Voluntary Investigation Work Plan

Coral Graphics, Inc.

840 Broadway
Hicksville, New York

NP&V Job No. 95115

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Coral Graphics, Inc.

840 Broadway
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1.0 SITE DESCRIPTION AND BACKGROUND

1.1 Site Location

The subject property lies in the Hamlet of Hicksville, Town of Oyster Bay, County of Nassau, New York. The subject property consists of a 4.0 acre developed parcel located on the west side of Broadway, south of Bloomingdale Road **(Figure 1)**. The property is more particularly described on the Nassau County Tax Map as Section 46, Block 629, Lot 61.

1.2 Purpose

This document provides a sampling and analysis plan for a supplemental site investigation in connection with the subject property and is intended to supplement prior investigation activities completed on the site. The purpose of this remedial investigation is to determine what impacts certain former on-site activities have had upon the environmental quality of the subject site. Specifically, the impacts associated with the former outdoor storage of wastes and process materials as well as discharges to the leaching pool field both located off of the southwest corner of the building. The purpose of the study, is to determine if any further remediation is necessary.

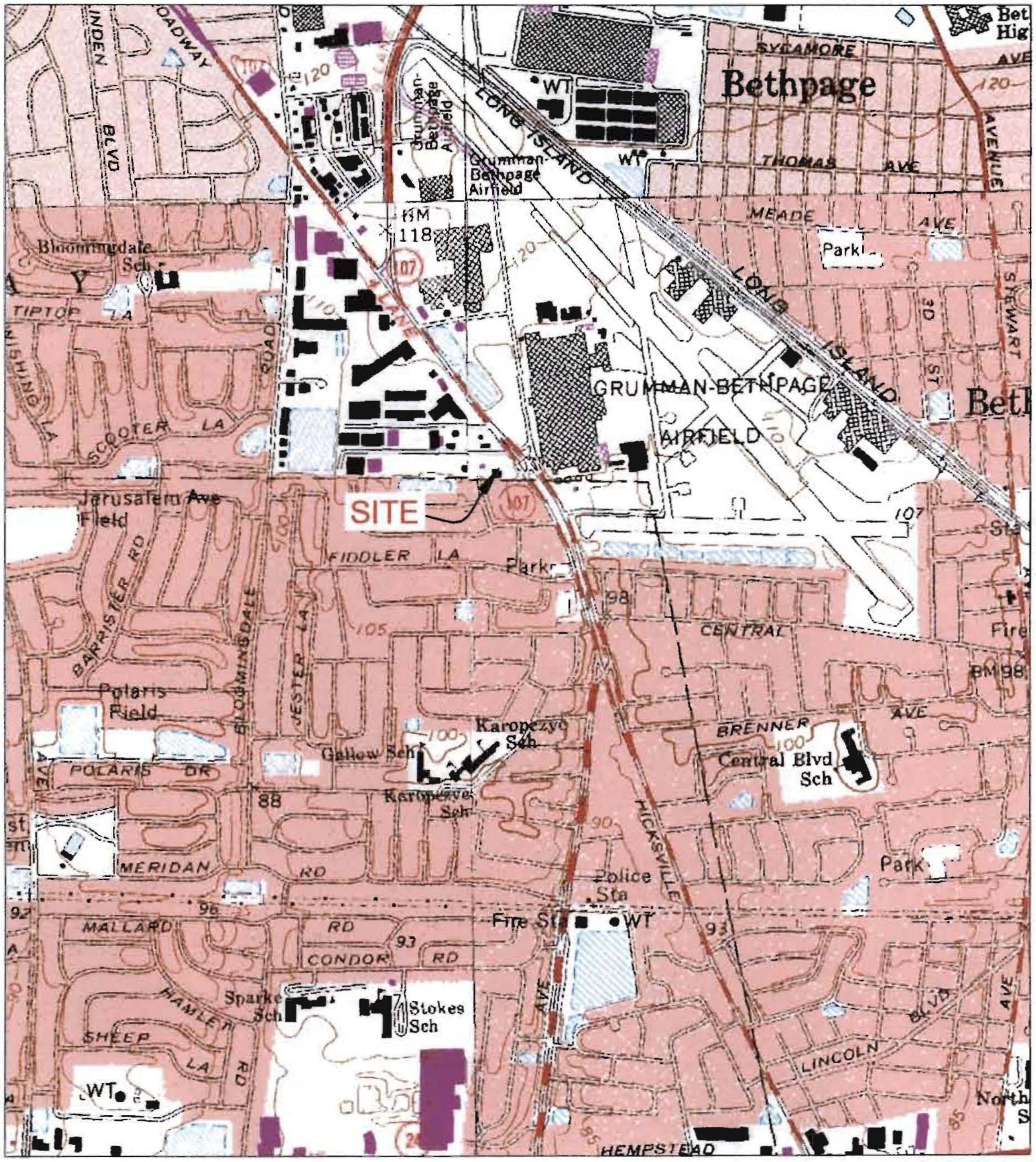
1.3 Site Description

The site is currently utilized for Coral Graphics headquarters and its larger production facility. The 4-acre lot houses a single story masonry building with a footprint area of approximately 17,725 SF and a 3,560 SF second floor office area. The front portion of the building consists of one (1) and two (2) story office space with the rear portion of the building utilized as a print shop which contains printing presses, U.V. finishers and coaters. Currently the printing process utilizes soy based inks. Prior to utilizing these inks, the facility used chemical based inks (containing volatile organic compounds) which were removed from press rollers with chemical solvents. The used cleaning rags were formerly stored outside the rear loading dock in 55-gallon drums and open bin containers for later pickup and disposal. Currently, these rags are stored in ventilated storage trailers (CONEX boxes) located along the southwestern property line. The facility maintains a leaching system consisting of two (2) filled in leaching pools, a distribution pool, a loading bay drainage pool and a distribution pool. The building is currently connected to the municipal sewer collection system in the area at an undetermined time. The site was not identified on any federal, state and local regulatory agency databases.

The site layout and structures are depicted in **Figure 2**.

FIGURE 1

LOCATION MAP



Source: USGS Topographic Maps
Scale: 1" = 1,500'

NORTH

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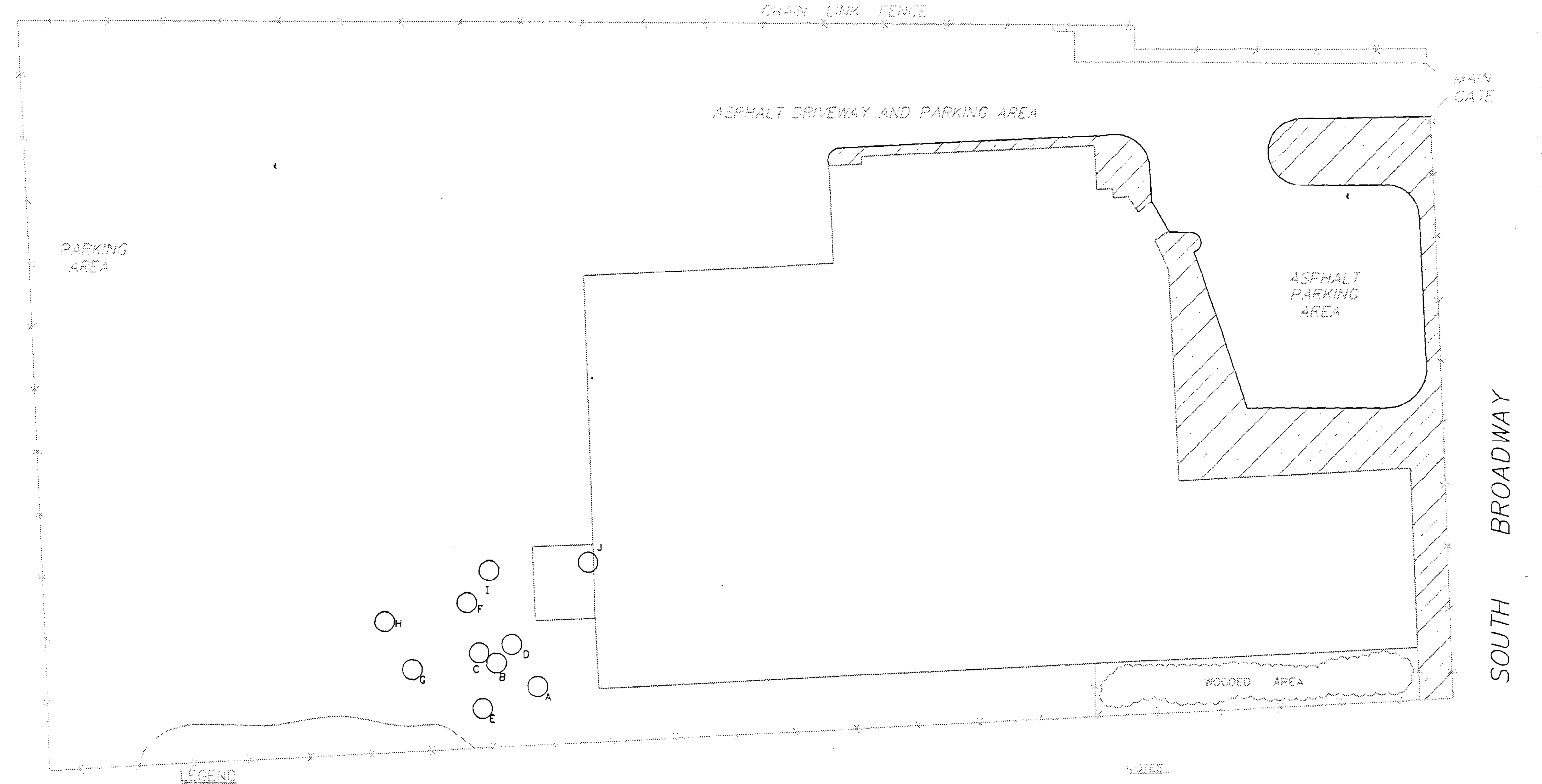

LEGEND

▨ GRASS COVERED AND LANDSCAPED AREAS

○A DRYWELL

NOTES

1. SOURCE OF DRAWING IS SURVEY BY ROBERT W. [illegible] LICENSED LAND SURVEYOR PLAINVIEW NEW YORK, SURVEYED JUNE [illegible] 2000
2. DRAWING SUPPLEMENTED BY FIELD OBSERVATIONS.

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NASSAU COUNTY, NEW YORK

VOLUNTARY INVESTIGATION WORKPLAN
SITE PLAN

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FIGURE 3

1.4 Prior Documentation and Adjacent Site Description

Prior documents involving the environmental quality of the site include a Phase I Environmental Site Assessment (ESA) conducted by Malcolm Pirnie dated May 2000, an initial Phase II ESA conducted by Malcolm Pirnie dated August 2000 and a Limited Phase II ESA conducted by Nelson, Pope & Voorhis, LLC dated August 18, 2000.

The Phase I ESA was conducted to identify recognized environmental conditions which may have been present on the subject property related to past or present uses of the site. Information compiled for the Phase I ESA was gathered through company and regulatory records review, environmental database searches, interviews with company personnel and site reconnaissance of the facility. The ESA also involved a review of company environmental compliance records and practices. A summary of the Phase I ESA results are provided below. In addition, excerpts from the report have been included in **Appendix A-1**.

A review of the Phase I ESA indicated several conditions which may impact the environmental quality of soil and groundwater resources associated with the subject property. The site was not identified in any of the databases searched, however, several surrounding properties were identified within the records reviewed and primarily included the Hooker Chemical/Ruco Polymer site located to the north, Grumman Aerospace Corporation located on South Oyster Bay Road and the Naval Weapons Industrial Reserve Plant located on Stewart Avenue. In addition to the records search, site reconnaissance of the property revealed several recognized environmental conditions which may impact the quality of soils and groundwater underlying the site. These conditions included the presence of several drywells for stormwater discharge located throughout the property, the former presence of a fuel oil UST used for the storage of heating oil, the storage of several hazardous materials including methyl chloride, 1,2,4-trimethylbenzene, toluene, phosphoric acid, cobalt, chromium, xylene and other chemicals used in smaller quantities and the generation of hazardous waste products.

Based on the results presented in the Phase I ESA it was concluded that a Phase II ESA should be preformed to evaluate the impact that former or current uses of the subject site may have had on soil and groundwater resources underlying the property. Excerpts from the Phase II ESA are provided in **Appendix A-2**. The initial Phase II ESA conducted by Malcolm Pirnie consisted of a soil, soil gas as well as a groundwater sampling and analysis program which also included a focused geophysical survey to locate a fuel oil underground storage tank which formerly serviced the site. Groundwater underlying the site was encountered at elevations ranging from 66.43 to 66.25 feet above the Nassau County datum (~50 ft below surface grade). Based on two synoptic well gauging events, the general direction of groundwater flow underlying the site was found to be in a southwesterly direction. Review of regional groundwater contour maps generally confirms this direction across the site. Result of the investigation revealed that subsurface soils and groundwater at the site were impacted by releases to the environment consisting primarily of PCE, toluene, total xylenes, benzo (a) anthracene, benzo (a) pyrene and chrysene above their respective TAGM standards. Impacted soils and groundwater were found to be primarily in the area around the rear loading dock off of the southwest corner of the facility building.

Groundwater impacts were also detected in samples collected from the sites upgradient monitoring wells indicating potential contribution from an off-site source. Analytical results for samples collected during the Phase II are summarized in **Table 1**.

Table 1
Malcolm Pirnie Phase II Analytical Results

Compounds Detected Above TAGM Standard	**Sample Location**				
	MW-1	**MW-2**	**MW-3**	**MW-4**	**GP-4**
	Groundwater	**Groundwater**	**Groundwater**	**Soil**	**Groundwater**
PCE	86.20 *(5)*	BS	BS	2,790 *(1,400)*	514 *(5)*
Toluene	BS	BS	BS	41,300 *(1,500)*	BS
Total Xylenes	BS	BS	BS	9,980 *(1,200)*	BS
Benzo (a) Anthracene	BS	BS	BS	725 *(224)*	BS
Benzo (a) Pyrene	BS	BS	BS	498 *(61)*	BS
Chrysene	BS	BS	BS	455 *(400)*	BS

Notes: Number in parenthesis indicates NYSDEC standard for matrix sampled
Blow regulatory standard.

Geophysical survey results did not reveal the presence of an underground fuel oil UST. In addition, during the initial Phase II ESA a series of drywells were observed in the vicinity of the buildings southwest corner and were the focus of the limited Phase II conducted in August of 2000. The limited Phase II ESA is provided in **Appendix A-3**.

The limited Phase II investigation consisted of the collection of groundwater and soil samples around and within the drywell field area. Laboratory analysis performed on the soil samples collected from eight (8) of the nine (9) leaching pools detected minor concentrations of tetrachloroethene, 1,3,5 trimethylbenzene, 1,2,4 trimethylbenzene and o-xylene below Guidance and TAGM 4046 values. Samples collected one leaching pool (DW-I), exhibited elevated concentrations of these constituents which exceeded these regulatory standards with tetrachloroethene detected at 1,712 ug/kg, 1,3,5-trimethylbenzene at 46,051 ug/kg, 1,2,4-trimethylbenzene at 46,039 ug/kg and o-xylene at 2,927 ug/kg.

It should also be noted that drywells DW-A and DW-B which were investigated as part of the limited Phase II had been backfilled and abandoned in place. To ensure that a sample was collected from the former bottom of each leaching pool, continuous Geoprobe samples were collected to identify the interface between backfilled and native soil materials which was encountered at a depth of approximately 14 to 15 ft below surface grade. A review of the logs completed as part of the field investigation indicated that the overlying backfilled materials consisted of clean brownish sands and that the underlying natural soil interface soils were comprised of distinctive dry black material presumed to be the former leaching pool bottoms.

Two groundwater samples identified as GWP-1 (upgradient sample located along the northern property boundary) and GWP-2 (downgradient sample located along southern property boundary) were collected as part of the limited Phase II ESA. The laboratory analysis performed on the groundwater samples revealed that both samples exhibited elevated concentrations of tetrachloroethene at 37 ug/l (GWP-1) and 76 ug/l (GWP-2). None of the other analyzed constituents exhibited elevated concentrations above their respective NYSDEC Ambient Water Quality Standards & Guidance Value.

It is noted that three sites adjacent to the subject site, but not the subject site are listed on several federal and State regulatory databases. These sites consist of Hooker Chemical/Ruco Polymer, Northrop/Grumman Aerospace Corporation and the Naval Weapons Industrial Reserve Plant and have been listed as either NPL CORRACTS and/or CERCLIS sites. According to Northrop/Grumman reports, the subject site is located approximately 500 feet west of a comingled total volatile organic (TVOC) plume which origniates from Hooker/Ruco, Northrop/Grumman and the Naval Weapons Industrial Reserve Plant. The initial Phase II concluded, based on conversations with NYSDEC representatives, that the high levels of PCE detected at the subject site are not likely to be a result of the regional TVOC plume.

2.0 FIELD SAMPLING PLAN

The Field Sampling Plan (FSP) has been designed to delineate the source areas and extent of soil and groundwater contamination present at the site. Investigative activities will consist of a historical literature search of Nassau County Department of Health (NCDOH) files, subsurface soil sampling as well as source area, upgradient and downgradient groundwater sampling. The FSP will be divided into three separate phases. Phase I will consist of the collection of bottom soils from leaching pool I and the installation of one (1) soil borings in the area of deteriorated asphalt near the southwest corner of the facility building to determine a wide range of analytical characteristics. Phase II will involve the collection of vertical soil samples and water samples from leach pool I, collection of soil samples from four (4) additional soil borings in the area of deteriorated asphalt, as well as the collection of groundwater samples from several sample probe points located upgradient and downgradient of facility operations. Phase III will involve the installation of permanent groundwater wells to monitor the vertical and horizontal extent of the delineated contaminant plume emanating from defined source areas at the site.

All field sampling procedures and protocols involved in execution of this FSP will be thoroughly outlined in Section 3.0 of this SAP. All appropriate QA/QC and sample tracking methods will be provided in Sections 4.0 and 5.0.

2.1 Historical Literature Search

In addition to the three phases of the proposed investigation NCDOH files relevant to the environmental contamination detected at the subject property will be reviewed. Specifically, files will be reviewed to retrieve information regarding the former fuel oil UST, sanitary and industrial leaching pools as well as when the facility was connected to the public sewer system. The findings of the search will be presented with all results obtained during field investigative activities. It should be noted that it is suspected that the abandoned leaching pools (DW-A and DW-B) were used for the former on-site sanitary system and were sampled during the Limited Phase II investigation. However, if during the review of NCDOH files it is revealed that this is not the case provisions will be made with NYSDEC guidance and approval to collect environmental quality samples from the former sanitary system. In addition, to the historical literature search site inspections will be conducted at the properties adjacent to the subject facility to determine the potential migrating soil gases may have on human health for personnel working in facilities directly south of the site. Following inspection of these facilities the New York State Department of Health (NYSDOH) and NYSDEC will be consulted to determine if indoor air monitoring will be required to determine if any impacts to air resources and human health may be present.

2.2 Phase I Proposed Sampling

Phase I of the proposed on-site sampling will be conducted to delineate potentially impacted soils in the vicinity of the southwest corner of the facility building and to determine the chemical composition of contaminants impacting the site. The results obtained during this phase will be used to aid in determining the extent of contamination and narrow the list of chemical analytes to be tested during the Phase II/III sampling events. Consultation with the NYSDEC will be conducted to determine the sampling parameters to be established for additional investigation Phases.

2.2.1 Soil Sampling – Former Waste Storage Area Southwest of Building

One (1) soil sample will be collected from the approximate former location of GP-4/MW-4 installed during Malcolm Pirnie's Phase II Investigation (May, 2000) (**Figure 3**). This location was located adjacent to the facilities former waste storage area. During this Phase II investigation elevated levels of PCE as well as several other volatile organic compounds were detected in soil samples collected from this area in a sample collected from the 4 to 6 ft interval. This sample will also be collected from the 4 to 6 ft interval to help identify the specific chemical constituents present within bottom soils of this probable source area and the results will be used to define the scope of laboratory analysis of collected samples in Phases II and III of this FSP.

The sample will be collected with Geoprobe® direct push technology using a two (2) ft core barrel sampling device.

2.2.2 Leaching Pool Bottom Sampling

Samples will be collected from the bottom soils present within both leaching pools I and J as present at the subject site. The locations of these leaching pools are provided in **Figure 3**. Analytical results from previous investigations indicate that both of these pools contain contaminants. These samples will be collected to identify the specific chemical constituents present within bottom soils of these probable source areas and the results will be used to define the scope of laboratory analysis of collected samples in Phases II and III of this FSP. In addition, surface sediment samples will also be collected from drywells located along the northwestern and eastern sides of the facility building. These locations designated as K, L, M and N on **Figure 2**. These drywells have not been previously investigated and samples will be collected to determine if these locations have been impacted by previous on-site activities. Since these pools have not been previously investigated samples will be analyzed for the same parameters utilized during Phase I. All of the pools are estimated to be approximately 20 ft deep. Samples will be collected utilizing a stainless steel hand auger inserted into the upper six (6) inches of the leaching pool bottoms. As a result confined space entry will not be required for sampling of the leaching pool. According to NCDOH records the subject facility was connected to the municipal sewerage system in April of 1995. These records will be further reviewed to determine the location of the former septic system and how it may have been abandoned. If possible or appropriate this system will be sampled to determine if discharges have impacted soil or groundwater resources underlying the subject property.

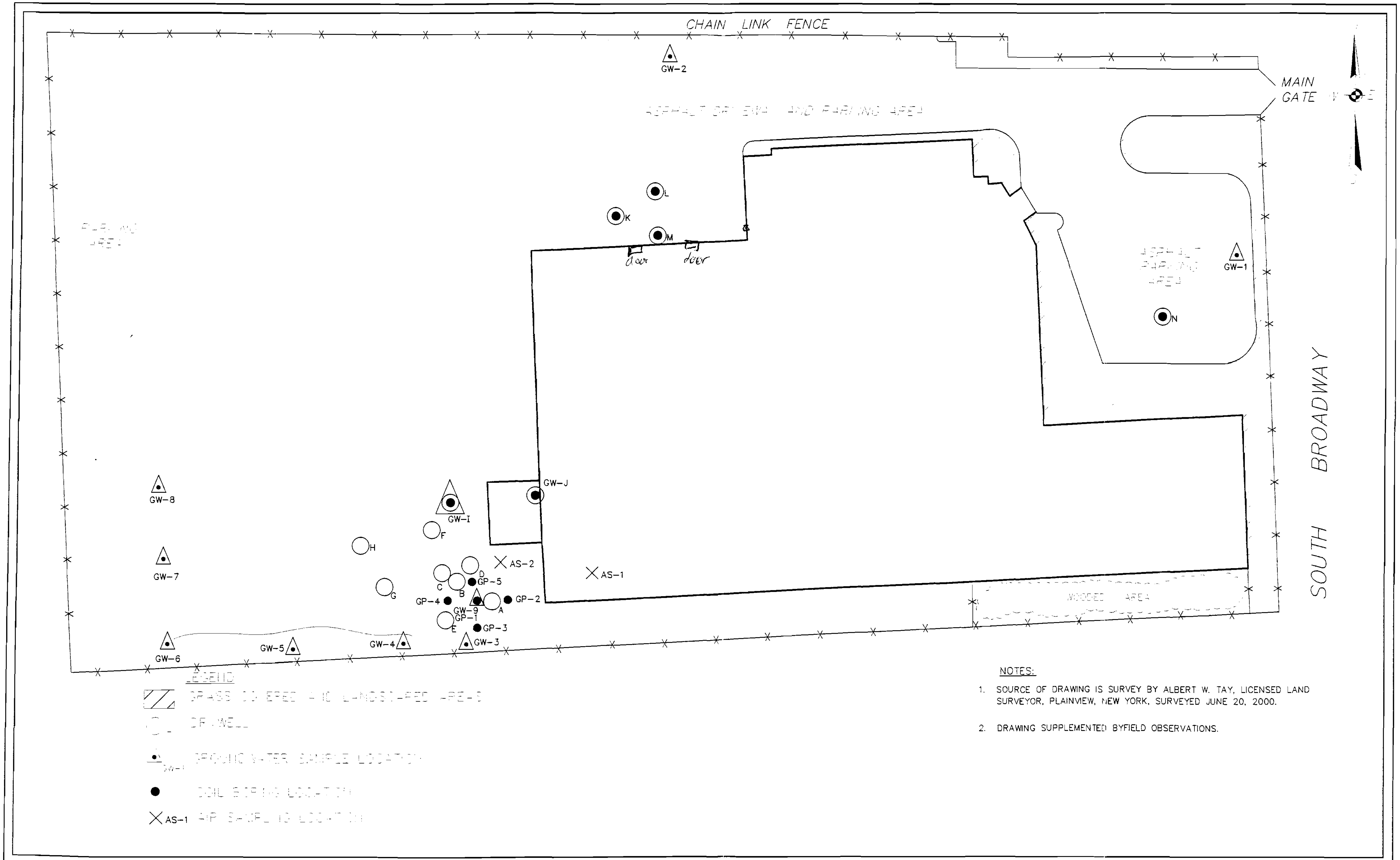
All samples collected during this phase will be analyzed for volatile organic compounds plus tentatively identified compound (TICs) as well as alcohol's and ketone's via EPA test method 8260, semi volatile (base neutral) compounds plus TICs via EPA test method 8270 and TAL metals. All samples will be analyzed by a NYSDOH Environmental Laboratory Approved Program (ELAP) CLP certified laboratory with Category B deliverables, using all appropriate QA/QC and sample tracking methods.

2.2.3 Air Quality Sampling

Air samples will be collected from inside the facility building and the ambient outdoor air. Soil gas sampling results during previous investigations detected elevated concentrations of PCE in soil gases in the drywell field area and along the sites southern property line. These samples will be collected to determine if contaminants present within soil gases may be migrating into the facility building and whether they may pose a significant risk to human health. The indoor sample will be collected in the vicinity of the facility loading area and the outdoor sample will be collected in the area of the drywell area located in the southern portion of the site. The location of each of these samples are presented in **Figure 3**. Samples will be collected utilizing an SKC low volume personal air pump set at a rate of 0.20 liters per minute. The air sample will be drawn through a sorbent collection tube containing a coconut shell charcoal filter apparatus set approximately 18 inches from the concrete slab floor. Sampling will be conducted for one hour resulting which will result in a total draw of approximately 12 liters of air through the collection tube. All samples collected will be analyzed for volatile organic compounds plus TICs as well as alcohols and ketone's via EPA test method 8260. All samples will be analyzed by a NYSDOH ELAP CLP certified laboratory. Since the samples collected will be used to determine indoor air quality for human health purposes and not used for selection or design of remedial alternatives formal QA/QC procedures and Category B deliverable packages will not be required.

2.3 Phase II Proposed Sampling

Phase II sampling will be conducted to characterize the vertical extent of contamination in each of the targeted on-site leaching pools as well as to evaluate the horizontal and vertical extent of groundwater contamination upgradient and downgradient of the facility building. With the exception of Geoprobe groundwater sampling, analysis of collected samples will be limited to analytes detected during Phase I of the FSP. Groundwater samples collected via Geoprobe will be analyzed for volatile organic compounds only and will be further discussed in Section 2.3.3. Determination of these parameters will be subject to a review of Phase I analytical data as well



NOTES:

1. SOURCE OF DRAWING IS SURVEY BY ALBERT W. TAY, LICENSED LAND SURVEYOR, PLAINVIEW, NEW YORK, SURVEYED JUNE 20, 2000.
2. DRAWING SUPPLEMENTED BYFIELD OBSERVATIONS.

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VOLUNTARY INVESTIGATION WORKPLAN
SAMPLE LOCATIONS

25 0 25 50
FT

7
FIGURE 3

\PROJECTS\95115\CORALGR.DWG, 12/19/2001 02:20:50 PM, hanson as discussion with NYSDEC personnel to devise an parameter list which will adequately characterize soil and groundwater quality underlying the site.

2.3.1 Leaching Pool Vertical Soil Profile Sampling

During this phase vertical profile soil samples will be collected from leaching pool I located along the buildings southern wall adjacent to the facility waste compactors as well as the other leaching pools sampled during Phase I if analytical results indicate that further sampling is required. Since this leaching pool is likely to be primary source areas based on prior sampling, samples will be collected continuously to the water table and screened with a PID for volatile organic contaminants. A maximum of three (3) soil samples will be collected from the boring and submitted for laboratory analysis. Samples submitted for analysis will include one (1) soil sample collected immediately above the water table and two (2) additional samples which exhibit the highest PID readings recorded during soil screening procedures. Additionally, the discharge pipe which extends to the east from this drywell will be further investigated to determine its origin. This will be accomplished by conducting a dye test and running a "snake" through the pipe to determine its connection.

In addition, one (1) sample will be collected at a depth of 10 ft below the bottom of DW-J to confirm that deeper soils do not exceed the NYSDEC TAGM standards. It should be noted that during the Limited Phase II none of the samples collected from this pool exceeded any of the TAGM standards for compounds analyzed.

Samples will be collected using Geoprobe direct push technology using a four (4) ft core barrel sampling device. Laboratory analysis for these samples will be subject to all appropriate QA/QC procedures and sample tracking methods and require a Category B deliverables package.

2.3.2 Former Waste Storage Area Southwest of Building Vertical Soil Profile Sampling

During this phase vertical profile soil samples will be collected from five (5) soil boring locations in the former waste storage area southwest of the facility building (**Figure 3**). Samples will be collected continuously to the water table and screened with a PID for volatile organic contaminants. A maximum of two (2) soil samples will be collected from each boring and submitted for laboratory analysis. Both of these samples will be selected based on PID screening procedures as well as visual observation of soil materials.

Samples will be collected using Geoprobe direct push technology with a four (4) ft core barrel sampling device. Laboratory analysis for these samples will be subject to all appropriate QA/QC procedures and sample tracking methods and require a Category B deliverables package.

In addition, during installation of groundwater probe GW-3 soil samples will be collected from a depth of 20 ft below surface grade and immediately above the water table and screened with a

PID for the presence of VOCs. This will be conducted to determine if significant soil gases may be migrating off the subject property to the south. If either or both of these samples demonstrate significant concentrations based on screening results they will be submitted for laboratory analysis identical to other soil samples submitted during this phase of investigative work. On-site NYSDEC personel will be consulted to determine if screening results are significant.

2.3.3 Groundwater Sampling

During this phase groundwater samples will be collected from specified locations across the subject site. Groundwater samples will be collected from two (2) upgradient points (GW-1 and GW-2) to characterize groundwater quality entering the sites northern and eastern property lines. Two (2) samples will be collected from each of these points with one (1) retrieved from five (5) feet into the water table and the second from 15 ft below the water table interface. Sample results from these points will be used to characterize groundwater quality at the water table interface and at depth. The second series of groundwater samples will be collected from the water table interface located directly below leaching pool I (GW-I) and the former location of GP-4/MW-4 (GW-9). These samples will be collected at the water table to determine the degree that discharges to these leaching structures may have impacted the groundwater quality underlying the site. The final series of groundwater samples collected during this phase will be retrieved from several probe points located along the sites southern and western property boundaries downgradient of the sites leaching pool network and will be designated GW-3 through GW-8. Samples at each of these locations will be collected at the water table interface and 15 ft below the interface in order to delineate the horizontal and vertical extent of a contaminant plume emanating from an upgradient source The location of each of the groundwater sampling points is provided in **Figure 3**. Groundwater samples will be collected utilizing Geoprobe® direct push technology according to the procedures outlined in Section 3.0. As mentioned previously analytical parameters for samples collected from these points will be limited to volatile organic compounds since the turbidity of samples collected utilizing Geoprobe technology tend to provide unreliable metals analysis results. Due to the turbidity of samples generally collected via Geoprobe operations, metals analysis tend to be unreliable. Groundwater sampling will be in accordance with all appropriate QA/QC procedures as well as sample tracking methods and shall require a Category B deliverables package.

2.4 Phase III Proposed Sampling

Based on the results obtained during Phase I and II of the FSP, six (6) two (2) inch monitoring wells will be installed on-site to monitor any contaminant plume which may be identified at the site. One (1) well each (MW-1 and MW-1A) will be placed in the northern and eastern portions of the property upgradient of the facility building to monitor groundwater quality entering the property boundaries. One well will also be installed within the plume identified during Phase II (MW-2). Once these wells are installed each well will be surveyed and groundwater elevation measurements will be collected to determine the direction of on-site groundwater flow through triangulation. Once the direction of groundwater flow is determined the three (3) remaining

In addition, any monitoring wells installed beneath the water table will be fitted with five ft screens for discrete-interval sampling. Monitoring wells will be installed using a Hollow Stem Auger (HAS) drill rig in accordance with the specifications outlined in Section 3.0. Groundwater samples will be collected consistent with the analytical parameters utilized during Phase II. In addition, samples will be collected in accordance with all appropriate QA/QC procedures as well as sample tracking methods and shall require a Category B deliverables package.

2.5 Sampling Summary

Table 2 has been included to summarize the groundwater, soil and soil gas sampling schedule. Water samples will be place in containers as follows: VOC's - 40ml glass vials with no preservative (7 day holding time), SVOC's – 1 liter amber glass bottles with no preservative (5 days until extraction and 40 days for analysis) and TCL Metals – 500ml plastic bottles preserved with NHO_3 (6 months holding time). All soil samples will be placed in 8 oz glass jars without preservative.

2.6 Exposure Assessment

A human health qualitative exposure assessment will be conducted as part of the investigation to determine the risk that a possible release to the environment may have on the surrounding community. The scope of this assessment will include a characterization of the exposure setting, identifying exposure pathways and an evaluation of the contaminant fate and transport.

Evaluation of the exposure setting will involve a full review of all sample data generated during investigative activities. It will also include an evaluation of the contaminant characteristics as well as the physical environment which may impact or influence potential route of exposure to potentially exposed human populations.

The exposure pathway assessment will analyze the means by which a population may be exposed to contaminants potentially emanating from a site. In order for a pathway to be established it must contain five elements which include 1) a contaminant source; 2) contaminant source and transport mechanisms; 3) a point of exposure; 4) a route of exposure; and 5) a receptor population. An exposure pathway will be considered complete when all five elements of an exposure pathway are documented. An exposure pathway will be eliminated from further evaluation when any one of the five elements has not existed in the past, does not presently exist or will not exist in the future. In addition, if significant indoor air concentrations which may present a risk to human health are detected to be present which may result in an additional route of exposure than those that are anticipated, an air exposure assessment will also be conducted for indoor air quality.

Finally, the identified contaminant fate and transport assessment will require an evaluation of the mechanisms responsible for the transfer of contaminant, an identification of the receptor populations expected to be impacted by exposure to contamination and the likely routes of contact.

monitoring wells, MW-3 through MW-5, will be placed downgradient of the identified source area to monitor impacts to groundwater quality originating from past site activities. One of these wells will be installed directly downgradient of the identified source area immediately adjacent to the facilities property line to determine if any potential plume is migrating off-site. Screen intervals of each monitoring well will depend on results obtained during Phase II. If it is determined based on groundwater probe results that any of the monitoring wells should be set beneath the surface of the water table, the well installation will include a 1-inch piezometer which will straddle the water table for groundwater flow and elevation determination purposes.

In addition, any monitoring wells installed beneath the water table will be fitted with five ft screens for discrete interval sampling. Monitoring wells will be installed using a Hollow Stem Auger (HAS) drill rig in accordance with the specifications outlined in Section 3.0. Groundwater samples will be collected consistent with the analytical parameters utilized during Phase II. In addition, samples will be collected in accordance with all appropriate QA/QC procedures as well as sample tracking methods and shall require a Category B deliverables package.

2.5 Sampling Summary

~~**Table 2** has been included to summarize the groundwater, soil and soil gas sampling schedule. Water samples will be place in containers as follows: VOC's - 40ml glass vials preserved with HCL (7 day holding time), SVOC's – 1 liter amber glass bottles with no preservative (5 days until extraction and 40 days for analysis) and TCL Metals – 500ml plastic bottles preserved with NHO_3 (6 months holding time). All soil samples will be placed in 8 oz glass jars without preservative.~~

2.6 Exposure Assessment

~~To determine what the risk of exposure to the surrounding community an exposure assessment of the site will be conducted. This assessment will review the surrounding property uses, routes of exposure and provide an inventory of public and private groundwater supply wells within 2 miles of the site. The extent and degree of contamination delineated as part of this investigation will be evaluated to determine if routes of exposure to the surrounding population exists. If any supply wells are found within a downgradient plume emanating from the site they will be sampled to determine if they have been impacted by on-site contamination.~~

~~In addition, if significant indoor air concentrations are detected to be present, an air exposure assessment will also be conducted for indoor air quality as a possible pathway of exposure to site related contamination which may present a risk to human health.~~

← See Revised [illegible]

TABLE 2

SAMPLING SCHEDULE

Phase I						
Sample ID	**Sample Location**	**Sample Interval (ft)**	**Probe Interval (ft)**	**Sample Type**	**# of Samples**	**Analytical Parameters**
GP-1	Former Rag/Drum Storage Area (GP-4/MW-4)	4-6	4-6	Soil	1	See Note 1
LP-I	Leach Field	NA	0.0-0.5	Soil	1	See Note 1
LP-K,	North Side	Continuous	0-1	Soil	1	See Note 1
LP-L	North Side	Continuous	0-1	Soil	1	See Note 1
LP-M	North Side	Continuous	0-1	Soil	1	See Note 1
LP-N	North Side	Continuous	0-1	Soil	1	See Note 1
Duplicates	LP-I	NA	0.0-0.5	Soil	1	See Note 1
MS/MSD	LP-I	NA	0.0-0.5	Soil	1	See Note 1
Field Blanks	NA	NA	NA	Water	1	See Note 1
Trip Blanks	NA	NA	NA	NA	1	See Note 1
AS-1	Inside Bld	NA	NA	Air	1	EPA 8260
AS-2	Outside Bld	NA	NA	Air	1	EPA 8260
Phase II						
Sample ID	**Sample Location**	**Sample Interval (ft)**	**Probe Interval (ft)**	**Sample Type**	**# of Samples**	**Analytical Parameters**
LP-I	Leach Field	Continuous	Pool Bottom to Water Table	Soil	3	See Note 2
LP-J	Leach Field	10-12	10-12	Soil	1	See Note 2
GP-1	Former Rag/Drum Storage Area (GP-4/MW-4)	Continuous	Surface to Water Table	Soil	2	See Note 2
GP-2	Former Rag/Drum Storage Area	Continuous	Surface to Water Table	Soil	2	See Note 2
GP-3	Former Rag/Drum Storage Area	Continuous	Surface to Water Table	Soil	2	See Note 2
GP-4	Former Rag/Drum Storage Area	Continuous	Surface to Water Table	Soil	2	See Note 2
GP-5	Former Rag/Drum Storage Area	Continuous	Surface to Water Table	Soil	2	See Note 2
GPGW-3	GW-3	20 ft & WT	20 ft & WT	Soil	2 (See Note 3)	See Note 2
Duplicates	LP-I	NA	NA	Soil	2	See Note 2
MS/MSD	LP-E	NA	NA	Soil	1	See Note 2
Field Blanks	NA	NA	NA	Water	3	See Note 2
Trip Blanks	NA	NA	NA	Water	3	See Note 2

TABLE 2 CON'T

Phase II Con't						
Sample ID	**Sample Location**	**Sample Interval (ft)**	**Probe Interval (ft)**	**Sample Type**	**# of Samples**	**Analytical Parameters**
GW-1	Upgradient	NA	Water Table & 15 ft below	Groundwater	2	See Note 2
GW-2	Upgradient	NA	Water Table & 15 ft below	Groundwater	2	See Note 2
GW-3	Downgradient	NA	Water Table & 15 ft below	Groundwater	2	See Note 2
GW-4	Downgradient	NA	Water Table & 15 ft below	Groundwater	2	See Note 2
GW-5	Downgradient	NA	Water Table & 15 ft below	Groundwater	2	See Note 2
GW-6	Downgradient	NA	Water Table & 15 ft below	Groundwater	2	See Note 2
GW-7	Downgradient	NA	Water Table & 15 ft below	Groundwater	2	See Note 2
GW-8	Downgradient	NA	Water Table & 15 ft below	Groundwater	2	See Note 2
GW-9	Within Plume	NA	Water Table & 15 ft below	Groundwater	2	See Note 2
GW-I	Within LP-1	NA	Water Table & 15 ft below	Groundwater	2	See Note 2
Duplicates	Downgradient	NA	Water Table	Groundwater	3	See Note 2
MS/MSD	Upgradient	NA	Water Table	Groundwater	2	See Note 2
Field Blanks	NA	NA	NA	Water	3	See Note 2
Trip Blanks	NA	NA	NA	Water	3	See Note 2
Phase III						
Sample ID	**Sample Location**	**Sample Interval (ft)**	**Probe Interval (ft)**	**Sample Type**	**# of Samples**	**Analytical Parameters**
MW-1	Upgradient	Water Table or 15	NA	Groundwater	1	See Note 2
MW-2	Upgradient	Water Table or 15	NA	Groundwater	1	See Note 2
MW-3	Plume	Water Table or 15	NA	Groundwater	1	See Note 2
MW-4	Downgradient	Water Table or 15	NA	Groundwater	1	See Note 2
MW-5	Downgradient	Water Table or 15	NA	Groundwater	1	See Note 2
MW-6	Downgradient	Water Table or 15	NA	Groundwater	1	See Note 2
Duplicates	Downgradient	Water Table	NA	Groundwater	1	See Note 2
MS/MSD	Upgradient	Water Table	NA	Groundwater	1	See Note 2
Field Blanks	NA	NA	NA	Water	1	See Note 2
Trip Blanks	NA	NA	NA	Water	1	See Note 2

Notes: 1 – Samples to be analyzed for VOCs (8260), SVOCs (8270) and TAL Metals

2 – Sample parameters will be determined with NYSDEC following receipt of Phase I results.

3 – These samples will only be collected if significant PID reading are detected during PID field screening. NYSDEC will be consulted in field to determine if screening results are significant.

3.0 FIELD SAMPLING PROCEDURES AND PROTOCOLS

3.1 Monitoring Well Installation and Groundwater Sampling Protocol

Monitoring wells will be installed and constructed in compliance with applicable methods for groundwater quality monitoring well installation, as per the description and illustration provided in **Appendix B**.

