PRELIMINARY SITE ASSESSMENT WORK PLAN

VERONA RESEARCH FACILITY

TOWN OF VERONA, NEW YORK

Prepared for

ROME LABORATORY

Prepared by

STEARNS & WHELER, LLC
Environmental Engineers and Scientists
One Remington Park Drive
Cazenovia, NY 13035
(315) 655-8161

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TOWN OF VERONA, NY

SECTION 1 - INTRODUCTION

The New York State Department of Environmental Conservation (NYSDEC) has identified the Rome Laboratory Verona Research Facility as a Potential Inactive Hazardous Waste Disposal site. As such, NYSDEC is requiring that Rome Laboratory perform a Preliminary Site Assessment (PSA) at the Verona Research Facility. The facility is located on Germany Road, Town of Verona, Oneida County, NY (Figure 1).

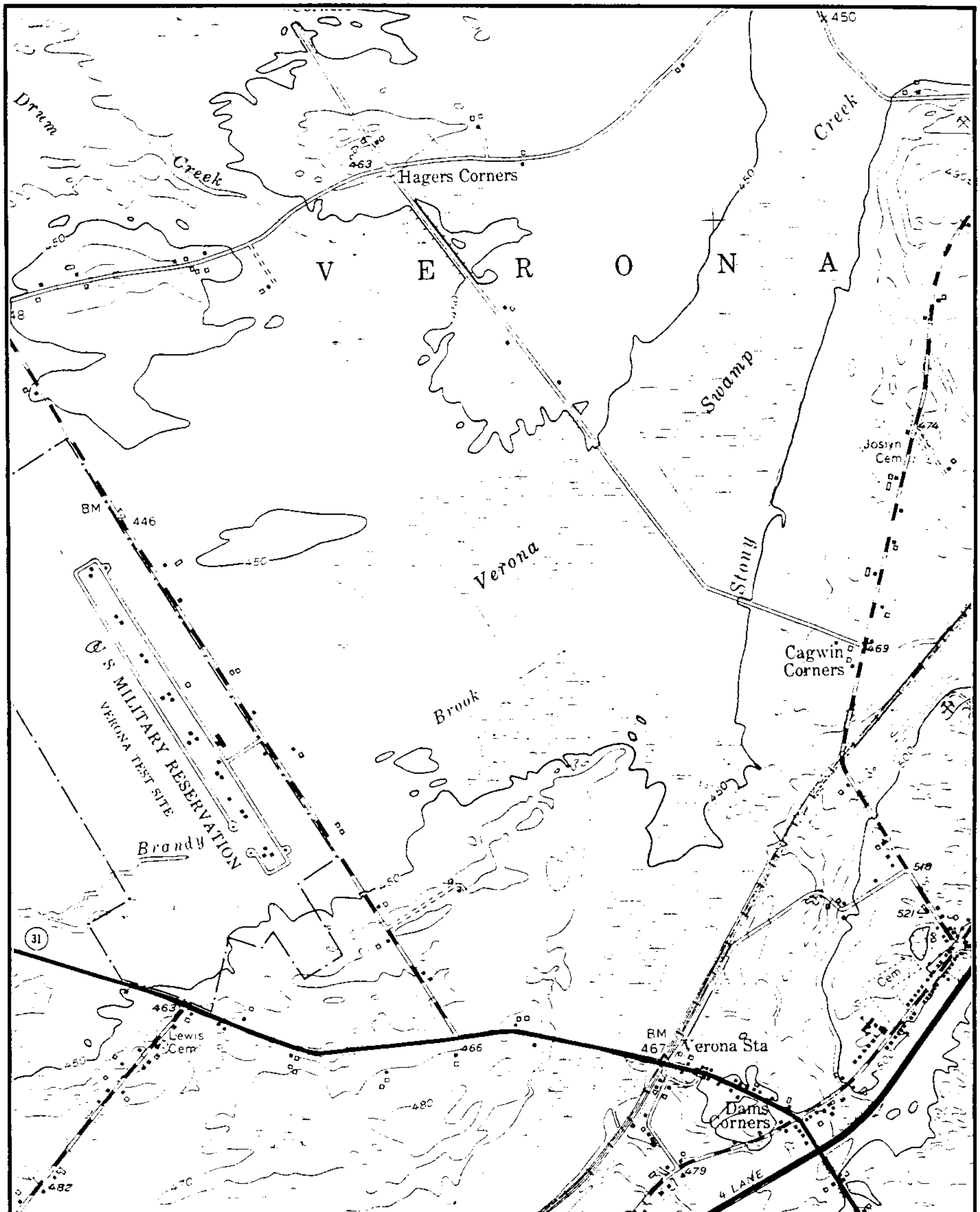
During a subsurface investigation conducted in response to fuel oil spill reports filed by Griffiss AFB to the NYSDEC, chlorinated organic compounds were detected (Parsons Engineering Science, September 1995). Due to the unexpected occurrence of organic compounds not associated with fuel oil, the scope and focus of the project was modified to include an interpretation of the presence of the chlorinated volatile organic compounds at the site. Based on the results of that work, NYSDEC is requiring additional investigation at the site.

This document is a preliminary site assessment work plan which will describe the type of data required and the methods used to collect that data in order to complete this investigation (NYSDEC, NYSDOH, NYSDOL, January 1995). The goal of the PSA is to determine whether a site meets the state's definition of an Inactive Hazardous Waste Site by confirming the presence of hazardous waste and determining if the site poses a degree of threat to public health or the environment. Typically, the PSA has three steps:

1. **Records Search.** A thorough background review and record check into the past use and disposal activity at the site.

2. **Sampling/Surveys.** Sampling of soil, surface water, and sediment.

3. **Groundwater Monitoring.** Installing monitoring wells and analyzing water samples to check for subsurface contamination.



VERONA
7.5 MINUTE
QUADRANGLE

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FIGURE 1
SITE LOCATION MAP

Each step ends with a decision point that can lead to one of two outcomes:

1. If the presence of hazardous waste and the degree of health and environmental threat can be documented, a site is classified to Class 1, imminent danger; Class 2, significant threat, or Class 3, no significant threat.

2. If hazardous waste cannot be documented, a site is delisted.

SECTION 2 - WORK PLAN ORGANIZATION

Following is an outline of this PSA Work Plan. The outline is based on the NYSDEC Division of Hazardous Waste Remediation Division Technical/Administrative Guidance Memorandum: Investigation Generic Work Plan.

2.1 OBJECTIVE

The objective of this investigation is to determine if the release of contaminants at the site is having an impact on human population and/or the environment. To meet these objectives, a field investigation, including the installation of groundwater monitoring wells, determination of the hydrogeologic nature of the site, and analysis of groundwater and surface water samples will be completed.

2.2 SITE HISTORY AND PREVIOUS INVESTIGATIONS

This section will discuss the site history and current chemical and hydrogeologic data available in the public domain. Included will be interviews with knowledgeable facility personnel (past and present) and a solicitation made for public input on past disposal practices at the site.

2.3 FIELD INVESTIGATION

This section describes the installation methods and completion of test borings and monitoring wells. This section will also describe protocols for the completion of slug tests, surveys, and other information required to complete the PSA.

2.4 SAMPLING AND ANALYSIS

Locations and the type of sampling will be described in this section of the work plan. A more thorough discussion of sampling protocols will be found in the Field Sampling Plan, Appendix A.

2.5 MAPS AND PLANS

A site map will be constructed indicating the estimated well locations, all sampling points, site facilities, and other pertinent information. In addition, a site location map based on a USGS topographic map will also be included.

2.6 TASK PRESENTATION

This table will indicate each task and a brief description of how they will be implemented (Appendix B).

2.7 PROJECT TEAM

The project team has been selected. The experience and qualifications of the team will be represented in a brief resume format. The resume will include the position that the team member will fill and the previous experience which makes the team member qualified to complete the tasks assigned (Appendix B).

SECTION 3 - OBJECTIVE

The objective of this investigation is to determine the nature and extent of the VOC contamination at the Verona Research Facility. To achieve this end, the following tasks will be completed:

1. **Hydrogeological Investigation.** This investigation will further the understanding of the hydrogeologic characteristics of the site. This will be completed by installing groundwater monitoring wells, completing soil borings, and determining the association between surface water and groundwater at the site.

2. **Groundwater Sampling.** Groundwater will be collected from geoprobe sample locations to determine the extent of contaminant migration from the various buildings at the site. Groundwater samples will be analyzed in the field using a portable gas chromatograph. The GC will be programmed to identify the contaminants of concern (Table 1) and will assist in determining the placement of the new monitoring wells.

3. **Surface Water and Sediment Sampling.** Surface water samples will be collected to determine if impacted groundwater is entering Brandy Brook. The surface water will be sampled during three separate monthly events. Sediment samples will be collected only during the first round. The samples will be collected at the same locations as the surface water samples. In the spring of 1997, three surface water samples will be collected from drainage ditches on site which discharge to Brandy Brook. These samples will be analyzed for VOCs and metals.

4. **Completion of a PSA Report.** This report will draw conclusions based on the data collected and determine whether additional information will have to be collected at the site, in order to classify the site.

SECTION 4 - SITE HISTORY

The Rome Laboratory Verona Research Facility (formerly the Griffiss AFB Verona Test Annex) was founded in the early 1950s on 513 acres of former farmland adjacent to Germany Road (U.S. Air Force Fact Sheet). The site consists of approximately 35 buildings constructed along a one-mile long road in the eastern section of the property. The facility has been used for a wide variety of electronic research and development activities since 1952.

Each of the laboratories, the headquarters building, and the Space Command facilities are heated with individual fuel-oil-fired boilers. Each of the boilers is connected to an individual fuel oil tank. Until recently, all of these heating oil tanks were located underground. Currently, a combination of aboveground and underground tanks are utilized.

TABLE 1
CONTAMINANTS OF CONCERN
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Analyte	**Analyte**
Benzene	Vinyl Chloride
Chlorobenzene	1,4-Dichlorobenzene
Cis 1,2-Dichloroethene	1,1-Dichloroethane
M,P-Xylene*	Trans 1,2-Dichloroethene
Tetrachloroethene	1,1,1-Trichloroethane
Trichloroethene	Dichlorodifluoromethane

The GC will detect total Xylene because of coelution of this analyte

As a result of a heating oil tank replacement project, a groundwater investigation was conducted to determine if the previous tanks had leaked. Parsons Engineering Science (ES) was contracted by the Air Force to install monitoring wells at six sites to test the soil and groundwater.

In December 1993, a subsurface investigation was initiated at the research facility by ES. During the investigation, ES completed 24 soil borings and installed 24 monitoring wells. The wells were installed at Buildings 1203, 1225, 1231, 1245, 1253, and 1277 to a depth of 12 feet. During drilling, soil samples were collected at all 24 borings, including two samples at MW002/Building 1245. The wells were used to collect groundwater samples, and the soil samples were used to describe the hydrogeologic nature of the site. In addition, slug tests were also performed at a number of well locations to calculate an order of magnitude hydraulic conductivity of the aquifer underlying the site, and in turn, calculate the seepage velocity of the groundwater across the site.

During the investigation, four rounds of groundwater sampling were completed. In Round 1, analysis was completed for both volatile and semi-volatile organic compounds using USEPA Methods 8021 and 8270, respectively. In Rounds 2 and 3, analysis was completed for volatiles only (USEPA Method 8021). During Round 3, unexpected chlorinated compounds were reported; this resulted in a change in sampling protocol in the fourth round.

The fourth round of sampling included analysis for volatiles (8240), semi-volatiles (8270), pesticides/PCBs (8080), metals (6010, 3010, 3020), and mercury (7270).

Groundwater sampling results indicated that there were a number of exceedances of NYSDEC groundwater standards (October 1993) during the four sampling rounds. The metals concentrations at the site may be the result of high turbidity of the samples collected. Acidification of high turbidity samples during preservation and analysis may dissolve a portion of the suspended material, resulting in elevated metals concentrations, potentially driving the concentrations above state standards. Exceedances were found for arsenic, chromium, lead, and cadmium at a number of locations.

Numerous exceedances for volatile organic compounds were found in groundwater. The bulk of these compounds were components of common solvents, probably associated with the cleaning of electronic components. The presence of cis-1,2-dichloroethene and vinyl chloride, breakdown products of tetrachloroethene and trichloroethene, among others, suggests that the contamination has been in the environment for sufficient time to have allowed the breakdown.

According to the ES report, only Monitoring Well MW001/Building 1231 showed exceedances of compounds associated with No. 2 fuel oil and only during the first two rounds of sampling. It was documented that the presence of fuel oil is attributed to overfills and spillages when the tanks were refilled and/or failed tank tightness tests.

Well logs from the investigation indicate that the first 12 feet of overburden consists of silt and sand with limited components of clay, gravel, fill, and peat. Figure 3 is a cross section developed from the ES data.

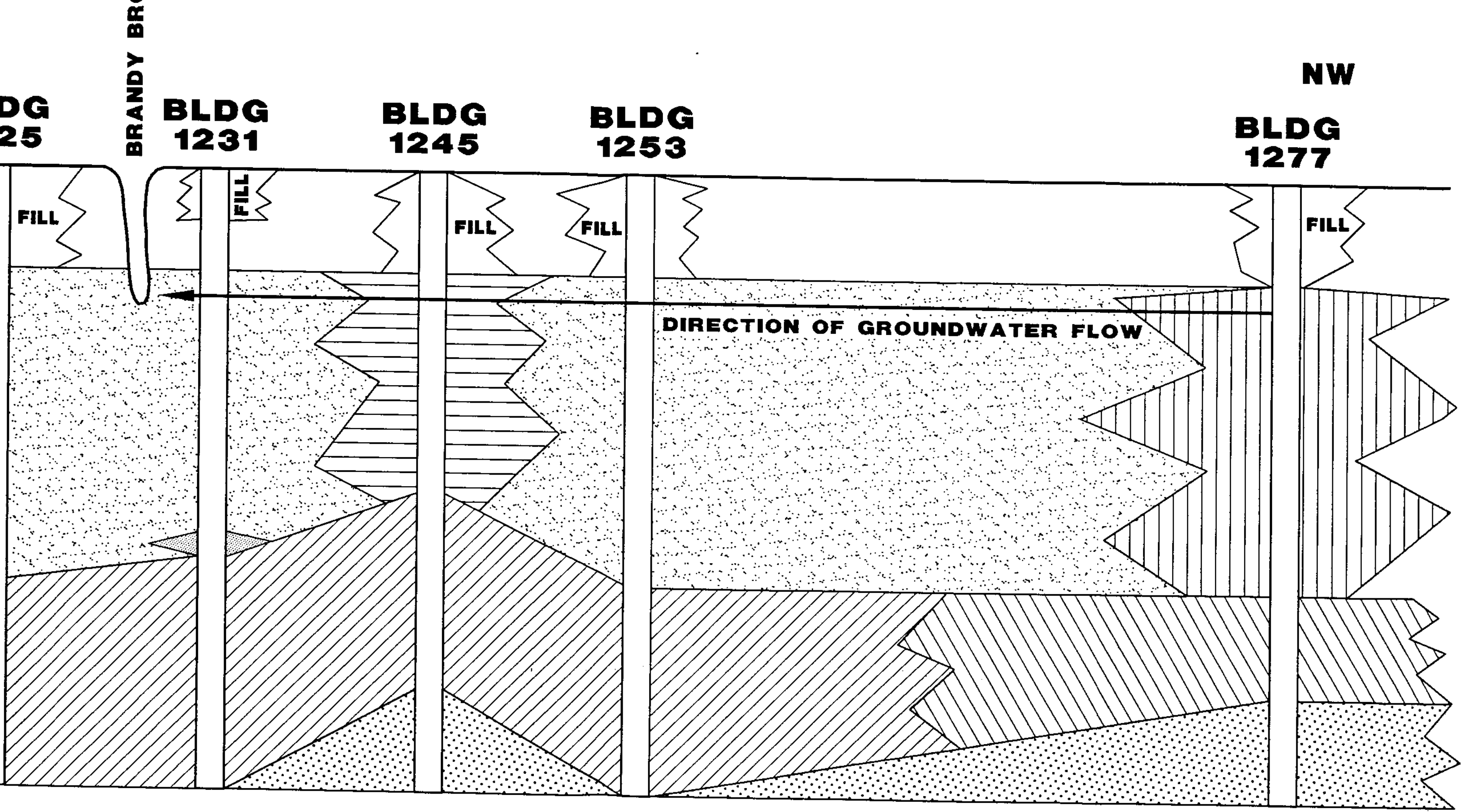
Slug test and seepage velocity results determined by ES indicate that the mean hydraulic conductivity at the site is 2.019 feet/day. The range of permeability values is from .968 feet/day to 97.92 feet/day. This translates into seepage velocities on the order of .04 to 2.8 feet per day.

