive errors. In the event of discrepant documentation, the laboratory will immediately contact the site investigation team leader as part of the corrective action process. A qualitative assessment of each sample container is performed to note any anomalies, such as broken or leaking bottles. This assessment is recorded as part of the incoming chain-of-custody procedure.

4. The samples are stored in a secured area at a temperature of approximately 4°C until analyses are to commence.

5. A laboratory chain-of-custody record accompanies the sample or sample fraction through final analysis for control.

6. A copy of the chain-of-custody form will accompany the laboratory report and will become a permanent part of the project records.

FINAL EVIDENCE FILES

Final evidence files include all originals of laboratory reports and are maintained under documented control in a secure area.

A sample or an evidence file is under custody if:

- it is in your possession; it is in your view, after being in your possession
- it was in your possession and you placed it in a secure area
- it is in a designated secure area

SECTION 6

CALIBRATION PROCEDURES

Instruments and equipment used to gather, generate or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the appropriate manufacturer's specifications or project specific requirements. The procedures for instrument calibration, calibration verification, and the frequency of calibrations are described in the NYSDEC-CLP. The calibration of instruments used for the determination of metals will be as described in the appropriate CLP standard operating procedures.

Calibration of other instruments required for measurements associated with these analyses will be in accordance with the manufacturer's recommendations and the standard operating procedures of the laboratory.

SECTION 7

ANALYTICAL PROCEDURES

Analytical procedures shall conform to the most recent revision of the NYSDEC-ASP and are summarized on Table 7-1. In the absence of USEPA or NYSDEC guidelines, appropriate procedures shall be submitted for approval by NYSDEC prior to use.

The procedures for the sample preparation and analysis for organic compounds are as specified in the NYSDEC-ASP. Analytical cleanups are mandatory where matrix interferences are noted. No sample shall be diluted any more than 1 to 5. The sample shall be either re-extracted, re-sonicated, re-stream distilled, etc. or be subjected to any one analytical cleanup noted in SW846 or a combination thereof. The analytical laboratory shall expend such effort and discretion to demonstrate good laboratory practice and demonstrate an attempt to best achieve the method detection limit.

VOLATILE ORGANICS (VOA)

For the analysis of water samples for Target Compound List (TCL), volatile organic compounds (VOCs), no sample preservation is required. The analytical procedure for volatiles is detailed in NYSDEC-ASP (Volume I, Section D-I). A measured portion of the sample is placed in the purge and trap apparatus and the sample analysis is performed by gas chromatography/mass spectrometry for the first round. USEPA Methods 8010 or 8020 (gas chromatography with different detectors) will be used if subsequent rounds with lower limits of detection are warranted.

For indoor air samples, USEPA Method TO-14 will be followed for analysis for VOCs.

SEMI-VOLATILE ORGANIC COMPOUNDS

The extraction and analytical procedures used for preparation of water, soil and sediment samples for the analysis of the TCL semi-volatile organic compounds are described in NYSDEC-ASP Volume I, Section D-III.

TABLE 7-1

CONTRACT-REQUIRED QUANTITATION LEVELS AND ANALYTICAL METHODS
ASP INORGANICS, ASP VOLATILES, ASP SEMI-VOLATILES. ASP PESTICIDES, AND PCBS

Superfund Target Compound List (TCL) and Contract-Required Quantitation Limit

SECTION 1 - ASP INORGANICS

Method: NYSDEC-ASP-91-4

PARAMETER	CONTRACT-REQUIRED DETECTION LEVEL* (μg/l)
1. Aluminum	200
2. Antimony	60
3. Arsenic	10
4. Barium	200
5. Beryllium	5
6. Cadmium	5
7. Calcium	5000
8. Chromium	10
9. Cobalt	50
10. Copper	25
11. Iron	100
12. Lead	3
13. Magnesium	5000
14. Manganese	15
15. Mercury	0.2
16. Nickel	40
17. Potassium	5000
18. Selenium	5
19. Silver	10
20. Sodium	5000
21. Thallium	10
22. Vanadium	50
23. Zinc	20
24. Cyanide	10

*Matrix: groundwater. For soil matrix, multiply CRDL by 100.

TABLE 7-1 (continued)

SECTION I - ASP ORGANICS
Method: NYSDEC-ASP-91-1

VOLATILE	CONTRACT-REQUIRED QUANTITATION LIMIT (μg/l)*
1. Chloromethane	10
2. Bromomethane	10
3. Vinyl chloride	10
4. Chloroethane	10
5. Methylene chloride	10
6. Acetone	10
7. Carbon disulfide	10
8. 1,1-Dichloroethylene	10
9. 1,1-Dichloroethane	10
10. 1,2-Dichloroethylene (total)	10
11. Chloroform	10
12. 1,2-Dichloroethane	10
13. 2-Butanone	10
14. 1,1,1-Trichloroethane	10
15. Carbon tetrachloride	10
16. Bromodichloromethane	10
17. 1,1,2,2-Tetrachloroethane	10
18. 1,2-Dichloropropane	10
19. cis-1,3-Dichloropropene	10
20. Trichloroethene	10
21. Dibromochloromethane	10
22. 1,1,2-Trichloroethane	10
23. Benzene	10
24. Trans-1,3-Dichloropropene	10
25. Bromoform	10
26. 2-Hexanone	10
27. 4-Methyl-2-pentanone	10
28. Tetrachloroethylene	10
29. Toluene	10
30. Chlorobenzene	10
31. Ethylbenzene	10
32. Styrene	10
33. Total xylenes	10

*Quantitation limit for medium-level soil is 1200 μg/kg (wet weight basis).

SECTION I - ASP ORGANICS
Method: NYSDEC-ASP-91-2

SEMI-VOLATILES	CONTRACT-REQUIRED QUANTITATION LIMIT (μg/l)
34. Phenol	10
35. Bis(2-chloroethyl) ether	10
36. 2-Chlorophenol	10
37. 1,3-Dichlorobenzene	10
38. 1,4-Dichlorobenzene	10
39. 1,2-Dichlorobenzene	10
40. 2-Methylphenol	10
41. 2,2' oxybis(1-Chloropropane)	10
42. 4-Methylphenol	10
43. N-Nitroso-dipropylamine	10
44. Hexachloroethane	10
45. Nitrobenzene	10
46. Isophorone	10
47. 2-Nitrophenol	10
48. 2,4-Dimethylphenol	10
49. bis(2-Chloroethoxy) methane	10
50. 2,4-Dichlorophenol	10
51. 1,2,4-Trichlorobenzene	10
52. Naphthalene	10
53. 4-Chloroaniline	10
54. Hexachlorobutadiene	10
55. 4-Chloro-3-methylphenol	10
56. 2-Methylnaphthalene	10
57. Hexachlorocyclopentadiene	10
58. 2,4,6-Trichlorophenol	10
59. 2,4,5-Trichlorophenol	25
60. 2-Chloronaphthalene	10
61. 2-Nitroaniline	25
62. Dimethyl phthalate	10
63. Acenaphthylene	10
64. 2,6-Dinitrotoluene	10
65. 3-Nitroaniline	25
66. Acenaphthene	10
67. 2,4-Dinitrophenol	25

TABLE 7-1 (continued)

SECTION I - ASP ORGANICS
Method: NYSDEC-ASP-91-2

SEMI-VOLATILES	CONTRACT-REQUIRED QUANTITATION LIMIT
68. 4-Nitrophenol	25
69. Dibenzofuran	10
70. Dinitrotoluene	10
71. Diethylphthalate	10
72. 4-Chlorophenyl phenyl ether	10
73. Fluorene	10
74. 4-Nitroanile	25
75. 4,6-Dinitro-2-methylphenol	25
76. N-nitrosodiphenylamine	10
77. 4-Bromophenyl phenyl ether	10
78. Hexachlorobenzene	10
79. Pentachlorophenol	25
80. Phenanthrene	10
81. Anthracene	10
82. Carbazole	10
83. Di-n-butyl phthalate	10
84. Fluoranthene	10
85. Pyrene	10
86. Butyl benzyl phthalate	10
87. 3,3'-Dichlorobenzidine	10
88. Benz(a) anthracene	10
89. Chrysene	10
90. bis(2-ethylhexyl)phthalate	10
91. Di-n-octyl phthalate	10
92. Benzo(b)fluoranthene	10
93. Benzo(k)fluoranthene	10
94. Benzo(a)pyrene	10
95. Indeno(1,2,3-cd)pyrene	10
96. Dibenz(a,h)anthracene	10
97. Benzo(g,h,i)perylene	10

Instrument calibration, compound identification, and quantitation are performed as described in Section 6 of this document and in the NYSDEC-ASP.

A modified Method TO-17 will be used to analyze air samples for naphthalene. This modified method will resemble the guidance set forth under USEPA Method TO-10A, allowing for the collection of 24-hour time-integrated samples.

METALS

Water, soil and waste samples will be analyzed for the metals listed in Table 7-2. The detection limits for these metals are as specified in the NYSDEC-ASP, Section D-V. The instrument detection limits will be determined using calibration standards and procedures specified in the NYSDEC-ASP. The detection limits for individual samples may be higher due to the sample matrix. The procedures for these analyses will be as described in the NYSDEC-ASP.

The digestion procedures for water samples are not recommended for samples requiring analysis for mercury, arsenic or selenium. The aliquot of sample analyzed for As and Se will be prepared using the modifications described in USEPA Methods 206.2 CLP-M and 270.2 CLP-M, respectively. Analysis for mercury requires a separate digestion procedure (245.1 CLP-M, or 245.2 CLP-M).

The analyses for metals will be performed by atomic absorption spectroscopy (AAS) or inductively-coupled plasma emission spectroscopy (ICPES), as specified in the ASP with regard to AAS flame analysis.

SITE SPECIFICITY OF ANALYSES

Work plans prepared for remedial investigation waste sites contain recommendations for the chemical parameters to be determined for each site. Thus, some or all of the referenced methods will apply to the analysis of samples collected at the individual waste sites. Analyses of Target Compound List (TCL) analytes will be performed on all samples.

TABLE 7-2

ELEMENTS DETERMINED BY INDUCTIVELY-COUPLED PLASMA EMISSION OR ATOMIC ABSORPTION SPECTROSCOPY

ELEMENT	CONTRACT REQUIRED DETECTION LIMITS (µg/l)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5,000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	5
Magnesium	5,000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5,000
Selenium	5
Silver	10
Sodium	5,000
Thallium	10
Tin	40
Vanadium	50
Zinc	20

SECTION 8

DATA REDUCTION, VALIDATION, AND REPORTING

Although ASP will ensure that the laboratory data package can undergo the validation process, it is understood that validation will not necessarily be completed as part of this work plan scope. The following is provided, however, in the event that validation is required at a future time. Principal criteria to be used to validate the integrity of data during collection and reporting will adhere to the NYSDEC-CLP Volumes I and IV unless otherwise specified.

A. **TCL Organic Compounds.** The instrument performance test data will accompany the raw data to be analyzed. The following criteria must be attained to make qualitative identification of an organic pollutant:

> Identification and quantification of compounds should be done in accordance with NYSDEC's Analytical, Quality Control and Reporting Requirements as adopted from the USEPA Caucus Protocol for the Contract Laboratory Program, with the requirement that all GC/MS peaks greater than 10 percent of the nearest calibrating standard be included in the identification and quantification.
>
> Characteristic ions for each compound of interest must maximize in the same or within one scan of each other.
>
> Retention time must occur within ±30 seconds of the retention time of the authentic compound.
>
> Relative peak heights of the three characteristic ions in the Extracted Ion Current Profile (EICP) must fall within ±20 percent of the relative intensities of these ions in a reference mass spectrum. The reference mass spectrum can be obtained by a standard analyzed in the GC/MS system or from a reference library.
>
> The entire mass spectrum of the compound of interest is compared to the reference compound.

- As an additional measure for TCL volatile and semi-volatile analyses, a library search for and quantification of any additional non-TCL compounds.

Structural isomers having similar mass spectra can be explicitly identified only if the resolution between authentic isomers in a standard mix is acceptable. Acceptable resolution is achieved if the base-to-valley height between the isomers is less than 25 percent of the sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs.

When a compound has been identified, the quantitation of that compound is based on the integrated abundance from the EICP of the primary characteristic ion. The base peak ion for internal standards is used. If the sample produces an interference for the first listed ion, a secondary ion is used to quantitate. Quantitation is performed using internal standard techniques.