During sampling, groundwater samples shall be collected from all groundwater monitoring wells within the monitoring well network using conventional well sampling techniques. Prior to sampling, a round of static water levels shall be taken from all monitoring wells. Specific sampling and measurement procedures are presented in the following sections. The groundwater elevation data shall be tabulated.

Three to five well volumes shall be purged with a submersible pump and dedicated polyethylene tubing using low flow methodology. A stainless-steel bailer, on polypropylene monofilament or stainless-steel Teflon-coated wire shall be used to obtain the groundwater samples. Samples shall be collected within three (3) hours of purging. All samples shall be sent to the laboratory for the analyses within 24-hours of sampling.

The following Standard Protocol for Groundwater Sampling has been established to conform to NYSDEC rules and regulations. The standard methods for preparation, collection, and transfer of groundwater samples, as well as record keeping, are detailed within.

After collection of an acceptable sample in accordance with this protocol, the sample will be submitted to a NYSDOH certified laboratory. The preparation, collection, preservation, transfer and record keeping of each sample will be coordinated with the analytical laboratory to ensure reliable test results. Before contracting with a certified laboratory, the appropriate analytical testing QA/QC Protocol will be verified with the laboratory and submitted to the NYSDEC for approval.

3.2 Geoprobe Groundwater Sampling

3.2.1 Definitions

The **Geoprobe** machine is a vehicle-mounted hydraulically-powered soil probing machine that utilizes static force and percussion to advance small diameter sampling tools into the subsurface. This section of the RI workplan will discuss only the groundwater sampling tools.

Screen Point Groundwater Sampler: The assembled screen point sampler is 1.0 inch O.D. by 36 inches in overall length. This sampler employs a 19-inch screen encased in a perforated stainless steel sleeve. A dedicated screen will be used at every groundwater sample interval.

3.2.2 Groundwater Sampler Placement

In this procedure, the assembled Screen Point Sampler threads onto the leading end of a Geoprobe probe rod and is driven into the subsurface using a Geoprobe machine. Additional probe rods are connected in succession to advance the sampler to depth. While the Screen Point Sampler is being driven to the desired sampling depth, it is kept sealed by O-ring connections placed at critical locations on the assembly.

When the desired sampling depth is reached, the sampler is pulled up about 2 feet which disengages the expendable drive point and creates an open borehole from which to sample. The inner core, which consists of a stainless steel wire screen inside of a perforated stainless steel sleeve, is then pushed out into the borehole and water is allowed to enter the sampler and connected probe rods.

In common practice, ground water samples are recovered by pumping or bailing of water collected in the open probe rods. Alternately, tubing from the surface may be connected directly to the sampler screen using a Geoprobe PR (post run) fitting, and samples recovered using a peristaltic pump. The pore size of the screen of this sampler is .0057 inches (0.145 mm). This sampler will allow the user to collect relatively clean water samples in a short time period due to its large surface area. See **Appendix C** for Groundwater Sampler Diagrams.

3.2.3 Basic Operation

The outer appearance of the Screen Point Groundwater Sampler, once it has been assembled properly, looks just like a normal Geoprobe 3-foot probe rod. The bottom is fitted with an expendable drive point, while the top part of the sampler can simply be connected to Geoprobe rods and other accessories. The assembled sampler will be driven by a Geoprobe machine.

At sampling depth, the probe rods attached to the sampler are retracted two feet to allow the sampler screen to be pushed out into the formation.

3.2.4 Decontamination and Preparation of Parts

In order to assemble the water sampler properly and to take accurate and precise water samples, all parts need to be cleaned thoroughly and, if necessary, individually decontaminated prior to their use. For each test run, fresh, decontaminated sampler parts and O-rings will be used.

All parts will be washed with alcanox detergent. All soil adhering to the parts will be removed by steam cleaning. Finally, all parts will be rinsed with clean, contaminant-free water and allowed to dry before they are assembled.

3.2.5 Assembly

A diagram of the unassembled screen point sampler parts is presented in **Appendix C**. Assembly instructions are as follows:

a) Push the screen insert and plug (P/N GW-444), equipped with an O-ring (P/N GW-444R), into the screen sleeves (P/N GW-441), which is the end of the screen sleeves with only one drain hole.

b) Push the screen connector (P/N GW-443), which is fitted with an O-ring (P/N GW-443R), over the top of the screen sleeve and secure with the connector pin. The pin can easily fall out since it is a rather loose fit.

c) Insert the screen connector end of the assembled screen sleeve halfway into the screen point sampler sheath (P/N GW-440) from either end. Again, the screen connector end is inserted first.

d) Slide the drive point seat (O-ring P/N GW-440-1R) over the outstanding end of the screen sleeve and screw it tightly into the sampler sheath.

e) Push the screen sleeve up into the sampler sheath just far enough to fit the expendable drive point (O-ring GW-445R) into the bottom end of the drive point seat.

f) Screw the O-ring end of the water sampler drive head (P/N GW-430B) into the top of the sampler sheath. Make sure all threads are fastened tightly.

3.2.6 Probing

a) Drive the water sampler approximately two-foot below the depth level where you want to sample by simply attaching it to Geoprobe rods.

b) Never drive the water sampler without the O-ring (P/N GW-445R) attached to the drive point. Failure to use this O-ring may result in flowing soils clogging the screen during driving.

3.2.7 Screen Deployment

Once the Screen Point Groundwater Sampler has been driven to the base of the interval desired for sampling, the probe rods are retracted a distance of 2 feet (607 mm) and the screen is pushed out into the formation. The following procedures are employed to deploy the screen:

a) Retract the probe rods, from the ground a distance of 24 inches.

b) Insert Geoprobe stainless steel extension rods (P/N AT-67) down the bore of the probe rods. An extension rod coupler (P/N AT-68) must be placed at the bottom end of the lead extension rod in order to protect the threads at the end of this rod. One extension rod will be required for each probe rod in the ground, plus one extension rod for the screen point sampler itself. Place an extension rod handle (P/N AT-69) at the top of the extension rod string.

c) When the proper number of extension rods have been coupled together and inserted down the bore of the probe rods, the last extension rod will protrude from the top of the probe rods a distance of approximately 24 inches (607 mm).

d) Pushing down on the extension rods should now push the screen out into the formation. When the screen is completely pushed out, the extension rod handle will come to rest at a final position approximately 3 inches (76 mm) above the top of the probe rods.

e) In extreme situations, it may be necessary to tap on the top of the extension rod handle with a hammer in order to force the screen out into the formation.

3.2.8 Sampling, General Considerations

There are two methods for obtaining a sample from the GW-440 series Screen Point Sampler. Groundwater samples can be obtained by bailing or pumping directly from the bore of the probe rods above the screen point. Alternately, a tubing system may be attached directly to the top of the deployed screen and samples pumped to the surface using a peristaltic pump.

3.2.9 Bottom Check Valve Sampling

The most common method employed is to pump directly from the bore of the probe rods immediately above the screen point using a tubing bottom check valve. This method is often referred to as sampling from the open rods, and is essentially the same for bottom check valve sampling as it is for bailing. Note that in order for this method to be employed, the piezometric

head in the saturated formation must be above the top of the deployed screen joint; water from the formation must rise into the probe rods where it can then be pumped to the surface. Sampling is performed as described in the following steps:

a) Either 3/8 inch (9.5 mm) O.D., teflon (P/N TB-30T) or polyethylene (P/N TB-25L) tubing will be used for groundwater sampling. Selection of tubing material will be based on the analytes of interest and the purpose of the groundwater investigation.

b) Place a tubing check valve (P/N GW-42) at the bottom end of a roll of tubing. This bottom check valve will fit either of the tubing types listed above.

c) Push the tubing, check valve end first, down the bore of the probe rods until it strikes the top of the screen point sampler.

d) Lift the tubing approximately 4 inches (102 mm) off the bottom (top of the screen point sampler) and oscillate the tubing up and down in 8 to 12 inches (200 to 300 mm) strokes. In field practice, the tubing is oscillated up and down by hand at a rate of 60 to 100 strokes per minute. This pumping can yield as much as 500 milliliters of sample per minute.

e) Air bubbles appearing in the pumped stream indicate that the pumping action is exceeding recharge from the screen point, allowing air to enter at the check valve end. For most purposes, intermixing of air with the pumped sample is undesirable. The pumping rate should be slowed and balanced with the recharged rate.

f) If water cannot be pumped to the surface, sufficient sample may be obtained by using the tubing and check valve as a bailer. Oscillate the tubing to fill it with several feet of sample and then remove the tubing from the rods.

3.2.10 Sampling Through PRT Tubing

"PRT" (post run tubing) refers to a Geoprobe proprietary system of tubing and fittings that are used both for vapor and groundwater sampling. This tubing is inserted down the rods after the sampler has already been driven to depth and has been deployed for sampling. The top of the screen point sampler screen is equipped with a PRT adapter fitted onto the end of the sample tubing.

In practice, the tubing with PRT adapter at the lower end is inserted down the bore of the probe rods and screwed into the receptacle on the top of the sampler screen. This procedure forms a vacuum tight sample train from the sampler screen to ground surface. Sample is normally pumped to the surface using a peristaltic pump or other vacuum source.

The advantage of this method is that the sample is only placed in contact with the stainless steel sampler screen and the sample tubing. The sample is never exposed to a free surface. The disadvantage of this method is that it is limited to maximum groundwater depths of 20 to 28 feet (6 to 8.5 mm) below ground surface.

Although this sampling method is desirable, it will probably not be possible due to the depth of the groundwater table.

The following procedures are used to obtain groundwater samples using PRT fittings and tubing:

a) Either 3/8 inch (9.5 mm) O.D. teflon (P/N TB-30T) or polyethylene (P/N TB-25L) tubing may be used for groundwater sampling. Selection of tubing material should be based on the analytes of interest and the purpose of the groundwater investigation. Each of these tubings has a corresponding PRT adapter that will be required for this sampling. These adapters are shown in the following table.

Tubing and PRT Adapters

Tubing	Description	PRT Adapter Part Number
TB-30T	3/8 inch (9.5 mm) TFE	PR-30S
TB-25L	3/8 inch (9.5 mm) LDPE	PR-25S

b) Place the barbed end of the appropriate adapter into the selected tubing.

c) Push the adapter end of the tubing down the bore of the probe rods until it comes into contact with the PRT threads at the top of the screen point sampler.

d) Rotate the tubing counter-clockwise at the surface to screw the adapter into the screen point threads. Rotate the tubing several revolutions until the down hole adapter is completely sealed and the tubing starts twisting. In this condition, the tubing will rotate backwards (clockwise) when released.

e) The tubing can now be attached to a peristaltic pump or vacuum source at the surface.

f) After sampling is complete, tubing should be removed by pulling it up at the surface. This will pull the tubing off the barbed end of the tubing adapter and will allow the operator to examine the connection at the top end of the screen point when it is pulled from the ground.

3.2.11 Removal

a) Remove all sampling tubing from the bore of the probe rods.

b) Pull all probe rods fromthe ground using the Geoprobe machine. Care should be taken not to push down on the probe rods during removal.

c) Care should be taken to lift the screen point sampler vertically upward at the surface. Pulling the probe rods or sampler from the ground at any direction other than vertical may result in bending of the screen point sampler.

d) Dismantle the sampler at the surface and examine it for damage. Decontaminate all parts, replace all O-rings, and reassemble the sampler for the next sample.

3.3 Geoprobe Groundwater Sampling Protocol

During sampling, groundwater samples shall be collected from Geoprobe groundwater samplers using the technique discussed in Section 3.2.9. Prior to sampling, the groundwater elevation will be measured. The groundwater elevation data shall then be tabulated.

Three to five sampler volumes shall be purged using the bottom check valve sampling tubing. Samples shall be collected within three (3) hours of purging. All samples shall be sent to the laboratory for the analyses within 24-hours of sampling.

The following Standard Protocol for Groundwater Sampling has been established to conform to NYSDEC rules and regulations. The standard methods for preparation, collection, and transfer of groundwater samples, as well as record keeping, are detailed within. These methods should be followed to provide a representative sample of the critical stratigraphic unit for chemical analysis.

After collection of an acceptable sample in accordance with this protocol, the sample will be submitted to a NYSDOH certified laboratory. The preparation, collection, preservation, transfer and record keeping of each sample will be coordinated with the analytical laboratory to ensure reliable test results. Before contracting with a certified laboratory, the appropriate analytical testing QA/QC Protocol will be verified with the laboratory and submitted to the NYSDEC for approval.

3.4 Pre-Sampling Preparation / Equipment for Monitoring Well Sampling

- Health and safety: The health and safety protocols of the contractor shall conform to typical level D industry standards.
- Authorized personnel: All individuals involved in the sampling will have read this groundwater sampling protocol, be technically qualified, and follow the protocol whenever groundwater samples are obtained.
- Staging: Prior to any sampling event, the following steps will be taken by personnel responsible for sampling.
- Review the sampling procedures.
- Assemble and inspect field equipment necessary for sample collection, verify that equipment is clean and in proper working order.
- Calibrate equipment to manufacturer's specifications.
- Examine shuttles, bottles and preservatives. Contact laboratory immediately if any problems are found.
- Confirm sample delivery time and method of sample shipment with the laboratory.

- Establish a well purging and sampling schedule for the activities of the day. Establish a staging area consisting of plastic sheets.

3.5 Monitoring Well Groundwater Level Measurement Procedures (SOP 1)

- Clean all water-level measuring equipment using appropriate decontamination procedures.
- Remove locking well cap, note weather, time of day, and date, etc. in field notebook, or on an appropriate form.
- Remove well casing cap.
  Measure the static water level in the well with a decontaminated water level indicator which shall be decontaminated with an alconox soap water wash followed by a deionized water rinse between each individual well to prevent cross-contamination. Synoptic round of water level measurements shall all be completed on the same day.
- Measure distance from water surface to reference measuring point on well casing, and record in field notebook.
  NOTE: water level measurement is from either the top of protective steel casing, top of PVC riser pipe, from ground surface, or some other position on the well head.
- Measure total depth of well and record in field notebook or on log form.
- Remove all downhole equipment, replace well casing cap and locking steel caps.
- Calculate elevation of water:

$$Ew = E - D$$

where
Ew = Elevation of Water
E = Elevation at point of measurement
D = Depth to Water

- All water level measurements are to be recorded to the nearest 0.01 foot.
  NOTE: The same procedure may be used to determine the elevation of DNAPL. In addition, handling of coal tar residues if present will be conducted in compliance with the Field Health and Safety Plan (HASP) prepared for this site.

3.6 Procedures for Well Purging and Purge Water Disposal (SOP 2)

Well purging is necessary to obtain a sample which is representative of the hydrogeologic regime and not standing water in the well.

- Identify the well and record the well number on the field data sheet.
- Verify that the well is not damaged.
- Field personnel put on new disposable gloves.
- Carefully remove well cover to avoid entry of foreign material into well.
- Purging the well.
- Three to five casing volumes of standing water will be removed from the well prior to sampling with either a dedicated bailer, or properly decontaminated bailer (stainless steel, Teflon or PVC) or water tubing. That volume can be calculated with the following formula:

$V = r^2 (h) (0.49)$
Where:
V = standing water volume in gallons to be purged
r = inside radius of well in inches
h = linear feet of standing water in the casing (total depth - groundwater or potentiometric level)
(0.49) is correction factor which includes conversion from inches to feet and assumes three well volumes will be purged; or purge until water temperature, conductivity and pH stabilize. If a well purges to dryness and is slow to recharge, only one well volume of water needs to be purged.

- Temperature, specific conductance, pH, turbidity and water level measurements will be measured during purging. At a minimum, the first bail of water or first water pumped will be measured and measurements will be taken after each well volume is purged. When sampling is concluded, another measurement will be taken. Purging will continue until stabilization of readings and a turbidity of 50 NTUs is achieved.
- All purging and sampling equipment must be stored and transported in a manner which minimizes the possibility of accidental contamination.
- Record keeping.
- The sampling team will record the following information regarding the well purging procedure:
- Day / Date / Time
- Weather Conditions
- Air Temperature
- Condition of the well (rusty, bent casing, etc.)
- Person(s) doing the purging
- Groundwater level prior to purging
- Depth to the bottom of the well
- Volume to groundwater to be purged.

Chemical properties of evacuated water:

Temperature, specific conductance and pH.

Physical properties of evacuated water.

Color, odor, turbidity, presence of non-aqueous liquids and Volume of purged water.

Procedures for collection, measurement, and disposal of purged water.

- Purged water from each well shall be placed directly into NYSDEC approved, spillproof, 55 gallon steel drums. Gasketed tops shall be placed on the drums and drawn tight with a steel ring / bolt mechanism. Drums will be stored on-site for subsequent classification and disposal. However, purge water from some locations may be discharged at the site under certain circumstances. Approval of the on-site NYSDEC representative will be sought prior to this disposal option.

3.7 Procedures for the Measurement of Groundwater pH and Temperature (SOP 3)

- Immerse the tip of the electrode in demineralized water.
- Rinse the electrode with demineralized water.
- Immerse the electrode in pH 7 buffer solution.
- Adjust the temperature compensator to the proper temperature.
- Adjust the pH meter to read 7.0.
- Remove the electrode from the buffer and rinse with demineralized water.
- Collect a groundwater sample using either a stainless steel, Teflon or PVC / polyethylene bailer and pour a small amount of this sample into an extra sample jar which shall not be used to store chemically analyzed samples.
- Immerse the electrode into the extra sample jar. Do not immerse the electrode into a sample which shall be chemically analyzed.
- Read and record the pH of the solution, after adjusting the temperature compensator to the sample temperature.
- Rinse the electrodes with demineralized water.
- Keep the electrode immersed in demineralized water when not in use.

All results are to be recorded in the Field Notebook.

3.8 Procedure for the Measurement of Groundwater for Specific Conductance (SOP 4)

- Immerse the electrode in water overnight. If this is not possible due to field conditions, immerse the electrode for at least an hour before use.
- Rinse the cell with one or more portions of the sample to be tested.
- Immerse the electrode in the sample and measure the conductivity.
- Adjust the temperature setting to the sample temperature.
- Record the results in the field notebook.

3.9 Procedures for Monitoring Well Groundwater Sampling (SOP 5)

The following procedure shall be used for monitoring well groundwater sampling.

- Decontaminate bailer and cord (submersible pump, if used). If a submersible pump is used, discard pump discharge line.
- After purging, allow static water level to recover approximate original level.
- Obtain sample from well with either a stainless steel, Teflon or PVC bailer suspended on either a polypropylene monofilament or a stainless-steel, Teflon-coated wire. The maximum time between purging and sampling shall be three (3) hours.
- Collect inorganic samples by pouring directly into pre-preserved sample bottles from bailers.
- Place analytical samples in cooler and chill to 4 degrees C. Samples shall be delivered to the appropriate laboratory within 24 hours.
- Re-lock well cap.
- Fill out field notebook, Well Sample Log Sheet, labels, custody seals and chain of custody forms.

3.10 Soil Gas Survey and Ambient Air Sampling Procedures

3.10.1 Definitions

Geoprobe Soil Probing Machine: A vehicle-mounted, hydraulically powered machine that utilizes static force and percussion to advance a small diameter sampling tool into the subsurface for collecting soil core and soil/waste core samples **(Appendix C)**.

Screen Point Sampler: The assembled screen point sampler is 1.0 inch O.D. by 36 inches in overall length. This sampler employs a 19-inch screen encased in a perforated stainless steel sleeve.

3.10.2 Soil Gas Sampler Placement

In this procedure, the expendable drive point and PRT expendable point holder are placed onto the leading end of a *Geoprobe* probe rod and is driven into the subsurface using a *Geoprobe* machine. Additional probe rods are connected in succession to advance the sampler to depth. While the Screen Point Sampler is being driven to the desired sampling depth, it is kept sealed by O-ring connections placed at critical locations on the assembly. When the desired sampling depth is reached, the sampler is pulled up about 2 feet which disengages the expendable drive point and creates an open borehole from which to sample.

In common practice, soil gas samples are recovered by extracting soil gases through tubing which is connected directly to the PRT expendable point holder using a *Geoprobe* PR (post run) fitting. Samples are recovered using a vacuum pump. See **Appendix C** for Soil Gas Sampler Diagrams.

3.10.3 Basic Operation

The outer appearance of the Screen Point Groundwater Sampler, once it has been assembled properly, looks just like a normal *Geoprobe* 3-foot probe rod. The bottom is fitted with an expendable drive point, while the top part of the sampler can simply be connected to *Geoprobe* rods and other accessories. The assembled sampler will be driven by a *Geoprobe* machine.

At sampling depth, the probe rods attached to the sampler are retracted two feet to allow the sampler screen to be pushed out into the formation.

3.10.4 Decontamination and Preparation of Parts

In order to assemble the sampler properly and to take accurate and precise soil gas samples, all parts need to be cleaned thoroughly and, if necessary, individually decontaminated prior to their use. For each test run, fresh, decontaminated sampler parts and O-rings will be used.

All parts will be washed with Alconox detergent. All soil adhering to the parts will be removed by steam cleaning. Finally, all parts will be rinsed with clean, contaminant-free water and allowed to dry before they are assembled.

3.10.5 Assembly

Appendix C presents a diagram of the unassembled screen point sampler parts. Assembly instructions are as follows:

a) Push the screen insert and plug (P/N GW-444), equipped with an O-ring (P/N GW-444R), into the screen sleeves (P/N GW-441), which is the end of the screen sleeves with only one drain hole.

b) Push the screen connector (P/N GW-443), which is fitted with an O-ring (P/N GW-443R), over the top of the screen sleeve and secure with the connector pin. The pin can easily fall out since it is a rather loose fit.

c) Insert the screen connector end of the assembled screen sleeve halfway into the screen point sampler sheath (P/N GW-440) from either end. Again, the screen connector end is inserted first.

d) Slide the drive point seat (O-ring P/N GW-440-1R) over the outstanding end of the screen sleeve and screw it tightly into the sampler sheath.

e) Push the screen sleeve up into the sampler sheath just far enough to fit the expendable drive point (O-ring GW-445R) into the bottom end of the drive point seat.

f) Screw the O-ring end of the water sampler drive head (P/N GW-430B) into the top of the sampler sheath. Make sure all threads are fastened tightly.

3.10.6 Driving

1) Attach a drive cap to a one-foot probe rod and thread the rod onto the assembled sampler. Position the assembly for driving into the subsurface.

2) Drive the assembly into the subsurface until the drive head on the sample tube is just above the ground surface.

3) Remove the drive cap and one-foot probe rod. Secure the drive head with a 1-1/4 inch open end, adjustable wrench or a Micro-Core combination wrench, and re-tighten the stop-pin with a 3/8 inch open end wrench.

4) Attach the drive cap to a two-foot probe rod and continue driving the sampler into the ground. Attach three or four foot probe rods in succession until the leading end of the sampler reaches the top of the desired sampling interval.

3.10.7 Probing

a) Drive the sampler approximately two-foot below the depth level where you want to sample by simply attaching it to *Geoprobe* rods.

b) Never drive the sampler without the O-ring (P/N GW-445R) attached to the drive point. Failure to use this O-ring may result in flowing soils clogging the screen during driving.

3.10.8 Geoprobe Soil Gas Sample Retrieval

Sampling will be conducted through post run tubing (PRT) which refers to a *Geoprobe* proprietary system of tubing and fittings that are used both for vapor and groundwater sampling. This tubing is inserted down the rods after the sampler has already been driven to depth and has been deployed for sampling. The top of the screen point sampler screen is equipped with a PRT adapter fitted onto the end of the sample tubing.

In practice, the tubing with PRT adapter at the lower end is inserted down the bore of the probe rods and screwed into the receptacle on the top of the sampler screen. This procedure forms a vacuum tight sample train from the sampler screen to ground surface. Sample is normally pumped to the surface using a peristaltic pump or other vacuum source.

The advantage of this method is that the sample is only placed in contact with the stainless steel sampler screen and the sample tubing. The sample is never exposed to a free surface.

The following procedures are used to obtain soil gas samples using PRT fittings and tubing:

a) Either 3/8 inch (9.5 mm) O.D. Teflon (P/N TB-30T) or polyethylene (P/N TB-25L) tubing may be used for groundwater sampling. Selection of tubing material should be based on the analytes of interest and the purpose of the groundwater investigation. Each of these tubings has a corresponding PRT adapter that will be required for this sampling. These adapters are shown in the following table.

Tubing and PRT Adapters

Tubing	Description	PRT Adapter Part Number
TB-30T	3/8 inch (9.5 mm) TFE	PR-30S
TB-25L	3/8 inch (9.5 mm) LDPE	PR-25S

b) Place the barbed end of the appropriate adapter into the selected tubing.

c) Push the adapter end of the tubing down the bore of the probe rods until it comes into contact with the PRT threads at the top of the screen point sampler.

d) Rotate the tubing counter-clockwise at the surface to screw the adapter into the screen point threads. Rotate the tubing several revolutions until the down hole adapter is completely sealed and the tubing starts twisting. In this condition, the tubing will rotate backwards (clockwise) when released.

e) The tubing can now be attached to the PID to screen potential soil gases for volatile organic content.

f) Insert the probe end of the PID into the PRT and record the digital display reading.

g) Prior to retrieval of a sample one volume of static air within the PRT sample train will be removed to ensure a representative collection of subsurface gases. To determine the volume of air to be removed, the length of the PRT will be multiplied by 0.0096 This represents the volume of air in liters contained within a 1-foot length of 3/8" OD, 1/4" ID PRT and is calculated through the following formula:

$V=\Pi\,(r^2)\,(h)\,(0.016387)$
Where:
V = volume of air in sample train in liters
Π = 3.14 (pie)
r = radius of tube
h = length of tube
0.016387 = conversion factor from cubic inches to liters

The volume of air will be purged utilizing the PID pump until one volume of air has been removed from the sample train. Typically the PID pump draws at a rate of 0.4 liters per minute.

h) Following PID screening and at selected locations the tubing can be attached to a vacuum pump to retrieve soil gases for laboratory analysis. The output end of the vacuum pump is attached to a NIOSH charcoal cylinder which is inflated with gases retrieved from the subsurface.

i) After sampling is complete, tubing should be removed by pulling it up at the surface. This will pull the tubing off the barbed end of the tubing adapter and will allow the operator to examine the connection at the top end of the screen point when it is pulled from the ground.

3.10.9 Removal

a) Remove all sampling tubing from the bore of the probe rods.

b) Pull all probe rods from the ground using the *Geoprobe* machine. Care should be taken not to push down on the probe rods during removal.

c) Dismantle the sampler at the surface and examine it for damage. Decontaminate all parts, replace all O-rings, and reassemble the sampler for the next sample.

3.10.10 Indoor/Outdoor Air Sampling

Samples will be collected utilizing an SKC low volume personal air pump set at a rate of 0.20 liters per minute. The air sample will be drawn through a sorbent collection tube containing a coconut shell charcoal filter apparatus set approximately 18 inches from the concrete slab floor. Sampling will be conducted for one hour resulting which will result in a total draw of approximately 12 liters of air through the collection tube.

3.11 Procedures for Sampling Soils/Waste

3.11.1 Objective

The objective of this procedure is to collect discrete soil/waste samples at prescribed depths and recover them for visual inspection and/or chemical analysis.

3.11.2 Definitions

Geoprobe* Soil Probing Machine: A vehicle-mounted, hydraulically-powered machine that utilizes static force and percussion to advance small diameter sampling tools into the subsurface for collecting soil core and soil/waste core samples.

*Geoprobe is a registered trademark of Kejr Engineering Inc., Salina, Kansas.

Large Bore Soil Sampler: A 24-inch long x 1-1/2 inch (610 mm x 38 mm) diameter soil sampler capable of recovering a discrete sample that measures up to 320 ml in volume in the form of a 22-inch x 1-1/16 inch (559 mm x 27 mm) core contained inside a removable liner.

Liner: A 24-inch long x 1-1/8 inch diameter (610 mm x 29 mm) removable/replaceable, thin walled tube inserted inside the Large Bore Sample Tube for the purpose of containing and storing soil samples. Liner materials include brass, stainless steel, teflon, and clear plastic (cellulose acetate butyrate).

3.11.3 Discussion

The Large Bore (LB) Soil Sampler is used primarily as a discrete interval sampler, that is, for the recovery of a sample at a prescribed depth. In certain circumstances, it is also used for continuous coring.

The assembled Large Bore Sampler is connected to the leading end of a Geoprobe brand probe rod and driven into the subsurface using a Geoprobe Soil Probing Machine. Additional probe rods are connected in succession to advance the sampler to depth. The sampler remains sealed (closed) by a piston tip as it is being driven. The piston is held in place by a reverse-threaded stop-pin at the trailing end of the sampler. When the sampler tip has reached the top of the desired sampling interval, a series of extension rods, sufficient to reach depth, are coupled together and lowered down the inside diameter of the probe rods. The extension rods are then rotated clockwise (using a handle). The male threads on the leading end of the extension rods and stop-pin have been removed; the tool string is advanced an additional 24 inches. The piston is displaced inside the sampler body by the soil as the sample is cut. To recover the sample, the sampler is retrieved from the hole and the liner containing the soil sample is removed. The operation is illustrated in Figure 20.

3.11.4 Decontamination

Before and after each use, thoroughly clean all parts of the soil sampling system by steam cleaning, Alconox wash, pesticide grade methanol wash and deionized/distilled water rinse followed by air drying as per project requirements. A clean, new liner will be used for each use. Parts should also be inspected for wear or damage at this time.

3.11.5 Assembly

1) Install a new AT-63R O-Ring into the O-Ring groove on the stop-pin.

2) Seat the pre-flared end of the LB liner over the interior end of the cutting shoe. It should fit snugly.

3) Insert the liner into either end of the sample tube and screw the cutting shoe and liner into place. If excessive resistance is encountered during this task, it may be necessary to use the LB shoe wrench. Place the wrench on the ground and position the sampler assembly with the shoe end down so that the recessed notch on the cutting shoe aligns with the pin in the socket of the wrench. Push down on the sample tube while turning it until the cutting shoe is threaded tightly into place.

4) Screw the piston rod into the piston tip. Insert the piston tip and rod into the sample tube from the end opposite the cutting shoe. Push and rotate the rod until the tip is seated completely into the cutting shoe.

5) Screw the drive head onto the top end of the sample tube, aligning the piston rod through the center bore.

6) Screw the reverse-threaded stop-pin into the top of the drive head and turn it counterclockwise with a 3/8 inch wrench until securely tightened. Hold the drive head in place with a 1-1/4 inch or adjustable wrench while completing this task to assure that the drive head stays completely seated The Macro-Core Combination Wrench will also fit the drive head for 1.25 inch probe rods. The assembly is now complete.

3.11.6 Pilot Hole

A pilot hole is appropriate when the surface to be penetrated contains gravel, asphalt, hard sands, or rubble. Pre-probing will prevent unnecessary wear on the sampling tools. A Large Bore Pre-Probe may be used for this purpose. The pilot hole should be made only to a depth above the sampling interval. Where surface pavements are present, a hole may be drilled with the Geoprobe Soil Probing Machine using a drill steel (AT-3255, AT-3536 or AT-3548 depending upon the thickness of the pavement), tipped with a 1.5 inch diameter carbide drill bit (AT-36) prior to probing.

3.11.7 Driving

1) Attach a drive cap to a one-foot probe rod and thread the rod onto the assembled sampler. Position the assembly for driving into the subsurface.

2) Drive the assembly into the subsurface until the drive head on the sample tube is just above the ground surface.

3) Remove the drive cap and one-foot probe rod. Secure the drive head with a 1-1/4 inch open end, adjustable wrench or a Micro-Core combination wrench, and re-tighten the stop-pin with a 3/8 inch open end wrench.

4) Attach the drive cap to a two-foot probe rod and continue driving the sampler into the ground. Attach three or four foot probe rods in succession until the leading end of the sampler reaches the top of the desired sampling interval.

3.11.8 Preparing to Sample

1) When sampling depth has been reached, position the Geoprobe machine away from the top of the probe rod to allow room to work.

2) Insert an extension rod down the inside diameter of the probe rods. Hold onto it and place an extension rod coupler or Quick Link extension rod connectors on the top threads of the extension rod (the downhole end of the leading extension rod should remain uncovered). Attach another extension rod to the coupler and lower the jointed rods down hole. An extension rod jig may be used to help hold the rods during Steps 2 and 3.

3) Couple additional extension rods together in the same fashion as in Step 2. The leading extension rod must reach the stop-pin at the top f the sampler assembly. When coupling extension rods together, you may opt to use the extension rod jig hold the downhole extension rods while adding additional rods.
4) When the leading extension rod has reached the stop-pin down hole, attach the extension rod handle to the top extension rod.

5) Turn the handle clockwise until the top-pin detaches from the threads on the drive head. Pull up lightly on the extension rods during this procedure to check thread engagement.

6) Remove the extension rods and uncouple the sections as each joint is pulled from the hole. The extension rod jig my be used to hold the rod couplers in place as the top extension rods are removed.

7) The stop-pin should be attached to the bottom of the last extension rod upon removal. Inspect it for damage. Once the stop-pin has been removed, the sampler is ready to be driven to collect a sample

3.11.9 Sample Collection

1) Reposition the Geoprobe machine over the probe rods, adding an additional probe rod to the tool string if necessary. Make a mark on the probe rod 24 inches above the ground surface (this is the distance the tool string will be advanced).

2) Attach a drive cap to the probe rod and drive the tool string and sampler another 24 inches. Actuate the hammer function during sample collection to increase sample recovery. Do not over-drive the sampler.

3.11.10 Retrieval

1) Remove the drive cap from the top probe rod and attach a pull cap. Lower the hammer assembly and close the hammer latch over the pull cap.

2) With the machine foot firmly on the ground, pull the tool string out of the hole. Stop when the top (drive head) of the sampler is about 12 inches above the ground surface.

3) Because the piston tip and rod have been displaced inside the sample tube, the piston rod now extends into the two-foot probe rod section. In loose soils, the two-foot probe rod and sampler may be recovered as one piece by using the Foot Control on the probe machine to lift the sampler the remaining distance out of the hole.

4) If excessive resistance is encountered while attempting to lift the sampler and probe rod out of the hole using the Foot Control, unscrew the drive head from the sampler and remove it with the probe rod, the piston rod, and the piston tip. Replace the drive head onto the sampler and attach a pull cap to it. Lower the hammer assembly and close the hammer latch over the pull cap and pull the sampler the remaining distance out of the hole with the probe machine foot firmly on the ground.

3.11.11 Sample Recovery

1) Detach the two-foot probe rod it has not been done previously.

2) Unscrew the cutting shoe using the LB Cutting Shoe Wrench, if necessary. Pull the cutting shoe out with the liner attached. If the liner doesn't slide out readily with the cutting shoe, take off the drive head and push down on the side wall of the liner. The liner and sample should slide out easily.

3.11.12 Core Liner Capping

1) The ends of the liners can be capped off using the vinyl end caps for further storage or transportation. A black end cap should be used at the bottom (down end) of the sample core and a red end cap at the top (up end) of the core.

2) On brass, stainless steel, and teflon liners, cover the end of the sample tube with AT-640T teflon tape before placing the end caps on the liner. The tape should be smoothed out and pressed over the end of the soil core so as to minimize headspace. However, care should be taken not to stretch and therefore thin the teflon tape.

3.11.13 Sample Removal

1) Large Bore clear plastic liners and teflon liners can be slit open easily with a hooked-blade utility knife for the samples to be analyzed or placed in appropriate containers.

2) Large Bore brass and stainless steel liners come with plastic cladding on the outside of the liner to keep four 6-inch sections aligned. Remove the cladding and cut the sections apart with a knife. The Large Bore Manual Extruder may be used to push to soil cores out of the liner sections for analysis or for transfer to other containers.

3.12 Procedures for Field Screening of Volatile Organic Compounds (SOP 6)

Once the target depth at the soil gas point has been reached the following procedures will be conducted to retrieve soil gases for screening:

- Calibrate with 100 parts per million (ppm) isobutelene gas to ensure proper operation.
- Calibrate to background conditions so to eliminate interference from the surrounding ambient air. The calibration procedures are outlined in the operations manual for the instrument.
- Insert PID probe into PRT tubing.
- Record reading from instrument digital display.

3.13 Field Procedures Documentation

Data reporting practices will be followed carefully and data entries will be validated regularly to insure that raw data are accurate and that an audit trail is developed for those data that require reduction. All the field data, such as that generated during field measurements, observations and field instrument calibrations, will be entered directly into a bound field notebook.

One or more bound books will be maintained for the site: each book will be consecutively numbered. The book(s) will remain with the main project files. Copies will be made for the Project Manager and for the person who made the entries, if requested.

All entries in the log book will be made in ink. When a mistake is made in the log, it will be crossed out with a single ink line and will be initialed and dated.

Special care will be taken in the description and documentation of sampling procedures. Sampling information to be documented in the field notebook and/or associated forms are as follows:

- Weather conditions.
- Sample number
- Date and time of sample collection
- Source of sample (monitoring well or *Geoprobe* sampling tool)

- Purged well-type of equipment, purge volume, rate of purge and decontamination procedures
- Location of sample - document with a site sketch and/or written description of the sampling location so that an accurate re-sampling can be conducted if necessary
- Sampling equipment (i.e., bailer, Teflon tube)
- Analysis and QA/QC required
- Field instrument calibration including date if calibration standards used and their source, results of calibration and any corrective action taken
- Field data (pH, temperature, conductivity, etc.)
- Field observation - all significant observation will be documented
- Sample condition (color, odor, turbidity, oil, sheen, etc.)
- Site conditions
- Sample shipping procedure, date time, destination and if legal seals were attached to transport container(s)
- Comments - any observation or event that occurred that would be relevant to the site; for example, weather changes and effect on sampling.

3.14 Corrective Action

If, during the course of sampling, it is determined that field procedures are yielding unrepresentative samples, (SAP) or field procedures modifications may be necessary. In this event, a proposal will be submitted to the DEC for approval before such modifications are made. SAP or field procedure modifications will not be implemented until approval is clearly conveyed by the DEC for such modifications.

4.0 GROUNDWATER/SOIL SAMPLING AND ANALYSIS PLAN (SAP)

4.1 Data Quality Objectives (DQO's)

The data quality objectives for the groundwater / soil SAP are to assure that the data collected and reported is of documented values and to utilize groundwater/soil quality data to ascertain and define any observed impacts of any on-site or off-site activities that may have had an impact upon groundwater quality. The objective of the SAP is to assess and document that all data collected, stored and reported is scientifically valid, defensible and within accepted standards for precision, accuracy and consistency. Additionally, the SAP will catalog that all data collection, storage and reporting was performed in accordance with all state and federal regulations. The laboratory analyses shall be performed by a laboratory currently certified by the New York State Department of Health's Environmental Laboratory Approval Program (ELAP).

The applicable regulatory programs and standards include the following:

- Technical Administrative Guidance Manual 4046 (TAGM 4046)
- Technical Operating Guidance Series TOGS 1.1.1 Groundwater Quality Standards and Limitations.

4.2 Quality Assurance Objectives

4.2.1 Overall Program Objectives

Groundwater

The monitoring, sampling and analytical program to be implemented will ensure that groundwater quality within the site has been adequately characterized and maintained. Analytical results of the groundwater monitoring program will be utilized to ascertain and monitor changes in water quality immediately up gradient, beneath and immediately down gradient of the site. The primary objectives of the ground water level measurements from existing and proposed monitoring wells will be to: 1) obtain depth to water measurements from all on-site monitoring wells; 2) calculate groundwater elevations and 3) construct groundwater table and potentiometric contour maps to monitor groundwater flow rate and direction.

Soil

The overall program objectives for soil/waste sampling are to:

1) Characterize residual contamination from past actions.
2) Evaluate possible areas which may still be acting as a continued source of groundwater contamination.
3) Assess the potential for future biological contact with hazardous wastes.

Soil Gas

The objectives of soil gas screening and sample collection are to:

1) Determine the presence of subsurface soil gases
2) If present, determine the extent of soil gases
3) Collect soil gas samples from selected screening points to confirm PID screening results.

Since these samples will only be collected to confirm the results of PID screening they will not be subject to the same QA/QC criteria as groundwater and soil samples. As a result no MS/MSD, duplicate or field blank samples will be collected for soil gas samples.

4.2.2 Field Sampling Objectives

The overall program objective of field sampling is to establish standard operating practices which will be consistently followed in order to minimize potential impacts to data quality over time. Sampling procedures that are consistently implemented improve the long term accuracy of data. To achieve this data quality objective, collection and handling of samples will be conducted in accordance with this document.

4.2.3 Laboratory Data Quality Objectives

The laboratory data quality objectives will focus on precision, accuracy, representativeness, comparability and completeness (PARCC). The laboratory performing analytical work will do such work in accordance with established protocols and analytic quality assurance/analytic quality control (AQA/AQC). The laboratory will be NYSDOH ELAP CLP certified and will follow the NYSDEC ASP QA/QC procedures.

Precision

The laboratory objective for precision is to equal or exceed the precision demonstrated by the respective analytical methods on similar samples. Precision measures the reproducibility of measurements under a given set of conditions; it is the agreement among a set of replicable measurements. Precision will be measured in the laboratory by the analysis of duplicate sample analysis. For the routine quarterly groundwater monitoring events, the laboratory will be required to perform these analyses at a frequency specified in USEPA SW-846 Test methods for Evaluating Solid Waste, Physical/ Chemical Methods, 3rd Edition. Typically, these analyses will be performed for every twenty (20) samples.

For baseline monitoring events, a site specific duplicate sample will be collected and submitted to the laboratory for analysis.

For organic analyses, precision will be measured by the laboratory as a function of relative percent difference (RPD).

RPD =
D1 = The first sample value
D2 = The second sample value

$$D2 - D1/D1 = RPD$$

A control limit for laboratory precision as a function of RPD of 20% shall be used for sample values greater than ten times the instrument detection limit.

The overall precision of measurement data is a mix of sampling and analytical factors. Analytical precision is much easier to control and quantify than sampling precision, considering that there are more historical data related to individual analytical method precision and sampling precision is unique to each site. Overall system precision will be determined by collecting field duplicate samples and will be expressed as the RPD between the first sample (original) and the second sample (duplicate). Field duplicates will be "blind" to the laboratory.

Precision for measurements performed in the field (pH, specific conductance, temperature, redox, turbidity, dissolved oxygen, water level measurements and well total depth measurements) will be performed by taking a replicate measurement every fifth sample. An RPD control limit of 20% will be used for these measurements.