Because of the extremely flat nature of the site, groundwater flow directions were subject to localized variations due to subtle changes in topography. These changes can be natural or man-made (fill, drainage ditches, etc.). Because of this, the mean value of the groundwater elevations at each of the buildings was used to determine the overall groundwater flow direction at the site. Using these values, groundwater flow at the site is to the south-southeast toward Brandy Brook.

SECTION 5 - FIELD INVESTIGATION

5.1 INSTALLATION OF MONITORING WELLS

Currently, 24 monitoring wells have been installed on the site. The wells were installed at Buildings 1203, 1225, 1231, 1245, 1253, and 1277 to investigate underground petroleum tanks. Impacts by chlorinated compounds at levels warranting further investigation were encountered at Buildings 1231 (600-700 ppb total VOCs); 1253 (15-70 ppb total VOCs); 1203 (5-40 ppb total VOCs); and 1245 (15 ppb total VOCs). No appreciable impacts were observed at Buildings 1225 or 1277. During Parsons' last round of sampling, selected metals were analyzed for and were detected at some locations at levels that exceeded NYSDEC standards. Both filtered and unfiltered



SOUTHEAST - NORTHWEST CROSS SECTION

ND
GRAVEL
FINE SAND

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metals samples will be collected at the site. This will determine the impact turbidity has on sample analysis. During preservation and analysis, each sample is acidified. Portions of the suspended material may dissolve, elevating the concentration of inorganic species, possibly above NYSDEC maximum contaminant levels (MCLs). Filtering samples reduces the possibility of false positives caused by turbidity.

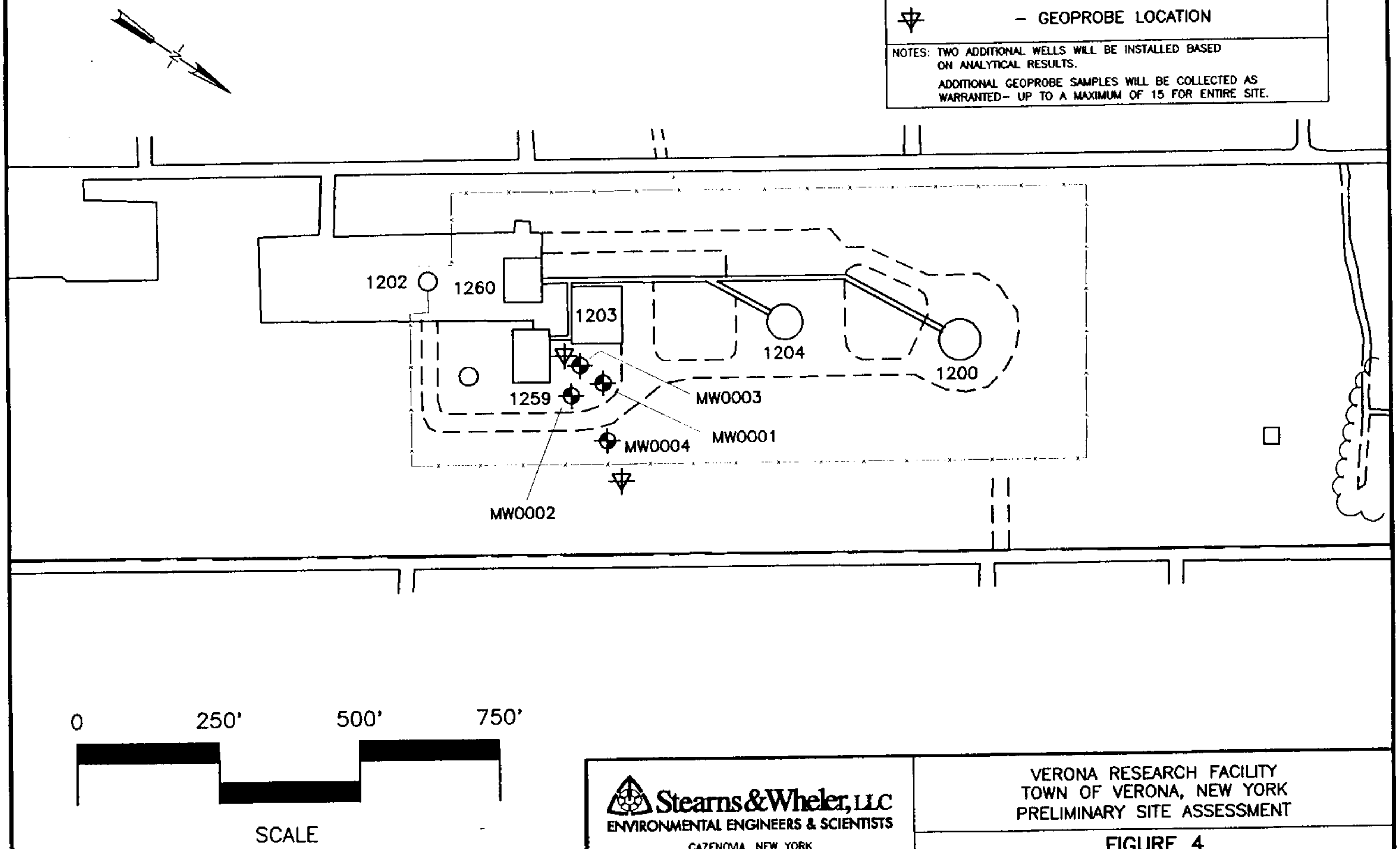
Further investigation will be conducted at the four sites where VOCs were detected at levels that exceeded standards. The purpose of the additional wells will be to approximate the source area by installing upgradient wells and to better define the areal extent of impacted groundwater.

Following is a generalized discussion of potential of well locations at the site. Specific locations will be determined based on the Geoprobe sampling and field GC analytical results.

A. **Building 1203.** Two wells will be installed at Building 1203 (Figure 4). VOCs were encountered at all wells at Building 1203 at levels ranging from 5 to 36 ppb. The most significant gradient at this location is to the north, from MW001 to MW004. However, a slight gradient appears to exist between MW001 and MW003 to the south. Because of this apparent mound, the location of the additional wells will be determined using a Geoprobe to collect groundwater samples. The groundwater samples will be analyzed using a field gas chromatograph. Two additional wells will be installed to better characterize the impact at this building. One well will be installed in the apparent source area, based on analytical results. A second well will be installed to better evaluate downgradient extent of impact.

B. **Building 1231.** Two or three wells will be installed at Building 1231 (Figure 5). One well will be installed upgradient (south to southwest of the building) to confirm that the source is in the immediate vicinity of the building. One downgradient well will be installed north of MW001 (the lateral extent to the east and west is already well defined by wells MW003 and MW004.) If GC results obtained during the Geoprobe survey indicate impact, a third well will be installed further to the north.

C. **Building 1245.** Two wells will be installed at building 1245 (Figure 6). VOCs were encountered in well MW003 at building 1245 at levels ranging from 15 to 27 ppb. The apparent gradient at that location is to the south. One well will be installed to the north, upgradient of well



LEGEND

MW0001 – EXISTING MONITORING WELL

– GEOPROBE LOCATION

NOTES: TWO ADDITIONAL WELLS WILL BE INSTALLED BASED ON ANALYTICAL RESULTS.

ADDITIONAL GEOPROBE SAMPLES WILL BE COLLECTED AS WARRANTED– UP TO A MAXIMUM OF 15 FOR ENTIRE SITE.

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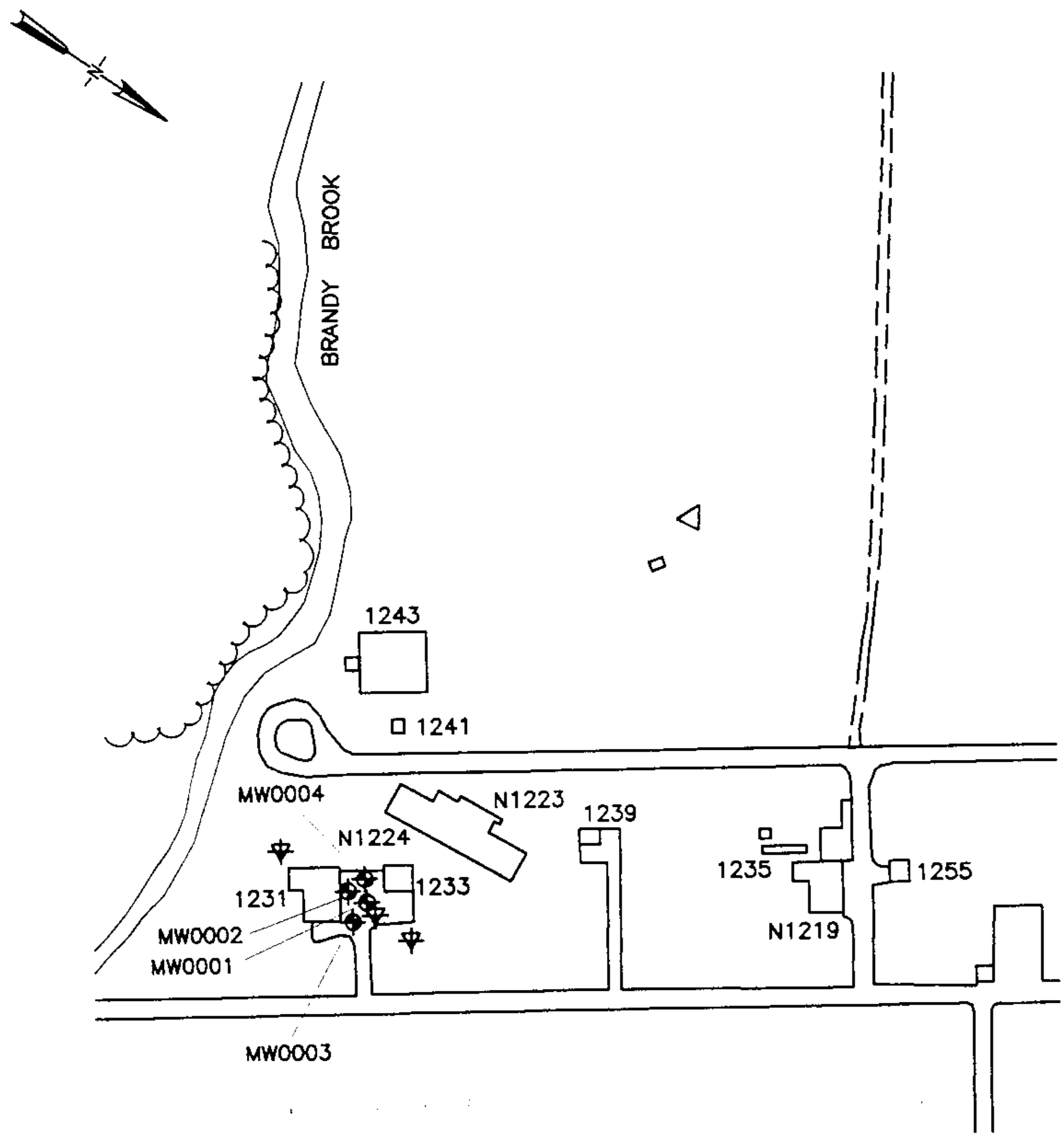
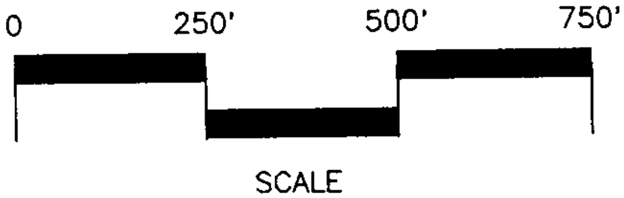
FIGURE 4
APPROXIMATE WELL LOCATIONS
BUILDING 1203





LEGEND

MW0001 – EXISTING MONITORING WELL

– GEOPROBE LOCATION

NOTES: NEW MONITORING WELL LOCATIONS BASED ON ANALYTICAL RESULTS DETERMINED IN THE FIELD AND GROUNDWATER FLOW DIRECTIONS.
ADDITIONAL GEOPROBE SAMPLES WILL BE COLLECTED AS WARRANTED– UP TO A MAXIMUM OF 15 FOR ENTIRE SITE.

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FIGURE 5
APPROXIMATE WELL LOCATION
BUILDING 1231

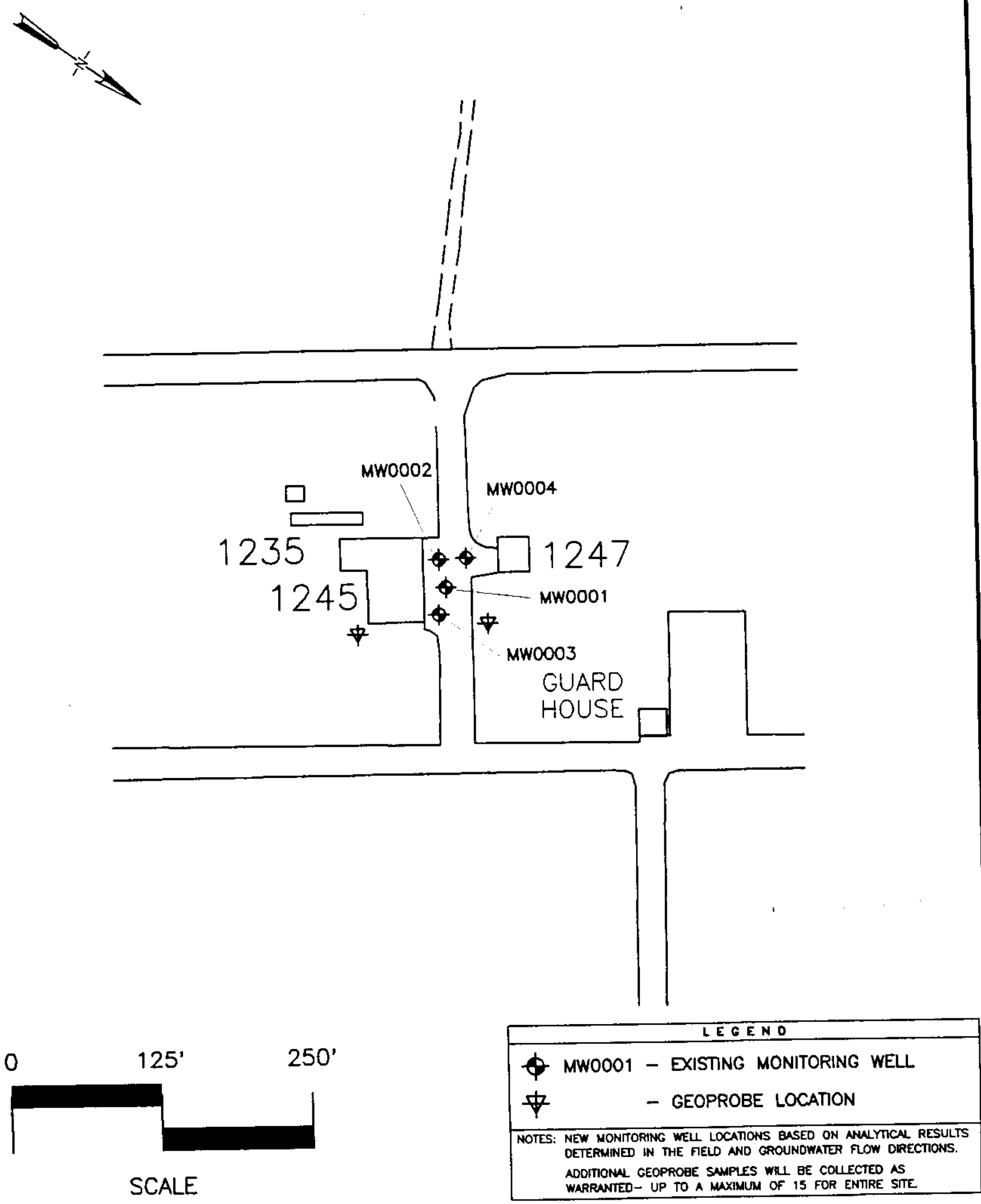

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FIGURE 6
APPROXIMATE WELL LOCATION
BUILDING 1245

MW003 to better define the source. One well will be installed to the southeast of MW003 to better evaluate downgradient extent of impact.