When the internal standard calibration procedure is used, the concentration in the sample is calculated by using the response factor (RF) as determined by the following equation:

$$\text{Concentration : g/l} = \frac{(A_s)\,(I_s)}{(A_{is})\,(Rf)\,(V^{\circ})}$$

where:

g/l = Grams per liter
A_s = Area of the characteristic ion for the parameter to be measured
A_{is} = Area of the characteristic ion for the internal standard
I_s = Amount of internal standard added to each extract (g)
V° = Volume of water extracted (liters)
Rf = Response factor

To ensure that reported data are accurate, all such resultant data are verified. Retention times and area counts are checked carefully for correct and accurate identification and quantification. All calculations are reviewed by a second analyst not involved in the original review.

B. **Metals.** The analytical and data reduction procedures specified in the ASP and as periodically updated are used to qualify and quantify metals.

All analyses will be reported by the laboratories to the specified project manager and data validator within a period of days to be defined by the laboratory subcontract.

REPORTING

The analytical report will be prepared in accordance with the NYSDEC-ASP December 1991 and as periodically updated. The appropriate forms for reporting results, QA/QC data, and additional documentation required by the ASP will be included in each report.

All samples collected at each individual site during a sampling episode are planned to be analyzed as a set and reported in a single report package.

ATTESTMENT

The following statement will be included on all laboratory reports of analytical testing:

> "I certify that the analytical procedures used are in accordance with NYSDEC-ASP December 1991 or most recent edition __________ (date)."

CHAIN-OF-CUSTODY SHEET

Completed copies of the chain-of-custody sheets accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the report by the analytical testing lab.

LABORATORY TRACKING RECORDS

The following forms (Figures 8-1 to 8-7) are to be provided to the analytical laboratory for completion and inclusion in the case narrative of the data package.

Matrix	Volatile Analysis Method # and Number of Samples	Metals Analysis Method # and Number of Samples	Base/Neutral/ Acid Extractables Method # and Number of Samples	Pesticide/PCB Method # and Number of Samples	Other
GROUNDWATER					
SOIL					
LEACHATE					
SLUDGE					
AIR					
FIELD BLANKS					
TRIP BLANKS					
DUPLICATES					
LABORATORY QA/QC					

Figure 8.1

To be included with
all lab data and with
each workplan

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE IDENTIFICATION AND ANALYTICAL REQUIREMENT SUMMARY

Customer Sample Code	Laboratory Sample Code	Analytical Requirements*					
		*VOA GC/MS	*BNA GC/MS	*VOA GC	*PEST PCB	*METALS	*OTHER

* Check Appropriate Boxes

* CLP, Non-CLP
* HSL, Priority Pollutant

PLEASE INDICATE YEAR OF PROTOCOL USED

Figure 8.2

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
B/N-A
ANALYSES

SAMPLE ID	MATRIX	DATE COLLECTED	DATE REC'D AT LAB	DATE EXTRACTED	DATE ANALYZED

Figure 8.3

.DU,OPREP,1

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY

ORGANIC ANALYSES

SAMPLE ID	MATRIX	ANALYTICAL PROTOCOL	EXTRACTION METHOD	AUXILARY CLEAN UP	DIL/CONC FACTOR

Figure 8.4

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
VOA
ANALYSES

SAMPLE ID	MATRIX	DATE COLLECTED	DATE REC'D AT LAB	DATE EXTRACTED	DATE ANALYZED

Figure 8.5

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
PESTICIDE/PCB
ANALYSES

SAMPLE ID	MATRIX	DATE COLLECTED	DATE REC'D AT LAB	DATE EXTRACTED	DATE ANALYZED

Figure 8.6

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY

INORGANIC ANALYSES

SAMPLE ID	MATRIX	METALS REQUESTED	DATE RECEIVED	DATE DIGESTED	DATE ANALYZED

Figure 8.7

INORGANIC ANALYSES

LABORATORY SAMPLE CODE	MATRIX	ANALYTICAL PROTOCOL	DIGESTION PROCEDURE	MATRIX MODIFIER	DIL/CONC FACTOR

Figure 8.8

SECTION 9

INTERNAL QUALITY CONTROL

QUALITY ASSURANCE BATCHING

The following guidelines apply to laboratory QA/QC to be followed during subsequent investigation phases and for laboratory analysis of active gas samples. Each set of samples will be analyzed concurrently with blanks, matrix spikes, surrogate spikes and replicate at the frequency described in the NYSDEC-ASP.

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.

ORGANIC BLANKS, SPIKED BLANK AND MATRIX SPIKE

Analysis of blank samples verifies that the analytical method does not introduce contaminants. The blank water can be generated by reverse osmosis and Super-Q filtration systems, or distillation of water containing $KMnO_4$. The spiked blank is generated by addition of standard solutions to the blank water. The matrix spike is generated by addition of standard solutions to the blank water. The matrix spike is generated by addition of surrogate standard to each sample.

TRIP AND FIELD BLANKS

Trip blanks and field blanks will be utilized in accordance with the specifications in Section 4 of this QA/QC Project Plan. These blanks will be analyzed to provide a check on sample bottle preparation and to evaluate the possibility of atmospheric or cross contamination of the samples.

SECTION 10

PERFORMANCE AND SYSTEMS AUDITS

Quality assurance audits are performed by the project quality assurance group under the direction and approval of the project quality assurance officer (PQAO). Functioning as an independent body and reporting directly to company quality assurance management, the PQAO will plan, schedule and approve system and performance audits based upon company procedure customized to the project requirements. These audits will 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 PQAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. However, these personnel will not have responsibility for the project work associated with the performance audit. Any deviation from the work plan must receive prior approval from the NYSDEC Quality Assurance Officer (QAO).

SYSTEM AUDITS

System audits, performed by the PQAO or designated auditors, will encompass evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory quality control procedures and associated documentation will be system audited. These audits will be performed at least once during the performance of the project. However, if conditions adverse to quality are detected between planned audits, or if the project manager requests the PQAO to perform unscheduled visits, these activities will be instituted.

PERFORMANCE AUDITS

Performance audits will be conducted on a quarterly basis to determine the accuracy and implementation of the measurement system(s) and parameter(s). As in system audits, the PQAO or assigned alternate will exercise planned and scheduled performance audits with the understanding that unplanned audits may be implemented for reasons stipulated in system audits above. Performance audits are most desirable and will be performed once the measurement systems are operational and initially generating measurement data.

QA MANAGEMENT ASSESSMENT

In addition to ongoing system and performance audits, quality assurance management assessments will be performed regularly by Stearns & Wheler. Such assessments will inform both company and project management that overall quality assurance requirements have been properly implemented and audited by the project QA group.

FORMALIZED AUDITS

Formalized audits refer to any system or performance audit that is documented and implemented by the QA group. These 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. Formalized 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 non-compliance shall be identified at exit interviews conducted with the involved management. Non-compliances 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 are directed to management to satisfactorily resolve the non-compliance in a specified and timely manner. All audit checklists, audit reports, audit findings and acceptable resolutions are approved by the PQAO prior to issue. QA verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the PQAO will close out the audit report and findings.

It is the project manager's overall responsibility to ensure that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily.

CHANGES TO WORK PLAN

Any change or deviation from the agreed protocols detailed in the Work Plan must be approved by both Stearns & Wheler's PQAO and the NYSDEC PQAO.

SECTION 11

PREVENTIVE MAINTENANCE

PREVENTIVE MAINTENANCE PROCEDURES

Equipment, maintenance, 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.

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.

In the absence of any manufacturer's recommended maintenance criteria, a maintenance procedure will be developed by the operator based upon experience and previous use of the equipment.

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 project QA group may audit these records to verify complete adherence to these procedures.

SPARE PARTS

A list of critical spare parts will be identified by the operator. 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.

SECTION 12

DATA ASSESSMENT PROCEDURES

Procedures which may be used to assess data precision and accuracy are in accordance with the NYSDEC-ASP December 1991 or most recent revision. Completeness is recorded by comparing the number of parameters initially analyzed for with the number of parameters successfully completed and validated. Data must be 100 percent compliant with NYSDEC-ASP.

ACCURACY

The percent recovery is calculated below:

$$\% = \frac{S_s - S_o}{S} \times 100$$

where:

S_o = The background value, i.e., the value obtained by analyzing the sample
S = Concentration of the spike added to the sample
S_s = Value obtained by analyzing the sample with the spike added
$\%$ = Percent recovery

PRECISION

The relative percent difference is calculated as below:

$$\frac{V_1 - V_2}{.5\,(V_1 + V_2)} \times 100 = \%\ \text{diff}$$

where:

V_1, V_2 = The two values obtained by analyzing the duplicate samples

SECTION 13

CORRECTIVE ACTIONS

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 at regional, site, laboratory or subcontractor locations, 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 site investigation team leaders, project managers, chief scientist, project QA manager, document control supervisors, and involved subcontractor management, as 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.

Corrective actions may be initiated as minimum:

- 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/interfield comparison studies

PROCEDURE DESCRIPTION

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups monitor ongoing work performance in the normal course of daily responsibilities.

Work is audited at the regional offices, sites, laboratories and subcontractor locations by the project QA manager and/or designated lead auditors. Items, activities or documents ascertained to be non-compliance 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 PQAO.

Technicians assigned quality assurance functions at the regional levels will also control non-compliance corrective actions by having the responsibility of issuing and controlling the appropriate Corrective Action Request Form (Figure 13-1). All project personnel can identify a non-compliance; however, the technician is responsible for documenting, numbering, logging and verifying the closeout action. It is the project manager's responsibility to ensure that all recommended corrective actions controlled at the regional level are produced, accepted and received in a timely manner. The project manager also approves all corrective actions issued by the staff.

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 to be taken. The technician maintains the log for status control of CAR's and responses, confirms the adequacy of the intended corrective action, and verifies its implementation. The technician will issue and distribute CAR's to specified personnel, including the originator, responsible project management involved with the condition, the project manager, involved subcontractor and the PQAO, as a minimum. CAR's are transmitted to the project file for the records.

SECTION 14

QUALITY ASSURANCE REPORTS

The procedure for reporting results was described in Section 8. The frequency of the performance audits and the system audits was described in Section 10.

During the course of the project, the Quality Assurance Officer will prepare one quality assurance report which will discuss:

1. The periodic assessment of measurement data accuracy, precision and completeness.
2. Results of performance audits.
3. Results of system audits.
4. Significant quality assurance problems and action taken.

A final report prepared at the completion of the project will include a separate section summarizing data quality information.

APPENDIX A-2

FIELD SAMPLING PLAN

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FIELD SAMPLING PLAN

SITE BACKGROUND

The Cortland/Homer coal gasification plant produced coal gas and carburetted water gas from 1858 to 1932. The gasholders continued to be used until the early 1930s for storage of natural gas. The by-products of the process included coal tar, coke, ash, and purification wastes, including spent oxide materials. The coal tars produced were disposed of in on-site storage vessels. Tar residues were also collected in the relief gasholder. Coke produced was stored outside and later sold as fuel for domestic use. It is also possible that at least some coal was stored outside.

In 1911, the plant was purchased by the predecessor of NYSEG, which later became NYSEG after a merger in 1918. The plant was closed in 1935 and remained idle until it was purchased by Brockway Motors in 1944. In 1947, the site's buildings were razed and a new building was constructed on site. In 1971 the property was purchased by I.D. Booth, a plumbing supply distributor. In 1972, I.D. Booth bought the adjacent property to the north. Today, I.D. Booth occupies the southern two-thirds of the site building, and Bell Atlantic occupies the northern one-third.

Results of Task 2 and Task 3 investigations (E.C. Jordan, 1987, 1989) identified an apparent source area of coal tar related chemicals in subsurface soils near the existing site building. Coal tar-related volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) were found in shallow soils at a number of soil boring locations. Groundwater from monitoring wells downgradient of the site contained detectable quantities of VOCs and PAHs. Surface water samples from the Tioughnioga River east of the site generally did not contain MGP-related substances, although downstream sediment samples did contain PAHs. In addition, amenable cyanide was detected in a seep sample collected in the basement of a building located east of the site across Route 11. Air samples collected within the site building indicated the presence of low levels of coal tar related substances in air. NYSEG is now undertaking a Supplemental Remedial Investigation (SRI) in order to fill data gaps from the previous Task 2 and Task 3 investigations.

SAMPLING OBJECTIVES

The objectives of the SRI include:

- investigate the presence of MGP-related gases in air in the I.D. Booth building
- complete soil sampling to assess the likelihood that site occupants might be exposed to MGP-related impacts via direct contact with soils
- investigate the presence of the former purifying house, which is believed to underlie the I.D. Booth building
- complete a comprehensive groundwater investigation, including existing and new site monitoring wells to establish the nature and extent of groundwater impacts related to the former MGP
- complete a comprehensive surface water and sediemnt sampling program in the Tioughnioga River to determine the potential for MGP-related impacts
- investigate the former gasholder, which underlies the I.D. Booth building
- complete a passive soil gas survey to assess the potential for migration of gas-phase MGP residuals to the Riverside Motel
- complete a Fish and Wildlife Impact Analysis (FWIA) through Step IIA
- conduct a survey of groundwater users in the study area.