Accuracy

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the respective analytical method based on the analysis of samples of a similar matrix. Accuracy is a measure of the closeness of agreement between an observed value and an accepted reference value. Laboratory accuracy will be measured as a function of percent recovery.

Percent (%) Recovery = $(R/S)*100$

Where:

R = Reported or detected concentration
S = Known concentration

The laboratory will evaluate the accuracy of inorganic (spike sample analysis) and inorganic (matrix spike analysis) through the analysis of matrix spike samples at a frequency of every twenty samples and laboratory control samples (LCS) for every batch. For the baseline (annual) monitoring event, a site specific matrix spike sample will be used for inorganic compound analysis.

Atomic absorption (AA) analysis and wet chemical analyses will include a laboratory batch matrix spike every twenty samples of analytical batch, whichever is more frequent, and a calibration check standard every ten samples. The control limit for the ICP and GFAA calibration check samples will be a percent recovery f ±10% (LCS percent recovery will be between 90 and 110). The control limit for the wet chemical calibration check samples will be a percent recovery of ±20% (LCS percent recovery will be between 80 and 120). The spike sample analysis control limit percent recovery will be ±25% (matrix spike percent recovery for all analyses will be between 75 and 125).

Matrix spike and surrogate quality control limits (if necessary) are calculated following the procedure described in the following test. The matrix spike and surrogate quality control limits will be used by the laboratory will be presented with all sample analysis reports submitted to the NYSDEC by the selected laboratory. The laboratory and its QC reports must be approved by the Department prior to performing any work for the SAP.

After the analysis of at least five spikes samples (of the same matrix type) the average percent recovery (p) and the standard deviation of the percent recovery (Sp) is calculated. The accuracy assessment is expressed as a percent recovery interval from *p - 2 Sp to p + 2Sp.* The accuracy assessment for each analyte is updated on a regular basis.

Accuracy is also a function of proper instrument calibration. The QA/QC criteria for the initial and continuing calibration procedures followed by the laboratory will be provided when a laboratory has been selected. The laboratory and its QA/QC procedures must be approved by the Department prior to performing any work for the SAP.

Representativeness

Representativeness refers to the degree to which the data collected accurately reflect the medium being sampled. It is a qualitative parameter which most concerned with the proper design of the sampling program in terms of location, numbers of samples and collection procedures. The field sampling procedures are presented in Section 7.0 of the SAP. The selected sampling locations and frequency of sampling are also present in the SAP. Together, they will ensure that samples are collected in a manner such that the data are representative of the groundwater, and soil, in the vicinity of the site.

Comparability

The objective of comparability is to ensure that the analytical data are of comparable quality, both between sample locations and with data from previous sampling/analytical events at the site.

The analysis of groundwater and soil samples will follow NYSDEC ASP Contract Required Quantification Limits (CRQL) methods. Standard sampling methods that will be used in the collection of environmental samples and data are presented in Section 5.0, herein.

Completeness

The goal of completeness will be to generate the maximum amount of data that is usable in evaluating environmental conditions at the site. The data validation and usability procedures detailed in Section 8.0 herein, will determine the usability of the data. If any data are determined unusable, and the data are determined critical to evaluating site conditions, resampling and analysis of the questionable data point(s) may be required.

4.3 Groundwater Data Quality Objectives

The groundwater data quality objectives will focus both on-site and off-site monitoring for Contract Required Quantification Limits for the site.

4.3.1 Data Quality Objective

CRQL Analysis

All groundwater samples which have been selected will be analyzed for contract required quantification limits (NYSDEC ASP methods for category B deliverables, inorganic (metals) parameters.

4.4 Soil Data Quality Objectives

The soil data quality objectives will focus on both on-site and off-site monitoring for Contract Required Quantification Limits.

4.4.1 Data Quality Objective

All soil samples which have been selected for analysis will be analyzed for Contract Required Quantification Limits.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

This section describes the QA/QC requirements for groundwater sampling at the site.

5.1 QA/QC Definitions

The following definitions are included for terms which are used in the SAP for laboratory procedures:

Accuracy: the degree of agreement of a measurement with an accepted reference value. Accuracy is generally reported as a percent recovery, and calculated as:

(Measure Value / Accepted Value) x 100

Analyte: the chemical or property for which a sample is analyzed.

Comparability: the expression of information in units and terms consistent with reporting conventions the collection of data by equivalent means; or the generation of data by the same analytical method. Aqueous samples shall be reported at mg/l solid samples shall be reported in units of mg/kg, dry weight.

Completeness: the percentage of valid data obtained relative to that which would be expected to be obtained under normal conditions. Data is judged valid if it meets the stated precision and accuracy goals.

Duplicate: two separate samples taken from the same source by the same person at essentially the same time and under the same conditions which are placed into separate containers for independent analysis. Duplicate samples are intended to assess the effectiveness of equipment decontamination, the precision of sampling efforts of ambient environmental conditions on sensitive analyses (e.g. volatile organics analysis or VOA), and the potential for contaminants attributable to reagents in decontamination fluids, identifying such potential sources or error is essential to the success of the sampling program and the validity of the environmental data. Each QC sample is described below. As a minimum, each set of ten or fewer field samples should include a trip blank, a duplicate and one sample collected in a sufficient volume to allow the laboratory to perform a matrix spike.

Episode: a continuous period of time during which sampling activities are undertaken. Cessation of activities for more than 48 hours terminates the episode.

Field Blanks: field blanks are the final analyte-free water rinse from equipment decontamination in the field and are collected at least once during a sampling episode. If analytes pertinent to the project are found in the field blank, the results from the blanks will be used to qualify the levels of analytes in the samples. This qualification is made during the validation. The field blank is analyzed for the same analytes as the sample that has been collected with that equipment.

Precision: a measure of the agreement among individual measurements of the sample property under prescribed similar conditions. Precision is generally reported as Relative Standard Deviation (RSD) or Relative Percent Difference (RPD). Relative standard deviation is used when three or more measurements are available and is calculated as:
RSD = (Standard Deviation / Arithmetic Mean) * 100

Relative Percent Difference is used for duplicate measurements and is calculated as:
RPD = [(Value 1 - Value 2)/Arithmetic Mean) * 100

Quality Assurance (QA): all means taken in the field and inside the laboratory to make certain that all procedures and protocols use the same calibration and standardization procedures for reporting results; also, a program which integrates the quality of planning, quality assessment, and quality improvement activities within an organization.

Quality Control (QC): all the means taken by an analyst to ensure that the total measurement system is calibrated correctly. It is achieved by using reference standards, duplicates, replicates, and sample spikes. Also, the routine application of procedures designed to ensure that the data produced achieved known limits of precision and accuracy.

Replicate: two aliquots taken from the same sample container and analyzed separately. Where replicates are impossible, as with volatile organics, duplicates must be taken.

5.2 Field Instrument Calibration and Preventative Maintenance

The field engineer or hydrogeologist shall be responsible for keeping a master instrument calibration/maintenance form for each measuring device. Calibration procedures shall be performed in accordance with each manufacturer's recommended procedures. Each form shall include at least the following information, where applicable.

- Name of device/or instrument calibrated;
- Device/instrument serial and/or I.D. number;
- Frequency of calibration;
- Date of calibration;
- Results of calibration;
- Name of person performing the calibration;
- Identification of the calibration standards, and
- Buffer solutions (pH meter only)

5.3 QA/QC Sample Collection

General guidance and the specific requirements regarding the collection of QA/QC samples are presented separately below.

5.3.1 Field Blanks (SOP 7)

Field blanks shall be taken to evaluate the cleanliness of groundwater sampling equipment, sample bottles and the potential for cross-contamination of samples due to airborne contaminants present in the air at the site and handling of equipment and sample bottles. Field blank samples shall be performed on the groundwater sample bailers and any filtering equipment. The frequency of field blanks taken shall be three (3) for the first week of field work (one each on Monday, Wednesday and Friday) and two (2) for the 01second week of sampling (on each on Tuesday and Thursday), as per NYSDEC Division of Environmental Remediation Quality Assurance Group.

Where required, field blanks shall be obtained prior to the occurrence of any analytical field sampling event by pouring deionized or potable water over a particular piece of sampling equipment and into a sample container. The analytical laboratory shall provide filled blank water and sample jars with preservatives for collection of all field blanks. Glass jars shall be used for organic blanks, and polypropylene jars shall be used for inorganic blanks. The field blanks as well as the trip blanks shall accompany field personnel to the sampling location. The field blanks shall be analyzed in accordance with the parameters selected for the groundwater samples (i.e. baseline or expanded) and shall be shipped with the samples taken subsequently that day.

Field blanks shall be taken in accordance with the procedure described below:

- Decontaminate sampler using the procedures specified in this plan.
- Pour distilled/deionized water over the sampling equipment and collect the rinsate water in the appropriate sample bottles.
- The sample shall be immediately placed in a sample cooler and maintained at a temperature of 4°C until receipt by the laboratory.
- Fill out sample log, labels and chain of custody forms, and record in notebook.

5.3.2 Duplicate Samples

Duplicate samples shall be analyzed to check laboratory reproducibility of analytical data. At least 5% of the total number of collected samples shall be duplicated to evaluate the precision of the method used. Field duplicates will be "blind" to the laboratory.

5.3.3 Sample Preservation

If acidification of the volatile samples causes effervescence, the sample should be submitted without acid preservation (cooling to 4°C only). The occurrence of the effervescence must be appropriately noted on each sample label prior to shipment.

- Immediately following collection of the samples, they shall be placed in a cooler with freezer packs in order to maintain sample integrity. Any preservatives required will be added by the analytical laboratory. It is desirable to have preservatives placed in the bottles by the laboratory prior to the sampling event. This will save time in the field and increase overall QA/QC for the event. All volatile sample bottles to be filled to capacity with no head space for volatilization. If necessary, to meet the maximum recommended holding time, the samples are to be shipped by overnight couriers to the laboratory.
- The shipping contained used will be designed to prevent breakage, spills and contamination of the samples. Tight packing material is to be provided around each sample container and any voids around the freezer packs. The container is to be securely sealed, clearly labeled and accompanied by a chain-of-custody record. Separate shipping containers should be used for “clean” samples and samples suspected of being heavily contaminated. During winter months, care should be taken to prevent samples from freezing. Sample bottles will not be placed directly on freezer packs.

5.3.4 Sample Holding Times

- Samples must be received by the laboratory within 48-hours of sampling.
- The samples must be stored at or near 4°C and analyzed within applicable holding times.
- The laboratory must conform with the NYSDEC Analytical Services Protocol (1995 Revision).

5.4 Decontamination of Sampling Equipment (SOP 8)

As presented below, all field sampling equipment shall be decontaminated prior to use and/or between sampling locations.

The submersible sample pumps that are placed in the monitoring well shall be decontaminated with an Alconox detergent rinse and by pumping approximately twenty gallons of potable water through the pump. Since dedicated new lengths of polyethylene tubing shall be used for sampling each well, the tubing shall not be decontaminated. Unless otherwise specified, the submersible pumps, the pump’s electrical wire, and the pump’s safety wire shall be decontaminated prior to the sampling of the first well and between each subsequent well as follows:

- Potable water rinse
- Alconox detergent and potable water scrub

- Potable water rinse
- Distilled/deionized water rinse
- Wrap pump in aluminum foil, shiny side facing out

In lieu of safety wire, a new length of polypropylene safety rope may be utilized for the submersible pump between well locations.

Unless otherwise specified, all non-detect sampling equipment utilized to obtain groundwater environmental samples for chemical analyses (either stainless steel, Teflon, or PVC/polyethylene disposable bailers) shall be decontaminated between sampling points as follows:

- Potable water rinse
- Alconox detergent and potable water scrub
- Potable water rinse
- Ultra pure grade 10% nitric acid rinse
- Distilled/deionized water rinse
- Pesticide grade methanol (diluted with distilled/deionized water) rinse
- Distilled/deionized water rinse
- Air dry
- Wrap over with aluminum foil shiny side face out

The rinse water utilized to clean and rinse the sampling equipment will be disposed of into the on-site storm drains, pursuant to approval from the SCDHS.

6.0 SAMPLE TRACKING SYSTEM

In order to provide for proper identification in the field, and proper tracking in the laboratory, all samples must be labeled clear and in a consistent fashion using the procedures and protocols described below and with the following subsections.

- Sample labels will be waterproof and have a pre-assigned, unique number that is indelible.
- Field personnel must maintain a field notebook. This notebook must be water resistant with sequentially numbered pages. Field activities shall be sequentially recorded at a later time.
- The notebook, along with the chain of custody form, must contain sufficient information to allow reconstruction of the sample collection and handling procedure at a later time.
- Each sample shall have a corresponding notebook entry which includes:
    Sample ID number
    Well location and number
    Date and time
    Analysis for which sample was collected
    Additional comments as necessary
    Samplers name
- Each sample must have a corresponding notebook entry on a chain of custody form.
- The manifest entry for sampling at any one well is to be completed before sampling is initiated by the same sampling team at any other well.
- In cases where the samples leave the immediate control of the sampling team the shipping must be sealed.

6.1 Sample Identification System

Each sample collected shall be designated by an alpha numeric code that shall identify the type of sampling location, the specific location, the matrix sampled, an a specific sample designation. Site specific procedures are described below.

Sample identifications shall contain a sequential code consisting of three segments. The first segment shall designate the proper NP&V project number. The second segment shall identify the location type and specific sample location. Location types shall be identified by a two letter code, for example: MW for monitoring well, GP for Geoprobe, etc. The specific sampling location shall be identified using a three digit number.

The third segment shall identify the matrix type and sample designation or identifier which identifies the sample depth, the sample event number, or other designation depending on the sample type. The matrix type shall be designated by a two letter code, for example: GW for groundwater. The sample identifier shall be represented by a two digit numeric code. Sampling events or rounds, such as for groundwater sampling shall be numbered in sequence beginning with "01" which corresponds to the round of sampling.

The following shall be a general guide for sample identification:

First Segment	**Second Segment**	**Third Segment**
Project #	Location Type and Location Number/Letter Designation	Matrix Type Identifier Sample Round and Depth
95115	MW01	GW0120

Notes:

Project #	Location Type	Sample Round	Matrix Type
95115	MW = Monitoring Well	Phase I = 01	S = Soil
	FB = Field Blank	Phase II = 02	GW = Groundwater
	TB = Trip Blank	Phase III = 03	A = Air
	PW = Potable Water		
	GP = *Geoprobe*		
	SG = Soil Gas		
	DP = Deep Probe		
	AS = Air Sample		

An example illustrating the above identification scheme is presented as follows:

A groundwater sample collected from monitoring well #1 during the first round where the depth to water is 20 ft below ground surface would be represented as:

97081 MW01 GW0120

97081 is the NP&V project number
MW is the monitoring well location type
01 is the location type number designation
GW is the matrix type
01 is the Sample Round
20 is the depth of the sample collected

6.2 Sample Containers and Analytical Requirements

- As required in the NYSDEC ASP, all sample containers must be provided by the laboratory.
- If glass bottles are used, extra glass bottles will be obtained from the laboratory to allow for accidental breakage that may occur.
- Necessary preservatives will be placed in the sample bottles by the laboratory.
- The sample bottles will be handled carefully so that preservatives are not inadvertently spilled.

Further details regarding specific sample holding times and glassware are provided in **Table 2**.

6.3 Sample Packing and Shipping

Samples shall be packaged and shipped according to Section 6.2 of the *Compendium of Superfund Field Operations Methods (CSFOM)*, entitled "Packaging. Labeling and Shipping" **(Appendix D)**. Chain of custody forms, sample labels, custody seals and other sample documents shall be filled out as specified in the USEPA CLP Users Guide. Sample bottles and samples shall either be delivered/picked up at the site daily by the analytical laboratory, or delivered via overnight courier.

The proper procedures for packaging and shipping must be followed once samples have been collected.

Packaging

Prior to shipment, samples must be packaged in accordance with current US DOT regulations. All required government and commercial carrier shipping papers must be filled out. The procedure below should be followed regardless of transport method.

- As required in the NYSDEC ASP, samples will be transported in metal ice chests or sturdy plastic coolers.
- Remove previously used labels, tape and postage from cooler.
- Ship filled sample bottles in same cooler in which empty bottles were received.
- Check that all bottle labels are complete.
- Check that all sample bottles are tightly capped.
- Affix return address labels.
- Be sure that chain-of-custody forms are complete.
- Wrap sample bottles in bubble pack and place in cooler.
- Pack bottles with extra bubble pack, vermiculite, or Styrofoam. Be sure to pack trip blank, if applicable.
- Keep samples refrigerated in cooler with bagged ice or frozen cold packs. Do not use ice for packing material.
- Separate and retain the sampler's copy of chain-of-custody.
- Tape paperwork in zipper bag to inside cooler lid.
- Close cooler and apply signed and dated custody seal in such a way that the seal must be broken to open the cooler.
- Securely close cooler lid with packing or duct tape. Be sure to tape latches and drain plugs in closed position

Shipping

Samples should arrive at the lab as soon as possible following sample collection to ensure holding times are not exceeded. All samples must be hand delivered on the same day as sampling or sent via overnight courier. When using a commercial carrier, the following steps will be followed:

- Securely package samples and complete paperwork.
- Weigh coolers for air transport.
- Complete air bill for commercial carrier. If necessary, insure packages.
- Keep customer copy of air bill with field notes and chain-of-custody form.
- When coolers have been released to transporter, call receiving laboratory and give information regarding samplers names, method of arrival.
- Call lab on the day following shipment to be sure all samples arrived intact. If bottles are broken, locations can be determined from chain-of-custody form.

6.4 Sample Documentation

The sample team or individual performing a particular activity shall be required to keep a weatherproof field notebook. Field notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during projects and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross examination and are admissible as evidence. The field notebook entries should be factual, detailed and objective. All entries are to be signed and dated. All members of the field investigation team are to use this notebook, which shall be kept as a permanent record. The field notebook shall be filled out at the location of sample collection immediately after sampling. It shall contain sample descriptions including: sample number, sample collection time, sample location, sample description, sampling method used, daily weather conditions, field measurements, name of sampler, and other site-specific observations. The field notebook shall contain any deviations from the protocol contained herein, visitors names, or community contacts made during sampling, geologic and other site-specific information which may be noteworthy.

Chain of custody forms, sample labels, custody seals and other sample documents shall be filled out as specified in Section 4.0 of the CSFOM, entitled *Sample Control, Including Chain of Custody* **(Appendix D)**. Additionally, a dedicated sampling master log shall be maintained as the field program progresses. The sample log book shall contain the sample number, sample date/time, sampling team, and chain-of-custody number.

6.5 Chain-of-Custody Protocol

The primary objective of the sample custody procedures is to create an accurate written record that can be used to trace the possession and handling of all samples from the moment of their collection, through analysis, until their final disposition. Sample custody for samples collected during the investigation will be maintained by the on-site hydrogeologist or the field personnel collecting the samples. Field personnel are responsible for documenting each sample transfer and maintaining custody of all samples until they are shipped to the laboratory.

Chain-of-custody forms will be completed at the time of sample collection and will accompany the samples inside the cooler for shipment to the selected laboratory.

7.0 ANALYTICAL QUALITY ASSURANCE/ANALYTICAL QUALITY CONTROL LABORATORY PROCEDURES

7.1 Analytical Laboratory Qualifications and Standard Operating Procedures

The laboratory must perform all analytical work in accordance with established protocols and analytical quality assurance/quality control (QA/QC). Any laboratory to be used for the SAP will be accredited by the NYSDOH. Laboratory analyses will be performed by a laboratory currently certified under the appropriate approval categories by the NYSDOH's Environmental Laboratory Program (ELAP), with contract laboratory protocol (CLP) certification and in accordance with protocols and analyses reporting outlined in ASP (category B deliverables). The ELAP CLP certified laboratory will be Chemtech laboratories (see **Appendix E** for qualifications and **Appendix F** for analytical protocols and MDL's). The Category B deliverables package will be sent to the NYSDEC project manger.

The analytical QA plan will include procedures for the following:

- Receipt, storage and handling of samples.
- Sample scheduling to ensure that holding time requirements are met.
- Reagent/standards preparation.
- General laboratory techniques such as glassware cleaning procedures, operation of analytical balances, pipetting techniques and use of volumetric glassware.
- Description of how analytical methods are actually to be performed including precise reference to the analytical method used.
- Standard operating procedures for equipment calibration and maintenance to ensure that laboratory equipment and instrumentation are in working order, including, but not limited to procedures and schedules for calibration and maintenance in accordance with manufacturers' specifications.
- For a correction action, procedures for identifying and correcting deficiencies in the laboratory procedures. Each corrective action measure will be documented in the sampling event report submitted to the NYSDEC with a description of the deficiency, the corrective action taken, and the person responsible for implementing the corrective action.

Any alterations to the laboratory procedures will be included as an amendment to the SAP.

7.2 Laboratory Analytical Procedures

7.2.1 Groundwater Analysis

The groundwater quality monitoring will require analysis of groundwater samples for CRQL's.

Analytical Methods

The specific analytes and the suggested methodologies for the CRQL's are set forth in the Contract Required Quantification Limits (CRQL's) for the NYSDEC ASP methods. These analytical methods should include volatile, semi volatile organic analysis and TAL metals with Category B deliverables (see **Appendix F**).

Comparability

The CRQL's for groundwater that will be used for the SAP are presented in **Appendix F**. Standard sampling methods that will be used in the collection of environmental data are presented in Section 6.0 herein.

7.2.2 Soils Analysis

Laboratory analytical procedures with regard to soils analysis shall be consistent with NYSDEC ASP methods Category B deliverables as can be seen **Appendix F**. This information has been obtained from the laboratories Statement of Qualifications, which is the laboratory which will be performing the soils analysis.

7.2.3 Waste Analysis

Laboratory analytical procedures with regard to wastes analysis shall be consistent with NYSDEC ASP methods Category B as can be seen in **Appendix F**. This information has been obtained from the Chemtech Laboratories Statement of Qualifications, which is the laboratory which will be performing the waste analysis.

8.0 COMMUNITY HEALTH AND SAFETY PLAN

In order to protect communities, businesses and on-site workers not directly involved with the work activities associated with the Voluntary Investigation Work Plan a community air monitoring plan will be initiated during on-site investigative activities. The Plan along with target response and action levels are provided in **Appendix G**.

9.0 PROJECT MANAGEMENT AND SCHEDULE

9.1 General

The NYSDEC Project Manager for the Brooklyn Commons SAP is Robert Stewart. The Nelson, Pope & Voorhis (NP&V) Project Manager is Mr. Charles Voorhis.

9.2 Quality Assurance Officers

One ELAP certified laboratory will be used for sample analysis (Chemtech, Edison, NJ). The Laboratory Quality Assurance Officer will oversee the data validation and review process. This process is accomplished by using systems including audits, reference material, analyses, quality control checks and performance evaluations. The laboratory quality assurance officer will be assigned at a later date.

The quality assurance officer representing Nelson, Pope & Voorhis, LLC in the field is Mr. Eric Arnesen, P.G., or Steven McGinn, who will report directly to the NP&V project manager. One drilling company will be used for field sample acquisition, Geoprobe, etc. (Impact Environmental, Kings Park, NY). A qualified field sample quality assurance officer (FSQAO) will oversee field work and sample acquisition to ensure that representative samples are collected, stored, transported and delivered to the laboratory in accordance with the RI/FS workplan. The FSQAO will be responsible for communication with the laboratory and third party provider of the data usability summary report (DUSR). He will also visit the job site to perform an informal sampling audit. The field sample quality assurance officer will be Mr. Eric Arnesen of Nelson, Pope & Voorhis. The resumes of key personnel may be found in **Appendix H**.

9.3 Schedule

It is anticipated that following NYSDEC work plan review that site investigative activities will commence the first week in August, 2001. Work will be conducted in three phases with Phase 1 beginning in August, 2001, Phase II beginning in September, 2001 and Phase II beginning in October 2001. Following all field work a report summarizing field activities, results and conclusions will be submitted to the NYSDEC the first week in December, 2001.

Table 3 summarizes the project schedule for each phase and phase activity.

Table 2

Coral Graphics
840 South Broadway
Hicksville, New York
Project Schedule

Task/Month #	Jan				Feb				Mar				April				May				June				Remarks
Week #	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
Phase I					■	■	■	■																	Complete end Feb
Drainage and Leaching Structure Inventory					▨																				
Soil Sampling					▨																				
Geoprobe Groundwater Sampling					▨																				
Turnaround for Results						▨	▨																		
NYSDEC Consultation								▨																	
Phase II									■	■	■	■	■												Complete begin April
Vertical Profile soil Sampling									▨																
Geoprobe Groundwater sampling										▨															
Turnaround for Results											▨	▨													
NYSDEC Consultation													▨												
Phase III														■	■	■	■								Complete begin May
Monitoring Well Installation and Development														▨	▨										
Monitoring Well Sampling																▨									
Turnaround for Results																	▨								
Reporting																		■	■	■	■				Submit beginning June

10.0 DATA QUALITY ASSESSMENT

10.1 Data Validation

Independent data validation will not be used because it is not necessary. Instead, a Data Usability Summary Report (DUSR) will be prepared by Michael Veraldi of Long Island Analytical Laboratories and will be contracted to Nelson, Pope & Voorhis LLP. The credential of Mr. Veraldiare provided in **Appendix H**. The category B deliverables package will be sent to the NYSDEC project manger.

Mr. Veraldi will review the submitted data packages to determine compliance with those portions of the work plan which pertain to the production of laboratory data. Data compliance is defined by the following criteria: the data package is complete as defined in the above paragraph, data has been produced and reported in a manner consistent with the requirements of the laboratory subcontract, all protocol required QA/QC criteria have been met, all instrument tune and calibration requirements have been met for the time frame during which the analyses were completed, all protocol required initial and continuing calibration data is present and documented, and data reporting forms are complete for all samples submitted and all problems encountered during the analytical process have been reported in the case narrative along with any and all actions taken by the laboratory to correct these problems.

10.2 Data Usability Analysis

Data usability is the determination of whether or not a data set is sufficiently complete and of sufficient quality to support a decision action, in terms of the specific objectives of the data collection activity.

A Data Usability Summary Report will be prepared and submitted with the Category B deliverables package. The raw data review must be based upon the criteria set forth in NYSDEC ASP (Reference N-20), as well as EPA CLP guidelines (Reference U-9) and validation protocols. The DUSR will be prepared by a qualified chemist or environmental professional whose credentials will be submitted to the NYSDEC for approval prior to preparation of the document and will be written in accordance with the NYSDEC's "Guidance for the Development of Data Usability Summary Reports" document.

The DUSR is developed by reviewing and evaluating the analytical data package. During the course of this review the following questions must be asked and answered:

1. Is the data package complete as defined under the requirements for the NYSDEC ASP Category B or USEPA CLP deliverables?

2. Have all holding times been met?

3. Do all the QC data: blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data fall within the protocol required limits and specifications?

4. Have all of the data been generated using established and agreed upon analytical protocols?

5. Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification form?

6. Have the correct data qualifiers been used?

Once the data package has been reviewed and the above questions answered the DUSR will proceed to describe the samples and analytical parameters. Any deficiencies, deviations or problems will be identified and their effect on the data discussed. The DUSR shall also include recommendations on sampling and reanalysis if required. All data qualifications will be documented following the NYSDEC ASP guidelines or the EPA Region 2 data validation guidelines.

Appendix A

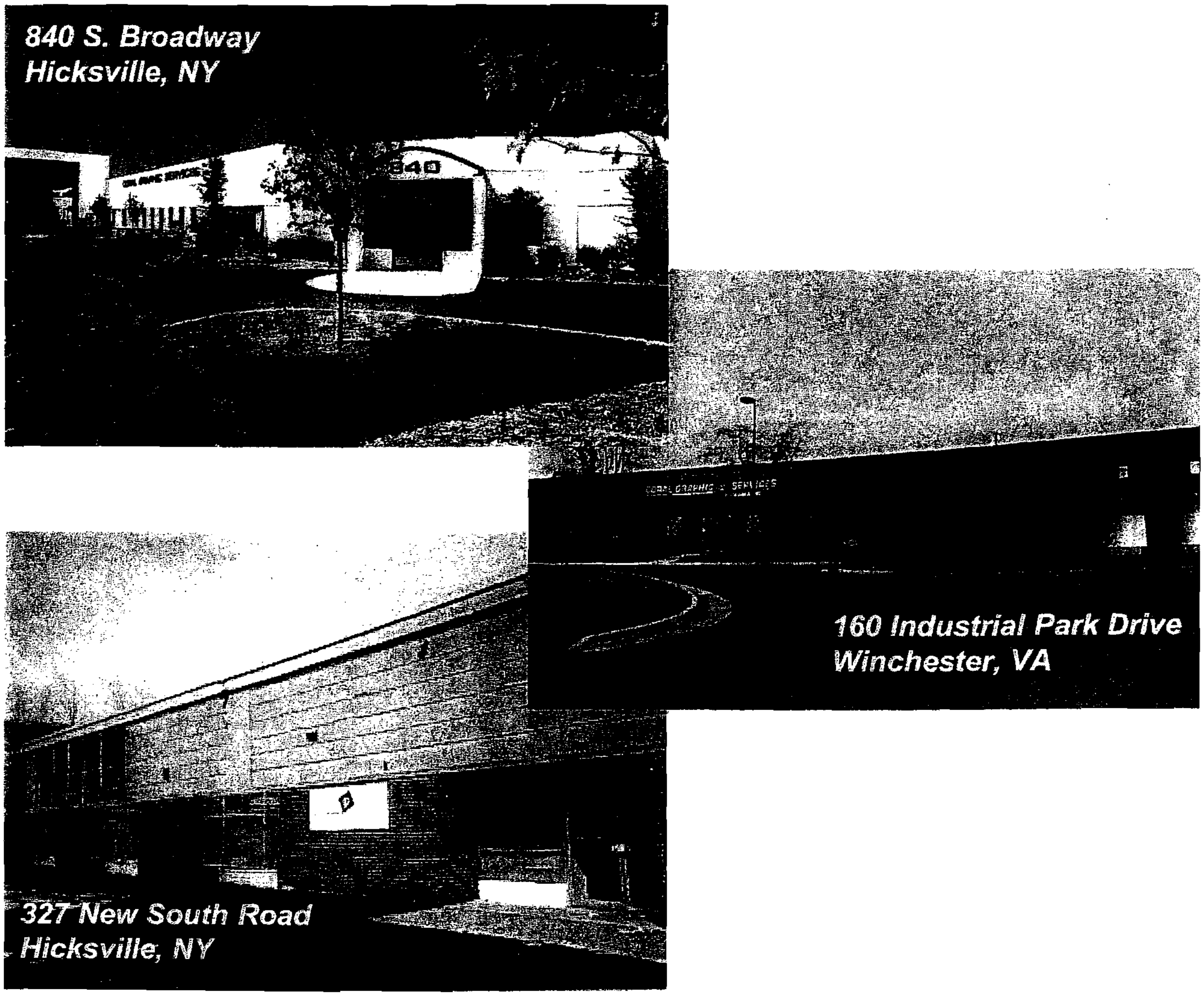
Prior Site Investigations and Documentation

Appendix A-1

Malcolm Pirnie
Phase I ESA
May, 2000

CORAL GRAPHIC SERVICES, INC.

Environmental Site Assessment



Prepared by:

MALCOLM PIRNIE

WALTER, CONSTON,
ALEXANDER & GREEN, P.C.

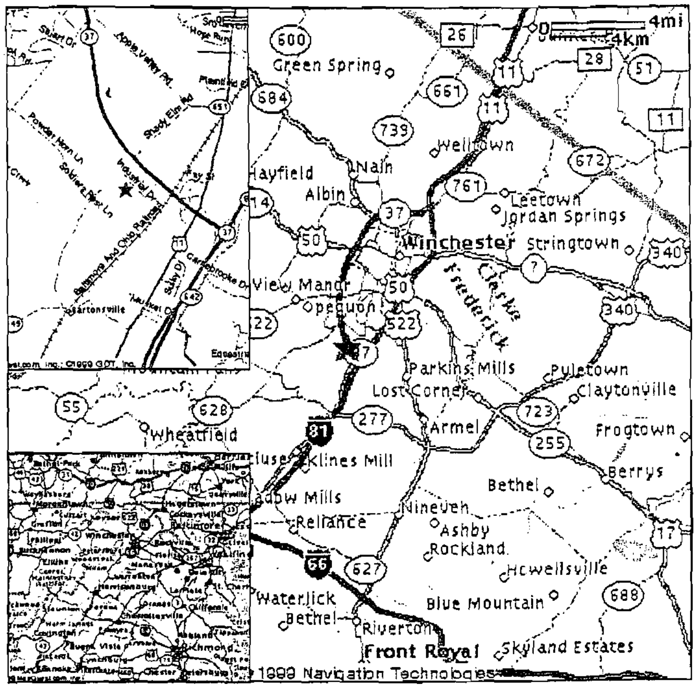
Confidential

May 2000

3.1.2 WINCHESTER, VA FACILITY

The Company's Winchester, VA facility is located at 160 Industrial Park Drive just off Interstate 81 and adjacent to Apple Valley Road. The 37,500-sf building is situated on an approximately 5-acre lot in an industrial area. The building is constructed of approximately 6 to 8 feet of cinder block with brick facade topped with insulated sheet metal siding and roofing on steel girders.

The Company established a Memphis, TN production facility (1801 Shelby Oaks Drive) in 1995. In 1998, the TN facility was closed and the operations were relocated to Winchester, VA. The Company began renovating the existing Winchester, VA building in October 1997. The subject property is located in an industrial park and surrounded by industrial properties to the north, east, south, and west.



Site Location Map: 160 Industrial Park Drive

3.2 SITE HISTORY

3.2.1 840 S. BROADWAY, HICKSVILLE, NY

Prior to 1960, the property was owned by Corydon Johnson. Records do not indicate that any structures were present on the property during that time. The existing building was constructed in 1960 and occupied by Unity Buying Service, a mail-order showroom, from approximately 1960 to 1985. The building was renovated in 1985 and from 1985 to 1990 it was used as a training center by Grumman Industries. The building was vacant for four years from 1990 to 1994 and was purchased for use by the Company in 1994. In 1994, the Company modified the building by adding an alcohol storage room. A waste evaporator was added in 1995. Currently, the 58,100-sf building is used for three purposes: 12,000-sf is office space, 35,100-sf is for printing production areas, and the remaining 11,000-sf is for storage and shipping. A City Directory Abstract that identifies property occupants in the vicinity of the plant from the 1960s to the present is provided in Appendix A.

3.2.2 327 NEW SOUTH ROAD, HICKSVILLE, NY

The Company's warehouse facility is approximately 15,000-sf in size and is situated on an approximately 42,900-sf lot. The majority of the building, approximately 13,400-sf, is used for storage space while the remaining 1,600-sf is used as office space. According to a review of

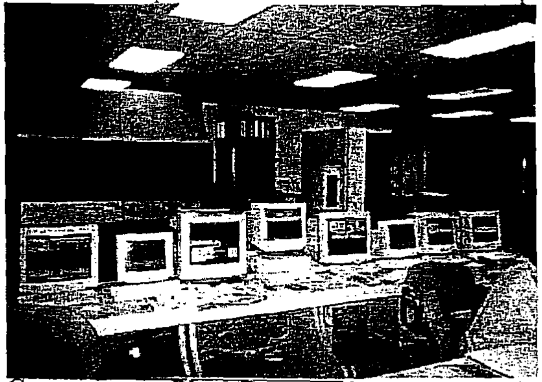
The Company's operations involve the use of two production facilities with similar processes. The facilities operate a 2-shifts/day schedule and work six days a week for 24 hours a day. The workforce at the Hicksville production facility consists of approximately 85 employees. Approximately 63 employees comprise the Winchester, VA workforce.

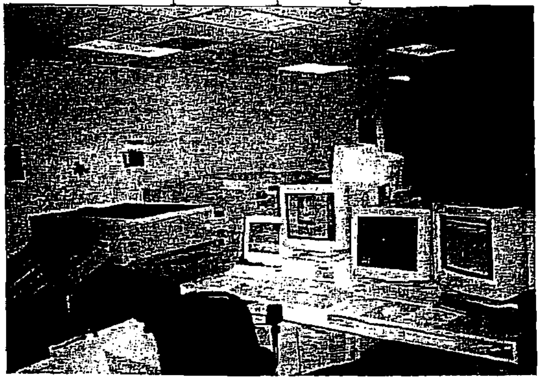
Production operations at the facilities include camera work, computer graphics, art layout, and printing using lithographic and flexographic methods. Raw materials include paper, inks, water, liquid or film lamination, and aluminum. The primary processes involved are electronic pre-press, computer to plate operations, conventional proofing and plate making, image processing, coating and laminating, and cutting and binding. A process flow diagram is provided below. Appendix E contains drawings that illustrate the building plans for the production facilities.

Print Order Received
↓
Art Computer Layout
↓
Digital Master (CTP Unit)
↓
Printing Press
↓
Ultraviolet Coating Operation
↓
Cutting & Binding
↓
Shipping

5.1 ELECTRONIC PRE-PRESS

Printing operations at the Hicksville location are 95% digital and 5% conventional. Operations at the Winchester facility are 100% digital. The first step in the production process occurs in the Computer to Plate Room. Electronic files containing digitized images/graphics are developed on personal computers. Customer orders are processed in this room prior to plating.


Computer to Plate Room – Hicksville, NY

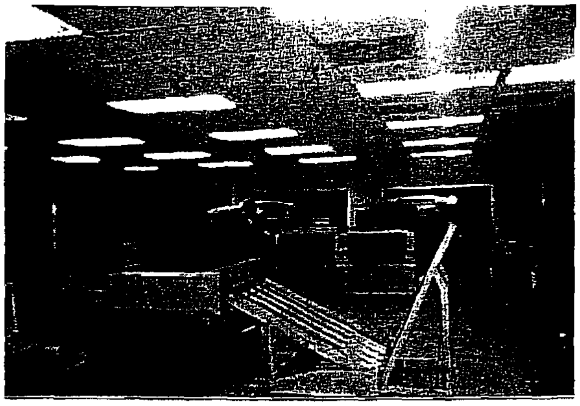

Computer to Plate Room – Winchester, VA

5.2 COMPUTER TO PLATE OPERATIONS

Digital images are processed onto aluminum plates using a plate-setting thermal operation and a laser, which applies the image onto aluminum plates. Images are baked on the plates using heat and further processed using developer, finisher and mechanical scrubbing. Two plate burn/developing machines are utilized in both facilities and potassium hydroxide is used as a plate finisher mix. The type of plate developer was unidentified at the time of the site reconnaissance. The film processors that generate the plant's major wastewater stream are all equipped with silver-recovery units. Wastewater is pre-treated in these units before it is discharged to the POTW. The POTW routinely samples the waste discharge and has never notified the Company of any violations of the sewer use ordinance. Spent developer is disposed of off-site by a licensed waste hauler. Water used in the developing/cleaning process is softened using an ion exchange system located in the Conventional Proofing and Plating Room of the Hicksville production facility and in a room adjacent to the Computer to Plate Room in the Winchester, VA facility.

Conventional films (in lieu of digital images) are also manufactured at the Hicksville facility on an as needed basis. Conventional film development accounts for approximately 5% of production business. Conventional film is handled in a corner of the Computer to Plate Room. Kodak XP2 Proofing Machines are located adjacent to the conventional film area.

Burn/Developer Unit – Hicksville, NY



Burn/Developer Unit – Hicksville, NY

5.3 CONVENTIONAL PROOFING AND PLATE MAKING

UV Vacuum Unit – Hicksville, NY

This operation is only used at the Hicksville facility. The Winchester, VA facility is 100% digital and therefore does not employ this process. Conventional films are used (or are supplied by customer) and color key material/negatives are transferred onto plates through four vacuum frames, which utilize an ultra violet light process. The images are developed using either the UV vacuum frames or step and repeat machines (old process), which burn the images onto the plates. The UV exposed negative is then placed into a Proofing-Process Developer machine. The Proofing-Processor machine removes color (Donor Colors) from the color key material/negatives that are not imprinted on the final plates. The final plates are then placed in a wash tank. The spent film/negative, which had the donor colors removed, is then discarded as solid waste. Spent developer and dyes (wastewater) from the Proofing-Process machine are drummed and disposed of off-site by a licensed waste hauler. A laminating machine is used to laminate the final negative/image onto cardboard backing.

A water-softening unit is located behind the Proofing-Processor. This is used to purify the water that is used in developing the plates in the Computer to Plate room.

5.4 PRINTING PRESS

Printing Press – Winchester, VA

Plates are placed onto printing press machines for processing images. Soy-based inks are used to generate the images onto paper/stock. Nine printing presses are used at the production facility in Hicksville including four 40" printing machines and five 28" machines. Each of the printing machines is equipped with refrigeration units. Information regarding the type of refrigerant used should be gathered. On some of the printing machines a coating is applied after the image is pressed onto the paper/stock. Both ink and etch are run over the plates during printing.

Printing Press – Hicksville, NY

The Winchester facility is equipped with seven presses. Six of the presses are 28" units and one is a 20" unit for smaller jobs. Dynamic Graphics, a Bertelsmann AG operation, uses some space at the Winchester facility and does specialty modifications to print jobs (i.e., raised text, highlights, spot silkscreening).

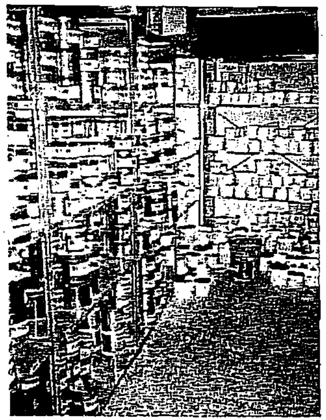
The waste generated from the printing operation is a mixture of etch/coating and water. This wastewater is drained from each of the printing presses approximately once a week. The waste solution, until recently, was concentrated in an evaporator. Currently spent etch, coating and water from the presses are contained and disposed of off-site by a licensed waste handler. Spent inks are also contained and are either re-used or disposed of by the waste hauler. Inks are manually loaded into the printing presses.

Chemical Storage Room

Within the Hicksville, NY Press Room is a small storage room for chemicals. The storage room is labeled "Please – No Waste Allowed in this Room at Any Time." Fountain solutions for the presses are stored in this room. The fountain solutions observed at the time of the walk-through were primarily alcohol/isopropanol. Lubricating oils are also stored immediately outside the chemical storage room.