D. **Building 1253.** Two wells will be installed at Building 1253 (Figure 7). VOCs were encountered at all wells at Building 1253 at levels ranging from 15 to 70 ppb. The apparent gradient at that location is to the south. Two additional wells will be installed to better characterize the impact. One well will be installed to the north, upgradient of Well MW001 to better define the source. One well will be installed to the south-southwest of MW003 to better evaluate downgradient extent of impact.

Specific permanent monitoring well locations will be determined using the procedure described in the following section.

5.2 GEOPROBE/MONITORING WELL SITE SELECTION

In order to select the best monitoring well locations and delineate contaminant plumes, up to 15 Geoprobe borings will be completed. Through use of the Geoprobe, groundwater samples will be collected and analyzed using a field gas chromatograph (GC). The GC will be programmed to identify specific compounds found on the site during the fourth round of sampling completed by ES. Permanent wells will be located based on two criteria: at each site, the need for an upgradient well will be determined. Downgradient wells (location and number) will be based on field GC results of samples collected at the Geoprobe sites. Permanent wells will be installed in downgradient locations that are most appropriate for monitoring plume concentrations and extent. Three soil samples will be collected at Buildings 1203, 1231, 1245, and 1215. These samples will be collected only if PID readings exceed 5 ppm above background. If this limit is exceeded, samples will be collected and analyzed for VOCs and metals. Following is a synopsis of how the Geoprobe will be used in the field; a complete description on the use of the gas chromatograph is found in Appendix A.

The Geoprobe sampler is attached to the end of drive rods and driven into the subsurface. The sampler is driven to the sampling depth by adding more rods. Once the sampling depth has been reached, the rods are pulled back approximately 2 feet, exposing the screened sampling device to the aquifer. Groundwater is recovered using a specialized bailer. Once the sample is recovered, the rods and screen can be removed. At this point, the water sample is prepared for analysis by the gas chromatograph.

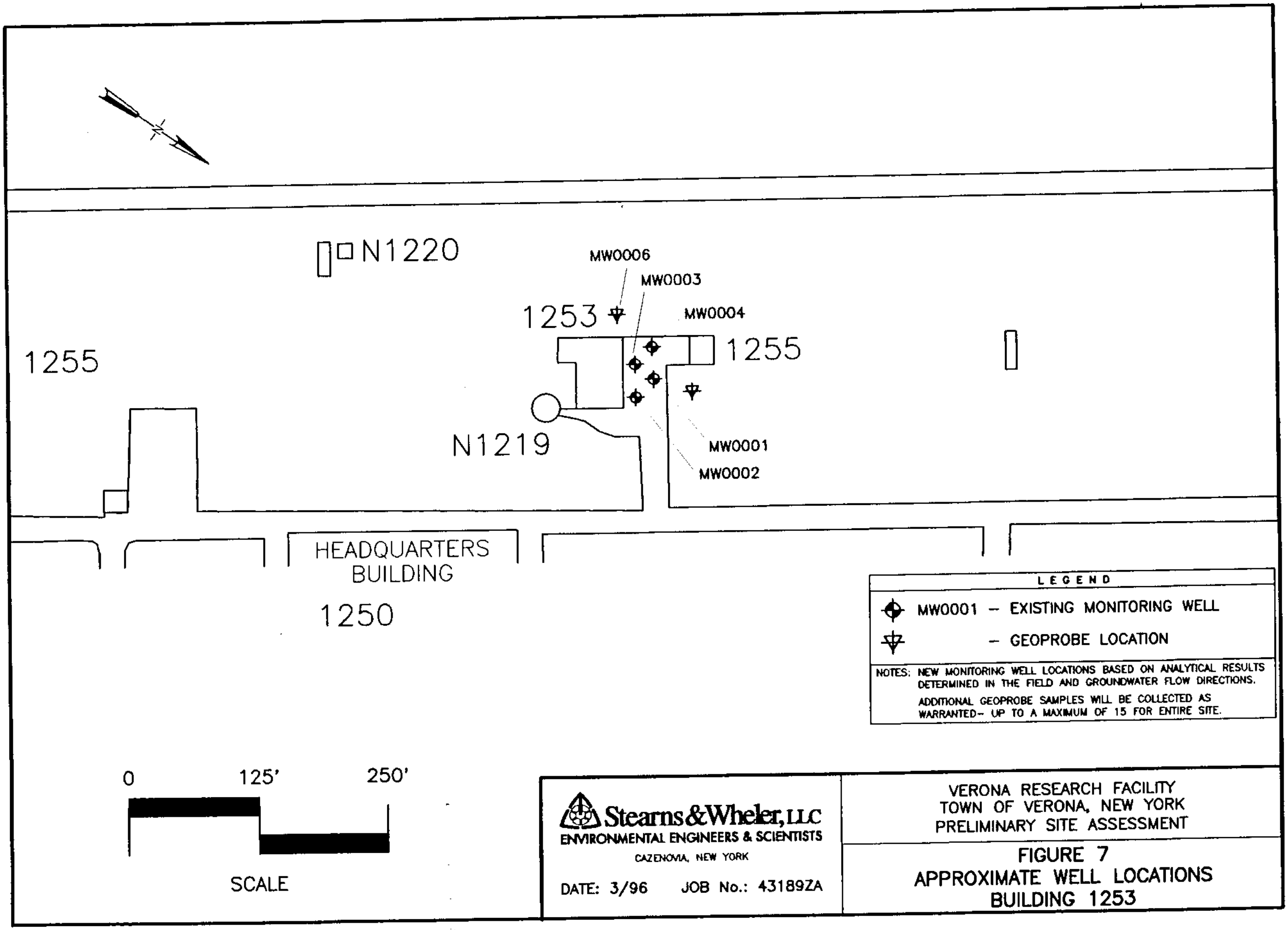
N1220
MW0006
MW0003
MW0004
1253
1255
1255
N1219
MW0001
MW0002
HEADQUARTERS
BUILDING
1250
LEGEND
MW0001 – EXISTING MONITORING WELL
– GEOPROBE LOCATION
NOTES: NEW MONITORING WELL LOCATIONS BASED ON ANALYTICAL RESULTS DETERMINED IN THE FIELD AND GROUNDWATER FLOW DIRECTIONS.
ADDITIONAL GEOPROBE SAMPLES WILL BE COLLECTED AS WARRANTED– UP TO A MAXIMUM OF 15 FOR ENTIRE SITE.
0
125'
250'
SCALE
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FIGURE 7
APPROXIMATE WELL LOCATIONS
BUILDING 1253

Following is the basic procedure for the collection, storage, and analysis of the groundwater samples using a field GC. The complete step-by-step procedure in the use of the field GC is found in Appendix A.

1. Collect samples in clean, unpreserved 40 ml septum capped glass vials with zero headspace. Cap vials and invert to avoid loss of volatiles.

2. Before samples are analyzed, the portable gas chromatograph should be calibrated with an aqueous standard containing all of the compounds of interest. The standardization procedure is found in PE Photovac TechTIP Volume 1, Number 4. The standard should be handled in exactly the same fashion as the sample, using the identical volume of headspace, the identical injection volume, and the identical equilibration time and temperature. The compound names and concentrations should be stored in the GC library for comparison against the sample.

3. Refrigerate the samples at 4° C if not analyzing immediately; otherwise, place inverted vials into a constant temperature bath for 15 minutes to reach thermal equilibrium. The minimum temperature of the water bath should be 25° C and the maximum temperature 50° C. Using the maximum temperature will increase the rate of volatilization and result in greater recoveries.

4. Insert a syringe needle into the septum to allow air to enter the vial, then use a second syringe to withdraw 10 ml of sample. Discard the 10 ml of sample.

5. Invert the vial with the 10 ml of headspace and shake vigorously for two minutes. Place the vial into the water bath for five minutes.

6. When ready to analyze, remove a suitable amount of headspace for injection into the GC using a gastight syringe. Typically, injection volumes of headspace range from 100-500 ul.

7. During analysis, the sample is automatically compared to the library compounds; sample constituents will be identified and quantified. After the analysis is complete, the results will appear on the GC printout.

5.3 MONITORING WELL INSTALLATION, CONSTRUCTION, AND DEVELOPMENT

Monitoring wells will be installed using 4.25-inch hollow stem augers (HSA). The boring diameter will permit at least 2 inches of annular space between the boring wall and all sides of the centered well. The boring diameter will be of sufficient size to allow for accurate placement of screen, riser, filter pack, seal and grout.

All drill cuttings will be monitored with a photoionization detector (PID) to determine the presence of contaminants. Soils with readings exceeding 5 parts per million (ppm) above background will be considered potentially contaminated. Materials with PID readings below 5 ppm will be placed on 8 mil, clear reinforced polyethylene sheets and will be raked out in the vicinity of the well after drilling is complete. Any potentially contaminated material will be drummed in containers which are NYSDOT-approved for the transportation of contaminated materials, and disposed of in accordance with applicable NYSDEC regulations or guidelines. The drums will be supplied by the contractor and clearly marked. After filling, the drums will be taken to a designated staging area and placed on pallets.

Split-spoon soil samples will be collected at 5-foot intervals using a 2-inch split spoon driven by a 140-pound hammer using a 30-inch fall. Each soil sample will be physically described in the field by a qualified hydrogeologist. The samples will be stored in jars and maintained by Rome Laboratory if additional description is required.

All downhole drilling equipment will be decontaminated between drilling locations. This will limit the possibility of cross contamination at the site. A single decontamination area will be established on the site. A decontamination pad will be set up at a point downgradient from all monitoring wells. The pad will consist of pallets laid out on polyethylene plastic. Augers, split spoons, and other downhole equipment will be placed on the pallets and steam cleaned. Wash water will be allowed to drain from the plastic to the ground surface nearby.

The wells will be screened in the first water-bearing unit able to supply the well with adequate recharge to develop and sample the well. Because the densities of solvents in the nonaqueous phase are greater than the density of water, it is not necessary to screen the wells across the water table. The screens will be placed at a depth determined in the field by a hydrogeologist. The depth will be determined by estimating the moisture content of the split-spoon samples and by taking direct measurements from the hollow-stem augers during drilling.

The annular space around the well screen will be backfilled with a clean, washed, silica sand sized to perform as a filter between the formation and the well screen. The grain size of the filter pack which is used will be a function of the screen slot size used, which in turn will be a function of the grain size of the sediment encountered during drilling. The filter pack material will be placed by pouring it between the auger and the riser and screen. The filter pack will extend from 1 foot below to 2 feet above the well screen.

Riser sections will be joined by threaded flush-joint couplings to form watertight unions. No solvent glues or cement will be used to join riser sections. All risers will be set round, plumb, and true to line.

A 1- to 2-foot thick bentonite pellet or granular bentonite seal shall be poured into place in the annular space above the well screen and filter pack sand. Potable water will be added, if necessary, to fully hydrate the seal. The seal will be kept fully saturated for a minimum of one hour before the well is grouted. Cement grout will be placed in the annular space above the bentonite seal to the ground surface. The cement grout will consist of a mixture of Portland cement and water in the proportion of not more than seven gallons of potable water per 94-pound bag of cement. Grout will be placed by pumping through a tremie pipe with the lower end of the tremie pipe within 10 feet of the top of the bentonite seal. Placement of the grout will continue until undiluted grout discharges at the surface. If necessary, where the well screen is located near the ground surface, the bentonite seal will be installed from the top of the well screen and filter pack to the ground surface.

The guard pipe will be surrounded by a minimum 4-inch concrete pad, placed so that it slopes away from the well. Groundwater at the site is expected to be found 2 feet below the surface. Because of this, modifications will have to be made in monitoring well construction. The primary concern is the potential for frost heave of the protective casings and monitoring wells. Frost heave of the protective casing can be limited by keeping the sides of the cement cap perpendicular to the ground surface. The cap should not be placed in the form of a cone, but rather that of a cylinder.

To prevent frost heave of the well, the following installation procedure will be used. As grout is emplaced above the bentonite seal, a 4-inch PVC sleeve will be placed around the 2-inch riser. No grout will be allowed between the 4-inch and 2-inch PVC. Placing the sleeve around the well in this fashion will limit potential frost heave of the monitoring well by allowing the cap to move without the riser moving.

Any other modifications of the well construction protocol noted above will be cleared with the Rome Laboratory site representative and the NYSDEC representative in charge of the site before completion. Figure 8 is a depiction of an expected well completion.

Any well that is to be left incomplete due to delay in construction will be sealed with a watertight cap.

Boring logs detailing well-specific construction techniques will be maintained for inclusion in the draft and final report. Final construction logs will be submitted in the final report. The logs will be prepared by a qualified hydrogeologist present during all drilling operations. The following information will be included on each well log:

1. Description of soils using the modified Burmeister Method.

2. Reference elevation for all measurements

3. Project site and names.

4. Well number.

5. Depth and thickness of each different stratum, and a brief description of each stratum.

6. Hole diameters and depth at which the hole diameter changes.

7. Total depth of completed well.

8. Depth of grouting, sealing, and grout mixes.

9. Depth and type of well casing.

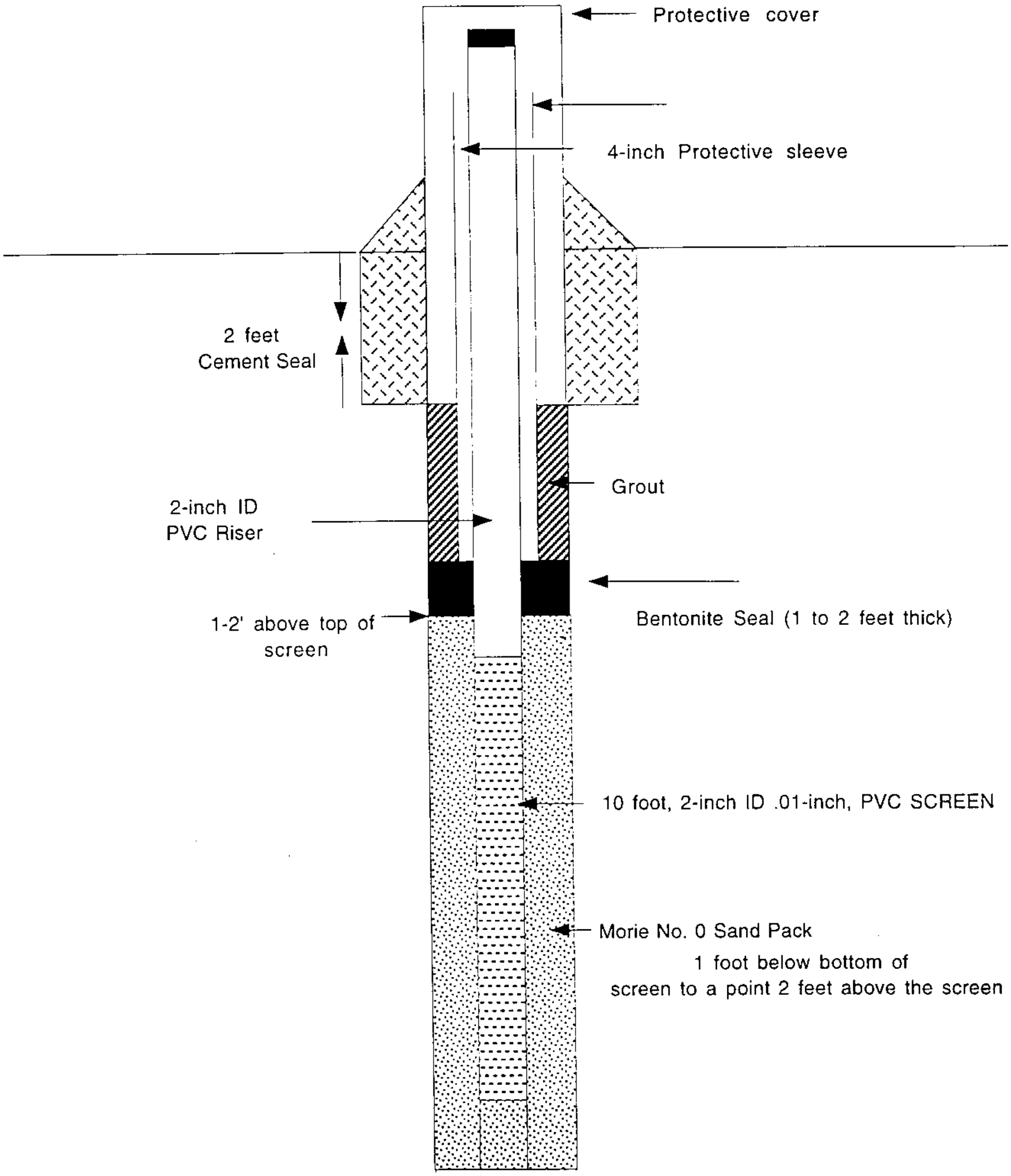

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FIGURE 8
MONITORING WELL DESIGN

10. Description of well screen, to include length, location, diameter, slot size, material and manufacturer, and blank pipe below and above the screen.