SAMPLE LOCATION AND FREQUENCY

Figure 2 of the work plan summarizes the sampling scheme and locations. Table 1 presents a summary of the sampling and analytical program. Table 2 summarizes QA/QC protocol to be followed.

SAMPLE DESIGNATION

All sampling locations of a particular matrix type (surface water, groundwater, soil, sediment) will be given a unique sample designation. The sample designation consists of matrix type, location, site name, date and time of sampling. Sample matrices are identified by a short alphanumeric prefix to the sample location number. A list of prefixes for various matrices is shown below:

IA - Indoor air
MW - Groundwater
SW - Surface water
SED - Sediment
SS - Surface soil
SG - Soil gas
SB - Soil boring (subsurface soil)

All sample containers will be labeled individually. Each label will identify the site name, depth, matrix and sample location (i.e., MW-1, SED-1) and date and time of sample collection. Chain-of-custody forms and field log book entries should refer to each sample in the same manner. No two samples will carry the same sample designation.

SAMPLING EQUIPMENT AND PROCEDURES

Decontamination

The following materials and procedures should be used to decontaminate all equipment that will come in contact with sample media. Wherever possible, dedicated or disposable sampling equipment is used to eliminate the need for decontamination and further reduce the possibility of cross contamination between samples.

Materials:
Five-gallon jug with pour spout, potable water source
Five-gallon bucket - wash tub
Tall, kitchen-style garbage can lined with clean garbage bag - clean equipment holder/dryer
Small Rubbermaid storage box - small parts wash tub
Alconox
Bottle brushes - 24" or more
Bristle scrub brush
Pesticide-grade methanol or hexane
Deionized water
PVC gloves
Nitrile gloves
Tyvek suit
Pipe wrench
Paper towels
Aluminum foil
Goggles
Nitric acid rinse

To avoid being splashed during decontamination, the sampler shall wear a Tyvek suit, goggles and a pair of nitrile gloves over PVC gloves. Outer gloves must undergo decontamination procedures simultaneously with equipment.

Procedure:

1. Wash non-dedicated/disposable equipment in alconox and water; rinse and wipe with paper towel.

2. Rinse with tap water; be sure to rinse hands (collect rinse solution in wash bucket).

3. Rinse with methanol or hexane and allow to air dry; rinse hands.

4. Rinse with deionized water; air dry.

5. Dispose of rinse water properly.

Groundwater Sampling by Bailer

Table 3 is a list of equipment needed and step-by-step procedures for sampling monitoring wells using bailers. All the listed equipment may not be needed if the sampling effort is limited in scope, but the general procedures should be followed in all situations. The protocol is designed to provide representative samples while minimizing the chances for cross contamination between sampling points. Disposable or dedicated bailers should be used. In addition, sampling shall proceed from the least likely to the most likely contaminated locations.

Bailer Sampling Procedure

A. **Preparation.**

   1. Review sampling plan, project QAPP, and HSP.

   2. Order sample bottles from laboratory.

   3. Notify interested parties (regulators, client) of sampling event.

4. Receive bottles. Check for proper bottles and chain-of-custody information.

5. Attend presampling meeting.

6. Assemble and check necessary equipment (personal protection equipment, rope, bailers, field instruments, notebook).

B. **Sampling.**

1. Identify the well and record the location in the field book. If the well is poorly marked, remark protective cover using paint or indelible marker.

2. Clean and calibrate all meters, tools, equipment, etc. before use.

3. Put on a new pair of disposable PVC gloves.

4. Put on a pair of nitrile gloves.

5. Cut a slit in the center of the plastic sheet and slip it over the well, creating a clean surface onto which the sampling equipment can be positioned.

6. Do not kick, transfer, drop or in any way let soils or other materials fall onto this plastic sheet unless it comes from inside the well.

7. Clean the well cap with a clean towel, remove the well cap, and plug, placing both on the plastic sheet. Do not use petroleum products or aerosol lubricants to free.

8. Using an electric water level indicator, measure the depth to the water table to the nearest 0.01 foot. If free-phase product is present, use an oil-water interface probe or a clear bottom-valve bailer to determine the thickness of the free product. Record this information in the field book.

9. Clean the well depth probe and rinse it with deionized water after use. Table 4 illustrates capacities of various diameter wells (2-inch wells = .164 gal/ft; 4-inch wells = .651 gal/ft).

10. Compute the volume of water in the well and record this volume in the field book.

11. Attach enough polypropylene rope to a bailer to reach the bottom of the well and lower the bailer slowly into the well, making certain to submerge it only far enough to fill it one-half full. The purpose of this is to recover any oil film if one is present on the water table.

12. Pull the bailer out of the well, keeping the polypropylene rope on the plastic sheet. Empty the groundwater from the bailer into a clean glass quart container and observe its appearance. Note: This sample will not undergo laboratory analysis and is collected to observe the physical appearance of the groundwater only.

13. Record the physical appearance of the groundwater in the field book.

14. Initiate bailing the well from the top of the water column, making certain to keep the polypropylene rope on the plastic sheet. All groundwater should be dumped from the bailer into a graduated pail to measure the quantity of water removed from the well.

15. Continue bailing the well until a sufficient volume of groundwater in the well has been removed or until the well is bailed dry. If the well appears to be going dry (small amount of water in the bailer), let the well recover and sample. Avoid letting the well go completely dry because cascading of the water into the well may alter analytical results, particularly volatiles. If the well is bailed dry, allow sufficient time for the well to recover before proceeding with Step 18. Record this information on the groundwater field sampling record.

16. Remove the sampling bottles from their transport containers and prepare the bottles for receiving samples. Inspect all labels to insure proper sample identification. Be sure labeling is complete before filling containers. Sample bottles should be kept cool with their caps on until they are ready to receive samples. Arrange the sampling containers to allow for convenient filling. Always fill the containers for volatile organic compounds first. Filter appropriate samples.

17. Record time sampling begins, and note the interval between bailing (purging) and sampling. To ensure comparable samples, maintain same interval between well evacuation and sampling.

18. To minimize agitation of the water and obtain a sample fresh from the surrounding formation, initiate sampling by lowering the bailer slowly into the well, making certain to submerge it only far enough to fill it completely. Fill sample bottles and return each to its proper transport container. Keep samples on ice. If required, seal each container with chain-of-custody seals.

19. If the sample bottles cannot be filled quickly, keep them cool with the caps on until they are filled. The vials (3) labeled purgeable priority pollutant analysis should be filled from one bailer, then securely capped.

20. After the last sample has been collected, record the date and time and empty one bailer of water from the surface of the water in the well into a beaker and measure the record the pH, Eh, conductivity, turbidity, and temperature of the groundwater following the procedures outlined in the equipment operation manuals. Record this information in the field book or sampling sheet. The beaker must then be rinsed with distilled water prior to reuse.

21. Begin the chain-of-custody record (Figure 4-5, QAPP). A separate entry is required for each well with the required analysis listed individually.

22. If a duplicate sample is required at a well, record in the field book or on the sampling sheet where the sample was collected, the date, and time. Do not record the location or time of duplicate collection on the chain of custody. It is appropriate to record the date, well number, and time of matrix spike and matrix spike duplicate samples on the chain of custody. These are internal lab QA/QC requirements.

23. Replace the well cap and lock the well protection assembly before leaving the well location.

24. Place the polypropylene rope and disposable bailer, gloves, rags and plastic sheeting into a plastic bag for disposal.

Surface Water Sampling

When sampling from a stream, care must be exercised to collect a representative sample. The sample should cause as little disturbance to the water body as possible. Avoid taking a sample of water which shows evidence of sediment, debris or other material which may have been stirred up by the presence of the sampler.

Equipment for surface water sampling is listed in Table 5.

Surface Water Sampling Procedure

A. Preparation.

1. Design sampling plan.
2. Order sample bottles from laboratory.
3. Notify interested parties (regulators, client) of sampling event.
4. Receive bottles. Check for proper bottles and chain-of-custody information.
5. Attend presampling meeting.
6. Assemble and check necessary equipment (personal protection equipment, field instruments, notebook).

B. Surface Water Sampling.

1. Determine sampling locations, record on site map and in field book. Begin at farthest downstream location.
2. Properly label sample containers.
3. Put on PVC and nitrile gloves.

4. Record physical appearance of water body, sampling time, and date in the field book.

5. Screen with PID when sampling leachate seeps or springs.

6. Fill sample bottles directly, if possible, always tilted upstream. If depth of water body is insufficient to fill containers, use a clear glass beaker. Place samples immediately in a cooler on ice. If required, seal each container with a chain-of-custody seal.

7. Using a clean beaker or by measuring directly in water, record field parameters (pH, Eh, conductivity, temperature and turbidity). Record this information in the field book.

8. Remove and dispose of gloves before sampling next locations.

Soil Sampling

Table 6 is a list of equipment needed and step-by-step procedures for soil sampling. All the listed equipment may not be needed if the sampling effort is limited in scope, but the general procedures should be followed in all situations. The protocol is designed to provide representative samples while minimizing the chances for cross contamination between sampling points. If possible, sampling should proceed from the least likely to the most likely contaminated locations.

Soil Sampling Procedure

A. **Preparation**.

1. Review sampling plan and project QAPP.

2. Order sample bottles from laboratory.

3. Notify interested parties (regulators, client) of sampling event.

4. Receive bottles. Check for proper bottles and chain-of-custody information.

5. Attend presampling meeting.

6. Assemble and check necessary equipment (personal protection equipment, rope, bailers, field instruments, notebook).

B. **Sampling**.

1. Grid the site map with number codes in two perpendicular directions. Mark the sampling locations with flags or stakes. Ensure equipment is decontaminated and calibrated before use.

2. Identify the sampling point and record the location in the field book.

3. Put on a new pair of disposable PVC gloves.

4. If an auger is used, turn it down to the required depth, collect all scrapings in a bucket for a composite. Augers tend to cross contaminate between depths.

5. If surface or shallow samples are taken, a stainless steel spatula or a shovel can be used.

6. If volatiles are the contaminant of concern, composite samples should not be collected. For volatile samples, quickly pack soil into vials, wipe the rim, screw the septum cap snug, and keep on ice.

7. Record PID readings at each location.

8. Decontaminate equipment before next sample site.

Passive Soil Gas Survey

The following field procedures are routinely used during EMFLUX® soil gas surveys. Modifications can be and are incorporated from time to time in response to individual project requirements. In all instances, USEPA-approved quality assurance and quality control practices will be followed.

As a general rule, ambient conditions need to be precisely documented at the time the sample devices are deployed. Among the more critical information is the soil's moisture content, and the occurrence of precipitation in the 24-hour period before the test, and also during the test period itself. Soil conditions should be described as either dry, moist, or wet (saturated) at the time the samplers are deployed and retrieved. Also, depth to groundwater information, if available, should be recorded at some time during the sampling period. If possible, the period of the test should be planned so that heavy or long-duration rainfall events are avoided. Ideally, the conditions during the test should be as dry as possible.

1. Field personnel carry EMFLUX® system components and support equipment to the site and deploy the EMFLUX® collectors in a prearranged survey pattern.

2. For those sample locations covered with soils or vegetation, a field technician clears vegetation and debris, exposing the ground surface. Using a hammer and a 3/4-inch diameter pointed metal stake, the technician creates a hole approximately 3 inches deep. For those locations covered with an asphalt or concrete cap, the field technician drills a 1-inch diameter hole through the cap to the soils beneath. (If necessary, the collector can be sleeved with a 3/4-inch I.D. copper pipe for either capped or uncapped locations.)

3. The technician then removes the solid plastic cap from an EMFLUX® collector (a glass vial containing an adsorbent cartridge with a length of wire attached to the vial for retrieval) and replaces it with a sampling cap (a plastic cap with a hole covered by screen meshing). The technician inserts the collector, with the sampling cap end facing down, into the hole (Figure 4-3, QAPP). The collector is then covered with either local soils for uncapped locations or, for capped locations, aluminum foil and a concrete patch. The collector's location, time and date of emplacement, and other relevant information are recorded on the Field Sampling Record.

4. As a quality control check during emplacement and retrieval, the technician takes periodic ambient air control samples with a PID and records the date, time, and location of each. (One or more trip blanks are also included as part of the quality control procedures.)

5. Once all EMFLUX® collectors have been deployed, field personnel schedule collector recovery (approximately 72 hours after emplacement) and depart, taking all no-longer-needed equipment and materials with them.