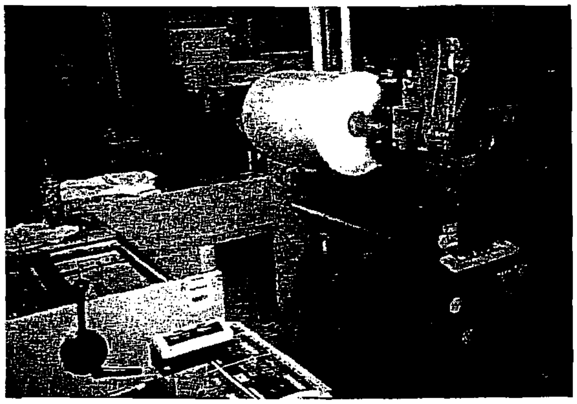
In addition, an ink storage and mixing room is located in a corner of the Press Room of the Hicksville production facility. Inks are stored on shelves and on the floor in a portion of this room and are manually mixed in another part of the room. The room appeared orderly; however, the aisle space was insufficient. Measurements should be taken to comply with OSHA regulations regarding aisle spacing and the facility's Contingency and Evacuation Plan dated March 1999. Inks are stored on shelves and on the floor. Photographs of the ink storage rooms of both facilities are provided below.

Ink Storage Room – Hicksville, NY



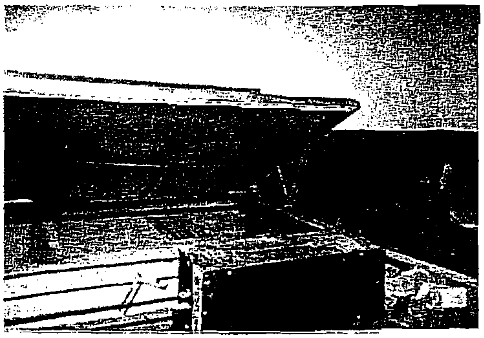
Ink Storage Room – Winchester, VA

5.5 COATINGS/LAMINATION



Film Coating Unit – Winchester, VA

After being processed in the Press Room, the printed stock is brought to the coatings room for application of either a matte or gloss finish. Film coatings are also applied to the printed paper stock. Film coating is applied by heat, pressure and tension. The Winchester facility uses two processes – a film lamination process whereby a roll of polymer is heat-sealed to the cover and a liquid lamination process where UV radiation is used to cure the laminate. Non-hazardous/Non-regulated coatings (e.g., AURACURE) are applied to the paper stock. No foil covering or edging is applied at either facility. Foil coverings and/or embossing are subcontracted out.



Screen Unit – Hicksville, NY

In addition to film and liquid coating, spot coating is used for special coating applications at the Hicksville facility. A screen is used to coat only specific areas of the printed stock. Screens for the spot coating process are manufactured in the screening room. The screening room is also used to wash down and remove coatings from used screens. A high-pressure water gun is used to wash down the used screens. The wash water is collected in a sink and then drained into a receiving 55-gallon drum. Until recently, the wash water, which contains coatings, was concentrated in the evaporator and the sludge was dispose of off-site by a licensed hazardous waste hauler. Currently, the drummed wash water is disposed of off-site as non-hazardous waste by a licensed waste hauler.

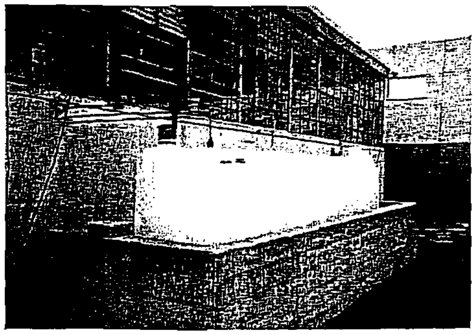
At the Winchester facility, stormwater is discharged to a drainage ditch that leads to a stream.

6.1.4 SURFACE WATER AND GROUNDWATER

There is no surface water within a mile radius of the Hicksville facilities. Surface water is present within 0.25 miles of the Winchester facility.

EDR reports the inferred depth to groundwater at the Hicksville facilities as approximately 60 feet below ground surface, however, an earlier ESA report indicated that the depth to groundwater is 40 feet. The depth to groundwater at the Winchester facility is unknown at the time of this ESA.

6.1.5 ABOVE AND UNDERGROUND STORAGE TANKS


AST at warehouse facility

A 1,500-gallon aboveground storage tank (AST) is located at the 327 New South Road warehouse facility in the rear lot along the northeast side of the building. The AST is used to store No. 2 fuel oil and is surrounded on three sides by a concrete berm and appears to have secondary containment. The tank was installed in 1993 and the fuel oil is used to heat the building. According to the Nassau County Health Department, the permit for the AST was renewed in March 2000. The presence of a former underground storage tank (UST) at the warehouse facility was confirmed by a previous investigation. A 3,000-gallon fuel oil UST was formerly located on the south side of the building. The UST was abandoned in place on January 28, 1994. Reports were not obtained to determine if there were any contamination issues at the time of abandonment.

The production facilities are heated via natural gas and do not have fuel tanks or other bulk material tanks aboveground or underground. A previous ESA regarding the 840 S. Broadway facility indicates that two fill ports and vent pipes for underground storage tanks were identified on the east side of the building. The report indicates that there was no evidence of fuel oil spills or leaks in the area of the fill ports; however no information regarding tank status, registration, or tank tightness tests was obtained.

6.1.6 HAZARDOUS MATERIAL STORAGE


Chemical Storage Room – Winchester, VA

The plants maintain MSDS listings of all hazardous materials, which include inks, solvents and coating materials. The main solvent is isopropyl alcohol. During the site reconnaissance effort at the Winchester facility, a strong solvent odor was noted throughout. Raw materials are stored in either the Ink Storage Room or in the Chemical Storage Room. Drum spacing within the Chemical Storage Room at the Winchester facility did not appear to meet regulatory standards for aisle spacing. Measurements should be taken to comply with OSHA regulations and the facility's existing Contingency and Evacuation Plan dated March 1999.

In addition to isopropyl alcohol, several hazardous materials were used and stored in the past at both production facilities. The chemicals of concern included methyl chloride, 1,2,4-trimethylbenzene, toluene, phosphoric acid, cobalt, chromium, xylene, and other chemicals used in smaller quantities. These materials were brought onto the properties to be used in the production process, stored temporarily, and then removed pursuant to manifest systems under either New York State Department of Environmental Conservation (NYSDEC) or Virginia Department of Environmental Quality (VADEQ) jurisdictions.

6.1.7 HAZARDOUS AND NON-HAZARDOUS WASTE STORAGE AND DISPOSAL

The generation of hazardous waste at both production facilities ceased after the use of soy-based inks and UV-curable coatings was implemented. Unused inks are returned to the supplier and spent UV coatings, lubricating oils for the presses, and press wash solutions are drummed and removed off-site monthly as non-hazardous waste by a waste handler.

The Company has been issued waste generator EPA ID numbers for the production facilities. The Hicksville production facility's EPA ID number is NYR000801230 and the Winchester production facility's EPA ID number is VAR000013565. Wastes generated in the past at the Winchester facility included EPA type D001 (ignitable hazardous wastes). Wastes generated at the Hicksville production facility included type F002 (spent halogenated solvents), type F003 (spent non-halogenated solvents), and type D007 (spent water dye solutions containing chromium). The Hicksville plant produced 8.7 tons of waste in 1996 and 2.5 tons in 1997. Both plants produced zero tons of waste in 1998 and 1999.

Before the production facilities switched to soy-based inks and UV-curable coatings, waste evaporators were used at both facilities. The schematic for the evaporation system is provided in Appendix E. Wastewater from the film processing units was sent to the evaporator where the volatile organic compounds and other chemicals were released to the atmosphere via a stack on the roof of the buildings. This process reduced the volume of waste. The remaining sludge was disposed of off-site by a licensed hazardous waste hauler.

6.1.8 POLYCHLORINATED BIPHENYL (PCB) CONTAINING MATERIALS

One transformer is present along the eastern wall of the interior of the warehouse space in Hicksville, NY. There is potential for this transformer to contain PCBs. Also the ballasts in the fluorescent lighting may contain PCBs.

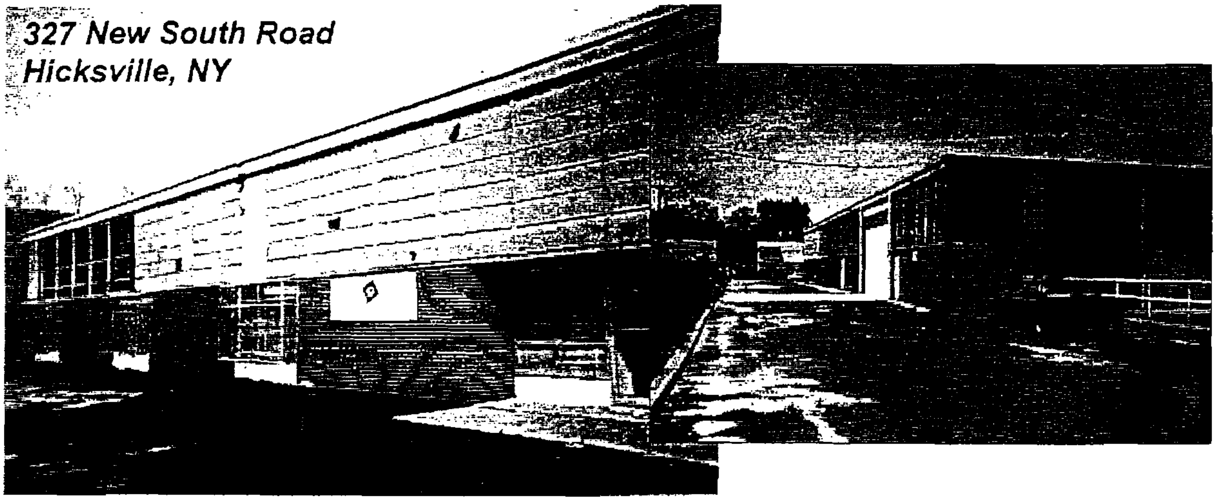
Reports indicate that there are two transformers at the 840 S. Broadway property. One of the transformers is located in the boiler room and contains dielectric fluid with an unknown PCB content. The second transformer is located in the computer room and is labeled dry-type.

Appendix A-2

Malcolm Pirnie
Phase II ESA
August, 2000

CORAL GRAPHIC SERVICES, INC.

Phase II Environmental Site Assessment



Prepared by:

MALCOLM PIRNIE

WALTER, CONSTON,
ALEXANDER & GREEN, P.C.

Confidential

August 2000

95115

TABLE 1
Analytical Methods for Soils and Groundwater
Phase II Environmental Site Assessment
Coral Graphic Services
Hicksville, NY

Analysis	Method of Analysis Soil	Method of Analysis Aqueous
Target Compound List (TCL) VOCs +10	EPA Method 8260B	EPA Method 8260B
TCL Semivolatiles Base Neutral / Acid Extractables +20	EPA Method 8270C	EPA Method 8270C
Target Analyte List (TAL) Metals	EPA Method 7000 and 6010A Series	EPA Method 200 and 6010A Series

To insure that groundwater samples collected were representative of groundwater quality conditions the temporary monitoring wells were developed prior to sampling. Well development was conducting using a 2-inch outer diameter (OD) submersible pump and dedicated tygon tubing. All drill cuttings and well development water (IDW) were containerized in DOT-approved 55-gallon drums. The drums were stored at the decontamination pad area for subsequent disposition at an approved facility. The drums were labeled for identification of content and origin.

A topographic survey of the newly constructed temporary monitoring wells and a select number of physical site features was completed by a New York State licensed land surveyor on June 20, 2000 at each site. Malcolm Pirnie, Inc. completed two synoptic rounds of groundwater elevation measurements within temporary monitoring wells at each site on June 19 and 20, 2000.

Each temporary groundwater monitoring well was properly abandoned upon completion of groundwater sampling activities. Upon completion of the Phase II site investigation, each site was returned to the condition that existed prior to commencement of the Phase II site investigation.

4.1 840 South Broadway Facility

The Phase II site investigation conducted at the 840 South Broadway facility involved the installation of four (4) soil borings at sample locations MW-1, MW-2, MW-3 and MW-4 for subsurface characterization of the site. Soil borings installed at sample locations MW-1, MW-2 and MW-3 were converted into temporary monitoring wells for subsequent groundwater elevation measurement and groundwater quality sample collection. The rationale behind the selection of each sample location is presented in Table 2. Focused geophysical mapping of the potential UST AOC was conducted prior to the intrusive investigation in order to locate the potential UST.

TABLE 2
Soil and Groundwater Sample Location Rationale
Phase II Environmental Site Assessment
Coral Graphic Services
840 South Broadway Facility
Hicksville, NY

Sample Location Identification	Location	Sample Matrix	Sample Rationale
MW-1	Along Center Street	Groundwater	Sample to represent upgradient water quality.
MW-2	Along Center Street	Groundwater	Sample to represent upgradient water quality.
MW-3	Along Center Street	Groundwater	Sample to represent groundwater quality adjacent to former UST identified in Phase I ESA.
MW-4	Along Center Street	Soil and Groundwater	Sample location within area of deteriorated asphalt adjacent to Hazardous Waste Storage CONEX box and subsurface leaching field identified during the Phase II ESA site reconnaissance walkover.

One groundwater sample was collected from each temporary monitoring well and submitted for analytical parameters listed in Table 1. The groundwater sample collected from sample location MW-3 was also analyzed for total extractable diesel range organic (DRO) compounds via EPA Method 8015 in order to determine the possible impact to groundwater from the potential UST near that sample location.

During the advancement of the soil boring at sample location MW-4, located within the AOC west of the Hazardous Waste Storage CONEX box where deteriorated asphalt was observed, sustained concentrations of total VOCs were observed in excess of 500 parts per million by volume (ppmv) in vapor within the breathing zone. Due to health and safety considerations, soil boring advancement at this location was terminated at a depth of eight feet below ground surface (bgs). One subsurface soil sample was collected from the 4 to 6 foot depth interval at the sample location and the borehole was backfilled with native materials. This soil sample was submitted for analyses for the analytical parameters listed in Table 1 and PCBs via EPA method 8082.

An open 55-gallon drum was observed to exist in the area immediately south of the Hazardous Waste Storage CONEX. The contents of the 55-gallon drum appeared to be a black, or dark green liquid (possibly ink). One sample of the contents of the 55-gallon drum was collected during the Phase II site investigation and submitted for TCL VOC analyses via the analytical method listed in Table 1.

4.1.1 840 South Broadway Facility Expanded Site Investigation

An expanded site investigation was conducted within the AOC west of the Hazardous Waste Storage CONEX box where deteriorated asphalt and sustained concentrations of total VOC vapors in excess of 500 ppmv were observed during the construction of the soil boring at sample location MW-4. The objective of the expanded site investigation was to:

- Estimate the extent of soil contamination in the vicinity of MW-4
- Determine if groundwater quality was impacted in the vicinity of MW-4
- Compile soil characterization data at the AOC for inclusion into the Phase II ESA

The expanded site investigation consisted of the collection and on-site analyses (via field gas chromatography techniques) of depth-specific soil gas samples using direct push (Geoprobe®) techniques to estimate the most probable source and extent of the soil contamination observed within the AOC. One groundwater sample within the source area and four depth-specific soil samples were then collected within the AOC using direct push techniques. These samples were submitted for off-site analyses via methods listed in Table 1.

Eleven depth-specific soil gas samples were collected at site sample locations GP-1 through GP-10 and MW-4 by TriState Environmental Management Services, Inc. (TriState) on June 28 through 30, 2000. Soil gas samples were collected at these locations at several depths ranging between 4 and 40 feet bgs, except at sample location MW-1 where only one sample was collected at a depth of 32 feet bgs.

Soil gas samples were collected using a Geoprobe® (Model 5400) direct push unit and associated tooling and equipment. At each sample location, the rods were advanced into the subsurface with an expendable drive point. Upon reaching the selected depth, the point was released from the rods, the rods retracted approximately one foot, and the soil gas sample collected into a tedlar sample bag using dedicated tubing through the rods via a Geoprobe® vacuum pump and box. Each soil gas sample was field screened for total VOC concentrations prior to sample collection using a MiniRae PID equipped with a standard 10.6 eV lamp.

The soil gas sample collected from sample location GP-4 was collected using a Geoprobe® Screen Point Sampler rather than from the expendable drive point sampler as used for the collection of all other soil gas samples at the site.

A total of thirty (30) soil gas samples were analyzed in the field immediately after sample collection using an onsite mobile laboratory operated by Environmental Management Associates, Inc. (EMA) under subcontract to TriState. Samples were analyzed by EMA for Benzene, Ethylbenzene, TCE, and PCE. The number of unqualified VOCs detected in each soil gas sample was also determined by EMA.

In addition to the collection of soil gas samples, four (4) depth-specific soil samples were collected (from sample locations SS-1 through SS-4) and one (1) groundwater sample was collected (from sample location GP-4) during the expanded site investigation. Soil samples were collected using a combination of a Geoprobe® Macro Core and Large Bore sampler, each equipped with single-use polyethylene teraphthalate (PETG) liners. The groundwater sample from this location was collected using a Geoprobe® Screen Point Sampler and disposable mini-bailer equipped with a foot valve.

4.2 327 New South Road Facility

The Phase II site investigation conducted at the 327 New South Road property involved the installation of four (4) soil borings at sample locations MW-1, MW-2, MW-3 and MW-4 for subsurface characterization of the site. Each soil boring was converted into a temporary monitoring well upon completion for subsequent groundwater elevation measurement and groundwater quality sample collection. These sample locations were based on the results provided in the Phase I ESA and the initial Phase II site reconnaissance walkover conducted on June 12, 2000. The rationale behind the selection of each sample location is presented in Table 3.

TABLE 3
Soil and Groundwater Sample Location Rationale
Phase II Environmental Site Assessment
Coral Graphic Services
327 New South Road Property
Hicksville, NY

Sample Location Identification	Location	Sample Matrix	Sample Rationale
MW-1	Front Parking Lot Area Along New South Road	Groundwater	Sample to represent upgradient water quality
MW-2	Rear Parking Lot Area near AST	Groundwater	Sample to represent upgradient water quality.
MW-3	Driveway South of facility building	Groundwater	Sample to represent groundwater quality adjacent to former UST and leaching field for former septic system identified in Phase I ESA .
MW-4	Driveway South of facility building	Soil and Groundwater	Sample location adjacent to former septic system identified In Phase I ESA where contamination previously detected.

One groundwater sample was collected from each of the temporary monitoring wells installed at the site and one subsurface soil sample was collected from sample location MW-4, located adjacent to the former on-site septic system. In order to determine the potential impact to groundwater from the abandoned UST area, the groundwater sample collected from sample location MW-3 was analyzed for total extractable DRO compounds via EPA Method 8015 in addition to the analytical parameters listed in Table 1.

Continuous split-spoon sampling of subsurface soils was conducted during the advancement of the soil boring at monitoring well MW-4 to a depth of ten feet bgs. Standard five-foot sampling intervals were employed throughout the remainder of the borehole. Field screening of split-spoon soil samples and drill cuttings during the construction of the soil boring at sample location MW-4 did not indicate the presence of soil contamination throughout the unsaturated zone at this sample location. Therefore, based on the field screening results, the soil sample was collected from this sample location within the 55 to 57 foot depth interval, just above the water table surface.

In addition, three (3) floor tile and associated mastic samples were collected on June 19, 2000 from the storage room area within the warehouse facility building. The tan streaked, 9" x 9" vinyl floor tile with black mastic adhesive was noted to be intact and in good condition during sample collection. The samples collected were sent to Scientific Laboratories, Inc. located in New York, New York for analysis by Polarized Light Microscopy (PLM) and Transmission Electron Microscopy (TEM).

5.0 PHASE II ESA SITE INVESTIGATION RESULTS

5.1 840 South Broadway Facility

5.1.1 Former UST

Initial site reconnaissance and focused geophysical mapping of the AOC at the 840 South Broadway property did not reveal the presence of a potential UST in the grass and landscaped area along the eastern wall of the main production facility building. However, a reconnaissance of the basement revealed the presence of oil / fuel lines that were formerly connected to a UST. The fuel /oil lines exited the basement wall located under the main conference room of the facility. Additional geophysical mapping of the interior of the main conference room did reveal the presence of a potential UST beneath the concrete slab underlying the northern portion of the building.

5.1.2 Dry Wells

A series of dry wells were observed in the parking lot located west of the Hazardous Waste Storage CONEX box which is west of the southwest corner of the main production facility building. Dry wells near the building were observed to be covered with steel manhole covers, while those farther to the west of the parking lot were covered with steel grates and are presumably used as recharge basins for drainage of standing water from the parking lot area. Approximately 1 to 2 feet of standing water was observed to completely cover the western third of the parking lot area at the initiation of site investigation activities at the site. This water appeared to have completely drained from the parking lot and infiltrated the subsurface within one week. Further inspection of two of the dry wells during the initial Phase II site reconnaissance and focused geophysical mapping of the site revealed the dry wells to be of circular 'bee-hive' type design and constructed of concrete. The dry wells were also observed to extend to a depth of about 20 feet bgs with varying amounts of sand and debris existing at the base of each well.

Focused geophysical mapping of a select number of the dry wells did not reveal the presence of subsurfaçe metallic pipes extending between them, but the possibility of their interconnection via non-metallic pipes could not be ruled out.

5.1.3 Hydrogeologic Conditions

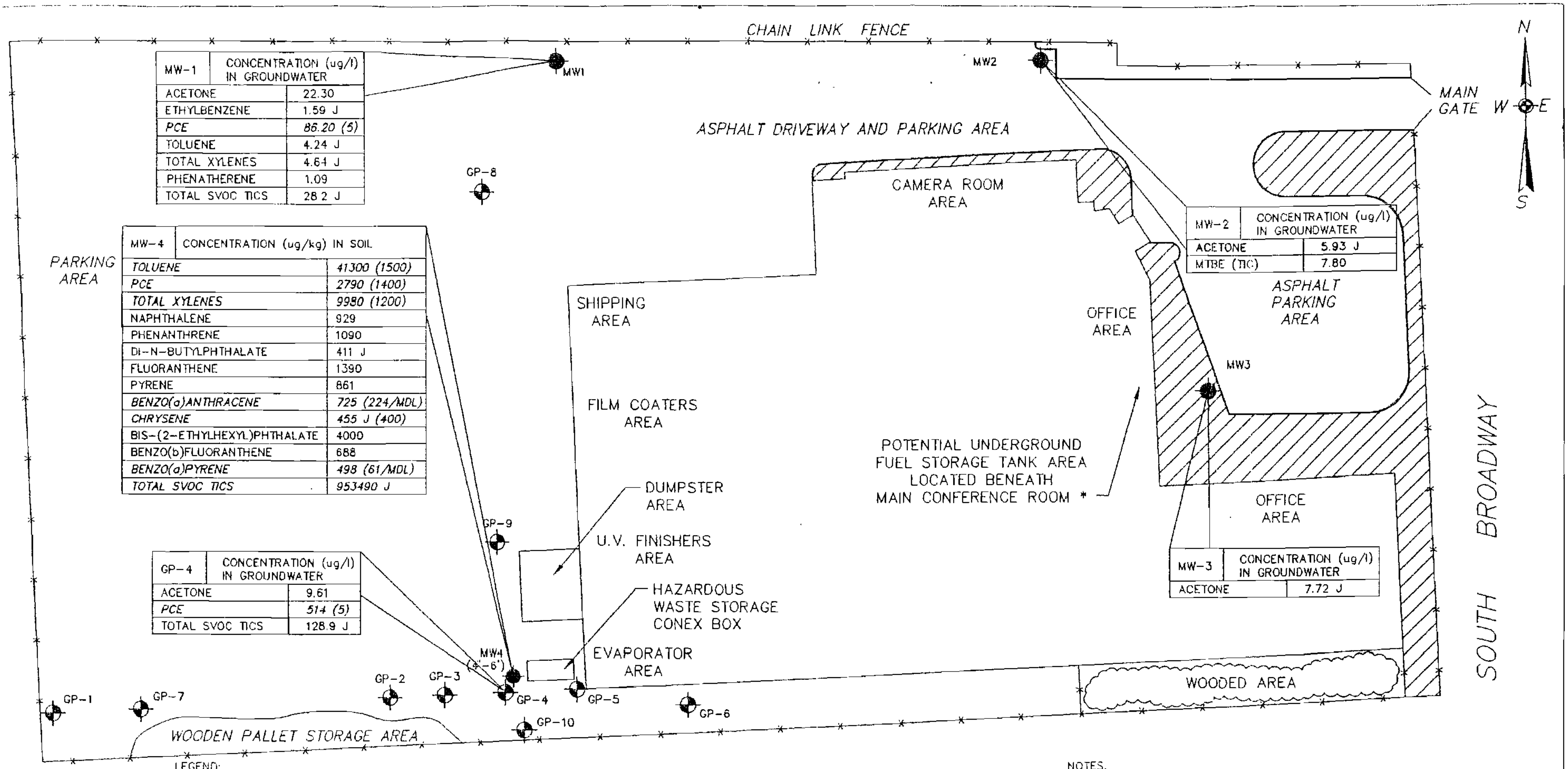
Soil boring logs compiled during the advancement of soil borings at sample locations MW-1, MW-2, MW-3 and MW-4 at the site indicate that the site is underlain by poorly sorted, coarse to medium grained tan sand and compact gravel with tightly packed, subrounded cobbles to a depth of about 30 feet bgs. Poorly sorted coarse to medium grained tan sand was encountered from about 30 to 40 feet bgs and well sorted, uniform medium to fine grained sands were encountered below these materials. Temporary monitoring wells MW-1, MW-2 and MW-3 installed at the site were screened in the well sorted materials encountered below depths of about 50 feet bgs.

Based upon two synoptic rounds of groundwater elevation measurements conducted at the site on July 10 and 20, 2000, groundwater beneath the site occurs under unconfined conditions within the Upper Glacial Aquifer and ranges in elevation from 66.43 to 66.25 feet above the Nassau County datum. Based on these measurements, the general direction of groundwater flow beneath the site, is southwesterly (Figure 5) under an average hydraulic gradient of 0.001 ft/ft.

5.1.4 Subsurface Soil Analytical Results

Results of PID field screening of split spoon soil samples collected during the advancement of soil borings at the 840 South Broadway property did not result in the detection of any total VOCs above background within soil borings constructed at sample locations MW-1, MW-2 and MW-3. As previously discussed, PID values in excess of 500 ppmv were observed in the breathing zone during the advancement of the soil boring at sample location MW-4. One subsurface soil sample was obtained at this sample location from a depth of 4 to 6 feet bgs. Four additional soil samples were also obtained from sample locations SS-1, SS-2, SS-3 and SS-4 during the expanded Phase II site investigation of the property. Sample locations and analytical results of the Phase II site investigation are displayed in Figure 6. Sample locations and analytical results of the expanded Phase II site investigation are displayed in Figure 7.

Toluene, PCE and total Xylenes were detected above analytical method detection limits (MDLs) at concentrations of 41300 µg/Kg, 2790 µg/Kg and 9980 µg/Kg respectively within the soil sample collected at sample location MW-4. Concentrations of these VOCs exceed New York State recommended soil clean-up objectives (TAGM 4046) and are displayed in italicized text on Figure 6. Benzo(a)anthracene and Benzo(a)pyrene were also detected above MDLs within the soil sample at concentrations of 725 µg/Kg and 498 µg/Kg, respectively. Concentrations of these semivolatile organic compounds



MW-1	CONCENTRATION (ug/l) IN GROUNDWATER
ACETONE	22.30
ETHYLBENZENE	1.59 J
PCE	*86.20 (5)*
TOLUENE	4.24 J
TOTAL XYLENES	4.64 J
PHENATHERENE	1.09
TOTAL SVOC TICS	28.2 J

MW-4	CONCENTRATION (ug/kg) IN SOIL
TOLUENE	*41300 (1500)*
PCE	*2790 (1400)*
TOTAL XYLENES	*9980 (1200)*
NAPHTHALENE	929
PHENANTHRENE	1090
DI-N-BUTYLPHTHALATE	411 J
FLUORANTHENE	1390
PYRENE	861
BENZO(a)ANTHRACENE	*725 (224/MDL)*
CHRYSENE	*455 J (400)*
BIS-(2-ETHYLHEXYL)PHTHALATE	4000
BENZO(b)FLUORANTHENE	688
BENZO(a)PYRENE	*498 (61/MDL)*
TOTAL SVOC TICS	*953490 J*

GP-4	CONCENTRATION (ug/l) IN GROUNDWATER
ACETONE	9.61
PCE	*514 (5)*
TOTAL SVOC TICS	128.9 J

MW-2	CONCENTRATION (ug/l) IN GROUNDWATER
ACETONE	5.93 J
MTBE (TIC)	7.80

MW-3	CONCENTRATION (ug/l) IN GROUNDWATER
ACETONE	7.72 J

LEGEND:

TOLUENE 41300 (1500)	*ANALYTE CONCENTRATION (ug/kg) EXCEEDING NEW YORK STATE RECOMMENDED SOIL CLEANUP OBJECTIVES (TAGM 1046 APPENDIX A THRESHOLD LIMIT)*
PCE 587 (5)	*ANALYTE CONCENTRATION (ug/l) EXCEEDING NEW YORK STATE AMBIENT GROUNDWATER QUALITY STANDARDS AND GUIDANCE VALUES (CLASS GA)(TOGS 1.1.1 THRESHOLD LIMIT)*
MW1 (4'-6') ●	TEMPORARY MONITORING WELL LOCATION AND SOIL SAMPLE DEPTH
GP-1 ⊕	GEOPROBE(R) LOCATION
▨	GRASS COVERED AND LANDSCAPED AREAS

NOTES.

1. SOURCE OF DRAWING IS SURVEY BY ALBERT W. TAY, LICENSED LAND SURVEYOR, PLAINVIEW, NEW YORK, SURVEYED JUNE 20, 2000.
2. DRAWING SUPPLEMENTED BY FIELD OBSERVATIONS.

*	LOCATION APPROXIMATE BASED UPON RESULTS OF GEOPHYSICAL INVESTIGATION
MDL	METHOD DETECTION LIMIT
J	CONCENTRATION DETECTED AT VALUE BELOW THE METHOD DETECTION LIMIT
TIC	TENTATIVELY IDENTIFIED COMPOUNDS

MALCOLM PIRNIE

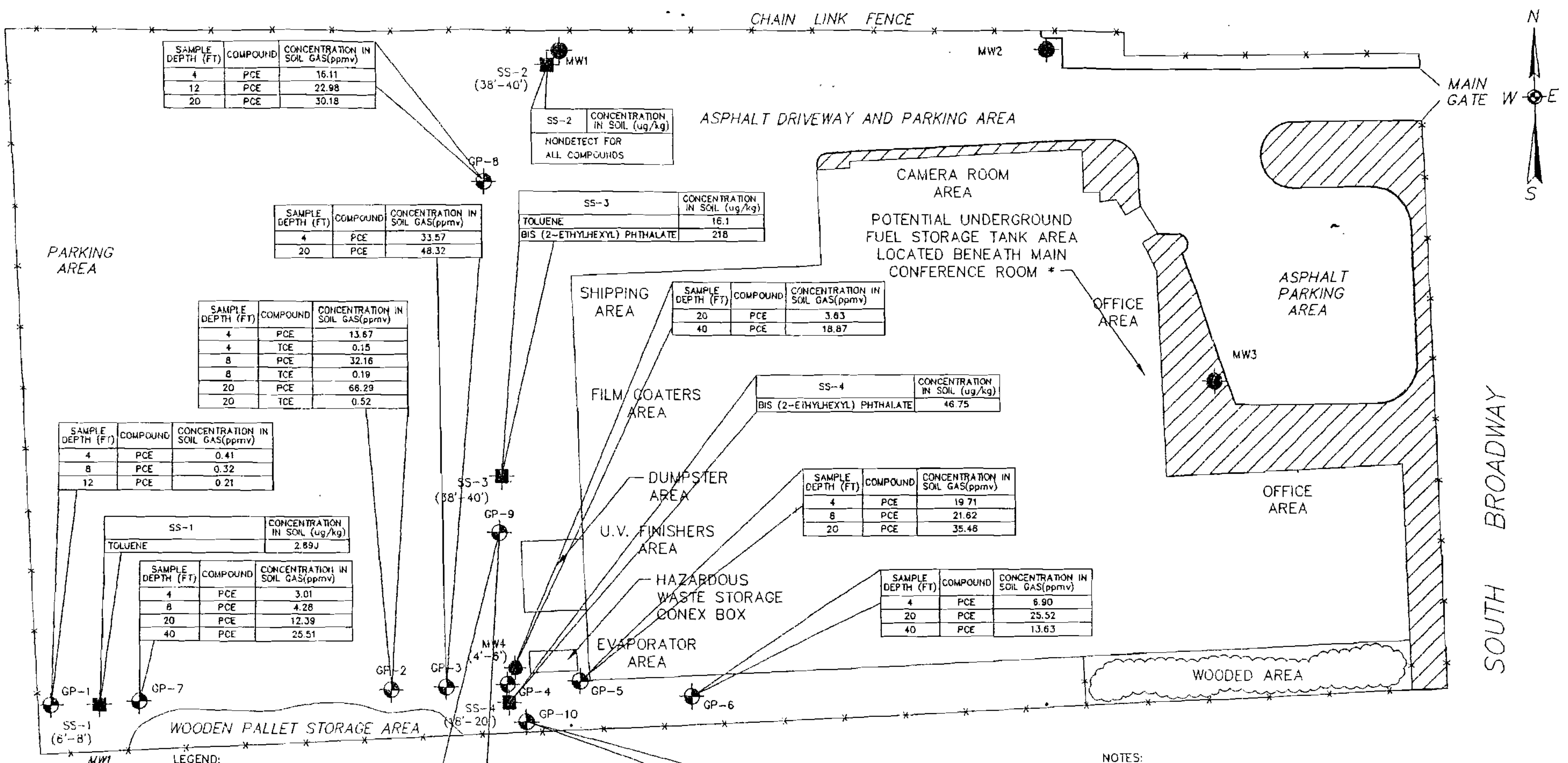
CORAL GRAPHIC SERVICES FACILITY
840 SOUTH BROADWAY
HICKSVILLE, TOWN OF OYSTER BAY,
NASSAU COUNTY, NEW YORK

ANALYTE CONCENTRATIONS
WITHIN SOILS AND GROUNDWATER

25 0 25 50
1"=50'

MALCOLM PIRNIE, INC.

FIGURE 6



SAMPLE DEPTH (FT)	COMPOUND	CONCENTRATION IN SOIL GAS(ppmv)
4	PCE	16.11
12	PCE	22.98
20	PCE	30.18

SS-2	CONCENTRATION IN SOIL (ug/kg)
NONDETECT FOR ALL COMPOUNDS	

SS-3	CONCENTRATION IN SOIL (ug/kg)
TOLUENE	16.1
BIS (2-ETHYLHEXYL) PHTHALATE	218

SAMPLE DEPTH (FT)	COMPOUND	CONCENTRATION IN SOIL GAS(ppmv)
4	PCE	33.57
20	PCE	48.32

SAMPLE DEPTH (FT)	COMPOUND	CONCENTRATION IN SOIL GAS(ppmv)
20	PCE	3.63
40	PCE	18.87

SAMPLE DEPTH (FT)	COMPOUND	CONCENTRATION IN SOIL GAS(ppmv)
4	PCE	13.67
4	TCE	0.15
8	PCE	32.16
8	TCE	0.19
20	PCE	66.29
20	TCE	0.52

SS-4	CONCENTRATION IN SOIL (ug/kg)
BIS (2-ETHYLHEXYL) PHTHALATE	46.75

SAMPLE DEPTH (FT)	COMPOUND	CONCENTRATION IN SOIL GAS(ppmv)
4	PCE	0.41
8	PCE	0.32
12	PCE	0.21

SAMPLE DEPTH (FT)	COMPOUND	CONCENTRATION IN SOIL GAS(ppmv)
4	PCE	19.71
8	PCE	21.62
20	PCE	35.46

SS-1	CONCENTRATION IN SOIL (ug/kg)
TOLUENE	2.89J

SAMPLE DEPTH (FT)	COMPOUND	CONCENTRATION IN SOIL GAS(ppmv)
4	PCE	3.01
8	PCE	4.28
20	PCE	12.39
40	PCE	25.51

SAMPLE DEPTH (FT)	COMPOUND	CONCENTRATION IN SOIL GAS(ppmv)
4	PCE	6.90
20	PCE	25.52
40	PCE	13.63

SAMPLE DEPTH (FT)	COMPOUND	CONCENTRATION IN SOIL GAS(ppmv)
4	PCE	45.93
20	PCE	89.97
40	PCE	329.66

SAMPLE DEPTH (FT)	COMPOUND	CONCENTRATION IN SOIL GAS(ppmv)
4	PCE	7.64
20	PCE	120.63
40	PCE	89.24

LEGEND:

MW1 (4'-6') ●	TEMPORARY MONITORING WELL LOCATION AND SOIL SAMPLE DEPTH
GP-1 ⊕	GEOPROBE(R) LOCATION
SS-1 (6'-8') ■	SOIL SAMPLE LOCATION AND DEPTH
▨	GRASS COVERED AND LANDSCAPED AREAS

NOTES:

1. SOURCE OF DRAWING IS SURVEY BY ALBERT W. TAY, LICENSED LAND SURVEYOR, PLAINVIEW, NEW YORK, SURVEYED JUNE 20, 2000.
2. DRAWING SUPPLEMENTED BY FIELD OBSERVATIONS.

* LOCATION APPROXIMATE BASED RESULTS OF GEOPHYSICAL INVESTIGATION

J CONCENTRATION DETECTED AT VALUE BELOW THE METHOD DETECTION LIMIT.

MALCOLM PIRNIE

CORAL GRAPHIC SERVICES FACILITY
840 SOUTH BROADWAY
HICKSVILLE, TOWN OF OYSTER BAY,
NASSAU COUNTY, NEW YORK

DEPTH SPECIFIC SOIL AND SOIL GAS CONCENTRATIONS

25 0 25 50
1"=50'

MALCOLM PIRNIE, INC

FIGURE 7

(SVOCs) exceed New York State recommended soil clean-up objectives (TAGM 4046) and are displayed in italicized text on Figure 6.

Chrysene and Di-n-Butylphthalate were detected at concentrations below MDLs within the soil sample from sample location MW-4 and are, therefore, displayed with a "J" in Figure 6 as estimated concentrations. Although Chrysene was detected at a concentrations lower than the MDL, its estimated concentration in the soil sample exceeds New York State recommended soil clean-up objectives and is also displayed in italicized text on Figure 6.

Naphthalene, Phenanthrene, Fluoranthene, Pyrene, bis-(2-Ethylhexyl)phthalate and Benzo(b)Fluoranthene were also detected at concentrations above MDLs within the soil sample at sample location MW-4 at concentrations of 929 µg/Kg, 1090 µg/Kg, 1390 µg/Kg, 861 µg/Kg, 4000 µg/Kg and 688 µg/Kg, respectvely. Concentrations of these SVOCs in the sample do not, however, exceed New York State recommended soil clean-up objectives. The total concentration of tentatively identified SVOCs in this soil sample was 953,490 µg/Kg.

A number of TAL metals were detected above MDLs within the soil sample at sample location MW-4, and within subsurface soil samples collected at sample locations SS-1, SS-2, SS-3 and SS-4 during the expanded Phase II site investigation. Concentrations of these metals were not observed to exceed New York State recommended soil clean-up objectives. PCBs were not detected at concentrations above MDLs within the soil sample collected at sample location MW-4.

Analyses of subsurface soil samples collected during the expanded Phase II site investigation indicated that no compounds or analytes of concern were detected above MDLs within the sample collected at sample location SS-2. Toluene was detected above the MDL at a concentration 16.1 µg/Kg within the soil sample collected at sample location SS-3 and below the MDL at a concentration of 2.69 µg/Kg within the soil sample collected at sample location SS-1. Bis-(2-Ethylhexyl)phthalate was detected above the MDL at concentrations of 218 µg/Kg and 46.7 µg/Kg within the soil samples collected at sample locations SS-3 and SS-4, respectively. Detected concentrations did not exceed New York State recommended soil clean-up objectives.

5.1.5 Drum Contents Analytical Results

Acetone and 2-Butanone (MEK) were detected above MDLs at concentrations of 1380 µg/L and 1990 µg/L, respectively in the sample of the contents from the open 55-gallon drum observed in the area directly south of the Hazardous Waste Storage CONEX Box. Two unknown aliphatic compounds were also tentatively identified in the sample at concentrations of 137 µg/L and 73 µg/L, respectively.

5.1.6 Groundwater Analytical Results

PCE was detected above the MDL at concentrations of 86.2 µg/L and 514 µg/L within groundwater samples collected from sample locations MW-1, and GP-4, respectively. Concentrations of this VOC in these samples were observed to exceed New York State Class GA Groundwater Quality Standards (T.O.G.S 1.1.1 threshold limits) and are displayed in italicized text on Figure 6.

Acetone was detected above the MDL at a concentration of 22.3 µg/L within the groundwater sample collected at sample location MW-1 and below the MDL at concentrations of 5.93µg/L, 7.72 µg/L and 9.61 µg/L within groundwater samples collected at sample locations MW-2, MW-3 and GP-4, respectively. Ethylbenzene, Toluene and total Xylenes were detected at concentrations below MDLs and Phenanthrene was detected at a concentration above the MDL within the groundwater sample collected at sample location MW-1. Concentrations of these VOCs in these samples do not exceed New York State Class GA T.O.G.S 1.1.1 threshold limits:

Tentatively identified SVOCs in groundwater samples collected from sample locations MW-1 and GP-4 were observed at total concentrations of 28.2 µg/L and 128.9 µg/L, respectively. MTBE was also tentatively identified within the groundwater sample collected at sample location MW-2 at a concentration of 7.8 µg/L.

Diesel range organic compounds were not detected above the MDL within the groundwater sample collected at sample location MW-3.

A number of TAL metals were detected above MDLs within groundwater samples collected from sample locations MW-1, MW-2, MW-3 and GP-4. Concentrations of these metals in groundwater were not, however, observed to exceed New York State T.O.G.S 1.1.1 threshold limits.