11. Any sealing of water-bearing strata.

12. Static water level of the well upon completion of the well and after development.

13. Drilling and installation date or dates.

14. Amount of cement or bentonite used.

15. Other construction details of the monitoring well, including grain size and source of well filter pack material and grain size and location of all seals and casing joints.

16. Total volume of water and any product removed during development of the well.

The well number will be marked on the outside and inside of the protective steel casing. The wells will also be clearly identified as a groundwater monitoring well. Soil boring logs will also be recorded at the three deep soil borings. These logs will include soil description, well drilling method, location, date, and other pertinent information.

Within one week, but not less than 48 hours, each monitoring well will be developed. The objectives of well development are to:

1. Ensure that the groundwater enters the well screen freely, thus yielding a representative groundwater sample and an accurate water level measurement.

2. Remove all water that may have been introduced during drilling and well installation.

3. Remove very fine-grained sediment in the filter pack and the nearby formation so that groundwater samples are not highly turbid and so that silting of the well does not occur.

Well development will be completed using a development pump or bailers. The water inlet and surge block will be lifted through the entire screened interval. Development will continue until 10 well volumes of groundwater are removed, or until field parameters (temperature, Eh, pH, conductivity and turbidity) have stabilized within 10 percent. Every attempt will be made to develop the well so that groundwater discharged from the well has a turbidity below 50 nephelometric turbidity units (NTU). Development water from the wells will be contained and drummed on the site.

The results of the well development and any sheen or free product encountered will be included in the report.

5.4 INSTALLATION OF THREE DEEP SOIL BORINGS

To date, the only borings or wells at the site are approximately 12 feet deep. To meet the requirements of the PSA, it is necessary to better define the site hydrogeology so that potential extent and migration pathways can be defined. Three deep soil borings will be advanced to 50 feet, auger refusal, a confining layer, or bedrock, whichever is encountered first. The soil borings will be completed in areas of no soil contamination. This will limit the possibility of cross contamination from the shallow aquifer to deeper aquifers which may exist at the site. The location of the soil borings is illustrated on Figure 9.

The borings will be completed using 3.25-inch HSAs. Split-spoon samples will be collected at 5-foot intervals at each boring; however, up to five additional spoons may be collected at each site based on the hydrogeologist's discretion. The samples will be recovered using a 2-inch split spoon driven by a 140-pound hammer using a 30-inch fall. All samples will be described in the field by an experienced hydrogeologist. The soil samples will be maintained by Rome Laboratory if the need for additional descriptions is required.

The soil boring farthest north (SB-1) will be completed as a monitoring well with specifications to conform with the other monitoring wells to be installed.

5.5 DISPOSITION OF INVESTIGATION-DERIVED WASTE

All field-generated liquids produced during development, as well as decontamination procedures, well construction, and testing will be disposed of on site by one of two methods, depending on the level of contamination. If headspace analysis of collected groundwater results in readings greater than 5 ppm, collected groundwater will be drummed and disposed of by an appropriate disposal contractor. If headspace readings are less than 5 ppm, collected water will be allowed to infiltrate back into the subsurface by being discharged to a grassy area.

Soils collected from drilling operations will be screened with a PID. Soils with PID readings exceeding 5 ppm above background levels or as directed by the contracting officer will be considered potentially contaminated. Potentially contaminated soils generated during field activities will be stored in separate drums and disposed of in accordance with applicable NYSDEC regulations. The drums will be supplied by the contractor. The drums should be NYSDOT approved for use in transporting contaminated materials. The potentially contaminated soil and groundwater will be secured at a designated staging area (drums on wooden pallets), pending receipt of analytical results. Once all the potentially contaminated material is collected at the staging area, the contractor will immediately sample the contents and forward the results to the Rome Laboratory Environmental Coordinator. Soils will be analyzed for TCLP organics. Stearns & Wheler will then properly dispose the material in accordance with applicable regulations.

Disposal of non-contaminated soil was discussed in Section 5.3.

5.6 PIEZOMETERS AND STAFF GAUGE LOCATIONS

Fundamental hydrogeological principles suggest that regional groundwater flow is to the southeast toward Brandy Brook. Because of the construction of the facility (buildings in a single, long, relatively straight line), the existing wells are in a similar relatively straight line. Piezometers need to be positioned to facilitate determination of groundwater flow direction through triangulation with wells whose locations are based on plume locations. Groundwater elevation measurements collected from these points can then be used to accurately determine the direction of groundwater flow.

Three piezometers are proposed on the north side of Brandy Brook to allow a better triangulation of groundwater flow direction in that area (Figure 9). One of the three piezometers will be located between the facility and Germany Road to assist in determining if groundwater is flowing toward residences located on Germany Road. Three additional piezometers will be installed on the south side of Brandy

Brook to determine flow direction in that area. This information will assist in determining whether Brandy Brook is acting as a flow boundary.

In addition to the piezometers, staff gauges will be installed in Brandy Brook to determine the surface water elevation compared to the groundwater elevation (Figure 9). This will also serve to help determine if the brook is a flow boundary. Staff gauges will be installed at the surface water sampling points. The gauges will consist of metal rods pounded into the sediment adjacent to the stream bank.

5.7 PIEZOMETER CONSTRUCTION AND DEVELOPMENT

Piezometers will be constructed and developed in the same manner as the monitoring wells.

5.8 SLUG TESTS

After development of the monitoring wells, the in-situ hydraulic conductivity of the significant water-bearing unit will be determined by performing slug tests in selected wells at the site. Slug tests will be performed using the following method:

1. Static water level will be recorded using a water level indicator.

2. A pressure transducer connected to an electronic datalogger will be lowered into the well to a depth to within 1 foot of the bottom of the well.

3. Static water level will be rechecked and checked against the head reading (height o ` water column over the pressure transducer on the readout of the datalogger).

4. One bailer volume of water will be removed from the well, lowering the water level in the well.

5. The recovery of the water level in the well will be monitored by watching the head values change on the datalogger. Recovery will be monitored until the water level reaches 90 percent of the static level.

6. Instrumentation will be removed from the well.

7. Recorded water level recovery data will be downloaded onto a computer. Hydraulic conductivity will be calculated using the Bouwer-Rice Method.

5.9 SITE SURVEY

It is assumed that groundwater flow direction is to the south toward Brandy Brook. This is supported by mapping the average groundwater elevations at each of the six sites. However, at each individual site, groundwater flow direction is not necessarily consistent with this assumption. To attempt to clarify inconsistencies in the data, all existing wells and all proposed wells piezometers and staff gauges will have their locations and elevations surveyed. Survey results will be plotted on an existing site base map.

SECTION 6 - SAMPLING AND ANALYSIS

6.1 GROUNDWATER SAMPLING

Existing monitoring wells at the four sites of concern and all new monitoring wells will be sampled for volatile organic compounds by USEPA Method 624 or equivalent, and metals by USEPA Method 6010. Appropriate field duplicates for QA/QC purposes will be collected. Lab analysis will be performed by a NYSDOH-ELAP approved laboratory. Specific protocols for the collection, shipment, and interpretation of the samples is found in the Field Sampling Plan (FSP), Appendix A.

6.2 SURFACE WATER AND SEDIMENT SAMPLING

Surface water samples will be collected at three locations on a quarterly basis. The samples will be collected upstream, adjacent to, and downstream from the site. The samples will be analyzed using USEPA Method 624 or equivalent, and USEPA Method 6010 for metals. Sampling protocols are described in the FSP, Appendix A. Sediment samples will be collected (and analyzed for VOCs and metals) during the first quarter only, unless analysis indicates that VOC or metals impact exists. If this occurs, sediment sampling will continue on a quarterly basis.

6.3 CHLORINATION DOSING CHAMBER SAMPLES

Water samples will be collected at the chlorination dosing chamber (Figure 9). Samples will be analyzed for VOCs using USEPA Method 624 and for the following inorganic constituents: arsenic, cadmium, chromium, lead, and silver.

6.4 REPORTED LANDFILL

Using a backhoe to excavate test pits, the area south of Building 1225 will be investigated to determine the presence of a landfill in that area. The purpose is to attempt to characterize the materials within the area. Five composite soil samples will be sampled for VOCs and metals using USEPA Methods 624 and 6010 (or equivalents), respectively. Each sampling point and estimated boundary of the landfill will be staked and surveyed.

SECTION 7 - EXPOSURE ASSESSMENT

The value of completing the above investigation is to develop conclusions about the nature and extent of impact and to use that information to develop conclusions about fate and migration of impacts. Upon receipt of all data, we will develop conclusions regarding the probable fate of the impacts and will identify potential receptors, particularly of the groundwater, the medium of greatest concern at this site. Potential risk to receptors will be discussed in a qualitative sense.

SECTION 8 - REPORT PREPARATION

A report will be prepared at the conclusion of work that will have the following components:

1. Synopsis of existing data, including site history and existing site data that served as rationale for the work plan.

2. Description of field activities, including boring and well logs.

3. A discussion of findings, including site geology, groundwater flow, and nature and extent of impact. Maps, boring logs and well logs, and laboratory reports.

4. Conclusions.

5. Recommendations.

FIELD SAMPLING PLAN

SITE BACKGROUND

The Verona Research Facility is located on Germany Road, Town of Verona, Oneida County, NY (Figure 1). The facility is operated by Rome Laboratory. The site consists of 35 buildings located on the eastern section of a 513-acre parcel. Since its founding in the 1950s, the site has been used for a wide variety of electronic research and development activities.

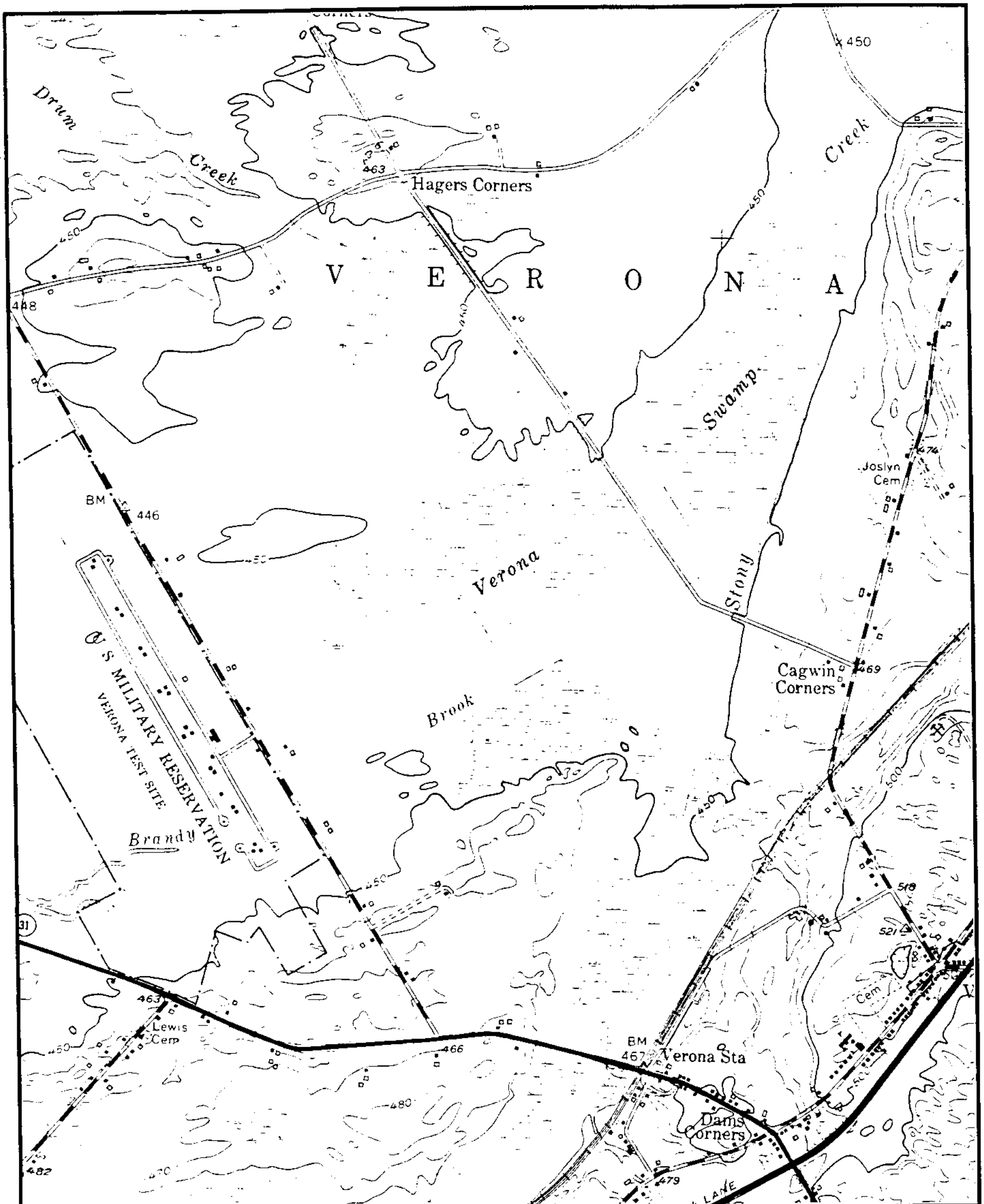
The site is currently under investigation to determine the nature and extent of groundwater contamination by chlorinated organic compounds. This Field Sampling Plan will be used as a guideline to determine how the surface water and groundwater samples will be collected, shipped, and analyzed.

SAMPLE DESIGNATION

All sampling locations of a particular matrix type (surface water or groundwater) 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:

MW -	Groundwater
SW -	Surface water
DC -	Dosing chamber
SED -	Sediment
SS -	Soil

All sample bottles 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. Table 1 summarizes sampling matrices, sampling location rationale, and analyses to be performed. Table 2 summarizes QA/QC requirements for the analytical results.