6. Field personnel retrieve the collectors at the end of the 72-hour exposure period. At each location, a field technician withdraws the collector from its hole and wipes the outside of the vial clean using gauze cloth; following removal of the sampling cap, the threads of the vial are also cleaned. A solid plastic cap is screwed onto the vial and the sample location number is written on the label. The technician then records sample point location, date, time, etc. on the Field Sampling Record (Figure 4-2, QAPP).

7. Sampling holes are refilled with soil, sand, or other suitable material. If collectors have been installed through asphalt or concrete, the hole is filled to grade with a plug of cold patch or cement.

8. Following retrieval, field personnel ship the EMFLUX® collectors to the analytical laboratory.

Control samples will be collected at five locations in the passive gas survey to measure representative ambient air conditions. At these five locations, after the passive sampler is deployed, control sample vials will be exposed to air for 10 seconds, which is roughly the time the passive sampler would be exposed to air. The same procedure would take place during the retrieval of the samplers. In addition, one trip blank will accompany the sampling technician during deployment and retrieval of the samplers.

Because the analytical methods for the sorbent media are generally not as susceptible to contaminant recovery problems as other media (such as soil or water samples), the passive survey analytical procedures have been demonstrated to consistently and reliably recover contaminants present in the sorbent media. Therefore, standard protocol for the passive soil gas analysis generally does not require matrix or surrogate spikes.

Indoor Air Sampling

Indoor air samples will be collected as 24-hour time-weighted average samples. Air sampling will take place according to two specific programs:

1. **VOCs**. Summa canisters will be used to collect air samples which will be analyzed for VOCs according to analytical Method TO-14.

2. **Naphthalene.** A modified Method TO-17 will be used to analyze air samples for the PAH naphthalene, which is among the more volatile of PAH compounds and thus a reliable PAH indicator. Low flow sampling pumps fitted with sampling cartridges, and polyurethane foam (PUF) will be used to collect the time-weighted samples.

A. **Sampling with Summa Canisters.** There are two basic methods of sampling with Summa canisters: grab and integrated. A grab sample is taken over a short period of time (i.e., 1 to 5 minutes), whereas an integrated sample is collected over longer periods (1 to 24 hours). For both types of sampling, an evacuated Summa canister is used to "pull" air into the canister.

The Summa canister comes with a brass plug that is removed prior to sampling. (The plug ensures the vacuum seal is maintained and that no dust fouls the valve.) A filter is used to prevent particulate matter from entering the canister during the sampling event. For grab sampling, a 5-micron filter is used. For integrated sampling, a 7-micron filter is used.

A vacuum gage measures the initial and final vacuum of the canister and monitors the filling of the canister when collecting an integrated sample. Other than to measure the receipt vacuum of the canister, a gage is generally not used for grab sampling. The gages are intended only to provide a relative measure of change. Their accuracy does not allow a canister-to-canister comparison.

1. Check the receipt pressure prior to use. The initial vacuum should be greater than 25 inches Hg.

   a. Verify that canister valve is closed.

   b. Remove brass plug and attach the gage tightly.

   c. Open and close the canister valve. The gage will register the level of vacuum. Record this value on the chain of custody.

   d. Verify that the canister valve is closed, remove the gage, and replace the brass plug. If the canister has less than 25 inches Hg, do not use. Order a new canister from the laboratory.

2. Measure the flow rate.

   a. Take the flow sensor provided with the canister and allow it to warm up for 15 minutes. Assemble as shown on Figure 4-4 of the QAPP. BE SURE ALL CONNECTIONS ARE TIGHT (generally, finger tight plus 1/16 turn with a wrench).

   b. Open canister valve and note the flow.

   c. Close the valve.

3. Assemble hardware according to Figure 4-4 of the QAPP. All fittings are 1/4-inch Swagelok®. A 9/16-inch open-end wrench is used to assemble the hardware: Canister → Flow controller → Gage → Filter. BE SURE ALL CONNECTIONS ARE TIGHT (generally, finger tight plus 1/16 turn with a wrench). Sampling can now begin.

4. Open valve and note the time.

In general, do not deploy sampling device in direct sunlight, as temperature swings will affect sample collection rate. As long as the pressure difference through the flow controller is greater than 4 inches Hg ambient pressure, the canister will fill at a constant rate. If the canister is properly prepared by the laboratory, and the fittings are adequately tight, this should not be a problem. Ideally, the final vacuum in the canister should be greater than 4" Hg. It will usually run between 6 and 12 inches Hg for a 24-hour test. If it is less than this, then the sample will be skewed towards the first portion of the sampling period. Although non-linear, the sample may still be valid if the beginning and ends of the sampling period are clearly defined, and the initial and final vacuums are recorded.

B. **Sampling with Low Flow Pumps.**

1. Carefully remove a clean sample (PUF) cartridge from its foil wrapping and connect it to the pump with flexible tubing.

2. Locate the sampling pump in an unobstructed area away from obstacles to air flow. The PUF cartridge should be between 3 and 6 feet above the ground.

3. Turn the pump on to activate the time meter and begin sampling. Record the start time.

4. At the end of the desired sampling period, turn the pump off. Remove the PUF cartridge and place it in the foil packaging. Use new aluminum foil if needed to complete a tight wrap.

5. Place the PUF cartridge in a cooler, and return to the laboratory for analysis.

SAMPLE HANDLING AND ANALYSIS

The following sections describe what to do with samples once they have been collected. Examples of paperwork are attached for reference.

Packaging

Samples processed for CLP analyses must be packaged for shipment in accordance with current U.S. Department of Transportation (DOT) regulations. All required government and commercial carrier shipping papers must be filled out. Information can be obtained from the carrier (i.e., Federal Express) before field sampling begins.

The following checklist should be followed regardless of transport method:

1. Samples will be transported in metal ice chests or sturdy plastic coolers (cardboard or styrofoam containers are unacceptable).

2. Remove previously used labels, tape and postage from cooler.

3. Coolers should have a permanent identification number affixed to the outside walls or lid.

4. Affix return address label to cooler.

5. Check to see that all sample bottles are tightly capped.

6. Be sure all bottle labels are completed.

7. While packing cooler, fill out chain-of-custody form.

8. Wrap sample bottles in bubble pack and place in cooler.

9. Pack bottles with extra bubble pack, vermiculite, or styrofoam "peanuts". Be sure to pack trip blank if applicable.

10. Keep samples refrigerated in cooler with bagged ice or frozen cold packs. Do not use ice for packing material; melting will cause bottle contact and possible breakage.

11. Separate sampler's copy of chain-of-custody and keep with field notes.

12. Tape paperwork (COC, manifest, return address) in ziplock bag to inside cooler lid.

13. Close cooler and apply signed and dated custody seal in such a way that the seal must be broken to open cooler.

14. Securely close cooler lid with packing or duct tape. Be sure to tape latches and drain plugs in closed position.

Shipping

Because holding times are very important for accurate laboratory analyses, it is imperative that samples arrive at the lab as soon as possible following sampling. All samples must be hand delivered on the same day as sampling or sent via overnight mail.

When using a commercial carrier, follow the steps below.

1. Securely package samples and complete paperwork.

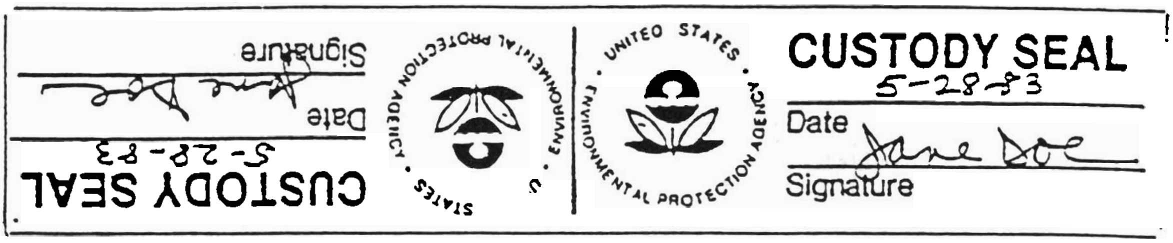
2. Complete air bill for commercial carrier (air bills can be partially completed in office prior to sampling to avoid omissions in field). If necessary, insure packages.

3. Keep customer copy of air bill with field notes and chain-of-custody form.

4. When coolers have been released to transporter, call receiving laboratory and give information regarding samplers' names, method of shipment, cooler identification numbers, and expected time of arrival.

5. Call lab on day following shipment to be sure all samples arrived intact. If bottles are broken, locations can be determined from chain of custody and resampled.

Custody Seal



CUSTODY SEAL

Date 5-28-83

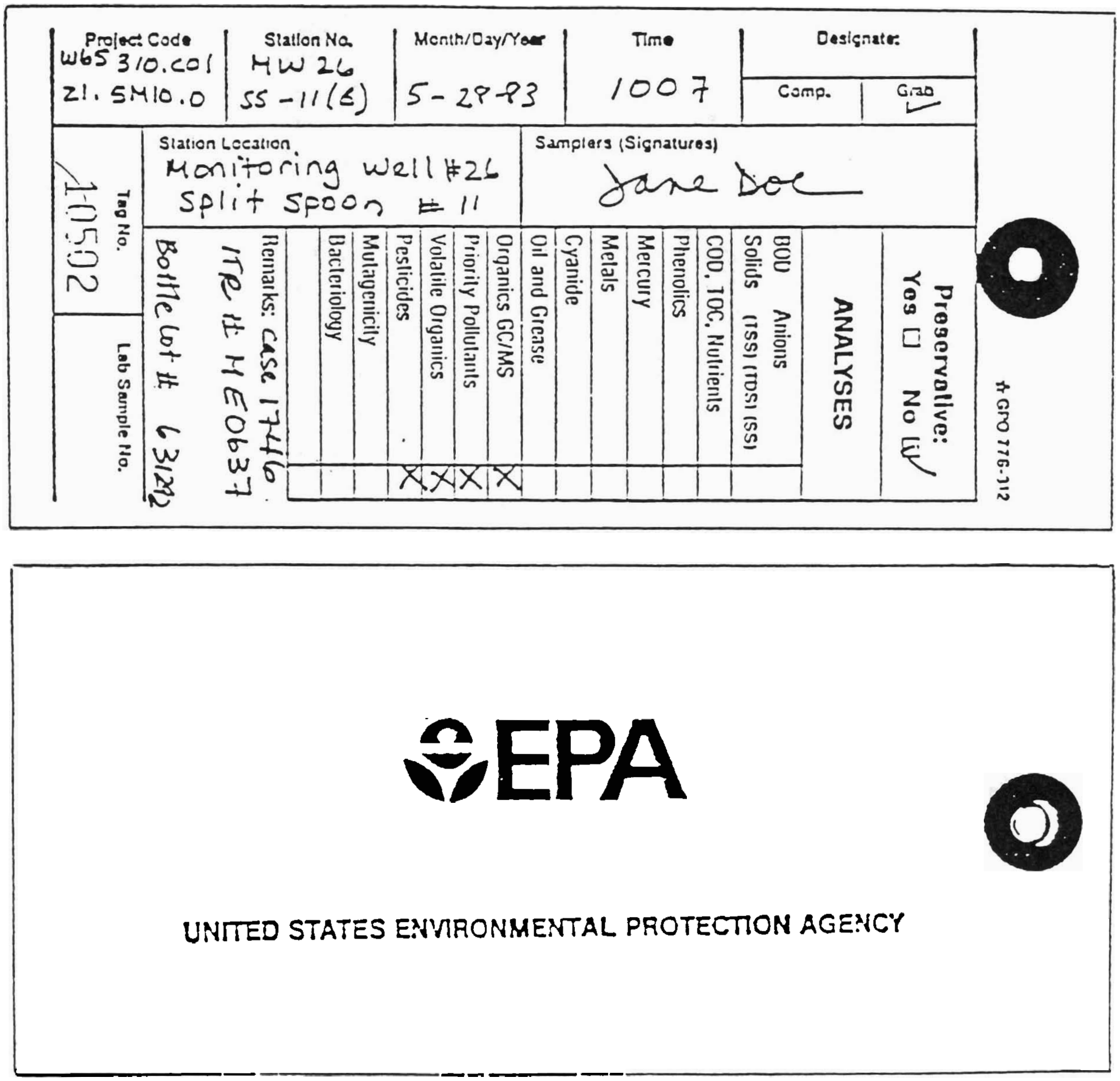
Signature Jane Doe

CUSTODY SEAL

Date 5-28-83

Signature Jane Doe

Sample Tag



Project Code	Station No.	Month/Day/Year	Time	Designate: Comp.	Designate: Grab
W65 310.C01 21.5M10.0	HW 26 SS-11(6)	5-28-83	1007		✓

Tag No. 10502

Station Location: Monitoring Well #26 Split Spoon #11

Samplers (Signatures): Jane Doe

Preservative: Yes ☐ No ☑

ANALYSES

BOD Anions	
Solids (TSS) (TDS) (SS)	
COD, TOC, Nutrients	
Phenolics	
Mercury	
Metals	
Cyanide	
Oil and Grease	
Organics GC/MS	X
Priority Pollutants	X
Volatile Organics	X
Pesticides	X
Mutagenicity	
Bacteriology	

Remarks: Case 17446 ITR # HE0637

Lab Sample No. Bottle Lot # 631272

☆ GPO 776-312

EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

FEDERAL

USE THIS AIRBILL FOR DOMESTIC SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
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607. 6410019663

Sender's Federal Express Account Number: 0132-0461-6

Date:

1 From (Your Name) Please Print:

Your Phone Number (Very Important): ( )

Company: STEARNS & WHELER

Department/Floor No:

Street Address: 10 ALBANY ST

City: CAZENOVIA State: NY

ZIP Required For Correct Invoicing: 1 3 0 3 5

2 To (Recipient's Name) Please Print: John Doe

Recipient's Phone Number (Very Important): (666) 756-1111

Company: Any lab

Department/Floor No.:

Exact Street Address (Use of P.O. Boxes or P.O. • Zip Codes Will Delay Delivery And Result In Extra Charge.): 1212 Main St.