5.1.7 Soil Gas Analytical Results

The results of the on-site analyses of depth-specific soil gas samples collected using Geoprobe® techniques during the expanded Phase II site investigation of the AOC west of the Hazardous Waste Storage CONEX box area displayed in Figure 7. Benzene and Ethylbenzene were detected in the soil gas sample collected at a depth of 4 feet bgs at concentrations of 0.06 parts per million by volume (ppmv) and 0.1 ppmv, respectively. TCE was detected in soil gas samples collected at depths of 4, 8 and 20 feet bgs at concentrations ranging from 0.15 to 0.52 ppmv.

PCE was detected in all of the samples at concentrations ranging from 0.21 to 329.66 ppmv, the majority of which are estimated because they were detected at concentrations above the instrument calibration range. Approximate PCE concentration distributions within soil gas at depths of 4 and 20 feet bgs at the site are graphically displayed in Figures 8 and 9, respectively. Since the soil gas samples collected from sample location

GP-4 were collected using a method that differed from that used for the collection of all other samples at the site, sample results for this location were excluded from the depth-specific PCE concentration distribution estimate displayed in these figures.

5.2 327 New South Road Facility

5.2.1 Former Septic System and Abandoned UST

The location of the former septic system and abandoned UST south of the warehouse facility was determined with the use of a focused geophysical survey. The location of these features at the 327 New South Road facility are displayed on Figure 10.

5.2.2 Hydrogeologic Conditions

Soil boring logs completed during the advancement of soil borings at sample locations MW-1, MW-2, MW-3 and MW-4 at the site indicate that site is underlain by poorly sorted, coarse to medium grained tan sand and compact gravel with tightly packed, subrounded cobbles to a depth of about 40 feet bgs. Poorly sorted coarse to medium grained tan sand was encountered from about 40 to 50 feet bgs and well sorted, uniform medium to fine grained sand were encountered below these materials.

Temporary monitoring wells MW-1, MW-3 and MW-4 installed at the site were screened in the well sorted materials encountered below depths of about 50 feet bgs. Temporary monitoring well MW-2 was screened in poorly sorted, fine grained sand which was overlain by stringers of dense, white clay.

Based upon two synoptic rounds of groundwater elevation measurements conducted at the site on July 10 and 20, 2000, groundwater beneath the site occurs under unconfined conditions within the Upper Glacial Aquifer and ranges in elevation from 68.42 to 68.15 feet above the Nassau County datum. Based on these measurements, the general direction of groundwater flow beneath the site, is southwesterly (Figure 11) under an average hydraulic gradient of 0.003 ft/ft.

5.2.3 Subsurface Soil Analytical Results

Results of PID field screening of split spoon soil samples collected during the advancement of soil borings at the 327 New South Road property did not result in the detection of any total VOCs above background. One subsurface soil sample was obtained from sample location MW-4 during the Phase II site investigation. Results of the PID field screening of split spoon samples at sample location MW-4 did not indicate the presence of total VOCs therefore, the sample was collected from a depth of 55 to 57 feet bgs, just above the water table elevation at the sample location (Figure 10).

Analyses of the subsurface soil sample collected at sample location MW-4 indicated that no compounds or analytes of concern were detected above MDLs within the sample.

Appendix A-3
Nelson, Pope & Voorhis, LLC

Limited Phase II ESA
August 18, 2000

Limited Phase II Environmental Site Assessment

Coral Graphics, Inc.

840 Broadway

Hicksville, New York

N&P Project No. 95115

August 18, 2000

NELSON, POPE & VOORHIS, LLC
ENVIRONMENTAL • PLANNING • CONSULTING
572 WALT WHITMAN ROAD, MELVILLE, NY 11747-2188 • (516) 427-5665 • FAX (516) 427-5620

Limited Phase II
Environmental Site Assessment

Coral Graphics, Inc.
840 Broadway

Hicksville, New York

N&P Project No. 95115

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Limited Phase II
Environmental Site Assessment

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840 Broadway

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Limited Phase II
Environmental Site Assessment

Coral Graphics, Inc.

CONTENTS

Limited Phase II
Environmental Site Assessment

Coral Graphics, Inc.
840 Broadway

1.0 INTRODUCTION AND PURPOSE

Nelson, Pope & Voorhis, LLC (NP&V) has been contracted to prepare a Limited Phase II Environmental Site Assessment for the subject property. This report is intended to further explore a potential contamination source associated with leaching pool structures near the southeast corner of the site building.

The subject property lies in the Hamlet of Hicksville, Town of Oyster Bay, County of Nassau, New York. The subject property is a 4.0 acre parcel of developed land. The property is located on the west side of Broadway, south of Bloomingdale Road. The property is more particularly described on the Nassau County Tax Map as Section 46, Block 629, Lot 61.

The subject property contains a masonry and steel frame structure which is utilized as an office and printing press shop for a large printing company. The building footprint is approximately 17,725 SF. The front portion of the building consists of one (1) and two (2) story office space. The rear portion of the building was utilized as a print shop which housed printing presses, U.V. finishers and coaters. The inks utilized on-site are currently soy based. Prior to utilizing these inks, ink containing chemicals were used. The cleaners used to clean the printing presses contain chemical solvents. The used cleaning rags were identified as being stored outside the rear loading dock in 55 gallon drums. Currently, these rags are stored in ventilated storage trailer off the southwest corner of the building. The building is currently connected to the municipal sewer collection system in the area. A leaching system off the southwest corner of the building is the subject of this report.

Based on the findings of a Malcolm Pirnie Phase I Environmental Site Assessment (May, 2000) recognized environmental conditions were identified that prompted the performance of the Phase II Environmental Site Assessment (August, 2000) completed by Malcolm Pirnie. The Malcolm Pirnie Phase II ESA identified several pertinent issues, specifically, a potential underground storage tank (UST) beneath the building slab, elevated concentrations of perchloroethane (PCE) in groundwater, and elevated concentrations of toluene, PCE and total xylenes in soil off the southwest corner of the building. This Limited Phase II ESA was completed in order to confirm the presence of the contamination and to identify the source. This assessment has been designed and performed by NP&V in collaboration with Impact Environmental Consulting, Inc. The laboratory analysis was provided by Long Island Analytical Laboratories. The following sections detail the subject property and surrounding area characteristics, sampling program, quality assurance protocol, laboratory analysis methodology and laboratory results.

2.0 SAMPLING AND ANALYSIS PROGRAM (SAP)

2.1 GEOPROBE GROUNDWATER PROBES

Two (2) groundwater probes, identified as GWP-1 and GWP-2 were installed on the northern and southern property boundaries of the subject site. **Figure 1** provides a map identifying the location of the above referenced groundwater probes. The probes were installed using a Geoprobe hydraulic probing unit. The two (2) groundwater probes were installed in order to collect groundwater samples from the groundwater interface. These samples were sent to a laboratory for analysis.

2.1.1 Groundwater Probe Installation

The groundwater probes were installed using a Geoprobe hydraulically powered probing tool (**Figure 2**). Mechanized, vehicle mounted probe systems apply both static force and hydraulically powered percussion hammers for tool placement (static down forces up to 3,000 pounds combined with percussion hammers of eight horsepower continuous output). A special screened probing rod is pushed to the desired depth and then retracted four (4) feet to the allow the screen to extend out of the probe section. Recovery of groundwater samples is then facilitated by placing a small vinyl hose down the hollow rods of the probe.

2.2 GEOPROBE SOIL PROBES

Two (2) soil probes, identified as DW-A and DW-B were installed in two (2) leaching pools which had been filled in. **Figure 1** provides a map identifying the location of the above referenced soil probes. The soil probes were installed using the Geoprobe hydraulic probing unit. The two (2) soil probes were installed in order to collect soil samples. These samples provided a representation of the subsurface soil at of the former bottom of these leaching pools. Based on sediment changes apparent in soil boring sleeves at the anticipated leaching pool depth.

2.2.1 Soil Probe Installation

The soil probes were installed using a Geoprobe hydraulically powered soil probing tool (**Figure 2**). Mechanized, vehicle mounted soil probe systems apply both static force and hydraulically powered percussion hammers for tool placement (static down forces up 3,000 pounds combined with percussion hammers of eight horsepower continuous output). Recovery of large sample volumes was facilitated with a probe-driven sampler. The probe-driven sampler consisted of a hollow probe that opened via a remote control mechanism at the selected sampling depth in the soil profile to allow soil to enter as it was advanced. Discrete samples were secured at the desired depths and were contained within a non-reactive plastic sleeve that lined the hollow probe for subsequent inspection and analysis.

FIGURE 1

SAMPLE LOCATION MAP

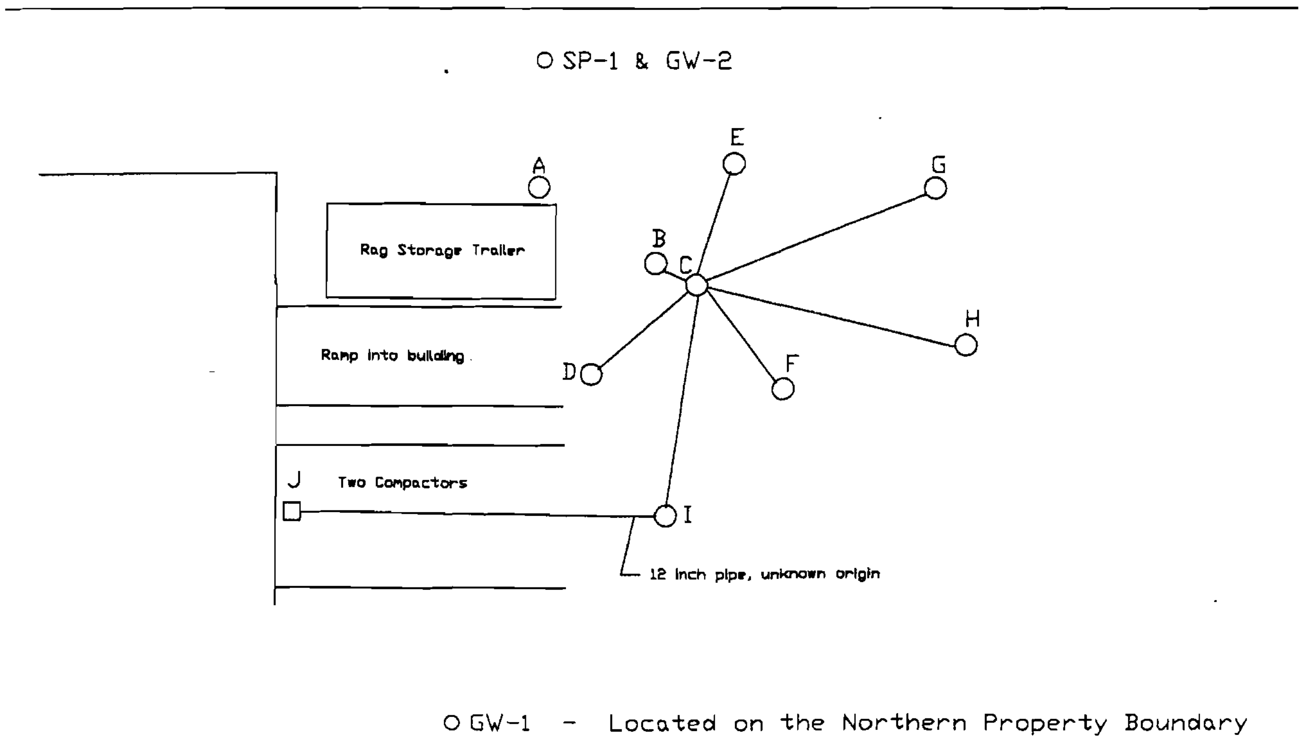
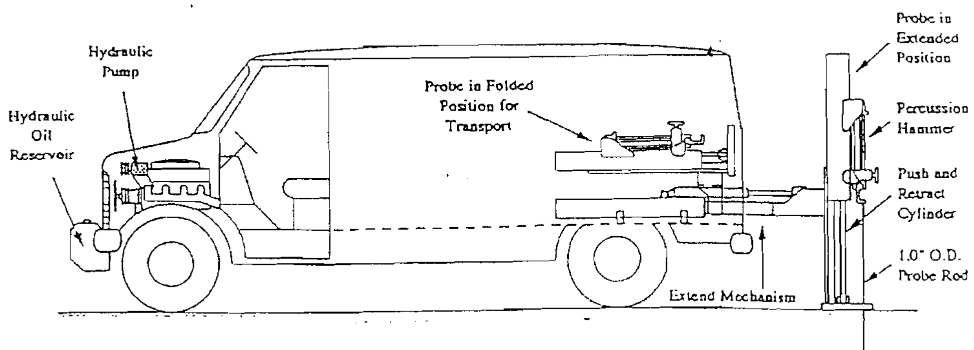
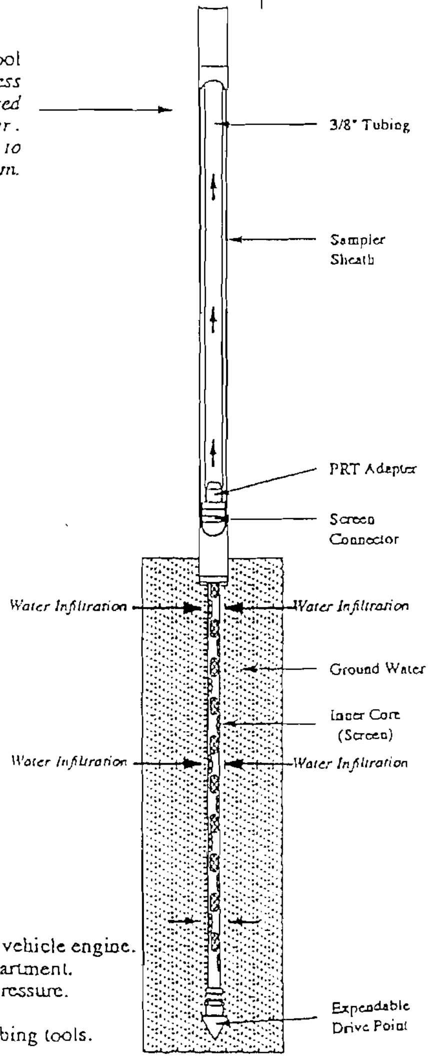


FIGURE 2

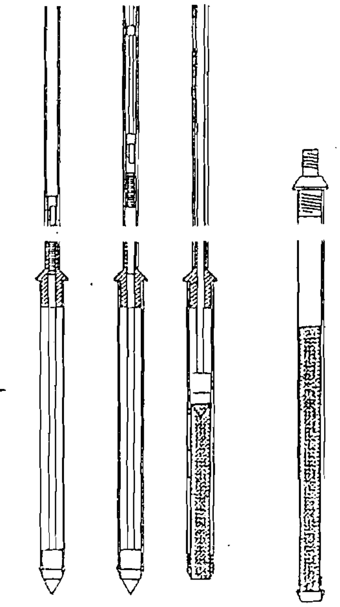
GEOPROBE SAMPLING APPARATUS



Ground Water Sample Tool
Tool allows a stainless steel screen to be delivered to intersect groundwater. Sample transported to surface via pump system.



Soil Probing Tool
Tool is advanced and sample is contained within a non-reactive plastic sheathing.



Basics
- Hydraulic powered probe unit operated from hydraulic system driven from the vehicle engine.
- Remote vehicle ignition allows operator to start vehicle engine from rear compartment.
- Belt driven hydraulic pump supplies 10 gpm at 2000 rpm, 2250 psi operating pressure.
- Probe unit folds for transport.
- Utilizes static force (weight of vehicle) and percussion hammer to advance probing tools.
- 8 horsepower hydraulic hammer delivers over 1800 blows per minute.
- Hammer features 0-300 rpm Lh directional rotary function for drilling surface pavements.
- Probes have greater than 12,000 pounds of pulling capacity.
- Drives small diameter (1.0" O.D.) probing tools to depths of over 80'.

2.3 HAND AUGER SOIL SAMPLES

The on-site leaching pool system consists of two (2) leaching pools which were filled in, a distribution pool and six (6) leaching pools located off the southwest corner of the building. Since the two (2) suspected leaching pools were filled in they were sampled utilizing a Geoprobe sampling apparatus as described in Section 2.2. The distribution pool (DW-C) had a solid bottom so no sample was obtained. The six (6) remaining leaching pools were sampled utilizing a using a stainless steel hand auger. The soil samples were collected from the top six (6) inches of the leaching pool bottoms. One (1) soil sample was collected from each of the six (6) leaching pools. These samples were analyzed for the presence of volatile organic compounds.

2.4 LABORATORY SAMPLE LOCATION AND FREQUENCY

The soil samples collected from the site were containerized and labeled for identification purposes. The labels were coded to correspond to the location in which the samples were secured. **Table 2** provides an index of how the samples were coded during labeling.

TABLE 2
SAMPLE IDENTIFICATION

SAMPLE LOCATION	SAMPLE ID CODE
Groundwater sample collected from northern property boundary	GWP-1
Groundwater sample collected from southern property boundary	GWP-2
Soil sample collected from leaching pool A	DW-A
Soil sample collected from leaching pool B	DW-B
Soil sample collected from leaching pool D	DW-D
Soil sample collected from leaching pool E	DW-E
Soil sample collected from leaching pool F	DW-F
Soil sample collected from leaching pool G	DW-G
Soil sample collected from leaching pool H	DW-H
Soil sample collected from leaching pool I	DW-I

3.0 LABORATORY ANALYSIS

3.1 ANALYTICAL TEST METHODS

The soil and groundwater samples were transported to a New York State Certified Commercial Laboratory for analysis. Selection of the analytical test methods for the soil samples was based on USEPA Test Method 8260 for volatile organic compounds. Selection of the analytical test methods for the groundwater samples was based on USEPA Test Method 602 for volatile organic compounds.

3.2 ANALYTICAL RESULTS

Laboratory analysis performed on the soil samples collected from eight (8) leaching pools detected minor concentrations of tetrachloroethene, 1,3,5 trimethylbenzene, 1,2,4 trimethylbenzene and o-xylene, excepted for DW-I. The sample secured from DW-I exhibited elevated concentrations of these constituents which exceeded the regulatory standards. **Table 1** provides a comparison of those constituents with elevated concentrations and the regulatory standards. The laboratory analysis sheets (NYS ASPA) as prepared by Long Island Analytical Laboratories are presented in **Appendix A** of this document.

The laboratory analysis performed on the groundwater samples revealed that both samples exhibited elevated concentrations of tetrachloroethene. None of the other analyzed constituents exhibited elevated concentrations. **Table 1** provides a comparison of those constituents with elevated concentrations and the regulatory standards.

Coral Graphics
840 Broadway, Hicksville
Leaching Field Soil Sampling
Volatile Organic Compounds

Constituents	**DW-A**	**DW-B**	**DW-D**	**DW-E**	**DW-F**	**DW-G**	**DW-H**	**DW-I**	**DW-J**	**Guidance Values**	**NYSDEC TAGM 4046**
Volatiles	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**
n-Butylbenzene	ND	ND	ND	ND	ND	ND	5	ND	34	6,800	NA
sec-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	163	13	10,000	NA
tert-Butylbenzene	ND	ND	ND	ND	ND	ND	57	67	ND	6,800	NA
cis-1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	8	469	600	40
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	17	ND	600	NA
Isopropylbenzene	ND	ND	ND	ND	ND	ND	ND	144	38	5,200	NA
p-Isopropyltoluene	ND	ND	ND	ND	ND	ND	ND	81	11	7,800	NA
Naphthalene	ND	ND	ND	ND	ND	ND	ND	10	ND	10,000	13,000
n-Propylbenzene	ND	ND	ND	ND	ND	ND	11	107	70	600	NA
Styrene	ND	ND	ND	ND	ND	ND	ND	24	16	10,00	NA
Tetrachloroethene	10	50	79	6	76	35	275	**1,712**	37	2,800	1,400
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	9	5	1,400	700
1,3,5-Trimethylbenzene	72	29	9	ND	38	ND	256	**46,051**	511	5,200	N/A
1,2,4-Trimethylbenzene	ND	54	ND	ND	84	ND	401	**46,039**	131	4,800	N/A
p&m-Xylene	ND	ND	ND	ND	ND	ND	ND	23	ND	2,400	1,200
o-Xylene	ND	ND	ND	ND	5	ND	33	**2,927**	67	2,400	1,200

Bold indicates the constituent exceeds the regulatory standards.
NYSDEC STARS Memo #1 Guidance is 100 ppb for Trimethylbenzene and Xylene.

Groundwater Samples

Constituents	**GW-1**	**GW-2**	**NYSDEC Ambient Water Quality Standards & Guidance Values**
Volatiles	**ppb**	**ppb**	**ppb**
Tetrachloroethene	**37**	**76**	5

Coral Graphics
840 Broadway, Hicksville
Leaching Field Soil Sampling
Semi-Volatile Organic Compounds

Constituents	DW-J	NYSDEC TAGM 4046	NYSDEC STARS Memo #1
Semi-Volatiles	**ppb**	**ppb**	**ppb**
Phenanthrene	**5,065**	50,000	1,000
Di-n-butylphthalate	**2,965**	8,100	1,000
Flouranthrene	**9,704**	50,000	1,000
Pyrene	**7,696**	50,000	1,000
Butylbenzylphthalate	**3,611**	50,000	NA
Benzo-a-anthracene	**4,059**	224	0.04
Chrysene	**6,363**	400	0.002
Bis(2-ethylexyl)phtalate	**13,261**	50,000	NA
Benzo-b-flouroanthene	**6,568**	1,100	0.002
Benzo-k-flouroanthene	**5,003**	1,100	0.002
Benzo-a-pryene	**5,912**	61	0.002
Indeno(1,2,3-cd)pyrene	**5,719**	3,200	0.002
Benzo-g,h,i-perylene	**4,555**	50,000	0.002

Bold indicates the constituent exceeds the regulatory standards.

4.0 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES (QA/QC)

This sampling protocol was conducted in accordance with USEPA accepted sampling procedures for hazardous waste streams (Municipal Research Laboratory, 1980, Sampling and Sampling Procedures for Hazardous Material Waste Streams, USEPA, Cincinnati, Ohio EPA- 600\280-018) and ASTM Material Sampling Procedures. All samples were collected by or under the auspices of USEPA trained personnel having completed the course Sampling of Hazardous Materials, offered by the Office of Emergency and Remedial Response. Separate QA/QC measures were implemented for each of the instruments used in soil-gas and soil sampling.

Separate QA/QC measures were implemented for each of the instruments used in the Sampling and Analysis Program. Sampling instruments included a stainless steel Geoprobe with probe sections, a stainless steel hand auger, organic vapor analyzer and sample vessels.

Prior to arrival on the site and between sample locations, the probes sections were decontaminated by washing with a detergent (alconox/liquinox) and potable water solution with distilled water rinse. The organic vapor analyzer was calibrated prior to sampling using a span gas of known concentration. All sample vessels were "level A" certified decontaminated containers. Samples were placed into vessels consistent with the analytical parameters. After acquisition, samples were preserved in the field. All containerized samples were refrigerated to 4° C during transport.

A sample represents physical evidence, therefore, an essential part of liability reduction is the proper control of gathered evidence. To establish proper control, the following sample identification and chain-of-custody procedures were followed.

Sample Identification

Sample identification was executed by use of a sample tag, log book and manifest. Documentation provides the following:

1. Project Code
2. Sample Laboratory Number
3. Sample Preservation
4. Instrument Used for Source Soil Grabs
5. Composite Medium Used for Source Soil Grabs
6. Date Sample was Secured from Source Soil
7. Time Sample was Secured from Source Soil
8. Person Who Secured Sample from Source Soil

Chain-of-Custody Procedures

Due to the evidential nature of samples, possession was traceable from the time the samples were collected until they were received by the testing laboratory. A sample was considered under custody if:

It was in a person's possession, or
It was in a person's view, after being in possession, or
It was in a person's possession and they were to lock it up, or
It is in a designated secure area.

When transferring custody, the individuals relinquishing and receiving signed, dated and noted the time on the Chain-of- Custody Form.

Laboratory Custody Procedures

A designated sample custodian accepted custody of the shipped samples and verified that the information on the sample tags matched that on the Chain-of-Custody records. Pertinent information as to shipment, pick-up, courier, etc. was entered in the "remarks" section. The custodian then entered the sample tag data into a bound logbook which was arranged by project code and station number.

The laboratory custodian used the sample tag number or assigned an unique laboratory number to each sample tag and assured that all samples were transferred to the proper analyst or stored in the appropriate source area.

The custodian distributed samples to the appropriate analysts. Laboratory personnel were responsible for the care and custody of samples from the time they were received until the sample was exhausted or returned to the custodian.

All identifying data sheets and laboratory records were retained as part of the permanent site record. Samples received by the laboratory were retained until after analysis and quality assurance checks were completed.

5.0 SUMMARY AND CONCLUSION

This investigation was completed to address potential contamination of a leaching pool system located off the southwest corner of the existing building and to supplement a prior Phase I & II ESA prepared by Malcolm Pirnie. The sampling and analysis plan consisted of soil/sediment and groundwater quality testing using analytical test methods consistent with expected parameters and agency soil cleanup objectives. The following presents an evaluation of the results of this investigation.

1. Groundwater samples were collected from the northern (upgradient) and southern (down gradient) property boundaries. These groundwater samples were sent to a certified laboratory for analysis of volatile organic compounds. The analysis results indicated that none of the constituents analyzed were elevated or exceeded NYSDEC standards established pursuant to Ambient Water Quality Standards & Guidance Values, except for tetrachloroethene. Both the up and down gradient groundwater samples exceeded the 5 parts per billion standard indicating a potential for regional and/or off-site groundwater contamination.

2. The subsurface leaching pool system consisting of two (2) filled in pools and six (6) leaching pools is located off the southwest corner of the building. All of these eight (8) leaching pools were sampled and analyzed for the presence of volatile organic compounds. The analytical results indicated that DW-A through DW-H exhibited slightly elevated concentrations of tetrachloroethene, 1,3,5 trimethylbenzene, 1,2,4 trimethylbenzene and xylene. DW-I exhibited slightly elevated concentrations of numerous analyzed constituents and concentrations of tetrachloroethene, 1,3,5 trimethylbenzene, 1,2,4 trimethylbenzene and xylene which exceeded the regulatory standards.

The subject property has been evaluated consistent with standard practice for the industry. This Limited Phase II ESA addresses only the specific areas of the site tested and can only provide conclusions regarding the subsurface soil quality in those specific areas tested. The Limited Phase II ESA report is limited to the evaluation of on-site conditions at the time of completion of the field sampling program.

Based on the findings of this Limited Phase II ESA, additional sampling and site investigation is recommended in order to define the soil contamination present on-site and extent of the groundwater contamination present beneath the site.

Date of Completion

Charles J. Voorhis, CEP, AICP
Project Manager

6.0 REFERENCES

New York State Department of Environmental Conservation (NYSDEC), 1992, Sampling Guidelines and Protocols, Technology Background and Quality Control/Quality Assurance for NYSDEC Spill Response Program, NYSDEC, Albany, New York.

NYSDEC, 1993, Spill Technology and Remediation Series (STARS), Memo 1, Guidance Document for Petroleum Contaminated Soils, NYSDEC, Albany, New York.

NYSDEC, 1994, Technical Administrative Guidance Memorandum, HWR-94-4046, Determination of soil cleanup objectives and cleanup levels, Division of Hazardous Waste Remediation, Albany, New York.

Suffolk County Department of Health Services (SCDHS), 1998, Standard Operating Procedure for the Administration of Article 12 of the Suffolk County Sanitary Code Article 12 ~ SOP 9-95 Pumpout and Soil Cleanup Criteria, Yaphank, New York

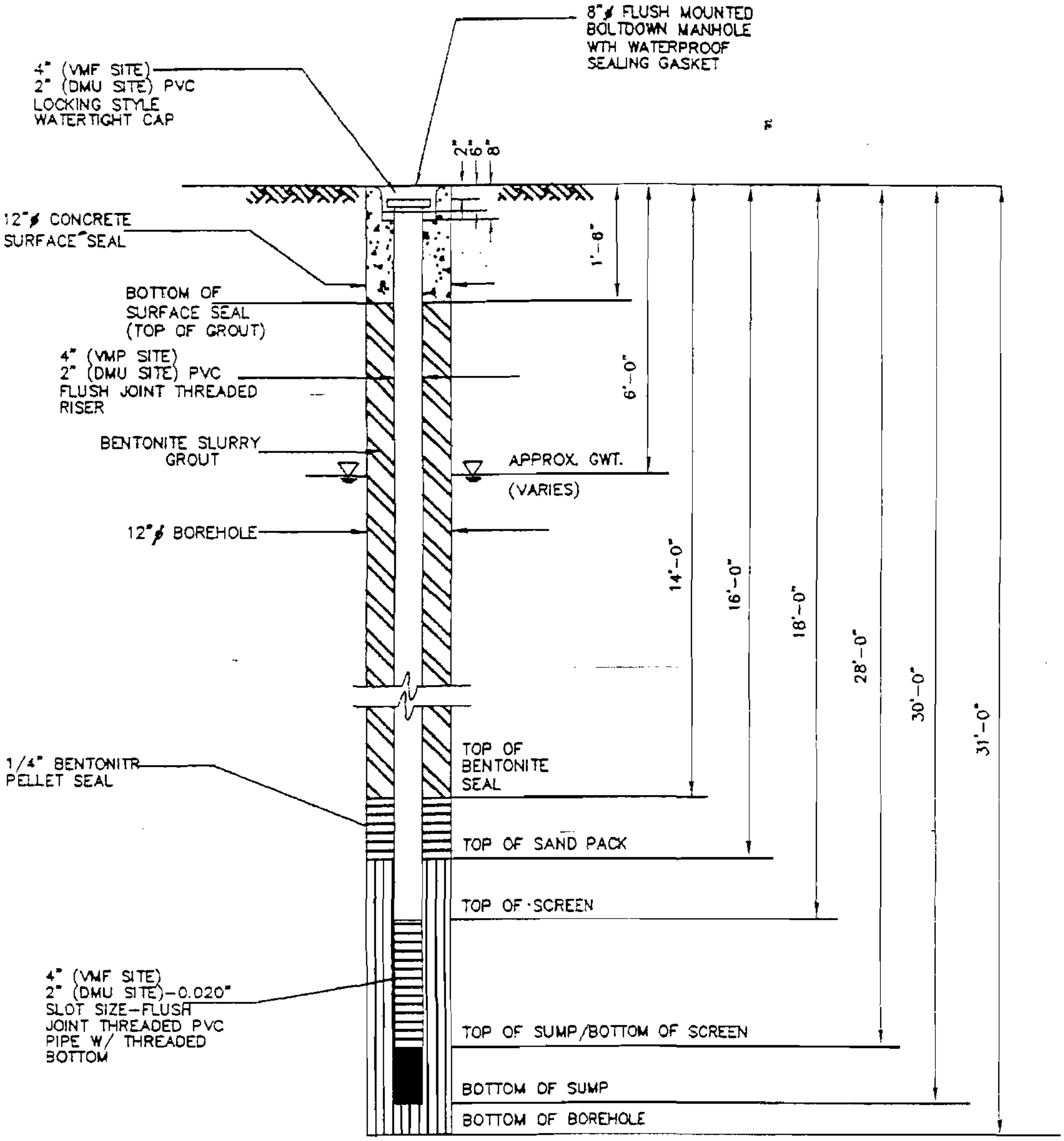
Appendix A-1 Addendum

This addendum has been provided to address comments issued by the New York State Department of Health regarding the two (2) transformers which service the 840 South Broadway facility. Both transformers are currently in use and actively service the facility. The potential for human exposure is severely limited since both are sealed and properly maintained. No leaks, discharges or ruptures have been reported during the use of each.

Appendix B

Monitoring Well Specifications

MONITORING WELL INSTALLATION AND CONSTRUCTION DETAIL



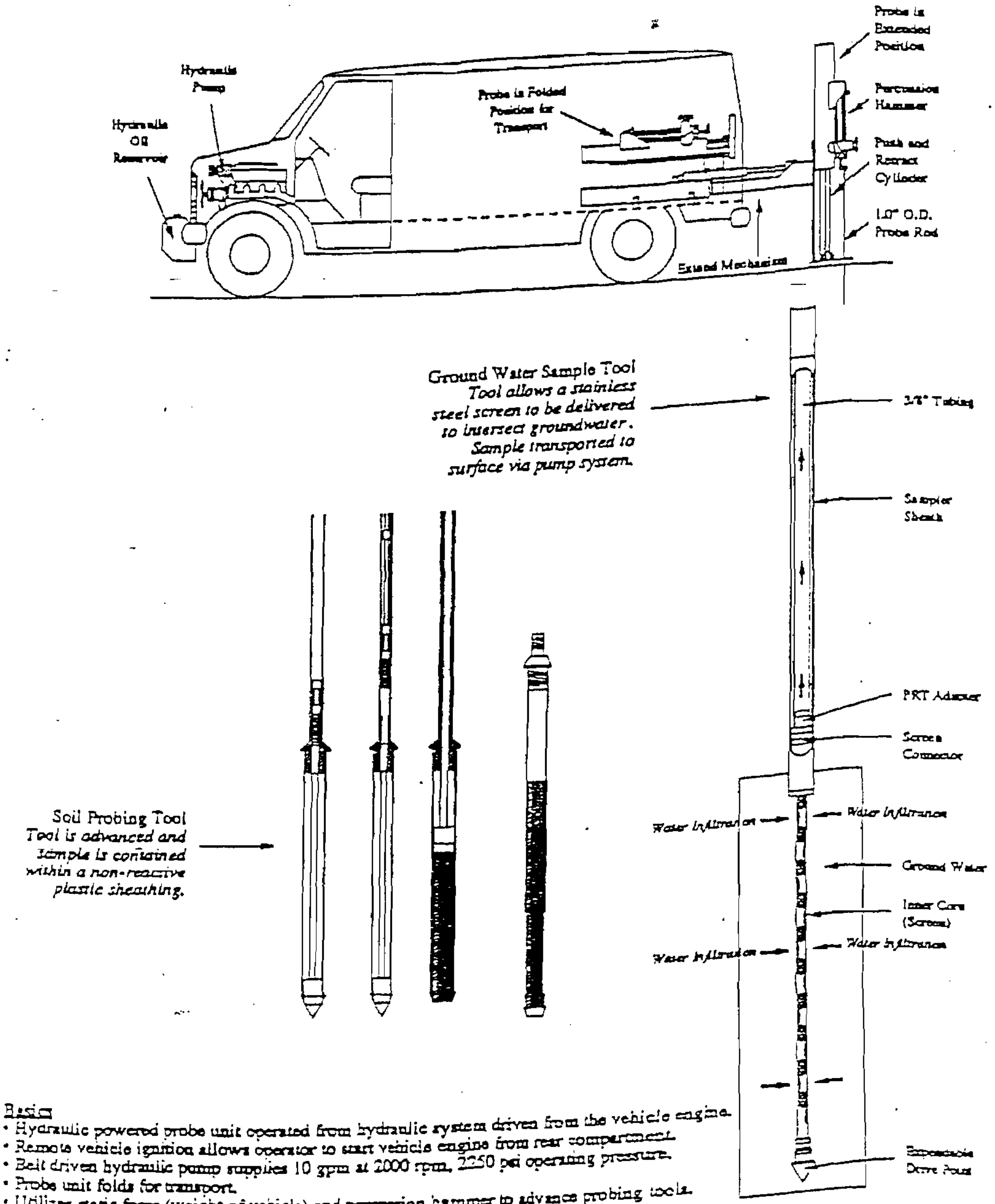
NOT TO SCALE

Groundwater monitoring wells will be installed in accordance with standard industry practice for water quality monitoring well installation. Boreholes will be constructed by use of a Hollow stem auger, by a contractor experienced in monitoring well installation, and supervised by the quality assurance office in charge of field operations. Auger sections will be decontaminated prior to arrival on site and between well installations using an alconox detergent solution and water rinse. Decon will be per Section 13.6, which specifies large equipment will be decontaminated by the contractor by steam cleaning prior to leaving the site. Wells will be installed such that the top of the screen will extend approximately 12' below the water table. The bottom of the borehole will be filled with 12" of clean granular sand packaged for monitoring well installations and used as a new product on site. Wells will consist of two (2) inch diameter PVC components at the DMU site and four (4) inch diameter pvc components at the vmf site including: a 0.20 inch slot size screen, riser, and locking stye watertight cap. All joints will be threaded with no use of glues or adhesives. All well components will be new materials which will remain as packaged from the manufacturer/distributer until used on site. Wells will be constructed with a sand pack above the top of the screen, topped by a 1/4" pellet bentonite seal, topped by bentonite slurry grout to fill the borehole. The well will be finished with an 18" concrete surface seal, and an 8" diameter flush mounted baltdown mannole with wterproof sealing gasket, labeled "monitoring well." Monitoring well construction detail is provided in the figure above.

Appendix C

Geoprobe Specifications Diagrams

GEOPROBE SAMPLING APPARATUS



Basics
- Hydraulic powered probe unit operated from hydraulic system driven from the vehicle engine.
- Remote vehicle ignition allows operator to start vehicle engine from rear compartment.
- Belt driven hydraulic pump supplies 10 gpm at 2000 rpm, 2250 psi operating pressure.
- Probe unit folds for transport.
- Utilizes static force (weight of vehicle) and percussion hammer to advance probing tools.
- 8 horsepower hydraulic hammer delivers over 1800 blows per minute.
- Hammer features 0-300 rpm Lh directional rotary function for drilling surface pavements.
- Probes have greater than 12,000 pounds of pulling capacity.
- Drives small diameter (1.0" O.D.) probing tools to depths of over 30'.

SOIL GAS SAMPLING

- POST-RUN TUBING
- PERMANENT IMPLANTS
- STANDARD SYSTEM
- VACUUM/VOLUME SYSTEMS

penned by Team Geoprobe

Geoprobe Systems has had a lot of experience with soil gas. Our soil probing machines were initially designed specifically for soil gas sampling. Our first set of tools were manufactured to extract vapor samples from our backyard.

Before the Geoprobe was available, most soil gas collection was done by manually advancing NPT pipe into the ground surface using a slam bar, often followed by using a car-type jack to remove the NPT pipe. Not a pretty picture, but it got the job done.

During our early years, we developed an expendable point which was driven to the depth using an expendable point holder and probe rods. Once at depth the probe rods were retracted a set distance to aid in sampling the soil gases from the created void. A gas sampling nipple was attached to the top probe rod, and a sample was collected by applying vacuum to the entire rod string and evacuating a volume equivalent to a minimum of three times the system volume. Even though this was an improvement over former methods there were still some limitations and drawbacks.

Then we developed a simple, quick, cost effective method for conducting soil gas surveys. This active sampling method is based on the Post Run Tubing (PRT) system of sample collection. Using the post run tubing and PRT adapter with O-rings eliminated concerns about system leaks at threaded joints. The PRT method also decreased labor costs, time requirements, and decontamination fluids generated for sample collection.

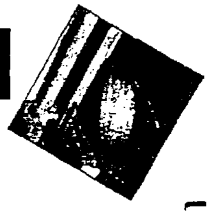
Soil gas sampling can be a powerful tool in locating and delineating contamination, and every field investigator should be familiar with its application and the basic tools available for field use. We manufacture a wide variety of soil gas sampling tools, from basic drive points to vacuum pumps. Our extensive experience and versatile probe systems have established us as a major supplier of soil gas survey systems to the environmental industry. We offer sampling systems for collection of samples through the probe rod, or through inserted tubing systems using either retractable or expendable point systems.

Soil gas sampling can do great service in determining the distribution of contaminants at a site. The advantages of soil gas sampling are that a sample can be obtained with relative ease, and that the sample is already in the gaseous phase for analysis by either GC or a gas detector. Both sampling and analysis can be done in a very short time, perhaps only 10 to 15 minutes for each operation, and the investigator is returned a valuable, if qualitative, piece of information concerning the site. The simple placement of a probe can allow the investigator to determine if a problem exists, and perhaps whether problem "A" is greater than problem "B."

Soil gas surveys can reveal various information:

- Using sufficient sampling points and appropriate analyses, it can be determined whether or not a site is contaminated with gasoline, other light hydrocarbons, or with chlorinated hydrocarbons.
- Discern the areal extent of contamination.
- Locate potential sources
- Track groundwater contamination.
- If soil gas concentrations are found to equal the saturated vapor content of the analyte, then it's a reasonable assumption that free product exists at the site.
- Compare the relative level of contamination from point to point.
- Monitor and control vapor extraction and bioremediation projects.

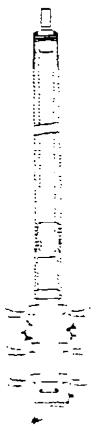
Requests for soil gas sampling tools have remained a constant for us over the years. And although this catalog is full of soil, groundwater, and sensing tools, we wanted you to know that soil gas sampling is still alive and well.



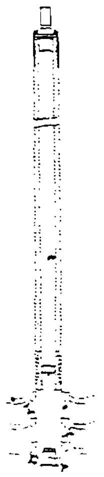
Active Sampling Options:

- Alloy Steel or Aluminum Expendable Drive Points.
- Stainless Steel Retractable Point.
- Sample through low volume Post-Run Tubing (PRT) or through alloy steel Probe Rods.
- Measure purge volume, control applied vacuum, and monitor pressure inside of the sampling train with Geoprobe's unique Vacuum/Volume System (see page 8.8).

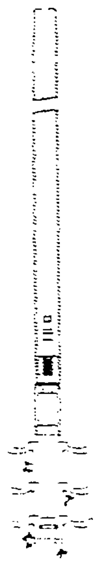
Three tip configurations for grab sampling are shown.