VERONA
7.5 MINUTE
QUADRANGLE

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

DATE: 3/96 JOB No.: 43189ZA

VERONA RESEARCH FACILITY
TOWN OF VERONA, NEW YORK
PRELIMINARY SITE ASSESSMENT

FIGURE FSP–1
SITE LOCATION MAP

TABLE 1
PRELIMINARY SITE ASSESEMENT
VERONA RESEARCH FACILITY
VERONA, NEW YORK

DESIGNATION	LOCATION RATIONALE	AQUIFER SCREENED	APPORXIMATE BORING DEPTH (ft)	ESTIMATED SCREEN LENGTH (ft)
Building 1203 - Groundwater				
MW001	Source Area	Overburden	15	10
MW002	Source Area	Overburden	15	10
MW003	Downgradient	Overburden	15	10
MW004	Source Area	Overburden	15	10
MW005	Downgradient	Overburden	15	10
MW006	Upgradient	Overburden	15	10
Building 1231 - Groundwater				
MW001	Source Area	Overburden	15	10
MW002	Upgradient	Overburden	15	10
MW003	Cross Gradient	Overburden	15	10
MW004	Cross Gradient	Overburden	15	10
MW005	Source Area	Overburden	15	10
MW006	Downgradient	Overburden	15	10
MW007*	Downgradient	Overburden	15	10
Building 1245 - Groundwater				
MW001	Upgradient	Overburden	15	10
MW002	Source Area	Overburden	15	10
MW003	Source Area	Overburden	15	10
MW004	Upgradient	Overburden	15	10
MW005	Upgradient	Overburden	15	10
MW006	Downgradient	Overburden	15	10
Building 1253 - Groundwater				
MW001	Source Area	Overburden	15	10
MW002	Source Area	Overburden	15	10
MW003	Downgradient	Overburden	15	10
MW004	Downgradient	Overburden	15	10
MW005	Upgradient	Overburden	15	10
MW006	Downgradient	Overburden	15	10
Surface Water/Sediment				
SW-1/SED-1	Up Stream	Samples will be collected at Staff Gauges		
SW-2/SED-2	Mid Stream			
SW-3/SED/3	Down Stream			
Landfill Area				
SS-1	Composite samples collected from in and around landfill area to characterize material in landfill			
SS-2				
SS-3				
SS-4				
SS-5				

* If Installed

TABLE 2

ANALYTICAL AND QA/QC REQUIREMENTS
PSA
VERONA RESEARCH FACILITY

MATRIX	NO. OF SAMPLING POINTS	FIELD QC NO. OF SAMPLES	LAB QC NO. OF SAMPLES	NO. OF SAMPLES, BY MATRIX	ANALYSIS
Groundwater	25	1 field duplicate	4 trip blanks (assumed)	30	VOCs by USEPA 624 Metals by USEPA 6010
Surface water/Sediment	3	1 field duplicate		4/4	VOCs by USEPA 624 Metals by USEPA 6010
Chlorination dosing chamber	1	--	--	1	VOCs by USEPA 624 Metals by USEPA 6010
Landfill soil samples	5	1		6	VOCs by USEPA 624 Metals by USEPA 6010
Soil samples*	12	1		13	VOCs by USEPA 624 Metals by USEPA 6010

*Only if PID readings exceed 5 ppm above background.

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
- Face shields

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

Procedure:

1. Wash in alconox and water; use bottle brush on inside of bailers; use bottle brush or scrub brush as necessary; wipe with paper towel.

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

3. Rinse with 10 percent nitric acid solution.

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

5. Rinse with methanol, followed by hexane, and allow to air dry; rinse hands.

6. Rinse with deionized water; air dry.

7. Dispose of rinse water properly.

8. Wrap clean equipment in aluminum foil, with the dull side touching the item and the shiny side on the outside for transport.

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. Toward this end, 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 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.

TABLE 3

EQUIPMENT FOR GROUNDWATER SAMPLING BY BAILER

	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

TABLE 3 (continued)

	Sample containers (bring 20 percent more than needed), all sealed, clean, and labeled
	Trip blanks and spiked samples for volatile samples
	Filter 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
	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
	ID card or business card
	Money
	Booklet, "How to Sample Groundwater and Soils"
	Bolt cutters

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.

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

3. Put on a pair of nitrile gloves.

4. 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.

5. 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.

6. Clean all meters, tools, equipment, etc. before use.

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.

10. Compute the volume of water in the well and record this volume in the field book (Table 4).

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	.15										
4-3/4	.92	.123	.67	.42										
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	1.71	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.

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. The purged water should be screened with the photoionization detector (PID) before disposing. PID readings above the site action level require that the purged water be drummed for proper disposal.

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 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 and add preservatives to 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 and temperature of the groundwater following the procedures outlined in the equipment operation manuals. Record this information in the field book. The beaker must then be rinsed with distilled water prior to reuse.

21. Begin the chain-of-custody record (Figure 3). A separate entry is required for each well with the required analysis listed individually.

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

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

ANALYSIS OF GROUNDWATER USING A PORTABLE GAS CHROMATOGRAPH

Following is a brief description of the preparation of standards and samples for analysis of groundwater using the portable gas chromatograph (GC). Groundwater samples will be collected using bailers. The samples will be transfered to 40 ml VOA bottles and prepared for analysis.

Equipment Required to Perform Dilutions for the Calibration of the GC

1. 40 ml VOA vials
2. Liquid or gas syringes (10 and 25 ul)
3. Disposable pipettes
4. Volumetric flasks, 100 ml with caps.
5. Organic-free water.

Once the compounds of interest have been identified, the GC must be calibrated with known concentrations of the compounds you wish to analyze. Using a stock solution of known concentration, provided by a lab, perform a dilution using the following procedure:

Calculate the volume of stock solution to be added to 100 ml of organic-free water to produce 5 μg/l (ppb):

Stock concentration = 200 μg/ml = 200 ppm weight (w)/volume (v)
Desired Standard concentration = 5 μg/l = 5 ppb w/v
5 μg/l = .005 mg/l = .005 ppm
Concentration desired/stock concentration = .005 ppm/200 ppm = 1/40,000
Volume of diluent organic-free water = 100 ml
100 ml x 1/40,000 = .0025 ml = 2.5 μl

This is the volume of stock solution to add to 100 ml water to create a 5 μg/l standard.

Using a clean 10 μl liquid syringe, transfer the calculated volume to a volumetric flask containing 99 ml of organic-free water. Place the syringe tip below the surface of the water before expelling its contents. Fill the flask to exactly 100 ml with organic-free water. Cap the flask and invert two to three times only (do not shake) to mix the contents. Discard the liquid in the flask neck and immediately transfer 20 ml of the working standard to a 40 ml VOA bottle. Cap immediately. This solution must be made fresh daily. (**Note**: Do not inject liquid into the GC. Typically, injection volumes of headspace range from 100 to 500 μl.)

When using the GC, use a separate file for water standard data. By storing the headspace concentration as the liquid concentration, from the standards, the GC will display results based on liquid concentration for field samples. This approach will prevent confusion with air calibration data and negates the need for using Henry's Law to calculate vapor pressure with respect to liquid samples.

Once the GC is calibrated with the aqueous standards and has been programmed, analysis of groundwater can begin.

The following equipment will be needed for the analysis of aqueous samples:

40 ml VOA vials with teflon septum caps
Constant temperature water bath
Gastight syringes (100-500 ul)
Spare needles

Procedure:

1. Collect samples in clean, unpreserved 40 ml septum-capped glass vials with zero headspace. Cap vials and invert to avoid loss of volatiles.

2. Before samples are analyzed, the portable gas chromatograph should be calibrated with an aqueous standard containing all of the compounds of interest. Aqueous standards will be provided by a laboratory. The standard should be handled in exactly the same fashion as the sample, using the identical volume of headspace, the identical injection volume, and the identical equilibration time and temperature. The compound names and concentrations will be stored in the library for comparison against the sample.

3. Refrigerate the samples at 4° C if not analyzing immediately; otherwise, place inverted vials into a constant temperature bath for 15 minutes to reach thermal equilibrium. The minimum temperature of the water bath should be 25° C and the maximum temperature 50° C. Using the maximum temperature will increase the rate of volatilization and result in greater recoveries.

4. Insert a syringe needle into the septum to allow air to enter the vial, then use a second syringe to withdraw 10 ml of sample. Discard the 10 ml of sample.

5. Invert the vial with the 10 ml of headspace and shake vigorously for two minutes. Place the vial into the water bath for five minutes.

6. When ready to analyze, remove a suitable amount of headspace for injection into the GC using a gastight syringe. Typically, injection volumes of headspace range from 100-500 μl.

7. During analysis, the sample is automatically compared to the library compounds; sample constituents will be identified and quantified. After the analysis is complete, the results will appear on the GC printout.

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.

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)
	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

TABLE 5 (continued)

	Tyvek suits
	Gloves, boots, respirator
	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"

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. Filtered samples should be obtained for metals analysis.

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

C. Sediment Sampling.

1. Determine sampling locations, record on site map and in field book. Begin at farthest downstream location. Sediment sampling locations should correspond with surface water sampling points.

2. Properly label sample containers.

3. Put on nitrile gloves.

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

5. Using a decontaminated trowel, collect samples from the stream bed.

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

D. Soil Sampling.

1. Determine sampling locations, record on site map and in field book.

2. Properly label sample containers.

3. Put on nitrile gloves.

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

5. Screen witih PID.

6. Place samples immediately in a cooler on ice. If required, seal each container with a chain-of-custody seal.

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

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

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. Ship filled sample bottles in same cooler in which empty bottles were received. 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. Weigh coolers for air transport.

3. 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.

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

5. 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.

6. 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.

TASK PRESENTATION TABLE
VERONA RESEARCH FACILITY
TOWN OF VERONA, NY

Project Team Member	Position	Task
Larry Hineline	Project Manager	Oversee day-to-day management of project to ensure its completion within time and budget constraints.
John Conklin	Site Safety Officer	To ensure that stated site safety guidelines are adhered to.
Scott Graham	Field Team Leader	Will oversee the completion of drilling, sampling, surveying and other field events. Will also complete a review and interpretation of collected hydrogeologic and analytical data and completion of the Phase II PSA Report.
Cathy Ferguson	Field Team Member	Will assist in the completion of field work and interpretation of all data collected.

T. LAWRENCE HINELINE, C.P.G.
Associate

M.S. (1979) Geology, Ball State University
B.S. (1977) Geology, Bowdoin College

Certified Professional Geologist

MEMBER: National Groundwater Association
American Institute of Professional Geologists

Completed: 40-Hour OSHA Hazardous Materials Training Course, 1988

EXPERIENCE:

Mr. Hineline has experience in scoping, conducting, and managing hydrogeologic investigations at hazardous waste sites, solid waste facilities, and petroleum spill sites. Additionally, he has experience in conducting environmental assessments, in regulatory affairs and permitting. Mr. Hineline:

- developed an RI/FS work plan for an inactive hazardous waste site where several on-site and off-site sources of organic and metals contamination discovered during a RCRA closure investigation needed to be defined. He served as project manager through the investigation which successfully characterized site contamination and its sources. The project proceeded with a feasibility study that identified appropriate remedial technologies including soil vapor extraction and groundwater treatment and the use of an in-situ, passive remediation funnel and gate system.

- served as project manager for the implementation of an RI/FS at an inactive hazardous waste site. Lateral and vertical extent of organics contamination was identified using inorganic hydrogeochemistry as a tool . Contaminant plumes and sources were identified and remedial alternatives are being developed. An IRM in the form of soil vapor extraction is currently underway and a soil removal IRM has been completed.

- conducted a Phase I and a multi-task Phase II investigation related to property transfer at a foundry where volatile organics were found present in groundwater. The investigation uncovered a probable off-site source that is impacting the owner's property. The investigation resulted in a reclassification to a site needing further significant action.

- served as project manager on state-required Phase II investigation of a Class 2A inactive hazardous waste site. He developed the work plan which had the objectives of characterizing site groundwater flow and contamination, and distinguishing between on- and off-site sources of contamination.

EXPERIENCE (Continued):

- served as project manager of an RI/FS at an abandoned metal working facility where free-phase TCE and an associated plume of contaminated groundwater has been identified. The objectives of this project were to delineate the extent of contamination, assess the impact on surface water, and develop appropriate remedial action. A feasibility study was completed that identified appropriate remedial technologies.

- developed an RI/FS work plan for a metal casting facility where PCBs were identified. The work plan called for a phased approach that first characterized the location and impacts of the PCB. Subsequent phases used field screening (immunoassay) testing to delineate area extent of impacts.

- served as project manager for a three task environmental investigation at a large university. The investigation evaluated pesticide impacts in an orchard, water and sludge quality in a waste lagoon and potential impacts of a closed landfill.

- served as project manager on several underground storage tank investigations. These investigations have entailed determining nature and lateral extent of free product and dissolved constituents and resulted in the design and or monitoring of recovery systems.

- served as project manager and technical lead on preclosure hydrogeologic investigation of a municipal landfill. The investigation defined hydrogeology and the impacts of the facility.

- served as project manager on preclosure hydrogeologic investigation of municipal landfill. The investigation was directed primarily at assessing the impacts of the facility on two wetland areas which flanked the landfill.

- served as project manager for two preclosure hydrogeologic investigations of municipal landfills. The focus of the investigations was the fate and impact of leachate.

- provided expert witness testimony on the suitability of the hydrogeological siting of a commercial hazardous waste disposal well for repermitting. A complete description of the site hydrogeology and the influence of the operation was presented. The well was repermitted by the Texas Water Commission.

- provided technical support to the National Solid Waste Management Association in the interpretation and implication of newly proposed hazardous waste management regulations pertinent to the operation of industrial disposal wells. Input was provided for over a year-long regulatory negotiation process between EPA, environmentalists, industry, and regulatory personnel.

EXPERIENCE (Continued):

- prepared Underground Injection Control (UIC) hazardous waste disposal permit applications for commercial and industrial clients in Texas and Ohio. A comprehensive evaluation of site hydrogeology and waste stream interaction, as well as construction and operation specifications were provided.

- provided field supervision for numerous site investigations involving monitoring well installations, groundwater sampling, soil, sludge, and impoundment bottom sampling.

- conducted extended pumping test on municipal supply well and determined maximum safe yield and cone of influence.

- evaluated extended pumping test of municipal supply well to determine maximum safe yield and cone of influence as it related to a plume of groundwater with organics contamination that was in the vicinity of the well.

- conducted exploratory drilling, test hole drilling, production well siting and drilling and hydrogeologic investigations associated with developing additional water supply capacity for a municipality.

- completed numerous environmental audits for property transfer ranging from minimal scope phase I audits of commercial property to hydrogeologic investigations of industrial sites and old industrial properties being re-developed.

PUBLICATIONS AND PRESENTATIONS:

Two Decades of Successful Class I Well Operation: A Compilation of Case Histories with Ken E. Davis. Presented at the International Symposium on Class I Wells, New Orleans, 1986.

Brine Disposal at Sour Lake Field, Texas: The Interplay of Area of Review, Mechanical Integrity and Geology in Evaluating Returns to the Surface. Presented at the International Symposium on the Disposal of Oil Field Brines, New Orleans, 1987.

SCOTT L. GRAHAM
Hydrogeologist

M.A. (1993) Hydrogeology, State University College of New York, Oneonta
B.S. (1990) Geology, State University College of New York, Oneonta

EXPERIENCE:

Mr. Graham has experience in the areas of fate and migration of contamination from municipal solid waste landfills and industrial facilities; and in many facets of field sampling, including ground and surface water sampling. The bulk of his experience is in the interpretation of the hydrogeologic characteristics of complex sedimentary and bedrock environments and their relationship to contaminant migration. Mr. Graham's experience includes:

- currently serving as a hydrogeologist for the remedial investigation and interim remedial measures of a municipal solid waste landfill. His duties include managing and completing the field investigation, interpretation of hydrogeologic data, and report preparation following CERCLA Guidance. In addition, Mr. Graham presented the findings to County officials.

- using groundwater modeling software to assist in the design and implementation of fuel oil recovery and solvent removal systems at an industrial facility in central New York. Interpretation included the use of three dimensional computer software packages to further determine the area of influence of the recovery system.

- completion of several landfill closure investigation reports following 6 NYCRR Part 360 Solid Waste Regulation Guidance. These investigations include interpretation of hydrogeologic and hydrogeochemical data. Data was collected via well installations, ground and surface water sampling, leachate and explosive gas investigations, and test pit excavations.

- completion of pump tests, including the compilation and analysis of associated data. This determined the parameters required for the installation of a recovery system to remove petroleum contaminants. Pump tests have also been completed to determine the hydrogeologic characteristics of overburden and bedrock. These tests were completed to determine well yields for private developers and municipalities.

- completion of numerous leaking underground storage tank investigations. These investigations included well installation, sample collection, data analysis, and determination of remedial options. These reports have been completed for both private and municipal clients.