City: Anytown State: NY

ZIP Street Address Zip Required: 12345

3 YOUR BILLING REFERENCE INFORMATION (FIRST 24 CHARACTERS WILL APPEAR ON INVOICE.)

VanBuren Samples

PAYMENT ☒ Bill Sender ☐ Cash ☐ Bill Recipient's FedEx Acct No. Fill in Account Number below ☐ Bill 3rd Party FedEx Acct No. Fill in Account Number below ☐ Bill Credit Card Fill in Credit Card Number below

H HOLD FOR PICK-UP AT THIS FEDERAL EXPRESS LOCATION:
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City State

ZIP • Zip Code of Street Address Required

4 SERVICES
CHECK ONLY ONE BOX

1 ☒ PRIORITY 1 Overnight Delivery Using Your Packaging

6 ☐ OVERNIGHT LETTER* (Our Packaging) 9½" x 12½"

OVERNIGHT DELIVERY USING OUR PACKAGING

2 ☐ Courier-Pak Overnight Envelope* 12" x 15½"

☐ Overnight Box 12½" x 17½" x 3" A ☐

4 ☐ Overnight Tube 38" x 6" x 6" x 6" B ☐

* Declared Value Limit $100.

STANDARD AIR

5 ☐ Delivery not later than second business day

SERVICE COMMITMENT

PRIORITY 1 - Delivery is scheduled early next business morning in most locations. It may take two or more business days if the destination is outside our primary service areas.

STANDARD AIR - Delivery is generally next business day or not later than second business day. It may take three or more business days if the destination is outside our primary service areas.

DELIVERY AND SPECIAL HANDLING
CHECK SERVICES REQUIRED

1 ☐ HOLD FOR PICK-UP (Fill in Section H at right)

2 ☒ DELIVER WEEKDAY

3 DELIVER SATURDAY (Extra charge) ☐

4 ☐ DANGEROUS GOODS (P-1 and Standard Air Packages only. Extra charge)

5 ☐ CONSTANT SURVEILLANCE SERVICE (CSS) (Extra charge) (Do Not Complete Section 5)

6 ☐ DRY ICE ______ Lbs

7 ☐ OTHER SPECIAL SERVICE ______

8 ☐

9 ☐ SATURDAY PICK-UP (Extra charge)

10 ☐

PACKAGES	WEIGHT	YOUR DECLARED VALUE (See right)
1	60	
1	50	
Total 2	Total 110	Total

5 Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature: Jane Sampler

YOUR DECLARED VALUE

DAMAGE OR LOSS

We are liable for no more than $100 per package in the event of physical loss or damage, unless you fill in a higher Declared Value to the left and document higher actual loss in the event of a claim. We charge 30¢ for each additional $100 of declared value up to the maximum shown in our Service Guide. Declared value restrictions are shown on the back of the Sender's Copy of this airbill. We make no expressed or implied warranties.

DELAY

There is always a risk of late delivery or non-delivery. In the event of a late delivery Federal Express will at your request and with some limitations refund all transportation charges paid. See back of Sender's Copy of this airbill for further information.

CONSEQUENTIAL DAMAGES

We will not be responsible or liable for any loss or damage resulting from delay, non-delivery or damage to a package, except as noted above. This includes loss of sales, income, interest, profits, attorney fees and other costs but is not limited to these items. Such damages are called "consequential damages."

DO NOT SHIP CASH OR CURRENCY

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TABLE 1

SAMPLING AND ANALYTICAL SUMMARY

TASK AREA	SAMPLE MATRIX	NO. OF SAMPLES	ANALYSES
Indoor air	Gas	To be determined	VOCs Naphthalene
Soil vapor survey	Gas	15	VOCs
Surface soil	Soil	6	TCL SVOC TAL metals TOC TPH R CN R S T CN
Purifying house	Soil	1	TCL VOC TCL SVOC TAL metals TOC TPH R CN R S T CN
Gasholders	Soil	1	TCL VOC TCL SVOC TAL metals R CN RS T CN TOC TPH
River	Sediment	9	TCL VOC TCL SVOC TAL metals TOC TPH T CN
	Water	9	TCL VOC TCL SVOC TAL metals TPH T CN
Groundwater	Water	17 (existing wells)	TCL VOC TCL SVOC TAL metals TPH TS T CN
DNAPL	Water	3 (new wells)	TCL VOC TCL SVOC TAL metals TPH TS T CN
	Soil	3	TCL VOC TCL SVOC TAL metals R CN R S TOC T CN

TABLE 2

QA/QC SUMMARY

MATRIX	ANALYSIS	NO. OF SAMPLES	DUPLICATES	MS	MSD
Soil/sediment	TCL VOC	14	1	1	1
	TCL SVOC	20	1	1	1
	TAL metals	20	1	1	1
	TOC	20	1	1	1
	TPH	17	1	1	1
	R CN	11	1	1	1
	R S	11	1	1	1
	T CN	20	1	1	1
Water	TCL VOC	29 (1)	1	1	1
	TCL SVOC	29	1	1	1
	TAL metals	29	1	1	1
	TPH	29	1	1	1
	T CN	29	1	1	1
	TS	20	1	1	1

(1) Assumes 17 existing wells will be suitable for sampling.

TABLE 3

EQUIPMENT FOR GROUNDWATER SAMPLING

	Field notebook, pencil, ballpoint and marker
	Data sheets
	Microcassette recorder (for quick and creative note-taking)
	Spare microcassettes and batteries
	Map of well locations
	Keys for wells; graphite lubricate for locks
	Photoionization meter or explosimeter/with calibration gases
	Water level gauge and spare battery
	Tape measure
	Interface probe (for wells with pure product)
	Paper towels/rags/oil sorbent pads
	YSI and flow-through cell
	Spare batteries, if necessary
	Beakers, stirrers, wash bottle, Chem-wipes
	Nitrile gloves (size 9-10) and glove inserts (cold weather)
	Surgical gloves
	Rope (polypropylene)
	Clear plastic bailer (if you expect oil)
	Bailers and bottom emptying tubes
	Buckets (calibrated in gallons or liters)
	Containers for purged water
	Sponges
	Garbage bags
	Plastic sheet
	Stopwatch or watch that indicates seconds
	Chain-of-custody and other forms
	Sample containers (bring 20 percent more than needed), all sealed, clean, and labeled
	Trip blanks and spiked samples for volatile samples
	Filter apparatus, filters

TABLE 3 (continued)

	Chest or six-pack cooler, ice, and maximum/minimum thermometer
	Decontamination vessel
	Washwater (1-1/2 gallons per well)
	Alconox detergent solution
	Deionized water (1-1/2 gallons per well)
	Garden spray cans for wash fluids
	Tyvek suits
	Gloves, boots, respirator
	Raingear or warm clothing
	Camera and film
	Toolbox, including hacksaw
	Knife
	Pipe wrenches (at least two). What size might you need?
	Flashlight
	Calculator
	Bug off spray (contains volatile organics - beware!)
	ID card or business card
	Money
	Booklet, "How to Sample Groundwater and Soils"
	Bolt cutters

TABLE 4

HOLE AND ANNULAR CAPACITY

HOLE DIAMETER (IN.)	HOLE CAP (GPF)	HOLE CAP (CU.FT./FT.)	ANNULAR CAPACITY (GALLONS PER FOOT)											
			CASING - OUTSIDE DIMENSION											
			2-1/2	3-1/2	4-1/2	5-1/2	6-3/8	7-3/8	8-3/8	9-5/8	10-3/4	12-3/4	13-3/8	16
3-3/4	.58	.077	.32											
4	.65	.087	.40	.1										
4-3/4	.92	.123	.67	.4										
5-3/8	1.32	.176	1.06	.82	.49									
5-7/8	1.41	.188	1.15	.91	.58									
6-1/4	1.59	.213	1.34	1.09	.78	.36								
6-1/2	1.73	.231	1.47	1.22	.90	.49								
6-3/4	1.86	.249	1.60	1.36	1.03	.63								
7	2.00	.267	1.74	1.50	1.17	.77	.21							
7-5/8	2.37	.317	2.19	1.87	1.55	1.14	.58							
8	3.61	.349	2.36	2.11	1.79	1.38	.82							
8-5/8	3.04	.406	2.78	2.54	2.21	1.81	1.25	.66						
9	3.31	.442	3.05	2.81	2.48	2.07	1.51	.93						
9-3/8	3.78	.506	3.53	3.28	2.96	2.55	1.99	1.41	.75					
10	4.08	.546	3.83	3.58	3.26	2.85	2.29		1.04					
10-5/8	4.61	.616	4.35	4.11	3.79	3.37	2.82	2.23	1.57	.83				
11	4.94	.660	4.68	4.44	4.11	3.70	3.15	2.57	1.90	1.16				
12-1/4	6.13	.819	5.87	5.63	5.30	4.89	4.33	3.75	3.09	2.34	1.41			
12-3/4	6.63	.887	6.38	6.14	5.81	5.40	4.84	4.26	3.60	2.85	1.92			
13-1/2	7.44	.994	7.18	6.94	6.61	6.21	5.65	5.06	4.40	3.66	2.72	.80		
15	9.18	1.227	8.93	8.68	8.36	7.95	7.39	6.81	6.15	5.40	4.47	2.55	1.88	

TABLE 4 (continued)

HOLE DIAMETER (IN.)	HOLE CAP (GPF)	HOLE CAP (CU.FT./FT.)	ANNULAR CAPACITY (GALLONS PER FOOT)											
			CASING - OUTSIDE DIMENSION											
			2-1/2	3-1/2	4-1/2	5-1/2	6-3/8	7-3/8	8-3/8	9-5/8	10-3/4	12-3/4	13-3/8	16
15-1/2	9.81	1.311	9.55	9.31	8.98	8.57	8.01	7.43	6.77	6.02	5.09	3.17	2.50	
17-3/4	12.93	1.729	12.60	12.36	12.03	11.62	11.07	10.49	9.82	9.07	8.14	6.22	5.56	2.41
26	27.59	3.689	27.33	27.09	26.76	26.36	25.80	25.22	24.55	23.81	22.87	20.96	20.29	17.08

When applied as recommended, each 50-lb. package will convert to the following gallonage:

ENVIROPLUG Fine..........................	105.0 gal/bag
ENVIROPLUG Medium	5.2 gal/bag*
ENVIROPLUG Coarse......................	5.4 gal/bag*
ENVIROPLUG Grout	17.0 gal/bag
ENVIROPLUG No. 8........................	6.2 gal/bag*
ENVIROPLUG Tablets	5.0 gal/bag*

*Generally applied dry.

For details on the application of ENVIROPLUG® products, see individual product bulletins.