A.
Sampling through probe rods using an expendable point.

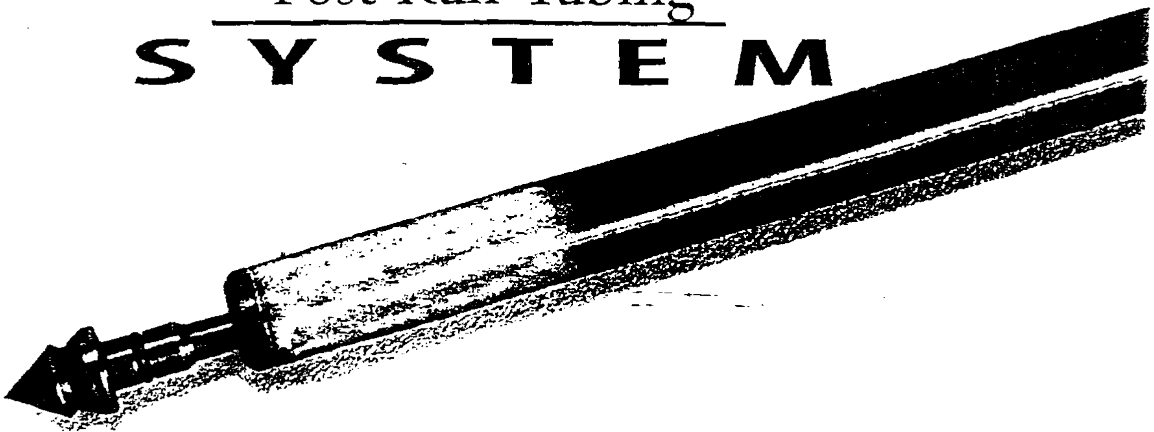


B
Sampling through probe rods using a retractable point.



C.
Sampling through inner tubing using the PRT system.

Post Run Tubing SYSTEM

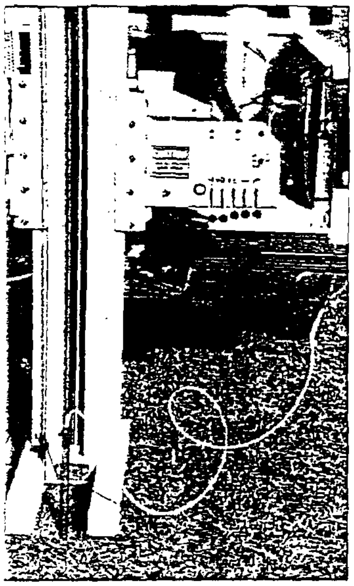


An Inner Tubing System inserted AFTER the probe rods are driven to depth ...

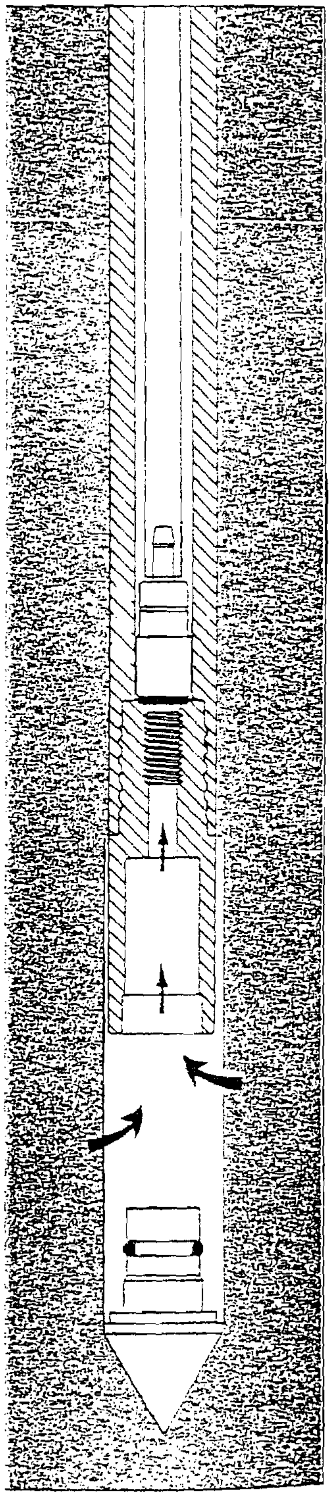
- Increases speed and accuracy of soil gas sampling.
- Eliminates problems associated with rod leakage and sample carryover.
- Utilizes simple design for ease of use and vacuum-tight probing.
- Sampling train and all connections can be checked to verify leak-free status.
- Requires no management of inner tubing during probing.

The Post-Run Tubing System

The Post-Run Tubing System (PRT) allows the user to collect soil vapor samples quickly and easily at the desired sampling depth WITHOUT the time-consuming complications associated with rod leakage and contamination. O-ring connections enable the PRT system to deliver a vacuum-tight seal that prevents sample contamination from UP hole, and assures that the sample is taken from the desired depth at the BOTTOM of the hole. The sample is drawn through the point holder, through the adapter, and into the sample tubing. The tubing can be replaced after each sample, thus eliminating sample carryover problems and the need to decontaminate the probe rods. The resulting time-savings translates into a higher productivity rate for you and your client.



Using the Post-Run Tubing (PRT) system for soil vapor sampling.



A cross section of the PRT System showing how soil gas (arrows) is drawn through the inner tubing system.

Sampling Methods

Some of the more common methods of active soil gas sample collectioninclude:

- Direct sampling from the PRT using a gas chromatograph-compatible syringe used when the Geoprobe van is equipped with a mobile laboratory and gas chromatograph for immediate analysis of the collected samples.

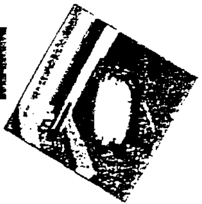
- Inline sampling using glass sampling bulbs or Tedlar bags. The sampling device is placed inline, between the PRT adapter and the vacuum/volume system. As the sampling system is purged, soil gas is trapped in the bulb or bag. These samples may be stored for limited periods of time and either analyzed on site or at an off-site laboratory.

- Summa cannisters, pre-evacuated steel devices that are connected to the surface end to the PRT tubing, also provide another sampling option for soil gas. A valve on the canister is opened and the vacuum inside the canister pulls in soil gases from the sample interval. This system is expensive and is usually reserved for sending samples to an off-site laboratory for specialized analyses or quality control purposes.

FIELD QUESTION . . .

Q. Is it possible to use a retractable point with the PRT system?

A. *Yes. You will need a Retractable Point (AT21B) with a PRT Retractable Point Holder (PR21B). See page 8.*



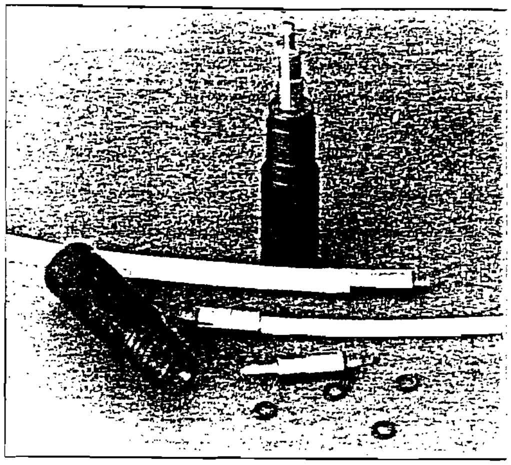
A Simple Sampling System

The downhole components of the PRT system include:

- Tubing, either polyethylene, Teflon®, or stainless steel
- Probe rods
- PRT adapter
- Expendable point holder
- Expendable point

O-ring seals are used on the PRT Adapter and the expendable point holder to provide a leak-proof system that assures sample integrity. Driving the expendable point to a sufficient depth is also a requirement to be sure that leakage from the surface ambient air is eliminated and sample integrity is assured.

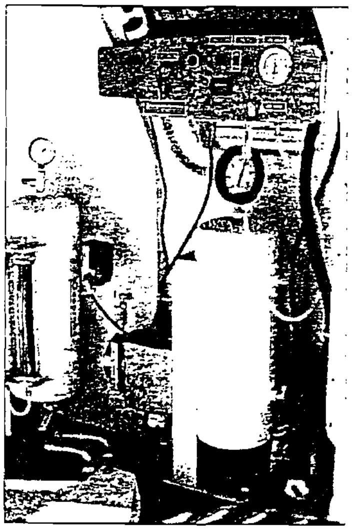
Aboveground, a Vacuum/Volume System is used to actively purge soil gas vapors from the probe cavities created when the probe rods are retracted from the expendable point. This is an eleven-liter tank with 12 volt DC diaphram pump and gauge calibrated in both tank volume and vacuum pressure. This system includes a a sampling valve, a line vacuum gauge, and a pump control switch. The vacuum tank gauge provides an accurate measurement of purge volume extracted from the probed hole. It also allows regulation of the maximum applied vacuum.



PRT SYSTEM PARTS
PRT Expendable Point Holder (PR13B), PRT Adapters, Tubing, and O-rings

PRT Applications

- Rapidly define the extent of VOC contamination in the subsurface, under appropriate conditions.
- Rapidly define potential source areas of VOC contamination over large or small areas.
- Determine the types of VOC contaminants present in the subsurface at a facility.
- Rapidly define the potential extent of groundwater contamination and down gradient migration of VOCs under appropriate conditions.
- Determine presence, extent, concentration, and types of landfill gasses (methane, carbon dioxide, etc.) present in the subsurface at active and abandoned landfills.
- Locate potential sources and delineate plumes of perchloroethylene (PCE) associated with active or abandoned dry cleaning facilities.
- Locate potential sources and delineate plumes of carbon tetrachloride (CCl_4) associated with active or abandoned grain storage facilities.
- Locate potential sources and delineate plumes of benzene, toluene, ethylbenzene, and xylenes (BTEX) associated with active or abandoned gasoline storage facilities [both underground storage tanks (UST) and aboveground storage tanks (AST)].
- Locate potential sources and delineate plumes of various chlorinated solvents, including compounds such as trichloroethane, trichloroethylene, dichloroethane and dichloroethylene, associated with active or abandoned facilities where degreasing or metal and plastic parts cleaning operations were conducted.

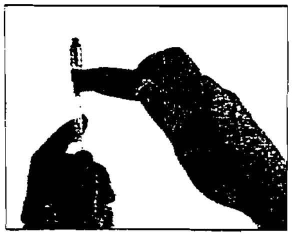


Mountable Vacuum/Volume System was designed for extraction of soil gas samples from probe cavities.

Performance Range

The PRT system has been used to collect soil gas samples from unconsolidated materials at depths ranging from near surface (1 to 2 feet) to depths in excess of 50 feet (15 m) below grade. The depth depends upon the equipment and methods used to advance the sampling point (manual, static vehicle weight, or percussion probing), the formation being penetrated, and operator experience.

Sampling Basics



Securing adapter to tubing with tape. NOTE: Tape does not contact soil gas sample.

Clean all parts prior to use. Install O-rings on the PR13B and the PRT adapter. Inspect the probe rods and clear them of all obstructions. TEST FIT the adapter with the PRT fitting on the expendable point holder to assure that the threads are compatible and fit together smoothly. Remember, PRT fittings are left-hand threaded! Push the adapter into the end of the selected tubing. Tape may be used on the outside of the adapter and tubing to prevent the tubing from spinning freely around the adapter during connection – especially when using Teflon tubing. The sample will not contact the outside of the tubing or adapter.

Drive the PRT tip configuration into the ground (Figure 1). Connect probe rods as necessary to reach the desired depth. After depth has been reached, disengage the expendable point by pulling up on the probe rods. Remove the pull cap from the top probe rod, and position the Geoprobe unit to allow room to work. Insert the adapter end of the tubing down the inside diameter of the probe rods (Figure 2). Feed the tubing down the rod bore until it hits bottom on the expendable point holder.

Allow about 2 ft. (610 mm) of tubing to extend out of the hole before cutting it. Grasp the excess tubing and apply some downward pressure while turning it in a counterclockwise motion to engage the adapter threads with the expendable point holder (Figure 3). Pull up lightly on the tubing to test engagement of the threads. (Failure of adapter to thread could mean that intrusion of soil may have occurred during driving of probe rods or disengagement of drive point.)

Figure 2. Insert adapter end of tubing down the ID of probe rods.

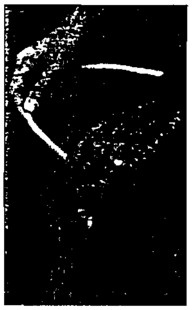


Figure 3. Engage threads by rotating tubing.

Connect the outer end of the tubing to the Silicone Tubing Adapter and vacuum hose (or other sampling apparatus). Follow the appropriate sampling procedure for collecting a soil gas sample (Figure 4). After collecting a sample, disconnect the tubing from the vacuum hose or sampling system. Pull up firmly on the tubing until it releases from the adapter at the bottom of the hole. (Taped tubing requires a stronger pull.) Remove the tubing from the probe rods. Dispose of polyethylene tubing or decontaminate Teflon® tubing as protocol dictates.

Retrieve the probe rods from the ground and recover the expendable point holder with the attached PRT adapter. Inspect the O-ring at the base of the PRT adapter to verify that proper sealing was achieved during sampling. The O-ring should be compressed. This seal can be tested by capping the open end of the point holder applying vacuum to the PRT adapter. Prepare for the next sample.

Figure 4. Taking a soil gas sample for direct injection into a GC with the PRT system.

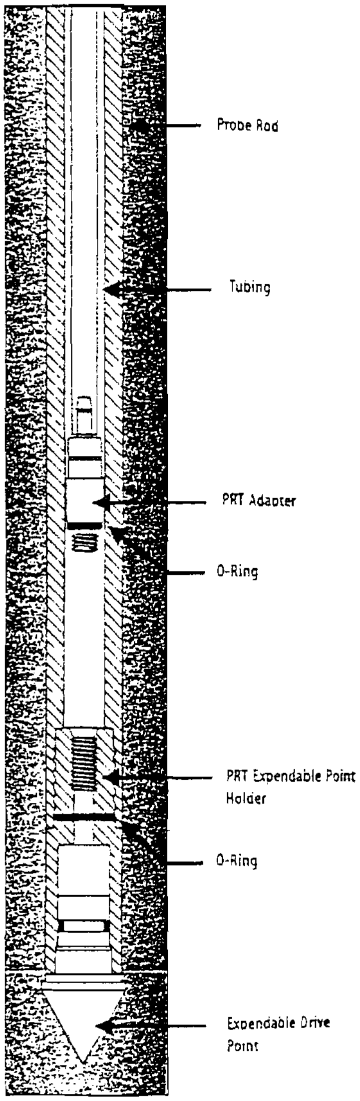
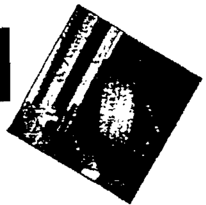
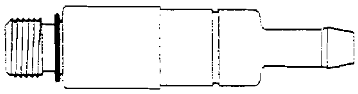
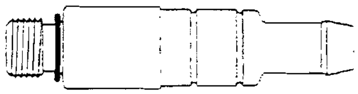


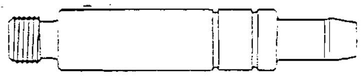
Figure 1. A cross section of probe rods that are being driven to depth and then retracted to allow for soil gas sampling. The PRT adapter and tubing are now fed through the rods and rotated to form a vacuum-tight connection at the point holder. The result is a continuous run of tubing from the sample level to the surface.



PRT Adapter Selection Guide

PRT ADAPTER (Actual Size)	RECOMMENDED TUBING SIZE	GEOPROBE TUBING PART NO.	TUBING INTERNAL VOLUME (mL/ft)	ADAPTER PART NUMBER
	1/8 in. I.D. (3,2 mm I.D.)	TB12T	2.41	PR12S
	0.17 in. I.D. (4,3 mm I.D.)	TB17L	4.46	PR17S
	3/16 in. I.D. (4,8 mm I.D.)	TB17T	5.43	
	1/4 in. I.D. (6,4 mm I.D.)	TB25L	9.65	PR25S
	5/16 in. I.D. (7,9 mm I.D.)	TB30T	15.08	PR30S

NOTE: The sorption characteristics of certain tubings may not permit their applications in all circumstances.



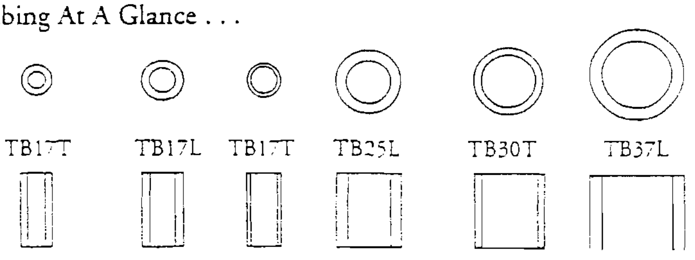
PR17D ... PRT Dummy Adapter

PRT "Dummy" Adapters

PR12D ... fits 1/8 in. (3,2 mm) ID tubing
PR17D ... fits 3/16 in. (4,8 mm) ID tubing
PR25D ... fits 1/4 in. (6,4 mm) ID tubing
PR30D ... fits 5/16 in. (7,9 mm) ID tubing

Solid PRT Adapters (no bore) fit same sizes of tubing as regular PRT Adapters. Stainless steel. For use with PR-14 Implant Anchors and selected tubing. Used for anchoring tubing to the drive point while the probe rods are retracted.

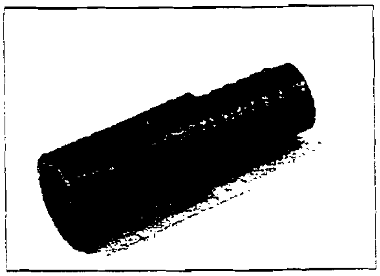
Tubing At A Glance . . .



Tubing Sizes, Materials, and Specifics detailed on pg. 8.8.

Geoprobe Systems

Basic Parts and Components



PR13B ... PRT Expendable Point Holder

Post Run Tubing System Point Holders

PR13B	PRT Expendable Point Holder
PR13R	O-Rings for PRT Point Holder, Pkg. of 25
PR21B	PRT Retractable Point Holder*
PR25R	O-Rings for PRT Adapter, Pkg. of 25

* *Retractable Point Holder Only*
Retractable Point (AT21B) is sold separately.

PR13K PRT Soil Gas Sampling Kit

PR13B	2	PRT Expendable Point Holders
PR13R	2	O-Rings for PRT Expendable Point Holder, Pkg. of 25
PR17S	4	PRT Adapters, 3/16 in.
PR25R	2	O-Rings for PRT Adapter, Pkg. of 25
TB17L	1	PRT Tubing, 1/4 in. x .170 in ID, 500 ft. Roll
AT14	100	Steel Expendable Drive Points

PRT Expendable Point Holder
PR13B

For use with the AT14 and AT14AL Expendable Drive Point and PRT System.

O-rings for PRT Expendable Point Holder
PR13R

Fits at base of probe rod threads to prevent ambient air from being pulled through the joint. Pkg. of 25.

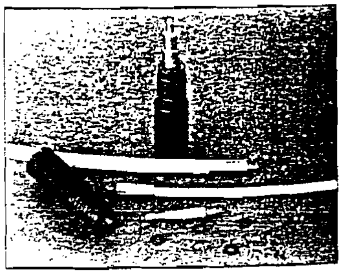
Expendable Drive Point
AT14 ... Steel
AT14AL ... Aluminum

1.1-inch (28 mm) maximum O.D., Drive Point. Point remains in soil upon retraction of probe rods leaving an open cavity for soil gas sampling. Improved design utilizes minimum tolerances to inhibit intrusion from soil flow. Optional O-ring fits in groove for even tighter sealing. Fits Geoprobe Expendable Point Holders. Reduced weight of AT14AL lowers shipping costs. No performance difference.

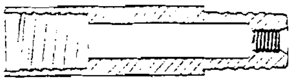
O-Rings for Expendable Drive Points
AT14R

Fits groove on Expendable Drive Points (AT14 and AT14AL). Pkg. of 25.

Steel Expendable Drive Point (AT14) with O-Ring (AT14R)



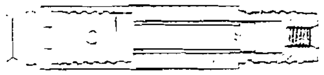
PRT SYSTEM PARTS
PRT Expendable Point Holder (PR13B), PRT Adapters, Tubing, and O-rings.



PR21B ... PRT Retractable Point Holder

PRT Retractable Point Holder
PR21B

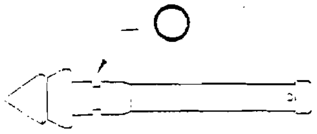
For use with the AT21B Retractable Point. Popular with manually-driven probes. AT21B Retractable Point Assembly not included.



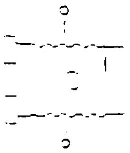
PRT Retractable Point Holder (PR21B) with Retractable Point Assembly (AT21B)

Retractable Drive Point Assembly
AT21B

Stainless steel retractable point insert with Geoprobe-threaded point holder and ball keepers. Point extends on pull-back to allow gas sampling but remains attached to holder for further probing. Point extends 2 inches (51 mm) on pull-back. Can be easily disassembled for cleaning.



AT211 ... Retractable Point Shaft and AT21R ... O-Rings



AT211B ... Retractable Point Housing and AT212 ... Ball Bearings

Sub-Assembly Parts

AT211B ... Retractable Point Housing

AT211 ... Stainless Retractable Point Shaft

AT212 ... Retractable Point Ball Bearing, Pkg. of 12.

AT21R ... O-Rings for Retractable Drive Point. Pkg. of 25.

Polyethylene Tubing (low density)

TB17L

0.17-in. ID x 1/4-in. OD (4.8 mm x 6.4 mm) with 0.040-in. (1 mm) wall tubing. Discard tubing after each sample.
500 ft. (152 m) roll.

TB25L

1/4-in. ID x 3/8-in. OD (6.4 mm x 9.5 mm) with 0.060-in. (1.5 mm) wall tubing. Discard tubing after each sample.
500 ft. (152 m) roll.

Teflon® Tubing

TB12T

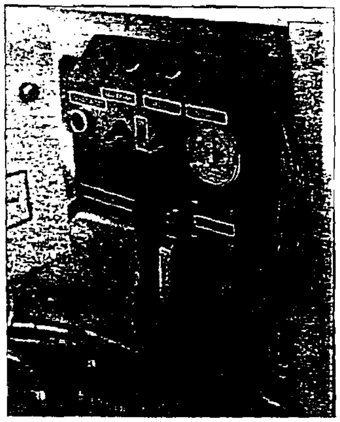
1/8-in. ID x 1/4-in. OD (3.2 mm x 6.4 mm) with 0.060-in. (1.5 mm) wall tubing. Discard tubing after each sample.
50 ft. (152 m) roll.

TB17T

3/16-in. ID x 1/4-in. OD (4.8 mm x 6.4 mm) with 0.030 in. (0.8 mm) wall tubing. Discard tubing after each sample.
50 ft. (15 m) roll.

TB30T

5/16-in. ID x 3/8-in. OD (7.9 mm x 9.5 mm) with 0.030-in. (0.8 mm) wall tubing. Discard tubing after each sample.
50 ft. (152 m) roll.



Control panel for Geoprobe's Vacuum/Volume System (AT1001) mounted in a standard pickup. The system was designed to extract soil gas vapors from probe cavities.

Tubing (PR17S shown above) is available in polyethylene and Teflon.

Silicone Tubing

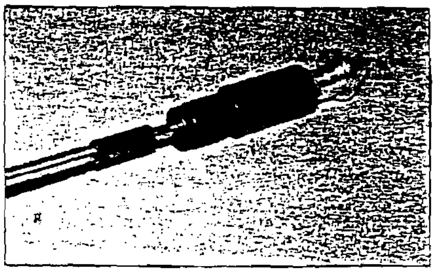
TB45SL

3/16-in. ID x 7/16-in. OD (4.8 mm x 11 mm) with 1/8-in. (3.2 mm) wall. Self-healing. Reseals itself when syringe is removed after drawing vapor sample.
25 ft. (8 m) roll.

Tygon Tubing

TB50TY

1/4-in. ID x .437-in. OD (6.4 mm x 11 mm) with 1/8-in. (3.18 mm) wall. Can also be used as a coupler for TB17L tubing.
100 ft. (31 m) roll.



The Post-Run Point Popper (PR15K) helps dislodge O-ring-sealed points down-hole.

Post-Run Point Popper

PR15K ... Point Popper & Adapter

PR15 ... Point Popper Only

Point Popper and Adapter. Use in conjunction with extension rods to dislodge O-ring sealed expendable and retractable points from point holder at the bottom of the hole. Fits through PRT point holder adapter threads. Threads onto extension rods.

Teflon® Tape

AT640T

3 in. (76 mm) wide x 3 mL thick.
100 ft. (30 m) roll.

Do You Need

Technical Support?

Sam Kincaid is just one in our fleet of Technical Service Reps ready to assist you with any probing problems or questions you may have. His first priority is to answer your questions, offer probing or tooling suggestions, and assist you in selecting the right tool for the job. With a background in teaching science classes, Sam seems to have a knack for explaining how different Geoprobe tools work. Although based in Salina, Sam keeps tabs on the fishing in Iowa, especially in the winter. Give him a call if you have questions.

Soil Gas Sampling

Gas Sampling Insert Adapter & Cap

AT153 ... Insert Adapter

AT155B ... Adapter Cap

For sampling directly through probe rods. An O-ring design enables a vacuum-tight seal when cap is tightened onto probe rod compressing the O-ring at the base of the sampling adapter.

NOTE: Probe rods should be decontaminated before sampling. Teflon tape is recommended for the probe rod joints to assure a sealed system.

O-rings for Gas Insert Adapter

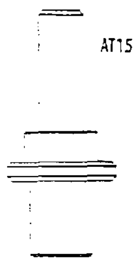
AT153R

Neoprene O-rings. Fit Gas Sampling Insert Adapter (AT153). Pkg. of 25.

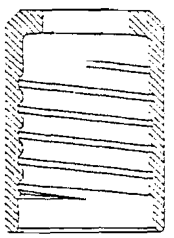
Silicone Tubing Adapter

AT118

3-inch (76 mm) section of silicone tubing and 1.5-in. (38 mm) section of polyethylene tubing. Silicone tubing fits over gas sampling adapters or PRT tubing, and connects to Geoprobe Vacuum/Volume system. Syringe needle is inserted through the silicone tubing for direct injection soil gas sampling. 10 per package.



AT153 ... Gas Sampling Insert Adapter



AT155B ... Gas Sampling Adapter Cap

Gas Sampling Cap

AT15B ... for 1.0 in. rods

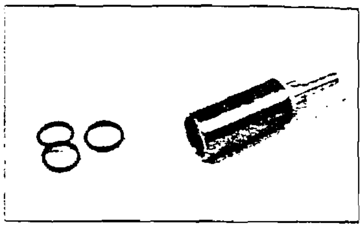
AT1265 ... for 1.25 in. rods

Geoprobe threaded top cap, supplied with a brass 0.25-in. barbed hose fitting for connection to vacuum supply.

O-rings for Gas Sampling Cap

AT15R

Neoprene O-rings. Fit inside female end of AT15B. Pkg. of 25.



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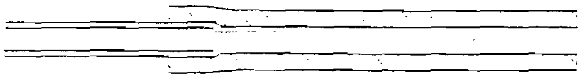
AT15B ... Gas Sampling Cap and AT15R ... O-Rings



AT118 ... Silicone Tubing Adapter

QUICK Parts REFERENCE List

Additional Tools Listing
Section 17

Using the Geoprobe R&D mobile laboratory with a Model 4200 probing machine, several soil gas sample arrays were installed during the initial stages of a long-term monitoring program at Wurtsmith Air Force Base near Oscoda, MI. The program site involves a 7.5 square mile (12 km) area, of which approximately 20 percent is contaminated with uncombusted jet fuel and chlorinated solvents. The National Center for Integrated Bioremediation Research and Development will study the natural biological processes occurring in the soil. At least five major plumes have been identified. Results of soil gas and groundwater monitoring will help define a comprehensive monitoring system for each plume.

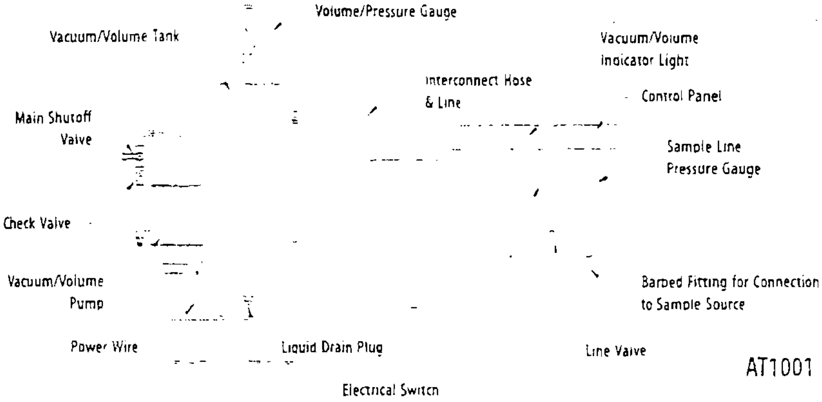
Vacuum/Volume System, Mountable

AT1001

Designed for extraction of soil gas vapors from probe cavities. Eleven-liter vacuum tank with 12 VDC diaphragm pump and gauge calibrated in both tank volume and vacuum pressure. Capable of a vacuum up to 21 in. Hg (70 centibars). Also includes a sampling valve, a line vacuum gauge, and a pump control switch. The vacuum tank gauge provides an accurate measurement of purge volume from the probed hole and allows regulation of the maximum applied vacuum. The line vacuum gauge indicates pressure at the probe head during vapor sampling.
Weight: 35 pounds (16 Kg).

Operating instructions on page 8.12.

Vacuum/Volume System (AT1000) mounted in a Geoprobe-equipped standard cargo van.

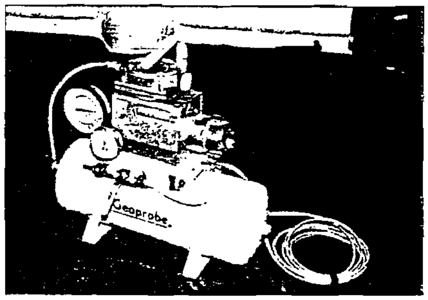


AT1001 ... Mountable Vacuum Volume System

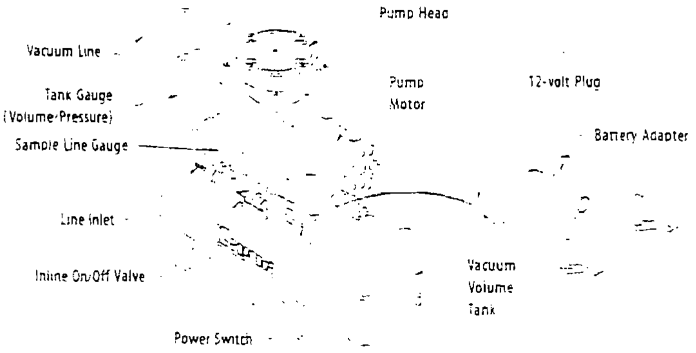
Vacuum/Volume System, Portable

AT1000

Portable version of Vacuum/Volume System. 12 VDC. Compact. Versatile. Same function as Mountable Vacuum/Volume System, different configuration. Provides mobility for the operator for vapor sampling monitoring wells at various locations without the need of a Geoprobe-equipped vehicle. Equipped with vehicle accessory plug and 10 feet (3 m) of cord.
Weight: 40 pounds (18 Kg).



AT1000 ... Portable Vacuum/Volume System



AT1000 ... Portable Vacuum Volume System

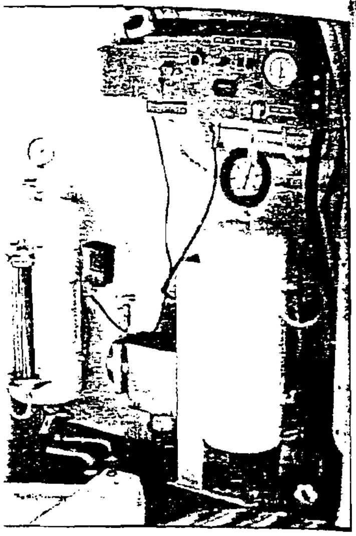
Operating Instructions for Vacuum/Volume System

The Vacuum/Volume system allows the operator to perform several functions necessary for the successful sampling of soil gas and thereafter, the interpretation of soil gas data. These functions include:

- Measurement of the volume of gas extracted at a sample point.
- Measurement of the initial vacuum applied to a sampling point.
- Measurement of the time for a sampling point to return to atmospheric pressure after a vacuum has been applied.

Note that the vacuum pump is not operated during the sampling process. Instead, the vacuum pump is operated between sampling points to return the vacuum tank on the system to the initial vacuum pressure. The change in pressure of the vacuum tank is then used to indicate the volume of sample gas being added to the tank. This change in gas volume is indicated on the outer scale of the tank pressure gauge.

Instructions provided in this section are for the operation of the Vacuum/Volume system only and assume that the operator is educated in the proper connection of the sampling train to a soil gas sampling point.

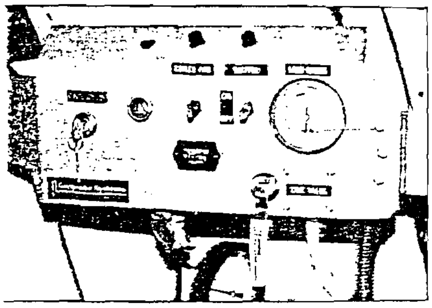


Mountable Vacuum/Volume System was designed for extraction of soil gas samples from probe cavities.

Operation

Follow these steps after probe rods have been driven to sampling depth and the expendable or retractable point has been disengaged, or after the PRT tubing has been attached.

1. Turn the vacuum pump on and allow vacuum to build in the vacuum tank. Make sure that the line valve is closed before starting the pump. The inside scale of the vacuum gauge is calibrated in kPa or in. Hg. The outside scale is calibrated for volume in liters (at standard temperature and pressure). Pump the tank down to the desired vacuum and turn the switch off.



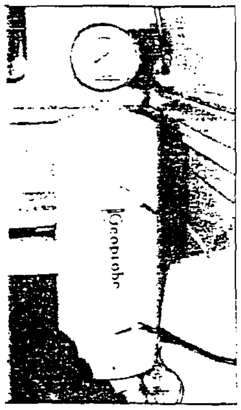
Vacuum/Volume control panel with line control valve and line pressure gauge from Geoprobe-equipped standard cargo van.

2. Attach vacuum hose to the top of the soil vapor sampling train (i.e. to sampling cap on top of probe rods or to PRT tubing).

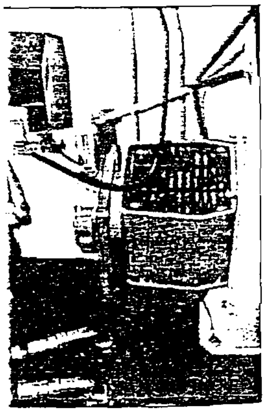
3. Open line control valve. If sampling through probe rods, evacuate 100 mL of volume for each rod used. Some protocols may call for a minimum of 3 purge volumes to be evacuated before sampling (i.e. 9-foot (3 m) depth = 3 rods x 100 mL x 3 = 900 mL). If using PRT tubing, evacuate appropriate volume to purge ambient air in the system. You may choose to purge a standard volume at each sample location.

4. After achieving sufficient purge volume, quickly close the line valve and allow sample line pressure to return to zero (0). This returns the sampling train to atmospheric pressure. The sample can be collected at this time.

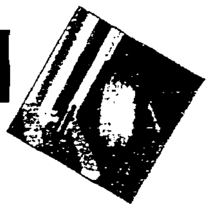
5. Syringe aliquots of soil gas sample are normally sampled from a silicone tubing adapter inserted in the sampling train between the top of the probe rod and the system line valve.



Vacuum/Volume System tank and gauge.



12 VDC Vacuum Pump.



Tom's Vacuum/Volume Pointers & Tips

Tom Christy
Geoprobe

✓ It's advisable to always begin the sampling process using the same initial tank pressure. Many operators begin the sampling process with the initial tank vacuum pressure set at 70 kPa or 21 in. Hg (70 centibars). This method creates equal disturbance with respect to the applied pressure change at each sampling point.

✓ If the sampling point does not yield (tank volume does not change over time), then the probe rods should be pulled up while the vacuum system is still attached. This is best performed using the PRT system and rod grip pull system. Pull the probe rods up until the tank pressure begins to change.

✓ Once the prescribed volume of soil gas has been removed, the line valve is shut and the sampling train is allowed to return to atmospheric pressure. The time required for the return to atmospheric pressure to occur is dependent upon the soil permeability. It's a good idea to record the time required to return to atmospheric pressure in the field notes.

✓ Be sure to watch the sample line and shut off the line valve at first sign of water coming up the line. Sucking water up the line is not uncommon, especially in cases where the position of the water table is not well known.

✓ Always have a method for checking the integrity of the sampling train for leaks. Assemble the sampling train, plug its sampling end, apply vacuum, and monitor for decay of vacuum as a sign of leakage.

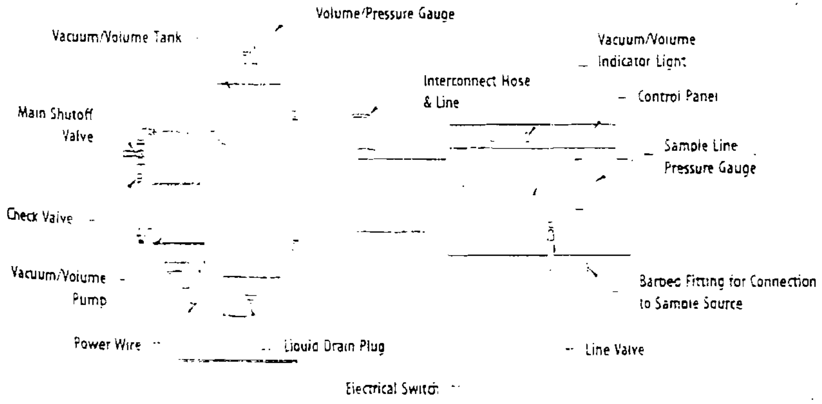
✓ The drain plug at the bottom of the Vacuum/Volume tank should be periodically removed to check for water in the tank.

✓ The Vacuum/Volume tank should be periodically pumped down and the system shut in (the line valve closed). Monitor the tank pressure for one-half hour. This pressure will remain constant if the system is free of leakage. If leakage does occur it may be the result of damaged tubing or loose fittings. Leakage through the valves of the pump can be diagnosed by closing the Main Shut-off Valve on the pump.

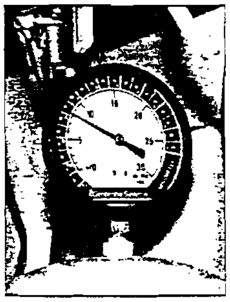
✓ If the needle on the line gauge does not return to atmospheric pressure after the line valve is shut (which disconnects the vacuum source), it may indicate that the soil at the sampling depth is saturated or that the pore space is too tight to yield a sample. It could also indicate that the sampling train is plugged.

✓ If the needle moves back to zero very quickly, it indicates that the soil at the sampling depth is very permeable or that there is a leak in the sampling train. You can check for leaks by laying out the sampling train and plugging the sampling end with a rubber stopper and applying a vacuum to it. You may want to do this before sampling.

✓ In some soils, the needle may return to zero very slowly once the valve line is shut. The time it takes for the needle to return to zero is called the "recovery" time. It should be noted for each sample taken. This information will allow relative comparison of soil permeability. Recovery times greater than 10 minutes should be considered suspect as the effect of any leakage in the sampling system is increased with longer recovery times. After 10 minutes, the operator should consider either changing the sampling depth, location, length of pullback from the sampling tip, or switching entirely from soil gas sampling to grab sampling and analysis of soil.



AT1001 ... Mountable Vacuum Volume System



Vacuum gauge calibrated in kPa and volume in liters.

SOIL GAS SAMPLING TOOLS

Post Run Tubing System Point Holders

PR13B .... PRT Expendable Point Holder
PR13R .... O-Rings for PRT Point Holder, Pkg. of 25
PR21B .... PRT Retractable Point Holder
PR25R .... O-Rings for PRT Adapter, Pkg. of 25

Drive Points

AT14 .... Expendable Drive Points, Steel
AT14 .... Expendable Drive Points, Aluminum

PRT "Dummy Adapters"

PR12D .... Fits 1/8-in. ID Tubing
PR17D .... Fits 3/16-in. ID Tubing
PR25D .... Fits 1/4-in. ID Tubing
PR30D .... Fits 5/16-in. ID Tubing

PRT Adapters

PR12S .... Fits 1/8-in. ID Tubing
PR17S .... Fits 3/16-in. ID Tubing
PR25S .... Fits 1/4-in. ID Tubing
PR30S .... Fits 5/16-in. ID Tubing

PRT Accessories

PR15 .... Post-Run Point Popper
PR15K .... Post-Run Point Popper Kit

Standard Soil Gas Sampling System

AT1265 ...... Gas Sampling Cap, for 1.25-in. probe rods
AT15B .... Gas Sampling Cap, for 1.0-in. probe rods
AT15R .... O-Rings for Gas Sampling Cap, Pkg. of 25
AT153 .... Gas Sampling Insert Adapter
AT155B ..... Gas Sampling Insert Adapter Cap
AT153R ..... O-Rings for Gas Insert Adapter, Pkg. of 25

PR13K PRT Soil Gas Sampling Kits

PR13B ..... 2 .... PRT Expendable Point Holders
PR13R ..... 2 .... O-Rings for PRT Exp Point Holder, Pkg. of 25
PR17S ..... 4 .... PRT Adapters, 3/16-in.
PR25R ..... 2 .... O-Rings for PRT Adapter, Pkg. of 25
TB17L ..... 1 .... Poly Tubing, 1/4-in. x 0.17-in. ID, [illegible]
AT14 .... [illegible] ..... Steel Expendable Drive Points

Tubing

Polyethylene Tubing

TB17L .... 0.17-in. ID x 0.25-in. OD, 500 ft. roll
TB25L .... 1/4-in. ID x 3/8-in. OD, 500 ft. roll

Teflon® Tubing

TB12T .... 1/8-in. ID x 1/4-in. OD, 50 ft. roll
TB17T .... 3/16-in. ID x 1/4-in. OD, 50 ft. roll
TB25T .... 1/4-in. ID x 5/16-in. OD, 50 ft. roll
TB30T .... 5/16-in. ID x 3/8-in. OD, 50 ft. roll

Silicone Tubing

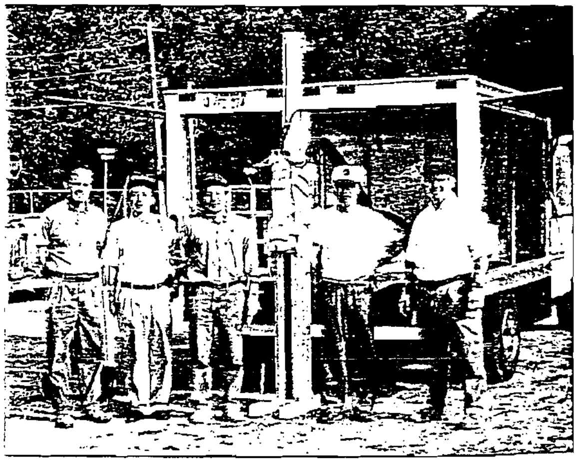
TB45SL ..... 3/16-in. ID x 7/16-in. OD, 25 ft. roll

Tygon Tubing

TB50TY .... 1/4-in. ID x 0.437-in. OD, 100 ft. roll

Silicone Tubing Adapter

AT118 .... Silicone Tubing, 3 in., and Poly Tubing, 1.5 in.