- completion of Phase I environmental site assessments for commercial and industrial facilities and private residences.

EXPERIENCE (Continued):

- completion of Phase II Remedial Investigation field work and report preparation at an aluminum casting facility.

- assisting the remediation project manager in the community participation plan at the Superfund Site at Dover Air Force Base, Delaware. This included document preparation and planning public meetings with Air Force, local officials, and private citizens.

- completed OSHA 40-hour course.

CATHERINE E. FERGUSON
Hydrogeologist

M.S. (Anticipated Completion, May 1996) Geology, Syracuse University
B.S. (1992) Geology, University of Minnesota-Duluth

EXPERIENCE:

Ms. Ferguson has a wide range of training in geochemical aspects of hydrogeology, as well as considerable groundwater sampling experience. Ms. Ferguson's experience includes:

- supervised drilling and performed geologic interpretation for monitoring well installation at both private and public properties.

- developed wells and collected groundwater samples to determine the extent, if any, of contamination.

- performed several underground storage tank investigations, including monitoring well installation, groundwater and soil sampling, and report preparation.

- collected and evaluated groundwater to determine geochemical landfill leachate indicators. Information from this investigation was used to decrease the sampling effort required by the New York State Department of Conservation.

- used inorganic chemical data at a landfill in northern New York to differentiate between contamination from a landfill and naturally poor groundwater quality.

- completed Phase II Remedial Investigation field work and report preparation at an equipment storage area in central New York.

- analyzed geochemical controls on groundwater quality at various sites to determine the potential for contaminant mobility and persistence.

- constructed three-dimensional computer model of groundwater flow in an aquifer to predict the effects of various pumping conditions on the water table beneath a wastewater discharge lagoon.

- performed statistical analysis of hydrogeologic data to assess the validity of groundwater chemical data from a landfill in Anne Arundel County, MD.

- designed and implemented a pump test to access the effect of additional well discharge on a community in central New York.

- trained in the usage of a portable gas chromatograph, and direct reading spectrophotometer.

EXPERIENCE (Continued):

- completed OSHA 40-hour course.

PUBLICATIONS:

Ferguson, C.E., 1996. "A Geochemical Groundwater Investigation for the Town of Manlius, Onondaga County, New York." M.S. Thesis, Syracuse University. p. 57.

JOHN A. CONKLIN
Manager, Air Quality Services

B.S. (1982) Chemical Engineering, State University of New York at Buffalo
A.A.S. (1979) Chemical Technology, Broome Community College

MEMBER: American Institute of Chemical Engineers
National Ground Water Association
Air and Waste Management Association

Completed: 8-Hour OSHA Hazardous Waste Site Worker Refresher Training, 1992-1995
8-Hour OSHA Hazardous Waste Site Supervisor Training, 1991
40-Hour OSHA Hazardous Waste Site Worker Safety Course, 1990

EXPERIENCE:

Mr. Conklin's 13 years of professional experience includes process evaluations and permitting of municipal and industrial facilities, solid and hazardous waste disposal facilities, and wastewater treatment facilities. Mr. Conklin has also provided expert witness and technical support to attorneys, the USEPA, and state agencies.

Mr. Conklin has been project manager for air quality projects. Project experience includes area and point sources and computing emissions inventories; evaluating, designing, and specifying air pollution control equipment; determining regulatory impact and modeling source emissions; and assessing hazardous air pollutant impact. Air quality modeling projects included medical waste incinerators; primary and secondary aluminum manufacturers; magnetic media; and volatile organic and hazardous air pollutants emitted from manufacturing processes, surface coating processes, high temperature metal recovery processes, wastewater treatment plants, and municipal sludge incinerators. Emissions source sampling and analytical and dispersion modeling protocols were approved by the United States Environmental Protection Agency and state agencies.

Regulatory Compliance and Health and Safety

- developed respiratory protection programs for personnel requiring respirator protection at inactive hazardous waste sites. Qualitative fit test programs and documentation requirements required by the USEPA and OSHA were satisfied.

- project manager responsible for developing OSHA compliance assessments for industry. The compliance programs focused on industrial hygiene, training, and safety program development and evaluations. Routine OSHA compliance assessments assisted clients with maintaining regulatory compliance with applicable standards.

- project manager responsible for evaluating employee exposure to carbon monoxide emissions produced from fork trucks around loading dock and material handling areas.

EXPERIENCE (Continued):

Electrochemical oxidation and direct reading instrument methods were used to produce sample data. Survey methods, sample data, work area evaluations, and recommendations to minimize occupational exposure were described in a written report.

- project manager responsible for conducting indoor air investigations of residential homes to determine if a chemical release from a nearby industry impacted air quality inside the homes. Sampling protocols, pre-sample inventory methods, and quality assurance project plans were approved by the New York State Department of Health. Air samples were submitted to an AIHA accredited laboratory for analysis. A report detailing the investigation methods and sample results was submitted to the NYSDOH for further evaluation.

- developed hazard communication programs and health and safety plans for industry, and construction, site investigation, and remediation programs. Site health and safety plans were approved by state agencies and USEPA regions. Several health and safety plans were developed for activities performed at inactive hazardous waste and National Priorities Listed Sites.

Industrial Compliance

- project manager responsible for developing process safety management plans describing information on the hazards, technology, and equipment involved with chlorine, ammonia and sulfuric, and processes. A process hazard analysis was conducted after compilation of process safety information. The process hazard analysis addresses potential hazards, previous incidents, engineering and administrative controls, consequences of failure, facility citing, human factors, and evaluation of health and safety effects of failure of controls. PSM plans addressed specific training (initial and refresher) related to the operating procedures and included provisions for notifying and training contractors that may work on or adjacent to the processes.

- project manager responsible for identifying and evaluating hazardous and toxic chemicals present at Naval Air Stations (BASE). Substance evaluations were used to determine reporting requirements of Superfund Amendment and Reauthorization Act (SARA) Title III and Executive Order 12856. Base shops utilizing hazardous and toxic chemicals will be provided an Authorized Use List (AUL) developed by Stearns & Wheler as required by OPNAVINST. Stearns & Wheler will be documenting threshold reporting quantities to satisfy State and Federal SARA Title III, Sections 311 and 312 and Executive Order reporting requirements. Information obtained from field investigations will be used to identify processes in each shop that uses hazardous and toxic chemicals and/or processes hazardous waste.

EXPERIENCE (Continued):

- project manager responsible for evaluations and pollution prevention options for process at two Naval Air stations. Pollution prevention evaluations will be documented with a technical and economic evaluation. Technical and economic evaluations will consider the limitations, workability, and the Base mission. Information collected during SARA Title III and pollution prevention assessments will be used to develop procedures and checklists for Base personnel to evaluate inventory materials contractors may use during construction activities at the Naval Air Stations. The procedures and checklists will be developed into a Contractor Authorized Material Program (CAMP) using information from Base files, records, and existing procedures. The information compiled from the CAMP will be used to satisfy SARA Title III and Executive Order requirements.

- performed SARA Title III Toxic Chemical Release Inventory Reporting for Electroplating, Tool and Die, and Plastic Extrusion Mold Manufacturing Industries. Chemical Release Inventory was reported in accordance with Sections 311, 312, and 313 (Tier I, Tier II, and Form R, respectively). Responsible for developing and implementing Section 304(e) compliance programs for accidental releases of "extremely hazardous substances" and CERCLA "hazardous substances."

- project manager for conducting regulatory compliance assessments for industrial facilities located in New York, Virginia, Tennessee, and Kentucky. Regulatory assessments evaluated compliance with Air Regulations; Solid and Hazardous Waste; Clean Water Act; Superfund Amendments and Reauthorization Act Title III; Spill Prevention Control and Countermeasures; and Comprehensive Environmental Response, Compensation and Liability Act. Clients were provided assessment reports describing study findings and recommendations.

Groundwater

- project manager of groundwater sampling and analytical services for a major Fortune 500 company. The sampling and analysis was for groundwater contamination detection, which is an extensive parameter list of inorganics and organics.

- project manager responsible for providing groundwater sampling and analysis for sanitary lagoons and landfills. The scope of services included the monitoring of 32 wells for Phase I and an additional extended analyte list with methods of detection.

- project manager responsible for completing a groundwater assessment program for the previously used wastewater recirculation pond, in order to meet regulatory requirements. These services include the completion of two quarterly monitoring events, the evaluation of data, and the submittal of data for three monitoring events in report format.

EXPERIENCE (Continued):

- project manager for conducting a groundwater risk assessment for a wastewater alum sludge lagoon. This ground water risk assessment is required by the Department of Environmental Quality as an initial alternative to groundwater monitoring and impact assessment. The risk assessment included a field, analytical, hydrogeological, and engineering evaluation program.

Underground Storage Tank Assessments

- completed UST site characterization reports for a 1000-gallon #2 fuel oil tank and #5 fuel oil tanks in an industrial park. Mr. Conklin has also performed industrial site characterizations for aboveground storage tanks, followed by corrective action plans.

- conducted numerous UST site assessments including work for municipalities, a motor vehicle maintenance facility, a gas company, attorneys, and hospitals.

Closure Plans

- project manager responsible for preparing a closure manual and engineering plans for a waste storage pile, and a closure manual and engineering plans to permit environmentally sound closure of two hazardous waste pile storage areas for the Department of Health. As part of this closure plan, a groundwater monitoring program was developed, monitoring wells installed, and sampling and analysis activities are currently underway.

- performed UST clean closure testing for UST removals. Closure testing included developing field sampling and laboratory analysis work plan development, analytical data validation using USEPA CLP and state-approved methods and evaluation, site characteristics, risk assessment, corrective action, and reporting.

- project manager responsible for cleaning-up and closing-out a hazardous waste site. The close-out of the existing site included removal of metal plating process sludge, which was EP toxic as a result of metal concentrations from two sludge storage lagoons and two wastewater treatment lagoons. Sludge and soils were analyzed throughout the site and surrounding areas to ascertain the extent of migration and soil removal required. A detailed hydrogeologic study was also conducted, and the contaminated material was transported to a permitted hazardous waste facility in accordance with RCRA regulations. The site was closed out with clay and seeded as required. The clean-up procedures and plans, along with the site closure, were approved and permitted by the State and the U.S. Environmental Protection Agency.

EXPERIENCE (Continued):

- project manager for a corrective action plan, clean-up, and preparation of closure plans and manual for a landfill. Mr. Conklin directed clean-up of a 4.5-acre tract of land that had been contaminated by hazardous wastes, and supervised excavation activities, followed by soil sample collection and analysis for clean-up verification purposes. After completion of clean-up activities, Mr. Conklin prepared a closure manual and engineering plans to provide for an environmentally acceptable closure of this hazardous waste landfill.

- project manager responsible for developing state-approved sampling and analysis work plans. Work plans were implemented to determine vertical and horizontal extents of soil and groundwater contamination. Analytical data was validated using USEPA-CLP and state-approved QA/QC methods. Analytical data was evaluated. Site characteristics reports were provided to the client and state.

Emergency Response

- a transportation accident resulted in the release to the environment of a compound known as dibasic lead stearate. This compound, having the consistency of talcum powder, was distributed by wind throughout a residential area while being transferred from a damaged tractor trailer to an intact trailer. First response to this incident was provided by State Emergency Services. Since this product was known to contain lead, but was otherwise unknown relative to its human health and environmental hazards, Mr. Conklin collected samples of contaminated soil, contaminated surface water, contaminated vegetation, and contaminated household belongings. Analytical results were provided within 24 hours to guide remedial action.

- expansion plans at a State University were interrupted when evidence of contamination was uncovered during preliminary site grading. Mr. Conklin conducted a risk assessment to identify the source of contamination, and to develop an EPA-approved work plan for corrective action. Air surveillance monitoring was conducted to provide real time results indicating that hazards from inhalation of the suspected contaminants were of minimal concern. Within an additional 24 hours, laboratory analyses were completed, showing that the contaminants consisted of residues from creosoting activities conducted by the previous owner of the property. Construction activities were allowed to proceed, without penalty, according to original contractual agreements.

- participated in the Pollution Response Program, requiring response to spill/accidental release incidents. The majority of incidents involved petroleum-related spills, mainly from underground storage tanks. Duties included review and approval of remedial action plans, site assessments, and certification of compliance with plans; certified clean-up of the sites;

SITE HEALTH AND SAFETY PLAN

A. SITE DESCRIPTION

Date:	March 3, 1996 Revised: ______
Location:	Verona Research Facility, Oneida County, NY
Hazards:	Volatile organics in soil and groundwater
Area Affected:	Groundwater/subsurface
Surrounding Population:	Residential/rural
Topography:	Flat
Weather Conditions:	Usually partly sunny to overcast, northwest winds

B. ENTRY OBJECTIVES: The objective of the initial entry to the contaminated area is to identify contaminated soil and groundwater, monitor conditions, surveying.

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:	Larry Hineline
Site Safety Officer:	John Conklin
Field Team Leader:	Scott Graham
Field Team Members:	Scott Graham/Catherine Ferguson
Federal Agency Representative:	Bruce Mero

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.

The on-site command post and staging area have been established at the site entrance. The prevailing wind conditions are northwesterly.

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. The primary hazards of each are identified.

SUBSTANCE	PRIMARY HAZARDS
Benzene	Headache, giddiness, irritation
Xylenes	Dizziness, excitement, drowsiness
Dichlorodifluoromethane	Dizziness, tremors
Chlorobenzene	Irritation to skin, eyes, nose
Dichlorobenzene	Irritates nose, eyes, liver
Tetrachloroethene	Irritates eyes, nose, throat
Trichloroethene	Headaches, visual distortion
Vinyl chloride	Weakness, abdominal pain
1,2-dichloroethene	Irritate eyes, respiratory system
Chromium	Histologic fibrous of the lungs
Arsenic	Ulceration of nasal septum
Lead	Weakness, insomnia
Cadmium	Pulmonary edema

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
Exclusion zone	Site investigation	A B C (D) Other
Contamination reduction zone	Support	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 5-200 ppm 200-1000 ppm 1000+ ppm	Level D Level C Level B - air line 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)
Benzene	Respirator
Xylenes	

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 following tasks:

Project Team Leader:	Larry Hineline
Work Party #1	Scott Graham, Cathy Ferguson
Work Party #2	
Rescue Team (required for entries to IDLH environments)	
Decontamination Team	

The work party(s) were briefed on the contents of this plan prior to commencement of work.

H. COMMUNICATION PROCEDURES. Personnel in the Exclusion Zone should remain in communication or within site of the Project Team Leader.

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

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. DECONTAMINATION PROCEDURES. Personnel and equipment leaving the Exclusion Zone shall be thoroughly decontaminated. The standard Level D decontamination protocol shall be used.

Emergency decontamination will include the following stations: N/A.

The following decontamination equipment is required: N/A.

Normally, detergent and water will be used as the decontamination solution.