TABLE 5

EQUIPMENT FOR SURFACE WATER SAMPLING

	Field notebook, pencil, ballpoint and marker
	Data sheets
	Microcassette recorder (for quick and creative note-taking)
	Spare microcassettes and batteries
	Map of sampling locations
	Photoionization meter or explosimeter
	Paper towels/rags/oil sorbent pads
	YSI
	Spare batteries, if necessary
	Beakers, stirrers, wash bottle, Chem-wipes
	Nitrile gloves (size 9-10) and glove inserts (cold weather)
	Surgical gloves
	Buckets (calibrated in gallons or liters)
	Containers for purged water
	Sponges
	Garbage bags
	Watch that indicates seconds
	Chain-of-custody and other forms
	Sample containers (bring 20 percent more than needed), all sealed, clean, and labeled
	Trip blanks and spiked samples for volatile samples
	Filtration apparatus, filters
	Chest or six-pack cooler, ice, and maximum/minimum thermometer
	Decontamination vessel
	Washwater (1-1/2 gallons per well)
	Alconox detergent solution
	Deionized water (1-1/2 gallons per well)
	Garden spray cans for wash fluids
	Tyvek suits
	Gloves, boots, respirator

TABLE 5 (continued)

	Raingear or warm clothing
	Camera and film
	Toolbox, including hacksaw
	Knife
	Flashlight
	Calculator
	ID card or business card
	Money
	Booklet, "How to Sample Groundwater and Soils"

TABLE 6

EQUIPMENT FOR SAMPLING SOILS

	Field notebook, pencil, ballpoint, and marker
	Data sheets
	Microcassette recorder (for quick and creative note-taking)
	Spare microcassettes and batteries
	Map of sampling locations
	Stainless steel sampling spatulas, shovel
	Photoionization meter or explosimeter
	Stakes for marking sampling locations
	Long steel tape measure
	Paper towels/rags/oil sorbent pads
	Spare batteries, if necessary
	Nitrile gloves (size 9-10) and glove inserts (cold weather)
	Surgical gloves
	Garbage bags
	Chain-of-custody and other forms
	Sample containers (bring 20 percent more than needed), all sealed, clean, and labeled
	Decontamination vessel
	Washwater (1-1/2 gallons per well)
	Alconox detergent solution
	Deionized water (1-1/2 gallons per well)
	Garden spray cans for wash fluids
	Tyvek suits
	Gloves, boots, respirator
	Raingear or warm clothing
	Camera and film
	Toolbox, including hacksaw
	Knife
	Calculator
	Bug off spray (contains volatile organics - beware!)

TABLE 6 (continued)

	ID card or business card
	Money
	Booklet, "How to Sample Groundwater and Soils"

APPENDIX B

HEALTH AND SAFETY PLAN

GENERAL HEALTH AND SAFETY POLICY

PREVENTIVE HEALTH MONITORING

Stearns & Wheler will utilize the services of a licensed occupational health physician with knowledge and/or experience in the hazards associated with the project to provide the medical examinations and surveillance specified herein. During field activities, the Site Safety Officer of each respective company will be responsible for monitoring temperature-related stress and exposure to potentially hazardous substances.

Medical Examination

Personnel involved in this operation will be provided with medical surveillance prior to participation in on-site operations and at 12-month intervals. The initial medical examination will include a complete medical and work history and a standard occupational physical; examination of all major organ systems; complete blood count with differential (CBC); and a SMAC/23 blood chemistry screen which includes calcium, phosphorus, glucose, uric acid, BUN, creatinine, albumin, SGPT, SGOT, LDH, globulin, A/G ratio, alkaline phosphatase, total protein, total bilirubin, triglyceride, cholesterol, and a creatinine/BUN ratio. Additionally, a pulmonary function test will be performed by trained personnel to record Forced Vital Capacity (FVC) and Forced Expiratory Volume in one second (FEV 1.0). An audiogram and visual acuity measurement, including color perception, will be provided. The medical exam will be performed under the direction of a licensed occupational health physician. A medical certification as to fitness or unfitness for employment on this job, or any restrictions on his/her utilization that may be indicated, will be provided by the physician. This evaluation will be repeated as indicated by substandard performance or evidence of particular stress that is evident by injury or time loss illness on the part of an worker.

Site-Specific Training

The Site Safety Officer will be responsible for developing a site-specific occupational hazard training program and providing initial training to all Stearns & Wheler personnel that are to work at the site. Responsibilities of project personnel are outlined on Table 1. This training will include the following topics:

- names of personnel responsible for site safety and health
- safety, health, and other hazards at the site
- proper use of personal protective equipment
- work practices by which the employee can minimize risk from hazards
- safe use of engineering controls and equipment on the site
- acute effects of compounds at the site
- decontamination procedures

Protective Equipment

This section describes hazardous level classifications. Table 2 shows minimum equipment requirements necessary for the specified protection levels.

Regardless of level of protection, every field team should be equipped with a first aid kit including, but not limited to, bandages, compresses, tape, scissors, disinfectant and eyewash.

Level A

Level A protection should be worn when the highest available level of both respiratory, skin and eye contact protection is needed. While Level A provides the maximum available protection, it does not protect against all possible airborne or splash hazards. For example, suit materials may be rapidly permeable to certain chemicals in high air concentrations or heavy splashes.

Level B

Level B protection should be selected when the highest level of respiratory protection is needed, but cutaneous or percutaneous exposure to the small unprotected areas of the body (i.e., neck and back of head) is unlikely or where concentrations are known within acceptable exposure standards.

Level C

Level C protection should be selected when the type(s) and concentration(s) of respirable material is known or reasonably assumed to be not greater than the protection factors associated with air-purifying respirators; and if exposure to the few unprotected areas of the body (i.e., neck and back of head) is unlikely to cause harm. Continuous monitoring of site and/or individuals should be established to ensure this minimum protection level is still acceptable throughout the exposure.

Level D

Level D is the basic work uniform and should be worn for all site operations. Level D protection should only be selected when sites are positively identified as having no toxic hazards. All protective clothing should meet applicable OSHA standards.

All personal protective equipment used during the course of this field investigation must meet the following applicable OSHA standards:

TYPE OF PROTECTION	REGULATION	SOURCE
Eye and face	29 CFR 1910.133	ANSI Z87.1-1968
Respiratory	29 CFR 1910.134	ANSI Z88.1-1980
Head	29 CFR 1910.135	ANSI Z89.1-1969
Foot	29 CFR 1910.136	ANSI Z41.1-1967

ANSI = American National Standards Institute

Level C respiratory protection consists of wearing a full-face air purifying respirator with compound specific cartridges. Both the respirator and chemical cartridges must be approved by NIOSH and MSHA.

Air purifying respirators cannot be used under the following conditions:

oxygen deficiency.
IDLH concentration.
high relative humidity.
contaminant levels exceed designated maximum use concentrations.
poor warning properties.

Individuals who use air purifying respirators must wear a respirator which has been successfully fitted to their faces. An improperly-fitted respirator provides little respiratory protection. In the event that organic vapor levels exceed the upper limit for Level C protection (20 ppm), all field personnel are to stop work while the Site Safety Officer consults with the Office Health and Safety Representative.

Heat Stress

The use of protective equipment may create heat stress. Monitoring of personnel wearing impermeable clothing should commence when the ambient temperature is 70°F or above. Table 3 presents the suggested frequency for such monitoring. Monitoring frequency should increase as the ambient temperature increases or as slow recovery rates are observed. Heat stress monitoring should be performed by a person with a current first aid certification who is trained to recognize heat stress symptoms. For monitoring the body's recuperative abilities to excess heat, one or more of the following techniques will be used. Other methods for determining heat stress monitoring, such as the wet bulb globe temperature (WBGT) index from American Conference of Governmental Industrial Hygienist (ACGIH) TLV Booklet can be used.

To monitor the worker, measure:

1. **Heart Rate.** Count the radial pulse during a 30-second period as early as possible in the rest period.

    - If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one third and keep the rest period the same.

    - If the heart rate exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one third.

2. **Oral Temperature.** Use a clinical thermometer (three minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).

    If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one third without changing the rest period.

    - If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following cycle by one third.

    - Do not permit a worker to wear a semi-permeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C).

Prevention of Heat Stress

Proper training and preventive measures will aid in averting loss of worker productivity and serious illness. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat-related illness. To avoid heat stress, the following steps should be taken:

1. Adjust work schedules.

   - Modify work/rest schedules according to monitoring requirements.
   - Mandate work slowdowns as needed.
   - Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.

2. Provide shelter (air conditioned, if possible) or shaded areas to protect personnel during rest periods.

3. Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, i.e., eight fluid ounces (0.23 liters) of water must be ingested for approximately every eight ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:

   - Maintain water temperature at 50° to 60°F (10° to 16.6°C).

     Provide small disposable cups that hold about 4 ounces (0.1 liter).

   - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.

   - Urge workers to drink a cup or two every 15 to 20 minutes or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight. Urge workers to salt their food appropriately.

4. Train workers to recognize the symptoms of heat-related illnesses.

5. Avoid alcohol consumption.

Cold-Related Illness

If work on this project begins in the winter months, thermal injury due to cold exposure can become a problem for field personnel. Systemic cold exposure is referred to as hypothermia. Local cold exposure is generally labeled frostbite.

1. **Hypothermia**. Hypothermia is defined as a decrease in the patient core temperature below 96°F. The body temperature is normally maintained by a combination of central (brain and spinal cord) and peripheral (skin and muscle) activity. Interferences with any of these mechanisms can result in hypothermia, even in the absence of what normally is considered a "cold" ambient temperature. Symptoms of hypothermia include shivering, apathy, listlessness, sleepiness and unconsciousness.

2. **Frostbite**. Frostbite is both a general and medical term given to areas of local cold injury. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperatures are less than freezing and usually less than 20°F. Symptoms of frostbite are a sudden blanching or whitening of the skin; the skin has a waxy or white appearance and is firm to the touch; tissues are cold, pale and solid.

Prevention of Cold-Related Illnesses

1. Educate worker to recognize the symptoms of frostbite and hypothermia.

2. Identify and limit known risk factors:

   - Prohibit phenothiazine use.
   - Identify/warn/limit beta blocker use.

3. Assure the availability of enclosed, heated environment on or adjacent to the site.

4. Assure the availability of dry changes of clothes.

5. Develop capability for temperature recording at the site.

6. Assure the availability of warm drinks.

Monitoring

Start (oral) temperature recording at job site:

1. At the Field Team Leader's discretion when suspicion is based on changes in worker's performance or mental status.

2. At worker's request.

3. As a screening measure, two times per shift, under unusually hazardous conditions (e.g., wind-chill less than 20°F or wind-chill less than 30°F with precipitation).

4. As a screening measure whenever any one worker on the site develops hypothermia.

Any person developing moderate hypothermia (a core temperature of 91°F) cannot return to work for 48 hours.

Air Monitoring Requirements

Initial site monitoring will be required utilizing Level D protection. Prior to performing site activities, ambient air monitoring will be performed and site work zones will be established. Periodic monitoring will be performed when:

1. A different type of operation is initiated (e.g., groundwater sampling as opposed to well installation).

2. The weather conditions change.

3. Work begins on a different portion of the site.

4. At 5-foot intervals during well installation.

A photoionization detector (PID) and explosimeter will be the monitoring instruments used on site. Continuous monitoring with an explosimeter will be conducted when drilling through refuse. The PID will be used to establish the appropriate level of respiratory protection, as follows:

VOLATILE ORGANICS IN BREATHING ZONE	LEVEL OF RESPIRATORY PROTECTION
0-5 ppm	Level D
5-200 ppm	Level C
200-1000 ppm	Level B - air line
1000+ ppm	Level B - SCBA

SITE WORK ZONES

To reduce the spread of hazardous materials by workers from the contaminated areas to the clean areas, zones will be delineated at the site where different types of operations will occur. The flow of personnel between the zones should be controlled. The establishment of work zones will help ensure that personnel are properly protected against the hazards present where they are working, work activities and contamination are confined to the appropriate areas, and personnel can be located and evacuated in an emergency.

Exclusion Zone

The exclusion zone is an area where contamination does or could occur. An exclusion zone will be established for all drilling and groundwater sampling activities. Access into the exclusion zone will be controlled to ensure that personnel entering the areas are wearing the proper protection (e.g., hard hat, gloves, Tyvek^{R}, respirators). Unprotected onlookers should be located 50 feet upwind of the drilling.

Contamination Reduction Zone

This will be established by Site Safety Officer as a buffer zone between the exclusion zone and the support zone. Contamination reduction zone will contain the personnel and equipment decontamination station indicated below. The contamination reduction zone should always be located upwind of the exclusion zone in an area devoid of air contaminants.

Support Zone

The support zone will include the remaining areas of the job site. Break areas, operational direction and support facilities (to include supplies, equipment storage and maintenance areas) will be located in this area. No equipment or personnel will be permitted to enter the clean zone from the contamination reduction zone without passing through the personnel or equipment decontamination station. Eating, smoking and drinking will be allowed only in this area.

ACCIDENT PREVENTION

All field personnel will receive health and safety training prior to the initiation of any site activities. On a day-to-day basis, individual personnel should be constantly alert for indicators of potentially-hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures. Rapid recognition of dangerous situations can avert an emergency. Before daily work assignments, regular meetings shall be held. Discussion should include:

1. Tasks to be performed.

2. Time constraints (e.g., rest breaks, cartridge changes).

3. Hazards that may be encountered, including their effects, how to recognize symptoms or monitor them, concentration limits, or other danger signals.