Tom (left) and Larry (right) welcome Geoprobe's representative from Japan, Ted Hamada (next to Larry) from International Business Corp., and his Tokyo guests during a Kansas visit. Guests at Geoprobe Systems are always welcome.

Geoprobe Systems

The Probes. The Tools. The Service.

Appendix D

Sections 4.0 and 6.2
Compendium of Superfund Field Operations Manual

- Sample traffic reports (e.g., Special Analytical Services (SAS); see Exhibits 5-2, 5-3, and 5-9)
- Chain-of-custody (COC) forms and records (see Exhibits 5-4, 5-5, and 5-6)
- Receipt-for-samples forms (varies among EPA regions; see Subsection 4.7 and Exhibit 4-3)
- Field Investigation Team (FIT) receipt (for sample forms and field notebooks not serially numbered by the U.S. EPA)
- Field notebooks
- Airbills or bills of lading
- Dioxin analysis forms (as applicable)
- Photographic logs

Subsection 4.6 describes procedures for these records; Subsection 5.1.6 shows completed exhibits of the first three items.

4.6 PROCEDURES

Sample identification documents must be prepared to maintain sample identification and chain of custody. The following are sample identification documents:

- Sample identification tags
- Sample traffic reports
- Chain-of-custody records
- Receipt-for-samples forms
- Custody seals
- Field notebooks

These documents are usually numbered (serialized) by EPA. Some varieties of custody seals, field notebooks, or photographic logs may not be serialized.

The following additional forms are used for samples shipped to CLP laboratories:

- Organic traffic reports
- Inorganic traffic reports
- High-hazard traffic reports
- SAS request forms
- Dioxin shipment records (as applicable)

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- SAS request forms
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Completed examples of these forms are in Subsection 5.1.6 of this compendium.

The organization's document control officer (designated on exhibits in this subsection as the Regional Document Control Officer or RDCO) or another designated person maintains a supply of the documents listed above, including field notebooks. The document control officer is responsible for the inventory of serialized documents and the assignment of these documents to specific projects. Unused field documents are usually returned to the document control officer at the end of the field sampling event. The document control officer notes the return of these documents in the serialized document logbook. In some EPA regions, unused field documents are retained by the sampler to whom they were originally assigned for use on future projects. The sampler maintains a personal logbook in which is recorded the final disposition of all relevant field information. Unused, returned documents may be checked out to another project by the RDCO, as needed. A cross-reference of serialized field documents is usually maintained for each project in the project files. A sample cross-reference matrix is shown in Exhibit 4-1.

The document control officer orders sample identification tags, receipt-for-samples forms, custody seals, and chain-of-custody records from the EPA regional offices. Traffic reports and SAS request forms are obtained through the Sample Management Office (SMO) representative.

Exhibit 4-2 shows how the sample control documents can be integrated into the document control procedures used in an EPA project. The procedures for using each document are discussed below. Subsection 4.7 discusses regional variations; however, because procedures change and vary from region to region, the EPA Regional Sample Coordinating Center (RSCC) should be contacted during the planning of field activities to obtain the most current procedures. Appendix A of the User's Guide to the CLP contains a directory of RSCC contacts and telephone numbers.

4.6.1 SAMPLE IDENTIFICATION TAGS

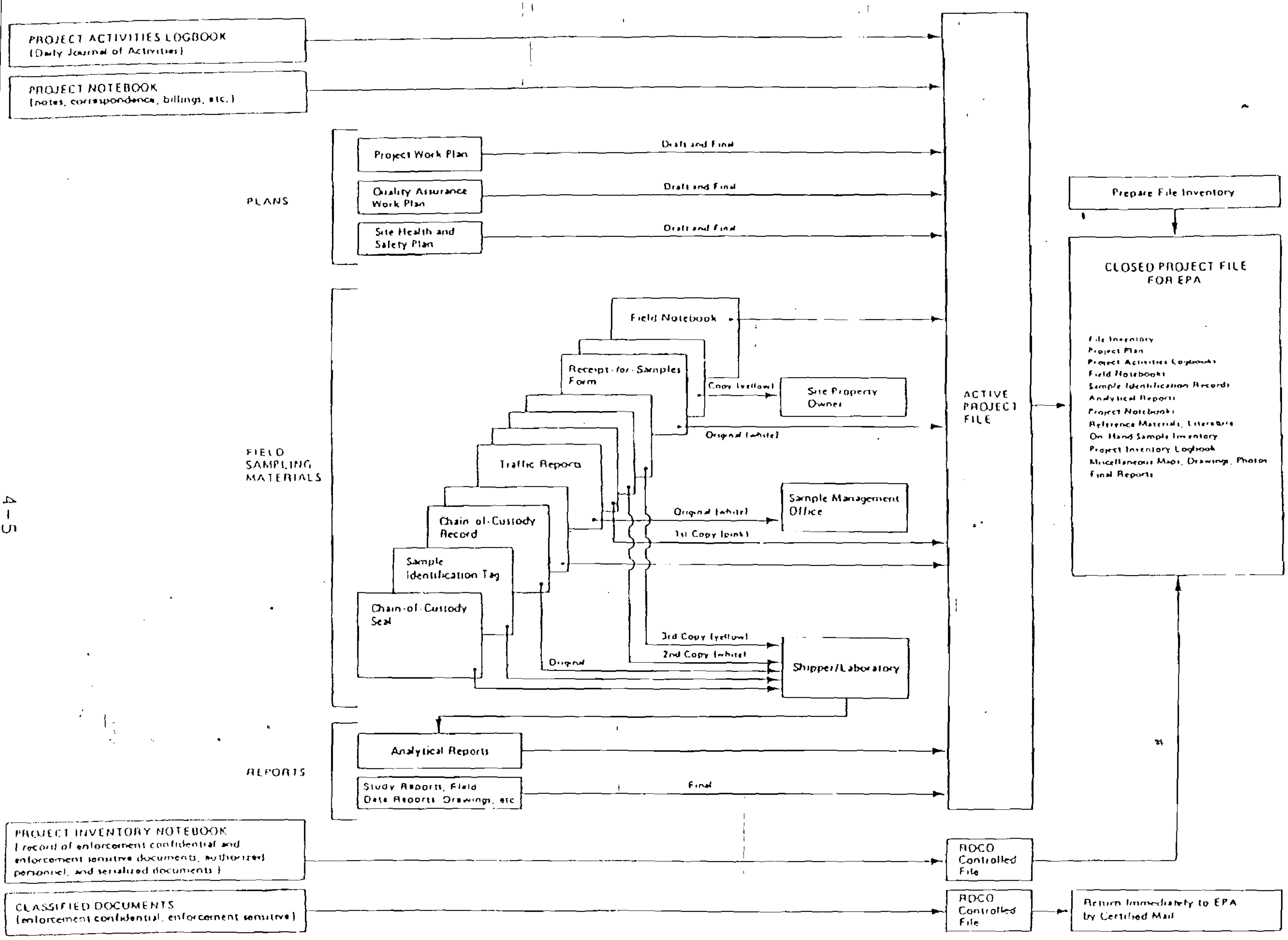
Sample identification tags (see Exhibit 5-7) are distributed as needed to field workers by the SM (or designated representative). Procedures vary among EPA regions. Generally, the EPA serial numbers are recorded in the project files, the field notebook, and the document control officer's serialized document logbook. Individuals are accountable for each tag assigned to them. A tag is considered to be in an individual's possession until it has been filled out, attached to a sample, and transferred to

Exhibit 4-1

CROSS-REFERENCE MATRIX FOR SERIALIZED DOCUMENTS

Sample Station	Sample Identification Tag Number	Type of Analysis	Organic Traffic Report Number	Inorganic Traffic Report Number	High-Hazard Traffic Report Number	Dioxin Forms	Chain-of-Custody Record Number	Receipt-for-Samples Form Number	Airbill Number	Date Shipped

Exhibit 4-2
DOCUMENT CONTROL PROCEDURES



NOTE Special analytical service forms are distributed as follows

Original (white) - SMO
1st Copy (yellow) - Active Project Files
2nd & 3rd Copies (pink & gold) - Shipper/Laboratory

another individual along with the corresponding chain-of-custody record. Sample identification tags are not to be discarded. If tags are lost, voided, or damaged, the facts are noted in the appropriate field notebook, and the SM is notified.

Upon the completion of the field activities, unused sample identification tags are returned to the document control officer, who checks them against the list of assigned serial numbers. Tags attached to those samples that are split with the owner, operator, agent-in-charge, or a government agency are accounted for by recording the serialized tag numbers on the receipt-for-samples form (Exhibit 4-3). Alternatively, the split samples are not tagged but are accounted for on a chain-of-custody form.

Samples are transferred from the sample location to a laboratory or another location for analysis. Before transfer, however, a sample is often separated into fractions, depending on the analysis to be performed. Each portion is preserved in accordance with prescribed procedures (see User's Guide to the CLP and Section 6 of this compendium) and is identified with a separate sample identification tag, which should indicate in the "Remarks" section that the sample is a split sample.

The following information is recorded on the tag:

- CLP case/SAS number(s). The unique number(s) assigned by SMO to identify the sampling event (entered under "Remarks" heading)
- CLP sample number. The unique sample identification number (from the TR, DSR, or PL) used to document that sample (entered under "Remarks" heading)
- Project code. An assigned contractor project number
- Station number. A unique identifier assigned to a sampling point by the sampling team leader and listed in the sampling plan
- Date. A six-digit number indicating the year, month, and day of collection
- Time. A four-digit number indicating the local standard time of collection using the 24-hour clock notation (for example, 1345 for 1:45 p.m.)

n Agenc

620 Union Avenue
Holtsville, NY 11742

RECEIPT FOR SAMPLES

PROJECT NO	PROJECT NAME	Name of Facility
SAMPLER(S): *(Signature)*		Facility Location
Split Samples Offered ( ) Accepted ( ) Declined		

Station Number	Date	Time	Comp.	Grab	Split Samples	Tag Numbers	Station Description	No. of Containers	Remarks

Transferred by *(Signature)*		Received by: *(Signature)*		Telephone Number
Date	Time	Title	Date	Time

Distribution: Original to Coordinator Field Files; Copy to Facility

- <u>Station location</u>. The sampling station description as specified in the sampling plan
- <u>Samplers</u>. Each sampler's name and signature
- <u>Preservative</u>. Whether a preservative is used and the type of preservative
- <u>Analysis</u>. The type of analysis requested
- <u>Tag number</u>. A unique serial number, stamped on each tag
- <u>Batch number</u>. The sample container cleaning batch number, recorded in the "Remarks" section
- <u>Remarks</u>. The sampler's record of pertinent information, such as batch number, split samples, and special procedures
- <u>Laboratory sample number</u>. Reserved for laboratory use

The tag used for water, soil, sediment, and biotic samples contains an appropriate place for identifying the sample as a grab or a composite, the type of sample collected, and the preservative used, if any. The tag used for air samples requires the sampler to designate the sequence number and identify the sample type. Sample identification tags are attached to or folded around each sample and are taped in place.

After collection, separation, identification, and preservation, a traffic report is completed and the sample is handled using chain-of-custody procedures discussed in the following sections. If the sample is to be split, aliquots are placed into similar sample containers. Depending on the EPA region, sample identification tags are completed and attached to each split and marked with the tag numbers of the other portions and with the word "split." Blank or duplicate samples are labeled in the same manner as "normal" samples. Information on blanks or duplicate samples is recorded in the field notebook. Some EPA regions require that laboratories be informed of the number of blanks and duplicates that are shipped, but not the identity of the quality assurance samples.

The printed and numbered adhesive sample labels affixed to the traffic reports are secured to sample containers by the sampler. Forms are filled out with waterproof ink, if weather permits. If a pen will not function because of inclement conditions, an indelible pencil may be used. If a pencil is used, a note explaining the conditions must be included in the field notebook. When necessary, the label is protected from water and solvents with clear tape.

The original is sent to the SMO. The first copy is retained for the project file. The second and third copies are sent with the shipment to the laboratory. Complete instructions for the use of traffic reports are given in the User's Guide to the CLP.

4.6.2 SAMPLE TRAFFIC REPORT (TR)

The sample documentation system for the CLP sample preparation program is based on the use of the sample traffic report (TR), a four-part carbonless form printed with a unique sample identification number. One TR and its printed identification number is assigned by the sampler to each sample collected. The three types of TRs currently in use include organic, inorganic dioxin, and high-concentration TRs. (See Subsection 5.1.6 for examples of completed TRs.)

To provide a permanent record for each sample collected, the sampler completes the appropriate TR, recording the case number, site name or code and location, analysis laboratory, sampling office, dates of sample collection and shipment, and sample concentration and matrix. Numbers of sample containers and volumes are entered by the sampler beside the analytical parameter(s) requested for particular sample portions.

4.6.3 CHAIN-OF-CUSTODY FORMS AND RECORDS

Because samples collected during an investigation could be used as evidence in litigation, possession of the samples must be traceable from the time each is collected until it is introduced as evidence in legal proceedings. To document sample possession, chain-of-custody procedures are followed.

4.6.3.1 Definition of Custody

A sample is under custody if one or more of the following criteria are met:

- The sample is in the sampler's possession.
- It is in the sampler's view after being in possession.
- It was in the sampler's possession and then was locked up to prevent tampering.
- It is in a designated secure area.

4.6.3.2 Field Custody Procedures

Only enough of the sample should be collected to provide a good representation of the medium being sampled. To the extent possible, the quantity and types of samples and the sample locations are determined before the actual fieldwork. As few people as possible should handle the samples.

Field samplers are personally responsible for the care and custody of the samples collected by their teams until the samples are transferred or dispatched properly. A person is usually designated to receive the samples from the field samplers after decontamination; this person maintains custody until the samples are dispatched.

The SM determines whether proper custody procedures were followed during the fieldwork and decides if additional samples are required.

4.6.3.3 Transfer of Custody and Shipment

Samples are accompanied by a chain-of-custody (COC) form or record (Exhibits 5-4 and 5-5). When transferring samples, the individuals relinquishing and receiving them should sign, date, and note the time on the form. This form documents sample custody transfer from the sampler, often through another person, to the analyst, who is in a mobile or contract laboratory.

Samples are packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate COC record accompanying each shipment. Shipping containers are padlocked or sealed with custody seals for shipment to the laboratory. The method of shipment, courier name(s), and other pertinent information such as the laboratory name should be entered in the "Remarks" section of the COC record.

When samples are split with an owner, operator, or government agency, the event is noted in the "Remarks" section of the COC record. The note indicates with whom the samples are being split. The person relinquishing the samples to the facility or agency requests the signature of the receiving party on a receipt-for-samples form (Exhibit 4-3) (described in the following subsection), thereby acknowledging receipt of the samples. If a representative is unavailable or refuses to sign, this situation is noted in the "Remarks" section of the COC record. When appropriate, for example, when an owner's representative is unavailable, the COC record and receipt-for-samples form should contain a statement that the samples were delivered to the designated location at the designated time. A witness to the attempted delivery should be obtained. The samples shall be secured if no one is present to receive them.

All shipments are accompanied by a COC record identifying their contents. The original form accompanies the shipment; the copies are retained by the sampler and returned to the sampling coordinator.

If nonhazardous samples are sent by mail, the package is registered, and a return receipt is requested. Note: Hazardous materials shall not be sent by mail. If samples are sent by common carrier, a bill of lading is used. Air freight shipments are sent prepaid. Freight bills, postal service receipts, and bills of lading should be retained as part of the permanent documentation for the COC records.

4.6.3.4 Laboratory Custody Procedures

Laboratory personnel are responsible for the care and custody of samples from the time they are received until the samples are exhausted or returned to the laboratory sample custodian for ultimate disposal. Laboratory-specific variations exist; however, a generally accepted laboratory chain-of-custody procedure is presented below. Any laboratory used for the analysis of samples taken in the course of EPA remedial response must have an adequate chain-of-custody procedure. This procedure is required as an exhibit in the Quality Assurance Project Plan (QAPjP) if the laboratory is not in the CLP.

A designated custodian of laboratory samples accepts custody of the shipped samples and verifies that the information on the sample identification tags matches that on the COC records. Pertinent information on shipment, pickup, courier, and condition of samples is entered in the "Remarks" section. The custodian then enters the sample identification tag data into a bound logbook, which is arranged by project code and station number.

The laboratory custodian uses the sample identification tag number or assigns a unique laboratory number to each sample; the custodian transfers the samples to the proper analyst or stores them in the appropriate secure area. A limited number of named individuals are allowed access to the sample storage area. The appropriate analysts are responsible for the samples until they are returned to the custodian.

When sample analyses and necessary quality assurance (QA) checks have been completed, the unused portion of the sample and the sample containers must be disposed of properly (see Subsection 5.2.6.4). All identifying tags, data sheets, and laboratory records are retained as part of the permanent documentation.

4.6.4 RECEIPT-FOR-SAMPLES FORM

Section 3007(a)(2) of the RCRA states "If the officer, employee, or representative obtains any samples, prior to leaving the premises he shall give to the owner, operator, or agent-in-charge a receipt describing the samples obtained and, if requested, a portion of each such sample equal in volume or weight to the portion retained." Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), contains identical requirements.

Completing a receipt-for-samples form complies with these requirements; such forms should be used whenever splits are offered or provided to the site owner, operator, or agent-in-charge. The particular form used may vary between EPA regions; an example is shown in Exhibit 4-3. This form is completed and a copy given to the owner, operator, or agent-in-charge even if the offer for split samples is declined. The original is given to the SM and is retained in the project files. In addition, the contractor must provide analytical results from the samples collected to the owner, operator, or agent in charge, as mandated in SARA.

4.6.5 CUSTODY SEALS

When samples are shipped to the laboratory, they must be placed in padlocked containers or containers sealed with custody seals; a completed example is shown in Exhibit 5-6. Some custody seals are serially numbered. These numbers must appear in the cross-reference matrix (Exhibit 4-1) of the field document and on the COC report. Other types of custody seals include unnumbered seals and evidence tape.

When samples are shipped, two or more seals are to be placed on each shipping container (such as a cooler), with at least one at the front and one at the back, located in a manner that would indicate if the container were opened in transit. Wide, clear tape should be placed over the seals to ensure that seals are not accidentally broken during shipment. Nylon packing tape may be used providing that it does not completely cover the custody seal. Completely covering the seal with this type of tape may allow the label to be peeled off. Alternatively, evidence tape may be substituted for custody seals.

If samples are subject to interim storage before shipment, custody seals or evidence tape may be placed over the lid of the jar or across the opening of the storage box. Custody during shipping would be the same as described above. Evidence tape may also be used to seal the plastic bags or metal cans that are used to contain samples in the cooler or shipping container. Sealing individual sample containers assures that sample integrity will not be compromised if the outer container seals are accidentally broken.

4.6.6 FIELD NOTEBOOKS

A bound field notebook must be maintained by the sampling team leader to provide daily records of significant events, observations, and measurements during field investigations. All entries are to be signed and dated. All members of the field investigation team are to use this notebook, which is to be kept as a permanent record. Observations or measurements that are taken in an area where contamination of the field notebooks may occur may be recorded in a separate bound and numbered logbook before being transferred to the project notebook. The original records are retained, and the delayed entry is noted as such.

Field notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during projects and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross-examination and are admissible as evidence. The field notebook entries should be factual, detailed, and objective.

4.6.7 CORRECTIONS TO DOCUMENTATION

Unless restricted by weather conditions, all original data recorded in field notebooks and on sample identification tags, chain-of-custody records, and receipt-for-samples forms are written in waterproof ink. These accountable serialized documents are not to be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on an accountable document assigned to one person, that individual may make corrections simply by crossing out the error and entering the correct information. The erroneous information should not be obliterated. Any error discovered on an accountable document should be corrected by the person who made the entry. All corrections must be initialed and dated.

For all photographs taken, a photographic log is kept; the log records date, time, subject, frame and roll number, and photographer. For "instant photos," the date, time, subject, and photographer are recorded directly on the developed picture. The serial number of the camera and lens are recorded in the project notebook. The photographer should review the photographs or slides when they return from developing and compare them to the log to assure that the log and photographs match. It can be particularly useful to photograph the labeled sample jars before packing them into shipping containers. A clear photograph of the sample jar, showing the label, any evidence tape sealing the jar, and the color and amount of sample can be most useful in reconciling any later discrepancies.

4.7 REGION-SPECIFIC VARIANCES

Region-specific variances are common; the SM should contact the EPA RPM or the RSCC before any sampling campaign to ascertain the latest procedures. Future changes in variances will be incorporated in subsequent revisions to this compendium.

4.7.1 REGION I

Region I uses a standard contractor serialized chain-of-custody form and an unnumbered chain-of-custody seal, which are placed on the outside of the shipping cooler. Numbered sample bottle labels are used for REM site work and numbered tags for FIT site work.

4.7.2 REGION II

Region II uses an unnumbered chain-of-custody form and numbered sample bottle labels for all site work. Custody seals are placed on the outside of the shipping cooler.

4.7.3 REGION III

Region III uses a serialized chain-of-custody form and numbered sampling tags. Chain-of-custody seals used by Region III are unnumbered and placed on the outside of the shipping cooler.

4.7.4 REGION IV

Region IV has a detailed procedural discussion in the Engineering Support Branch Standards Operating Procedures and Quality Assurance Manual, U.S. EPA, Region IV, Environmental Services Division, 1 April 1986.

4.7.5 REGION V

Region V uses a serialized chain-of-custody seal. Region V seals are color coded; orange is used for REM and FIT work. Seals are placed on the outside of the shipping cooler only if the samples are sent the same day as collected; otherwise, seals are placed across sample jar lids. FIT does not note whether or not samples were split on the chain-of-custody record. FIT includes the corresponding Traffic Report number under the remarks section of the tag. The bottle lot numbers or "batch numbers" are not recorded here, but on the "Chain-of-Custody form."

4.7.6 REGION VI

Region VI does not use a serialized number control system on custody seals.

4.7.7 REGION VII

Region VII personnel provide onsite sample control. Samples are logged into a computer by regional personnel. Although contractor personnel do not seal and log samples, chain of custody is followed as described above.

4.7.8 REGION VIII

Region VIII does not use a serialized number control system on custody seals.

4.7.9 REGION IX

Region IX does not use a serialized number control system on chain-of-custody seals.

4.7.10 REGION X

Region X does not use a serially numbered custody seal. Seals are signed, and the sample ID number is written on the seal.

4.8 INFORMATION SOURCES

Superfund Amendments and Reauthorization Act (SARA). Section 104(m), "Information Gathering Access Authorities."

U.S. Environmental Protection Agency. NEIC Policies and Procedures. EPA-330/9-78-001-R. May 1978. (Revised February 1983.)

U.S. Environmental Protection Agency. REM IV Zone Management Plan. Contract No. 68-01-7251, CH2M HILL and U.S. EPA.

U.S. Environmental Protection Agency. User's Guide to the Contract Laboratory Program. Office of Emergency and Remedial Response. December 1986.

U.S. Environmental Protection Agency. Zone II REM/FIT Quality Assurance Manual. Contract No. 68-01-6692, CH2M HILL and Hazardous Site Control Division.

WDR230/016

- o Store the samples so that their temperature is maintained at 4°C until the time of analysis.
- o Samples to be analyzed for TCL organics are packed in ice and shipped to the laboratory with ice in the cooler.

The following RAS samples do not require preservatives:

- o Soil or sediment samples
- o Medium- or high-concentration water samples

Exhibit 6-3 lists the preservatives used for frequently requested special analytical services.

3. The samples are shipped to the laboratory for analysis.

Exhibit 6-3
SAMPLE PRESERVATION REQUIREMENTS

Analysis	Preservation
Acidity	Cool, 4°C
Alkalinity	Cool, 4°C
Bicarbonate	Cool, 4°C
Carbonate	Cool, 4°C
Chloride	None
Chemical Oxygen Demand (COD)	H_2SO_4 to pH <2, Cool, 4°C
EP toxicity	None
Nitrogen	
Ammonia	H_2SO_4 to pH <2, Cool, 4°C
Kjeldahl, total	H_2SO_4 to pH <2, Cool, 4°C
Nitrate	H_2SO_4 to pH <2, Cool, 4°C
Nitrite	Cool, 4°C
Oil and grease	H_2SO_4 to pH <2, Cool, 4°C
Sulfate	Cool, 4°C
Solids	
Total dissolved	Cool, 4°C
Total suspended	Cool, 4°C
Total Organic Carbon (TOC)	H_2SO_4 or HCI to pH <2, Cool, 4°C
Total Organic Halogen (TOH or TOX)	Several crystals of sodium thiosulfate if chlorine is present, cool, 4°C

Refer to RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD) and SW-846 for additional information on sample preservation, recommended containers, maximum holding times, and volume requirements. EPA's Characterization of Hazardous Waste Sites, Vols. 1 and 2, and Soil Sampling QA User's Guide contain information regarding holding time criteria for soil or sediment.

6.2.2 DEFINITIONS

The definitions are the same as those in Subsection 6.1.2.

6.2.3 APPLICABILITY

The procedures described in this subsection apply to samples collected at a waste site. They must be followed whether shipping to a CLP laboratory or a noncontract laboratory.

The shipment of hazardous materials is governed by the Transportation Safety Act of 1974. Following is a list of references that detail the regulations:

- Title 49 CFR
  - Parts 100-177--Shipper Requirements and Hazardous Material Table
  - Parts 178-199--Packaging Specifications
  - Section 262.20--Hazardous Waste Manifest
- International Civil Aviation Regulations (ICAO)
  - Technical Instructions for the Safe Transport of Dangerous Goods by Air (lists mandatory international and optional domestic regulations)
- International Air Transport Association (IATA)
  - Dangerous Goods Regulations (This tariff incorporates 49 CFR, ICAO, and additional IATA regulations. Most international and domestic airlines belong to IATA and require conformance to all applicable regulations.)
- Tariff BOE-6000-D (reprint of 49 CFR with updates)

6.2.4 RESPONSIBILITIES

Detailed responsibilities are described in the procedures subsection. General responsibilities are assigned as follows:

- Site Managers will state, to the best of their knowledge, whether samples planned for collection are environmental or hazardous samples.
- Equipment manager will procure shipping supplies (metal cans, shipping labels, vermiculite, etc.) using RSCC whenever needed.
- Sampling personnel will properly label and package the samples.

12. An arrow symbol(s) indicating "This Way Up" should be placed on the cooler in addition to the markings and labels described above.

13. Restricted-article airbills are used for shipment. Exhibit 6-5 shows an example of a restricted article Federal Express airbill. The "Shipper Certification for Restricted Articles" section is filled out as follows for a flammable solid or a flammable liquid:

    - Number of packages or number of coolers

    - Proper shipping name: if unknown, use
        - Flammable solid, N.O.S., or
        - Flammable liquid, N.O.S.

    - Classification; if unknown, use
        - Flammable solid or
        - Flammable liquid

    - Identification number; if unknown, use
        - UN1325 (for flammable solids) or
        - UN1993 (for flammable liquids)

    - Net quantity per package or amount of substance in each cooler

    - Radioactive materials section (Leave blank.)

    - Passenger or cargo aircraft (Cross off the nonapplicable. Up to 25 pounds of flammable solid per cooler can be shipped on a passenger or cargo aircraft. Up to 1 quart of flammable liquid per cooler can be shipped on a passenger aircraft, and up to 10 gallons of flammable liquid per cooler can be shipped on a cargo aircraft.)

    - Name and title of shipper (printed)

    - An emergency telephone number at which the shipper can be reached within the following 24 to 48 hours

    - Shipper's signature

Note: The penalties for improper shipment of hazardous materials are severe; a fine of $25,000 and 5 years' imprisonment can be imposed for each violation. The SM or designee is urged to take adequate precautions.

Appendix E

Laboratory Qualifications

STATEMENT

OF

QUALIFICATIONS

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INTRODUCTION

Introduction

Chemtech, is a privately held, minority owned company incorporated in the State of New York. With guidance from our directors, and the dedication and experience of our management team, Chemtech has developed into a profitable multi-discipline environmental services company. Our directors, many of who are also major shareholders are acutely aware of the dynamics of our industry, the changing technology, and need for capital investment. Capital for investment in technology and expansion is mainly derived from operating profits and our shareholders. We have been successful in acquiring the necessary equipment, software and automation necessary to be a leader in the analytical community.

Chemtech provides comprehensive analytical testing services for the identification and assessment of environmental contaminates. Our services are used to meet various regulatory permitting and reporting requirements, determine compliance with both State and Federal environmental regulations and assess potential present or future environmental liabilities.

Our laboratories are designed for maximum efficiency and safety. They are equipped with state of the art automated instrumentation and computerization. Our technical staff is a highly skilled group of degreed chemists with diversified experience in environmental analysis, managed by a knowledgeable team of professionals who are dedicated to quality and customer satisfaction.

Our capabilities and technical experience extend beyond the analysis of the routine Priority Pollutants or Target Compound List of constituents. We are often called upon to design and implement analytical schemes for identifying and quantifying the presence of non-routine, unusual or esoteric compounds.

Our extensive laboratory facilities and technical expertise enable Chemtech to routinely meet our customers needs and produce timely analytical data of impeccable quality.

Chemtech's advantage lies in its commitment and ability to providing the most sophisticated accurate and timely analytical services, designed to aid and simplify it customers compliance needs at a reasonable cost.

To obtain more information regarding our environmental services, qualifications, prices, and to discuss your specific requirements, please call Mr. Joe Dockery at (201) 538 - 2700 or e-mail joe@chemtechlab.com

1.0 CAPABILITIES:

Chemtech is one of the original participants in the Environmental Protection Agency's Superfund Contract Laboratory Program (CLP), and is a multi-state certified laboratory for drinking water, ground and surface water, industrial effluent and wastewater, air, contaminated soil and solid/hazardous waste analysis. Capabilities include a variety of analytical methodologies in classical methods, metals, inorganic, microbiology and volatile and semi-volatile organic, Pesticides, PCB's, Herbicides and much more. The laboratory is available for operation in three shifts, 24 hours a day and 7 days a week, to provide timely and high-quality data.

Laboratory services include:

- Field Services and Sample Collection
  - Monitoring Wells
  - Air Sampling and Monitoring
  - Influent and Effluent, Water and wastewater
- Sample Control and Preparation
- Analysis
  - Metals (AA, ICP, CV, Hydride)
  - Organics (GC, GC/MS, HPLC, IR, TOC, TOX)
  - Classical & General Chemistry
- Waste Characterization and Treatability
- Data Management & Reporting
  - Standard, Tier I & Tier II
  - EPA, Superfund CLP
  - NYSDEC, ASP
  - Electronic Data Deliverables
  - Data Archival
- Data Validation
  - EPA & EPA Region II Certified Validation
  - NYSDEC, ASP Validation
- Legal and Regulatory Enforcement

1.1 Field Services and Sample Collection

Proper sample collection is critical to the integrity of the data resulting from analyses. Chemtech provides proper sample containers and preservatives as per the governing regulations to assist the client with proper sample collection.

Each sample collection kit includes a cooler containing all the necessary labeled bottles, Custody seals, Chain of Custody forms, preservatives and directions.

If preferred, Chemtech's field technicians can collect or direct the collection of air, water and soil samples.

1.2 Sample Control and Preparation

If sampling is performed by the client, samples are either picked up by our delivery staff or received by overnight couriers. If Chemtech is collecting the samples, they are delivered to the laboratory by the sampling staff. The sample control area is equipped with walk -in coolers (4° C) and dry storage areas for used and unused samples. The samples remain under stringent chain-of-custody control throughout the preparation, analysis and disposal process.

After analysis, any unused portion of sample, digestion or extract volumes are returned to Sample Control for storage or return to the customer. After the 30 days storage time, samples are properly disposed by licensed waste management companies in federally approved facilities.

1.3 Laboratory Analytical Services

As a full service environmental laboratory, Chemtech is capable of analyzing samples by a variety of methodologies, using various instrumentation and classical techniques.

1.3.1 Metals

1.3.1.a. Atomic Absorption Spectroscopy (AA):

After the sample preparation is completed, determination of trace concentrations of inorganic elements is performed by Atomic Absorption Spectroscopy (AA), either by Flame, Cold Vapor or Furnace techniques.

1.3.1.b Inductively Coupled Argon Plasma Spectroscopy (ICAP):

A majority of metals analyses are performed by ICAP simultaneous instrumentation. This technique can analyze each sample for up to 30 metallic elements in a single aspiration. Analytical tests routinely performed by ICAP include:

- Total Characteristic Leaching Procedure (TCLP) Metals
- Priority Pollutant Metals (PPM)
- NYSDEC, ASP
- Appendix IX Metals
- Target Analyte List (TAL) Metals (CLP and SW 846)
- Primary and Secondary Drinking Water Metals
- Metals Speciation

1.3.2 Organic

1.3.2.a Gas Chromatography/Mass Spectrometry (GC/MS)

Gas chromatography combined with a mass spectrometer detector is the most powerful tool for accurate identification and quantification of complex mixtures of organic compounds. This technique is widely used in analysis of groundwater, wastewater and soil for industrial pollutants, and in special concerns where the identity of unknown but suspected trace organic contaminants must be determined.

Chemtech offers many customized analytical services as well as the following types of standard services and analytical methods:

- USEPA Contract Laboratory Program (CLP) Methodologies
- US EPA Superfund CLP, Target Compound List Analyses (TCL)
- New York State DEC Superfund ASP Organic Analyses
- Solid Waste Manual Methodologies (SW846-8000 Series)
- Priority Pollutant Analyses (US EPA 600 Series)
- Drinking Water Analyses (US EPA 500 Series)
- Appendix IX Organic Analyses
- Identification of Tentative Compounds (TICs)

1.3.2.b Gas Chromatography (GC)

Chemtech is capable of performing many GC methods for analysis of samples suspected of containing pesticides or PCBs, or other known organic substances as a less expensive and often more sensitive (lower detection limit) alternative to GC/MS methods. Chemtech has six Gas Chromatographs with a wide range of detectors, including Halls Electrolytic Conductivity, Electron Capture, Flame Ionization and Photoionization.

All GC's are equipped with autosamplers and are integrated into a computerized data management system. These instruments are generally used for analyzing many types of organic compounds, including:

- Halogenated Volatile Organics (EPA 601, 8010)
- Aromatic Volatile Organics (EPA 602, 8020)
- Halogenated and Aromatic Volatile Organics (8021)
- Pesticides and PCB's (EPA 608, 8081/8082)
- PCB Congeners (8082)
- Chlorinated Herbicides (EPA 615, 8151)
- Organophosphorus Pesticides (EPA 8140)
- Gasoline and Diesel Range Organics (GRO/DRO EPA 8015M)
- USEPA Contract Laboratory Program Methodologies (CLP)
- NIOSH Air analysis Methods

1.3.2.c High Performance Liquid Chromatography (HPLC)

- PAHs (SW-846, Method 8310)
- Low Level Explosives (SW-846, Method 8330)

1.3.2.d TOC, TOX, TPH and IR Analysis

Samples are screened and analyzed for Total Organic Carbon , Total Organic Halides, Total Petroleum Hydrocarbons and Infra-Red (IR).

1.3.3 Classical & General Chemistry

Chemtech is uniquely qualified to process a large number of samples for a variety of limited chemistry. Chemtech's Wet Laboratory includes instrumentation such as Technicon Auto Analyzer II with multiple modules, UV-Visible Spectrophotometer, Ion Analyzers and multi distillation apparatus for cyanide and phenols analysis.

1.4 Waste Characterization and Treatability

Chemtech has extensive experience in the sampling and analysis of waste drums. The following are some of the analyses performed on these types of samples:

- Physical Characteristics
- Chemical Compositions
- Hazardous Characteristics
- Ignitability, Corrosivity Reactivity
- Toxicity Characteristic Leaching Procedure (TCLP)
- Synthetic Leaching Procedure (SPLP)
- ASTM Leaching Procedure

2.0 SAMPLING AND ANALYTICAL METHODOLOGIES

Sampling and analysis are performed using Chemtech's Standard Operating Procedures (SOP's) for analysis which are prepared based on US EPA and States Regulatory Agencies approved analytical and sampling procedures.

3.0 DATA PROCESSING AND REPORTING

The data processing and report generation department coordinates the data management requests and the assembly of a report in accordance with the specific requirements of the customer. Chemtech's data management capabilities complement its analytical services, by providing a solution for understanding, assessment and evaluation of large volume and complex analytical data.

3.1 Report Formats:

Chemtech is capable of providing different levels of reporting to meet specific regulatory and customer requirements; including standard, EPA Superfund, Contract Laboratory Protocol (CLP), NJDEP Reduced Deliverables, NJDEP Regulatory Deliverables-US EPA/CLP Methods and Non- USEPA/CLP Methods, and NYSDEC ASP formats

3.2 Electronic Data Deliverables (EDD):

Computer readable diskettes in DOS, ASCII formats are available for CLP and ASP packages. These disks can be used to directly load analytical results into most database softwares. Other customized spreadsheets EDD based on the specific projects requirements are available in other ASCII, Quattro pro, Excel, or Lotus database formats.

Chemtech can also provide ERPIMS and IRDMIS EDD in support of US Department of Defense-Air Force and Army Corps of Engineers Projects.

3.3 Data Archival/Data Retrieval

Chemtech maintains all raw data, laboratory notebooks, and other documentation pertinent to each project for three years from the date of report. Data retrieval from archives will be handled in a similar fashion to a request for analysis.

To maintain the client confidentiality, a specific written work request authorized by the original client must be submitted for retrieval of any data.

4.0 FACILITIES

Chemtech occupies over 18,000 square feet of space at 205 Campus Plaza 1, Edison, NJ. The single level facility houses the corporate headquarters as well as the laboratory facilities. The facility allows for contiguous space expansion.

Entrance to the laboratory is controlled by a security system. During regular business hours, entrance is into the Office/Reception area or directly into the sample receiving area (doorway or loading dock). After normal business hours, entrance and exit is by authorized personnel only. This entrance requires a security code.

All critical temperature areas, such as freezers, ovens, refrigerators, data processing rooms, phone and modem system rooms are closely monitored to ensure the integrity of the samples, analysis and reporting of the data. All temperatures are properly documented in the appropriate logbooks.

4.1 Sample Receipt Area

A separate portion of the laboratory equipped with hoods and adequate ventilation is designated as sample receipt area. The provided work space includes the benches with chemical resistant tops for receiving and safe handling of the coolers and samples.

4.2 Storage Area

Walking cooler and large commercial size refrigerators equipped with locks for security, are used to store the samples. Standards are stored in separate refrigerators away from the samples. The cool storage capacity is designed for simultaneous processing of large size projects.

4.3 Sample Preparation Laboratories

The sample preparation laboratories are isolated from the other sections to prevent cross contamination between the digested and undigested samples. These laboratories are equipped with four large hoods and digestion of Low, Medium and High Concentration for organic and inorganic samples according to the EPA CLP and Non-CLP methodologies.

4.4 Classical and General Chemistry Laboratory

An area encompassing over 2000 square feet and 300 square feet of bench space enables this laboratory to handle large and multi parameter projects for all matrices.

4.5 Instrumentation Laboratories

These laboratories consist of AA Lab, ICAP Lab, GC Lab and GC/MS Lab. Separated from each other and the rest of the operation, these laboratories are designed for a clean and contamination free environment to process a large number of samples for CLP and Non-CLP analyses.

4.6 Laboratory Hood Ventilation System

All hoods are monitored for air velocity and the information is logged in the logbooks. Every instrument is operated under a separate ventilation system and the entire laboratory is under negative pressure and is designed for a very safe working environment.

4.7 Chemical Hygiene Plan

Chemtech has taken all of the required steps to bring each of the division facilities into compliance with the OSHA Laboratory Standard. A site specific CHP is located at each facility. The CHP was prepared by an independent qualified consulting firm.

On site safety and hazardous substance training has been completed, as required, by the Laboratory Standard.