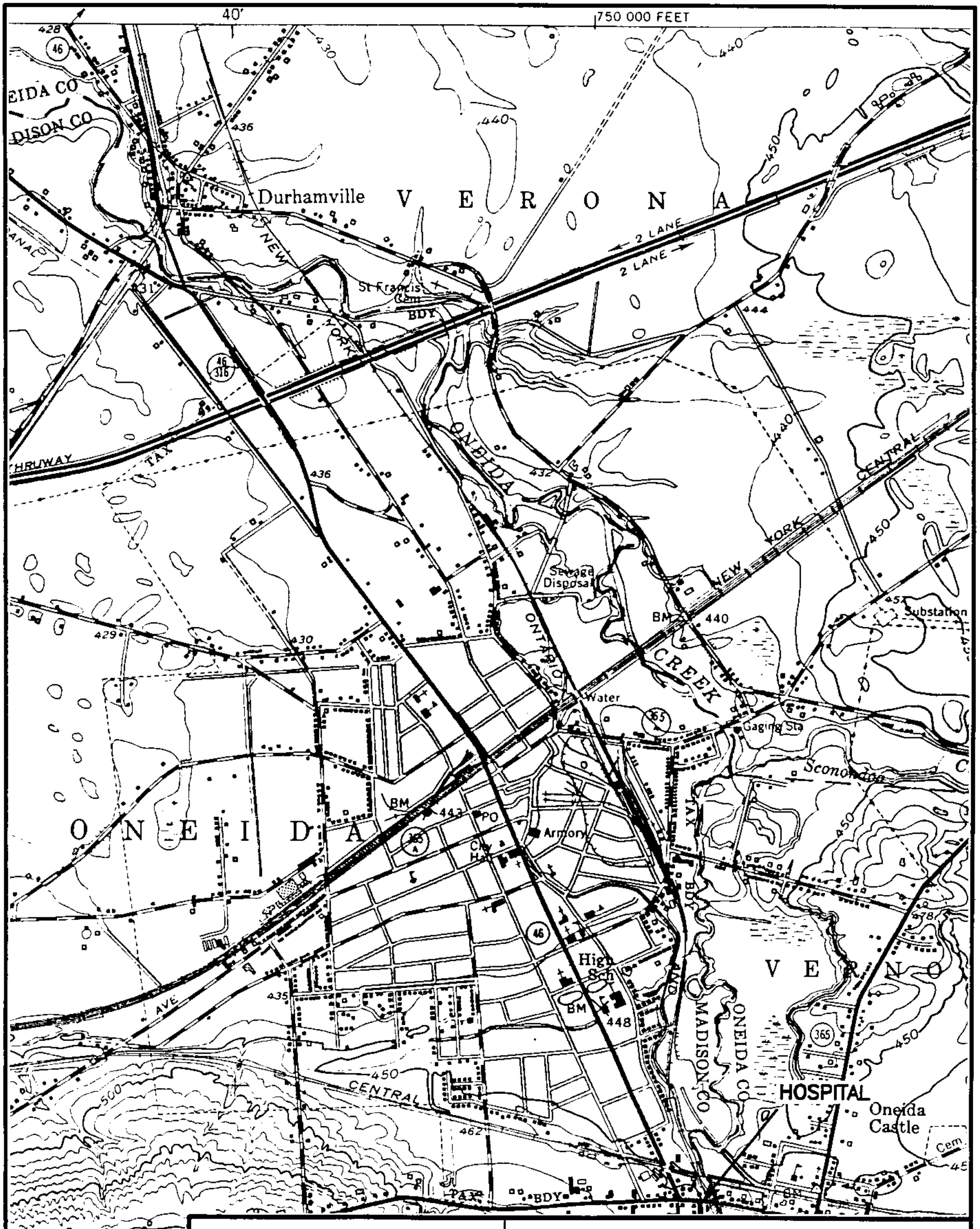
J. SITE SAFETY AND HEALTH PLAN.

1. John Conklin is the designated Site Safety Officer and is directly responsible to the Project Team Leader for safety recommendations on site.

2. **Emergency Medical Care.** Oneida Health Care Center 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



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

DATE: 3/96 JOB No.: 43189ZA

VERONA RESEARCH FACILITY
TOWN OF VERONA, NEW YORK
PRELIMINARY SITE ASSESSMENT

FIGURE HSP–1
HOSPITAL LOCATION MAP

List of emergency phone numbers:

Agency/Facility	Phone Number
Police (Oneida County Sherrif)	337-3710
Fire (Verona Fire Department)	363-2211
Hospital (Oneida Health Care Center)	363-6000
Ambulance	361-4502

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 monitoring wells.

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 Exclusion Zone.** Upon notification of an injury in the Exclusion Zone, the designated emergency signal, a continuous horn blast, shall be sounded. All site personnel shall assemble at the decontamination line. The rescue team will enter the Exclusion Zone (if required) to remove the injured person to the hotline. The Site Safety Officer and Project Team Leader should evaluate the nature of the injury and the affected person should be decontaminated to the extent possible prior to movement to the Support Zone. 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 Exclusion Zone until the cause of the injury or symptoms is determined.

   b. **Personnel Injury in the Support Zone.** Upon notification of an injury in the Support Zone, the Project Team Leader and Site Safety Officer will assess the nature of the injury. If the cause of the injury or loss of the injured person does not affect the performance of site personnel, operations may continue. If the injury increases the risk to others, the designated emergency signal, a continuous horn blast, shall be sounded and all site personnel shall move to the decontamination line for further instructions. Activities on site will stop until the added risk is removed or minimized.

   c. **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.

   d. **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 Exclusion Zone. Re-entry shall not be permitted until the equipment has been repaired or replaced.

e. **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 Exclusion Zone until the situation is evaluated and appropriate actions taken.

In all situations, when an on-site emergency results in evacuation of the Exclusion 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: MicropTip 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	John A. Conklin	
Project Team Leader	Larry Hineline	
Other Site Personnel	Scott Graham/Cathy Ferguson	

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 <u>not</u> 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 and explosimeter will be the monitoring instruments used on site. Continuous monitoring with an explosimeter will be conducted when drilling through refuse.

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:

- Containers of various sizes
- Plastic liners
- 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:

- Container (30 gallon)
- Alconox/water solution
- Long handle, soft bristle scrub brushes
- 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:

- Container (30 gallon)
- Spray unit
- Water
- 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:

- Plastic bag
- 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:

- Canister (or mask)
- Tape
- Boot covers
- Gloves

Station 6: Safety Boot Removal

Remove safety boots and deposit in individually-marked plastic bags. Necessary equipment includes:

- Container (30 gallon)
- Plastic liners
- 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:

- Container (30 gallon)
- Chair
- 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:

- Alconox/water solution
- Container
- Long handle, soft bristle brushes

Station 9: Inner Glove Rinse

Rinse inner gloves with water. Repeat as many times as necessary. Necessary equipment includes:

- Water
- Basin
- 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:

- Plastic bags
- Sanitizing solution
- Cotton

Station 11: Inner Glove Removal

Remove inner gloves and deposit in container with plastic liner. Necessary equipment includes:

- Container
- Plastic liners

Section 12: Field Wash

Wash hands and face. Necessary equipment includes:

- Water
- Soap
- Tables
- Wash basins or buckets
- Clean towels

Section 13: Redress

If re-entering exclusion zone, put on clean field clothes (e.g., Tyvek ^{R} , gloves, etc. Necessary equipment includes:

- Table
- Chairs
- 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	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		• 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.

TABLE 1 (continued)

TITLE	GENERAL DESCRIPTION	RESPONSIBILITIES
Site Safety Officer (continued)		• Trains on-site employees on site-specific health and safety plan. • Notifies, when necessary, local public emergency officials. • 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	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	√			

<u>TABLE 3</u>

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.

SECTION 1

PROJECT DESCRIPTION

The Verona Research Facility is located on Germany Road, Town of Verona, Oneida County, NY (Figure 1). The facility is operated by Rome Laboratory. The site consists of 35 buildings located on the eastern section of a 513-acre parcel. Since its founding in the 1950s, the site has been used for a wide variety of electronic research and development activities.

The site is currently under investigation to determine the nature and extent of groundwater contamination by chlorinated organic compounds.

SECTION 2

PROJECT DESCRIPTION

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

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). If NYSDEC-ASP is not specific, then the 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

The validity of the data produced will be assessed for precision and accuracy. 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 to 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 will be assessed by comparison of QC data with laboratory control charts for each test.

SECTION 4

SAMPLING PROCEDURES

The following description is a brief summary of specifications to be used for monitoring well installation. Detailed drilling procedures will be followed in accordance with Guidelines for Exploratory Boring, Monitoring Well Installation and Document of These Activities, as promulgated by NYSDEC.

MONITORING WELL INSTALLATION

A. **Drilling/Sampling Procedures.** Test borings shall be completed using the hollow stem auger drilling method or rotary drilling method to a depth specified by the Stearns & Wheler geologist.

If a hollow stem auger drilling method is to be utilized for monitoring well completion, the minimum inside diameter of the augers shall be 4-1/4 inches.

Samples of the encountered surface materials shall be collected at a minimum of every 5 feet and/or change in material or at the discretion of the geologist. The sampling method employed shall be ASTM D-1586/Split Barrel Sampling using a standard 2-foot long, 2-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 New York State 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 PVC well screen and riser casing that will extend from the screened interval to 2 to 3 feet above existing grade. The selection of stainless steel or PVC for supplemental wells will depend on groundwater quality results from the initial wells. Other materials utilized for completion will be washed silica sand (Q-Rock No. 4 or approved equivalent) bentonite grout, Portland cement, and a protective steel locking well casing and cap with locks.

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.

To prevent frost heave of the well, the following installation procedure will be used. As grout is emplaced above the bentonite seal, a 4-inch PVC sleeve will be placed around the 2-inch riser. No grout will be allowed between the 4-inch and 2-inch PVC. Placing the sleeve around the well in this fashion will limit potential frost heave of the monitoring well by allowing the cap to move without the riser moving.

A vented protective steel casing shall be located over the standpipe extending 2 feet below grade and 2 to 3 feet above grade, secured by a Portland cement seal. The cement seal shall extend laterally at least 1 foot in all directions from the protective casing and shall slope gently away to drain water away from the well. A vented steel cap will be fitted on the protective casing. The cap shall be constructed so it may be secured with a steel lock.

Typical well details are shown in Figures 4.1 and 4.2. The geologist shall specify the monitoring well design to the drilling contractor before installation.

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 the turbidity falls below 50 NTUs or until specific conductivity, pH, and temperature are stable (i.e., consecutive readings are within 10 percent with no overall upward or downward trends in measurements). Well development water will be contained in drums.

PERMEABILITY TESTING

In-situ permeability test will be conducted using instantaneous withdrawal. The water level within the well will be measured prior to withdrawal or displacement and measured at predesignated intervals thereafter. The recorded data is then analyzed using the Bouwer-Rice method.

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. Representative samples of the contained decontamination water and well development water will be screened in the field to determine the proper method of disposal. Every effort will be made to minimize the generation of contaminated water.

SAMPLING PROGRAM

The sampling program for the project consists of representative sampling of groundwater. In addition, sampling of surface water will be conducted as described in the field sampling plan. The sampling program has been developed for this investigation to provide additional data necessary to identify the extent and severity of site contamination and to determine if any imminent health hazard exists from groundwater or other contaminated media. All samples will be handled in accordance with the Health and and Safety Plan, the Field Sampling Plan, and this Quality Assurance Project Plan. Site-specific details as to number of samples, sample locations, and sampling procedures are discussed in the Field Sampling Plan (FSP).

A. **Bottle Preparation.** It is important to use the proper sample containers in order to minimize the alteration of the groundwater 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.

1. **Groundwater.**

   - 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".

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 the wells evacuated to assure that the water in the well is truly representative of the groundwater. All well data will be recorded on the field sampling record (Figure 4.3). For shallow wells or deep wells with a relatively low static water level, evacuation will be accomplished by using a stainless steel or teflon bailer with a ball check valve at its lower end. A bladder may be used to evacuate the deeper wells at a rate of approximately 1 gpm. Water samples to be analyzed for volatile and/or semi-volatile organics must be sampled by bailer.

A centrifugal 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.

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. Sampling procedures are summarized on Table 4.2. Table 4.3 details the analytes sampled for, analytical procedures, contract-required detection limits, and limits of concern appropriate for subsequent sampling. In addition, the potential for increasing turbidity is reduced using this method.

In addition to water samples collected from the monitoring wells, one type of "blank" will be collected and submitted to the chemical laboratory for analyses. The blank 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.

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

A. **Surface Water Samples.** Surface water samples will be collected 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. **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.

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".

TABLE 4.1

SAMPLE CONTAINERIZATION

ANALYSIS	NO.	BOTTLE TYPE	PRESERVATIVE(1)	HOLDING TIME(2)
Water Samples				
GC/MS (extractable) and pesticides/PCBs	2	1-liter glass bottle	None	5 days (until extraction, 40 days extracted)
GC/MS (VOA)	2	40 mil, glass vial with septum cap	None	7 days
Metals(3)	1	1 liter, plastic bottle	Nitric acid to pH <2	6 months Mercury: 26 days
COD		Plastic or glass	Sulfuric acid to pH <2	28 days
TDS		Plastic or glass	None	7 days
Chlorides		Plastic or glass	None	28 days
Ammonia		Plastic or glass	Sulfuric acid to pH <2	28 days
Alpha, Beta, Gamma		Plastic or glass	Nitric acid to pH <2	6 months
Dioxin		Glass with teflon-lined cap	None	7 days
pH		Plastic or glass	None	Analyze immediately
Soil, Sediment, Solid Waste				
TCL organics		Wide mouth, plastic or glass	None	7 days (until extraction, 40 days extracted)
TCL inorganics		Wide mouth, plastic or glass	None	6 months Cyanide: 12 days Mercury: 28 days
Ragiological tests		Wide mouth, plastic or glass	None	6 months

TABLE 4.1 (continued)

ANALYSIS	NO.	BOTTLE TYPE	PRESERVATIVE[1]	HOLDING TIME[2]
pH		Plastic or glass	None	Analyze immediately

(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).
(3) Metals refers to the 24 metals and cyanide in the Target Compound List (NYSDEC-CLP 11/87).

TABLE 4.2

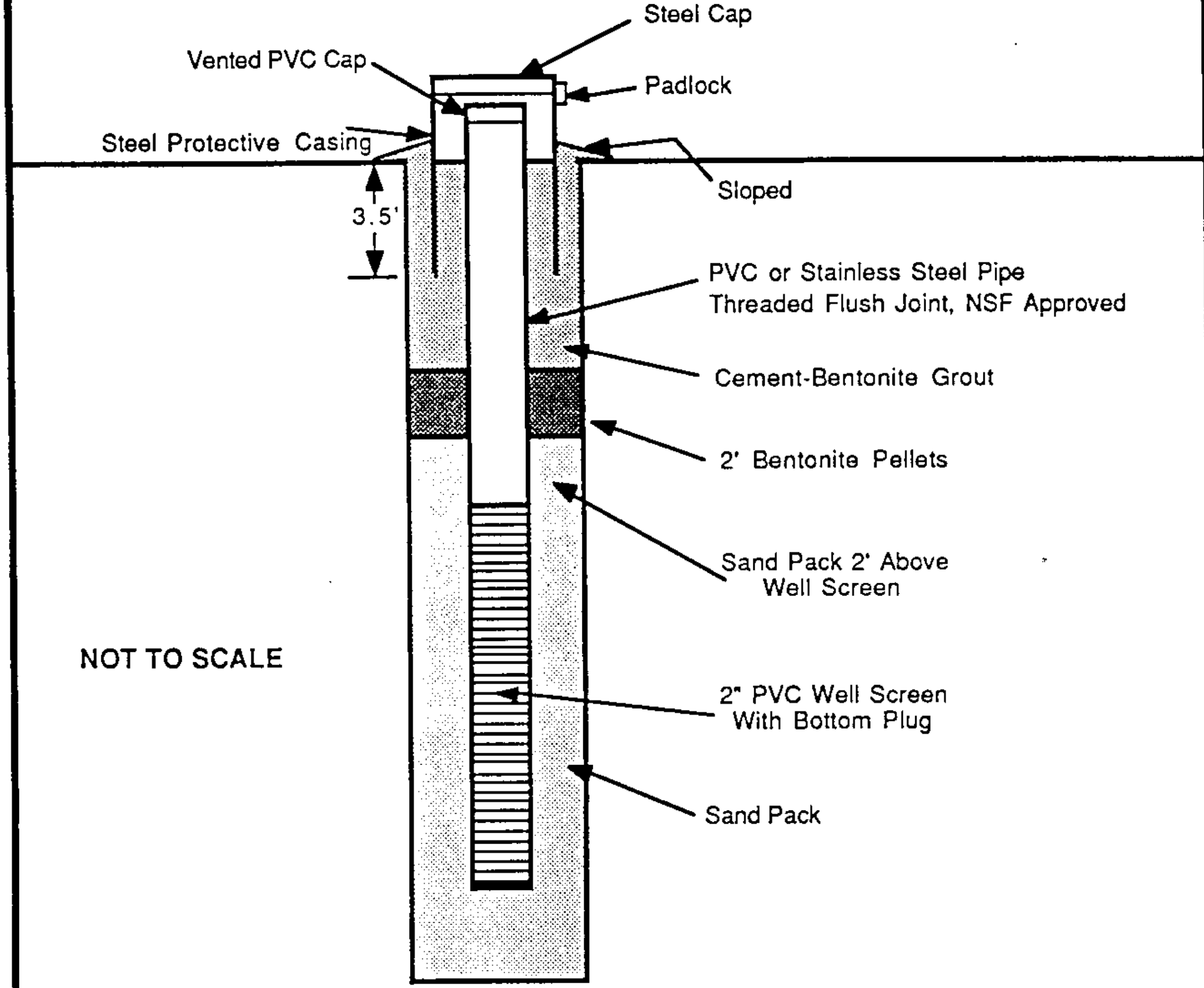
SAMPLING PROCEDURE FOR MONITORING WELLS

1. Initial static water level recorded with an electric contact probe accurate to the nearest 0.1 foot.
2. Sampling device and electric contact probe decontaminated.
   - Sampling device and probe are rinsed with pesticide-grade methanol and distilled water.
   - Methanol is collected into a large funnel which empties into a five- gallon container.
3. Sampling device lowered into well.
   - Bailer lowered by dedicated PVC or polypropylene line.
4. Sample taken.
   - Sample is poured slowly from the open end of the bailer and the sample bottle tilted so that aeration and turbulence are minimized.
   - Duplicate sample is collected when appropriate.
5. Samples are capped, labeled and placed in laboratory coolers with ice packs or bagged ice.
6. All equipment is cleaned with successive rinses of pesticide-grade methanol and distilled water.
   - Dedicated line is disposed of or left at well site.
7. Equipment/wash blanks are collected when non-dedicated sampling equipment is used.
8. Chain-of-custody forms are completed in triplicate.
   - The original and one carbon copy are put into a zip-lock bag and placed into the cooler. The original will be returned following sample analysis.
   - A second carbon copy is kept on file.
9. Cooler is sealed with strapping tape and chain-of-custody seals to assure integrity and to prevent tampering of sample.