4. Emergency procedures.

Each phase (drilling and groundwater sampling) presents unique hazards of which the field team should be vigilant.

Drilling

Prior to any drilling activity, efforts should be made to determine whether underground installations (i.e., telephone cables, sewer lines, fuel pipes, electrical lines, etc.) will be encountered and, if so, where these installations are located. The Field Team Leader must coordinate with the site owner or utility companies to locate underground utilities prior to performing drilling activities. The Field Team Leader or Site Safety Officer will provide constant on-site observation of the drilling subcontractor to encourage that they meet the health and safety requirements. If deficiencies are noted, work will be stopped and corrective action will be taken (e.g., retrain, purchase additional safety equipment). Reports of health and safety deficiencies and the correction action taken will be forwarded to the Project Manager. Periodic air monitoring will be performed by the Site Safety Officer to verify that proper personal protection is being utilized.

Drill rig operators must be constantly aware of the potential for explosion from methane/hydrogen sulfide releases.

Sampling

The Site Safety Officer will verify that entry into any exclusion zone is controlled to make certain that personnel entering this zone don the proper protective clothing. Periodic air monitoring will be conducted to determine whether atmospheric chemical conditions have changed from the initial air characterization. The Safety Officer will post the emergency phone numbers (phone numbers of the physicians, hospitals, ambulances, etc.) in a conspicuous place. The field team will be trained in emergency contingencies. Constant monitoring of field activities will be performed to verify compliance with the safety plan.

CONTINGENCY PLAN

Emergency Procedures

In the event that an emergency develops on site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

1. Any member of the field crew is involved in an accident or experiences any adverse effects of symptoms of exposure while on site.

2. A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

General emergency procedures and specific procedures for personal injury and chemical exposures are described in the Health and Safety Plan.

Chemical Exposure

If a member of the field crew demonstrates symptoms of chemical exposure, the procedures outlined below should be followed:

1. Another team member (buddy) should remove the individual from the immediate area of contamination. The buddy should communicate to the Field Team Leader (via two-way radio or hand signals) of the chemical exposure. The Field Team Leader should contact the appropriate emergency response agency.

2. Precautions should be taken to avoid exposure of other individuals to the chemical.

3. If the chemical is on the individual's clothing, the chemical should be neutralized or removed if it is safe to do so.

4. If the chemical has contacted the skin, the skin should be washed with copious amounts of water.

5. In case of eye contact, an emergency eyewash should be used. Eyes should be washed for at least 15 minutes. Emergency eyewash solution will be provided by Stearns & Wheler.

6. All chemical exposure incidents must be reported in writing to the Office Health and Safety Representative. The Site Safety Officer or Field Team Leader is responsible for completing the accident repor.

Personal Injury

In case of personal injury at the site, the following procedure should be followed:

1. Another team member (buddy) should signal the Field Team Leader (via two-way radio or hand signals) that an injury has occurred.

2. A field team member trained in first aid can administer treatment of an injured worker.

3. The victim should then be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.

4. For less severe cases, the individual can be taken to the site dispensary (i.e., engineer's trailer office, plant infirmary, or field worker's vehicle equipped with first aid kit).

5. The Field Team Leader or Site Safety Officer is responsible for making certain that an accident report form is completed. This form is to be submitted to the Office Health and Safety Representative. Follow-up action should be taken to correct the situation that caused the accident.

Fire or Explosion

1. Notify paramedics and/or fire department as necessary.

2. Signal the evacuation procedure previously outlined and implement the entire procedure.

3. Isolate the area.

4. Stay upwind of any fire.

5. Keep area surrounding the problem source clear after the incident occurs.

6. Complete accident report form and distribute to appropriate personnel.

Smoking, eating, and the use of contact lenses or cosmetics will not be permitted on site.

Evacuation

1. The Field Team Leader will initiate evacuation procedures by signaling (via two-way radio or whistle) to leave the site.

2. All personnel in the work area should evacuate the area and meet in the common designated area.

3. All personnel suspected to be in or near the contract work area should be accounted for and the whereabouts of missing persons determined immediately.

4. Further instruction will then be given by the Field Team Leader.

DECONTAMINATION PROCEDURES

Personnel

To prevent harmful materials from being transferred into clean areas or from exposing unprotected workers, all field personnel exiting an area of potential contamination will undergo decontamination. The extent of decontamination depends on a number of factors, the most important being the type and concentration of the contaminant involved.

Soft-bristled scrub brushes and long handle brushes will be used to remove contaminants from personnel. Buckets of water or garden sprayers will be used for rinsing. Large plastic garbage bags will be used to store contaminated clothing (gloves, etc.) and equipment. Metal or plastic cans or drums will be used to store contaminated liquids. Washing and rinsing are done in combination with a sequential doffing of clothing starting at the first decon station with the most heavily contaminated article and progressing to the last station with the least contaminated article. Decontamination will not be required for Level D activities. An exclusion zone will be established for drilling and Level C activities to prevent personnel from entering these areas without proper safety equipment (e.g., hard hat, steel-toe boots, respirators, etc.).

Decontamination procedures will be divided into 13 stations. Level C decontamination at all sites will consist of the following.

Station 1: Segregated Equipment Drop

Deposit equipment used on the site (tools, sampling devices and containers, monitoring instruments, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross-contamination. Necessary equipment includes: (1) containers of various sizes; (2) plastic liners; and (3) plastic drop cloths

Section 2: Suit/Safety Boot and Outer Glove Wash

Thoroughly wash chemically-resistant suit, safety boots and outer gloves. Scrub with long handle, soft bristle scrub brush and copious amounts of alconox/water solution. Necessary equipment includes: (1) container (30-gallon); (2) alconox/water solution; (3) long handle, soft bristle scrub brushes; and (4) isopropanol.

Station 3: Suit/Safety Boot and Outer Glove Rinse

Rinse off alconox/water solution using copious amounts of water. Repeat as many times as necessary. Necessary equipment includes: (1) container (30-gallon); (2) spray unit; (3) water; and (4) long handle, soft bristle scrub brushes.

Station 4: Outer Gloves Removal

Remove the outer gloves and deposit in individually-marked plastic bags. Necessary equipment includes: (1) plastic bag; and (2) bench or stool.

Station 5: Canister or Mask Change

If a worker leaves the exclusion zone to change a canister (or mask), this is the last step in the decontamination procedures. The worker's canister is exchanged, new outer glove donned, and joints taped. Worker returns to duty. Otherwise the worker proceeds to Station 6. Necessary equipment includes: (1) canister (or mask); (2) tape; (3) boot covers; and (4) gloves.

Station 6: Safety Boot Removal

Remove safety boots and deposit in individually-marked plastic bags. Necessary equipment includes: (1) container (30-gallon); (2) plastic liners; and (3) bench or stool.

Station 7: Removal of Chemically-Resistant Suit

With assistance of helper, remove suit. Deposit in container with plastic liner. Necessary equipment includes: (1) container (30-gallon); (2) chair; and (3) plastic liner.

Section 8: Inner Glove Wash

Wash inner gloves with alconox/water solution that will not harm skin. Repeat as many times as necessary. Necessary equipment includes: (1) alconox/water solution; (2) container; and (3) long handle, soft bristle brushes.

Station 9: Inner Glove Rinse

Rinse inner gloves with water. Repeat as many times as necessary. Necessary equipment includes: (1) water; (2) basin; and (3) small table.

Station 10: Respirator Removal

Remove facepiece. Avoid touching face. Wash respirator in clean, sanitized solution. Allow to dry and deposit facepiece in plastic bag. Store in clean area. Necessary equipment includes: (1) plastic bags; (2) sanitizing solution; and (3) cotton.

Station 11: Inner Glove Removal

Remove inner gloves and deposit in container with plastic liner. Necessary equipment includes: (1) container; and (2) plastic liners.

Section 12: Field Wash

Wash hands and face. Necessary equipment includes: (1) water; (2) soap; (3) tables; (4) wash basins or buckets; and (5) clean towels.

Section 13: Redress

If re-entering exclusion zone, put on clean field clothes (e.g., Tyvek ^{R}, gloves, etc. Necessary equipment includes: (1) table; (2) chairs; and (3) clothing.

Modification can be made to the 13-station decontamination process depending upon the extent of contamination. The effectiveness of the decontamination process can be checked visually or by the use of a photoionization detector.

Personnel breaking for lunch will be required to wash hands and face prior to eating. Personnel should shower upon return to their hotels at the end of the work day.

Equipment

Drill rigs will be steam cleaned and drilled equipment will be decontaminated prior to moving to a site. Drilling equipment used for multiple boreholes will be decontaminated prior to drilling each boring at the site. The equipment will be decontaminated in the following manner:

1. The drilling rig will be steam cleaned to remove gross contamination.
2. Downhole equipment (auger bits, drill rods, split spoons, etc.) will be steam cleaned to remove gross contamination.
3. Lastly, the downhole equipment will be air dried.

A drilling sequence hierarchy (from less likely to more likely contaminated boring locations) will be imposed to reduce the potential for cross contamination.

All sampling equipment will be decontaminated prior to use at each sampling location. The methodology used to decontaminate sampling equipment is similar to that used for downhole equipment; the exception being that the first step, steam cleaning, is not necessary for decontaminating sampling equipment.

TABLE 1

ON-SITE PERSONNEL

TITLE	GENERAL DESCRIPTION	RESPONSIBILITIES
Project Manager (Daniel Ours)	Reports to upper-level management. Has authority to direct response operations.	• Prepares and organizes the background review of the situation, the work plan, the site safety plan, and the field team. • Obtains permission for site access and coordinates activities with appropriate officials. • Ensures that the work plan is completed and on schedule. • Briefs the field teams on their specific assignments. • Uses the Site Safety and Health Officer to ensure that safety and health requirements are met • Prepares the final report and support files on the response activities. • Serves as the liaison with public officials.
Site Safety Officer (Jerry Clark)		• Periodically inspects protective clothing and equipment. • Ensures that protective clothing and equipment are properly stored and maintained • Controls entry and exit at the access control points. • Coordinates safety and health program activities with the Office Health and Safety Representative • Confirms each team member's suitability for work based on a physician's recommendation • Monitors the work parties for signs of stress, such as cold exposure, heat stress and fatigue. • Implements the Site Safety Plan. • Verifies compliance with the site safety plan. • Conducts periodic inspections to determine if the site safety plan is being followed. • Enforces the "buddy system". • Knows emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department and police department. • Trains on-site employees on site-specific health and safety plan. • Notifies, when necessary, local public emergency officials.

TITLE	GENERAL DESCRIPTION	RESPONSIBILITIES
Site Safety Officer (continued)		• Coordinates emergency medical care. • Sets up decontamination of all equipment, personnel and samples from the decontaminated areas. • Controls the decontamination of all equipment, personnel, and samples from the contaminated areas. • Assures proper disposal of contaminated clothing and materials. • Ensures that all required equipment is available. • Advises medical personnel of potential exposures and consequences. • Notifies emergency response by telephone or radio in the event of an emergency.
Field Team Leader (Scott Graham)	Responsible for field team operations and safety.	• Manages field operations. • Executes the work plan and schedule. • Enforces safety procedures. • Coordinates with the Site Safety Officer in determining protection level. • Enforces site control. • Documents field activities and sample collection. • Serves as a liaison with public officials.
Work Team	Remediation contractor.	• Safely completes the on-site tasks required to fulfill the work plan. • Complies with Site Safety Plan. • Notifies the Site Safety Officer or supervisor of suspected unsafe conditions.

TABLE 2

HAZARD LEVEL VS. EQUIPMENT

	LEVEL OF PROTECTION			
	A	B	C	D
Hard hat	√	√	√	√
Face shield/safety glasses			√	√
Boots	√	√	√	√
Inner gloves	√	√	√	
Outer gloves	√	√	√	
Work coveralls				√
Chemical-resistant coveralls			√	
Chemical-resistant suit		√		
Fully encapsulating suit	√			
Air purifying respirator			√	
SCBA/air-line respirator	√	√		
Two-way radio	√			

TABLE 3

SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING AND WORK/REST SCHEDULE FOR FIT AND ACCLIMATIZED WORKERS(1)

ADJUSTED TEMPERATURE(2)	NORMAL WORK ENSEMBLE(3)	IMPERMEABLE ENSEMBLE(4)
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°-90°F (30.8°- 32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-30.8°C)		After each 60 minutes of work
77.5°-82.5°C (25.3°-28.1°C)		After each 90 minutes of work
72.5°-77.5°C (22.5°C-25.3°C)		After each 120 minutes of work

(1) For work levels of 250 kilocalories/hour (light to moderate type of work).