5.0 INSTRUMENTATION

Partial list of instruments includes:

GAS CHROMATOGRAPH/MASS SPECTROMETRY SYSTEMS

Instrumentation	Make	Model	Autosampler	Data System
GC/MS # 1 "M"	Hewlett-Packard	5971A	Arcon/Tekmar	HP Chemstation
GC/MS # 2 "V"	Hewlett-Packard	5971A	Arcon/Tekmar	HP Chemstation
GC/MS # 3 "S"	Hewlett-Packard	5971A	HP 7673	HP Chemstation
GC/MS # 4 "J"	Hewlett-Packard	5971	HP 7673	HP Chemstation
GC/MS # 5 "C"	Hewlett-Packard	5970	Tekmar	HP Chemstation
GC/MS # 6 "D"	Hewlett-Packard	5970	Tekmar	HP Chemstation
GC/MS # 7 "E"	Hewlett-Packard	5970	Tekmar	HP Chemstation
GC/MS # 8 "F"	Hewlett-Packard	5970	HP 7673	HP Chemstation
GC/MS # 9 " H "	Hewlett-Packard	5970	Tekmar	HP Chemstation
GC/MS # 10 "I"	Hewlett-Packard	5970	Precept	HP Chemstation
GC/MS # 11 "Z"	Hewlett-Packard	5970	HP7673	HP Chemstation
GC/MS # 12 "K"	Hewlett-Packard	5970	HP7673	HP Chemstation
GC/MS # 13 "L"	Hewlett-Packard	5970	Tekmar	HP Chemstation
GC/MS # 14 "N"	Hewlett-Packard	5970	HP7673	HP Chemstation
GC/MS # 15 "B"	Hewlett-Packard	5971	HP7673	HP Chemstation

GAS CHROMATOGRAPHS

Instrumentation	Make	Model	Autosampler	Detector	Data System
GC # 1	Hewlett-Packard	5890	HP7673	Dual ECD	HP Chem
GC # 2	Hewlett-Packard	5890	HP7673	Dual ECD	HP Chem
GC # 3	Hewlett-Packard	5890	HP7673A	Dual ECD	HP Chem
GC # 4	Hewlett-Packard	5890	HP7673A	Dual ECD	HP Chem
GC # 5	Hewlett-Packard	5890	HP7673A	Dual ECD	HP Chem
GC # 6	Hewlett-Packard	5890	HP7673A	Dual ECD	HP Chem
GC # 7	Hewlett-Packard	5890II	HP7673A	Dual ECD	HP Chem
GC # 8	Hewlett-Packard	5890	HP7673A	Dual FID	HP Chem
GC # 9	Perken Elmer	Autosy	PE Autosys.	Hall/PID	HP Chem
GC # 10	Tracor	540	Tekmar	Hall/PID	HP Chem
GC # 11	Varian	3400	Tekmar	PID	HP Chem
GC # 12	Tremetrics	9000	Demension	PID/Hall/FID	HP Chem

TOTAL ORGANIC HALOGENS

Instrumentation	Make	Model	Autosampler	Detector	Data System
TOX Analyzer	Mitsubishi	TOX-10E	TOX-10E	NA	Chemtech LIMS/Labtrol

HPLC SYSTEMS

Make	Model	Autosampler	Detector	Data System
Hewlett Packard	1100 (UVD)	HP Series	UV/Fluorescent	PC

ORGANIC EXTRACTION SYSTEM

Instrumentation	Make	Model	Autosampler
GPC	ABC	AS2000	ABC-1000
GPC	OI	AP-500	AP-500
Turbovap	Zymark	II	NA

SPECTROPHOTOMETERS

Instrumentation	Make	Model	Data System
ICP	Thermo Jarrell Ash	TRACE 61E	Chemtech LIMS/Labtrol
ICP	Thermo Jarrell Ash	TRACE 61E	Chemtech LIMS/Labtrol
GFAA	Perkin Elmer	5100	Chemtech LIMS/Labtrol
AACV	Spectro	Spectro Product	Chemtech LIMS/Labtrol
HG Analyzer	Leeman Labs	PS 20011	Chemtech LIMS/Labtrol
IR	Perkin Elmer	1310	Chemtech LIMS/Labtrol
UV/VIS	GBC	UV/VIS 918	Chemtech LIMS/Labtrol

GENERAL CHEMISTRY

Instrumentation	Make	Model	Data System
Ion Chromatoghraph	Millpare	CIA	PC
Auto-Analyzer	Lachat	Quik Chem	PC

6.0 STATE CERTIFICATIONS:

A. New York State, Department of Health (NYSDOH # 11376):

1. Potable Water:
2. Non-Potable Water / Wastewater
3. Environmental Analyses / Air and Emissions
4. Environmental Analyses / Solid And Hazardous Waste

B. New York State Department of Health, ASP Certification

ASP / CLP Inorganic and Organic Analysis

C. State of New Jersey, Department of Environmental Protection (NJDEP # 12013):

1. Potable Water
2. Non-Potable Water
3. Solid and Hazardous Waste
4. CLP

D. State of Oklahoma, Department of Environmental Quality (# 9705)

1. Drinking Water
2. Wastewater
3. Solid

E. State of Connecticut Department of Health (# PH 0649)

1. Potable Water
2. Wastewater
3. Sewage
4. Effluent
5. Soil
6. Trade Waste

F. State of Rhode Island (#232)

G. USDA
Soil Permit-Expires June, 2005

7.0 LABORATORY ORGANIZATION AND MANAGEMENT STRUCTURE

Prior to start of any analytical work on any project, the requirements of the client and Statement of Work are fully discussed among project manager, supervisors, analysts, and the staff assigned to the project. During these meetings laboratory personnel are familiarized with the requirements, and are asked to participate in the planning and implementation of the project.

Chemtech uses a Project Management system to plan, coordinate, integrate and monitor project activities. Efficient and effective project management is critical to the successful execution of any contract and to building lasting customer relationships. To assure that there is a clear and specific understanding of all the technical and administrative aspects of a project, an initial "project kick off meeting" is scheduled with the customer and our project management team.

At Chemtech, Project Management Teams are organized as a unit separate from laboratory operations. In this manner, laboratory project managers work with the customer to address the project requirements and with the laboratory operations staff to schedule and track the project's progress. Our Technical Director is an integral part of the Project Management Team. His responsibilities include the review of all technical issues as they relate to analytical protocols and regulatory requirements.

This team approach to project management provides the customer with a team of qualified laboratory professionals who can answer all questions and solve problems in a responsive manner.

As soon as samples are scheduled to arrive at the laboratory the Laboratory Supervisor, QA/QC Supervisor, and Laboratory Manager are notified. Laboratory procedures and personnel involved shall be reviewed and analysts shall be scheduled to process the upcoming workload.

After the samples arrive in the laboratory, the sample custodian will check the containers, verifying the content. He will follow the SOP for sample receipt, making sure that all the necessary documents have been received, and that all the information is correct, and all the samples are in good condition. In case any problem is encountered, the information will be given to the Laboratory Manager, who will call the project officer in charge, for further guidance. Upon adopting the project officer's recommendations regarding the found discrepancies, or if all the documentation and samples are in a good condition, the sample custodian will sign and date the chain-of-custody form and will start the logging-in process. The samples will be logged into the computer according to the SOP. Log page, and labels will be produced. The labels will be placed on each appropriate bottle, and they will be matched to the information on the bottles for the second time. These labels shall contain the project sample numbers, and Chemtech case and sample numbers. The log pages will be placed in the case folders and a copy will be given to Laboratory Manager.

The Laboratory Manager at this point will prepare the sample preparation log page. This sheet will be reviewed by the QA/QC Supervisor for completeness. This sheet will list all of the samples of the same matrix.

Sample log pages will indicate the matrices of the samples, project sample and case numbers, Chemtech sample and case numbers, dilution factors, balance standardization check weight (in case of digestion by weight), and name of the analyst. The Laboratory Supervisor shall oversee the sample preparation and make sure that all the requirements of the contract are fully implemented. He also will check by estimation the sample volume for liquids and sample weight for soil and sludges, ensuring adequate sample volume for completion of the analyses.

After completion of sample preparation, the digestion log page will be signed and dated by the analyst. The digestion log page is submitted to the QA/QC Supervisor and is placed in the permanent case folder, in order to be sent out as part of the documentation.

Analysts will start the analyses for indicated parameters utilizing contract required instrumentation, and methodologies.

Sample duplicates, spikes and all the other QC involved shall be completed. If at any time any analyst has a problem with any part of the analysis, he will contact the Laboratory Manager and QA/QC Supervisor requesting guidance.

All the information regarding the analyses shall be recorded in permanent logbooks and a copy of these log pages will be placed in the folder, as part of the submittal. If at any time there is a problem with one of instruments, the analysis will be performed on the back -up unit. Every instrument and every analyst performing the analyses has at least one backup. When necessary the laboratory has and will operate twenty -four hours in three consecutive shifts per day, seven days a week.

After each section of the analyses is completed, the computer printout containing the results and all information pertaining to the case, with the analyst's signature shall be submitted to the QA/QC Supervisor. QA/QC will immediately review the printout making sure that all the contract requirements have been met.

All analytical data produced by the analysts are reviewed by the QA/QC Supervisor for completeness, correctness, and contractual requirements. After completion of reviewing the data it is then given to data reduction personnel for reporting. After the case is complete it is again reviewed by the QA/QC Supervisor. If everything is correct it will be submitted to the Laboratory Manager for final review and signature.

8.0 PERSONNEL QUALIFICATIONS

Emanuel Hedvat, President - Mr. Hedvat is responsible for the management of the laboratory. His responsibilities include establishing the objectives of the laboratory including the planning and implementation required to meeting the objectives. Mr. Hedvat has a BS & MS in Chemistry and over 19 years of environmental laboratory experience.

Divya Mehta, Chief Operating Officer - Mr. Mehta is responsible for all the operating functions of the laboratory, including the overall technical performance and data quality. He also provides technical expertise and the resources as required to meet contractual requirements. Mr. Mehta has a BS & MS in Chemical Engineering and over 15 years of environmental laboratory experience.

Ravinder Bajwa, QA/QC Officer - Ms. Bajwa is responsible for the QA/QC programs and ensures compliance to all Standard Operating Procedures. She is also responsible for the data validation and reporting requirements. Ms Bajwa has a Ph. D. in Environmental Science and over 10 years of research, teaching and environmental laboratory experience.

Sarav Patel, Systems Manager - Mr. Patel is responsible for managing and updating all computer systems used in the laboratory, including the LIMS. He is also responsible for generating and updating the automated process for laboratory deliverables, including coordinating the preparation of all electronic deliverables. Mr. Patel has a BS in Computer Science and over 4 years of laboratory computer experience.

Thomas Mancuso, Laboratory Director & Organic Manager - Mr. Mancuso is responsible for managing the day to day functions of the laboratory including the accurate and timely reporting of data in compliance with the regulatory requirements. He is also in charge of the Organic Department, including Sample Prep, GC and GC/MS. Mr. Mancuso has a BS in Chemistry and over 18 years of environmental laboratory experience.

Hamex Patel, Inorganic Manger - Mr. Patel is in charge of the Inorganic Department, including Sample Prep, Wet Chemistry and Trace Metals. He is responsible for managing the day to day functions of the department including scheduling data processing and data quality. Mr. Patel has a BS in Chemical Engineering over 3 years of environmental laboratory experience.

9.0 QUALITY ASSURANCE OVERVIEW

Chemtech, operate under a quality assurance program which covers every level of the company and controls all aspects of the analytical laboratory measurement and reporting process. The Chemtech Quality Assurance/Quality Control (QA/QC) Manual governs the operations of all Chemtech analytical laboratories.

9.1 Quality Policy

Chemtech is committed to the production of analytical data meeting specific defined quality standards and to continue improvements in all areas of our operation. As a result of having a focus on environmental analyses, an emphasis is placed on timelines of work, meeting data quality objectives, and the legal defensibility of the data. Each operation maintains a local perspective in its scope of services and client relations and maintains a national perspective in terms of quality. Under the guidance of this quality assurance manual, a level of quality, which is acceptable on a national and international scale, is upheld in all Chemtech laboratory operations.

The corporate goal for all segments of Chemtech operations is to have uniform products and service quality standards, while encouraging local variation to meet state regulations and customer specifics needs. The process of achieving this goal entails continuous evaluation and action. Chemtech management requires documentation of existing practices and improvement action plans at every stage in the analytical measurement process. Documentation is fundamental to the demonstration and management of quality practices in environmental analytical laboratories.

A spirit of innovation is an essential element to the success of Chemtech in solving the complicated analytical problems encountered with environmental samples. This spirit, combined with the discipline and attention to detail required to provide the level of service expected by our customers, is what makes Chemtech stand out among others in this field. This same spirit is what drives continuous quality improvement and which is the keystone to the Chemtech quality program.

9.2 Quality System

Chemtech has established and maintains a comprehensive quality systems appropriate to the environmental analyses and related services that it performs. The elements of the system are documented and made available for use by all laboratory personnel. Laboratory management is committed to production of data in conformance with Chemtech documented Standard Operating Procedures and the Chemtech Quality Assurance/Quality Control (QA/QC) Manual.

Documentation of policies and procedures relating to analytical methods and QA/QC are provided in various documents. Figure 1.1. lists the documents, the responsible persons, purpose, scope of application, and period of review.

In the event of conflict or discrepancy among policies the order of precedence is as follows:

1. Chemtech Quality Assurance Policy Manual

2. Chemtech Quality Assurance/Quality Control Manual

3. Corporate SOPs except where local addenda modify requirements.

4. Local SOPs (required when a corporate SOP is unavailable)

5. Other (help notes, flow charts and condensed procedures)

Responsibility for implementation resides with the President and Laboratory/Operation Directors at each location.

9.3 Mission

Chemtech mission is to provide analytical laboratory and sampling support in the fields of environmental engineering, hydrogeology, geology, and risk assessment. Chemtech clients include a wide range of engineering and consulting firms, private industry, and the Federal Government.

Chemtech can provide comprehensive nationwide solutions to complex analytical problems, making available the specialties developed in each laboratory as well as the back-up analytical capacity for large scale projects.

9.4 Fields of Testing Covered

The methods specifically covered by this manual include the most frequently requested air, water, industrial waste, and soil methodologies currently needed to provide environmental analytical testing and sampling services in the United States. The approach of this manual is o provide an "Chemtech/minimum" level of quality assurance and quality control across all methods. All methods performed by Chemtech shall meet these minimum criteria where applicable. In some instances, Quality Assurance project plans (QAPPs), project specific data quality objectives (DQOs) or local regulations may require more stringent criteria than those contained in this manual. In these cases the laboratory will abide by the more stringent criteria following review and acceptance of the requirements by the Laboratory Director and the laboratory Quality Assurance Manage.

9.5 Laboratory Operations Covered

The manual contains detailed operational procedures for all phases of sample handling, analysis and data reporting in the laboratory. Sampling services are not provided by Chemtech, however specifications for sampling containers provided by Chemtech and other protocols pertinent to verification of the integrity of samples as received are covered in this manual.

9.6 Management of the Manual

The Corporate Technical Director will address all comments and requests to change or add to the manual.

10. PROJECT EXPERIENCE

Client and Address	Contracting Officer/Phone Number	Contract Number/Name	Type of Contract	Period of Performance	Value of Contract
USEPA Cont. Mgmt. Res. Triangle Pk, NC	Chris Baker (919) 541-2519	68-D5-0166 3 Bid Lots	CLP Analyses of Multimedia samples for TAL Metals	9/21/96 - open	1,655,400
Foster Wheeler Langhorne, PA	Meg Watson (215) 752-4000	Navy RAC NORTHDIV N62472-94D-0398	Analysis of Water, Soil andWaste at various sites. TCL/TAL/Form U/Rush TAT	10/98 - Present	275,000
CH2M Hill Herndon, VA	Ann West (703) 471-1441	39-3LL7.0-DAS Navy CLEAN II I/R	Analysis of Soil, Water, Air & Haz-Waste at various sites in LANTDIV	11/96 - open	350,000/year
BEM Systems Florham Park, NJ	Shobba Bodhu (201) 301-0078	NJ Transit Waterfront	TCL/TAL analyses of Soil & G'water. EPA level IV w/ GIS EDD	6/95 - open	1,500,000
ICF Kaiser Edgewood, MD	Eric Malarek (410) 612-6322	Radford Army Ammunition Plant	G'water monitoring analysis for TCL/TAL/Explosives	3/98 - Open	90,000
IT Corp. Knoxville, TN	Allen Bradley (423) 690-3211	Tinker Air Force Base	Basewide contract for yearly analysis of Mon.Wells	5/98 - 1-99	700,000
NYC Transit Auth. Brooklyn, NY	Josephine Brown (718) 243-4581	95F6227	Sampling & Analysis of Water, Soil & Air at various depots	3/1/96-3/1/99	225,000
Arecon, Ltd. Bordentown, NJ	Patrick Nocera (609) 298-0770	Square D Industries	Analysis of TCL/TAL/Air for Remediation project	6/97 - Open	276,000
Earth Tech, Inc. Richmond, VA	Cathy Mahone (804) 358-5858	US EPA Region II & III ERSS Contract	Analysis of Haz-Waste samples for TCL/TAL/TCLP	9/97 - Open	350,000

11. REFERENCES

Federal Programs References

Client	Contact/Phone #	Project/Contract	Value of Contract ($)
US EPA Research Triangle Pk., NC	Chris Baker 919-541-2519	68-D5-0166 CLP - 3 Bid Lots	1,655,400.00
CH2M Hill Herndon, VA	Ann West 703-471-1441	39-3LL7.0-DAS Navy CLEAN II I/R	350,000.00/Year
Foster Wheeler Env. Langhorne, PA	Meg Watson 215-702-4039	Trenton NAWC Warminster NAWC	275,000.00
ICF Kaiser Engineers Fairfax, VA	Davida Trumbo 703-934-3996	Radford Army Ammunition Plant	90,000.00
TetraTech, NUS Oklahoma City, OK	Scott Boling 405-741-7803	Tinker Air Force Base Oklahoma City, OK	250,000.00

Commercial References

Client	Contact/Phone #	Project/Contract	Value of Contract ($)
BEM Systems, Inc. Florham Pk., NJ	Shobbha Boddu 201-301-0078	NJ Transit	1,500,000.00
Earth Tech, Inc. Richmond, VA	Cathy Mahone 804-358-5858	US EPA Regions II and III Emergency Response	300,000.00
Foster Wheeler Env. Langhorne, PA	Bryan Sladky 215-702-4000	PA DEP G-Tech Furlong, PA	40,000.00
NYC Transit Authority Brooklyn, NY	Josephine Brown 718-243-4581	95F6227 Analysis of Soil, Air and Water, ASP Protocol	225,000.00
Arecon, Ltd. Bordentown, NJ	Patrick Nocera 609-298-0770	The NY/NJ Port Authority-Newark 72 Hrs. TAT - CLP	230,000.00

Appendix F

Laboratory Analytical Protocols

ORGANIC MDL/PQL INFORMATION 8/28/00

CAS#	COMPOUND NAME	MATRIX	ppb MDL	ppb PQL	METHOD
75-71-8	Dichlorodifluoromethane	LOW SOIL	3.3	5	
74-87-3	Chloromethane	LOW SOIL	2.8	5	
75-01-4	Vinyl Chloride	LOW SOIL	1.8	5	
74-83-9	Bromomethane	LOW SOIL	1.9	5	
75-00-3	Chloroethane	LOW SOIL	2.3	5	
75-69-4	Trichlorofluoromethane	LOW SOIL	1	5	
75-35-4	1,1-Dichloroethene	LOW SOIL	1.6	5	
67-64-1	Acetone	LOW SOIL	5.8	5	
75-15-0	Carbon Disulfide	LOW SOIL	1	5	
75-09-2	Methylene Chloride	LOW SOIL	1.1	5	
156-60-5	trans-1,2-Dichloroethene	LOW SOIL	1.7	5	
108-0504	Vinyl Acetate	LOW SOIL	6.1	5	
75-34-3	1,1-Dichloroethane	LOW SOIL	1	5	
78-93-3	2-Butanone	LOW SOIL	5.6	5	
549-20-7	2,2-Dichloropropane	LOW SOIL	1.1	5	
156-59-2	cis-1,2-Dichloroethene	LOW SOIL	1.8	5	
74-97-5	Bromochloromethane	LOW SOIL	1.6	5	
67-66-3	Chloroform	LOW SOIL	1	5	
71-55-6	1,1,1-Trichloroethane	LOW SOIL	1.5	5	
563-58-6	1,1-Dichloropropene	LOW SOIL	1.3	5	
56-23-5	Carbon Tetrachloride	LOW SOIL	1	5	
71-43-2	Benzene	LOW SOIL	1	5	
107-06-2	1,2-Dichloroethane	LOW SOIL	2.5	5	
79-01-6	Trichloroethene	LOW SOIL	2.8	5	
78-87-5	1,2-Dichloropropane	LOW SOIL	3.6	5	
74-95-3	Dibromomethane	LOW SOIL	1	5	
75-27-4	Bromodichloromethane	LOW SOIL	1	5	
108-10-1	4-Methyl-2-Pentanone	LOW SOIL	3	5	
108-88-3	Toluene	LOW SOIL	1.2	5	
10061-02-6	t-1,3-Dichloropropene	LOW SOIL	1.7	5	
10061-01-5	cis-1,3-Dichloropropene	LOW SOIL	1	5	
79-00-5	1,1,2-Trichloroethane	LOW SOIL	1.1	5	
142-28-9	1,3-Dichloropropane	LOW SOIL	1	5	
110-75-8	2-Chloroethyl vinyl ether	LOW SOIL	9.6	5	
591-78-6	2-Hexanone	LOW SOIL	12	5	
124-48-1	Dibromochloromethane	LOW SOIL	1	5	
106-93-4	1,2-Dibromoethane	LOW SOIL	1	5	
127-18-4	Tetrachloroethene	LOW SOIL	1.6	5	
108-90-7	Chlorobenzene	LOW SOIL	1	5	
630-20-6	1,1,1,2-Tetrachloroethane	LOW SOIL	1.5	5	
100-41-4	Ethyl Benzene	LOW SOIL	1.5	5	
1330-20-7	m/p-Xylenes	LOW SOIL	1.5	5	
95-47-6	o-Xylene	LOW SOIL	1.7	5	

100-42-5	Styrene	LOW SOIL	1	5
75-25-2	Bromoform	LOW SOIL	1	5
98-82-8	Isopropylbenzene	LOW SOIL	1	5
79-34-5	1,1,2,2-Tetrachloroethane	LOW SOIL	2.2	5
96-18-4	1,2,3-Trichloropropane	LOW SOIL	2.2	5
108-86-1	Bromobenzene	LOW SOIL	1	5
103-65-1	n-propylbenzene	LOW SOIL	1	5
95-49-8	2-Chlorotoluene	LOW SOIL	1	5
108-67-8	1,3,5-Trimethylbenzene	LOW SOIL	1	5
106-43-4	4-Chlorotoluene	LOW SOIL	1	5
98-06-6	tert-Butylbenzene	LOW SOIL	1	5
95-63-6	1,2,4-Trimethylbenzene	LOW SOIL	1	5
135-98-8	sec-Butylbenzene	LOW SOIL	1	5
99-87-6	p-Isopropyltoluene	LOW SOIL	1	5
541-73-1	1,3-Dichlorobenzene	LOW SOIL	1	5
106-46-7	1,4-Dichlorobenzene	LOW SOIL	1	5
1045-10-8	n-Butylbenzene	LOW SOIL	1	5
95-50-1	1,2-Dichlorobenzene	LOW SOIL	1	5
96-12-8	1,2-Dibromo-3-Chloropropane	LOW SOIL	2.1	5
120-82-1	1,2,4-Trichlorobenzene	LOW SOIL	1	5
87-68-3	Hexachlorobutadiene	LOW SOIL	1	5
91-20-3	Naphthalene	LOW SOIL	1	5
87-61-6	1,2,3-Trichlorobenzene	LOW SOIL	1.8	5

75-71-8	Dichlorodifluoromethane	MED SOIL	230	625
74-87-3	Chloromethane	MED SOIL	400	625
75-01-4	Vinyl Chloride	MED SOIL	510	625
74-83-9	Bromomethane	MED SOIL	270	625
75-00-3	Chloroethane	MED SOIL	340	625
75-69-4	Trichlorofluoromethane	MED SOIL	230	625
75-35-4	1,1-Dichloroethene	MED SOIL	190	625
67-64-1	Acetone	MED SOIL	800	625
75-15-0	Carbon Disulfide	MED SOIL	220	625
75-09-2	Methylene Chloride	MED SOIL	170	625
156-60-5	trans-1,2-Dichloroethene	MED SOIL	290	625
108-0504	Vinyl Acetate	MED SOIL	600	625
75-34-3	1,1-Dichloroethane	MED SOIL	210	625
78-93-3	2-Butanone	MED SOIL	390	625
549-20-7	2,2-Dichloropropane	MED SOIL	270	625
156-59-2	cis-1,2-Dichloroethene	MED SOIL	170	625
74-97-5	Bromochloromethane	MED SOIL	240	625
67-66-3	Chloroform	MED SOIL	230	625
71-55-6	1,1,1-Trichloroethane	MED SOIL	230	625
563-58-6	1,1-Dichloropropene	MED SOIL	260	625
56-23-5	Carbon Tetrachloride	MED SOIL	250	625
71-43-2	Benzene	MED SOIL	130	625
107-06-2	1,2-Dichloroethane	MED SOIL	230	625
79-01-6	Trichloroethene	MED SOIL	130	625
78-87-5	1,2-Dichloropropane	MED SOIL	130	625
74-95-3	Dibromomethane	MED SOIL	220	625
75-27-4	Bromodichloromethane	MED SOIL	200	625

541-73-1	1,3-Dichlorobenzene	MED SOIL	170	625
106-46-7	1,4-Dichlorobenzene	MED SOIL	190	625
1045-10-8	n-Butylbenzene	MED SOIL	170	625
95-50-1	1,2-Dichlorobenzene	MED SOIL	220	625
96-12-8	1,2-Dibromo-3-Chloropropane	MED SOIL	380	625
120-82-1	1,2,4-Trichlorobenzene	MED SOIL	140	625
87-68-3	Hexachlorobutadiene	MED SOIL	130	625
91-20-3	Naphthalene	MED SOIL	200	625
87-61-6	1,2,3-Trichlorobenzene	MED SOIL	180	625

Client:	Client ID:
Date received:	Laboratory ID:
Date extracted:	Matrix: Soil
Date analyzed:	ELAP #:

EPA METHOD 8260

Parameter	CAS No.	Results ug/kg
BENZENE	71-43-2	<5
BROMOBENZENE	108-86-1	<5
BROMOCHLOROMETHANE	74-97-5	<5
BROMODICHLOROMETHANE	75-27-4	<5
BROMOFORM	75-25-2	<5
BROMOMETHANE	74-83-9	<5
n-BUTYLBENZENE	104-51-8	<5
sec-BUTYLBENZENE	135-98-8	<5
tert-BUTYLBENZENE	98-06-6	<5
CARBON TETRACHLORIDE	56-23-5	<5
CHLOROBENZENE	108-90-7	<5
CHLORODIBROMOMETHANE	124-48-1	<5
CHLOROETHANE	75-00-3	<5
CHLOROFORM	67-66-3	<5
CHLOROMETHANE	74-87-3	<5
2-CHLOROTOLUENE	95-49-8	<5
4-CHLOROTOLUENE	106-43-4	<5
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	<5
1,2-DIBROMOETHANE	106-93-4	<5
DIBROMOMETHANE	74-95-3	<5
1,2-DICHLOROBENZENE	95-50-1	<5
1,3-DICHLOROBENZENE	541-73-1	<5
1,4-DICHLOROBENZENE	106-46-7	<5
DICHLORODIFLUOROMETHANE	75-71-8	<5
1,1-DICHLOROETHANE	75-34-3	<5
1,2-DICHLOROETHANE	107-06-2	<5
1,1-DICHLOROETHENE	75-35-4	<5
cis-1,2-DICHLOROETHENE	156-59-2	<5
trans-1,2-DICHLOROETHENE	156-60-5	<5

Client:	Client ID:
Date received:	Laboratory ID:
Date extracted:	Matrix: Soil
Date analyzed:	ELAP #:

EPA METHOD 8260

Parameter	CAS No.	Results ug/kg
1,2-DICHLOROPROPANE	78-87-5	<5
1,3-DICHLOROPROPANE	142-28-9	<5
2,2-DICHLOROPROPANE	594-20-7	<5
1,1-DICHLOROPROPENE	563-58-6	<5
ETHYLBENZENE	100-41-4	<5
HEXACHLOROBUTADIENE	87-68-3	<5
ISOPROPYLBENZENE	98-82-8	<5
p-ISOPROPYLTOLUENE	99-87-6	<5
METHYLENE CHLORIDE	75-09-2	<5
NAPHTHALENE	91-20-3	<5
n-PROPYLBENZENE	103-65-1	<5
STYRENE	100-42-5	<5
1,1,1,2-TETRACHLOROETHANE	630-20-6	<5
1,1,2,2-TETRACHLOROETHANE	79-34-5	<5
TETRACHLOROETHENE	127-18-4	<5
TOLUENE	108-88-3	<5
1,2,3-TRICHLOROBENZENE	87-61-6	<5
1,2,4-TRICHLOROBENZENE	120-82-1	<5
1,1,1-TRICHLOROETHANE	71-55-6	<5
1,1,2-TRICHLOROETHANE	79-00-5	<5
TRICHLOROETHENE	79-01-6	<5
TRICHLOROFLUOROMETHANE	75-69-4	<5
1,2,3-TRICHLOROPROPANE	96-18-4	<5
1,3,5-TRIMETHYLBENZENE	108-67-8	<5
1,2,4-TRIMETHYLBENZENE	95-63-6	<5
VINYL CHLORIDE	75-01-4	<5
ACETONE	62-64-1	<5
CARBON DISULFIDE	75-15-0	<5
2-BUTANONE	78-93-3	<5
VINYL ACETATE	108-05-4	<5
2-HEXANONE	591-78-6	<5
XYLENES (TOTAL)	1330-20-7	<15

Laboratory Director

Appendix G

Generic Community Air Monitoring Plan

New York State Department of Health
Generic Community Air Monitoring Plan

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

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

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

Community Air Monitoring Plan

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

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

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

VOC Monitoring, Response Levels, and Actions

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

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

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

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

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

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

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

June 20, 2000

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Appendix H

Resumes of Key Personnel

PERSONAL PROFESSIONAL QUALIFICATIONS

CHARLES J. VOORHIS, CEP, AICP

Licensing and Certification:

Certified Environmental Professional (CEP)
American Institute of Certified Planners (AICP)
Certified Environmental Inspector, Environmental Assessment Association
US Coast Guard Master Steam and Auxiliary Sail Vessels

Experience:

- Managing Partner of Firm, Nelson, Pope & Voorhis, LLC; Melville, New York (1/97-Present)
- Principal of Firm, Charles Voorhis & Associates, Inc.; Miller Place, New York (8/88-1/97)
- Director, Division of Environmental Protection, Department of Planning, Environment and Development; Town of Brookhaven, New York (3/86-8/88)
- Environmental Analyst, Division of Environmental Protection, Department of Planning, Environment and Development; Town of Brookhaven, New York (8/82-3/86)
- Private and Public Consultant, Planning and Environmental Issues (8/82-3/87)
- Public Health Sanitarian, Suffolk County Department of Health Services; Hauppauge, New York (1/80-8/82)
- Environmentalist I, Suffolk County Department of Environmental Control, Central Islip, New York (2/78- 8/79)

Education:

- SUNY at Stony Brook; Master of Science in Environmental Engineering, concentration in Water Resource Management, 1984
- Princeton Associates; Groundwater Pollution and Hydrology Short Course, Princeton, New Jersey, 1983
- New York State Health Department, Environmental Health Training Course, Hauppauge, New York, 1982
- Southampton College of Long Island University; Bachelor of Science in Environmental Geology, 1977

Significant Professional Achievements:

- Old Orchard Woods, DEIS and FEIS, 2000
- Town of Smithtown Armory Park, DEIS, 2000
- Town of Southold Water Supply Management & Water Protection Strategy, 2000
- CVS @ Greenlawn, DEIS and FEIS, 1998
- Knightsbridge Gardens, DEIS and FEIS, 1997
- Camelot Village @ Huntington, DEIS, 1997
- Airport International Plaza. DEIS and FEIS, 1996
- Patchogue Lace Mill, Phase I ESA, 1996
- Price Club @ New Rochelle, DEIS and FEIS, 1995
- Commack Campus Park @ Commack DEIS and FEIS, 1994
- Water Mill Shops @ Water Mill DEIS, 1993
- PJ Venture Wholesale Club @ Commack DEIS and FEIS, 1993
- Dowling College NAT Center DEIS and FEIS, 1992
- Final EIS Angel Shores @ Southold, 1991
- Town of Brookhaven Boat Mooring Plan, 1991
- Draft EIS Round Hill @ Old Westbury, 1990
- Draft EIS St. Elsewhere @ Nesconset, 1989
- GEIS Commercial Rezonings on the Towns Own Motion, 1988
- GEIS Large Lot Rezonings on the Towns Own Motion, 1988
- Award for Environmentally Sensitive Land Design, Pine Barrens Review Comm., 1988
- EQBA, Acquisition Study for Brookhaven Town, 1987
- Town of Brookhaven Land Use Plan, 1987
- Discussion of Hydrogeologic Zone Boundaries in the Vicinity of S. Yaphank, LI, NY, 1986
- Duck Farms in Brookhaven Town, Land Restoration Techniques, 1985
- Coastal Energy Impact Program, 1984
- Comprehensive Review of Industrial Zoned Land in the Sensitive Hydrogeologic Zone, Town of Brookhaven, 1983
- Groundwater Supply and Early Groundwater Use in Brookhaven Township, Suffolk County, New York 1983

Professional & Other Organizations (past and present):

- American Institute of Certified Planners
- American Planning Association, Washington, D.C.
- National Association of Environmental Professionals, Alexandria, VA
- Environmental Assessment Association, Scottsdale, Arizona
- American Water Resources Association, Syracuse, New York
- National Water Well Association, Worthington, Ohio
- New York Planning Federation, Albany, New York
- New York Water Pollution Control Association, Riverdale, New York
- Water Pollution Control Federation, Washington, D.C.
- Long Island Seaport & EcoCenter, Inc., Director, Port Jefferson, NY
- Boy Scouts of America, Trained Scoutmaster, Nathanial Woodhull District, NY
- Historical Society of Port Jefferson, Trustee, Port Jefferson, NY
- Environmental Conservation Board, Village of Port Jefferson, NY
- Port Jefferson Village, Waterfront Advisory Committee, Port Jefferson, NY

- Town of Brookhaven Mount Sinai Harbor Advisory Committee, Medford, NY
- Brookhaven Conservation Advisory Council, Medford, New York

PERSONAL PROFESSIONAL QUALIFICATIONS

Eric C. Arnesen, P.G.

Education:

State University of New York at Stony Brook, Masters of Science, Hydrogeology (2000).
State University of New York at Cortland Bachelors of Science, Geology (1988).

Experience:

- Hydrogeologist, Nelson, Pope & Voorhis, LLC, Melville, NY (1999-Present). Responsible for providing technical and professional expertise for Phase I, II, III, RI/FS studies, ESAs, EISs and EAFs regarding groundwater, surface water, soil and solid waste issues. Involved in all phases of stormwater permitting.

- Hydrogeologist, Fanning, Phillips and Molnar, Ronkonkoma, NY (1998-1999). Field coordination and management of delineation and long-term monitoring programs for Air Force Center for Environmental Excellence (AFCEE) at United States Air Force Bases.

- Hydrogeologist, ERM-Northeast, Woodbury, NY (1993-1998). Field coordination and management of Phase I and II Investigation studies. Field Manager of RI/FSs, removal actions and plume delineation studies under jurisdiction of USEPA, USDOE and NYSDEC.

- Geologist/Hydrogeologist Roux Associates, Huntington, NY (1988-1993). Involved in over 30 Phase I and II investigations in all aspects of participation.

Professional Achievements:

- Conducted several Draft EISs for major development projects on Long Island which included the development of a 600,000 sq ft industrial facility on a 78 acre parcel within the Central Pine Barrens Compatible Growth Area in Yaphank and a PRC complex on a 74 acre parcel within the Central Pine Barrens Compatible Growth Area in Eastport. Considered variety of environmental resources including water, geology, soils ecology community, aesthetics, transportation, cultural, zoning, land use and planning. Evaluated impacts developments may have on these resources and proposed mitigation measures to reduce impacts. Also evaluated alternatives to proposed project to determine most appropriate and feasible development approach. Presented finding during public information meetings sponsored by Town planning boards

- Prepared several Draft EISs for the State Education Department (SED) related to the expansion and/or construction of educational facilities. Specifically, conducted an environmental review and authored the Draft EIS related to the proposed construction of a new Middle School for the Hewlett-Woodmere School District, High School expansion for the Center Moriches School District, construction for a proposed new public library in South Huntington and expansion of the Baldwin Public Library. Reviewed and analyzed potential project impacts on environmental resources, demography, public services, traffic patterns, cultural resources, aesthetics and surrounding land use. Outlined measures to be undertaken to mitigate any negative impact which may have resulted from each project.

- Conducted Part III EAF's for several development proposals including PRCs, multiple retail outlets, restaurants and apartment complexes. Addressed issues outlined in scoping documentation which include groundwater, topography, ecology, transportation cultural resources, aesthetic resources, community services, community character, sanitary disposal, etc. Analyzed impact development has on these resources and proposed mitigation measures to alleviate negative effects..

- Prepared Compatible Growth Area Application package for a Development of Regional Significance related to the construction of a light industrial facility in the Central Pine Barrens Region on Long Island, New York. Provided information requested by Central Pine Barrens Commission to ensure compliance with the standards and guidelines outlined in the Central Pine Barrens Comprehensive Land Use Plan.

- Conducted RI/FS for a electroplating facility in Farmingdale, New York. Prepared RI/FS report in accordance with NYSDEC requirements for the evaluation of remedial alternatives related to impacts to soils and groundwater. Evaluated technical data for the proposal of several remedial alternatives which included groundwater pump and treat, capping, excavation and encapsulation.

- Conducting RI/FS for an EPA listed Super Fund site in Port Jefferson, New York. Currently involved in work plan phase of process which outlines investigative approach and scope as well as risk evaluation according to EPA protocols.

- Supervised and conducted field activities related to several RI/FS and Phase II studies for a variety of facilities which include government installations, dry cleaners, and industrial facilities. Oversaw all aspects of field investigation including well and boring installations, sampling activities, geophysical studies and hydrogeological studies (pump tests, step tests, stratigraphic mapping, etc.)

Professional Affiliations:

- National Groundwater Association, 1989 to Present

Certifications

- Certified Professional Geologist, Tennessee Department of Commerce, Certification # 4471, 1999 to Present.

LONG
ISLAND
ANALYTICAL
LABORATORIES INC.

"TOMORROWS ANALYTICAL SOLUTIONS TODAY"

NYSDOH ELAP# 11693
USEPA# NY01273

Curriculum Vitae
Of
Michael D. Veraldi
Long Island Analytical Laboratories

Michael Veraldi
Laboratory Director of
Long Island Analytical Laboratories Inc.
101-4 Colin Drive, Holbrook, NY 11741

Work Related Experience:

Mr. Veraldi has over 17 years of experience as a chemist in the environmental field and has been a New York State Department of Health (NYSDOH) Certified Environmental Laboratory Director for the past 10 years. Mr. Veraldi, in partnership with Mr. Domenik Veraldi Jr., founded Long Island Analytical Laboratory (LIAL) a NYSDOH certified laboratory and consulting firm in Holbrook, New York. LIAL offers a variety of services including subsurface investigations, groundwater surveys, hazardous, and non hazardous remediation as well as analytical services to all levels of governmental agency's (i.e. NYSDEC, EPA, SCDH, NCDH).

Mr. Veraldi has 12 years of experience working for two New York State Licensed Hazardous Waste Treatment, Storage and Disposal Facilities (TSDF) on Long Island (KBF Pollution Management Inc. of Farmingdale, and Republic Environmental Systems of New York). Mr. Veraldi has established an excellent repour with NYSDEC, SCDH, and NCDH over the years by working interactively with these agencies. Mr. Veraldi has worked with regulatory agencies on groundwater remediation projects, underground storage tank removals and installations, large and small releases of petroleum products and/or hazardous materials.

Certifications/Affiliations:

- **NYS Department of Health Environmental Laboratory Director #11693**
- **Department of Health and Human Services #15668**
- **American Industrial Hygiene Association #15668**
- **Occupational Safety and Health Administration 40 hour course**
- **Occupational Safety and Health Administration Supervisor course**
- **Member of the Chemical Society**
- **Member of Applied Chemist Society**
- **Member of National Groundwater Association**
- **NYSDOL Asbestos Inspectors License AH 96-18417**

Following is a partial list of the most current cases for which Mr. Veraldi has provided expert testimony or an affidavit.

Insurance Carrier	Case	Legal Firm
Empire Insurance	Pichardo #7570EMP	Armienti, Brooks & Dunphy
Empire Insurance	Morales #EML0019	Armienti, Brooks & Dunphy
Empire Insurance	Hartley #7761EML	Armienti, Brooks & Dunphy
Empire Insurance	Davis #826394EML	Armienti, Brooks & Dunphy
Empire Insurance	Shepherd #EML0141	Armienti, Brooks & Dunphy
Investors Insurance Group	Lopez #IIG0643	Armienti, Brooks & Dunphy
Royal Insurance	Andino #RYL0323	Armienti, Brooks & Dunphy
Prudential Insurance	Ramos #PWI0009	Armienti, Brooks & Dunphy
Empire Insurance	Reves #EML8069	Armienti, Brooks & Dunphy
Empire Insurance	Morgan #8158EML	Armienti, Brooks & Dunphy
Travelers Insurance Group	Jones #TIC9452	Armienti, Brooks & Dunphy
Empire Insurance	Randolph #EM225	Executive Claim Services
Transtate Insurance Company	Rodriguez	Roura & Melamed
Lion Claims	Dula RVP/4000	Pino Associates
LTD, Inc.	Lowery #250	Garritty, Graham & Favetta
Transtate Insurance Company	Con Edison #126-908	Helfer, Helfer, Kardisch
AIG Insurance Group	Con Edison #124-456	Goldberg & Marin

Michael D. Veraldi
5 Almike Drive
Centereach, NY 11720
(631) 585-3701

EDUCATION:

State University of New York at Farmingdale,
Farmingdale, New York 11735
A.A.S. Biological Technology, December 1984

State University of New York at Stony Brook,
Stony Brook, New York 11794
B.S. Biological Sciences/Chemistry, May 1987

WORK EXPERIENCE:

- **LABORATORY DIRECTOR**
  August 1998-Present
  Long Island Analytical Laboratories, Inc.
  101-4 Colin Drive
  Holbrook, New York 11741

- **LABORATORY DIRECTOR**
  October 1993-August 1998
  American Analytical Laboratories, Inc.
  56 Toledo Street
  Farmingdale, New York 11735

- **GENERAL MANAGER**
  October 1992-October 1993
  Republic Environmental Systems
  Eastern Parkway
  Farmingdale, New York 11735

- **LABORATORY DIRECTOR**
  September 1988-October 1992
  KBF Pollution Management, Inc.
  1110 Farmingdale Road
  North Lindenhurst, New York 11757

- **LABORATORY CHEMIST**
  September 1987-August 1988
  Research Chemist
  KBF Pollution Management, Inc.
  1110 Farmingdale Road
  North Lindenhurst, New York 11757

- **LABORATORY TECHNICIAN**
  September 1985-September 1987
  State University at Stony Brook
  Ecology and Evolution Department
  Stony Brook, New York 11794

- **NATURALIST**
  Nassau County BOCES, outdoor education program
  Naturalist duties involved guided tours and educational
  Programs for elementary and high school students

- **BIOLOGICAL TECHNICIAN**
  December 1983-September 1984
  State University at Farmingdale
  Biology Department
  Duties included preparation of chemical solutions,
  Titrations, autoclaving, monitoring cultures, etc.

TRAVELS: Italy, Germany, Switzerland, Yugoslavia, Spain, France, England, Greece, Iceland, Canada, Austria, Ireland and Curacao

PERSONAL: Date of Birth December 15, 1962, excellent health

REFERENCES: Furnished upon request