QAPP GENERIC TABLE 4.3. SAMPLE AND ANALYSIS IDENTIFICATION.

	SITE NAME AND LOCATION			SAMPLE AND ANALYSIS IDENTIFICATION					
TASK	SAMPLE I.D.	SOURCE	DEPTH	TCL METALS	TCL VOLATILES	TCL SEMI-VOLATILES	TCL PESTI-CIDES/PCBs	TOTAL PHENOLICS	
1									
2									
3									
4									
TASK									
1									
2									
3									
4									
MATRIX	VOLATILES	METALS	B/N/A EXTR.	PEST./PCB	TOTAL PHENOLICS	LAB QA/QC			
	METHOD # AND	METHOD # AND	METHOD #	METHOD #	METHOD #	(BY MATRIX)	TRIP BLANKS	FIELD BLANKS	
	# OF SAMPLES	# OF SAMPLES	# OF SAMPLES	# OF SAMPLES	# OF SAMPLES	# OF SAMPLES			
GW	X SAMPLES	X SAMPLES	X SAMPLES	X SAMPLES	X SAMPLES	X/20	1/20 GW VOL	1/20 GW VOL	
	method 8240,first	ICP (6010) or	method 8250	8080	9066				
	if second round	AA (7000 series)	or 8270						
	methods 8010/8020								
SOIL	X SAMPLES	X SAMPLES	X SAMPLES	X SAMPLES	X SAMPLES	X/20	0	X/20	
	method 8240,first	ICP (6010) or	method 8250	8080	9066				
	methods 8010/8020	AA (7000 series)	or 8270						
SW	X SAMPLES	X SAMPLES	X SAMPLES	X SAMPLES	X SAMPLES	X/20	0	X/20	
	method 8240,first	ICP (6010) or	method 8250	8080	9066				
	methods 8010/8020	AA (7000 series)	or 8270						
SED	X SAMPLES	X SAMPLES	X SAMPLES	X SAMPLES	X SAMPLES	X/20	0	X/20	
	method 8240,first	ICP (6010) or	method 8250	8080	9066				
	methods 8010/8020	AA (7000 series)	or 8270						
OTHER	X SAMPLES	X SAMPLES	X SAMPLES	X SAMPLES	X SAMPLES	X/20	0	X/20	
	method 8240,first	ICP (6010) or	method 8250	8080	9066				
	methods 8010/8020	AA (7000 series)	or 8270						

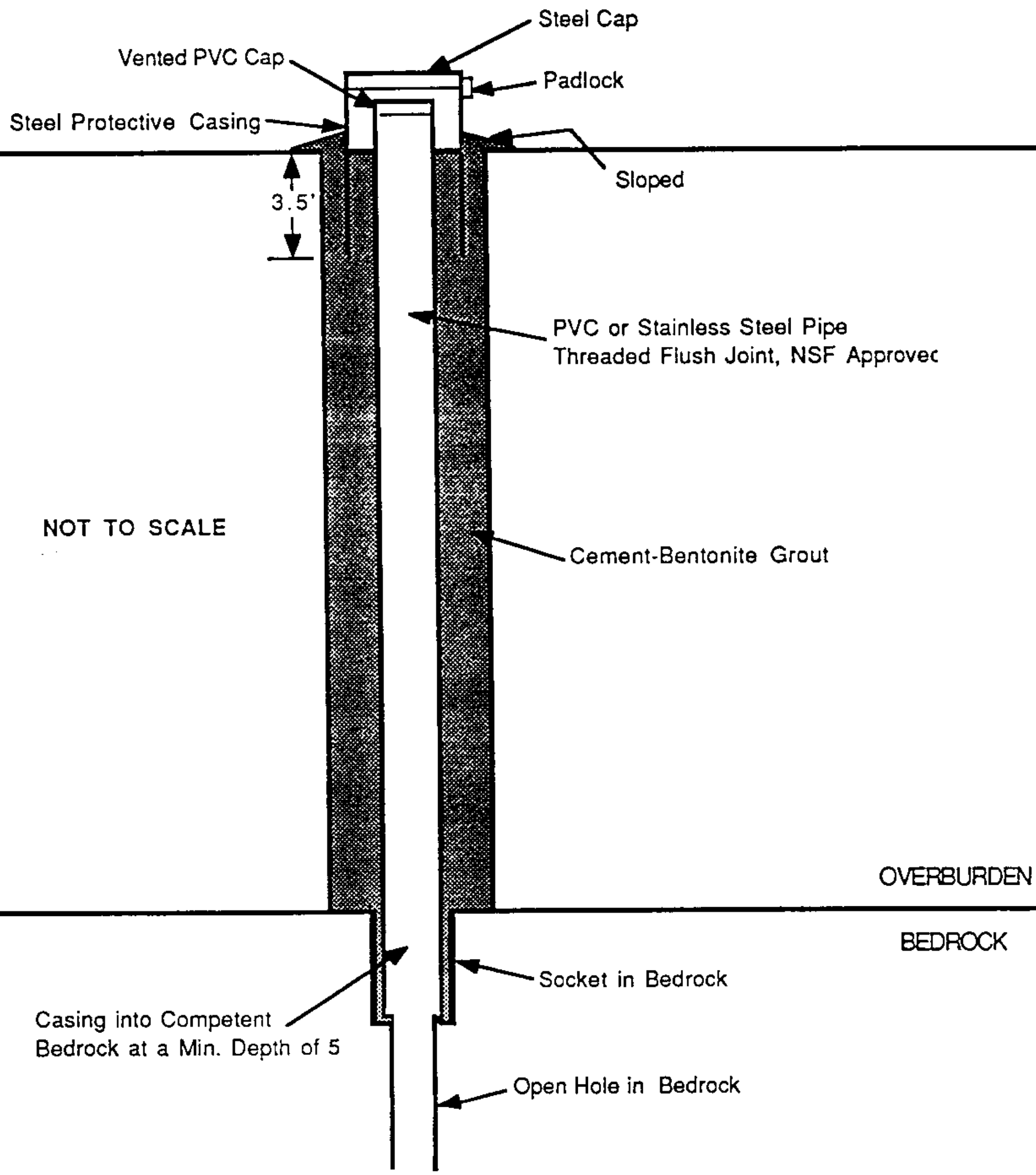
Figure 4.1



OVERBURDEN WELL

Stearns & Wheler

Figure 4.2



BEDROCK WELL

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GROUNDWATER FIELD SAMPLING RECORD

SITE ______________________ DATE ______________

Samplers: ______________________ SAMPLE ID ______________

____

Depth of well (from top of casing) . . . . ________

Initial static water level (from top of casing) . . . ________

Evacuation Method:

Submersible ______ Centrifugal ______

Airlift ______ Pos. Displ. ______

Bailer ______>>> No. of bails ______

Volume of water removed __________ gals.

> 3 volumes: yes no

dry: yes no

Well Volume Calculation

2in. casing:________ ft. of water X .16 = ______gallons

3in. casing:________ ft. of water X .36 = ______gallons

4in. casing:________ ft. of water X .65 = ______gallons

Field Tests:

Sample Temp: ________ C / F

pH ________

Eh ________

Alkalinity (filtered) ________ ml ___N acid

Alkalinity (unfiltered)________ ml ___N acid

Spec. Conductivity ________ umhos/cm

Sampling:

Time:____________

Sampling Method:

Stainless steel Bailer ______

Teflon Bailer ______

Pos. Disp. Pump ______

Other ______________

Analyses:

Baseline ______

Routine ______

Other:

____

____

____

____

Observations:

Weather/Temperature:______________________________________

Pysical Appearance and odor:of sample: ______________________________

____

Comments: ____

____

FIGURE 4.3

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 5-2 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 24-48 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 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

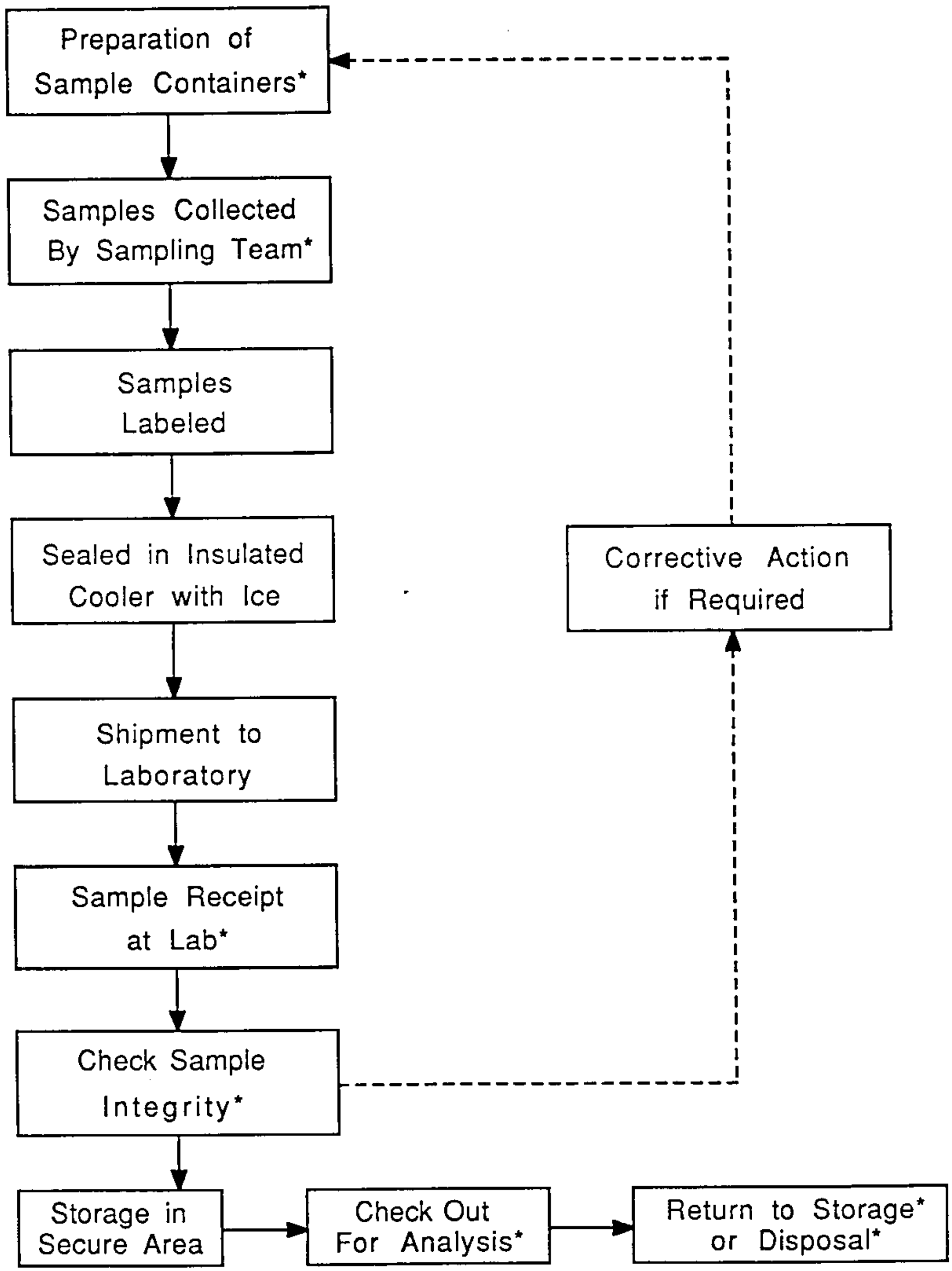
Final evidence files include all originals of laboratory reports and are maintained under documented control in a secure area.

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.

Figure 5.1

SAMPLE CUSTODY



*requires sign-off on Chain of Custody Form

Stearns & Wheler

WATER TESTING LABORATORY, INC.

4 CHENANGO STREET, CAZENOVIA, NY 13035 (315) 655-3211

CHAIN OF CUSTODY RECORD

Proj. No.	Project Name					No. of containers						Remarks
Samplers: (Signature)												
WTL. No.	Date	Time	Comp.	Grab	Station Location							

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)		Date/Time	Remarks

Figure 5.2

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-HSP 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 volatile organic compounds (VOCs), no sample preparation is required. 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 Method 624 (gas chromatography with different detectors) or equivalent will be used if subsequent rounds with lower limits of detection are warranted.

METALS

Water, soil and waste samples will be analyzed for the metals listed in Table 7.2. 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.

TABLE 7.1

VOLATILE ORGANIC COMPOUNDS
Method: USEPA 624 or equivalent

Element	Contract Required Detection Limits (μg/l)*
1. Chloromethane	10
2. Bromomethane	10
3. Vinyl chloride	10
4. Chloroethane	10
5. Methylene chloride	10
6. 1,2-dichlorobenzene	10
7. 1,3-dichlorobenzene	10
8. 1,4-dichlorobenzene	10
9. 1,1-dichloroethylene	10
10. 1,1-dichloroethane	10
11. Trans-1,2-dichloroethene	10
12. Chloroform	10
13. 1,2-dichlorethane	10
14. 1,1,1-trichloroethane	10
15. Carbon tetrachloride	10
16. Trichlorofluoromethane	10
17. Bromodichloromethane	10
18. 1,1,2,2-tetrachloroethane	10
19. 1,2-dichloropropane	10
20. cis-1,3-dichloropropene	10
21. Trichloroethene	10
22. Dibromochloromethane	10
23. 1,1,2-trichloroethane	10
24. Benzene	10
25. Trans-1,3-dichloropropene	10
26. Bromoform	10
27. Tetrachloroethylene	10
28. Toluene	10
29. Chlorobenzene	10
30. Ethyl benzene	10
31. m-xylene	10
32. o-xylene	10
33. p-xylene	10

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

TABLE 7.1 (continued)

TOTAL AND DISSOLVED METALS ANALYSIS
Method: USEPA 6010

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	3
Magnesium	5,000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5,000
Selenium	5
Silver	10
Sodium	5,000
Thallium	10
Vanadium	50
Zinc	20
Cyanide	10

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

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. **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:

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

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)

$V_{\circ}$ = 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 any additional documentation 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.

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

SAMPLE PREPARATION AND ANALYSIS SUMMARY

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

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 will be utilized in accordance with the specifications 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 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.

This Report Contained FULL SIZE DRAWINGS That Could Not Be Scanned DER/2007