(2) Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F + (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).

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

SITE HEALTH AND SAFETY PLAN

A. SITE DESCRIPTION

Date ...._________ Revised: _______
Location ....Homer/Cortland Former MGP Site, U.S. Route 11, Village of Homer, Cortland County, NY
Hazards ....Volatile and semi-volatile organics in soil, soil gas, and groundwater
Area Affected ....Subsurface, surface soils, groundwater
Surrounding Population ....Commercial
Topography .... Flat
Weather Conditions ....Usually partly sunny to overcast, south winds

B. ENTRY OBJECTIVES: The objective of site entry to the contaminated area is to investigate previously identified source areas for volatile and semi-volatile VOCs.

C. ON-SITE ORGANIZATION AND COORDINATION. The following personnel are designated to carry out the stated job functions on site. (Note: One person may carry out more than one job function.)

Project Team Leader:	Daniel Ours	(315) 655-8161
Site Safety Officer:	Jerry Clark	(315) 655-4953
Field Team Leader:	Donald S. Sorbello	(315) 655-8161
Field Team Members:	Donald S. Sorbello/Jeffrey Kiggins	(315) 655-8161
NYSEG Representative:	Tracy Blazicek	(607) 762-8839

All personnel arriving or departing the site should log in and out with the Field Team Leader. All activities on site must be cleared through the Project Team Leader.

D. ON-SITE CONTROL. The Field Team Leader has been designated to coordinate access control and security on site. A safe perimeter has been established at the site boundaries. No unauthorized personnel should be within this area.

Control boundaries have been established as necessary. These boundaries will be identified as the site perimeter.

E. HAZARD EVALUATION. The following substances are known or suspected to be on site, primarily in soils. The primary hazards of each are identified.

SUBSTANCE	PRIMARY HAZARDS
Volatile Organics	
Toluene	Fatigue, weakness, confusion
Ethylbenzene	Irritated nose, throat; dizziness; breathing difficulty
Benzene	Headache; giddiness; irritated eyes, nose, throat

SUBSTANCE	PRIMARY HAZARDS
Semi-Volatile Organics*	
Acenaphthene	Skin irritation, mucous membrane irritation, vomiting
Benzo(a)pyrene	Skin tumors, carcinogen
Chrysene	Carcinogen
Fluoranthene	Possible carcinogen
Naphthalene	Headache, nausea, sweating

*Compounds listed above are PAHs. A number of other PAHs have been tentatively identified which do not have reported short-term exposure effects, but which are suspected carcinogens. These other PAHs are not included in the above table.

F. **PERSONAL PROTECTIVE EQUIPMENT.** Based on evaluation of potential hazards, the following levels of personal protection have been designated for the applicable work areas or tasks:

LOCATION	JOB FUNCTION	LEVEL OF PROTECTION
Work zone	Site investigation	A B C [✓ D] Other

Specific protective equipment for each level of protection is as follows:

Level A	Fully-encapsulating suit SCBA (disposable coveralls)
Level B	Splash gear (saranax-coated Tyvek suit) SCBA or airline respirators
Level C	Splash gear (Tyvek suit) Full-face canister respirator Boots Gloves Hard hat
Level D	Overalls Safety glasses Boots Gloves Hard hat

Action Levels. The following criteria shall be used to determine appropriate action:

VOLATILE ORGANICS IN BREATHING ZONE	LEVEL OF RESPIRATORY PROTECTION
0-5 ppm	Level D
5-200 ppm	Level C
200-1000 ppm	Level B - air line
1000+ ppm	Level B - SCBA

% LOWER EXPLOSIVE LIMIT (LEL)	ACTION
Above 10	Discontinue work and take remedial action

The following protective clothing materials are required for the involved substances:

SUBSTANCE (CHEMICAL NAME)	MATERIAL (MATERIAL NAME, E.G., VITON)
Volatile Organics	
Toluene	Respirator
Ethylbenzene	Respirator
Benzene	Respirator
Semi-Volatile Organics	
Acenaphthene	Respirator
Benzo(a)pyrene	Respirator
Chrysene	Respirator
Fluoranthene	Respirator
Naphthalene	Respirator

NO CHANGE TO THE SPECIFIED LEVELS OF PROTECTION SHALL BE MADE WITHOUT THE APPROVAL OF THE SITE SAFETY OFFICER AND THE PROJECT TEAM LEADER.

G. **ON-SITE WORK PLANS.** Work party(s) consisting of at least two persons will perform the field investigation.

Project Team Leader:..Daniel Ours
Work Party ....Don Sorbello, Jeffrey Kiggins

The work party was briefed on the contents of this plan prior to commencement of work.

H. **COMMUNICATION PROCEDURES.** The Project Team Leader should remain in communication with the Field Team Leader.

Continuous horn blast is the emergency signal to indicate that all personnel should leave the Work Zone.

In the event that radio communications are used, the following standard hand signals will be used in case of failure of radio communications:

Hand gripping throat	Out of air; can't breathe
Grip partner's wrist or both hands around waist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	OK; I am all right; I understand
Thumbs down	No; negative

I. SITE HEALTH AND SAFETY PLAN.

1. Jerry Clark is the designated Site Safety Officer and is directly responsible to the Project Team Leader for safety recommendations on site. The Field Team Leader will be responsible for executing and enforcing the Site Health and Safety Plan.

2. **Emergency Medical Care.** Cortland Memorial Hospital is located 10 minutes from this location. A map of alternative routes to this facility is available at the field vehicle (attached).

First aid equipment is available on site at the following locations:

First aid kit	Field vehicle

List of emergency phone numbers:

AGENCY/FACILITY	PHONE NUMBER
Police (Homer Police Department)	(607) 749-2022
Fire (Homer Fire Department)	911 or (607) 749-3121
Ambulance (TLC Emergency Medical Services)	911
Cortland Memorial Hospital	(607) 756-3500

3. **Environmental Monitoring.** The following environmental monitoring instruments shall be used on site at the specified intervals:

- MiniRAE photoionization detector (PID). Continuous during installation of soil gas monitoring probes.
- Percent methane gas detector. Continuous during installation of soil gas monitoring probes.
- Dust monitor.

4. **Emergency Procedures.** The following standard procedures will be used by on-site personnel. The Site Safety Officer shall be notified of any on-site emergencies and be responsible for ensuring that the appropriate procedures are followed:

   a. **Personnel Injury in the Work Zone.** Upon notification of an injury in the Work Zone, the designated emergency signal, a continuous horn blast, shall be sounded. A rescue team will enter the Work Zone (if required) to remove the injured person to safety. Appropriate first aid shall be initiated and contact should be made for an ambulance and with the designated medical facility (if required). No persons shall re-enter the Work Zone until the cause of the injury or symptoms is determined.

   b. **Fire/Explosion.** Upon notification of a fire or explosion on site, the designated emergency signal, a continuous horn blast, shall be sounded and all site personnel assembled at the decontamination line. The fire department shall be alerted and all personnel moved to a safe distance from the involved area.

   c. **Personal Protective Equipment Failure.** If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and his/her buddy shall immediately leave the Work Zone. Re-entry shall not be permitted until the equipment has been repaired or replaced.

d. **Other Equipment Failure.** If any other equipment on site fails to operate properly, the Project Team Leader and Site Safety Officer shall be notified and then determine the effect of this failure on continuing operations on site. If the failure affects the safety of personnel or prevents completion of the Work Plan tasks, all personnel shall leave the Work Zone until the situation is evaluated and appropriate actions taken.

In all situations, when an on-site emergency results in evacuation of the Work Zone, personnel shall not re-enter until:

a. The conditions resulting in the emergency have been corrected.
b. The hazards have been reassessed.
c. The Site Health and Safety Plan has been reviewed.
d. Site personnel have been briefed on any changes in the Site Health and Safety Plan.

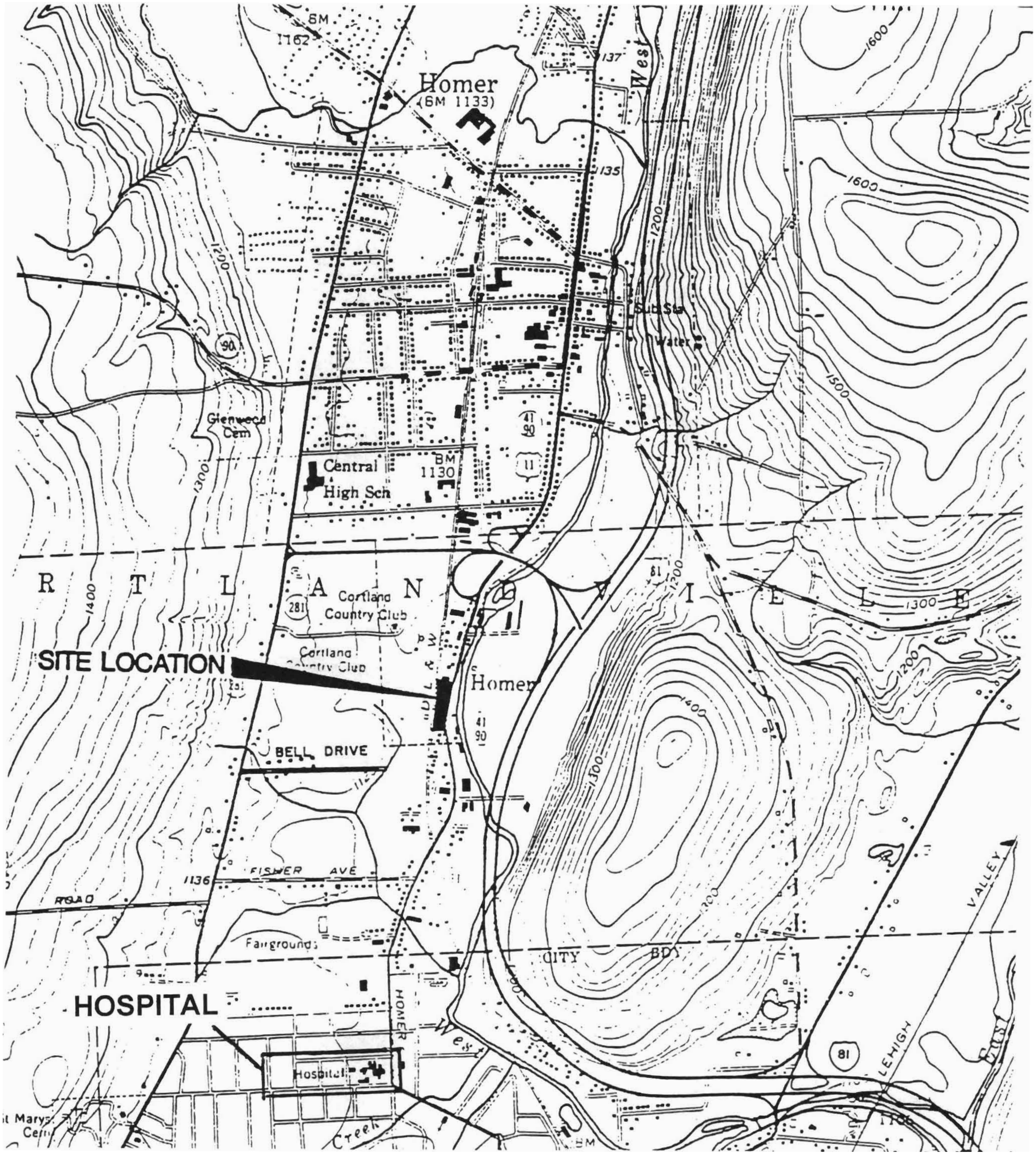
5. **Personal Monitoring.** The following personal monitoring will be in effect on site:

Personal exposure sampling: MiniRAE PID screening, sampling pumps/tubes , or organic vapor monitors.

Medical monitoring: The expected air temperature will be less than 70°F. If it is determined that heat stress monitoring is required (mandatory if over 70°F), the following procedures shall be followed: Monitoring body temperature, body weight, pulse weight.

All site personnel have read the above plan and are familiar with its provisions.

	Name	Signature
Site Safety Officer	Jerry Clark	
Project Team Leader	Daniel P. Ours	
Other Site Personnel	Don Sorbello/Jeffrey Kiggins	



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ENVIRONMENTAL ENGINEERS & SCIENTISTS
CAZENOVIA, NEW YORK

DATE: 5/99 JOB No: 90103

NYSEG
CORTLAND/HOMER FORMER MGP SITE
SUPPLEMENTAL REMEDIAL INVESTIGATION

FIGURE 1
SITE LOCATION